THE DETERMINANTS OF ELECTRONIC VOTING ADOPTION: INDEPENDENT NATIONAL ELECTORAL COMMISSION OF NIGERIA EMPLOYEES' PERSPECTIVE

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Abstrak

Perkembangan teknologi telah menjadikan penggunaan teknologi maklumat dan peranti penyokong sangat penting dalam hampir semua aspek kehidupan. Namun, terdapat pengguna yang memilih untuk menolak sistem maklumat yang telah dibangunkan kerana beberapa faktor. Kos penolakan ini akan menjadi tinggi jika tidak dapat diselesaikan. Kajian ini menyelidik faktor penentu yang boleh mempengaruhi kejayaan penerimaan terhadap teknologi mengundi secara elektronik. Hal ini dilakukan dengan membuat kajian tinjauan ke atas perspektif pekerja dalam kalangan kakitangan pengurusan dan operasi suruhanjaya pilihan raya Nigeria untuk mengumpulkan data melalui kajian soal selidik. Berdasarkan kajian lepas mengenai penerimaan teknologi, empat faktor utama penentu atau pemboleh ubah adalah Kesediaan Teknologi, Kesediaan Organisasi, Faktor Persekitaran, dan Faktor Faedah yang Diperoleh. Semua faktor tersebut telah dikenal pasti daripada Teori Penyebaran Inovasi, Teori Kerangka Kerja Teknologi-Organisasi-Persekitaran dan model Iacovou et al. (1995) untuk membangunkan satu model penerimaan organisasi terhadap teknologi mengundi secara elektronik. Kajian lepas dalam bidang penerimaan teknologi juga telah mengenal pasti faktor-faktor penting lain yang mempengaruhi penerimaan teknologi. Faktor ini ialah Penglibatan Pengguna dalam Pembangunan Sistem serta Latihan ICT dan Kemahiran. Kajian ini juga mengembangkan model ini dengan dua faktor tersebut dan diuji untuk menjadi pengantara serta kesan tidak langsung dalam model hubungan menggunakan latihan ICT. Latihan ini menjadi faktor kritikal dalam kejayaan teknologi maklumat, terutamanya di negara-negara membangun seperti Nigeria berdasarkan kajian lepas. Model yang dicadangkan terdiri daripada sebelas hubungan struktur hipotesis (langsung dan tidak langsung). Sebanyak 500 soal selidik telah diedarkan untuk kajian ini dalam kalangan dua kategori utama responden, iaitu kakitangan pengurusan dan kakitangan operasi. Kajian ini menggunakan kaedah analisis Partial Least Structural Equation Modelling untuk mengkaji hubungan sebab dan akibat, hubungan pengantara dan sederhana antara pemboleh ubah tersembunyi. Hasil kajian menunjukkan bahawa semua faktor penentu mempengaruhi secara positif berjaya menerima teknologi mengundi secara elektronik. Berdasarkan keputusan yang diperolehi, model penerimaan teknologi maklumat yang dikenali sebagai E-Voting Adoption telah dicadangkan. Implikasi teori dan praktikal akhirnya dibincangkan, manakala cadangan untuk penyelidikan pada masa akan datang turut disyorkan.

Kata kunci: Penerimaan E-voting, Penggunaan teknologi maklumat,
Konteks organisasi, Pemodelan persamaan struktur

Abstract

The trend in the technological development has made the use of information technology and supporting devices mandatory in virtually all aspects of life. Yet the development of an Information system can be rejected by users due to several factors, that can be costly if left unsolved. This study investigates the determinant factors that can influence the successful adoption of electronic voting technology in the organisational context using the managerial and operational staff of the electoral commission for the data collection thorough a survey study. Based on previous studies on adoption of technology, four key determinants factors or variables i.e. Technological Readiness, Organisational Readiness, Environmental Factors, and Perceived Benefits were identified from theories of Diffusion of Innovations, Technology-Organisation-Environment framework, and Iacovou et al. (1995) model to develop a model of organisational adoption of electronic voting technology. Past studies in the area of technology adoption have equally identified other important factors that can influence adoption of technology such as user participation in system development and ICT training and Skills. The study extend the model with these two factors and tested for mediation and indirect effects in the model relationships using ICT training and Skills being a critical factors in the success of any information technology adoption, especially in the developing countries such as Nigeria as shown from previous studies. The proposed model consists of eleven hypothesized structural relationships-direct and indirect. A total of 500 questionnaires was distributed for this study between the two major categories, i.e. Managerial and operational staff. A Partial Least Structural Equation Modelling method of analysis was use to investigate the causal, mediating and moderating relationships between the latent variables. The results showed that all the determinants factors positively influence the electronic voting technology adoption success. Based on the results obtained, a model of information technology adoption known as E-voting adoption is proposed. The theoretical and practical implications were finally discussed, while necessary suggestions on future research were recommended.

Keywords: E-voting adoption, Information technology adoption, Organisational context, Structural equation modelling.

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Salimonu Rasheed Ishaq

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Glossary of Terms

E-voting Technology refers to the use of computers and other related equipment for votes casting in an election with the aims of increasing voter's participation, reducing the costs of elections and improving the accuracy of the election results.

IT Adoption IT Adoption refers to the application of Information and Communication Technologies (ICT) tools including computer hardware, software, and networks required for connecting to the internet in order to provide operational, managerial, and decision making supports in an organisation or to the users.

IT Innovations is the use of information technology in a creative ways to make organisation or users more efficient in order to improve the relationships between technology initiatives and the business or information technology goals.

List of Abbreviations

ACE	Administration and Cost of Elections
AVE	Average Variance Extracted
CB-SEM	Covariance-Based Structural Equation Modelling
CD	Compact Disk
CR	Composite Reliability
DOI	Diffusion Of Innovations
DRE	Direct Recording Electronic
DV	Dependent Variable
EAD	Electronic Voting Adoption
EF	Environment Factors
FIMIX-PLS	Finite Mixture- Partial Least Squares
GWIS	Government Wide Information System
ICT	Information Communication Technology
ICTSKILL	ICT Training and Skills
INEC	Independent National Electoral Commission
IPMA	Important Performance Matrix Analysis
IS	Information Systems
IT	Information Technology
IV	Independent Variable
IVS	Internet Voting Systems
KMO	Kaiser Meyer-Oklin
LV	Latent Variable
MGA	Multi Group Analysis
MOBS	Modified Open Ballot System
NNPIT	Nigerian National Policy for Information Technology
OBS	Open Ballot System
OMR	Optical Mark Recognition
OR	Organisational Readiness
OSBS	Open Secret Ballot System
OSVS	Optical Scan Voting System
PB	Perceived Benefits
PCA	Principal Component Analysis
PLS-SEM	Partial Least Squares Structural Equation Modelling
SBS	Secret Ballot System
SMART	Speed, Moral, Accountable/Accurate, Responsive and Transparent
SPSS	Statistical Package for Social Science
TOE	Technology Organisation Environment
TR	Technological Readiness
UPSD	User Participation in Systems Developement
VIF	Variance Inflation Factor
VVPAT	Voter-Verified Paper Audit Trail

CHAPTER ONE
INTRODUCTION

1.1 Background of the study

Paper voting (non-electronic voting) technology, the oldest and most popular voting system used by democratic countries the world over, has not been able to establish the voter's intents and to accurately translate the intents into a final tally or count in a convenient way for voters due to the scale and complexity of election. This has brought about decline in the voters turnout and apathy towards elections in most democracies (Burmester & Magkos, 2003; Merighi & Ravaioli, 2009). This has equally led to vote manipulation, ballot stuffing, ballot snatching, and outright vote stealing, among others, in most developing democracies, especially on the African continent (Folorunsho, Ogunseye, Okesola & Olaniyan, 2010).

The adoption and implementation of E-voting technology into the conduct of elections in some developed democracies such as United States of America, India and Brazil has reduced voter's apathy, improved voters turnout during elections, and ensured, to a greater extent, the accuracy of vote count (Avgerou, Ganzaroli, Poulymenakou, & Reinhard, 2009). The adoption of E-voting technology by developing democratic countries is not only expected to prevent, but also eliminate problems of ballot stuffing, ballot snatching, votes and voters records manipulations, among others (Umonbong, 2006; AlJa'am, Alkhelaifi, Al-Khinji & Al-Sayrafi, 2009; ACE Electoral Knowledge Network, 2011).

E-voting technology innovation must ensure that the right to cast a vote is restricted to only those who are eligible. Votes are counted only once, voter's opinions are expressed without undue influence, protection of vote secrecy at every voting stage, accessibility of voting to all voters, particularly to persons with disabilities, and maximization of information transparency in order to increase voter's confidence (ACE Electoral Knowledge Network, 2011).

Nigeria, over the years, has used manual system of registration and voting processes, which is a mixed bag in terms of freeness, fairness and transparency. This most times, has moved the country towards lawlessness, destructions of property, detention of oppositions, deaths, and civil war because the political class continues to exploit the problems with manual voting systems. In 2005, the National Political Reform Conference set up by the federal government recommended the use of E-voting technology as an alternative to the manual system, and hence, the decision to adopt the technology by Independent National Electoral Commission (INEC) (Ezegwu, 2006; Okoye, 2010). The technology has not yet been implemented in Nigeria because doing this requires an adoption study from the perspective of the employees of the Independent National Electoral Commission of Nigeria in order to better the understanding of how to effectively introduce the technology since the findings of Ayo, Adeniyi and Fatudimu (2008) show majority of respondent voters supported the adoption and use of E-voting technology due to its capability to solve some of the problems associated with paper balloting.

Little empirical research which covers issues of E-voting adoption limits the understanding of the determinants of the technology in the context of this research. Therefore, it is important to understand how organisations adopt technology in developing countries and the factors that support the adoption processes. The aim of this study is to develop a conceptual model using existing theories and methods of technology adoption in the organisational context to study E-voting adoption by INEC, Nigeria with different organisational attributes and attitude towards a technology.

Integrating and combining constructs from more than one theoretical model have been suggested to have an improved understanding of a complex IT or technological innovations compared to using one theoretical model for the same study (Yi, Jackson, Park, and Probst, 2006; Scott, Plotnikoff, Karunamuni, Bize, and Rogers, 2008; Oliveira & Martins, 2011; Awa, Ukoha, Emecheta, and Nzogwu, 2012). This research, therefore, integrates factors or constructs from Rogers (1995) Diffusion of Innovations (DOI), Tornatzky and Fleischer's (1990) Technology, Organisation and Environment (TOE) framework, and Iacovou et al. (1995) model to develop a conceptual model to study the E-voting adoption because the technology under study is a complex one. These three models also provide a basis for identifying sets of generic factors which could affect adoption and diffusion towards the use and implementation of an IT within an organisation because they have broad support in empirical work and have remained the most prominent and widely utilized theories of organisational adoption (Oliveira & Martins, 2011; Baker, 2012).

1.2 Motivation of Study

The trend in the technological development has made use of computer and its supporting technologies mandatory in virtually all aspects of life. This development has brought about some changes in information processing, dissemination and storage by setting new standards of speed, efficiency, and accuracy in human activities (Sembok, 2003). This is never an exception in the conventional voting process. Manual voting is often tedious, non-secured, and time-consuming and this makes it inappropriate in the emerging technology-driven society. Countries such as Brazil, India, United States of America and Estonia have successfully implemented an electronic voting technology while country such United Kingdom is at a pilot stage to address problems of electoral delays, distribution of electoral materials, lack of trust, and costs associated with manual or paper-based voting system (Achieng & Ruhode, 2013).

A good E-Voting technology must ensure that only persons with the right to vote are able to cast vote. Every vote is counted but only once. Voter's right to express his or her opinion without any undue must also be maintained. Also, the protection of the secrecy of vote at every stage of voting process; guaranteed accessibility to voters, especially persons with disabilities, to increase voter's confidence by maximizing transparency of information on the functions of each system (ACE Electoral Knowledge Network, 2011).

Evidences have shown that electronic voting technology can deliver credible, fraud free-elections in Nigeria (Iteshi, 2006; Nkanga, 2006, Eze, 2011). The delay in the implementation of this platform in Nigeria has nothing to do with the electorates but with the body entrusted with the responsibility of conducting election in the country i.e. Independent National Electoral Commission (INEC) of Nigeria and the required legislation to back up the use of this technology as suggested by Ayo et al. (2008). The commission has decided to adopt E-voting technology for its future elections in Nigeria in order to mitigate the many challenges of conducting free, fair, and credible elections. Empirical evidence as to factors that can aid this adoption decision from the perspective of the employees of the commission remains scarce. Hence, there is the need to investigate these determinant factors within the organisational context.

1.3 Problem Statement

Many studies have revealed the global quest for democracy as a means of improving the political values of most countries in the world (Balzarotti, Banks, Cova, Felmetsger, Kemmerer, Robertson, Valeur & Vigna, 2008; Aroge, 2012). Voting is crucial and mandatory in order to achieve meaningful democracy, as it will give the relevant stakeholders the opportunities to decide. Traditional voting system using manual approach in Nigeria was revealed to be characterized by a number of problems and issues ranging from vote manipulation, ballot stuffing, ballot snatching, mass thumb printing, voter's impersonation, and multiple registrations to outright vote stealing (Ogunseye, Okesola & Olaniyan, 2010). These problems were

equally identified as hindrances towards electing good leaders with passions to serve and develop the country (Mohammed & Bashir, 2010; Faniran & Olaniyan, 2011; Okonigene & Ojieabu, 2011) since having a transparent, credible, efficient and accurate voting system is not guaranted by using the traditional voting system.

Several studies also support the need to adopt, implement and use E-voting technology in Nigeria in order to achieve transparent, efficient, accurate and credible electoral system and that, for a smooth implementation of this technology, adoption study is very essential (Iteshi, 2006; Nkanga; 2006; Umonbong, 2006; Ayo, Adeniyi & Fatudimu, 2008; Adepetun & Orimisan, 2009; Folorunsho et al. ,2010; Eze, 2011). According to Ayo et al. (2008), McGrath and Maiye (2010), Faniran and Olaniyan (2011), the major bottleneck in the adoption of the E-voting technology in Nigeria is the affected organisation therefore, there is need to consider adoption factors from the organizational point of view.

The scarcity of theoretical framework to aid the understanding of acceptance factors coupled with limited empirical researches calls for the need for a model of E-voting adoption from the perspective of an electoral organisation (Schaupp & Carter, 2005; McGrath & Maiye, 2010; Mohammed & Bashir, 2010; Achieng & Ruhode, 2013). The study is set to determine adoption factors of e-voting technology from organizational point of view. In doing this, three previous models, which include DOI, TOE, and Iacovou et al., were explored as the basis for the development of the proposed framework. This research adapted and integrate the constructs of DOI, TOE, and Iacovou et al models as its theoretical framework because the constructs of

each of the underpinning models may not completely reveal the influence of a complex technology such as E-voting technology.

However, the three models as used in previous studies do not address organisational factors such as User Participation in Systems Development (UPSD) and ICT Training and Skills (ICTSKILL) that are critical in measuring the adoption success of E-voting technology from the perspective of employees of an electoral management organisation. (Duan et al., 2002; Terry, 2004; Hashim, 2007; Subramanyam et al., 2010). This helps extend the constructs of the three models and fill existing research gap in the conceptual model development for technology adoption study.

The need to add and test mediating effects in a cause-effect model relationship has been suggested (Baron & Kenny, 1986; Bennett, 2000; Preacher & Hayes, 2008) but researchers (Hair et al., 2014) usually not explicitly test this. Hair et al (2014) suggest that the nature of cause-effect relationship could be understood fully only when mediation is theoretically taken into account and tested empirically. Likewise, the assumption that independent variables (exogenous) directly affect the dependant (endogenous) variable (s) of a study without the influence or moderating effect of other variables cannot hold. This is because respondents may likely differ (heterogeneous) in their perception and evaluation of research variables, resulting in significant differences in path model coefficients across two or more groups of the respondents (Hair et al., 2014). Thus, this study will look into this matter.

Some studies have identified differential effects (heterogeneity) of age, gender, experience, education level, voluntariness and managers tenure (Position) on the perception or attitude of consumers (users) and the mediating effect on the structural path relationship of an IT adoption in the organisational context (Park, Yang, & Lehto, 2007; Kim , Chan, & Gupta, 2007; Walker, Damanpour, & Devece, 2010; Lin , 2011). However, empirical studies on mediating and heterogeneous effects in E-voting technology adoption in the organisational setting are sparse. Therefore, the need to investigate the mediating effect and heterogeneity in the cause-effect relationships between the determinants and E-voting adoption from the perspective of employees of an electoral management organisation became necessary in order to fill this research gap and to better the understanding of the domain of this study.

1.4 Research Questions

The study will address the following questions:

1. What are the factors that determine the adoption of E-voting technology in the organisational context?
2. Are these factors co-related to form the basis for the model of E-voting technology in the organisational context?
3. Do ICT training and skills mediate or have indirect effect on the relationship between the adoption factors and E-voting adoption in the organisational context?

4. Is there a differential effect in the perception of the employees (staff) based on their position and working experience on the relationships between these factors and E-voting adoption?
5. Can the underpinning model of the study be used to explain E-voting adoption in an electoral organisation setting in Nigeria?

1.5 Research Objectives

The main objective of the study is to develop a theoretical model for the adoption of E-voting technology and to validate the model using data collected from staff of INEC, Nigeria. In achieving this primary objective, the following specific objectives are formulated:

1. To determine the factors of E-voting adoption in the organisational context

2. To predict the influence and significance among the identified factors on the E-voting adoption in the organisational context

3. To investigate the mediating or indirect effect of ICT training and skill on the relationship between the adoption factors and E-voting adoption in the organisational context
4. To test the differential effect in the perception of the employees (staff) based on their position and working experience on the relationship between these factors and E-voting adoption

5. To evaluate the applicability of the underpinning model of the study in explaining the determinants of E-voting adoption in an electoral organisation setting in Nigeria

1.6 Theoretical Framework

This research adapted and integrated four constructs from Diffusion of Innovations (Rogers, 1995), Technology-Organisation-Environment Framework (Tornatzky & Fleischer, 1990), and Iacovou, Benbasat, & Dexter (1995) model as a theoretical framework. This constructs are Technological Readiness, Organisational Readiness, Environmental Factors and Perceived Benefits. Studies have revealed that, apart for the need to integrate constructs of these models. There are equally the needs for possible extension with other relevant constructs in order to further our understanding of factors that contribute to the adoption of a complex IT innovation in the organisation (Zhu et al., 2006b; Lee & Shim, 2007; Oliveira & Martins, 2011; Awa et al., 2012).

This study introduced new factors into the integrated model; these factors include User Participation in System Development and ICT Training and Skills. The empirical support on the relationships between these two factors and E-Voting adoption were established in this study based on the suggestions by Barki and Hartwick (1994); Lin and Shao (2000); Harel and Tzafrir (1999); Vaughan (2001) and Foley (2004). Past studies in the literatures that examined this relationship in the context of E-Voting technology adoption are limited based on the researcher

knowledge. Therefore, research measuring these two constructs in E-Voting technology adoption from the perspectives of employees of an electoral organisation is scarce. The research constructs and sources are as illustrated in Table 1.1.

For this study, Technological Readiness (TR) construct is the degree to which the organisation is technologically ready to adopt IT innovation, was adapted from TOE and Iacovou et al (1995) models. Organisational Readiness (OR) construct refers to the extent, to which an organisation is ready for the adoption of IT innovation based on their internal structural characteristics, is adapted from TOE, DOI, and Iacovou et al (1995) models. Environmental Factors (EF) construct which identifies those factors external to the organisation which can affect the successful adoption of the IT innovation was adapted from TOE model (Baker, 2012). Perceived Benefits (PB) construct is the benefits derivable by organisation for adopting an IT innovation which can be direct or indirect in nature was adapted from Iacovou et al. (1995) model. User Participation in System Development (UPSD) construct describes the behaviors and activities targeted towards users or the participation of representatives

in system development process before the adoption of the IT innovation by the organisation. This constructs is supported by the research works of Barki and Hartwick (1994), Lin and Shao (2000). ICT Training and Skills (ICTSKILL) refers to the training plans and acquisition of basic technical skills necessary for the successful adoption and operation of an IT innovation by an organisation. This construct is supported by the research works of Harel and Tzafrir (1999); Vaughan (2001) and Foley (2004). Chapter two discusses these theories in detail.

Table 1.1

Research Variables and Sources

Research Variable	Source
Technological Readiness (TR)	Technology-Organisation-Environment (Tornatzky & Fleischer, 1990); Iacovou et al. (Iacovou, Benbasat & Dexter, 1995) Model
Organisational Readiness (OR)	Technology-Organisation-Environment (Tornatzky & Fleischer, 1990); Diffusion of Innovation (Rogers, 1995); Iacovou et al. (Iacovou, Benbasat & Dexter, 1995) Model
Environmental Factors (EF)	Technology-Organisation-Environment (Tornatzky & Fleischer, 1990)
Perceived Benefits (PB)	Iacovou et al. (Iacovou, Benbasat & Dexter, 1995)
User participation in System Development (UPSD)	Baroudi, Olson, & Ives, 1986; Barki & Hartwick, 1994; Cavaye, 1995; Lin &Shao, 2000
ICT Training and Skills Sets (ICTSKILL)	Harel & Tzafrir, 1999; Vaughan, 2001; Foley, 2004; Martins & Oliveira, 2008

1.7 Scope of the Research

The focus of this study is to determine what factors of technology adoption influence the adoption of E-voting technology from the perspective of employees of an electoral management organisation. The research is limited to the employees of the Independent National Electoral Commission of Nigeria where questionnaire forms were distributed to various groups of employee within the organisation to determine the relationship that exists between technology adoption dimensions and E-voting adoption success within an electoral organisation setting as a strategic part of the

management adoption decisions. The study uses a quantitative-based survey method of investigation with the selected employees from 12,341 available at the electoral commission of Nigeria.

In order to establish those factors in technology adoption that determine E-voting technology adoption, the researcher focused on the managerial and operational staff of the electoral commission, because they are the primary operators of the E-voting technology and they serve as links between voters who are the end users and the electoral processes during elections. The questionnaire instrument was structured to capture the employee's perception on the objective measure of the adoption of E-voting technology by the Commission.

The findings of this research are expected to aid the adoption decisions of the electoral commission in Nigeria and other electoral organisation with same or similar attributes and characteristics. The coverage of this study is limited to one geo-political zone each from the north and south of the country and then the selection of two states each from the selected geo-political zones. This is to ensure sample adequacy since the population of study is both homogenous and heterogeneous in nature.

1.8 Research Contributions

The main aim of public organisation's adoption of IT innovations is to improve the quality of life, build better and stronger communities in which services would be delivered to the users and citizens (Walker, Damanpour & Devece, 2010). One of

such IT innovations is the E-voting technology that enables registered voters cast a ballot during elections. Rogers (1995) suggests that, the capabilities of the IT innovations largely depend on: (1) the characteristics of the organisation (2) its work systems (3) its people (4) its development and implementation methodologies. All these determine the extent to which the aims of IT innovations could be achieved.

This research seeks to contribute to the existing theories in the information systems discipline, particularly, information technology adoption from the electoral organisational perspective. The study focues on determining the factors influencing the adoption of E-voting technology from the perspective of employees of the Independent National Electoral Commission of Nigeria based on the model of DOI (Rogers, 1995), TOE (Tornatzky & Fleischer, 1990) and Iacovou et al., (1995).
The study will advance the following contributions:

(1) The findings of this study are expected to make contributions to the information systems discipline, in particular, technology adoption literatures. It is expected that the findings of the study would advance a model on E-voting adoption from the perspective of employees of an electoral management organisation.

(2) The study has contributed to the underpinning theories of DOI, TOE and Iacovou et al. The hypothesized relationships between the determinants of E-voting technology adoption model (Technological Readiness, Organisational Readiness, Environmental Factors, Perceived Benefits, User Participation in

System Development, and ICT Training and Skills) which are supported further to validate the reliability of the dimension in information technology adoption.

(3) The effect of the modification to the original DOI, TOE and Iacovou et al models by integrating ICT Training and Skills and User Participation in System Development offer better measure of E-voting technology adoption within the context of the study. This shows an increase in variance explained from model of the research compared with when studies that uses only one of the underpinning models. The researchers and academic could use the research model for further study in the context of organisational adoption of information technology.

(4) The findings of this study would help the top managers of the electoral management organisation in Nigeria and other countries with similar electoral challenges in the implementation and use of E-voting technology in the conduct of elections. The study could assist and equip the management with crucial information about the factors that influence the E-voting technology adoption from the organisational perspectives in Nigeria based on their levels of importance and performance in order to achieve success in the implementation and use of the technology for elections.

(5) The findings are expected to fill research gaps in the adoption, implementation and use of ICT as a tool for interactions between government

and citizens and service provisions in Nigeria and can be generalized to other countries having same characteristics and attributes as Nigeria. It will also form the basis for supporting concrete national policy on adoption and diffusion of ICT within the country.

1.9 Organisation of the Thesis

Chapter one presents the introduction and background to the study. The chapter also discusses the motivation of study, the problem statement, research questions, research objectives, theoretical framework of the study and the scope of the research, the research as well as contributions and the organisation of the thesis.

Chapter two presents reviews of literatures on the electronic voting technology and issues relating to its adoption and implementation. Specifically, the chapter discusses electronic government (E-Government) and services, topology and functions of E-voting technologies, the context of E-Government and E-democracy in Nigeria, the needs, challenges and issues of E-voting technology adoption in Nigeria, overview of countries that have already adopted and implemented E-voting technology. Also discussed are models of information technology adoption, the research model, research constructs, hypotheses formulation, categorization of research variables and the summary of the chapter.

Chapter three presents detailed research methods used in this study. The chapter provides insight into the research approach adopted for the study and the justification, research methods and research design adopted in the study. Also

discussed are sampling and sample size, methods of data collection, unit of analysis, data analysis method adopted for the study, reliability, and validity of Instruments, Instrument development, validation process used for the pilot study as well as the chapter's conclusion and summary.

Chapter four presents the analysis from the empirical data collected, while chapter five presents the outcomes of the research findings. Finally, chapter six makes necessary conclusions regarding the research questions, objectives of the research and points out the theoretical contributions along with the managerial implications in the research. Also included in chapter six are recommendations for future research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter comprises the review of relevant literatures on E-Government services and types of E-Government services. Overview of topology, functions, features and functionalities of E-voting technologies, countries that have already adopted and implemented E-voting technology, E-Government and E-democracy in Nigerian context and the needs and challenges of E-voting adoption in Nigeria. Finally, this chapter establish the related underlying theories of information technology adoption in the organisational context and E-voting technology adoption with detailed explanations on construct relationships in the research framework.

2.2 Electronic Government (E- Government) and Services

Fang (2002) defines E-government as:

> *a way for governments to use the most innovative information and communication technologies, to provide citizens and businesses with more convenient access to government information and services, to improve the quality of the services and to provide greater opportunities to participate in democratic institutions and processes (p. 1).*

This includes transactions between government and business, government and citizen, government and employee, and among different units and levels of government (Fang, 2002). Dawes (2002) also defines E-government as "*the use of information technology to support government operations, engage citizens, and provide government services*" (p. 1).

E-government serves as a tool to achieve E-governance, while E-governance entails the processes of providing services to the public or citizens by government using ICT as an enabler in order to achieve SMART (Speed, Moral, Accountable/Accurate, Responsive and Transparent) governance. E-governance is not only about providing digital access to government information and other services but also to change how citizens relate with governments as much as how citizens relate to each other. E-governance is also expected to achieve the concepts of citizenships defined in terms of needs and responsibilities (Fang, 2002; Dawes, 2002).

E-government may be categorised into three based on the levels or stages of interaction (Alshehri & Drew, 2010a). The categories are Government-to-Government (G2G), Government to Citizens (G2C) and Government to Business (G2B) (Markellou, Panayiotaki & Tsakalidis, 2003; Seifert, 2003; Alshehri & Drew, 2010b). Further, the categories can also include Government to Employees (G2E) (Ndou, 2004) or Government to Civil Society Organisations (G2CS) (Makoza, 2013). The five categories are summarised as follows:

(1) **G2G:** This relates to the activities which will improve and upgrade governments' services. This involves intra- and interagency exchanges at the federal level as well as exchanges between the federal, state, and local levels (Markellou, et al., 2003; Seifert, 2003).

(2) **G2C:** This deals with the relationship between government and citizens. It allows government or its agencies to relate and continuously communicate with its citizens, supporting, in this way, accountability, democracy and improvements to public services (Ndou, 2004).

(3) **G2B**: This relates to the relationships between governments and businesses. It mostly deals with common activities at national and international level that requires co-operations. It allows e-transaction initiatives such as e-procurement and the development of an electronic marketplace for government (Fang, 2002; Markellou, et al., 2003).

(4) **G2E**: This refers to the relationship between government and its employees only. The purpose of this relationship is to serve employees and offer some online services such as applying online for an annual leave, checking the balance of leave, and reviewing salary payment records, among other things (Seifert, 2003). It is a combination of information and services offered by government institutions to their employees to interact with each other and their management (Alshehri & Drew, 2010b).

(5) **G2CS**: This refers to the relationship between government and civil society organisations. The purpose of this relationship is to provide services to civil society organisations using internet technologies (Makoza, 2013).

Makoza (2013) suggests that the level of implementation of each category varies across the globe and depends on the factors such as provision of online services, infrastructure, human capacity and participation in e-government. One components of G2C is the electronic democracy (E-democracy) as discussed in the following sub-section.

2.2.1 Electronic Democracy (E-democracy)

Macintosh and Whyte (2006) cite Macintosh (2004) as defining E-democracy as:

> *concerned with the use of information and communication technologies to engage citizens, support the democratic decision-making processes and strengthen representative democracy. The principal ICT mechanism is the internet accessed through an increasing variety of channels, including PCs, both in the home and in pubic locations, mobile phones, and interactive digital TV. The democratic decision making processes can be divided into two main categories: one addressing the electoral process, including e-voting, and the other addressing citizen e-participation in democratic decision-making* (p. 2).

E-democracy consists of that process by which electronic communication is used by those in power and the citizens in order to interact with each other. This also informs and modifies the way that power is used. According to Coleman and Norris (2005), E-democracy is what governments do to facilitate greater participation of citizens in government using digital or electronic means. They suggest this to include e-forums, e-town hall meetings, e-consultations, e-referenda, E-voting, e-rule making, and other forms of E-participation.

The advantages of E-democracy include (1) Providing an opportunity for societal decision-making with all citizens engaged in the decision process; (2) Facilitating, discussion and establishing collaboration between citizen and government; (3) Helping participants to learn about possible alternatives, their constraints and implications; and aiding them in the specification of their preferences, and provide other support tools. While E-democracy will not provide all solutions to the problems of democracy, it will surely make a significant contribution in bringing power closer to the people.

Despite the advantages as enumerated above, E-democracy like any other E-government services faces the following problems or challenges as suggested by Makoza (2013): (a) Lack of infrastructures especially in developing countries (b) Lack of adequate skills and human resources such as literacy of the users and the ability to use computer (c) Challenges of digital divide which include, lack of unequal access to internet technology by citizens, usability of services and lack of

unequal access to computers (d) Loss of person-to-person interactions valued by many people. And, likewise (e) The concerns of public on the security of E-government services, fear of spam from providing email addresses and government retention of user's transaction or interaction history. One of the most important components of E-democracy today is the Electronic Voting (E-voting) as discussed in section 2.2.2.

2.2.2 Electronic-Voting (E-voting)

E-voting involves the use of electronic devices and other technologies as a means of casting votes. E-voting lies at the heart of E-democracy and E-participation initiatives. The use of new technologies to support voting has been and still the subject of intense debate. Lots of people advocate for the benefits it can bring—such as improved speed and accuracy in counting, accessibility, voting from home; while many are concerned with the risks it poses, such as unequal access (digital divide), violation to secrecy and anonymity, alteration of the results of an election (due to malicious attacks, bad design/coding, or procedural weaknesses (Villafiorita, Weldemariam, & Tiella, 2009). Governments all over the world have different attitude towards the use of E-voting as an alternative method of conducting an election. There have been many developments in the application of E-voting since its introduction. Some countries no longer use E-voting; some have conducted pilot E-voting schemes and decided not to introduce it. At the same time, there are other countries, which are continuing to conduct pilot schemes with the introduction of E-voting. Countries such as USA, Brazil, India, and Estonia have not only provided

enabling laws on the use of E-voting but also have implemented its use over the years. It has been used in order elections such as students' elections or university elections. There are also other countries which would like to launch pilot E-voting schemes but have not yet examined all the options (Caarls, 2010).

Because, E-voting is a vital part of electronic democracy, Zissis and Lekkas (2011) suggest that E-voting must have the capacity to accommodate variety of citizens (voters) when compared to the manual voting process. It must provide timely means of expressing opinions on civil matters and most importantly, built on people's trust. However, analysis of India's E-voting by Prasad et al. (2010) suggests security, cost, power, natural hazards, illiteracy, unfamiliarity with technology as some of the challenges currently facing the use of E-voting.

2.3 Topology and Functions of E-voting Technologies

2.3.1 Topology of E-voting Technologies

According to International IDEA (2011), most E-voting technologies fall into one of the following four categories:

(1) **Direct Recording Electronic (DRE) Voting Machines**

A Direct Recording Electronic voting machine is typically a stand-alone device with storage, a processor and a computer screen that presents a voter with elections' choices and records.

Their selections count as part of the canvass (Figure 2.1). These devices often use an LCD and touch screen to interact with the voters (Figure 2.2). Visually impaired voters can generally use alternate input and output method which presents a boon to some voters who previously require assistance to vote (Sastry, Kohno & Wagner, 2006). DREs can come with or without a paper trail (Voter-Verified Paper Audit Trail- VVPAT). VVPAT is to provide physical evidence of the votes cast (International IDEA, 2011).

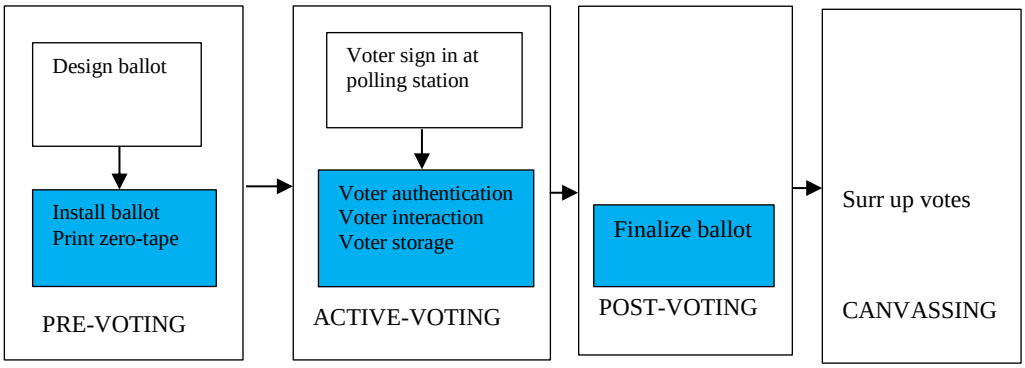


Figure 2.1. Major steps in the voting process when using DREs. The shaded portions are internal to the DREs. Source: (Sastry et al., 2006)

Figure 2.2. Direct Recording Electronic Voting System. Source (Ramilli, 2008)

(2) **Optical Mark Recognition (OMR) Voting Systems**

OMR systems, based on scanners, can recognize the voter's choice on special machine-readable ballot papers. The voters fill the ballot, usually filling a rectangle, a circle, and oval or completing an arrow. After the refilling phase, he/she puts the ballot under an optical scan sensor, which is able to read the voter's sign. The voting machine uses the "dark mark logic" where machine selects the darkest mark within a given set as the correct choices, understanding and counting the voting chosen (International IDEA, 2011; Ramilli, 2008). Figure 2.3 shows one model of OMR.

Figure 2.3. Optical sMark Recognition.
Source: (Ramilli,2008)

OMR systems are of two types namely: (1) Central Count systems, where ballot paper are scanned and counted in special counting centres (2) Precinct Count Optical Scanning (PCOS) systems, where scanning and counting take place at the polling station as voters feed their ballot into the machine (International IDEA, 2011).

(3) **Electronic Ballot Printers (EBP)**

A device similar to a DRE produces a machine-readable paper or electronic token containing the voter's choice. This token is then fed into a separate ballot scanner, with the automatic vote counts (International IDEA, 2011).

(4) **Internet Voting (Voting Kiosks or remote voting or poll-site)**

When the term "Internet Voting" is used, it generally refers to where votes are transferred via the internet to a Central Server. Votes are cast from public computers or from voting kiosk in polling stations or, more commonly, from any Internet connected computer accessible to a voter. "Poll-site" E-voting technology requires voters to go to staffed polling sites and used computers to cast their votes. A network (Internet or private) is use to transfer ballots from each polling place to a centralized site, where votes are tallied and elections results are published, while the "Kiosk" E-voting technology allows voters to vote from computers/ATM-like machines situated within kiosks. The kiosks are set up by the voting authority in suitable locations such as post offices or shopping malls and connected to a central location via the Internet (or a private network). A vote cast at the kiosk will be sent immediately across the network to the centralized tallying site. The kiosks are not monitored by poll workers at all time and may allow voting over a period of several days or weeks. Once the voting period for a given election is up, the associated tallying site publishes the result of that election.

The "Remote" E-voting technology, on the other hand, allows voters to cast their votes from any computer or digital device connected to the Internet or to a private network, typically from home or at work. Devices such as personal digital assistance, mobile phones and even game machines may access these systems. Each of these three ways of Internet voting has its own particular security requirements. In Kiosk, election officials may install the voting client but the voting environment is out of election officials' control. With Poll-site, election officials have control over the voting and the operating environment. The remote voting is a third party arrangement where the voter himself rather than the election official have control over the voting client and operating environment (International IDEA, 2011; Kiayias, Korman and Walluck, 2006).

2.3.2 Features and Functionalities of E-voting Technology

E-voting technology has many functions; These include encryption, randomization, communication and security systems (International IDEA, 2011). According to International IDEA (2011), E-voting technology should be able to provide the following end-user functionalities to both the voters and election officials.

(1) **Electronic Voters List and Voters Authentication:** Part of the component of E-voting technology is the electronic voters list, covering either a single polling station or the entire country. The list is used to authenticate the eligible voters and to record the vote cast by the voter.

(2) **Poll Worker Interface:** This is a special interface for only the poll workers. It enables the poll worker to perform functions such as resetting the votes count at the start of the poll, close the poll, transmission and thereafter printing of the election results.

(3) **Interface for Casting Votes:** This includes touch screens, optical mark recognition (OMR) ballot papers that are fed into the scanner, touch-sensitive tablets, push button, web pages or special client software for internet voting.

(4) **Special Interfaces for Handicapped Voters:** This includes audio input devices for the blind, easier access for voters with physical disabilities and simpler interfaces for illiterate voters.

(5) **Interfaces for the Results Output:** For voting machines, this is often a printer. However, some machines only use digital displays. Once voting closed, this interface displays or prints the results recorded by the voting machine. If results are printed, the printouts are used as physical evidence of the results produced by the voting machine, and copies can be distributed to stakeholders present at the polling station and can be posted for public display.

(6) **Printers for printing a Voter-Verifiable Receipt for Each Vote:** This provides the physical evidence of the vote cast (VVPAT).

(7) **Result Transmission Systems:** Many voting machines can transmit results to central counting systems; for example, via the Internet, telephone, mobile phone or satellite connection. In the absence of communication links, the results are transported physically, using electronic storage media such as memory cards.

(8) **Result Tabulation Systems:** This is usually located at result processing centres and at the end of election day, the electronic results are received from the polling stations and automatically tabulated for the various competitions and districts.

(9) **Result Publication Systems:** Pilot and final results are published in many different ways including on websites, CDs, and geographic visualization systems. This requires details at all levels down to a single polling stations. The more detailed the published results are, the more transparent is the election.

(10) **Confirmation Code Systems:** Some E-voting solutions allow for control codes intended to allow individual verification of each vote by the relevant voters.

2.4 E-Government and E-Democracy: The Nigerian Perspectives

Nigerian National Policy on Information Technology-NNPIT (Nigerian Information Technology Development Agency, 2000) states that, "the nation will use Information Technology (IT) as the major driving force to re-engineer and rapidly transform governance to interface with the needs of its citizenry by establishing transparent Government Wide Information System (GWIS) at national, state and local government levels". The objectives include creation of knowledge-based SMART governance, easy and free access to government information (Nigerian Information Technology Development Agency, 2000). With the introduction of E-government in Nigeria, it is expected that E-democracy will be easier to implement. According to Ayo et al. (2008), there are evidences that E-democracy will bridge the gap between the elected and the electorates. It will bring governance closer to the grassroots and this will encourage a successful adoption of E-voting technology.

2.5 E-voting Technology Adoption in Nigeria: The Needs, Challenges and Issues

Iwu (2005) traces the needs for adoption of E-voting technology in Nigeria to the electoral system that is full of several experiments since 1922 and how best to make the voter's vote count in an election. From the traditional direct Open Ballot System (OBS), which is completely paper-based used widely in the early 1990s to the Modified Open Ballot System (MOBS), or Open Secret Ballot System (OSBS) up to the present Secret Ballot System (SBS), it has been a continuous attempt at electoral engineering for a better voting system.

The idea of adopting E-voting technology in the conduct of election in Nigeria arose from reviews of the year 2003 general elections at several conferences involving stakeholders such as electoral officers, political parties, local and international observer groups, civil society organisations etc. (Umonbong, 2006). The National Political Reform Committee (a body set up and funded by the federal government) in 2005 equally recommened the use of E-voting technology as an alternative method of conducting elections and eventual decision to adopt by the Independent Electoral Commission (INEC) in July, 2005 (Ezegwu, 2006).

The core challenge of the electoral process in Nigeria is the ability and capability to generate and deliver secured, authentic, transparent and generally-accepted electoral results (Folorunsho, Ogunseye, Okesola & Olaniyan, 2010). The quality of any election is determined by the appropriateness of the overall electoral process; the quality and possibility of all players to follow the electoral law with fidelity; and the practical mechanisms for the conduct of the election, which include the voters register, and free, fair and credible voting system (Mohammed & Bashir, 2010). According to The International Crisis Group report on Nigeria (2007), numerous electoral malpractices were observed in the conduct of 2007 general elections. These include: intimidation of voters, under age voting, hoarding of electoral materials by the INEC officials, ballot-box stuffing by dominant political parties in connivance with INEC and security officials, theft of ballot boxes and ballot papers, announcement of election results where there was no voting, inadequate voting materials and partisan act of INEC and security officials.

Past studies on the E-voting in Nigeria have suggested types for adoption, implementation, and use. Iwu (2005) proposes E-voting technology, an image-based integrated system which consists of the following components: Electronic Voters' Register, Eligible Voters' Authentication, Electronic Balloting (Voting Machine), and Electronic Transmission of Results. Study of Folorunsho et al. (2010) proposes a TreeMap based visualization technique for distributed balloting and voting processes type of E-voting system. Similarly, Faniran and Olaniyan (2011) propose an E-voting architecture with four components: E-voting application system (EVAS), E-voting storage server (eVSS), E-voting counting application (eVCA) and Certificate verification system (CVS).

The option to adopt E-voting technology with its relative and modest successes in India and Brazil has received wide spread appeal in Nigeria as it is expected to enhance the standard of elections in the country (Mohammed & Bashir, 2010; Iwu, 2005). Iwu (2005) raises the following issues that need consideration before adopting any E-voting technology:

1. The grey area in the selection of the balloting method using electronic platform that will be appropriate to the Nigerian situation;

2. The need for a VVPAT to provide independent external check on accuracy and to act as a backup system;

3. Electronically-generated evidence when the result of an election is challenged in courts or election tribunals;

4. Hardware and software design failures leading to a number of risk factors such as: (i) Error in the system itself which could result in system failure (ii) Tampering with ballot modules during transportation from the point of manufacture to point of usage and (iii) Damage to machines before election;

5. The threat of third party interference to compromise and corrupt the system;

6. The problem of physical security of the machines, their components or even the handlers /operators.

In addition, the problems of connectivity, low level of ICT literacy and skills and erratic power supply are some factors that must be considered because of their serious effects on the adoption success of E-voting technology in Nigeria (Ayo et al., 2008).

2.6 Overview of Countries with Adoption and Implementation E-voting Technology

2.6.1 Introduction

E-voting is a tool for advancing democracy, building trust in electoral management, increasing credibility in election results and generally improving the totality of the electoral process. E-voting in polling stations is used by some of the world's largest

democracies. Internet voting as used in some countries today was originally used by smaller and historically conflict-free countries such as Estonia (International IDEA, 2011). Many countries are currently considering the introduction of E-voting technology and are running a variety of pilot projects (ACE Electoral Knowledge Network, 2011; International IDEA, 2011). The under-listed sub-sections discuss selected countries that have legally adopted and implemented E-voting for their elections.

2.6.2 India

India, the world's largest democracy adopted and implemented polling place E-voting type of Direct Recording Electronic (DRE) Machine referred to as Electronic Voting Machines (EVMs). Since 1998, the Elections Commission of India has continued to use EVMs in polling places. In recent elections, there were more votes cast than combined population of the United States and Canada, and the vast majority of voters used the paperless EVMs (ACE Electoral Knowledge Network, 2011; Prasad, Halderman, Gonggrijp, Wolchok, Wustrow, Kankipati, Sakhamuri & Yagati, 2010).

The Elections Commission of India developed the country's EVMs in partnership with two government-owned companies; the Electronics Corporation of India (ECIL) and Bharat Electronics Limited (BEL). The first generation EVMs developed in 1980s by ECIL was Hitachi 6305 microcontrollers and it used firmware stored in

external UV-erasable PROMs along with 64kb EEPROMs for storing votes. The second generations introduced in 2000 by both ECIL and BEL.

These machines moved the firmware into the CPU and upgraded other components. In 2006, the manufacturers adopted a third-generation design incorporating additional changes suggested by the Electoral Commission. According to the Electoral Commission statistics, 1,378,352 EVMs were in use as at July 2009. Of these, 448,000 were third-generation machines manufactured from 2006 to 2009, and the remaining 930,353 were second-generation models manufactured between 2000 and 2006 (Prasad et al., 2010). Two distinct features of Indian EVMs are (1) low price; significantly lower than that of most other systems, and (2) relatively simple technology (International IDEA, 2011). One of the major challenges of India's EVMs is the lack of provision for paper trail (VVPAT).

Findings of Prasad et al. (2010) show that despite elaborate safeguards, the India's EVMs are vulnerable to serious attacks. Dishonest insiders or other criminals with physical access to the machines can insert malicious hardware that can steal votes for the lifetime of the machines. Attackers with physical access between voting and counting can arbitrarily change vote totals and can learn which candidate each voter voted for. This security problem led the Indian Electoral Commission to consider the introduction of VVPAT in 2011 (International IDEA, 2011).

2.6.3 Brazil

Brazil, like India, adopted and implemented the polling place DRE voting machines called Urna Elecronica. The economic and fraud preventions were the motivating factors for the introduction of E-voting (International IDEA, 2011). According to International IDEA (2011), a multi-year approach or method of implementation was adopted which includes the following steps: (1) In 1986, voters and civic information which also include feasibility and usability study was carried out (2) Results digitalization and capacity building of the electoral management body (Superior Electoral Tribunal, (3) The use of local technical experts to develop the hardware and software (4) Equipment testing within the Brazilian environment (5) Type of machine that best fits the context of Brazil (final decision of TSE) (6) Testing and quality control experiment in various environments (7) In 1996, approval of E-voting for local and municipal elections (8) Quality overhaul and post-election review (9) Full implementation of E-voting for 2002 general elections

The voting machine (Urna Electronica) consists of two terminals installed in each polling station: (1) The voting board representatives' terminal has a numerical keyboard with a two lines liquid crystal screen. The board representative types a voter's identification number before voters use it. If he or she has registered in the precinct, his or her name would be displayed on the screen and the identification would be accomplished. The board representative checks on the screen the status of the voting machine and, if available, presses 'enter' to turn the machine on the ready state (2) The second terminal is the voters' one. When the voter enters the booth, the

machine should be on the ready state. The voter expresses his/her preference by typing the candidate's identification number. The screen shows the candidate's name, initials of the party or coalition he or she belongs to and his or her photo, and if these are, correct, voters press enter to confirm (Avgerou, Ganzaroli, Poulymenakou & Reinhard, 2009).

The keyboard has two additional keys: the first is the correction key that allows voters to re-start the process; the second is the blank vote key. The voting machine program saves the data on a diskette in an encrypted format to prevent data modification and the diskette delivered to the local electoral committee. Data are then, decrypted and uploaded with a "guiding program". The process, at this point, varies according to the type of election (Avgerou, Ganzaroli, Poulymenakou & Reinhard, 2009). The paper trail initially included in the URNA electronic was discarded due to technical problems associated with the printers. While E-voting Technology without paper trails is subject of dispute. The Brazilian case is an example of systems built on trust, capacity and consensus over years and many electoral cycles (International IDEA, 2011).

2.6.4 USA

The United States of America's use of E-voting technology dated back to 1960s with the introduction of punch card and mechanical voting technology. US witnessed massive investment in voting machines (many non-paper trail) with the Help America Vote Act (HAVA) (International IDEA, 2011). Municipalities and States

throughout the country replaced their outdated punch card and mechanical system with the adoption of paperless DRE systems (Kohno, Stubblefield, Rubin & Wallach, 2004).

However, widespread reports of voting terminal failure, and growing concern about the security of these machines have given rise to debates on how to ensure the integrity of the elections. An important part of this debate has focused on whether to equip DRE voting terminals with a VVAPT (ACE Electoral Knowledge Network, 2011). International IDEA (2011) reported that US in 2005 and 2007 published Voluntary Voting System Guidelines (VVSG), a comprehensive guidelines with specifications and requirements for certifying voting machines. By 2008, United States requirements was DRE with VVPAT, thereby making the one without VVPAT obsolete, and as at 2010, 40 states in the USA moved to acquire DRE with VVPAT (international IDEA, 2011).

2.6.5 Estonia

In 2005, an additional voting channel (Internet voting) was introduced. From the beginning, it enjoyed widespread trust. The legal provisions were in place in 2002 with a public procurement procedure carried out and mandate given to Estonian Company Cybernetica Ltd to develop E-voting Technology. The developed system included the use of smart cards and electronic signature (ACE Electoral Knowledge Network, 2011; International IDEA, 2011). Before the 2007 elections, there were

several cyber attacks on the Estonian E-voting system but inspite of that, the confidence of citizens in the participation of internet voting remains un-eroded.

Increasing number of Estonians has used the opportunity to vote online in the last elections. Even though, the election result may be reducing quality of democracy by making voting purely transactional, it has not decreased the turnout in the elections. Most importantly, it has made voting more convenient for constantly increasing number of voters online. In 2011, online votes cast was about 24 per cent. (International IDEA, 2011).

2.7 Models of Information Technology Adoption

Researchers have utilized several theories and theoretical models to explain IT adoption behaviour at organisational level. However, the generalization of any of the model into overall representation of an IT innovation adoption phenomenon is not feasible due to the changing nature of IT innovation (Wolfe, 1994). Therefore, Fichman (1992) suggests the need for modifications and extension of these models citing three main reasons: (a) Some variables of the models do totally fit with the organisational level of analysis (b) Decision-making process at the organisational level most times involves complex interactions between interested stakeholders (c) Adoption of innovation within the organisational context is a stage process which unfolds over times and not usually a two-way events. In order to understand the complex decision process involved in the organisational adoption of IT innovations,

Oliveira and Martins (2011) and Awa et al (2012) suggest the need to integrate two or more of these models.

The most commonly used theoretical models in organisational IT adoption studies are the Diffusion of Innovation (DOI) Theory (Rogers, 1995), Perceived Characteristics of Innovating (PCI) (Moore and Benbasat, 1991), Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), Theory of Planned Behaviour (TPB) (Ajzen, 1991), Technology Acceptance Model (TAM) (Davis, 1989), Technology Acceptance Model 2 (TAM2) (Venkatesh and Davis, 2000), Technology Acceptance Model 3 (TAM3) (Venkatesh and Bala, 2008), Technology, Organisation and Environment (TOE) model (Tornatzky and Fleischer, 1990). Other models include Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003), Iacovou et al 1995 model, and Task-Technology Fit (TTF) (Goodhue and Thompson, 1995).

When objectives of the studies are to learn more about users acceptance, user satisfaction, and users resistance of an IT innovative , researchers apply theoretical models of TAM, TAM2, TAM3, TPB, TRA, PCI, UTAUT, SCT, and TTF. When the objectives of the studies are to learn more about the adoption decisions of IT innovations within the organisational context, researchers adopt DOI (1995), TOE, and to some extent Iacovou et al (1995) model. These three models have been extensively applied in the domain of IT adoption research at the organisational level and which subsequently form the basis of the theories adopted in this study.

2.7.1 Diffusion of Innovations (DOI)

Rogers (1995) model has been a well-established and most common theoretical basis for the study of IT innovation adoption in the organisational context (Mustonen-Ollila & Lyytinen, 2003). The theory sees innovations as being communicated through certain channels over time and within a particular social system (Rogers, 1995). The model in Figure 2.4 is related to three independent variables namely; individual characteristics, internal organisational structural characteristics, and external characteristics to the organisation (Oliveira & Martins, 2011; Jamaludin, Ahmad & Ramayah, 2012). Individual characteristics describes the attitude of a leader towards change. The internal characteristics of the organisational structure includes centralization, complexity, formalization organisational slack and size while external characteristic of organisation refers to system openness (Rogers, 1995). It provides a useful theory framework with constant empirical support for studying variety of IT innovative adoption (Moore and Benbasat, 1991; Tan, Chong, Lin & Eze, 2009).

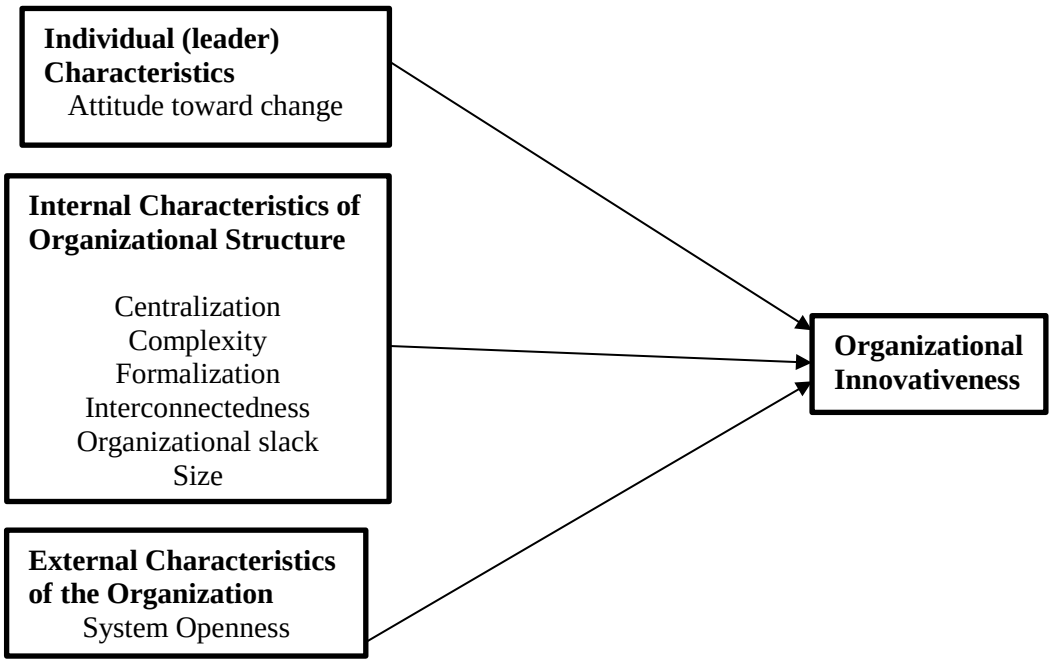


Figure 2.4. Diffusion of Innovation. Source: (Rogers, 1995)

2.7.2 Technology, Organisation, and Environment (TOE) Framework

Tornatzky and Fleischer develop TOE framework in 1990. According to Oliveira and Martins (2010) and Oliveira, Thomas and Espadanal (2014), the model describes three contexts of organisational technological innovations, namely: technological context, organisational context, and environmental context (Figure 2.5). They posit that all these factors influence the adoption of technological innovations. Technological context describes both the internal and external technologies relevant to the firm. This includes current practices and equipment internal to the firm as well as the set of available technologies external to the firm. Organisational context refers to the descriptive measures about the organisation such as scope, size, and managerial structure. Environmental context is the arena in which a firm conducts its business—its industry, competitors, and dealings with the government (Tornatzky &

Fleischer, 1990). Existing researches have shown the wide applicability and explanatory power of TOE model over a number of technological contexts (Baker, 2012). TOE model has been used to examine the adoption of enterprise resource planning in Taiwan's communications industry (Pan & Jang, 2008), E-commerce adoption levels among SMEs in Malaysia (Lip-Sam & Hock-Eam, 2011), adoption of Knowledge Management (KM) systems in public sector organisations in Saudi Arabia (Alatawi, Dwivedi, Williams & Rana, 2012), and understanding of cloud adoption decisions (Polyviou, Pouloudi & Pramatari, 2014). Results of these empirical studies indicate that the three context of TOE framework influenced the adoption of the technology under study and therefore agreed with Tornatzky and Fleischer (1990).

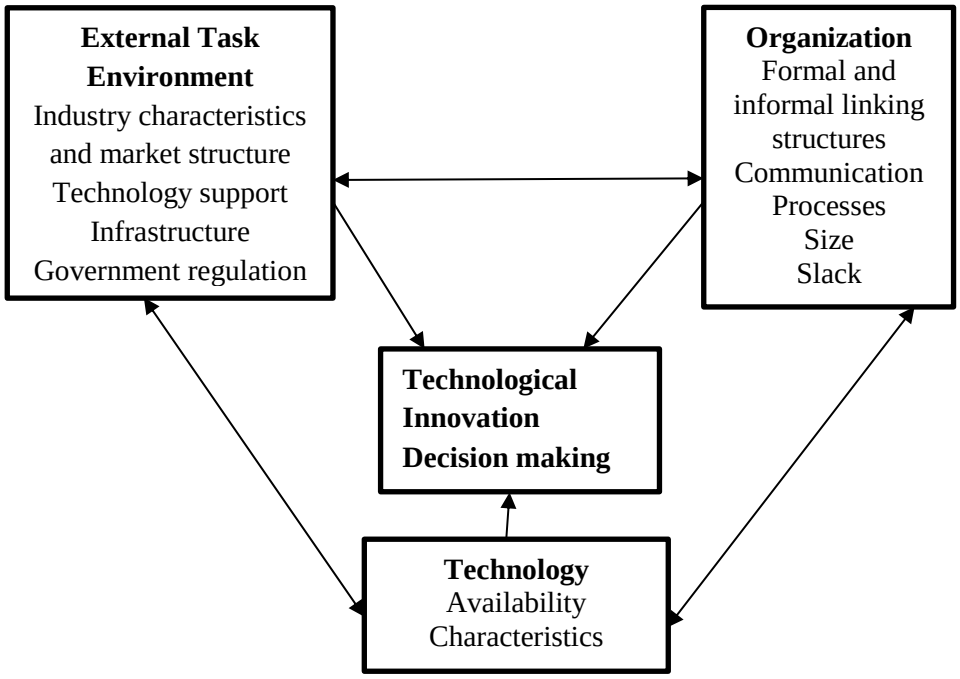


Figure 2.5. Technology, Organisation, and Environment Framework
Source: (Tornatzky & Fleischer, 1990)

2.7.3 Iacovou et al. (1995) Model

The model (Figure 2.6) was developed using multiple case study research approach by Iacovou, Benbasat, and Dexter (1995). The model explains the organisational readiness, external pressure, and perceived benefits, predicts the adoption of Electronic Data Interchange (EDI) adoption within the context of small organisation and very similar to the TOE framework (Baker, 2012). Perceived benefits factor refers to the relative advantage that EDI technology could provide to the organisation. It has two dimensions; direct benefits, which measure the cost savings related to the internal efficiency of the organization, and indirect benefits, which measure tactical and competitive advantages that affect business processes and relationships of the organisation (Iacovou, Benbasat & Dexter, 1995).

The technological readiness dimension measures the level of sophistication of IT usage and IT management in an organisation. The external pressure factor refers to the influences from the external business environment. This factor is measured using two main dimensions; competitive pressure measures the level of EDI capability in the organisation's industry and that of its competitors while imposition by trading partners measures the potential power and the strategic influence of the trading partners who seek EDI adoption (Iacovou, Benbasat & Dexter, 1995).

The model of Iacovou, et al. (1995) has been employed to examine the adoption and impact of EDI in Dutch SME's (van Heck & Ribbers (1999). It has also been employed to explain Inter Organisational Systems (IOS) adoption (Oliveira &

Martins, 2011), investigate the extent of acceptance of EDI technology in Nigerian SMEs (Maikudi & Eta, 2012).

As part of future research, the authors suggest the inclusion of the constructs from other studies to better determine the influences of each factor in an adoption study. Also, the model is applicable to a larger organisation as well in order to enlarge its generalizability (Iacovou, Benbasat, & Dexter, 1995). Table 2.1 describes the construct of each independent variable and its association with the dependent variable (Adoption, Integration and Impact).

Table 2.1

Association of Independent Variables and Dependent Variables of Iacovou et al. Model

Independent Variable	**Construct**	**Association with Dependent Variables (Adoption,Integration, and Impact of EDI)**
Perceived Benefits	Direct Benefits Indirect Benefits	Positive
Organisational Readiness	Financial Readiness Technological Readiness	Positive
External Pressure	Competitive Pressure Imposition by Partners	Positive

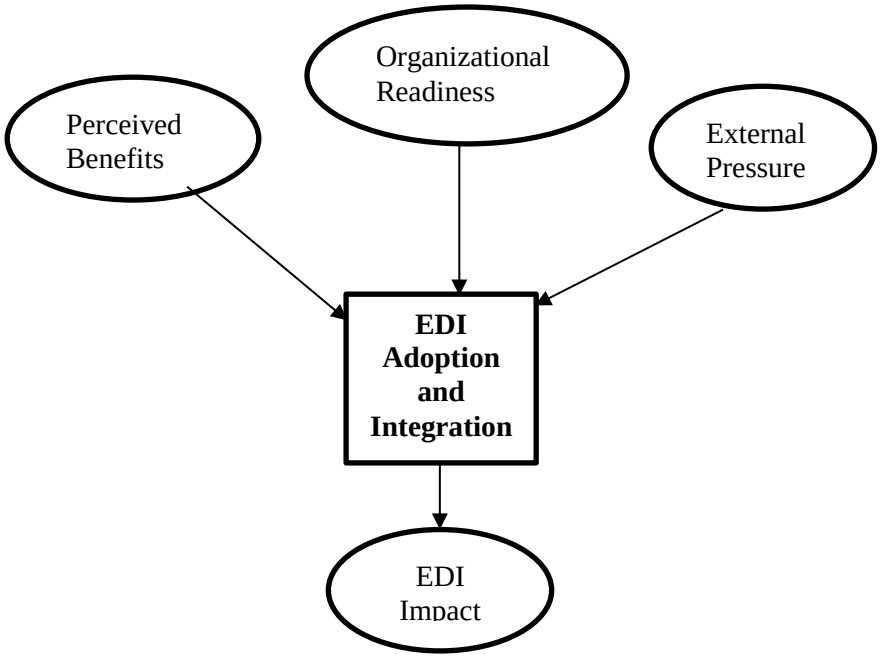


Figure 2.6. Iacovou, Benbasat, & Dexter (1995) model

In conclusion, DOI and TOE are the most prominent models while studying IT adoption at the organisational level. However, for more complex new technology adoption, it is important to combine or integrate more than one theoretical models to achieve a better understanding of the IT adoption phenomenon as suggested by Oliveira and Martins (2011) and Awa, Ukoha, Emecheta and Nzogwu (2012).

2.7.4 Limitation of the Adoption Theories

DOI, TOE and Iacovou et al (1995) theories do not provide complete explanation and understanding to IT adoption decisions at the organisational level. Empirical studies suggest that when DOI is applied to organisational studies, inconsistency normally occurs due to the failure to recognize the differences in the unit of analysis, environment, and technology characteristics or due to difficulty in predicting the

adoption of complex IT systems (Zhu, Dong, Xin Xu & Kraemer, 2006b). DOI theory's non-consideration of the effect of demographic differences such as age, income, education, and gender among adopters discovered in the past research was said to have influenced the attitudes or perceptions towards the technological innovations adoption (Abukhzam & Lee, 2010). TOE framework is more of taxonomy for classifying factors into their various contexts. It does not offer concrete model that gives descriptions of influential factors of adoption process (Ven & Verelst, 2011). The freedom to vary factors or measures of TOE in a new research context makes it highly adaptable; therefore, there is little need to adjust or refine the theory, as was the case with UTAUT. This reasons, among others, contribute to lack of development of TOE since its initial development by Tornatzky and Fleischer (Baker, 2012). Iacovou et al. (1995) model rather than being recognized and acknowledged as an independent theory with different drivers of adoption processes, it is becoming subsumed in TOE research framework due to similarity of drivers of adoption process (Baker, 2012).

2.7.5 Integrating Innovation Adoption Theories and Frameworks

Literatures on IT innovation suggest that most researchers conduct their studies either by extending individual innovation theories or by integrating two or more theories to explain innovation adoption in organisation because these theories individually would not fully explain all the aspects of organisational innovation adoption (Oliveira & Martins, 2010; Oliveira et al., 2014). Therefore, there is the need for integration and possible extension in order to explain fully, the adoption

process of a complex IT innovation in the organisation (Zhu et al., 2006b; Lee & Shim, 2007; Oliveira & Martins, 2011).

Research has attempted to combine and possibly extend the theories of DOI and TOE or TOE, DOI and Institutional Theory or TOE and Institutional Theory or DOI, TOE and Iacovou et al. (1995) or TOE and Iacovou et al. (1995) to validate empirical findings. Ismail and Ali (2013) use an integrated theoretical model of TOE and DOI to investigate the factors that influenced the adoption of computerised accounting information systems (CAIS) among Malaysian SMEs. The inclusion of DOI) in the technological context of the study make the proposed model more robust. Similarly, Li (2008) use DOI, TOE and Institutional Theory to identify major factors that affect electronic procurement adoption in Chinese manufacturing enterprises. Hsu, Kraemer and Dunkle (2008) use DOI, TOE and Iacovou et al (1995) to study the determinants of E-business use in US firms. Gibbs and Kraemer (2004) examine the determinants of scope of E-commerce use by integrating Institutional Theory and TOE. Their findings confirm strategic benefits, external pressure, technology and financial resources factors as important in the use of E-commerce. The study also highlights the importance of effects of the policy environment on scope of E-commerce use. Likewise, Oliveira and Martins (2010) integrate TOE and Iacovou et al. (1995) model to study e-business adoption across industries (Telecommunication and Tourism) in European countries. The results of the study confirm that perceived benefits and obstacles, technology readiness,

trading partner collaboration, and competitive pressure are the most significant factors of E-business adoption across industries.

Based on the reviewed literatures on IT adoption, a research model was developed by integrating adoption theories used in the organisational context to study the E-voting technology adoption from the perspective of the employees of the Independent National Electoral Commission of Nigeria. The model is a combination of dimensions of common factors of DOI, TOE and Iacovou et al. (1995) with the addition of the context of ICT Training and Skills and User Participation in Systems Development. The model was extended by analysing for mediation using ICT training and Skills factor. Likewise, the model test for differential effect in the perception of the employees (staff) of the electoral organisation based on their Position and Working Experience categorical variables on the relationships between factors of the study and E-voting adoption using multigroup analysis.

2.8 The Research Model

The research model used for the main study introduced Users Participation in System Development (UPSD) variables to measure the actual and expected participation of staff in the system development life cycle of the adoption of E-voting Technology in the ogranizational context. Equally, a construct called ICT training and Skills (ICTSKILL) was introduced into the model to determine its relationship with the dependant construct of the study. The mediating effect of ICTSKILL in the relationships between other independent constructs of the research model and the

dependant construct was tested in order to gain more insights into the model of research. ICTSKILL measures the nature and extent of training and skill. Figure 2.7 shows the main research model.

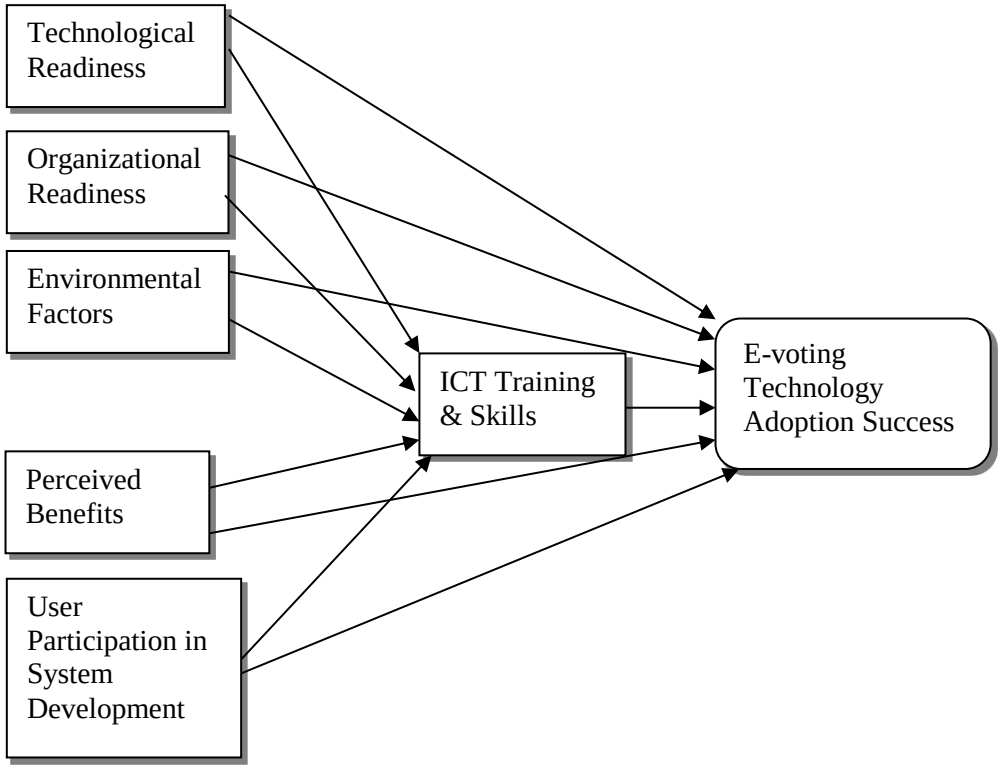


Figure 2.7. Main Research Model for E-voting adoption (EVTAM)

2.8.1 Research Constructs and Hypotheses Formulation

The following sub-sections describe the factors extracted from DOI, TOE, Iacovou et al and reviewed literatures on ICT Training and Skills and User Participation in System Development in the context of E-voting technology adoption.

2.8.1.1 Technological Readiness (TR)

This construct measures the degree to which the organisation is ready technologically to adopt IT innovations. This construct integrates technology construct in the TOE with technological readiness dimension of Iacovou et al. (1995). Tornatzky and Fleischer (1990) describe technological factor (readiness) in terms of the availability and characteristics of the technologies (internal and external) relevant to the firm or organisation while Iacovou et al. (1995) considers technological readiness dimension in terms of the level of IT usage and management in an organisation. Alvar (2011) considers some aspects of technology such as its reliability, its level of security and its relationship with existing technology contributing to the overall framework of factors of IT adoption.

TR is an enabler of all organisational processes and it plays a key role in the IT adoption and implementation phases of an organisation, therefore people's perception about technologies was that it has characteristics which influences the decision to adopt and how they will be implemented (Bouwman, Van den Hooff, Van de Wijngaert, Lidwien & Van Dijk, 2005). Therefore, it is the most self-evident factor that organisation must establish and assess in relation to its present organisational structures and culture in order to make an explicit adoption decision of its readiness and ability with regards to happenings in IT adoption (Alvar 2011). The measurement items used for the study are adapted from previous studies to suit the domain of the study. The stated hypothesis below is to be tested using the research model:

H1: *Technological Readiness will have positive influence on the adoption success of E-voting Technology.*

2.8.1.2 Organisational Readiness (OR)

This measures the degree to which organisation is ready for the adoption of IT innovation. The construct captures the centralization, complexity, formalization, interconnectedness and organisational slack resources of DOI as well as formal and informal linking structures and communication processes dimensions of TOE and financial resources dimension of Iacovou et al. model (Rogers, 1995; Tornatzky & Fleischer, 1990; Iacovou et al., 1995). Molla and Licker (2005) confirm OR construct to be more influential than the environment factors in the adoption processes. OR acts as a catalyst and a driving force to organisation intention to adopt a technology. The construct is positively correlated to the IT adoption (Alvar, 2011). Reviewed literatures established OR as a crucial determinant factor to the successful adoption of any IT innovation. Findings of Tan et al. (2009) reveal that complexity among other dimensions of DOI in the context of organisational characteristics significantly influence internet-based ICT adoption. Baker (2012) suggests that TOE dimensions in the context of organisational readiness influence the adoption of technological innovations. Likewise, study of Maikudi and Eta (2012) which investigates factors affecting the adoption of EDI technology in Nigerian SMEs found financial resources dimension of Iacovou et al. model a significant predictor of EDI adoption. Items under this construct were adapted from Moore and Benbasat (2001); Molla and Licker (2005); Zhu et al. (2006a); Tan et al. (2007) and Ifinedo

(2011) they were reframed to make them suitable for the domain of this study. This hypothesis is to be tested using the research model:

H2: *Organisational Readiness will have positve influence on the adoption success of E-voting Technology.*

2.8.1.3 Environmental Factors (EF)

This construct measures factors external to the organisation that influences successful adoption of IT innovation. It captures the dimensions of industry characteristics and market structure, technology support, infrastructure and government regulation of Tornatzky and Fleischer (1990). Baker (2012) suggests environmental context measures to include regulatory environment (Government regulation, legal framework), absence or presence of technology service provider's supports and the structure of the organisation. Findings of Gibbs and Kraemer (2004) reveal that among significant predictors of organisational adoption of E-commerce are the dimensions of legislation barriers, external pressure and government promotion in the context of environmental factors. Al-Zhoubi (2013) found government support, an element of external (environmental) factors, influences the adoption of e-business investigated.

Similarly, study of Ismail and Ali (2014) found vendor support and government influence in the context of environmental factors a significant construct in the IS success and a determinant factor which positively influences the adoption of IS

innovation in organisation. Items for this constructs were adapted from Tan et al. (2007), Molla, and Licker (2005) and reframed for their suitability to the domain of this study. The next hypothesis is to be tested using the research model:

H3: *Environmental Factors will have positive influence on the adoption success of E-voting Technology.*

2.8.1.4 Perceived Benefits (PB)

This constructs measures direct and indirect benefits that IT innovation adoption can provide to a concerned organisation. Direct benefits measure operational cost savings and other internal efficiencies arising from the IT adoption while indirect benefits measure the opportunities that originate from the IT adoption, including satisfactory service delivery and the possibilities for process reengineering (Iacovou et al., 1995). Chwelos, Benbasat & Dexter, 2001) suggest that perceived benefits constructs should take into consideration the appropriate benefits of an IT adoption. Findings of van Heck and Ribbers (1999) reveal that, the perceived benefits factor can significantly explain the adoption of EDI among the Dutch SME's. The result of the study conducted by Maikudi and Eta (2012) shows that, perceived benefits, among other factors, have positive relationship with EDI adoption by Nigerian SME's. Likewise, study of Alam (2009), on the factor influencing adoption of ICT among SMEs in the service sectors of Malaysia reveals that perceived benefits factors is a good predictor of ICT adoption intention. The fourteen items used in this study to measure PB constructs was adapted from the study of Kim et al (2008) and

reframed to make it suitable for the study domain. The hypothesis below is to be tested using the research model:

H4: *Perceived Benefits will have positive influence on the adoption success of E-voting Technology.*

2.8.1.5 Inclusion of ICT Training and Skills and Users Participation in System Development

Empirical evidence suggests that ICT training and Skills and Users Participation in System Development are determinants of IT innovation adoption although existing theories used in the study of IT innovation have not clearly demonstrate their benefits (Baroudi, Olson & Ives, 1986; Vaughan, 2001). Since many researchers have considered these two variables an important predictor of IT innovation adoption in organisation, the researcher therefore deems it fit to include these variables in the study to provide a better understanding of the research and to contribute to this argument in this domain of study.

2.8.1.5.1 Users Participation in System Development (UPSD)

Barki and Hartwick (1994) define user participation or UPSD as "the process of users or their representative taking part in assignments and activities during systems development" (p. 60). In this study, the interest is the decision to adopt E-voting technology by electoral organisation. Therefore, UPSD will have direct effect on the adoption success of E-voting technology. The construct captures General, Non-Stage-Specific Participation, System Definition Phase Participation, Physical Design

Phase Participation and Development Phase Participation dimensions as suggested by Barki and Hartwick (1994). Previous studies on IT adoption reveal that UPSD predicts the adoption success of IT innovations within the organisational context. Findings of Baroudi, Olson and Ives (1986) indicate that UPSD enhances both system usage and user's satisfaction with the system of study. Study of Lin and Shao (2000) confirm the positive influence of UPSD on the implementation success of an IS system. Lawrence, Goodwin and Fildes (2002) found that user participation in the design of a forecasting decision support system (FDSS) increases the user's satisfaction with the system. The study of Terry and Standing (2004) establishes a consistent correlation between the user participation and user satisfaction. Studies of McLeod et al. (2007), Harris and Weistroffer (2008) confirm a correlation between UPSD and system success. Findings of Subramanyam et al. (2010) reveal that user participation generates high levels of developer and user satisfaction. Gibbs (2010) confirms a positive relationship between user participation and satisfaction with human resources (HR) information system. Likewise, empirical study of Menghrajani (2011) suggests a positive relationship between user participation and technology acceptance in the post-implementation phase of an IT system. Items under this construct are adapted from Barki and Hartwick (1994) and reframed to make them suitable for the domain of this study. The hypothesis below is to be tested using the research model:

H5: *Users Participation in System Development will have positive influence on the adoption Success of E-voting Technology.*

2.8.1.5.2 ICT Training and Skills (ICTSKILL)

ICT Training and Skills (ICTSKILL) refer to the training plans and acquisition of basic technical skills necessary for the successful adoption and operation of an IT innovation by an organisation. Harel and Tzafrir (1999) suggest that it is a crucial component for continuous improvement of individuals and organisation. Development of a training plan and acquisition of basic skill set is a critical determinant of an IS adoption success (Vaughan, 2001). Widening access and providing training are obviously important factors in enhancing adoption and use (Foley, 2004). Previous studies on IT adoption reveal that ICTSKILL predicts the adoption of IT innovations within the organisational context. Study of Forth and Mason (2004) reveals that ICT training is significant and positively related to the ICT adoption among the UK firms. Findings of Hashim (2007) indicate that ICT skill positively correlate to the ICT adoption among the SME owner in Malaysia.

Findings of Arntzen Bechina and Nkosi Ndlela (2009) show that, ICT training and skill is a factor in the successful implementation of knowledge-based systems. Similarly, findings of Isabalija, Mayoka, Rwashana and Mbarika (2011) indicate that ICT skills among other factors are crucial to the adoption, implementation and sustainability of telemedicine information systems in Uganda. Items under this construct are adapted from Din, Zakaria, Mastor and Embi (2008) and reframed to make them suitable for the domain of this study. The hypothesis below is to be tested using the research model:

H6: *ICT Training and Skills will have positive influence on the adoption success of E-voting Technology.*

2.8.1.6 Hypotheses for Mediating Variable

The needs to theoretically takes into account and empirically test for mediation or indirect effect in order to understand fully the nature of cause-effect structural relationships have been suggested (Baron & Kenny, 1986; Bennett, 2000; Preacher & Hayes, 2008). However, researchers, most of the times do not explicitly test these (Hair et al., 2014). Some studies have identified mediating effect on structural path relationships of an IT innovation adoption. Findings of Kim et al (2007) reveal that Perceived Value variable mediate the relationships between usefulness, enjoyment, Technicality and Perceived Fee constructs (independent variables) and Adoption Intention (dependent variable). The study of Chen and Huang (2009) finds out the evidence of mediating role of knowledge management capacity in the relationships between strategic human resource practices and innovation performance. Study of Walker et al (2010) indicates that the impact of Management Innovations (MI) on Organisational Performance is not direct; Performance Management mediates it. In contrast, there is sparse evidence of empirical studies that analyse mediation or indirect effect in the context of E-voting technology adoption in the organisational settings. This study therefore attempts to fill this research gap by investigating the mediating and indirect effect of ICT Training and Skills variable.

A critical determinant of an IS or IT adoption success as suggested by Vaughan (2001) in the cause-effect relationships between the remaining determinants factors of the study and E-voting adoption from the perspectives of employees of an electoral management organization was studied.

The following indirect hypotheses will be tested in the study:

H7: *ICT Training and Skills will have mediating or indirect effect on the relationship between Technological Readiness and the adoption success of E-voting Technology.*

H8: *ICT Training and Skills will have mediating or indirect effect on the relationship between Organisational Readiness and the adoption success of E-voting Technology.*

H9: *ICT Training and Skills will have mediating or indirect effect on the relationship between Environmental Factors and the adoption success of E-voting Technology.*

H10: *ICT Training and Skills will have mediating or indirect effect on the relationship between Perceived Benefits and the adoption success of E-voting Technology.*

H11: *ICT Training and Skills will have mediating or indirect effect on the relationship between IT Staff Participation in System Development and the adoption success of E-voting Technology.*

2.8.1.7 Hypothesis for Multi-Group Variables

The assumption that independent (exogenous) variables directly affect the dependant (endogenous) variable(s) of a study without the influence or moderating effect of other variables cannot hold because respondents may likely differ (heterogeneous) in their perception and evaluation of research variables, resulting in significant differences in path model coefficients across two or more groups of respondents (Hair et al., 2014). Recent studies have identified differential effects (heterogeneity) of age, gender, experience, education level, voluntariness and managers tenure (Position) of adopters on structural path relationships of an IT adoption in the organisational context (Park, Yang, & Lehto, 2007; Lin, 2010; Wang and Lin, 2011). Park et al. (2007) conduct a Structural Equation Modelling (SEM) multi-group analysis that indicates a significant moderating effect of gender and educational level on the adoption of mobile technologies by the Chinese consumers. The study of Lin (2011) on mobile banking adoption confirmes a difference of attitude towards mobile banking between potential and repeat customers in Taiwan using multi-group analysis with t-statistics. Similarly, the results of Wang and Lin (2011) multi-group analysis reveal the differences between blog readers and writers perception based on the blog platform qualities and the intensity of path coefficients among factors in the research model.

However, empirical studies of heterogeneous effects in E-voting technology adoption in the organisational setting are sparse. Therefore, the need to investigate heterogeneity in the cause-effect relationships between the determinants and E-

voting adoption from the perspectives of employees of an electoral management organization becomes necessary in order to fill a research gap and to better the understanding of the domain of this study. The next hypothesis will be tested using the research model.

H12: *The established structural model relationships of E-voting technology adoption may be moderated by staff position and work experience.*

2.8.1.8 E-voting adoption (EAD)

For this study, EAD is the dependent variable since the study is about the adoption of IT innovation in the organisational setting. The items are adapted from Molla and Licker (2005) and reframed to suit the domain of this study. The summary of all the research hypotheses for this study is as shown in Table 2.2, while Figure 2.8 shows the hypothesized research model.

Table 2.2

Summary of the Research Hypotheses

Name	Hypothesis
	Direct Relationships
H1	Technological Readiness will have positive influence on the adoption success of E-voting Technology.
H2	Organisational Readiness will have positive influence on the adoption success of E-voting Technology.
H3	Environmental Factors will have positive influence on the adoption success of E-voting Technology.
H4	Perceived Benefits will have positive influence on the adoption success of E-voting Technology.
H5	Users Participation in System Development will have positive influence on the adoption Success of E-voting Technology.

Table 2.2
Continued.

H6	ICT Training and Skill will have positive influence on the adoption success of E-voting Technology.
	Indirect Relationships
H7	ICT Training and Skills will have mediating or indirect effect on the relationship between Technological Readiness and the adoption success of E-voting Technology.
H8	ICT Training and Skills will have mediating or indirect effect on the relationship between Organisational Readiness and the adoption success of E-voting Technology.
H9	ICT Training and Skills will have mediating or indirect effect on the relationship between Environmental Factors and the adoption success of E-voting Technology.
H10	ICT Training and Skills will have mediating or indirect effect on the relationship between Perceived Benefits and the adoption success of E-voting Technology.
H11	ICT Training and Skills will have mediating or indirect effect on the relationship between IT Staff Participation in System Development and the adoption success of E-voting Technology.
H12	The established structural model relationships of E-voting technology adoption may be moderated by staff position and work experience.

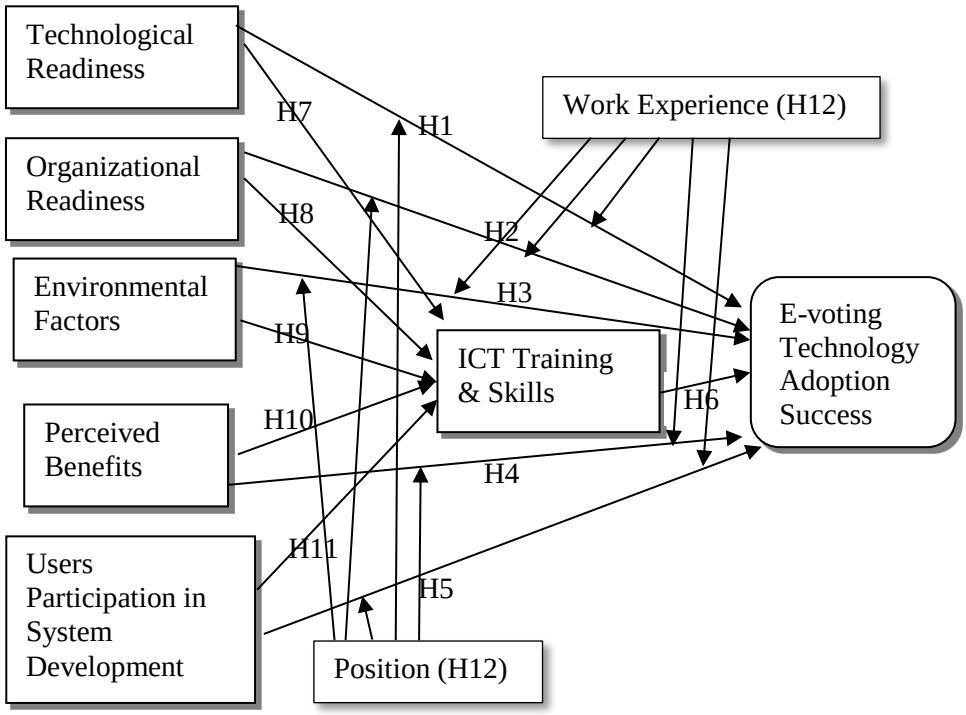


Figure 2.8. The Hypothesized Research Model

2.9 Categorization of Research variables

The research variables are categorized into three major parts:

(1) **Independent Variables**: This is an attribute or characteristics that influences or affects an outcome or dependent variable (Creswell, 2012). The independent variables based on the main research model are listed in Table 2.3.

(2) **Mediating Variable:** A variable that specifies the way association between an Independent variable and an outcome or dependent variable occurs (Bennett, 2000). ICTSKILL is the only mediating variable used in this study as shown in Table 2.3.

(3) **Dependent Variable:** It is an attribute or characteristic influenced by the Independent variable (Creswell, 2012). The Dependent Variable for this study is the E-voting adoption (EAD). This is as shown in Table 2.3.

Table 2.3.

Research Variables

Independent variable	Mediator	Dependent Variable
Technological Readiness (TR) Organisational Readiness (OR) Environmental Factors (EF) Perceived Benefits (PB) Users Participation in System Development (UPSD)	ICT Training and Skills (ICTSKILL)	E-voting Adoption (EAD)

2.10 Chapter Summary

This chapter reviews related works on IT innovations adoption with particular attention to E-voting technology adoption. The chapter also reviews the basic concepts of E-voting technology and reasons for its adoption in Nigeria in order to justify the position of the researcher on the need to identify those determinants that can influence its successful adoption by the electoral commission of Nigeria. The chapter presents the research framework and hypotheses based on the proposed model of the study. It also explains the dimensions of the study, their sources and the justification for such inclusion. The chapter equally serves as a guide to the interpretation of the findings of the research having established links between the researches variables used in the study.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed in detail the methods used in this study for the pilot study and main studies. The chapter begins with the research approach, research methods, research design, sampling design and sample size and research instrumentations and validation process for the pilot study. Detailed discussions of the reliability and validity of the instruments and outcome of the pilot study are presented. The process of data collection and unit of analysis for the main study are also explained.

3.2 Research Approach

Sekaran and Bougie (2011) suggest the need for a researcher to take into considerations issues such as the type of investigation and where the research is being conducted, population of study, sample type and the sampling technique to be adopted. In addition, methods of data collection, means of variable measurement and method of data analysis bing adopted to test the research hypotheses in order to make the right choice of research approach appropriate to the study under investigation. The research approach is an effective strategy to increase the validity of research (Creswell, 2012).

Mandal (2013) and Woodwell (2014) suggest two major approaches, namely: deductive and inductive. In a deductive research approache, a researcher moves from general to specific or from top to bottom. The researcher attempts to prove the validity of the study based on the available knowledge or information on pre-existing theories (Mandal, 2013). Cause and effect relationships are argued using formal logic rather than informal method of pattern recognition of empirical data normally used in inductive approach (Woodwell, 2014). In the inductive approach, a researcher moves from specific to general or from bottom-up. Some happenings are observed, pattern deducted and then conclusion drawn (Mandal, 2013). This approach relies on the observation and description of event or process (Woodwell, 2014). Research approach may also be quantitative or qualitative, or mixture of both (Garson, 2002). The choice depends on the nature of the problem under investigation (Thomas, 2003; Sekaran & Bougie, 2011; Kumar, 2011).

The purpose of selecting any approach is to contribute to an empirical knowledge or the development of the theory (Creswell, 2012). The approach selected by a researcher depends on the objectives of the study, the research design and availability of resources and time. Since, the study aimed at theory prediction through an empirical research, it is expected to move from general to specific. Deductive and quantitative approaches are considered appropriates in identifying factors that influence technology adoption of E-voting in the context of employee of Independent National Electoral Commission of Nigeria through hypotheses testing.

3.2.1 Quantitative Approach

Quantitative research uses numbers and statistical methods based on numerical measurements of specific aspects of phenomena in order to seek general description or test causal hypotheses. It seeks measurement analyses that are easily replicable by other researchers (King, Keohane, & Verba, 1994).

According to Kumar (2011), the main objective of quantitative research in data analysis is to decide how to analyze data or information obtained based on the questions asked the respondents by the researcher. This approach is used to collect data to investigate the relationship between the independent variables (IT adoption factors) and the adoption of E-voting technology (dependent variable) in the organisational context using both the managerial and operational staff of INEC, Nigeria as respondents for the study.

3.2.2 Justification for Quantitative Approach

Quantitative approach offers the advantage of generalizability: this is the extension of research findings and conclusions on a study conducted using a sample population to the population at large. Because sound generalizability requires data on a large population, quantitative approach provides the best foundation for producing broad generalizability. That is, the larger the population sample, the more generalizable the results of the research. Though this extension is not absolute, it is however statistically probable (Creswell, 2012; Colorado State University, 2012).

Kumar (2014) and Creswell (2014) suggest this approach as the best if the objective of a study is to achieve any or all of the following (a) quantifying the extent of variation in a phenomenon (b) when the emphasis is on the measurement of variables (c) when reliability and validity of findings are of importance (d) identification of factors that influence an outcome (e) the use of analytical and aggregate means of communicating research findings (f) understanding the best predictors of outcomes (g) testing a theory or explanation.

This study portrays all the characteristics or attributes of quantitative studies as mentioned above.

3.3 Research Methods

This research uses a large, quantitative, cross-sectional survey method. Survey methods according to Creswell (2012) are "*procedures in quantitative research in which investigators administer a survey or questionnaire to a sample or to the entire population of people to describe the attitudes, opinions, behaviors, or characteristics of the population*" (p. 13). Research finding by Choudrie and Dwivedi (2005) suggests that two methods, survey and case study are employed in the organisational context for technology adoption research, the choice of which corresponds to the unit of analysis. If a researcher considers the organisation as a unit of analysis, case study method is applicable but when the unit of analysis is individual in the organisation, researcher employs survey methods. Kumar (2014) suggests that cross-sectional method is best suited to studies in which the objectives are to find out the fact or

commonness of a phenomenon, situation, problem, attitude, perception or issue, by taking a cross-section of the population in order to obtain complete situation as at the time of the study.

Since the unit of analysis of the research is the managerial and operational staff of INEC, survey method (questionnaire) is employed. The managerial and operational staff are the ones charged with the responsibilities of conducting elections. The study is essentially to investigate the perception of the staff on the adoption of E-voting technology using the proposed conceptual research model. It is cross-sectional because, it will take a cross-section (samples) of the population as a means of obtaining an overall 'picture' as it stands at the time of the study.

3.4 Research Design

Having identified the variables in a problem situation and developed the theoretical framework, the next step is to design the research in such a way that the requisite data can be collected and analyzed to arrive at a solution (Sekaran & Bougie, 2011). Components of a research design offer several critical choices and the extent of scientific rigor in a research study depends on how the researcher chooses the appropriate design alternatives, taking into consideration its specific purpose (Kumar, 2011; Sekaran & Bougie, 2011; Creswell, 2012). Sekaran and Bougie (2011) suggest five components of research design, namely: (1) Purpose of the study (2) Investigation Types (3) Degree of Researchers Interference with the study (4) Study Setting and (5) Measurement.

This research design employs quantitative method which leads to five phases. The first phase embraces descriptive and a survey study. In details, the research variables were identified and described using questionnaire items to elicit responses from the managerial and operational staff of the electoral organisation. Thereafter, the hypothesized research variables were tested in order to gain insight into the research topic. The second phase is associated with correlational study, based on the identified research variables in phase one and using Multi-Stage, Disproportionate Stratified random sampling techniques. Analysis was done in order to establish the mutual influence the research variables has on one another (Sekaran & Bougie, 2011).

In the third and fourth phases, the study was conducted at the electoral organisation office with minimal interference from the researcher in the sequence of activities at the organisation using the sampling technique adopted in phase two to gather data once over a period of five months in order to find answers to the research questions (Sekaran & Bougie, 2011). Finally, the quantitative data collection using printed questionnaire was conducted. Procedure of multi-item scaling, categorization and code development suggested by Kumar (2011) and Sekaran and Bougie (2011) was employed in order to define items that measure the research variables (constructs) used in the study.

All issues in this research were addressed in one way or the other by the aforementioned research design since the primary aim of the study is to measure the perceptions of the employees of an electoral organisation on the adoption of electronic voting technology by the management for the successful conduct of future elections. Figure 3.1 shows the schematic diagram of the overall research design for the study.

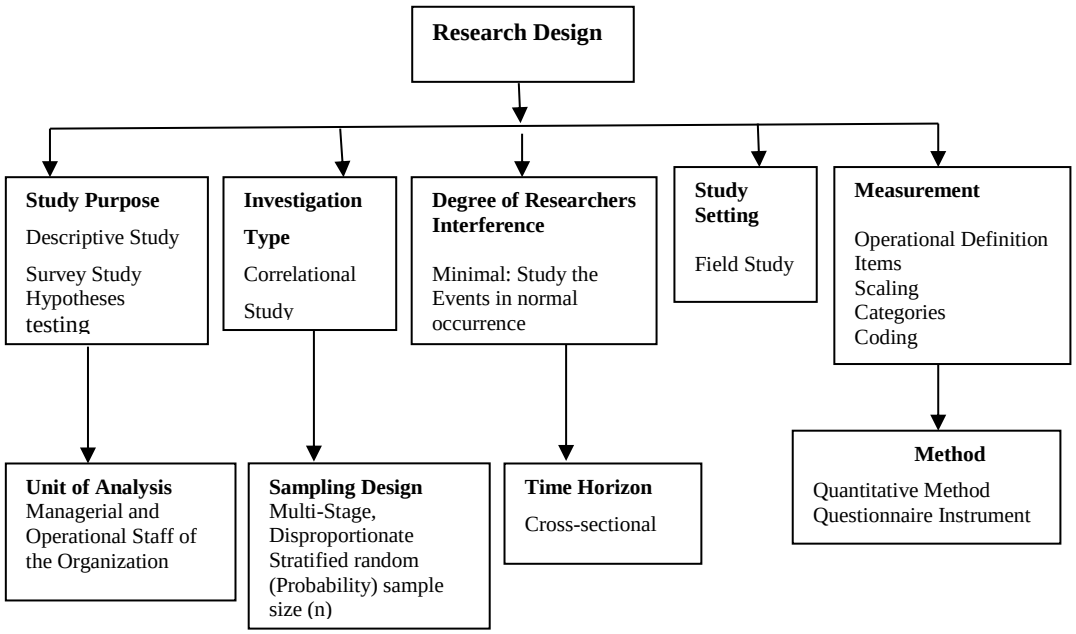


Figure 3.1. Schematic diagram for the Research Design
Source: (Sekaran & Bougie, 2011)

3.5 Sampling Design and Sample Size

3.5.1 Population of the Study

Sekaran and Bougie (2011) refer to population as "*the entire group of people, events, or things of interest for which the researcher wants to investigate and make inference based on sample statistics*" (p. 262). It is from the study population that researcher obtained information required to provide answer to his/her research questions. As the research problem is narrowed down, the researcher must decide, in clear terms, what constitutes his/her study population in order to select the appropriate respondents (Kumar, 2011, 2014). The population for this study is the 12,341 staff of the Independent National Electoral Commission of Nigeria as detailed in the list of employee of the Commission as at January 2012. The purpose was to get an appropriate number of samples that is representative of the respondents for the study to infer the influence of the determinant factors of information technology adoption on the adoption of E-voting technology by the electoral commission in Nigeria.

3.5.2 Sampling Design

There are two major types of sampling design: probability and non-probability sampling designs. In probability sampling, the elements in the population have some known non-zero chance or probability of being selected as sample subjects while in non-probability sampling, the elements do not have a known or predetermined chance of being selected as sample subjects (Sekaran & Bougie, 2011).

The researcher used disproportionate stratified random sampling for the study. Disproportionate sampling design was adopted because some strata in the population of the study were too large or too small and due to variability in the stratum. The stratification will ensure homogeneity within each stratum (little dispersion on variable within each stratum) but heterogeneity (variability) between strata (Sekaran & Bougie, 2011; Kumar, 2011). This sampling design is more efficient compared to simple random sampling design because there is better representation of each segment of the population, and for each group, valuable and differentiated information were obtained (Sekaran & Bougie, 2011).

The researcher equally employed the use of multi-stage cluster sampling in addition to the stratification for the study because INEC, Nigeria is a national electoral organisation with a national headquarters and offices in the 36 state of the federation. The 36 states are in the Northern and Southern parts of the federations out of which six-geopolitical zones were created as shown in Figure 3.2. The multistage sampling involves the selection of staff at the national headquarters and selection of staff from each of the northern and southern regions. One geo-political zone was selected from the north and one from the south, then two states each were selected from the six geo-political zones of north and south.

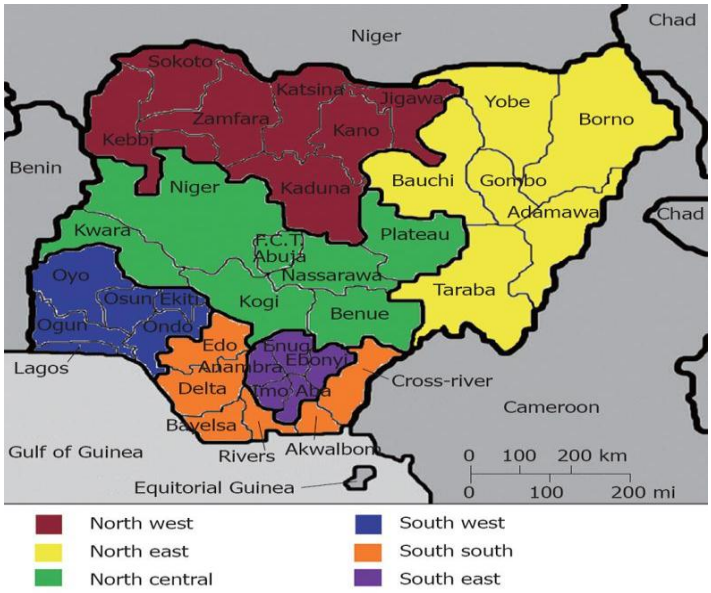


Figure 3.2. Map of Nigeria Showing the Geo-Political Zones
Source:http://www.nigeriahc.org.uk/about-nigeria (2014)

3.5.3 Sample Size

Sample size is governed by the extent of precision (standard error) and confidence desired by the researcher (Sekaran & Bougie, 2011). INEC, Nigeria, is structured as follows: as obtained from the office of Director of Human Resources of the Commission during the pilot study in February 2012.

(1) **Managerial Cadre**

This comprises a Chairman, Eleven (11) National Commissioner, Thirty-six (36) State Resident Electoral Commissioners, One hundred and seventeen (117) Directors, Three hundred and twenty-five (325) Deputy Directors, and Two hundred and twenty-eight (228) Assistant Directors.

(2) **Operational Cadre**

The Operational Cadre comprises senior staff with a population of seven thousand, two hundred and eighty-four (7,284), and junior staff with a population of four thousand, three hundred and thirty-eight (4,338).

The total population based on the above statistics is 12,341 as at 2012 based on secondary data received during the pilot study. For the main study, a sample size was selected using sampling table of Krejice & Morgan (1970). Base on the table, since the population is above 10,000 but less than 15,000 a sample size of 375 is therefore assumed for the study. Base on the sample size, a disproportionate stratified random sampling was used in order to determine the number required for each level and stratum that formed the sample size of 375.

Disproportionate stratified random sampling was used because some strata are too small or too large (see Table 3.1). Sekaran and Bougie (2011) and Kumar (2011) support this procedure. The sample size guided the distribution of 500 questionnaires to the categories of the selected staff. The questionnaire is in English language because Nigeria is an English-speaking country (see Appendix B). Table 3.1 shows the distribution pattern of the questionnaires for each group (stratum) of the population based on the estimated sample size while Table 3.2 shows the number returned by the respondents.

Table 3.1

Questionnaire Distribution Pattern

Category of Staff	**Population per Strata**	**Number Shared Questionnaires (Disproportionate Sampling)**
Top management	49	15
Director	117	25
Deputy Director	325	60
Assistant Director	228	30
Senior Staff	7284	220
Junior Staff	4338	150

Table 3.2

Number of Questionnaire Returned

Category of Staff	**Number of Questionnaires Distributed**	**Number Returned**
Top management	15	8
Director	25	22
Deputy Director	60	50
Assistant Director	30	25
Senior Staff	220	166
Junior Staff	150	109

3.6 Data Collection Methods

3.6.1 Survey Administration

Data was collected using personally administered questionnaires. The respondents were given paper questionnaire to fill and to return same to the researcher within one week, although this could not be achieved because the researcher have to travel between the selected four states offices of the electoral commission in Oyo, Osun, Niger, Kogi and the Head Office in Abuja within the five months used for data collection. The researcher distributed 500 questionnaires among the staff of the Commission based on position as indicated in Table 3.2. However, the breakdown of the distribution shows that one each was distributed to the four states (only the state resident commissioner for each state belongs to the top managers) and eleven to the head office for the top Managers making a total of fifteen (15). Five (5) each was distributed among the Directors in the five locations making a total of twenty-five (25) questionnaires while twelve (12) each was distributed among the Deputy Directors in the five locations making a total of sixty (60) questionnaires. Six (6) each was distributed among the Assistant Directors making a total of thirty (30) questionnaires, while forty-four (44) each was distributed among the Senior Staff with a total of two hundred and twenty (220). Lastly, thirty (30) each, was distributed among the Junior Staff making one hundred and fifty (150) questionnaires.

The main advantage of this method is that the researcher can collect all the response within a short period; it is less expensive and the return rates are high when compared with mailed questionnaire (Sekaran & Bougie, 2011; Kumar, 2011). The challenges of internet connectivity in Nigeria also make the personally-administered questionnaire an ideal option for the survey. The questionnaire is designed for easier understanding by the respondents. Time for the administration of the questionnaire is between 15 to 20 minutes. A total sum of 500 questionnaire were distributed, 125 above the required number of 375 as recommended by Krejice and Morgan (1970) for a study population of 12,341. The increase is to accommodate likely low return rate and to improve the reliability of the sample size (Kumar, 2011; Sekaran & Bougie, 2011).

3.6.2 Instrument Design

A five (5) point Likert scale questionnaire, with 1 indicating "Strongly Disagree" and 5 indicating "Strongly Agree" was administered to the two categories of INEC (i.e. Managerial and Operational staff of INEC). The questionnaire comprises two main parts: (1) the Demographic Information section and (2) the section that contains items used to operationalize all research variables or constructs to measure the perception of the INEC staff in relation to the readiness of INEC to adopt E-voting technology.

Items of the questionnaire were adapted from one source of the literatures or the other and reconstructed to suite the domain of this study (Moore & Benbasat, 2001; Molla & Licker, 2005; Zhu et al., 2006a; Tan et al., 2007; Kim et al., 2008; Ifinedo, 2011). The design instruments were given to two experts from University of Ilorin, Nigeria who are Senior Lecturers of more than fifteen years working experience for content validity before it was administered for the Pilot Study. Their comments were used to make some necessary adjustments to the instruments.

For the main instrument (See Appendix B), two experts in quantitative study, one an Associate Professor and the other, a Professor from the School of Computing, Universiti Utara Malaysia were appointed to review the items in the main instrument (See Appendix A). Their comments and suggestions were used to improve the content of the instrument by making adjustment or amendments where necessary in order to make items as simple as possible for the respondents. Detailed discussions on the instrument development are as follows.

TR Dimension

All Items under this dimension were adapted from relevant literatures on adoption studies. The first fourteen items under the construct (TR1 to TR14) were adapted from Molla and Licker (2005). The remaining four items (TR15 to TR18) were adapted from Tan et al. (2007). All the eighteen reflective items reframed to suite the domain of the study. Refer to Table 3.3.

Table 3.3

Technological Readiness Coding

Item Description	Code
INEC adopts electronic voting system because it will guarantee the accomplishment of a free and fair elections within the shortest possible time.	TR1
INEC adopts electronic voting system because most of the staff are computer literates.	TR2
INEC has the necessary technical skills to implement electronic voting system	TR3
Electronic voting system will be a success if INEC is aggressive about its implementation.	TR4
Because INEC has sufficiently invested in the electronic voting system project its adoption will be successful.	TR5
The adoption of electronic voting system will remove the problem of ballot stuffing during elections.	TR6
Hardware,software and other infrastructures for the implementation of the electronic voting systems have been provided.	TR7
The staff are adequately trained for the adoption of the electronic voting system.	TR8
Staff have the required technical skills to adopt electronic voting systems.	TR9
INEC cannot adopt electronic voting system because most staff are not computer literates.	TR10
Reliable and efficient telecommunication infrastructure is a requirement for the adoption of electronic voting system.	TR11
Support from local IT industry will assist INEC in the adoption of electronic voting system.	TR12
Telecommunication infrastructure is not a perquisite for the adoption of electronic voting system.	TR13
The adoption of electronic voting system will not guarantee free and fair elections.	TR14
INEC is well computerized with Local Area Network (LAN) and Wide Area Network (WAN).	TR15
INEC has high bandwidth connectivity to the Internet.	TR16
The existing systems at INEC are flexible to accommodate the adoption of electronic voting systems.	TR17
The existing systems at INEC are customizable to the needs of electronic voting system when adopted.	TR18

OR Dimension

Items under OR were adapted from relevant literatures on technology adoption. The first and second items of the construct, OR1 and OR2 were adapted from study of Ifinedo (2011). The third and fourth items of the construct, OR3 and OR4 are adapted from study of Moore and Benbasat (2001) while construct, OR8, OR9,

OR10 and OR11 were adapted from the views of Zhu et al. (2006a) and Thiesse et al. (2011). Items OR12 and OR13 were adapted from Tan et al. (2007) and lastly, Items OR5, OR6, OR7, OR14, OR15, OR16, OR17, OR18, and OR19 were derived from the studies of Molla and Licker (2005) and Tan et al. (2007). The table 3.4 contains reflective items of this construct.

Table 3.4

Organisational Readiness Coding

Item Description	Code
INEC has the necessary technical, managerial and other skills to implement electronic voting system.	OR1
Using electronic voting systems will not be too complex for INEC to operate.	OR2
Electronic voting system will enable INEC to accomplish tasks more quickly during elections.	OR3
Electronic voting system will assist INEC to improve voter's participation during elections.	OR4
Electronic voting system will enhance the general administration and conduct of elections by INEC.	OR5
Electronic voting system will assist INEC to maintain good conduct of voters and political parties during the elections.	OR6
Electronic voting system will achieve interconnection of systems for easier communication among units and departments of INEC.	OR7
Electronic voting system is compatible with INEC's corporate culture and value system.	OR8
Top management of INEC is willing to take the risk (financial and organisational) involved in adopting electronic voting system.	OR9
INEC has hardware and software that are compatible with the implementation of electronic voting system.	OR10
The skills needed to implement and to use electronic voting systems are too complex for INEC.	OR11
INEC understands electronic voting model applicable to the conduct of credible elections.	OR12
INEC has a clear vision regarding the implementation of electronic voting system.	OR13
INEC has put in place an effective legal framework to combat cyber crime.	OR14
INEC understands the potential benefits of electronic voting system to the conduct of elections.	OR15

Table 3.4

Continued.

INEC has thought about whether or not electronic voting system has impact on the way elections are to be conducted in the country.	OR16
Roles, responsibility are clearly defined within electronic voting system adoption initiatives.	OR17
Decision-making authority has been clearly assigned for all electronic voting system adoption initiatives.	OR18
INEC will follow systematic process for managing change issues as a results of electronic voting system implementation.	OR19

EF Dimension

Table 3.5 illustrates the description and Code for the EF construct. The dimension consists of nineteen reflective items adapted from Tan et al. (2007), Molla, and Licker (2005). The items were adapted to suite the domain of E-voting adoption study.

Table 3.5

Environmental Factors Coding

Item Description	Code
Introduction of electronic voting system will guarantee security of voter's data and voter's vote during elections.	EF1
Electronic voting system can be operated for all levels of elections.	EF2
The working together of interdependent components external to the electronic voting such as telecommunication will ensure smooth conduct of elections.	EF3
Processing large amount of data within a very short time is a condition for electronic voting system adoption.	EF4
Quick responses to a specific task requests during and after elections is a requirement for the adoption success of electronic voting system.	EF5
Managerial skills of INEC is a perquisite for the adoption success of the electronic voting system.	EF6
Adequate voters education is a necessity for the success of electronic voting systems.	EF7
For INEC to adopt Electronic voting system its gains or benefits must outweighs its costs.	EF8
Adequate power supply is a major problem in the implementation of electronic voting system.	EF9

Table 3.5

Continued.

Minimal government interference will ensure the success of electronic voting system adoption.	EF10
Political parties cooperation with INEC will ensure the success of the electronic voting system.	EF11
Effective legal framework to protect its implementation is a factor that will determine its success.	EF12
Security of all electronic transactions during and after elections will be guaranteed by electronic voting system.	EF13
INEC has carried out the necessary voter's education on electronic voting system.	EF14
INEC has put inadequate measure to ensure constant power supply in the use of electronic voting system during elections.	EF15
Government interference in the use and operations of electronic voting system will not affect its success.	EF16
Political parties cooperation with INEC is not a factor to be considered for the success of the electronic voting system.	EF17
INEC can operate the electronic voting system in line with the current legal provisions.	EF18
Security of all electronic transactions during and after elections cannot be guaranteed by electronic voting system.	EF19

PB Dimension

Items under this dimension were adapted from the study of Kim et al (2008). They all reflective measures and reconstruct to suite the domain of this study.

Table 3.6

Perceived Benefits Coding

Item Description	Code
Implementation of electronic voting system across a network during elections to capture as many voters as possible is a benefit for its adoption.	PB1
Electronic voting system will stop vote manipulation.	PB2
Electronic voting system will remove all internal treats to the conduct of free, fair and credible elections.	PB3
INEC will save cost using electronic voting system for elections.	PB4
Using electronic Voting systems for election is convenient.	PB5

Table 3.6

Continued.

Adoption of electronic voting system by INEC will remove the problem of ballot stuffing during election.	PB6
Adoption of electronic voting system will assist INEC in achieving accurate vote count.	PB7
Adoption of electronic voting system will assist INEC to remove problem of multiple registration by eligible voters during elections.	PB8
With the adoption of electronic voting systems, INEC will solve the problem of multiple voting during elections.	PB9
Adoption of electronic voting system will improve the voters trust in INEC in the conduct of elections.	PB10
Using electronic voting system enhances staff job performance.	PB11
Using electronic voting system help in accomplishment of staff job more quickly.	PB12
Using electronic voting system can increase staff productivity.	PB13
Using electronic voting system will enhance staff productivity.	PB14

ICTSKILL Dimension

The nineteen items under this dimension were adapted from the study of Din, Zakaria, Mastor and Embi (2008). The construct was measured reflectively and reconstructed to suite the domain of the study.

Table 3.7

ICT Training and Skills Coding

Item Description	Code
INEC has trained the staff on how to use and operate computers.	ICTSKILL1
My Unit has organized seminars or workshops on IT training and skills.	ICTSKILL2
INEC staff will be able to use their ICT skill to operate the electronic voting systems.	ICTSKILL3
My Unit was among those trained on how to use or operate electronic voting systems.	ICTSKILL4
No staff have been trained on how to use or operate electronic voting systems.	ICTSKILL5
The training provided by INEC is relevant for the implementation of electronic voting systems.	ICTSKILL6
Lack of ICT training and skills among the staff will affect the organisation readiness for electronic voting systems.	ICTSKILL7

Table 3.7

Continued.

The content of the training provided covers current usage of the technology.	ICTSKILL8
Lack of ICT training and skills among staff will affect the benefits of adopting the electronic voting systems.	ICTSKILL9
The ICT training and skills builds staff confidence for the adoption of electronic voting systems.	ICTSKILL10
Adoption of electronic voting systems by INEC will succeed if all necessary ICT training and skill needed by staff are put in place.	ICTSKILL11
The skills acquired from the training provides sufficient practice opportunity in the operation of electronic voting systems.	ICTSKILL12
Training on the operations and use of the voting system will influence the attitude of staff towards its adoption.	ICTSKILL13
Staff should be able to develop new skill in ICT if they are given adequate training on electronic voting system.	ICTSKILL14
Staff perquisite knowledge and skills of computer will enhance their training on electronic voting system.	ICTSKILL15
There will be strong links between theory and practice of electronic voting system when staff undergo training.	ICTSKILL16
Insufficient time for staff training will have impact on the needed skills to operate the electronic voting system.	ICTSKILL17
The relevance of training and skills received on the electronic voting system does not matter for its implementation.	ICTSKILL18
It is the responsibility of voters education Unit/Department to train staff on electronic voting system, not that of ICT Unit/Department.	ICTSKILL19

UPSD Dimension

The thirty items under this dimension were adapted from Barki and Hartwick (1994). The items were adapted items to suite the domain of E-voting adoption study. The items in this construct are reflective measures.

Table 3.8

User Participation in System Development Coding

Item Description	Code
The success of electronic voting system will only be guaranteed if staff are members of the team that designed and developed it.	UPSD1
Electronic voting systems will succeed if staff of ICT Unit was responsible for selecting the hardware and/or software needed for the implementation.	UPSD2
Only the management has responsibility for the success of the electronic voting systems.	UPSD3
System development errors will be reduced if a member of the ICT Unit acted as "formal liaison" between INEC, the hardware and software vendors or developers.	UPSD4
Evaluation of ICT staff's performance has been or will be influenced by my own personal evaluation of the electronic voting system's success.	UPSD5
Evaluation of my performance has been or will be influenced by my Department or Unit's evaluation of the electronic voting system's success.	UPSD6
Given responsibility to staff during the system development phase will enhance the implementation of the electronic voting systems.	UPSD7
Management will not allow ICT Unit developed the system specification for the voting systems.	UPSD8
No staff will be allowed to participate in the system specification, design and implementation of the voting systems.	UPSD9
Staff will be allowed to participate in development of the user's requirements for the voting system.	UPSD10
Only the management can be or is allowed to develop the user's requirements for the voting systems.	UPSD11
Defining the user's requirements for the voting system is not the business of staff of INEC.	UPSD12
ICT staff should not be involved in determining the cost/benefits analysis of the electronic voting systems.	UPSD13
Only the management can or should determine the cost/benefits analysis for the voting systems.	UPSD14
Units/Departments were assigned responsibility during the development of design phase for the voting systems.	UPSD15
No Unit/Department was assigned any responsibility in the design phase of the voting systems.	UPSD16
The input/output for the voting system should be designed by both the ICT staff and the vendor.	UPSD17
There is no need for management and staff to participate in the design the input/output forms for the voting systems.	UPSD18
Developing the system control and/or security procedures for the voting system is the responsibility of the ICT Unit and not that of the vendor.	UPSD19
Management should not allow staff to participate in the development of the system control and/or security procedures for the voting system.	UPSD20
ICT Unit only will be responsible for the implementation of the electronic voting system.	UPSD21

Table 3.8

Continued.

Other Unit or Department will responsible for the implementation of the voting system, not ICT Unit.	UPSD22
Test data specifications for the voting system was developed by our Unit.	UPSD23
Test data specification for the voting system can only be developed by the vendor.	UPSD24
Only ICT staff should participate in the design of the user training program for the voting systems.	UPSD25
Another Unit or Department will be responsible for the user training, not ICT Unit.	UPSD26
The user procedures manual will be created by our Unit for the system.	UPSD27
Only the vendor can train the staff on how to use the voting system.	UPSD28
It is not the duty of ICT Unit to train other staff on how to use the voting system.	UPSD29
Lack of adequate training and necessary skill sets will affect ICT staff involvement in the system development of the electronic voting systems.	UPSD30

3.7 Unit of Analysis

The research focus is on developing a model of E-voting adoption from the point of view of employees of the electoral organisation. The objective is to determine whether the adoption factors of the research can jointly predict the adoption success of E-voting technology in the organisational context using the staff of the organisation as the unit of analysis. Therefore, the unit of analysis for the data collection is the Managerial and Operational Staff of INEC, Nigeria.

3.8 Data Analysis

Data analyses were carried out to determine the suitability of the data collected during the pilot study in order to explain the behavior of the data. The data collected was subjected to correlation analysis and bi-variate analysis (See sections 3.9 and

3.10). The data collected during the final field study was subjected to multivariate data analysis using the Partial Least Square, Structural Equation Modelling (PLS-SEM) approach (See Chapter 4). Multivariate data analysis was carried out to confirm both the internal and external validity of the final instrument (measurement model) and to confirm or reject the research hypotheses based on the research questions (structural model) using PLS-SEM method (Urbach & Ahlemann, 2010; Hair et al., 2011; 2014) implemented on SmartPLS software (Ringle, Wende & Will, 2005).

3.9 Reliability and Validity of Instruments Used for the Pilot Study

According to Sekaran and Bougie (2011) "*Pilot information gathering can be obtained by interviews, observations or by administering questionnaires to individuals*". Such data gathered for research from the actual site of occurrence of events are referred to as primary data. The collection of primary data during the pilot study was to test whether the researcher can collect and analyze data from the participants (respondents) using the operationalized (questionnaires) items from the identified constructs of the research and to see if the researcher's overall conceptual model design is workable. The questionnaire items used for the pilot study were subjected to principal component analysis (PCA) using SPSS version 14. Inspection of correlation matrix revealed the presence of many coefficients of .3 and above.

Results of PCA revealed five components with Eigenvalues greater than 1 and explaining 15.7%, 15%, 14.8%, 7.3% and 5.6% of the variance. An inspection of the Scree Plot revealed a clear break after the fifth component. The five components solution explained a total of 58.3% of the variance, with the first component contributing 15.7%, second component 15%, third component 14.7%, fourth component 7.3% and the fifth component 5.6%. To assist the interpretation of the five components, varimax rotation was performed. The rotated solution as presented in Table 3.9, revealed the presence of simple structure, with both components showing a number of strong loadings, and all variables loading substantially on only one component. The results of the analysis supported the use of the items of the pilot study as a separate scale for the main study.

Table 3.9

Varimax Rotation of Five-Factor Solution for ItemsUsed in Pilot Study

Items	**Component**				
	1	2	3	4	5
EF4	.718				
EF3	.656				
EF5	.595				
EF8	.576				
EF1	.572				
TR7		.913			
TR9		.895			
TR20		.890			
TR19		.829			
TR8		.818			
TR10		.808			
TR12		.752			
TR14		.722			
TR21		.666			
TR17		.587			

Table 3.9

Continued.

Items	**Component**				
	1	2	3	4	5
TR16		.571			
TR3		.529			
TR1		.504			
OR16			.790		
OR7			.756		
OR6			.722		
OR5			.695		
OR2			.694		
OR15			.691		
OR11			.687		
OR9			.669		
OR13			.631		
OR12			.611		
OR18			.583		
OR8			.578		
OR10			.575		
PB4				.679	
PB9				.640	
PB5				.578	
PB11				.576	
PB14				.559	
PB3				.527	
EAD2					.765
EAD4					.659
EAD3					.610
EAD1					.542

The results of the pilot study were validated internally and externally. Internal validity raised the questions of whether the variables or constructs alone or some additional extraneous factors of causes the effects external validity raised issues about the generalizability of the findings to other settings (Sekaran & Bougie, 2011).

Reliability analysis was carried out to examine internal consistency of the items constituting each of the research variables and PCA to test the external validity of the variables in the pilot study (Pallant, 2001; 2003; 2011).

3.10 The Pilot Study: Instrument Development and validation Process

In a more complex new Information Technology (IT) adoption, it is important to combine more than one theoretical model to achieve a better understanding of the IT adoption phenomenon (Yi et al., 2006; Scott et al., 2008; Oliveira & Martins, 2011; Awa et al., 2012). This formed the basis for the four variables (Technological Readiness, Organisational Readiness, Perceived Benefits, and Environmental factors) used for the pilot study derived from Diffusion of Innovations (DOI), Technology, Organisation and Environment (TOE), and Iacovou et al. to determine the suitableility of the four variables in predicting the adoption of E-voting technology within the organisational context. The researcher conducted a pilot study between January 16th and February 24th, 2012 among the managerial and operational staff at the headquarters in Abuja and their state office in Kwara State to investigate the perception of the staff of the commission on the adoption of E-voting technology by the Commission as an alternative method of conducting acceptable elections in Nigeria. The outcome served as a practical justification for the researcher to continue with this research.

3.10.1 Method Used

Quantitative approach was used to capture data for the pilot study. The questionnaire contains two main parts: (1) the demographic questions and (2) the questions on the operationalized items for the five variables. Technological Readiness (TR) variable consists of twenty-one (21) items; Organisational Readiness (OR) variable contains twenty (20) items; fifteen (15) items was used for Perceived Benefits (PB) variable, while Environmental Factors (EF) variable consists of ten (10) items. Five (5) items was used to capture data for E-voting Adoption (EAD) which is the dependent construct of the research. SPSS 14.0 was employed for the validation of items under each constructs.

3.10.2 Results and Discussion

The pilot study enabled the researcher to determine whether there is a correlation between the four independent variables, namely TR, OR, PB, EF and the dependent variable of E-voting adoption. Based on stratified random sampling, INEC has twenty (20) Departments/Units from which the sample of hundred (100) was drawn (as at the time of the pilot study, information concerning staff position was not yet available). The sampling ensured that each Department/Unit was represented. Therefore, five (5) respondents were randomly selected to make a sample of 100 i.e. 20x5 = 100. Sum of 50 responses representing 50% response rate were received, with 3 invalid due to missing data, making the total number of responses used for the analysis to be 47.

3.10.2.1 Profile of Respondents (Pilot Study)

(1) **Working Experience:** Among the sampled respondents, 6.4% which made up 3 individuals were under 5 years of Working Experience, 26 individuals who made up 55.3% of respondents were between 5 and 10 years of Working Experience, 10 individuals who made up 21.3% of respondents were between 10 and 20 years of Working Experience while only 8 individuals who made up 17.0% of respondents were above 20 years of Working Experience. This is as shown in Table 3.10 and Figure 3.3.

Table 3.10

Working Experience of INEC Staff

		Frequency	Percent
Valid	Less than 5 years	3	6.4
	5-10 years	26	55.3
	10-20 years	10	21.3
	Above 20 years	8	17.0
	Total	47	100.0

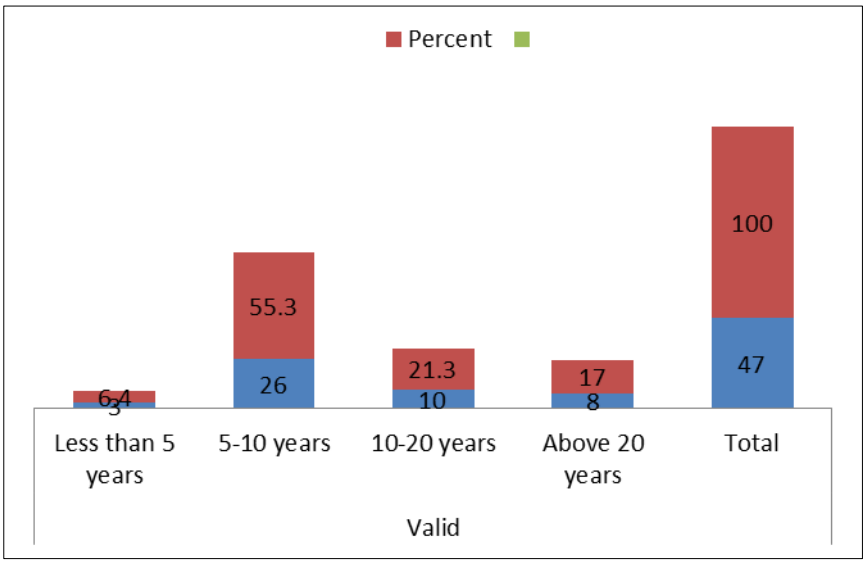


Figure 3.3. Working Experience of INEC Staff

(2) **Qualification:** A total number of nine respondents which accounted for 19.1% of the respondents are Diploma holders, 34 respondents, which accounted for 72.3% of the respondents are first degree (B.Sc.) or Higher National Diploma (HND) holders while a total of four respondents, which accounted for 8.5% of the respondents are Master degree holders. See Table 3.11 and Figure 3.4.

Table 3.11

Qualification for INEC Staff

		Frequency	Percent
Valid	Diploma	9	19.1
	B.Sc./HND	34	72.3
	Master	4	8.5
	Total	47	100.0

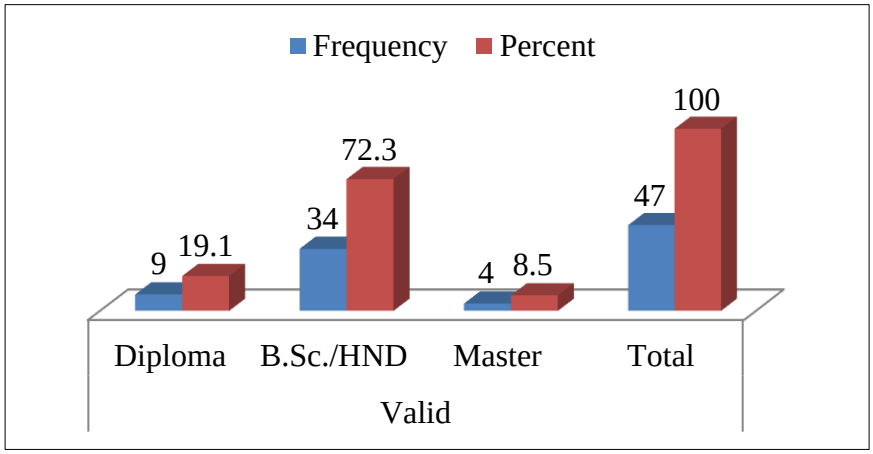


Figure 3.4. Qualification for INEC Staff

3.10.2.2 Reliability of Research Constructs

(1) Reliability Analysis of the Variables

Technological Readiness (TR): TR has twenty-one (21) items whose reliability was measured with Cronbach's alpha (α). Items under this construct (dimension) were considered reliable with average Cronbach's alpha (α) of 0.817 which is greater than 0.7 (Pallant, 2011) as shown in Table 3.12 and Figure 3.5.

Organisational Readiness (OR): It is made up of twenty (20) items, the reliability of which was measured using Cronbach's alpha (α) with recorded value of 0.882. According to Sekaran and Bougie (2011), items under a construct (dimension) with the average Cronbach's alpha (α) greater than 0.7 are reliable. Therefore, OR in this study with an average Cronbach's alpha is reliable as shown in Table 3.12 and Figure 3.5.

Perceived Benefits (PB): The fifteen (15) items under this construct (dimension) were found to be reliable with the average Cronbach's alpha (α) of 0.767 which is greater than the benchmark of 0.7 (Sekaran, 2011; Pallant, 2011) as shown in Table 3.12 and Figure 3.5.

Environmental Factors (EF): EF, a construct under this study with ten (10) items whose reliability was measured with Cronbach's alpha (α) of 0.762 which is considered reliable (Sekaran, 2011; Pallant, 2011). See Table 3.12 and Figure 3.5.

E-voting Adoption (EAD): EAD is a construct under in this study with five (5) items whose reliability was measured with a Cronbach's alpha (α) of 0.853. EAD in this study is therefore reliable with an average Cronbach's alpha greater than 0.7 (Sekaran, 2011; Pallant, 2011). See Table 3.12 and Figure 3.5.

Table 3.12

Reliability Analysis for the Variables Construct

Variable	Cronbach's Alpha (α)	No of Items
TR	0.817	21
PB	0.769	15
OR	0.882	20
EF	0.762	10
EAD	0.853	5

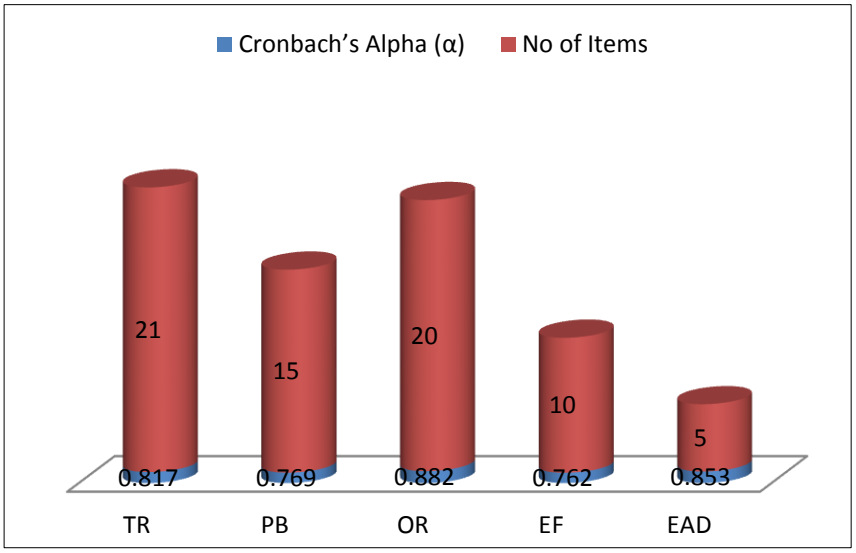


Figure 3.5. Chart Showing the Reliability Analysis for the variables constructs.

(2) Bi-Variate Analysis (Correlation)

Technological Readiness and E-voting Adoption: The bi-variate analysis (correlation) between the average of TR and the average of EAD was measured and the value is given as 0.658 which shows high correlation significant at 0.01 level (i.e. <0.05) as shown in Table 3.13. This correlation value means that TR can explain 65.8% variance of EAD which means that the Technological Readiness influences the E-voting adoption. Thus, the higher the TR, the higher the EAD.

Table 3.13

Correlation between TR and EAD

		AVEAD	AVTR
AVEAD	Pearson Correlation	1	.658**
	Sig. (2-tailed)		.000
	N	47	47
AVTR	Pearson Correlation	.658**	1
	Sig. (2-tailed)	.000	
	N	47	47
**. Correlation is significant at the 0.01(2-tailed). le			

Perceived Benefits and E-voting Adoption: The analysis of correlation between the average of PB and the average of EAD was measured and the value was given as 0.456 which shows that PB has influence on EAD. The correlation is significantly at 0.01 level i.e. <0.05, as shown in Table 3.14.

Table 3.14

Correlation between PB and EAD

		AVEAD	AVPB
AVEAD	Pearson Correlation	1	.456**
	Sig. (2-tailed)		.001
	N	47	47
AVPB	Pearson Correlation	.456**	1
	Sig. (2-tailed)	.001	
	N	47	47
**. Correlation is significant at the 0.01 level (2-tailed).			

Organisational Readiness and E-voting Adoption: The analysis of correlation between the average of OR and the average of EAD was measured and the value is given as 0.869 which shows that OR has a high

influence on EAD by 68.9%. The correlation is significant at 0.01 level i.e. <0.05, as shown in Table 3.15.

Table 3.15

Correlation between OR and EAD

		AVEAD	AVOR
AVEAD	Pearson Correlation	1	.869**
	Sig. (2-tailed)		.000
	N	47	47
AVOR	Pearson Correlation	.869**	1
	Sig. (2-tailed)	.000	
	N	47	47

**. Correlation is significant at the 0.01 level (2-tailed).

Environmental Factors and E-voting Adoption: The correlation between the average of EF and the average of EAD was measured and the value is given as 0.764 which shows high correlation significant at 0.01 level (i.e. <0.05) as shown in Table 3.16. This correlation value means that EF can explain 76.4% variance of EAD which means that the Environmental Factors influence the E-voting Adoption.

Table 3.16

Correlation between EF and EAD

		AVEAD	AVEF
AVEAD	Pearson Correlation	1	.764**
	Sig. (2-tailed)		.000
	N	47	47
AVEF	Pearson Correlation	.764**	1
	Sig. (2-tailed)	.000	
	N	47	47

**. Correlation is significant at the 0.01 level (2-tailed).

(3) Multiple Regression Analysis

The researchers ran a pilot regression analysis to test the predictive tendency of the model on the overall. From the result as shown in Table 3.17, the value of adjusted R2 is 0.796 which suggested that 79.6% of the variance in of adoption of E-voting is explained by the model. Thus, this informed the researcher of the appropriateness of the constructs constituting the model in measuring the adoption of the technology under study.

Table 3.17

Model Summary (Regression Analysis)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.902[a]	.814	.796	.3185

Predictors: (Constant), AVEF, AVPB, AVOR, AVTR

3.11 Conclusion

This study aimed at investigating factors that influence the E-voting adoption in the organisational context using the staff of the Independent National Electoral Commission, Nigeria as the unit of analysis. The results of the pilot study showed that the four constructs, TR, OR, TB, and EF significantly predicated EAD. This is because of combining variables from three models of DOI, TOE, and Iacovou et al. The results equally showed that organisational readiness highly influenced the adoption process of E-voting when compared with other factors. The pilot study helped to fill some gaps by providing insight into the issue of E-voting adoption from the perspectives of developing country, Nigeria.

3.12 Chapter Summary

This chapter discusses in brief, the methods employed for the research and the methods of data collection during the field study. The chapter also discusses the instrument design, how the instrument was used to measure the reliability and test for validity using pilot study data. The structure of the final questionnaire and survey administration was equally discussed. The chapter concludes with discussion on the unit of analysis used in the research and the target population for the final data collection.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

4.1 Introduction

The main objective of this chapter is to present detailed analysis of the outcome of the quantitative data that were collected via the questionnaire designed for the purpose of main study. It specifically presents the results of the analysis of the responses from the survey and analyse the respondents profiles using their demograhic attributes, data screening, measures of validity and reliability of the measurement model, path analysis of the structural model and detailed results from the hypotheses testing. Finaly, it discusses the analysis of the qualitative responses from the respondents collected via the research questionnaire.

4.2 Analysis of Survey Response

4.2.1 Response Rate of Distribution

The data collection for the main study was undertaken from October 15th 2012 to February 28th, 2013. The researcher travelled once to each INEC state offices of Oyo, Osun, Niger, and Kogi for questionnaire distributions. For the collection, the researcher travelled twice to Niger and Kogi states in the north central zone and thrice each to Oyo and Osun states located in the south west zone of the country while the researcher spent three weeks (4th to 25th December, 2012) at the head office in Abuja (the capital of Nigeria) both for distribution and collection.

A total of 500 questionnaires were distributed for this study among the six (two major) categories of staff of the Independent National Electoral Commission of Nigeria (INEC), 399 were returned representing a response rate of 79.8%, the remaining 120 questionnaires representing 20.2% were not returned by respondents. Out of this total, 19 were excluded due to incomplete data thereby leaving 380 usable questionnaires for the purpose of data analysis.

4.2.2 Non-Response Bias Test

Sometimes, individuals chosen for the sample in a survey were unwilling or unable to participate in the survey. Non-response bias is the bias that results when respondents differ in meaningful ways from non-respondents. This difference could be as a result of many factors among which are attitude, demography, personalities, behaviours and/or motivations any or all of which might affect the results of the study by limiting the generalizability of the sample to the population of the research (Malhotra, Hall, Shaw, & Oppenheim, 2006).

In this study, non-response and the response bias was tested using descriptive tests to compare the means, standard deviation and standard error means between the early and late respondents and Levene‘s test for equality of variance were carried out on continuous variables of the research. Findings of Churchill and Brown (2004b) and Malhortra et al (2006), show that late respondents can be used of in place of non-respondents in order to estimate the non-response bias because they (late respondents) might not have respond if there was no serious follow-up by the

researcher. Malhortra et al (2006) further argues that non-respondents and late respondents have the same characteristics. In order to apply the option of comparing the early and late respondents, this study divided the research sample into two (early respondents and late respondents). Respondents that returned the questionnaires within two weeks after the distribution were the early responses. The late responses were those respondents that returned the questionnaires after two weeks from the date of distribution. Therefore, 206 respondents were classified as early responses while 174 respondents as late responses.

There were no much differences in the statistical significance between the early respondents and late respondents as shown from the results of the descriptive test conducted on the demographic variables of the research (See Table 4.1), except for the demographic variable department, which showed slight difference between early respondent and late respondents. For example, majority of respondents in the Department of Human Resources and Management and ICT respond early when compared with the respondents from Procurement Department where majority responded late to the questionnaires. The resullts of the Levene's Test for Equality of Variance showed that there is no diffference between early respondents and late rsepondents.

For example, a comparision between variable Position and Marital Status showed that no significant difference i.e. (p = 0.173, t= 0.262) and (p = 0.177, t = 0.673). The detailed result of the Levene's test of equality variance is as shown in the appendix D.

Table 4.1

Test of Non-Respondents Bias

Variable	Response	No.	Mean	Std. Deviation	Std. Error Mean
Department	Early Response	206	7.79	6.332	.441
	Late Response	174	7.10	5.846	.443
Position	Early Response	206	4.63	1.230	.086
	Late Response	174	4.60	1.249	.095
WkExperience	Early Response	206	2.55	.955	.067
	Late Response	174	2.48	.954	.072
Qualification	Early Response	206	3.08	1.006	.070
	Late Response	174	3.02	.952	.072
Gender	Early Response	206	1.33	.470	.033
	Late Response	174	1.37	.484	.037
Age	Early Response	206	2.43	.618	.043
	Late Response	174	2.36	.655	.050
MaritalStatus	Early Response	206	1.15	.358	.025
	Late Response	174	1.13	.333	.025

4.3 Profile of Respondents

The researcher analyzes the profile of the respondents using the demographic characteristics of department, position, working experience, qualification, gender, age and marital status. The detailed analyses are as presented in the following sub-sections.

4.3.1 Respondents Profile by Department

Of the 380 respondents, 71 (18.7%) belong to the Human Resources and Management Department, 68 (17.9%) in ICT Department, 25 (6.6%) in Training, 2 (0.5%) in Research and Documentation, 12 (3.2%) in Voters Education, 16 (4.2%) in Audit, 15 (3.9%) in Servicom, 2(0.5%) in Voters Registry, 38 (10%) in Operations, 14 (3.7%) in Procurement. Also, 14 (3.7%) are in Finance and Account, 10 (2.6%) in Logistics and Transport, 17 (4.5%) in Estate and Works, 15 (3.9%) in Store Department, 4 (1.1%) in Compliance, 28 (7.4%) in Public Affairs, 1 (0.3%) in PPML, 6 (1.6%) in Security, 2 (0.5%) in International Desk, 5 (1.3%) in State Coordination and 15 (3.9%) in other Departments. A summary of these profiles is as presented in Table 4.2. The SPSS output is as presented in the Appendix D.

Table 4.2

Respondent Distribution by Department (main study)

	Frequency	%
Human Resources & Management	71	18.7
ICT	68	17.9
Training	25	6.6
Research & Documentation	2	.5
Voters Education	12	3.2
Audit	16	4.2
Servicom	15	3.9
Voters Registry	2	.5
Operations	38	10.0
Procurement	14	3.7
Finance & Account	14	3.7
Logistics & Transport	10	2.6
Estate & Works	17	4.5
Store	15	3.9
Compliance	4	1.1
Public Affairs	28	7.4
PPML	1	.3
Security	6	1.6
International Desk	2	.5
State Coordination	5	1.3
Others	15	3.9
Total	**380**	**100.0**

4.3.2 Respondents Profile by Position at INEC

Out of the 380 respondents, 2.1% (n=8) belongs to Top Management cadre, 5.8% (n=22) are Directors, 13.1% (n=50) are Deputy Directors, 6.6% (n=25) are Assistant Directors, 43.7% (n=166) Senior Staff and 28.7% (n=109) belongs to the Junior Staff cadre. A summary of these categories are as presented in Table 4.3.

Table 4.3

Respondent Distribution by Position (main study)

	Frequency	%
Top Management	8	2.1
Director	22	5.8
Deputy Director	50	13.1
Assistant Director	25	6.6
Senior Staff	166	43.7
Junior Staff	109	28.7
Total	**380**	**100.0**

4.3.3 Respondents Profile by Work Experience

Out of the 380 respondents, 44 (11.6%) have less than five years of work experience with INEC, 176 (46.3%) are between five and ten years in the service of INEC, 20.8% (n=79) falls within ten and twenty years of work experience, while 21.3% (n=81) have put in twenty years and above in the service of INEC. Summary is as presented in Table 4.4.

Table 4.4

Respondent Distribution by Work Experience (main study)

Work Experience	Frequency	%
Less than 5 Years	44	11.6
5 - 10 Years	176	46.3
10 - 20 Years	79	20.8
Above 20 Years	81	21.3
Total	**380**	**100.0**

4.3.4 Respondents Profile by Qualification

Majority of the respondents, representing 55.3% (n=210) hold first degree or Higher National Diploma certificates, 71 representing 18.7% have Master's degree, while 62(16.3%) have Ordinary Diploma certificates. 20 respondents (5.3%) have Certificates, while 17, representing 4.5% have other types of qualifications. The detail is as shown in Table 4.5.

Table 4.5

Respondent Distribution by Qualification

	Frequency	**%**
Certificate	20	5.3
Diploma	62	16.3
BSc/HND	210	55.3
Master	71	18.7
Others	17	4.5
Total	**380**	**100.0**

4.3.5 Respondents Profile by Gender

A descriptive analysis of the respondents by gender revealed that majority of them, 249 (65.5%) are male, while the remaining 34.5% (n = 131) are female. See Table 4.6.

Table 4.6
Respondent Distribution by Gender (main study)

	Frequency	**%**
Male	249	65.5
Female	131	34.5
Total	**380**	**100.0**

4.3.6 Descriptive Statistics of the Research Constructs (Variables)

The construct of User Participation in Systems Development (UPSD) has the lowest mean with 2.95, while the Perceived Benefits (PB) has the highest mean with 3.77. The standard deviation for all the constructs falls in the ranges of 1.013 to 1.708, which suggests that there was a significant acceptability within the data set. The standard errors of the continuous variables range from 0.052 to 0.112 (See Table 4.7). Detailed descriptive statistics for each constructs is as shown in the Appendix D.

Table 4.7

Descriptive Statistics for al Research Constructs (Variables) of the Study

Resarch Variabbes	**Code**	**No. of Items**	**Mean**	**SD. Error**	**SD.**	**Min**	**Max**
Technological Readiness	TR	18	3.34	.057	1.120	1	5
Organisational Readiness	OR	19	3.46	.052	1.013	1	5
Environmental Factors	EF	19	3.46	.112	1.107	1	5
Perceived Benefits	PB	14	3.77	.085	1.046	1	5
ICT Training and Skill	ICTSKILL	19	3.26	.056	1.082	1	5
User Participation in Systems Development	UPSD	30	2.95	.091	1.131	1	5
Electronic Voting Adoption	EAD	14	3.29	.055	1.708	1	5

4.3.7 Respondents Profile by Age

The descriptive analysis revealed that 55.8% (n=212) respondents are between 25 and 40 years of age. Between 41 and 56 years of age, we have 137 respondents, representing 36.1%, while 3.9 % (n=15) respondents are above 56 years of age. Also, 16 (4.2%) respondents are under 25 years of age. Summary is as presented in Table 4.8.

Table 4.8

Respondents by Age (main study)

		Frequency	%	Valid %	Cumulative %
	Under 25 Years	16	4.2	4.2	4.2
	25 - 40 Years	212	55.8	55.8	60.0
Valid	**41 - 56 Years**	137	36.1	36.1	96.1
	Above 56 Years	15	3.9	3.9	100.0
	Total	**380**	**100.0**	**100.0**	

4.3.8 Respondents Profile by Marital Status

Of the 380 respondents, the married are in the majority, representing 86.1% (n=327) of the sampled respondents, while the remaining 13.9% (n=53) are single by marital status. See Table 4.9.

Table 4.9

Respondent Distribution by Marital Status (main study)

		Frequency	%	Valid %	Cumulative %
	Married	327	86.1	86.1	86.1
Valid	**Single**	53	13.9	13.9	100.0
	Total	**380**	**100.0**	**100.0**	

4.4 Data Screening

After the collection of the empirical data using questionnaires (personally administered), there is the need to address data collection issues before applying the appropriate data analysis techniques because of their direct effect or impact on our choice of data analysis techniques. Those issues that need to be examined include missing data, detection and management of outliers, and data distribution assumptions i.e. linearity, normality, and multicollinearity tests (Hair, Black, Babin & Anderson, 2010; Byrne, 2010; Hair, Hult, Ringle & Sarstedt, 2014). This study carried out data screening using the above-mentioned approaches before proceeding to data analysis stage.

4.4.1 Missing Data

Missing data are often a problem in a research (human centred) that obtains data using survey (questionnaire) method. Missing data occurs when a respondent either consciously or unconsciously fails to answer one or more question(s) and which may negatively affect the outcome of the empirical research if not properly treated before data analysis. Hair et al. (2014) suggest that (1) when the amount of missing data on a questionnaire exceeds 15%, the observations should be removed from the data file, (2) if a high proportion of responses is missing for a single constructs, then the entire observation may be removed even if the overall missing data on the questionnaire does not exceed 15% and (3) other alternatives such as mean value replacement or case wise deletion can also be used in the treatment of the missing data.

The returned questionnaires were inspected for missing data, 19 out of the 399 returned had a high proportion of incomplete data or responses for a particular constructs. This is because some respondents were not too disposed to answer those questions while others gave reasons of engagement with their official assignments. These 19 cases (observations) were removed from the analysis in line with the recommendation of Hair et al (2014). Sum of 380 observations were entered into SPSS windows version 14 for further data screening. Each of the variables in the data sets was inspected for scores that were out of range or empty cells via frequency tables in SPSS. The identified errors in the data file were corrected and aligned according to the inputs in the codebook.

In situations where out of range scores were entered from responses, the name of the variable and the corresponding identification number of the observation in which the error occurred was identified, and the concerned questionnaire was checked for correct value. Thirteen of such cases were observed for departmental, position and work experience variables in the demographic section of the instrument in which an out-of-range value such as '22' was keyed-in instead of values in the range of '1 to 21' for demographic variable called department. The affected case numbers were checked and corrected accordingly. After fixing the errors, the frequencies were re-runed again to double check and be sure that there was no more missing data in the SPSS data file. The frequency results (Appendix D) indicated that there was no missing data in the data file.

4.4.2 Test of Normality

Testing for normality is an important and common procedure in statistics tests and multivariate data analysis; many tests have been proposed (Doornik & Hansen, 2008). Such tests include the use of visual tools, such as stem and leaf plots, normal Q-Q plot. Others are the use of skewness and kurtosis and Kolmogorov-Smirnov tests. Lack of normality in variable distributions could distort the relationships between the variables of research and the significance of the results in multivariate analysis; therefore, it is important for researchers to examine the normality of their data distributions before proceeding to analysis stage (Hulland, 1999; Hair et al., 2014:55). The normality tests were carried out using the Normal Q-Q plot, followed with skewness and kurtosis, and lastly the Kolmogorov-Smirnov test.

As a first step, the normal probability plot (Normal Q-Q plot) was inspected for the entire variable (constructs) of the model (see Appendix D). The observed value for each score of the variable was plotted against the expected value from the normal distribution. A reasonably straight line suggested a normal distribution (Pallant, 2011). The normal probability plots indicated deviation from normality for majority of the research variables.

In the second step, normality test was conducted by examining the skewness and kurtosis of the distributions (Hair et al, 2007; Tabachnick and Fidell, 2007; Pallant, 2011). Skewness is the extent to which the distribution of a variable is symmetrical. When the distribution of the observed scores of the variable clustered to the left at

the low values or to the right-hand side (high values) of graph, then the distribution is assumed to be skewed.

Kurtosis, on the other hand, measures the peakedness of the distribution. When kurtosis is positive, the distribution is peaked with most of the cases clustered at the centre (long thin tails) but if negative then the distribution is somewhat flat, with many cases in the extreme. When both skewness and kurtosis are close to zero (0), the distribution of the observations is considered normal (a situation unlikely to occur in human-centred research). As a general rule, when skewness is greater than +1 (> +1) or less than -1 (< -1), the distribution is considered skewed. For kurtosis greater than +1 (> +1), the distribution is considered too peaked, while kurtosis less than -1 (< -1), the distribution is too flat. Any distribution of the observation exceeding the above guideline (rules) is considered a non-normal distribution (Pallant, 2011, Hair et al., 2014).

Table 4.10

Values of Skewness and Kurtosis of measured variables.

Variable	Skewness	Standard Error	Kurtosis	Standard Error
Technological Readiness	-.542	.125	1.382	.250
Organisational Readiness	-.344	.125	.115	.250
Environmental Factors	-.739	.125	.500	.250
Perceived Benefits	-.803	.125	.544	.250
User Participation in Systems Development	.124	.125	.321	.250
ICT Training and Skill Sets	.309	.125	.228	.250
E-voting Adoption	-.471	.125	1.180	.250

Table 4.10 revealed only User Participation in Systems Development (.124) and ICT Training and Skill Sets (.309) measures fall within the skewness general guideline (not > +1), the remaining measures violate the general guideline (< -1). Likewise, all measures with the exemption of Technological Readiness (1.382) and E-voting Adoption (1.180) fall within the general guidelines of kurtosis (not > +1). Since the guidelines for skewness and kurtosis were partially violated by all the measured variables, it can be concluded that the observed distributions are non-normal.

The third normality test was conducted by examining the Kolmogorov-Smirnov test and Shapiro-Wilks test for the distributions of the observed variable scores. These two tests compared the observed score to a normal distribution having the same mean and standard deviation as the observed score (Mooi & Sarstedt, 2011; Hair et al., 2014). When the result of the test is not significant ($p > .05$), then the distribution of the variable score is said be normal (Pallant, 2011). The test result as shown in Table 4.11 , indicates that all the measured variables are significant ($p < .05$), therefore their distributions are non-normal; this is due to the use of large sample size (n=380) as suggested by Pallant (2011).

Table 4.11

Kolmogorov- Smirnov test of normality for all measured variables

Variabe	**Kolmogorov-Smirnov(a)**			**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Technological Readiness	.088	380	.000	.970	380	.000
Organisational Readiness	.061	380	.002	.984	380	.000
Environmental Factors	.102	380	.000	.959	380	.000
Perceived Benefits	.130	380	.000	.948	380	.000
User Participation in Systems Development	.109	380	.000	.982	380	.000
ICT Training and Skill Sets	.095	380	.000	.972	380	.000
E-voting Adoption	.079	380	.000	.968	380	.000

a Lilliefors Significance Correction

The results of the three tests indicated violation of the normality for all the measured variables; however, the data were not too far from being normal. When data are extremely non-normal, the data become problematic in the assessment of the parameters' of the significance (Hair et al., 2014). To solve the normality problem, the researchers employed the use of Partial Least Squares Structural Equation Modelling (PLS-SEM) method of data analysis, a nonparametric statistical method different from Maximum Likelihood (ML)- Covariance-Based Structural Equation Modelling (CB-SEM), as it does not require normal- distributed data input (Urbach & Ahlemann, 2010; Hair et al., 2014).

4.4.3 Linearity Test

The test of linearity is a requirement in any multivariate techniques based on measures of association (correlation); for example, Linear or Multiple Regression Analysis, Factor Analysis, Discriminant Analysis, Structural Equation Modelling,

etc. If the relationship between independent variables (IV) and the dependent variable (DV) is not linear, the results of the regression analysis or structural equation model will under-estimate the true relationship. This underestimation carries two risks: increased chance of a Type II error for that IV; and, in the case of multiple regression, an increased risk of Type I errors (overestimation) for other IVs that share variance with that IV (Osborne & Waters, 2002). Hair et al. (2010) and Pallant (2011) suggest the examination of normal probability plot (Scatter plot) between the variables in a study in order to determine the linearity in their relationship. Among the methods suggested in detecting non-linearity by Hanke, Reitsch and Wichern (1998), and Nunnally and Bernstein (1994) include the use of items from existing theory or previous studies in the current analysis.

This study adopted these two approaches to test linearity of the measured variables of the study. The scatter plots of residuals against predicted values (each IV against the DV) were examined for non-linearity relationship, the scatter plot of scores showed a roughly straight line for each plots and not curves (Appendix D). Since items were adapted from existing and related studies (Molla & Licker, 2005, Barki & Hartwick, 1994), the relationships between the IVs and the DV were equally confirmed to be non-linear.

4.4.4 Detection and Management of Outliers

Outlier (observations) are data point(s) that deviate significantly from others and often cause important changes in the results (outcome) of an empirical research; they are far from the regression line. They are observations or measures that are much smaller or much larger when compared with the vast majority of the observations (Yuan & Zhong, 2008; Cousineau & Chartier, 2010; Aguinis, Gottfredson & Joo, 2013). Outliers can be categorized into three major types: (a) Errors Outliers- are data point(s) that are far from the rest because of inaccuracies, inaccuracy due to error of sampling, errors in observations, errors in recording, errors in preparing data, errors in computation, errors in coding, or error of data manipulation. (b) Interesting Outliers are data point(s) identified as outlying observations. They are not error outliers which need to be further investigated. (c) Influential Outliers are outliers already confirmed as interesting outliers and investigation shows that they cause important changes in the outcome of the data analysis. This error could be as a result of respondents' bias or errors as a results of items or question engineering. Therefore, reporting how outliers are defined, identified, and handled is very important to the conclusion or outcome of an empirical research (Aguinis et al., 2013).

The researcher used two major techniques to identify and handle the error outliers for the collected data as suggested by Aguinis et al. (2013). (a) Single construct techniques examine extreme values within each individual construct using visual tools (boxplots) and followed by a quantitative method (percentiles analysis) to

identify the potential error outliers. Visual inspection was conducted on the boxplot graphs generated from SPSS for Windows (14) for each constructs (see Appendix D). Cases (observations) listed in Table 4.12 were identified as potential error outliers.

Table 4.12

Identification of Error Outliers Using Boxplots

Construct	**Case Identification Number**
Technological Readiness (TR)	364,312 (upper slop) 32,367 (upper slop)
Organisational Readiness (OR)	216 (lower slop)
Environmental Factors (EF)	213, 215 (lower slop)
Perceived Benefits (PB)	35 (lower slop)
ICT Training and Skill Sets (ICTSKILL)	117,55 (upper slop)
User participation in Systems Development (UPSD)	289 (upper slop),324 (lower slop)
E-voting Adoption (EAD)	215 (lower slop)

Next, the researcher used the percentiles analysis techniques of SPSS for Windows(14) to identify more potential error outliers based on the recommended (Aguinis, 2013) cut-off values of above or below 25% (two-tailed, $\alpha = .05$). The multiplier formula used is:

$$Q3+ (2.2 * Q3-Q1) = \text{Upper boundary} \quad (1)$$

$$Q1- (2.2 * Q3-Q1) = \text{Lower boundary} \quad (2)$$

Where Q3 = 75% upper value; Q1 = 25% lower value, was used to determine error outliers within this category (see Appendix D). Table 4.13 lists the potential cases for each construct.

Table 4.13

Identification of Error Outliers Using Percentiles Analysis

Construct	**Case Identification Number**
Technological Readiness (TR)	366 (lower slop), 367(lower slop)
Organisational Readiness (OR)	No potential error outliers above the upper or below the lower range of values
Environmental Factors (EF)	No potential error outliers above the upper or below the lower range of values
Perceived Benefits (PB)	No potential error outliers above the upper and below the lower range of values
ICT Training and Skill Sets (ICTSKILL)	No potential error outliers above the upper or below the lower range of values
User participation in Systems Development (UPSD)	No potential error outliers above the upper or below the lower range of values
E-voting Adoption (EAD)	No potential error outliers above the upper or below the lower range of values

b) *Multiple constructs techniques* assess the distance of an observation from the centroid of data points computed for two or more constructs. The scatter plots graph (see Appendix D) for each independent (exogenous) variable (i.e. TR, OR, EF, PB, UPSD, ICTSKILL) against the dependent (endogenous) variable (EAD) was visually examined for potential error outliers. The observations listed in Table 4.14 were identified for each scatter plot.

Table 4.14

Identification of Error Outliers using Scatter Plots

Scatter Plot	Case Identification Number
TR and EAD	366,367,355,341,378,368,360,349 (upper slop) 32,334,285,364,365 (lower slop)
OR and EAD	276,355,206,378,289,368,36,312 (upper slop) 32,215,285,334,45,324,128 (lower slop)
EF and EAD	206,355,23,123,40,188,5,233,117,88,245,236,120, 65,148,242,378,36,368,289,312 (upper slop) 45,128,298,324,4,187,343,194,11 (lower slop)
PB and EAD	335,33,314,367,288,37,137,355,206,276,340,191, 8,315,289,36,368,312 (upper slop) 334,215,285,336,101,4,45,324,298 (lower slop)
ICTSKILL and EAD	131,301,48,341,192,312,315,289,368,341,192,311 (upper slop) 285,334,215,324,128,298,44,127,323,297,138,55, 233,117 (lower slop)
UPSD and EAD	151,245,68,148,48,131,65,105,221,17,349,270,312 (upper slop) 32,334,215,336,217,297,323,44,207,254,77 (lower slop)

The scatter plots were followed with two quantitative categories: (i) Outlyingness based on predictors' scores using Malahanobis distance values and (ii) Outlyingness based on residual scores using generalized Cook's Distance (Cook'sD). Malahanobis distance scores were generated for each case using SPSS for Windows (14), thereafter, residual statistics table was used to identify potential error outliers. A case is a potential outlier if its Malahanobis is below the minimum value of 0.526 (< .526) or above the maximum value of 41.472 (> .41.472). The under listed cases fall into these categories (Table 4.15).

Table 4.15

Identification of Error Potential Outliers using Malahanobis Distance

Malahanobis (p_Mah_1) Value	Case Identification Number
0.00	83
0.00	102
0.00	166
0.00	218
0.00	260
0.00	337
0.00	379

Next, the researcher identified potential error outliers based on residual scores using the generalized Cook's Distance scores. Values greater than 4/(n-k-1) = 4/(380-6-1) = 0.0107 as suggested by Schofer (2007) were treated as potential error outliers, where n= Sample size and k = number of predictors in the model. Table 4.16 depicts the case identified.

Table 4.16

Cases with Cook's D above 0.0107

Case Identification Number
32,44,45,48,65,68,128,131,137,148,151,187,206,215,242,245,276,285, 289,297,298,301,315,323,324,334,341,349,355,364,365,366,367,368,378

In all, 81 potential outliers were identified and investigated. Investigation shows that these outliers are not error outliers because they are not as a result of coding error or data entry error but due to the responses to the items in the questionnaires by the respondents; therefore, the outliers was treated as potential interesting outliers which needed to be investigated further. The potential interesting outliers were investigated as influential outliers by checking if their removal from the initial PLS-SEM model

specification could change the model fit values of the endogenous variable EAD (R2 =0.713) and moderating variable ICTSKILL (R2= 0.471).

Eighty-one (81) cases were removed from the data set leaving 299 cases (n=299) and our model re-specified. The re-specified model results showed an increase in the values of our model fit parameters (EAD-R2 = 0.841; ICTSKILL-R2 = 0.483). There were equally changes in the inner model prediction (path coefficients) values for the exogenous constructs (see Appendix D). This confirmed our potential outliers to be bad, influential outliers which need to be removed to improve the model fit and the prediction scores of the exogenous latent variables on the endogenous late variables.

4.4.5 Assessment of Multicollinearity

Multicollinearity occurs when two or more predictors (independent variables) in a structural model correlate and provide redundant information about the response (dependent variable). This redundant information tends to increase or boost the size of standard errors and often leads to confusing and misleading results. Multicollinearity can have impact on the predictive ability and the significance of path coefficients estimate of the predictors in a structural model; hence, the need to check for multicollinearity among the predictor variables before the start of any regression or multivariate analysis (Hair et al, 2010, Hair et al, 2011, Pallant, 2011). Hair et al. (2014) suggests the computation of tolerance and variance inflation factor (VIF) to assess the level of collinearity of structural relationships when using PLS-SEM method of analysis.

Tolerance represents the amount of variance of a predictor variable not explained by the other predictor variables in a structural model while VIF is the degree to which the standard error was been inflated due to the presence of collinearity; it is the reciprocal of tolerance. A tolerance of 0.20 or lower and a VIF of 5.0 or higher suggests a multicollinearity problem. When collinearity exceeds the recommended thresholds, the researchers should consider removing constructs, combine predictors into one construct, or develop a higher-order construct to address the collinearity problems (Hair et al, 2011; Hair et al, 2014).

In order to assess the multicollinearity for the research model, the researcher applied the PLS-SEM algorithm to obtain the path coefficients estimate representing the hypothesized structural relationships between the constructs. The latent variable scores were extracted from the default reports of PLS calculation. These scores were then copied and saved into an SPSS file (Appendix D) to run linear regression analysis with the following sets of constructs (predictor) to assess the collinearity: (1) Environmental Factors (EF), ICT Training and Skill Sets (ICTSKILL), Organisational Readiness (OR), Perceived Benefits (PB), Technological Readiness (TR), and User Participation in System Development (UPSD) as predictors of E-voting Adoption (EAD); (2) Environmental Factors (EF), Organisational Readiness (OR), Perceived Benefits (PB), Technological Readiness (TR), and User Participation in System Development (UPSD) as predictors of ICT Training and Skill Sets (ICTSKILL). The results of collinearity test are shown in Table 4.17 and

Table 4.18. All tolerance values were clearly above the threshold of 0.20. Likewise, All VIF values were clearly below the threshold of 0.50 as recommended by Hair et al (2014).

Table 4.17

Collinearity Test with EAD as Endogenous Construct

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	9.461E-08	.023		.000	1.000		
	EF	.158	.036	.158	4.404	.000	.424	2.361
	ICTSKILL	.053	.032	.053	1.629	.104	.517	1.935
	ORD	.043	.036	.043	1.197	.232	.416	2.404
	PB	.005	.039	.005	.138	.891	.357	2.798
	TR	.753	.031	.753	24.162	.000	.559	1.788
	UPSD	.005	.030	.005	.173	.863	.609	1.641

a. Dependent Variable: EAD
Predictors: (Constant), UPSD, TR, PB, ICTSKILL, EF, OR

Table 4.18

Collinearity Test with ICTSKILL as Endogenous Construct

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-7.291E-08	.042		.000	1.000		
	EF	-.065	.064	-.065	-1.010	.313	.425	2.352
	ORD	.107	.065	.107	1.647	.101	.420	2.382
	PB	.330	.068	.330	4.889	.000	.387	2.587
	TR	.268	.054	.268	4.968	.000	.606	1.649
	UPSD	.209	.052	.209	3.979	.000	.642	1.557

a. Dependent Variable: ICTSKILL
b. Predictors: (Constant), UPSD, TR, PB, EF, ORD

4.5 Measurement Model Assessment (PLS-SEM)

4.5.1 Overview

Model estimation in Structural Equation Model (SEM) involves two major approaches; namely Covariance Based-Structural Equation Model (CB-SEM) and Partial Least Square- Structural Equation Model (PLS-SEM). CB-SEM uses the maximum likelihood (ML) estimation method to reduce or minimize the difference between the theoretical model implied covariance and the estimated covariance matrix obtained from the research data. PLS-SEM, on the other hand, is a variance-based approach to SEM. It uses the obtained data to estimate the relationships between the path models (coefficients) with the aim of reducing the error terms (residual variance) of the independent (endogenous) variables in the structural model (Hair et al., 2014; Hair et al., 2011; Chin, 2010). The two approaches are complementaries and not alternatives of each other. As such, either to the methods chosen is based on the research aims or objectives (Urbach and Ahlemann, 2010; Hair et al., 2011; Chin; 2010).

Partial Least Square-Structural Equation Modelling (PLS-SEM) was used to estimate the theoretical model for the research using SmartPLS application software (Ringle, Wende, and Will, 2005). PLS-SEM approach was chosen instead of Covariance-Based SEM (CB-SEM) because of the following reasons: (1) it is good for model development and prediction (2) it can be used when normality assumption of data is not met (3) it can be used for model with large number of indicator (observed) variables (4) it can be used for model with formative and reflective constructs and

(5) it is suitable when the phenomenon under investigation is new and measurement model need to be newly developed (Urbach and Ahlemann, 2010; Hair et al., 2011, Hair et al., 2014).

Measurement model estimate for the research was carried out by assessing the PLS algorithm procedure to determine the reliability and validity of the constructs in the measurement model. The measurement model (outer models) is the relationships between variables (constructs) and their indicators variables.

4.5.2 Reliability and Validity Assessment

There are main approaches to assessing the reliability and validity of a measurement model; namely, reflective and formative measurements. In evaluating the measurement model of a research, there is the need to differentiate between a reflective construct and a formative construct measures assessment in order to better the understanding of the researcher as to the choice of what to report in his/her model assessment.

4.5.2.1 Reflective Measurement Assessment

Reflective measure assesses the internal consistency (reliability) of the reflective items (indicators) in the measurement of a construct (latent variables); therefore, reflective indicators must measure the same Latent Variable construct (LV) and any changes to the LV must lead to changes in the indicators measures-indicators as the effects of the LV (Urbach & Ahlemann, 2010; Hair et al., 2014; Chin; 2010). The

following are the specific measurement criteria for reflective measurement model (Hair et al., 2014):

1. Internal Consistency Reliability

This is the first criterion that should be evaluated after the unidimensionality of the indicators has been carried out. To measure the internal consistency reliability, PLS-SEM employs the use of Composite Reliability (ρc), instead of Cronbach's alpha (α) which estimate the reliability based on the inter-correlations of the observed indicators variables. Cronbach's alpha (α) assumes equality of all indicators loadings, it is sensitive to the number of indicators on a construct, and it underestimates the internal consistency reliability. These limitations of Cronbach's alpha (α) and the prioritization of indicators in accordance with their individual reliability by PLS-SEM make them imperatives for an alternative means of measuring the internal consistency reliability of which composite reliability (ρc) readily fills the gaps. Composite reliability (ρc) takes note of outer loadings of every indicator variables and calculation using the following formula as suggested by Hair et al. (2014).

$$\rho_c = \frac{(\sum_i l_i)^2}{(\sum_i l_i)^2 + \sum_i var(e_i)} \qquad (3)$$

Where l_i is the standardized outer, loading of the indicator variable l of a specific construct, ei represents the measurement error of indicator variable l, and var(ei) is the variance of the measurement of error defined as 1-l2i .

Composite reliability is expected to be higher than 0.78 while in exploratory research, the value is expected to range from 0.60 to 0.70. Individual indicator reliability (outer loadings) between 0.40 and 0.70 should be removed only if their removal leads to an increase above the threshold values of composite reliability and Average Variance Extracted (AVE) (Henseler, Ringle & Sinkovics, 2009; Urbach & Ahlemann, 2010; Hair et al., 2011; Hair et al. 2014).

2. Convergent Validity

This measures the extent to which each indicator of a construct shares a high proportions of variance and converges in comparison to indicators measuring other constructs. Convergent validity tests if an item measures the expected.

The criterion for measuring convergent validity is the AVE (Fornell & Larcker, 1981). AVE, which is equivalent to the communality of a construct, is the sum of square loadings of indicators associated with a construct divided by the number of indicators. Convergent validity is achieved when the AVE value is 0.50 and above which means that, the construct explains more than half of the variance of its indicators on the average.

When the value of AVE is below the threshold value of 0.50, convergent validity is not achieved because the construct on the average cannot explain the variance of its indicators due to errors in the items (Gotz, Liehr-Gobbers & Krafft, 2010; Urbach & Ahlemann, 2010; Hair et al., 2011; Hair et al., 2014).

3. Discriminant Validity

Discriminant validity defined as the extent to which the measures of a construct are distinct from the measures of another construct by empirical standards. When discriminant validity is established, it means that a construct is distinct in its representation of a phenomena in comparison to other constructs in the model.

Two methods have been proposed for measuring discriminant validity in a reflective measurement model, namely: (a) Examination of the indicators cross-loadings. The indicators loadings for a particular construct should be greater than its loadings (cross-loadings) on the other constructs in the same model under consideration. Where any of the cross-loadings is greater than the actual construct loading, then discriminant validity is violated and not achieved for that particular construct; (b) Fornell-Larcker criterion; a conservative method of assessing discriminant validity examines and compares the square root of AVE of each latent construct with the latent variable correlations of other latent constructs. The square root of AVE

should be greater than its correlations with other constructs, otherwise, Fornell-Lacker discriminant validity criterion is assumed not met for a reflective measurement models (Urbach & Ahlemann, 2010; Hair et al., 2014).

4.5.2.2 Formative Measurement Assessment

Formative measure assesses the contents validity, convergent validity, collinearity and the importance and relevance of the latent variable indicators. Formative indicators form or cause the latent variable (construct) and do not necessarily correlate with the indicators of the reflective measures (Hair et al., 2014; Urbach & Ahlemann, 2010). The following are the procedures for evaluating a formative measure:

1. **Content validity**

   Content validity is carried out before data collection and model estimation because each indicator measures a specific aspect of a construct and an omission of any indicator translates into an omission of part of the latent construct. Therefore, all indicators of a formative construct need to be considered (Gotz, Liehr-Gobbers & Krafft, 2010; Hair et al., 2014).

2. **Convergent validity**

   Convergent validity is the degree to which an indicator positively correlates with other indicators of the same construct. If the correlations between the

formative constructs and all the other constructs in the model are greater than 0.80, then the constructs differ sufficiently from one another. Therefore, convergent validity is said to be established, otherwise convergent validity is not met.

3. Collinearity Assessment

Collinearity is the degree to which indicators of other constructs can explain a construct indicator in the same measurement analysis. When more than two indicators are involved in a formative measurement, collinearity (multicollinearity) assessment is necessary. For the collinearity assessment to be acceptable, the correlation between the items in the formative model should not be high. This is not a requirement for a reflective model.

The level of collinearity of a measure is assessed using tolerance and Variance Inflation Factor (VIF). Tolerance represents the sum of variance of a formative indicator not explained by other indicators within the same block. The threshold value of tolerance expected for a formative model is 0.20 or lower, any value above the threshold means that the collinearity is not achieved. VIF is the extent to which the standard error increased due to the collinearity presence. It is derived from the square root of the VIF (√VIF) and can be derived as the inverse of tolerance i.e. VIFx1 = (1/TOL x1), where x1 is the first indicator and TOL x1 the tolerance of the first indicator.

In PLS-SEM, a threshold value less than 5 of VIF is expected for a formartive model, a value of 5 and higher indicates collinearity problem (Hair, Black, Babin & Anderson, 2010; Hair et al., 2014).

4. Significance and Relevance of Formative Indicators Assessment

This last stage of formative measurement assessment assesses the significance and relevance of the outer (indicators) weights (results of multiple regression analysis). The multiple regression analysis will produce the variance explained (R2) value of 1.0, since the indicator as a linear combination that formed the construct must explain 100% variance of the constructs. The value of each outer weight is then compared and used to determine each indicator relevance and significance to the construct under consideration.

For the formative model, in comparison with the reflective model, the estimated values of outer weights are usually smaller than that of the reflective indicators. When the outer weight of the indicators is significant, the interpretation of the outer weight's and relative size is continued. However, if the outer weight of the indicators is not significant, then the indicators outer loading is analysed for significance. If the outer loading is greater than or equal to the threshold of 0.50 ($\geq$ 0.5), it is suggested that the indicator should be retained as part of the construct though the outer weights

are not significant. Otherwise, the outer loadings of the indicator is less than the threshold of 0.50 (< 0.50) and not significant or threshold is less than 0.50 and the indicator is significant. It is suggested that the formative indicators be deleted or removed from the construct. However, if the theoretical conceptualization of the construct is in strong support of retention of the indicator, it should be retained as part of the formative measurement model. On the contrary, there is no strong support theoretically for retaining such indicator; it should be removed from the measurement model. Removal of any formative indicator, which does not meet threshold criteria, is of no effect when the model is re-estimated. Statistical outcomes should not be the yardstick for the removal of any indicator without checking for its relevance from content validity's point of view because the omission of any indicator amounts to omitting the content of the construct (Hair et al., 2014).

4.5.3 Reliability and Validity Assessment Results

The evaluation of the reflective measurement model of the study was carried out using unidimensionality, reliability and validity of the constructs. The unidimensionality of the remaining items (after carrying out PLS algorithm procedures) of the scales for each construct was assessed using principal component analysis (PCA) of SPSS 14 (Pallant, 2011). Appendix E1 shows that, the items on each scale load only on their constructs with Eigenvalue exceeding 1.0 and a loading coefficient above .6 which is considered high (Urbach and Ahlemann, 2010; Pallant, 2011).

The measurement model validation was based on the results of reliability and validity of the constructs. The internal consistency reliability and indicator reliability was assessed by examining the composite reliability and indicator loadings. The composite reliability values for the constructs ranged from 0.802 to 0.90, while the indicator loadings was also above the threshold of 0.5 as shown in of Appendix E2 respectively (Urbach and Ahlemann, 2010; Hair, Ringle, and Sarstedt, 2011). All the seven reflective constructs have high levels of internal consistency (Composite Reliability) ranging from 0.802 to 0.90. The convergent validity for the seven constructs was assessed using the Average Variance Extracted (AVE). The AVE values representing the convergent validity of the constructs was higher (0.504 - 0.550) than the minimum recommended value of 0.50 (Appendix E2).

The discriminant validity was assessed using both the Fornell-Larcker and Cross Loadings Criteria. Results of discriminant validity (Fornell-Larcker) indicated that the square root of AVE of each constructs is higher than its correlation with any other constructs (Appendix E3). Also the indicator's outer loading of each construct (Appendix E4) was higher than all its cross loadings with other constructs (Hair, Hult, Ringle, & Sarstedt, 2014; Urbach and Ahlemann, 2010; Hair et al., 2011).

4.6 Structural Model Assessment (PLS-SEM)

4.6.1 Overview

After the assessment of the measurement model, the reliability and validity of the indicators was confirmed. Next is to carry out the assessment of the structural model.

Structural model examines the relationships among a theoretical and logical reasoning-hypothesized construct. A hypothetical construct in structural equation modelling consists of latent construct called exogenous variable, which predict other latent construct called endogenous variable in a causal relationship (G¨otz, Liehr-Gobbers & Krafft, 2010; Urbach and Ahlemann, 2010). In PLS-SEM, the assessment of structural model of the relationships should follow the basic steps as discussed in the following sub-sections.

4.6.1.1 Assessing the Structural Model for Collinearity

Assessment of collinearity in structural model follows the same step as used in the evaluation of formative model. Each exogenous variable (predictors construct) in the model was assessed for collinearity- Tolerance and VIF and each predictor construct should meet the threshold value of 0.20 tolerance or higher (> 0.20) and a VIF lower than 5. When the condition is not meet by predictor constructs, it is suggested that, the predictor construct be removed, merged into a single construct, or a higher-order construct be created in order to solve the collinearity problems (Hair et al., 2014).

4.6.1.2 The Relevance and Significance of the Path Coefficients

Bootstrapping algorithm of the PLS-SEM is used to assess the significance and relevance of the structural path coefficients and minimum of 5,000 bootstrap samples were suggested. The number of valid observation in the sample (original) collected for the research is expected to be the same as the

number of cases. The bootstrap standard error generated by the PLS-SEM enabled the calculation of empirical (critical) t value, which was then used to determine the significant contribution of each path coefficient to the dependent variable (endogenous construct) under study. The critical t value is the significance of a path coefficient linking an independent variable (exogenous construct) to the endogenous construct divided by the standard error i.e.

$$t = \frac{P_{ie}}{S_{ie}} \qquad (4)$$

Where P_{ie} = the path coefficient linking an exogenous construct i to endogenous construct e; S_{ie} = standard error of the path coefficient P_{ie}. Path coefficients for the constructs (endogenous or exogenous) were analysed based on the signs (algebraic), magnitude, and significance. The threshold for a critical **t** values using two-tailed test can be significant at 10% (1.65), significant at 5% (1.96), or significant at 1% (2.57). In practice, a researcher is expected to consider path coefficient with a 5% or less probability of error as significant (Urbach and Ahlemann, 2010 ; Hair et al., 2011; Hair et al., 2014).

4.6.1.3 Coefficient of Determination (R^2)

The *Coefficient of Determination* (R^2) is the common means of measurement that is used to evaluate the structural model of relationships in terms of predictive capabilities or accuracy of the model. R^2 is a measure of the *variance explained* by each exogenous latent construct to the *total variance explained* by all the exogenous latent constructs in the model. It is a measure of the *goodness of fit* (regression function) against the empirically manifest items obtained with values ranging from 0 to 1. For explanatory power of a model to be considered minimum, it is expected that the value of R^2 should be high.

Endogenous construct with R^2 value of 0.75 and above is considered *substantial* in terms of explanatory power, one with value of 0.50 but less than 0.75 is considered to have a *medium* explanatory power, while 0.20 and below or less than 0.50 has a *weak* explanatory power as suggested by Hair et al. (2014). Acceptability or non-acceptability of the R^2 value varies from one study to another, from one research discipline to the other or on a particular model. However, the bigger the value of R^2, the bigger the percentage of the explained variance (Urbach and Ahlemann, 2010; G¨otz, Liehr-Gobbers & Krafft, 2010; Hair et al., 2011; Hair et al., 2014).

4.6.1.4 Effect Size (f^2)

After the determination of R^2, next is the evaluation of the contribution of each exogenous construct to the overall prediction of the endogenous construct of the research model, referred to as *effect size (f^2)*. Effect Size (f^2) was determined by omitting an exogenous construct from the model and re-specifying the structural model to determine the new R^2 , the difference between the R^2 when the exogenous construct of interest was included and the new R^2 when it was omitted showed the impact of the exogenous construct in the prediction of the endogenous construct under investigation. This was repeated for all exogenous constructs in the model to determine their impact. f^2 is calculated as:

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}} \qquad (5)$$

where $R^2_{included}$ and $R^2_{excluded}$ are the R^2 values of endogenous constructs when a particular exogenous construct is included and removed from the model by estimating the PLS path model twice. When the value f^2 is 0.02, 0.15 or 0.35, it indicates *small*, *medium*, and *large* effect size of the exogenous construct on the endogenous construct respectively (Urbach and Ahlemann, 2010; G¨otz, Liehr-Gobbers & Krafft, 2010; Hair et al., 2014).

4.6.1.5 Predictive Relevance (Q^2)

Predictive relevance (Q^2) referred to as *Stone-Geisser's* Q^2 value is a measure of model predictive relevance. When a PLS-SEM exhibits predictive relevance, it means that the data points of indicators in a measurement model of an endogenous constructs and a single-item endogenous constructs are accurate in their prediction of the model under study. *Blindfolding* procedures of PLS-SEM were used to obtain the Q^2 value using two basic approaches: (a) *Cross-validated Redundancy*; this approach builds on the path model estimation of the structural model and the measurement model of data prediction, thereby, making this approach a better one for PLS-SEM; (b) *Cross-validated Communality*; this approach uses only the measurement model (Scores of the exogenous constructs estimate for a target endogenous construct) for data prediction.

Since cross-validated redundancy approach includes the path estimate (structural model) to predict the data points. Hair et al. (2011) and Hair et al. (2014) recommend it for estimating the predictive relevance Q^2. Predictive relevance assessment follows the same procedures as that of Effect Size (f^2); the impact of each exogenous predictive relevance can be compare using q^2 *Effect Size* measure calculated as follows:

$$q^2 = \frac{Q^2_{included} - Q^2_{excluded}}{1 - Q^2_{included}} \qquad (6)$$

where $Q^2_{included}$ and $Q^2_{excluded}$ are the Q^2 values of endogenous constructs when a particular exogenous construct is included and removed from the model by estimating the PLS path model twice. When the values q^2 is 0.02, 0.15, or 0.35, it indicates *small*, *medium*, and *large* effect size of the exogenous construct on the endogenous construct respectively (Hair et al., 2011; Hair et al., 2014).

4.6.2 Structural Model Assessment Results

The structural model relationship was evaluated by (1) assessing our structural model for collinearity issues and then, bootstrapping was used to assess the significance of the path coefficients-minimum of 5,000 bootstrap samples was used as recommended (Hair et al. 2011); (2) examining the Effect Sizes (f^2) of each path coefficients when included in and excluded from the model on the R^2; (3) blindfolding technique was used to obtain cross-validated redundancy for each construct-this determined the predictive relevance (Q^2) of our endogenous constructs with the reliability and validity of the constructs confirmed. Next, the researcher carries out the assessment of the structural model relationships between the constructs of the models. This involves the examination of the predictive capabilities and relationships between the constructs of the model.

First, the structural model was assessed for collinearity among its predictor constructs by copying the PLS latent variable scores results into an IBM SPSS 20 file for a linear regression analysis of the exogenous constructs against each of the

two endogenous construct in the model. The results of collinearity for using EF, ICTSKILL, OR, PB, TR, UPSD as predictors of EAD showed all the VIF values to be below the recommended threshold of 5.0 and the tolerance levels values > 0.20 threshold. Equally, the collinearity for using EF, OR, PB, TR, UPSD as predictors of ICTSKILL showed, the VIF to be below the threshold of 5.0 and the tolerance levels > 0.20 (Hair et al., 2014), see Table 4.17 and Table 4.18.

The results confirmed that there is no problem of collinearity among the predictors construct of the model. Therefore, the researcher proceeded to the next step of the analysis. In the second step, the researcher conducted the assessment of the significance and relevance of the structural model relationships. Structural model relationships (path coefficients) estimate was evaluated using SmartPLS-SEM algorithm (Ringle et al, 2005).

Before examining the sizes of the path coefficients, the researcher first examined their significance by running the PLS bootstrapping for the structural model relationships using the sample size of n=299(without outliers) and a threshold bootstrap sample size of 5,000 cases (n=5000). The results indicated that five structural paths were significant with two-tailed (t> 1.96) i.e. TR –> EAD, EF –> EAD, PB -> ICTSKILL, and TR ->ICTSKILL, UPSD -> ICTSKILL. The remaining paths coefficients were non-significant at two-tailed threshold. (Hair et al., 2014; Urbach and Ahlemann, 2010; Hair et al., 2011). The results are as depicted in Table 4.19 and Figure 4.1.

Table 4.19

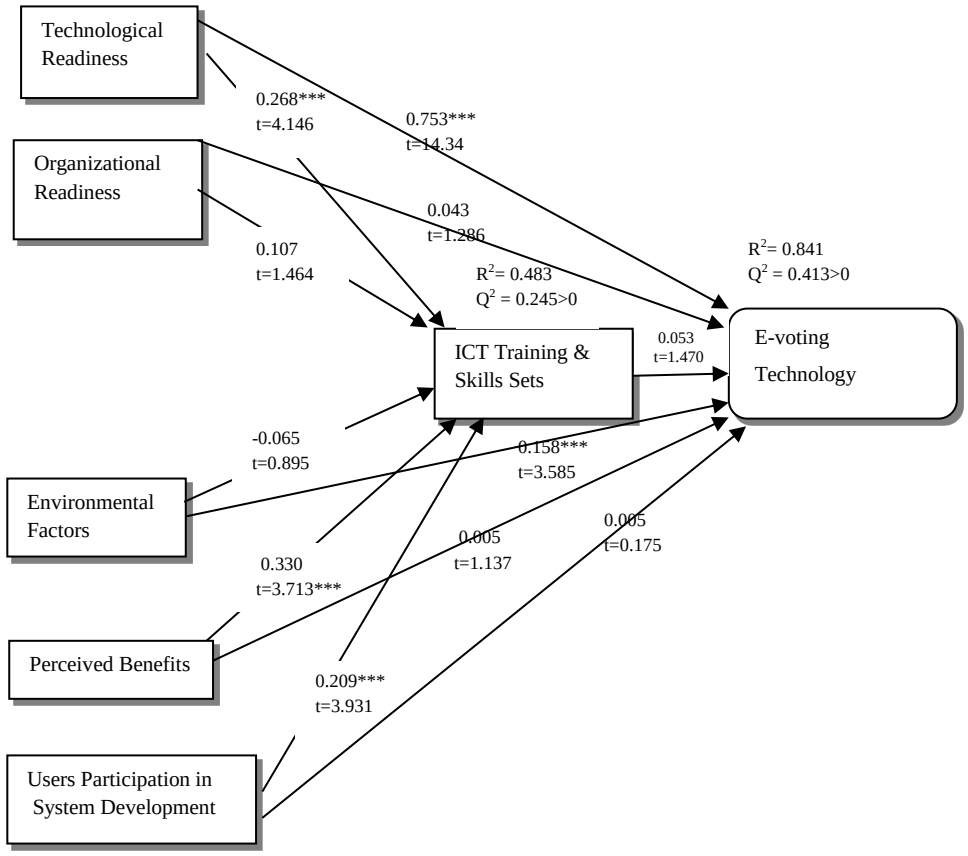
Results of Significant Relationships

Path Relationship	Std. Beta	SE	t-Value	Decision
Environmental Factors(EF) -> E-Vote Adoption(EAD)	0.144	0.041	3.493***	Significant
Environmental Factors(EF) -> ICT-Training(ICTSKILL)	-0.065	0.073	0.895	Not Significant
ICT-Training(ICTSKILL) -> E-Vote Adoption(EAD)	0.053	0.036	1.470	Not Significant
Organisational Readiness(OR) -> E-Vote Adoption(EAD)	0.052	0.034	1.527	Not Significant
Organisational Readiness(OR) -> ICT-Training(ICTSKILL)	0.107	0.073	1.464	Not Significant
Perceived Benefits(PB) -> E-Vote Adoption(EAD)	0.029	0.037	0.777	Not Significant
Perceived Benefits(PB) -> ICT-Training(ICTSKILL)	0.330	0.089	3.713***	Significant
Technological Readiness(TR) -> E-Vote Adoption(EAD)	0.766	0.049	15.602***	Significant
Technological Readiness(TR) -> ICT-Training(ICTSKILL)	0.268	0.065	4.146***	Significant
User Participation(UPSD) -> E-Vote Adoption(EAD)	0.021	0.029	0.728	Not Significant
User Participation(UPSD) -> ICT-Training(ICTSKILL)	0.209	0.053	3.931***	Significant

Note: ***p< 0.01, Std. Beta=Path Coefficient, SE= Standard Error

To determine their level of significance, the predicting strength of the exogenous constructs on the two endogenous constructs were assessed. The perceptions of Technological Readiness of INEC (TR = 0.766) is the most important determinant factor (direct relationship) of E-voting adoption, followed by Environmental Factors (EF= 0.144). ICT Training and Skill Sets (ICTSKILL= 0.053) and Organisational Readiness (OR= 0.052) has little but non-significant positive influence (direct relationships) on E-voting adoption (EAD). Also, User Participation in System Development (UPSD= 0.021) and Perceived Benefits (PB= 0.029) are not good predictors of E-voting adoption because of their very low values of path coefficients (not significant). However, they have positive influence on the E-voting adoption. Technological Readiness (TR= 0.268), Perceived Benefits (PB= 0.330) and User

Participation in System development (UPSD= 0.209) are the primary drivers of ICT Training and Skill Sets as an endogenous construct. Organisational Readiness (OR= 0.107) and Environmental Factors (EF= -0.0065) are very weak predictors of ICT Training and Skill Sets (See Figure 4.1).



Note: ***p < .01

Figure 4.1. Structural Model Results

In the third step, the coefficient of determination (R^2) and predictive relevance (Q^2) were assessed using default report of PLS Algorithm and default report of PLS Blindfolding techniques respectively. The R^2 measures the explained variance of all the exogenous latent variables relative to their total variance, while Q^2 measures the

predictive relevance of all the exogenous constructs for each endogenous construct under consideration (Urbach and Ahlemann, 2010; Hair, Ringle, and Sarstedt, 2011).

In the research model, ICT Training and Skill Sets (Indirect Effect Variable) explained 48% (R^2 = 0.483) of the exogenous constructs and can be considered moderate, while E-Vote Adoption variable explained 84% (R^2 = 0.841) which was considered high. Consequently, the exogenous path coefficients of research model explained 84% (R2 = 0.841) of variance in E-voting adoption success, likewise they accounted for 48% variation in ICT Training and Skills sets endogenous construct, both were considered to be substantial (Fig. 4.1). The default report of PLS Blindfolding (cross-validated redundancy) indicated that the predictive relevance Q^2 of ICTSKILL has a value of 0.245 (Q^2 >0) while Q^2 for EAD is 0.413 (Q^2 >0) which means that the model has medium and large predictive relevance to the exogenous constructs; thereby, providing support for the research model's predictive relevance for the two endogenous (ICTSKILL, EAD) constructs.

The researcher then evaluated the Effect Size (f^2) for each exogenous path on the R^2 of the two endogenous constructs by eliminating one path at a time and then re-estimating the model. The results showed that of all the endogenous paths pointing to the ICT Training and Skills(ICTSKILL), Technological Readiness (f^2= 0.081), Perceived Benefits (f^2= 0.079), and User Participation in System development (f^2= 0.055) have small effect size (impact) which was greater than the recommended threshold of f^2= 0.02 (Cohen, 1988; Hair et al., 2014; Urbach and Ahlemann, 2010;

Hair et al., 2011), Organisational Readiness and Environmental Factors have no effect on ICT Training and Skills endogenous construct(see Table 4.20).

The effect size on E-Vote Adoption (EAD) indicated that Environmental Factors has small impact (f^2= 0.054), while Technological Readiness has large impact (f^2= 2.009), the remaining path coefficients have no impact. The researcher equally evaluated the effect size (q^2) of each path on the predictive relevance using the cross-validated redundancy scores Q^2 for the two endogenous when they are parts of the model and when one is removed at a time from the model and the model re-estimated. The results indicated that only Technological Readiness has medium (q^2= 0.267, where $q^2 \geq 0.15$) predictive relevance on EAD, while other path coefficients have no predictive relevance on EAD. Perceived Benefits, Technological Readiness, and User Participation in System Development have small ($q^2 \geq 0.02$) predictive relevance on ICTSKILL when EAD is removed from the model and the model re-estimated. Environmental Factors and Organisational Readiness have no predictive relevance on ICTSKILL (Cohen, 1988; Hair et al., 2014). See Table 4.20.

Table 4.20

Summary of Results -Path Coefficients, Effect Sizes-f^2 and Effect Size-q^2

		E-Vote Adoption(EAD)			ICT Training and Skill (ICTSKILL)	
Exogenous Construct	Path Coefficient	f^2 effect size	q^2 effect size	Path Coefficient	f^2 effect size	q^2 effect size
Environmental Factors(EF)	0.158	**0.054**	0.007	-0.065	0.004	0.005
ICT-Training and Skills (ICTSKILL)	0.053	-0.001	-0.002	-	-	-
Organisational Readiness(OR)	0.043	-0.001	-0.001	0.107	0.008	0.002
Perceived Benefits(PB)	0.005	-0.001	-0.002	0.330	**0.079**	**0.031**
Technological Readiness(TR)	0.753	**2.009**	**0.267**	0.268	**0.081**	**0.028**
User Participation in System Development(UPSD)	0.005	-0.001	-0.002	0.209	**0.055**	**0.020**

Finally, the researcher carried out Importance Performance Matrix Analysis (IPMA) as a means of extending the PLS-SEM structural model results, which only identified the relative importance of the research constructs by estimating the direct, indirect, and total relationships to include the actual performance of each construct in the model using the latent variable scores of the PLS-SEM results. Hair et al. (2014) describe IPMA as a contrast of total effects (importance) and the average values of latent variable scores (performance) in order to show the significant areas for the improvement of management activities or the specific focus of the research model. First, the researcher obtained the total effect (direct and indirect effects) of the relationships between the constructs of the model (exogenous and endogenous) from the results of the previous analysis. Next, the researcher obtained the performance values by rescaling the latent variable scores values for each observation on a scale of 0 (lowest) to 100 (highest) for a scale of 1 to 5 using the formula below (Hair et al., 2014):

$$Y_i = \frac{(Y_{i-Minscale[Y]})}{(Maxscale[Y]-Minscale[Y])} * 100 \qquad (7)$$

Where, Y_i is the i^{th} data point (observations) of a specific latent variable in the PLS-SEM path model, Minscale= 1, and Maxscale=5 for the latent variable scores. The PLS algorithm was conducted using the rescaled latent variable scores to obtain from the PLS-SEM default reports, the index value (mean value of the rescaled scores of each latent variable on a scale of 0 to 100) of their performance. See, Table 4.21 and Figure 4.2.

Table 4.21

Index Values and Total Effects for the IPMA of EAD

Construct	Importance (Total Effect)	Performance (Index Values)
Environmental Factors(EF)	0.160	73.992
ICT Training and Skills(ICTSKILL)	0.050	73.142
Organisational Readiness(OR)	0.050	74.310
Perceived Benefits(PB)	0.030	72.449
Technological Readiness(TR)	0.760	67.636
User Participation in System Development(UPSD)	0.020	61.975

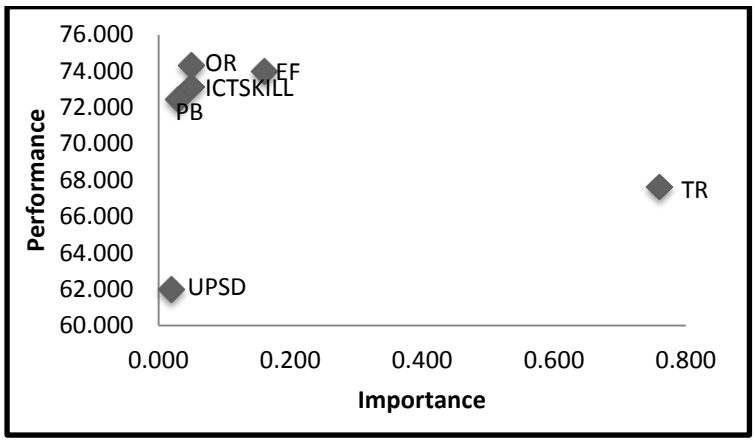


Figure 4.2. IPMA Results of EAD as Target Construct

Table 4.21 and Figure 4.2 indicated that, Technological Readiness (TR) is the primary important construct for achieving organisational adoption of E-voting technology. However, the performance was low compared with other constructs, with the exception of User Participation in System Development construct. Environmental Factors (EF) is next on the order of importance. It has higher performance compared to TR. User Participation in System Development (UPSD) construct has little relevance both in terms of performance and importance.

Therefore, there is need for an electoral management organisation to focus on improving the performance of TR in order to achieve success in the adoption of the E-voting technology. Likewise, Organisational Readiness (OR) exhibited the highest performance on EAD followed by Environmental Factors (EF), ICT Training and Skill (ICTSKILL) and Perceived Benefits (PB) constructs but of little (importance) or no effect on EAD. There is also the need to focus on improving the importance of these constructs based on the IPMA of their construct's indicators since these are very important drivers of any organisational IT adoption.

4.6.3 Results of Hypothesis Testing

The results showed that the predictive tendency of the factors were quiet substantial and represented higher variance in the adoption of E-voting Technology (R^2 = 0.841), meaning that the model could effectively explain the adoption of E-voting Technology by INEC, Nigeria. The model explains the underlying relationships between the exogenous variables and the endogenous variables, providing an insight

into how the adoption of E-voting Technology can further be explained and facilitated. The findings of the study showed that Technological Readiness have the highest significant and positive relationships (direct) with INEC staff perception on the adoption of E-voting Technology, with a path coefficient of 0.766 ($p < 0.01$), supporting the research hypotheses (H1).

The results also indicated that the direct relationships between Environmental Factors and E-voting adoption were positively significant ($p< 0.01$) thereby supporting the research hypothesis H3. However, the hypothesized direct relationships H2, H4, H5 and H6 were not significant and their impacts were very low, the results indicated a positive relationship with the research criterion variable. This supported the theoretical assumption of the research. Therefore, hypotheses H2,H4,H5, and H6 were equally supported (Urbach & Ahlemann, 2010). See Table 4.22.

Table 4.22

Results of Hypothesized Relationships

Code	Hypothesized Relationship	Std Beta	SE	t-Value	Decision
	Direct				
H1	Technological Readiness(TR) -> E-voting Adoption(EAD)	0.766	0.049	15.602***	Supported
H2	Organisational Readiness (OR)->E-voting Adoption(EAD)	0.052	0.034	1.527	Supported
H3	Environmental Factors(EF)->E-voting Adoption(EAD)	0.144	0.041	3.493***	Supported
H4	Perceived Benefits(PB)->E-voting Adoption(EAD)	0.029	0.037	0.777	Supported
H5	User Participation(UPSD)->E-voting Adoption(EAD)	0.021	0.029	0.728	Supported
H6	ICT Training(ICTSKILL)->E-voting Adoption(EAD)	0.053	0.036	1.470	Supported
	Indirect				
H7	Technological Readiness(TR)-> ICT Training(ICTSKILL)->E-voting Adoption(EAD)	0.014	0.012	1.230	Not Supported
H8	Organisational Readiness(OR)-> ICT Training(ICTSKILL)->E-voting Adoption(EAD)	0.007	0.006	1.025	Supported
H9	Environmental Factors(EF) ->ICT Training(ICTSKILL)->E-voting Adoption(EAD)	-0.003	0.005	-0.635	Supported
H10	Perceived Benefits(PB) ->ICT Training(ICTSKILL)->E-voting Adoption(EAD)	0.017	0.013	1.396	Not Supported
H11	User participation(UPSD) ->ICT Training(ICTSKILL) ->E-voting Adoption(EAD)	0.011	0.008	1.348	Not Supported

The study found empirical evidence that ICTSKILL did not mediate relationships between all exogenous constructs and EAD endogenous construct using the Baron and Kenny (1986) approach. This indicated that the research hypotheses H7, H8, H9, H10 and H11 were not supported (see Table 4.22). However, Organisational readiness (OR) and Environmental Factors (EF) showed an indirect effect in their relationship with E-Vote Adoption (EAD) when ICTSKILL act as a *intervening* variable in the research model using Preacher and Hayes approach. These results are explained in details in the section below.

4.6.4 Analysis of Mediating and Indirect Effect

4.6.4.1 Overview of Methods

A mediator can be described as a variable which accounts for either part (partial) or complete (full) significant total relationship that occurs between an independent (predictor) variable and a dependent (criterion) variable. While indirect effects are special type of mediation, in which the predictor and criterion variables may be uncorrelated but indirectly related thorough a significant link of an intervening variable (Mathieu & Taylor, 2006). According to Hair, Hult, Ringle and Sarstedt (2014), mediation focuses on a theoretically-established direct path relationship between a predictor variable X and a criterion variable Y as well as on an additional theoretically relevant variable M (mediator or intervening variable), which provides information on the direct effect via its indirect effect.

Mediation is generally present when: (1) the predictor variable (X) significantly influences the mediator (M); (2) the predictor variable (X) significantly influences the criterion variable (Y); when the mediator is not present; (3) when the mediator has a special significant influence on the criterion variable (Y); and (4) when the mediator is present in the model, the effect size of the predictor (X) on the criterion (Y) is reduced (McKinnon, Warsi & Dwyer, 1995).

Indirect Effect, a new approach to making inference about intervening variable effect proposed by Preacher and Hayes (2008) suggest the quantification of the indirect effect in the path relationships between the predictor variable and the intervening variable on one hand, and between the intervening and the criterion variable on the other (i.e. X to M to Y) rather than infer their existence as suggested by Baron and Kenny (1986). Sometimes, a direct relationship between the predictor and criterion variable may be insignificant and yet shows indirect effect relationship. There are two approaches to indirect effect analysis: bootstrapping and the empirical M-test. Although M-test offers higher statistical power, it is difficult to use without the assistance of tables compared to that of bootstrapping, which is already implemented in some Structural Equation Modelling (SEM) software and other programs such as IBM SPSS version 20 (Hayes, 2009).

The researcher adopts bootstrapping method because it generates an empirical representation of the indirect effect of the original sample distribution thorough repeated sampling with replacement. This process is repeated for k times, where k = 5,000 is recommended. Then, the bootstrap sample was used to calculate the product (size) of the indirect path coefficients (ai*bi) , where i= 1 to k. The size of indirect effect was then used to compute the standard error (SE) by finding standard deviation (sd) of the indirect effect size i.e. sd(ai*bi). The researcher conducted a mediation and indirect analysis simultaneously in order to answer the indirect hypotheses

H7 to H11 (See Figure 1) by following both PLS-SEM mediator analysis procedure of Baron and Kenny (Hair, et al., 2014), Preacher and Hayes (2008) and Hayes (2009) indirect effect analysis as discussed below.

4.6.4.2 Results of Mediation Analysis (Baron and Kenny Approach)

The significance of the direct relationship of the predictor variables with the criterion variable of the study without the mediator or intervening variable (ICTSKILL) in the PLS path model was assessed. The result showed that only Environmental Factors (EF) and Technological Readiness (TR) were significant ($t > 1.96$). Therefore, the researcher concluded that, there was no mediating effect of ICTSKILL in the relationships between Organisational Readiness (OR), Perceived Benefits (PB), User participation in System Development (UPSD) and E-Vote Adoption (EAD), since their direct relationships (path coefficients) were not statistically significant at two-tailed (Hair, et al., 2014). Next, the researcher examined the indirect relationships between the Technological Readiness (OR), Environmental Factors (EF) via the ICT Training and Skills (ICTSKILL-Mediator) and E-Vote Adoption (EAD) by including the mediator (ICTSKILL) into the PLS-SEM path analysis and then bootstrap using 5,000 samples. The analysis showed that the indirect relationships between TR and EAD, EF and EAD were not significant.

The researcher concluded that; there was no mediation in their relationship. Therefore the research hypotheses H7, H8, H9, H10, and H11 were not supported by the research data as suggested by Baron and Kenny (1986). See Table 4.23.

Table 4.23

Testing for Mediating Effect

Direct Relationships- Without the Mediator (ICTSKILL)				
	Std. Beta	**SE**	**t-Value**	**Decision**
Environmental Factors(EF) -> E-Vote Adoption(EAD)	0.144	0.041	3.493***	Significant
Organisational Readiness(OR) -> E-Vote Adoption(EAD)	0.052	0.034	1.527	Not Significant
Perceived Benefits(PB) -> E-Vote Adoption(EAD)	0.029	0.037	0.777	Not Significant
Technological Readiness(TR) -> E-Vote Adoption(EAD)	0.766	0.049	15.602***	Significant
User Participation(UPSD) -> E-Vote Adoption(EAD)	0.021	0.029	0.728	Not Significant
Indirect Relationships- With the Mediator (ICTSKILL)				
Environmental Factors(EF)-> ICT-Training(ICTSKILL) -> E-Vote Adoption(EAD)	-0.003	0.005	-0.635	Not Significant
Technological Readiness(TR) -> ICT-Training(ICTSKILL)-> E-Vote Adoption(EAD)	0.014	0.012	1.230	Not Significant

4.6.4.3 Results of Indirect Effect Analysis

Hayes (2009) argues for the need to test for indirect effect in the relationship between a predictor and criterion variables even if their direct relationships is not significant for two main reasons: (1) it is possible for an intervening variable to be causal between the predictor and criterion variables, even if both the predictor and criterion variables do not associate;

(2) the claim that a predictor variable can't affect the criterion variable indirectly without a significant direct relationship is false. The researchers therefore need to go beyond making an inference about indirect effect without testing for their existence in a path model as in Baron and Kenny (1986) method.

The researcher, therefore conducted a test on the mediation model for the indirect effects in the relationships between the predictors, intervening and the criterion variables using bootstrapping technique to generate empirical representation of the original sample distribution (n=299) by repeated resampling for a total of 5,000 times as recommended using PLS bootstrap algorithm (Hayes, 2009, Hair, et al., 2014). The researcher copied the path coefficients generated from the bootstrap sample into the excel spreadsheet in order to calculate for the product of each path relationships, the standard errors, and the t-Values as defined in equation (8) below.

The product of the indirect coefficients and their associated standard errors, and the t-Value for the indirect relationships was computed using the bootstrapping techniques formula as suggested by Preachers and Hayes (2008) and Hayes (2009):

$$t = \frac{a*b}{SE} \qquad (8)$$

Where a= path coefficient between predictor and mediator, b= path coefficient between mediator and the criterion (EAD), SE= standard error-calculated as: sd (a_i*b_i), where sd= standard deviation of the bootstrap product of path a_i and path b_i, where i= 1 – 5,000 samples. Next, the researcher made inference on the size of the indirect effect for the population sample using the 5,000 bootstrap sample estimate to generate the lower and upper values of t-Value, where the lower value was calculated as t- 1.96*SE (95% confidence interval) and the upper value as t+ 1.96*SE (95% confidence interval). If there is zero (0) value in between the lower and the upper value, then there is no indirect effect in the relationships, otherwise the researcher can infer indirect effect (Hayes, 2009).

The analysis shows that there is no indirect effect relationship between Perceived Benefits (t = -0.00706 to 0.04204), Technological Readiness (t = -0.00843 to 0.03683), User Participation in System Development (t = -0.00501 to 0.02718) and the E-Vote Adoption. However, there was indirect effect in the relationship between Organisational Readiness (t = 1.01415 to 1.03585), Environmental Factors (t = -0.646 to - 0.624) and E-Vote Adoption. See Table 4.24.

Table 4.24

Results of Indirect Effects Relationships

Path Relationship(Indirect)	Std Beta	SE	t-Value	Indirect Effect (95% Confidence Interval)		
				Lower Limit(t)	Upper Limit(t)	Decision
Environmental Factors(EF)-> ICT-Training(ICTSKILL) -> E-Vote Adoption(EAD)	-0.003	0.005	-0.635	-0.646	-0.624	Indirect Effect
Organisational Readiness(OR) -> ICT-Training(ICTSKILL)-> E-Vote Adoption(EAD)	0.007	0.006	1.025	1.014	1.036	Indirect Effect
Perceived Benefits(PB) -> ICT-Training(ICTSKILL)-> E-Vote Adoption(EAD)	0.017	0.013	1.396	-0.007	0.042	No Indirect Effect
Technological Readiness(TR) -> ICT-Training(ICTSKILL)-> E-Vote Adoption(EAD)	0.014	0.012	1.230	-0.008	0.037	No Indirect Effect
User Participation(UPSD)-> ICT-Training(ICTSKILL) -> E-Vote Adoption(EAD)	0.011	0.008	1.348	-0.005	0.027	No Indirect Effect

4.6.5 Multi-Group Analysis (MGA)- Heterogeneous Data Modelling

The assumption that independent (exogenous) latent variables (constructs) directly affect the dependent (endogenous) latent constructs in a cause and effect path model analysis without any influence of other constructs or variables does not hold due to the fact that, respondents can be *heterogeneous* in their perception and evaluation of a latent construct leading to significant difference in path coefficient across two or more groups of respondents. Therefore, there is the need for researcher to analyse the heterogeneity in the data structure in order to further validate the results of a structural model of the study, as failure to consider heterogeneity can be a threat to the validity of the PLS-SEM results as it can lead to incorrect conclusions (Hair et al., 2014). **M**ulti-**G**roup **A**nalysis (MGA) compares path coefficient for two or more

respondent groups to determine the heterogeneity in the data group and it is of two types: *Observed heterogeneous multi-group analysis* and *Unobserved heterogeneous multi-group analysis*. Detailed description of the two methods is as shown below.

4.6.5.1 Observed Multi-Group Analysis (MGA)

Observed MGA also referred to as *observed heterogeneity* is used when a researcher has information, which suggests that there was a possible difference in known subgroups exhibiting different underlying relationships with the constructs of the research model (Hair et al., 2014).

There are two methods or approaches to analysing observed multi-groups; the first is the use of *parametric method* brought forward by and Chin (2000), This method uses a modified independent samples t -test to compare path coefficients across two group of data using the standard deviations (standard errors) estimates resulting from bootstrapping. Bootstrapping for each group is conducted and if the standard errors are equal for the groups, the empirical t value is calculated as suggested by Hair et al. (2014) as follows:

$$t = \frac{|p^{(1)} - p^{(2)}|}{\sqrt{\frac{(n^{(1)}-1)^2}{(n^{(1)}+n^{(2)}-2)} . se(p^{(1)})^2 + \frac{(n^{(2)}-1)^2}{(n^{(1)}+n^{(2)}-2)} . se(p^{(2)})^2} . \sqrt{\frac{1}{n^{(1)}} + \frac{1}{n^{(2)}}}} \qquad (9)$$

The critical value from a t distribution with $n^{(1)} + n^{(2)} - 2$ degrees of freedom should be less than the empirical t value in order for the null hypotheses of equality of path coefficient to be rejected. But, if the standard errors for the

groups are not equal, then the empirical t-value or test statistics will be computed as follows:

$$t = \frac{|p^{(1)} - p^{(2)}|}{\sqrt{\frac{(n^{(1)}-1)}{n^{(1)}}.se(p^{(1)})^2 + \frac{(n^{(2)}-1)}{n^{(2)}}.se(p^{(2)})^2}} \qquad (10)$$

Since t is asymptotically distributed for the test statistics, the degree of freedom is computed as:

$$t = \left\| \frac{(\frac{(n^{(1)}-1)}{n^{(1)}}.se(p^{(1)})^2 + \frac{(n^{(2)}-1)}{n^{(2)}}.se(p^{(2)})^2)^2}{\frac{(n^{(1)}-1)}{n^{(1)}}.se(p^{(1)})^4 + \frac{(n^{(2)}-1)}{n^{(2)}}.se(p^{(2)})^4} \right\| \qquad (11)$$

Parametric approach to multi-group analysis makes an assumption of normality of data; this is not in tandem with the characteristics of PLS-SEM which is distribution free (Hair et al., 2014; Henseler, 2012).

The *non-parametric approach* introduced by Henseler (2007), Chin and Dibbern (2010), Sarstedt, Henseler and Ringle (2011), and Henseler (2012) is a distribution-free method to analysing multi-group which provides solution to the problem of distribution assumptions of the parametric approach developed by Keil et al. (2000) and Chin (2000).

Although, similar to parametric approach in terms of data division into subsamples of the population and bootstrapping analysis of each subsamples, however, unlike parametric, the non-parametric assesses the robustness of the

subsamples by evaluating the observed distributions of the bootstrap outcomes for each groups. This is used to determine the probability of group-specific difference given group-specific estimates and the empirical **c**umulative **d**istribution **f**unctions (CDFs).

Henseler (2012) proposes the following steps for analysing MGA using non-parametric approach:

(1) Let group-specific estimate be $\tilde{\theta}^{(g)}$ (g ∈ { 1, 2}),

(2) We assume $\tilde{\theta}^{(1)} > \tilde{\theta}^{(2)}$ since there was no loss of generality,

(3) We look for $P\left(\tilde{\theta}^{(1)} \leq \tilde{\theta}^{(2)} \mid \tilde{\theta}^{(1)}, \tilde{\theta}^{(2)}, \text{CDF}(\tilde{\theta}^{(1)}), \text{CDF}(\tilde{\theta}^{(2)})\right)$ as a means of assessing the group-effect significance,

(4) Let J = number of bootstrap estimates, and $\tilde{\theta}_j^{(g)*}$ (j ∈ { 1,..., J}) = the bootstrap estimates. Generally, there is a difference between the mean of the bootstrap estimates and the group-specific estimate; that is, the empirical distribution of $\theta^{(g)}$ does not have $\tilde{\theta}^{(g)}$ as its central value.

(5) To overcome the issue rasised in step (4), we determined the centred bootstrap estimates $\tilde{\theta}_j^{(g)\bar{*}}$ as:

$$\forall\ g, j: \quad \tilde{\theta}_j^{(g)\bar{*}} - \frac{1}{J} \sum_{i=1}^{J} \tilde{\theta}_j^{(g)*} + \tilde{\theta}^{(g)} \qquad (12)$$

(6) Using the bootstrap estimates as the discrete manifestations of the CDFs we then calculated

$$P\left(\theta^{(1)} \leq \theta^{(2)} \mid \tilde{\theta}^{(1)}, \tilde{\theta}^{(2)}, \text{CDF}(\theta^{(1)}), \text{CDF}(\theta^{(2)})\right) = P\left(\tilde{\theta}^{(1)\bar{*}} \leq \tilde{\theta}^{(2)\bar{*}}\right) \quad (13)$$

(7) Using Heaviside step function *H* (x)which is defined as:

$H(x) = \frac{1+\text{sgn}(x)}{2}$, then equation in step (6) is transformed into

$$P(\theta^{(1)} \leq \theta^{(2)} | \tilde{\theta}^{(1)}, \tilde{\theta}^{(2)}, \text{CDF}(\theta^{(1)}), \text{CDF}(\theta^{(2)})) = \frac{1}{J^2} \sum_{i=1}^{J} \sum_{j=1}^{J} H\left(\tilde{\theta}_j^{(1)*} - \tilde{\theta}_j^{(2)*} \right) \quad (14)$$

The last equation as shown in step (7) is the core of the new MGA PLS-based approach.

Henseler (2012) gives the following reasions for this new MGA approach:

"*Each centred bootstrap estimate of the second group is compared with each centred bootstrap estimate of the first group. The number of positive differences divided by the total number of comparisons(i.e.,J^2) indicates how probable it is in the population that the parameter of the second group is greater than the parameter of the first group* " (p. 498).

4.6.5.2 Unobserved Multi-Group Analysis

When heterogeneity in data structures is not traceable to observable characteristics of a population, this situation is refered to as *Unobserved heterogeneity*. Unobserved heterogeneity occurs because sources of data heterogeneity can never be known fully before hand. Therefore, situations arise when the PLS path model cannot be accurately estimated due to the presence of unobserved heterogeneity.

The researcher, therefore, needs to apply complementary techniques based on segmentation (latent class techniques) which allows identification and treatment of unobserved heterogeneity (Hair, et al., 2014). According to Ringle, Sarstedt, and Schlittgen (2010a), Ringle, Sarstedt, and Mooi (2010b),

and Hair, et al., (2014), there are many latent class techniques or segmentations approaches to analyzing unobserved heterogeneity in PLS-SEM.

Ringle, et al., (2010b) classify these into three major types; namely, (a) *Path Modelling Segmentation Tree*, (b) *Distance-Based* (i.e. PLS Typological Regression Approaches, Fuzzy PLS Path Modelling, PLS Genetic Algorithm Segmentation), and (c) *Finite Mixture-PLS Modelling* (FIMIX-PLS). Of all these methods, the FIMIX-PLS is the commonest, most comprehensive and important approach used by researchers to capture unobserved heterogeneity in PLS path modelling and has been integrated into *SmartPLS* application software (Ringle, et al., 2005; Ringle, et al., 2010b; Hair, et al., 2014).

In the application of FIMIX-PLS techniques, the assumption is that data originate from sources with different subpopulations or segments, therefore, each segment can be modeled separately and the combination of these subpopulation form the overall or total population (McLachlan & Peel, 2000; Sarstedt, 2008). The following steps should be followed, when applying the FIMIX-PLS:

1. Calculate the path model estimates using the PLS Algorithm on the data aggregate data level.

2. Latent variable scores in the inner path model generated from step (1) is used as input for the FIMIX-PLS procedure. Evaluation of the FIMIX-PLS results and identification of an appropriate number of segments by successively increasing the number of segments (s) in the model until the results become uninterpretable. Compare the FIMIX-PLS results of the models using the recommended fit criteria to find one with optimal number of segments.

   An **EN**tropy statistics (ENs) fit criterion can be used to identify the most appropriate number of segments. EN values ranges between 0 and 1. A model with an EN greater than 0.5 (EN > 0.5) is generally considered to represent unambiguous segmentation (Wedel & Kamakura, 2000; Ringle, Wende & Will, 2010). Applications of FIMIX-PLS provides evidence that EN values above 0.5 result in estimates of P_{ik} that permit unambiguous segmentation (Ringle, 2006; Sarstedt et al., 2009; Sarstedt & Ringle, 2010).

$$EN_k = 1 - \frac{[\sum_i \sum_k - P_{ik} \ln(P_{ik})]}{I ln(K)} \qquad (15)$$

   Other evaluation criteria that can also be used to identify the appropriate number of segments include Log-likelihood ($InL = \sum_i \sum_k z_{ik} In(f(\eta_i|\xi_i, B_k, \Gamma_k, \Psi_k)) + \sum_i \sum_k z_{ik} In(\rho k)$), the **A**kaike **I**nformation **C**riterion ($AIC_K = -2\ln L + 2N_K$), the **C**onsistent AIC

($CAIC_K$ = - 2lnL + (ln(I) + 1)N_K) or the **B**ayesian **I**nformation **C**riterion (BIC_K = - 2lnL + ln(I)N_K).

3. Uncover the explanatory variables that characterize the segments (e.g. demographic) thorough an ex-post analysis(as suggested by Hahn, Herrmann and Huber (2002)) of the probabilities estimate of membership using the Ramaswamy, DeSarbo, Reibstein & Robinson (1993) proposed approach.

4. Then, an a-priori segmentation of data and segment-specific estimation of the PLS path model is carried out, thereafter, PLS segment-specific result is evaluated and interpreted.

The researcher conducted multi-group analysis in order to find answers to the research question number four. The researcher therefore used both the observed (nonparametric approach) and unobserved (FIMIX-PLS approach) MGA to determine if there was heterogeneity in the data collected form the staff respondents of an electoral organisation (INEC, Nigeria) using two demographic variables (i.e. Position and Work Experience) as moderators as stated in the research question four (section 1.4, chapter one). The results of the two MGA method of analysis are as presented in section 4.6.5.3.

4.6.5.3 Results of Multi-Group Analysis (MGA)

The following section presents the results of the multi-group analysis assessment in order to provide answers to the research question four (4) as stated in section 1.4 of chapter one. The assessment was carried out using the SmartPLS 2.0 software package (Ringle, et al., 2005). Both observed and unobserved MGA was carried out to test for data heterogeneity among group-specific in the sampled population using two demographic variables of *Position* and *Work Experience* and the results are as presented in the following sub-sections.

4.6.5.3.1 Results of Observed Multi-Group Analysis(Nonparametric Approach)

The researcher used the Henseler (2012) *non-parametric* approach of analyzing the observed heterogeneity in data since; it is distribution free and does not make distribution assumption compared with the *paramertic* approach developed by Chin(2000) and Keil et al (2000); also, because PLS-SEM is a distribution free method of data analysis (Hair et al., 2014).

A cross-sectional study was conducted among the staff of an electoral organisation (INEC, Nigeria) to test the research hypotheses. Out of the 380 valid respondent's data collected, 81 was removed for bad outliers, the remaining 299 was used for the PLS-SEM analysis.

Out of the 299, 193 respondents belong to the Management cadre (Top Management, Director, Deputy Director, and Assistant Director) while the

remaining 106 respondents belong to Operational cadre (Senior Staff and Junior Staff). Also 177 have less than or equal to 10 years of working experience and the remaining 122 have more than 10 years of working experience. The researcher created two path models as shown in Figures 4.3 and 4.4 with their standardized path coefficients per group estimated using SmartPLS software (Ringle et al., 2005; Ringle et al., 2006).

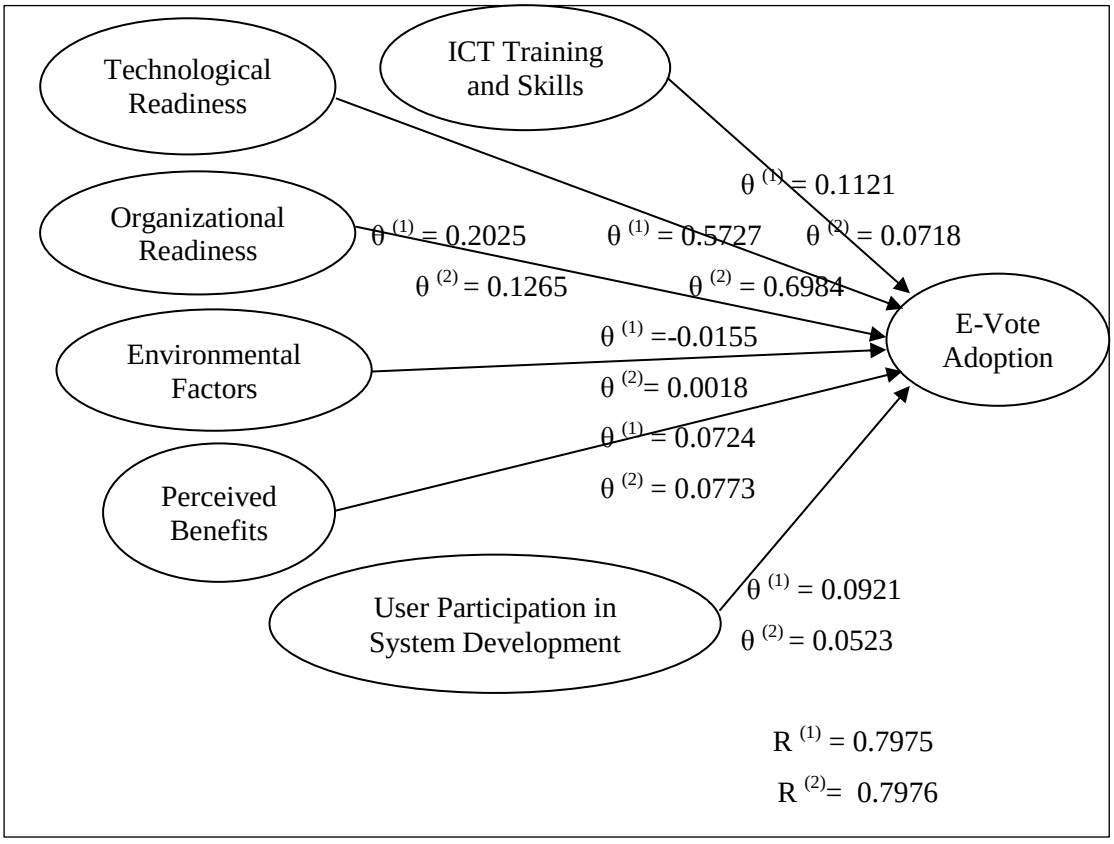


Figure 4.3. Structural model (standardized PLS path coefficients) with group (Position) parameter estimates

These models capture six direct relationships of the independent variables Ennvironmental Factors(EF), ICT Training and Skills (ICTSKILL), Organisational Readiness (OR), Perceived Benefits (PB), and Technological Readiness (TR) on E-Vote Adoption (EAD). In order to determine the moderating effect of position and work experience, the researcher separately estimated the two models; One for management cadre group and one for the operational cadre group of the position MGA on one hand, and one for group with less than or equal 10 years working experience and one for group with more than 10 years working experience MGA on the other.

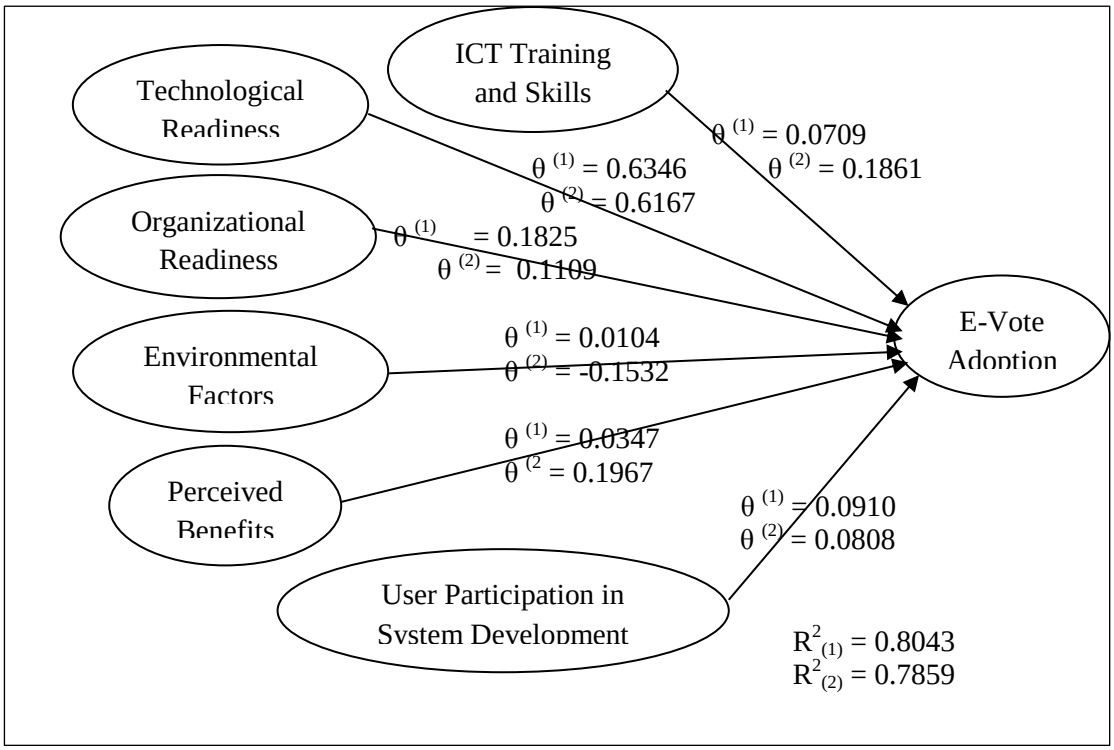


Figure 4.4. Structural model (standardized PLS path coefficients) with group (Work Experience) parameter estimates

Thereafter, the researcher carried out bootstrap re-sampling analyses with 500 samples per group, using each group path coefficients (path estimates) derived from the PLS-Algorithm procedures and estimates from the bootstrapping and using the PLS-Bootstrapping procedures. The researcher used the non-parametric Excel Template to count how often the first group's bootstrap estimates are greater than the bootstrap estimates of the second group (i.e. $\theta^{(1)} > \theta^{(2)}$), and divided it by the number of bootstrap samples N which is 500 in this case (N = 500) as suggested by Henseler (2012). Then the researcher calculated the values for the group difference and the p-Values for each group differences in the effects of EF, ICTSKILL, OR, PB, TR, and UPSD on EAD (See Table 4.25 and Table 4.26).

Before the examination of the results of the MGA analysis, the researcher examined the reliability and validity of the measurement model for each group-specific models for compliance. For internal consistency reliability showed that the composite reliability (CR) was above the recommended threshold and not greater than 0.90, while the indicators reliability (indicator loadings) was also above the threshold of 0.5. The convergent validity for the constructs of each group model was assessed using the Average Variance Extracted (AVE), which was above the threshold value of 0.50 while the discriminant validity was assessed using the Fornell-Larcker criterion. The results for each group showed that the square root of AVE for each constructs

was higher than its correlation with any other (off-diagonals elements). See Appendix E.

The examination of the results of the MGA analysis indicated a significant difference in the effect of Perceived Benefits (PB) on the E-Vote Adoption (EAD) with work experience (WkExperience) variable as the moderator (α = .05). This means, for staff with more than 10 years of working experience, the level of perceived benefits is a stronger predictor of E-Vote Adoption compared to the staff with less than 10 years working experience. Others rejected group effects of the remaining constructs on E-Vote Adoption based the on working experience as shown in the Table 4.25.

Table 4.25

Parameter Estimates (Path Coefficients) For Groups Based on WorkExperience

	Group 1 : (≤ 10 Years)	**Group 2 : (> 10 Years)**		
Path(s)	**$\theta^{(1)}$**	**$\theta^{(2)}$**	**Group Difference**	**P-Value**
EnvironFactors(EF) -> E-VoteAdoption(EAD)	0.0104	-0.1532	0.1636	0.9564
ICT-Training(ICTSKILL) -> E-VoteAdoption(EAD)	0.0709	0.1861	0.1152	0.1341
OrganReadiness(OR)->E- VoteAdoption(EAD)	0.1825	0.1109	0.0716	0.797
PerceivedBenefits(PB)-> E-VoteAdoption(EAD)	0.0347	0.1967	0.162	0.0571
TechReadiness(TR) -> E-VoteAdoption(EAD)	0.6346	0.6167	0.0179	0.5684
UserParticipation(UPSD)->E-VoteAdoption(EAD)	0.0910	0.0808	0.0102	0.5589
n	177	122		

Note: $\theta^{(1)}$ and $\theta^{(2)}$ are the parameter estimate (path coefficients) of Group 1 and Group 2; α = .05, is the probability that $\theta^{(1)} \leq \theta^{(2)}$, n = population

Table 4.26 indicates that the approach rejected group effect in the impact of all the constructs (independent variables – EF, ICTSKILL, OR, PB, TR, and UPSD) on the E-Vote Adoption (EAD). This means that position of the staff within the two group (i.e. Management and Operational) does not moderate their perceptions of the relationships between the independent variables and the dependant variable of the research; therefore, the researcher's initial assumption that $\theta^{(1)} > \theta^{(2)}$ as stated in step 2 (nonparametric procedures) of section 4.7.5 as proposed by Henseler (2012) still holds since there was no group difference.

Table 4.26

Parameter Estimates (Path Coefficients) For Groups Based on Position

	Group 1 : Management	**Group 2 : Operational**		
Path(s)	**$\theta^{(1)}$**	**$\theta^{(2)}$**	**Group Difference**	**P-Value**
EnvironFactors(EF)-> E-VoteAdoption(EAD)	-0.0155	0.0018	0.0173	0.4315
ICT-Training(ICTSKILL)->E-VoteAdoption(EAD)	0.1121	0.0718	0.0403	0.6589
OrganReadiness(OR)->E-VoteAdoption(EAD)	0.2025	0.1265	0.076	0.7917
PerceivedBenefits(PB)->E-VoteAdoption(EAD)	0.0724	0.0773	0.0049	0.4908
TechReadiness(TR)->E-VoteAdoption(EAD)	0.5727	0.6984	0.1257	0.1
UserParticipation(UPSD)->E-VoteAdoption(EAD)	0.0921	0.0523	0.0398	0.6856
n	193	106		

Note: $\theta^{(1)}$ and $\theta^{(2)}$ are the parameter estimate (path coefficients) of Group 1 and Group 2; $\alpha = .05$, is the probability that $\theta^{(1)} \leq \theta^{(2)}$, n = population

4.6.5.3.2 Results of Unobserved Multi-Group Analysis(FIMIX-PLS)

Since the path estimate using PLS Algorithm has already been carried out and both the measurement model and structural model results validated (See sections 4.7.1 and 4.7.2). The researcher proceeded to carry out an unobserved heterogeneity analysis using the FIMIX-PLS procedure to identify the appropriate number of segments (K classes) and segment sizes. The FIMIX-PLS results of the models (K classes and segment sizes) as shown in the table 4.27 were compared using the recommended fit criteria to determine the appropriate optimal number of segments.

Table 4.27

Model Selection

	K= 2	**K=3**	**K=4**	**K=5**
AIC	880.840	785.432	885.732	760.311
BIC	980.752	937.151	1089.256	1015.642
CAIC	980.842	937.287	1089.44	1015.872
EN	0.619	0.698	0.642	0.714

Table 4.28

Relative Segment Size for Different Numbers of Segments.

	K=1 (%)	**K=2 (%)**	**K=3 (%)**	**K=4 (%)**	**K=5 (%)**	**Sum (100%)**
K=2	32.6	67.4				100
K=3	32.2	26.6	41.2			100
K=4	35.4	32.8	22.5	9.3		100
K=5	25.5	16.9	25.3	13.7	18.6	100

Using ENtropy statistics (EN) fit criterion, the results indicated the entire segment have values above 0.50 (See Table 4.27), which means that all the segments were considered to represent unambiguous segmentation (Wedel & Kamakura, 2000), with K= 5 having highest numbers of segments (EN = 0.714) and K = 2 providing the lowest segmentation (EN = 0.619).

Because all the segments have EN value above the threshold. Next, the researcher examined the relative segment size to decide which segmentation actually fit for use. The result of the segment size as shown in table 4.28 indicated that, though EN for K = 5 is greater, it has a lower segment size (18.6%) when compared to that of k = 2 (67.4%). Therefore, two-segment class provides the most appropriate segmentation for further unobserved heterogeneity analysis.

Next, the researcher applied ex-post analysis to identify the an explanatory variable (e.g. demographic) of the research which fit the two class segmentation (k = 2) results of the FIMIX-PLS. Inspection of the demographic variables of the research revealed that only *Gender* variable fit the class segmentation. Therefore, the researcher adopt gender as the explanatory variable for further analysis, by a-priori clustering of the research data into *Male* and *Female* groups as suggested by Ringle, Wende and Will (2010c). Then, the researcher compute the latent variable path estimate using the PLS-SEM Algorithm and thereafter, applied Henseler(2012) approach of

MGA to determine the possible group difference in the path model of the research. Out of the 299 cases used for the PLS-SEM analysis, 197 are Male while the remaining 102 are Female. The researcher created two path models as shown in Figures 4.5 and 4.6 with their standardized path coefficients per group estimated using SmartPLS software (Ringle et al., 2005; Ringle et al., 2006).

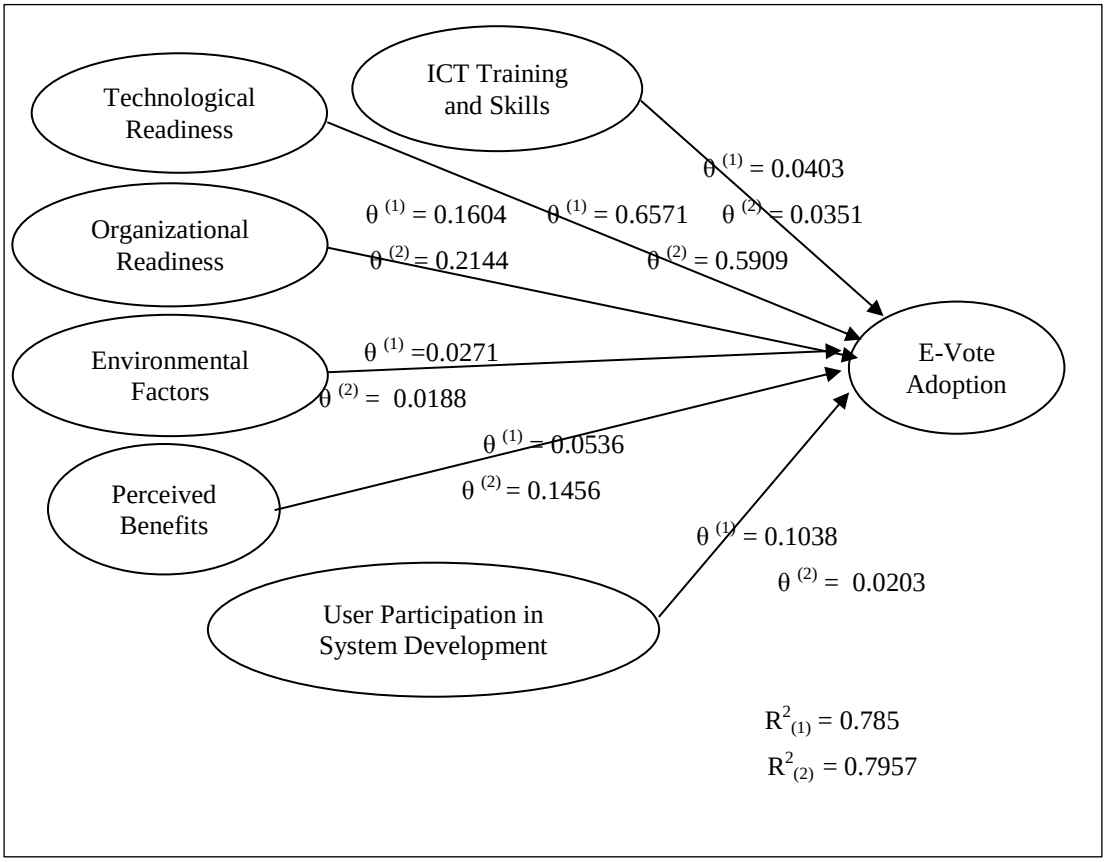


Figure 4.5. Structural model (standardized PLS path coefficients) with group (Gender) parameter estimates

The first model captured the relationships between the six independent variables of Environmental Factors(EF), ICT Training and Skills (ICTSKILL), Organisational Readiness (OR), Perceived Benefits (PB), and Technological Readiness (TR) and E-Vote Adoption (EAD), while the second model represented the relationships between five independent variables of Environmental Factors(EF), Organisational Readiness (OR), Perceived Benefits (PB), and Technological Readiness (TR) and ICT Training and Skills (ICTSKILL). To test the explanatory effect of *gender* on the path estimates, the researcher separately estimated the two models, once for the male group and once for the female group of the Gender MGA.

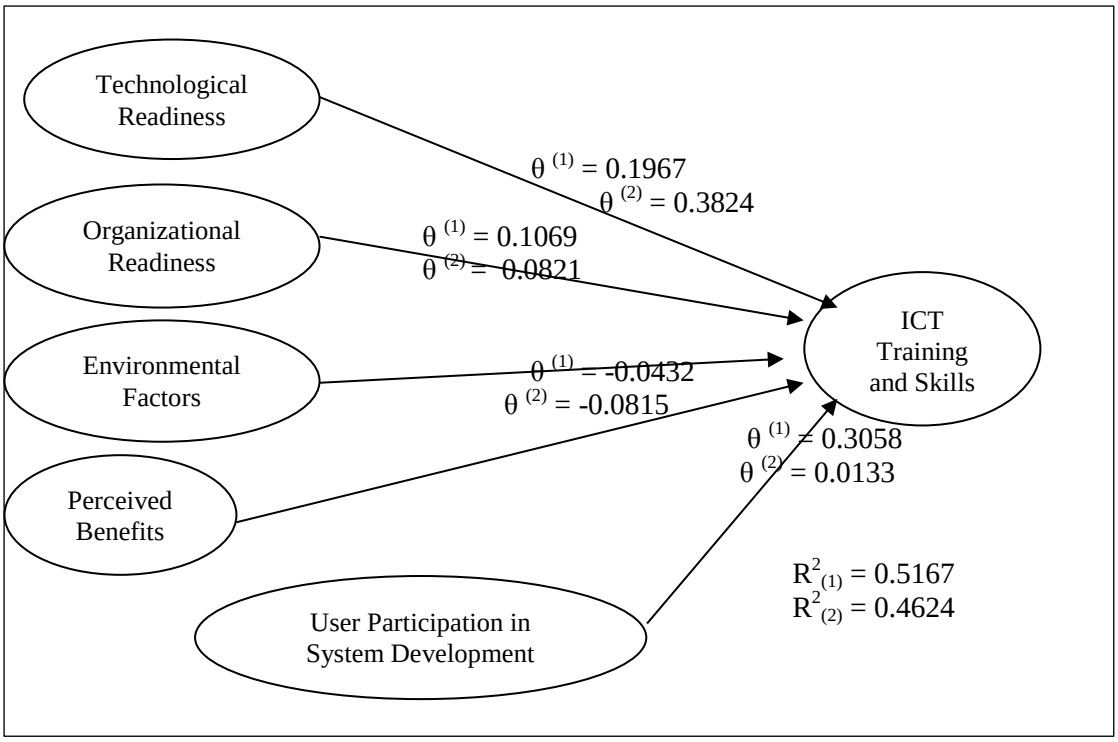


Figure 4.6. Structural model (standardized PLS path coefficients) with group (Gender) parameter estimates

Thereafter, the researcher carried out bootstrap re-sampling analyses with 500 samples per group. Using each group path coefficients (path estimates) derived from the PLS-Algorithm procedures and estimates from the bootstrapping using the PLS-Bootstrapping procedures.

The researcher used the non-parametric Excel Template to count how often the first group's bootstrap estimates is greater than the bootstrap estimates of the second group (i.e. $\theta(1) > \theta(2)$), and divided it by the number of bootstrap samples N which is 500 in this case (N = 500) as suggested by Henseler (2012). Then the researcher calculated the values for the group difference and the p-Values for each group differences in the effects of EF, ICTSKILL, OR, PB, TR, and UPSD on EAD on one hand and that of EF, OR, PB, TR, and UPSD on ICTSKILL on the other (See Table 4.29 and Table 4.30).

The researcher examined the reliability and validity of the measurement models for each group-specific model. The internal consistency reliability showed that the composite reliability (CR) was above the recommended threshold and not greater than 0.90, while the indicators reliability (indicator loadings) was also above the threshold of 0.5. The convergent validity for the constructs of each group model was assessed using the Average Variance Extracted (AVE) considered to be above the threshold value of 0.50 while Fornell-Larcker criterion was used to assess the discriminant validity.

The results for each group showed that the square root of AVE for each construct was higher than its correlation with any other (off-diagonals elements). See Appendix E.

The results of the Gender MGA analysis indicated that there was no significant difference in the effect of gender on the relationships between all the independent variables and the dependent variable of E-Vote Adoption (EAD). Therefore, the probability of group difference was rejected since $\alpha \neq .05$, the initial assumptions that the first group was greater than the second group therefore hold (i.e. $\theta^{(1)} > \theta^{(2)}$) as suggested by Henseler (2012). See Table 4.29.

Table 4.3

Parameter Estimates(Path Coefficients) For Groups Based on Gender

	Group 1 : Male	**Group 2 : Female**		
Hypothesis	**$\theta^{(1)}$**	**$\theta^{(2)}$**	**Group Difference**	**P-Value**
EnvironFactors(EF) -> E-VoteAdoption (EAD)	0.0271	0.0188	0.0083	0.5291
ICT-Training(ICTSKILL)->E-VoteAdoption (EAD)	0.0403	0.0351	0.0052	0.5136
OrganReadiness (OR) -> E-VoteAdoption (EAD)	0.1604	0.2144	0.054	0.2918
PerceivedBenefits (PB) -> E-VoteAdoption (EAD)	0.0536	0.1456	0.092	0.1798
TechReadiness (TR) -> E-VoteAdoption (EAD)	0.6571	0.5909	0.0662	0.7117
UserParticipation (UPSD)->E-VoteAdoption (EAD)	0.1038	0.0203	0.0835	0.8614
n	**197**	**102**		

Note: $\theta^{(1)}$ and $\theta^{(2)}$ are the parameter estimate (path coefficients) of Group 1 and Group 2; *p < .05 is the probability that $\theta^{(1)} \leq \theta^{(2)}$, n = population

Table 4.30 indicates that there was a group effect of gender on the relationship between Technological Readiness (TR) and the E-Vote Adoption (EAD), since the probability values showed that $\alpha < .05$. This means, for the female staff, the level of Technological Readiness was a stronger predictor of ICT-Training compared to the male staff of the electoral organisation. Group effect of gender on the relationships between other constructs and ICT-Training was rejected because the probability that $\theta^{(1)} \leq \theta^{(2)}$ did not hold, therefore initial assumptions that $\theta^{(1)} > \theta^{(2)}$ still holds (Henseler, 2012).

Table 4.30

Parameter Estimates (Path Coefficients) For Groups Based on Gender

	Group 1 : Male	**Group 2 : Female**		
Hypothesis	**$\theta^{(1)}$**	**$\theta^{(2)}$**	**Group Difference**	**P-Value**
EnvironFactors(EF) -> ICT-Training(ICTSKILL)	-0.0432	-0.0815	0.0383	0.6002
OrganReadiness (OR) -> ICT-Training(ICTSKILL)	0.1069	0.0821	0.0248	0.5733
PerceivedBenefits (PB) -> ICT-Training(ICTSKILL)	0.3258	0.3790	0.0532	0.3987
TechReadiness (TR) -> ICT-Training(ICTSKILL)	0.1967	0.3824	0.3942	0.0056
UserParticipation (UPSD) ->ICT-Training(ICTSKILL)	0.3058	0.0133	0.2925	0.9789
n	**197**	**102**		

Note: $\theta^{(1)}$ and $\theta^{(2)}$ are the parameter estimate (path coefficients) of Group 1 and Group 2; *p < .05 is the probability that $\theta^{(1)} \leq \theta^{(2)}$, n = population

4.7 Chapter Summary

This chapter describes both empirical and structural equation modelling analyses of data collected using questionnaires from an electoral management organisation. Descriptive statistics that gives the profile of respondents was calculated using frequency count and percentile.

Statistical test was conducted to test normal distribution of the research data; tests for outliers and multicollinearity and principal component analysis to determine Eigen values greater than one and factor loading. Test of group differences employed both observed and unobserved multi-group analysis approach of Structural Equation Modelling-Partial Least Square (PLS-SEM). These findings were then used to answer research questions one to four in chapter five.

CHAPTER FIVE
DISCUSSION

5.1 Introduction

This chapter discusses the findings based on the research results presented in chapter Four. First, the results of the hypotheses testing for the direct and mediating (indirect) relationships in line with the output obtained from PLS-SEM were discussed. This is followed by the discussion on the results of the multigroup analysis. The proposed research model of organisational adoption of electronic voting technology based on the results from the hypotheses was also discussed.

5.2 Research Overview

Technology adoption is a major area of continuous research in information systems with very limited studies that examined the adoption of electronic voting (E-voting) technology within the organisational context. To address this gap, the researcher developed and tested a model of E-voting adoption in the organisational context using the managerial and operational staff of the Independent National Electoral Commission of Nigeria for the data collection thorough a survey study. Based on a theoretical framework which outlined key areas and issues associated with the technology adoption, the researcher identified four key adoption of technology factors or variables from theories of Diffusion of Innovations, Technology-Organisation-Environment framework, and Iacovou et al. (1995) model, i.e.,

technological readiness, organisational readiness, environmental factors and perceived benefits, which ultimately influence the E-voting adoption success in the organisational context.

Past studies in the area of technology adoption have equally identified other important factors that can influence adoption of technology such as user participation in system development (Baroudi, Olson & Ives ,1986; Hartwick & Barki, 1994; Lin & Shao, 2000; Lawrence, Goodwin & Fildes , 2002; Terry & Standing, 2004; Harris & Weistroffer, 2008; Gibbs , 2010; Menghrajani, 2011) and ICT training and Skills (Harel & Tzafrir, 1999; Vaughan, 2001; Foley, 2004; Hashim, 2007). These factors are often discussed and empirically tested in literatures but their incorporation into theoretical models used in the study of technology adoption in the organisational context and their empirical testing within the framework remains scarce. The researcher therefore filled this gap by extending the models with these two factors to study the organisational adoption of E-voting technology and test whether ICT Training and skill can mediate or have indirect effect on the relationships between the predictors variables and any criterion variable under study.

Partial Least Square Structural Equation Model (PLS-SEM) path analysis method using SmartPLS 2.0 software was used to test the hypothesized structural relationships of the research. The results of the analysis as presented in table 4.22 of chapter four were discussed and compared with the results of similar studies on technology adoption or information technology adoption.

The outcome of the hypotheses testing is as discussed in details in the following sections.

5.3 Discussion on the Research Hypotheses

5.3.1 The Influence of Technological Readiness on E-voting Adoption Success (H1A)

The results of the hypothesis testing indicated that Technological Readiness (TR) which measures the extent to which the an organisation is ready technologically to adopt technology or Information Technology innovations influenced the adoption of E-voting technology in the organisational context and it was positively significant at two tailed ($p < 0.01$). This means that the size of the empirical t value ($t = 15.602$) for TR was above the critical t value of 2.57 as suggested by Hair et al. (2014) and that, the strength of relationship between TR and E-voting adoption which is positive was substantially different from zero at a significant level of 1% probability error indicating that TR is the most relevant factor in explaining E-voting adoption. Its effect size ($f^2 = 2.009$, $f^2 > 0.35$) on E-voting technology adoption was large. The 2.009 indicated that technological readiness has a large effect in producing the R^2 for E-voting adoption. The Important Performance Matrix Analysis (IPMA) of E-voting Adoption construct revealed that Technological Readiness has the highest importance value compared with other constructs for establishing E-voting adoption success.

However, it has low performance compared to that of Organisational Readiness, Environmental Factors, Perceived Benefits, and ICT Training and Skills constructs (see Table 4.21 and Figure 4.2). This means that if the index value (performance) of TR increases by one unit, the performance of the E-voting adoption increases by 0.760 points, all other things being equal or held constant. Therefore, it is apparent that TR is highly relevant or important for increasing E-voting adoption due to its impact. It is of a primary importance for establishing E-voting adoption in the organisational context. However, TR only has 67. 6% performance value index, which means that it has potentials for further increase in measuring E-voting adoption. Therefore, efforts should be made to expand its level of performance if necessary. Hair, et al. (2014) and Höck, Ringle, and Sarstedt (2010) present similar examples in their analysis of IPMA in PLS-SEM.

Inspection of the results of multi-group analysis indicated that position, work experience, or gender did not moderate the responses or perceptions of the staff of the commission on the path relationship between Technological Readiness and E-voting adoption (see Table 4.25, 4.26, and Table 4.29), which indicates that, there is no significant difference in the effect technological readiness on E-voting adoption either as a results of staff's gender, work experience or position in the organisation. The finding therefore, suggested that the success of adoption was determined by the hardware, software and other infrastructures already put in place and the technical skills already acquired by the staff in preparation for the eventual implementation of the technology.

This result agreed with the previous studies that proposed positive and significant direct relationships between the technological readiness factor and any technology or information technology innovations under studies. Bouwman et al. (2005) suggest that a number of factors emerge from four perspectives from which the process of adoption, implementation, use and effects is achieved and among these factors is the technological perspective in which hardware, software, networks, standards and so on are issues for consideration. Alqahtani and Fosso (2012) also found that in the context of Saudi retail industry, technology readiness or competence was a significant determinant of RFID technology adoption intention. Equally, Guhr, Loi, Wiegard and Breitner (2013) found out that technology readiness positively associated with all constructs of Technology Acceptance Model for each country of study and overall represents suitable methods to evaluate technology acceptance and technology readiness in an international context for m(mobile)-payment.

5.3.2 The Influence of Organisational Readiness on E-voting Adoption Success (H2A)

Organisational Readiness (OR) defines the degree to which the organisation is ready for IT innovation. The result of the hypothesized relationship between organisational readiness and the E-voting adoption success is not significant at two tailed ($p<0.01$), which means that, the size of the empirical t value ($t = 1.527$) for OR was less than the critical t value of 2.57 as suggested by Hair et

al. (2014) and that the strength of relationship between OR and E-voting adoption though positive correlated, was not substantially different from zero at a significant level of 1% probability of error indicating that OR is not an important factor in explaining E-voting adoption in the context of this study. The effect size results showed that it has no effect in producing R^2 for E-voting adoption (i.e. $f^2 < 0.02$, $q^2 < 0.02$, see Table 4.20).

The results of Importance-Performance Matrix Analysis (IPMA) indicated that organisational readiness factors is not important in the prediction of the criterion variable in the context of this research, but has the highest performance (see Table 4.21 and Figure 4.2), which means that if the index value (performance) of OR is increases by one unit, the performance of the E-voting adoption increases by 0.052 points all other things being equal or held constant. Therefore, OR is not relevant or important for increasing E-voting adoption due to its non-impact. It is not importance for establishing E-voting adoption in the organisational context and does not influence the staff perception on the decision of the INEC to adopt the E-voting technology for future elections. It was therefore considered not to be important compared with the technological readiness and environmental factors in determining the decision to adopt. OR performance value index (74.310) is the highest, therefore, there is relatively minor possibility for any other increase, the level of the performance can only be maintained, since its total effect (impact) is non-significant.

Multi-group analysis results showed that demographic variables of work experience, position and gender did not affect the perception of the staff when responding to the questions ask under this factors (see Tables 4.29, 4.30, and 4.33), indicating that there was no significant difference in the effect of organisational readiness on E-voting adoption either as a results of staff's gender, work experience or position in the organisation. The result of the path relationship between organisational readiness and E-voting adoption is insignificant in the context of this research, though, previous results showed that organisational readiness is significant in the decision to adopt a technology (Ramdani et al., 2009). The result of the hypothesis however, indicated a positive correlation between the predictor variable (OR) and the criterion variable (E-Vote Adoption success) in line with other previous results.

The findings of Iacovou et al. (1995) indicated that the relationship between organisational readiness and adoption was not very strong. Alvar (2011) report that organisational readiness positively correlates with technology adoption and that managers' attitude and subsequent organisational support towards adoption positively correlate with the successful adoption of progressive technology. In addition, X. Duan, Deng and Corbitt (2012) found that organisation readiness does not show a significant impact on the adoption of e-Market in Australian SMEs despite being a critical factor for the adoption of technology as suggested by the existing literature.

5.3.3 The Influence of Environmental Factors on E-voting Adoption Success (H3A)

The results of the third hypothesis indicated a significant positive relationship between Environmental Factors and E-voting adoption success ($p < 0.01$), which means that, the size of the empirical t value ($t = 3.493$) for EF is above the critical t value of 2.57 as suggested by Hair et al. (2014) and that, the strength of relationship between EF and E-voting adoption which is positive, was substantially different from zero at a significant level of 1% probability error indicating that EF is the second most relevant factor in explaining E-voting adoption. Its effect size ($f^2 = 0.054$, $f^2 > 0.02$) on E-voting technology adoption was small. The 0.054 indicated that environmental factors have more than small but not medium effect in producing the R^2 for E-voting adoption.

The Important Performance Matrix Analysis (IPMA) of E-voting adoption revealed that EF has the second importance construct after TR for establishing E-voting adoption and a higher performance compared to TR. This means that if the performance of EF increases by one unit, the performance of the E-voting adoption increases by 0.160 points all other things being equal or held constant. Therefore, EF has small but relevant or important for increasing E-voting adoption. It is the second on the scale of importance for establishing E-voting adoption in the organisational context. EF performance value index (73.99) is already high; therefore, there is relatively minor possibility for any other increase. Efforts should be directed at maintaining this performance level. Hair,

et al. (2014) and Höck, Ringle, and Sarstedt (2010) present similar examples in their analysis of IPMA in PLS-SEM. The results of multi-group analysis indicated that position, work experience, or gender did not moderate the responses or perceptions of the staff of the commission on the path relationship between Environmental Factors and E-voting adoption, thus indicating that there was no significant difference in the effect environmental factors on E-voting adoption either as a results of staff's gender, work experience or position in the organisation.

In conclusion, the results suggested that adoption of E-voting technology must guarantee the security of voter's data during elections. There is the need for telecommunication and other infrastructural support. There must be adequate voters education and the gains of adopting E-voting technology must outweigh the cost. There must be minimal or no interference from government and political parties support is a key factor to ensure the adoption success and finally, there is the need for effective legal framework to protect the E-voting implementation. All these are the environmental factors that the staff of the electoral organisation considered important to the success of the adoption. This outcome was supported by the work of Faniran and Olaniyan (2011) which identifies the need to provide necessary infrastructural support such as electricity, educating voters on the working of an E-voting Technology and the need to change the current legislation which limits the admissibility of electronic

media in adjudication and political participation as a pre-condition for diffusion in the use of electronic voting systems in Nigeria.

This result is in agreement with Tornatzky and Fleischer (1990) and other studies carried out to examine adoption of technology which show that environmental factors has a positive influence on the adoption of any technology in the organisational context. Tan et al. (2007) found out that the Perceived Environmental eReadiness has positive influence on eCommerce adoption in China. Government at the centre indicated serious support for the adoption of eCommerce by offering policy and investment for the industries in order to facilitate eCommerce.

Ellis et al. (2009) also found external support to be an enabler of Open Source Software (OSS) adoption by South African small and micro enterprises while the results of the study carried out by Cheng et al. (2012) showed that managerial support, job support, and organisational support were the significant environmental factors which, motivate employees' acceptance of e-learning system.

5.3.4 The Influence of Perceived Benefits on E-voting Adoption Success (H4A)

Perceived Benefits (PB) refer to the expected advantages that IT adoption can provide to the organisation concerned either as direct or indirect benefits (Iacovou et al., 1995).

The hypothesized relationship between perceived benefits and E-voting adoption is insignificant at two tailed ($p < 0.01$) which means that, the size of the empirical t value ($t = 0.777$) for PB is less than the critical t value of 2.57 as suggested by Hair et al. (2014) .

This result showed that the strength of relationship between PB and E-voting adoption though positive correlated was not substantially different from zero at a significant level of 1% probability of error indicating that PB like OR was not an important factor in explaining E-voting adoption when compared with technological readiness and environmental factors in the context of this study. The effect size result showed that it has no effect in producing R^2 for E-voting adoption (i.e. $f^2 < 0.02$, $q^2 < 0.02$).

The Important Performance Matrix Analysis (IPMA) of E-voting Adoption results revealed that Perceived Benefits has the second lowest importance value (Total Effect) compared with other constructs for establishing E-voting adoption success, while its performance was high compared to that of Technological Readiness and User Participation in System Development constructs (see Table 4.21 and Figure 4.2). This means that if the performance of PB is increased by one unit, the performance of the E-voting adoption increases by 0.030 points, all other things being equal or held constant.

Therefore, PB is not important for increasing E-voting adoption due to its lack of impact compared with the technological readiness and environmental factors in determining the decision to adopt. PB performance value index (74.310) is higher than that of technological readiness and user participation in systems development; therefore, there is relatively minor possibility for any other increase. The level of the performance only need to be maintained, since its total effect (impact) is non-significant. Höck (2010) and Hair et al. (2014) give similar related explanations.

Inspection of the results of multi-group analysis indicated that differences exist in the responses of the staff of the commission based on their position (see Table 4.26). That is, operational staff comprising the senior staff and junior staff had different view about the perceived benefits of E-voting adoption by INEC and their view was stronger than the view of the management staff (top management, directors and assistant directors) of the commission which means that the effect of perceived benefits on E-voting adoption is significantly (α =0.05) higher for junior and senior staff of INEC. This indicated that these two categories of staff were of the opinion that the adoption of E-voting technology will be beneficial for INEC, whereas the management staff thought otherwise. This accounts for the insignificant of the path relationship between PB and E-voting adoption.

The relationship between the Perceived benefits and E-voting adoption showed a positive relationships or influence, which is in line with findings of other previous studies on IT adoption. The findings of Iacovou et al. (1995) indicate a positive influence between perceived benefits and electronic data interchange adoption practices of small firms. Kim, Ferrin and Rao (2008) in their study found out that perceived benefits had a positive relationship with a consumer's intention to purchase on the Internet. Study conducted by Alam and Noor (2009) shows that perceived benefits has a strong significant relation to ICT adoption by Small and Medium Enterprises in Malaysia. Study conducted by Oliveira and Martins (2010) also shows that perceived benefits, as a factor of IT adoption is a positive predictor of e-business adoption across industries in European countries.

5.3.5 The Influence of User Participation in System Development on E-voting Adoption Success (H5A)

User Participation in System Development (UPSD) refers to all activities carried out by the users or their representatives during a technology or information systems development. The hypothesized relationship between User Participation in system development and E-voting adoption is positive correlated or have a positive influence but not significant at two tailed ($p< 0.01$) indicating that, the size of the empirical t value ($t = 0.728$) for UPSD is less than the critical t value of 2.57 as suggested by Hair et al. (2014) . This result showed that the strength of relationship between UPSD and E-voting adoption is not substantially different

from zero at a significant level of 1% probability of error; meaning that UPSD like OR and PB was not an important factor in explaining E-voting adoption when compared with technological readiness and environmental factors in the context of this study. The result of effect size reveals that UPSD has no effect in producing R^2 for E-voting adoption (i.e. $f^2 < 0.02$, $q^2 < 0.02$).

The results of IPMA showed that UPSD construct has the lowest importance (total effect) and performance values when compared with other constructs for establishing E-voting adoption success (see Table 4.21 and Figure 4.2). This means that if one unit increases the performance of UPSD, the performance of the E-voting adoption increases by 0.020 points, all other things being equal or held constant, therefore, UPSD is the least important factor for increasing E-voting adoption because it has no impact in determining the decision to adopt E-voting technology in the context of this study. UPSD performance value index (61.975) although above average, is the lowest in the structural relationships. There is relatively minor possibility for any other increase, the level of the performance only needs to be maintained since its total effect (impact) is not significant. Höck (2010) and Hair et al. (2014) suggest similar results in their IPMA examples.

Multi-group analysis results for UPSD revealed that position, work experience, or gender did not moderate the responses or perceptions of the staff of the commission on the path relationship between UPSD and E-voting adoption, which means that, there was no significant difference in the effect of UPSD on E-voting adoption as a results of staff's gender, work experience or position in the organisation. This result of positive correlation between UPSD and E-voting adoption was in line with similar previous studies.

The study of Harris and Weistroffer (2008) confirm that user participation in the systems development process is indeed critical to system success and positively correlated. The findings of Subramanyam et al (2010) show that the effect of user participation is statistically significant. While the result of study conducted by Menghrajani (2011) indicates that the overall relationship shared by the user participation variables and affective technology acceptance yielded statistical significance.

5.3.6 The Influence of ICT Training and Skills on E-voting Adoption Success (H5A)

The result of the hypothesized relationship between ICT Training and Skills and E-voting adoption success indicated that it was not significant at two tailed ($p < 0.01$) meaning that, the size of the empirical t value ($t = 1.410$) for ICTSKILL is less than the critical t value of 2.57 as suggested by Hair et al. (2014) .

This result showed that the strength of relationship between ICTSKILL and E-voting adoption was not substantially different from zero at a significant level of 1% probability of error. This Means that ICTSKILL like OR, PB and UPSD is not an important factor in explaining E-voting adoption compared with technological readiness and environmental factors in the context of this study. The result of effect size revealed that ICTSKILL has no effect in producing R^2 for E-voting adoption (i.e. $f^2 < 0.02$, $q^2 < 0.02$).

The IPMA results of E-voting Adoption construct revealed that ICT Training and Skills was of less importance when compared with the results of technological readiness and environmental factors for establishing E-voting adoption success. However, its performance was quiet high coming after that of Organisational Readiness construct (see Table 4.21 and Figure 4.2).

This means that if the performance of ICTSKILL is increased by one unit, the performance of the E-voting adoption is also increased by 0.050 points, all other things being equal or held constant. Therefore, ICTSKILL was not an important factor for increasing E-voting adoption because it has no impact in determining the decision to adopt E-voting technology in the context of this study. ICTSKILL performance value index (73.142), although substantial, was relatively minor possibility for any other increase in the level of its performance, it only needs to be maintained, since its total effect (impact) was not significant. Höck (2010) and Hair et al. (2014) suggest similar results in their IPMA examples.

The results of multi-group analysis indicated that position , work experience, or gender did not moderate the responses or perceptions of the staff of the commission on the path relationship between ICTSKILL and E-voting adoption (see Table 4.26) which means that, there was no significant difference in path relationship of ICTSKILL and E-voting adoption as a results of staff's gender, work experience or position in the organisation. This result is in line with other studies carried out to examine adoption of technology indicates that ICT training and skills had a positive correlation with IT adoption. Study of Gretton et al. (2004) shows that the positive benefits of ICT use on MFP growth were typically linked to the level of human capital and the skill base within the organisation. Findings of Hashim (2007) showed that ICT skill is positively correlated to ICT use or adoption among SME owners in Malaysia. The study conducted by Adebayo et al (2013) on factors affecting the adoption of ICT by SMEs in Nigeria also reveal that skills and training positively correlate with a significant impact on ICT adoption.

5.4 Discussion on the Mediating Effect Analysis

As an additional contribution, this study tested for mediating effect in a structural model derived from theories used in IT adoption studies that only hypothesized direct relationships between predictor variables and the criterion variable under investigation. In their argument to support the need to analyse and quantify both mediating and moderating effects, Helm, Eggert and Garnefeld (2010) state that most times mediating effects are hypothesized in structural equation modelling, but

not often clearly tested, causing a validity problem concerning the model and the managerial implications. Therefore, testing for mediating or moderating effects is fundamental because complex phenomena are usually affected by contingency factors.

Recognizing and quantifying these contingency factors is an important challenge because mostly, literatures often state their importance but there are limited empirical researches. ICT training and skills as part of the constructs in the research model functions as a mediator in the relationships between the predictors (technological readiness, organisational readines, environmental factors, perceived benefits, user participation in systems development) and the criterion variable (E-voting adoption) such that no direct effect of these predictors on criterion variable is evident.

From the results of the Barron and Kenny (1986) approach to mediation analysis, the researcher concluded that ICT training and Skills did not *mediate* the relationships between the predictors and the criterion variable, and that only direct relationship existed which is in line with that supported by the theoretical models of diffusion of innovations (Rogers, 1995), technology, organisation and environment (Tornatzky & Fleischer, 1990) and Iacovou et al. (1995) model (Iacovou, Benbasat, & Dexter, 1995).

However, using the Hayes (2009) method of analysis, the results showed that, ICT Training and Skills is an *intervening variable* or have indirect effect in the relationships between environmental factors and E-voting adoption, and between organisational readiness and E-voting adoption.

The practical implication of these to the electoral organisation (INEC) is that IT training and skills is an important factor when considering issues relating to environment factors and organisational readiness in the adoption decision of the E-voting technology in the organisational context. The research hypotheses H7, H10 and H11 which hypothesized a mediating influence of ICT training and skills in the relationships between the predictor variables (technological readiness, perceived benefits and user participation) and the criterion variable (E-voting adoption) were not supported, meaning that only direct relationships was supported. While hypothesized indirect relationships H8 and H9 between the predictor variables (organisational readiness and environmental factors), intervening variable (ICT training and skills) and the criterion variable (E-voting adoption) were supported since there was an indirect effects in their relationships.

5.5 Discussion on the Multi-group Analysis

Modelling heterogeneity (difference) in structural equation model could be based on observable characteristics of the population such as the demographic variables. Using demographic variables provides a means of segmenting or dividing the observed difference in the population under study into groups based on age, gender,

income, religion, occupation etc. for easy multi-group analysis. Multi-group analysis in this study examines the moderating effects or influence of demographic variables of work experience, position as an observed variable determined by the research question number four of the study. Only gender variable was identified based on unobserved segmentation conducted using FIMIX-PLS algorithm of SmartPLS software. The results suggested that position and gender do not moderate or influence the path relationships of model of the study and therefore not supported.

The results, however, indicated that work experience moderate or have influence on the relationship between Perceived Benefits and E-voting adoption. It is stronger for staff with more than ten years working experience than for staff with less than ten years of working experience. The difference obtained from work experience could be attributed to staff who had more experience in the conduct of elections in the organisation and who believed that adoption of E-voting technology by the commission will be beneficial not only to the commission but also to the country in general. Thus, their perceptions of the benefits strongly influence E-voting adoption. This result is similar to ones provided by Ringle et al (2010), Henseler (2012) and Hair et al (2014).

In conclusion, major findings from the six direct hypotheses indicated that the six determinant (direct) factors supported the hypothesized structural relationships. Technological readiness and environmental factors significantly determines E-voting adoption in the organisational context, while organisational readiness, Perceived

benefits, user participation in systems development, and ICT training and skills have some measured of influence (positively correlated) with E-voting adoption but not significant. The indirect hypotheses of technological readiness, perceived benefits, user participation in systems development and E-voting adoption indicated that ICT training and skills did not have influence on their hypothesized direct relationships (no mediation effect). However, it was discovered that there were indirect effects of ICT training and skills in the relationships between organisational readiness, environmental factors and the E-voting adoption. The measurement items, and the revised model of E-voting adoption are as shown in Table 5.1 and Figure 5.1 respectively.

Table 5.1

Organisational Factors Influencing E-voting adoption

Factors	Measures
Technological Readiness	7. Hardware,software and other infrastructures for the implementation of the electronic voting system has been provided. 8. The staff are adequately trained for the adoption of the electronic voting system. 9. Staff have the required technical skills to adopt electronic voting systems.
Organisational Readiness	2. Using electronic voting systems will not be too complex for INEC to operate. 3. Electronic voting system will enable INEC to accomplish tasks more quickly during elections. 4. Electronic voting system will assist INEC to improve voter's participation during elections. 5. Electronic voting system will enhance the general administration and conduct of elections by INEC. 6. Electronic voting system will assist INEC to maintain good conduct of voters and political parties during the elections.
Environmental factors	1. Introduction of electronic voting system will guarantee security of voter's data and voter's vote during elections.

Table 5.1

Continued.

	3. The working together of interdependent components external to the electronic voting such as telecommunication will ensure smooth conduct of elections. 7. Adequate voters education is a necessity for the success of electronic voting systems. 8. For INEC to adopt Electronic voting system, its gains or benefits must outweighs its costs. 10. Minimal government interference will ensure the success of electronic voting system adoption. 11. Political parties cooperation with INEC will ensure the success of the electronic voting system.
User Participation in Systems Development	1. The success of electronic voting system will only be guaranteed if, staff are member of the team that design and developed it. 2. Electronic voting systems will succeed if staff of ict unit was responsible for selecting the hardware and/or software needed for the implementation. 7. Given responsibility to staff during the system development phase will enhance the implementation of the electronic voting systems. 17. The input/output for the voting system should be designed by both the ict staff and the vendor.
Perceived Benefits	2. Electronic voting system will stop vote manipulation. 3. Electronic voting system will remove all internal treats to the conduct of free, fair and credible elections. 6. Adoption of electronic voting system by INEC will remove the problem of ballot stuffing during election. 7. Adoption of electronic voting system will assist INEC in achieving accurate vote count. 9. With the adoption of electronic voting systems, INEC will solve the problem of multiple voting during elections. 10. Adoption of electronic voting system will improve the voters trust in INEC in the conduct of elections 11. Using electronic voting system enhances staff job Performance. 12. Using electronic voting system help in accomplishment of staff job more quickly. 13. Using electronic voting system can increase staff Productivity. 14. Using electronic voting system enhances staff Productivity

Table 5.1

Continued.

ICT Training and Skills	10. The ICT training and skills builds staff confidence for the adoption of electronic voting systems. 11. Adoption of electronic voting systems by INEC will succeed if all necessary ICT training and skill needed by staff are put in place. 14. Staff should be able to develop new skill in ICT if they are given adequate training on electronic voting system. 16. There will be strong links between theory and practice of electronic voting system when staff undergoes training.

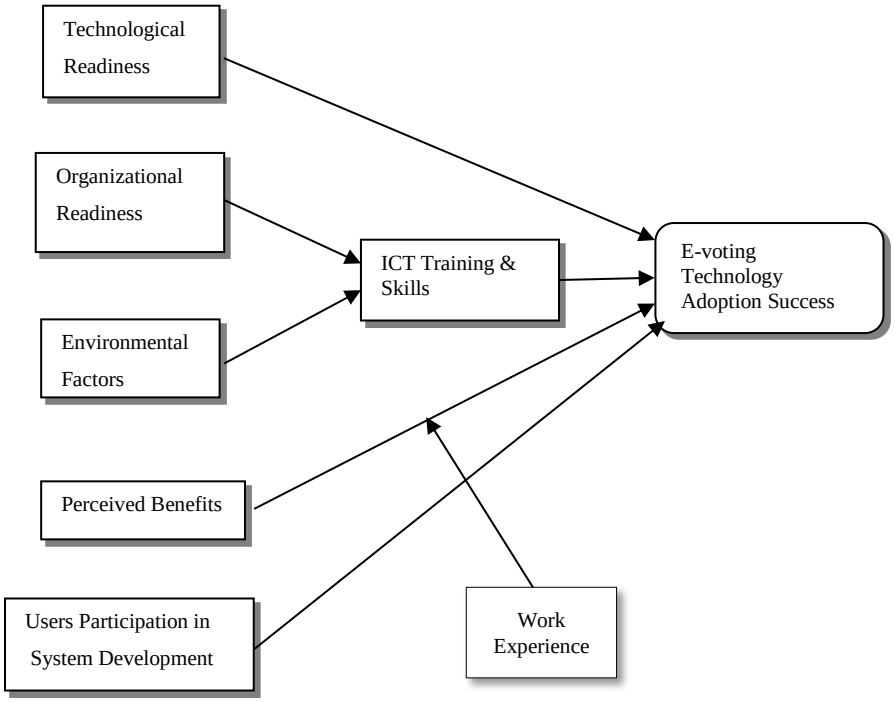


Figure 5.1. The Revised Structural Model of E-voting adoption.

5.6 Chapter Summary

This chapter discussed, in detail the findings from the hypothesized relationships between independent variables and dependent variables. Eleven hypotheses were formulated and tested in order to find answers to the research questions and to achieve the research objectives (Figure 5.1). Of the six hypotheses, only two were found to be statistically significant, while others conformed to the signs relationships, which means, they have positive correlation with the study under investigation. This is supported empirically by previous studies in the area of technology adoption in the organisational context.

Findings suggested the moderating effects of work experience while that of position and gender cannot be substantiated. The results of mediation analysis suggested that mediating effects on the relationships between independent variables and dependable variable (E-voting adoption) cannot hold, however ICT Training and Skills do intervene the relationships between two exogenous variables (Organisational Readiness and Environmental Factors) and the endogenous variable (E-voting adoption).

CHAPTER SIX

CONCLUSION AND FUTURE RESEARCH

6.1 Introduction

This concluding chapter summarises the research findings as it relates to the outcome of hypothesis testing, research questions and objectives of the study. The chapter also discusses the theoretical and practical contributions of the study as well as the delimitations of the research and suggestions on future research in this area.

6.2 Discussion

This study of adoption of technology is conducted to fill gaps in determining the factors that predict the organisational adoption of electronic voting technology by the Independent National Electoral Commission of Nigeria having officially announced her intention to adopt electronic technology for future elections in Nigeria with the aims of eradicating problems of ballot stuffing, ballot snatching and other forms of rigging or manipulations of the outcome of elections results currently associated with elections in Nigeria.

The study conducts a pilot study to elicit the perception of the staff of the Independent National Electoral Commission of Nigeria in order to determine the suitability of the four identified factors of technological readiness, organisational readiness, environmental factors and perceived benefits from the theoretical models

of diffusion of innovations (Rogers, 1995), technology, organisations and environment (Tornatzky & Fleischer, 1990) and Iacovou et al (1995) for the study. For the main study, the hypothesized four factors model were extended by adding ICT training and skills and users participation in systems development with justification from literature reviewed to see their influence on the dependant variable of the study, which is the electronic voting technology adoption in the organisational context. Evidences for the inclusions of these two factors were drawn from a number of literatures on organisation adoption of information technology (technology).

The research instrument was developed using items drawn from previous studies on adoption of technology and were modified to suit the domain of this study. The instrument developed for the study was reviewed by experts, pre-tested during the pilot study and which experts for further improvement again reviewed. The reliability and validity of the constructs was equally measured. Multi-stage, disproportionate stratified random sampling methods of data collection was used as suggested by Kumar (2011) and Sekaran and Bougie (2011) for study of this nature where samples have to be drawn from respondents that are geographically distributed, homogeneous and heterogeneous in composition. A response rate of 79.8% was achieved, 399 responses were collected out of which 380 were considered usable for the main study.

The collected data for the main study was subjected to pilot test in order to explore the nature of the research variables in readiness for conducting required statistical techniques to address the research questions of the study. To do this, a number of test statistics like non-response bias, missing data, descriptive statistics, test of normality, detection and management of outliers and assessment of multicollinearity were carried out to determine the suitability of the items of the research variables for further analysis. Having explored the nature of the data for the research variables, analyses such as measurement model, structural model, important-performance matrix, mediating and indirect effect, and multi-group were employed. The next section discusses the outcomes of the analyses.

6.2.1 Outcome of Hypotheses Testing

This study formulates twelve (12) hypothesized relationships, out of which six address direct relationships, five tests for mediating and indirect effect of ICT Training and skills in the relationships between the other five independent variables and the dependent variable of the research and one test for moderating influence of work experience and position variables in the structural relationships. The study hypothesizes that there exists a positive influence (effect) in the relationships between technological readiness (H1), organisational readiness (H2), environmental factors (H3), perceived benefits (H4), user participation in systems development (H5) and ICT training and skills (H6) and electronic voting technology adoption success in the organisation context.

The correlation results indicated a positive effect relationship for all the variables to the electronic voting adoption. In addition, technological readiness and environmental factors are also significant, meaning that, the two variables are the most important factors and has large effect on the adoption of electronic voting technology compared with other four variables. Based on these results, it can be inferred that all the null hypotheses H1 thorough H6 were accepted while the alternative hypotheses was therefore rejected.

The results of hypothesized structural model relationships H7 thorough H11 showed that, ICT training and skills did not play any mediating role between technological readiness, organisational readiness, environmental factors, perceived benefits, user participation in systems development and the adoption success of the electronic voting technology from the perspective of Baron and Kenny (1986). However, there was an indirect effect of ICT training and skills in the relationships between organisational readiness, environmental factors and the adoption success of electronic voting technology from the perspective of Preacher and Hayes (2008). This implies that null hypotheses H8 and H9 were accepted while hypotheses H7, H10 and H11 was rejected and alternative hypothesis accepted. The results of multi-group analysis indicate that hypothesis H12 holds only for relationships between perceived benefits and electronic voting technology adoption. This result led to the modification of the hypothesized structural model as shown in Figure 5.1(chapter 5).

6.2.2 Research Questions

The study is out to provide answers to the five research questions in order to address the problem statement as highlighted in chapter one. The first question concerns the determinant factors of organisational adoption of Electronic Voting (E-voting) Technology:

1. **What are the factors that determine the adoption of E-voting technology in the organisational context?**

To answer this question, a conceptual of E-voting adoption model was developed and hypothesized with four dimensions at the pilot study stage and later with additional two dimensions in the main study stage to make six dimensions. These six dimensions, namely technological readiness, organisational readiness, environmental factors, perceived benefits, user participation in systems development, and ICT training and skills were hypothesized to have a positive influence relationship , all of which have been supported. In addition, technological readiness and environmental factors were also significant at 1% level of probability of error. The results of each dimensions have been discussed section 5.3 of chapter 5.

In addition, electronic voting technology adoption explains 84% of the variances in the six dimensions, meaning that the explained variance of electronic voting adoption is of high values, indicating that the values of the electronic voting adoption is well predicted by the six dimensions via the path model. According to Hair et al

(2014) the higher the variance explained or coefficient of determination (R^2), the better the construct (dependent variable) that is explained by the latent variables (independent variables) in the structural model that point at it, via structural model path relationships. The results of the study also showed a Q^2 (predictive relevance) of 0.485, which is an indicative of a highly predictive model (see Fig. 5.1). This finding showed that prediction of the six dimensions is of much greater relevance than the estimation of their individual path coefficients which are often artificial construct parameters (which may be significant or not significant). This result is in line with the study of Akter, D'Ambra and Ray (2011).

Importance-Performance Matrix Analysis (IPMA) results confirmed that the six dimensions have well above average performance although only two (technological readiness and environment factors) are of importance due to their been significant. These results indicated that the six dimensions are relevant to the study and should be maintained as predictors of the adoption whlie there is the need to improve the importance (total effect) or significant contributions of organisational readiness, perceived benefits, ICT training and skills, and user participation in system development in the determination of the E-voting adoption decisions by the electoral management organisation. This results is in line with the study conducted by Huang (2009). From all these findings, it can be concluded that all the six dimensions are determinants or influential factors of E-voting adoption in the organisational context.

The second question addresses the significant relationships among the factors of the study.

2. **Are these factors co-related to form the basis for the model of E-voting technology in the organisational context?**

This study hypothesizes six factors or dimensions; Technological Readiness, Organisational Readiness, Environmental Factors (EF), Perceived Benefits, ICT Training and Skills (ICTSKILL) and User Participation in System Development (UPSD). Results of the path coefficient revealed that all the six factors have influence on the dependent or endogenous variable of the study, except that it is in varying degrees. Therefore, organisational readiness, perceived benefits, ICT training and skills, and user participation in system development) have positive, non-significant influence on the electronic voting technology adoption, while technological readiness, environmental factors have positive significant influence on the electronic voting technology adoption. Technological readiness has large influence and user participation in system development is having the least influence. The results of effect size f^2 and q^2 showed that environmental factors have small impact while technological readiness have large impact on E-voting adoption, the remaining four path coefficients have no sizeable impact.

The insignificance in the path relationships of the four constructs could be attributed to response of the respondents to the measurement items for the constructs; the respondents agreed that the factors are related to the success of E-voting adoption but were of the opinion that they are not an important factors presently in the context

of the electoral organisation of this study. This insignificant results may change over time if the study is longitudinal instead of the current cross-sectional and if the study is conducted in a similar but different electoral organisations with attributes and characteristics. This reason is in line with the suggestions of Ringle, Wende and Straub (2012) that "when studies arrive at significantly different results, the natural course is to attempt explaining the differences in terms of the theory or concept employed, the empirical data used, and how the research method was applied". Table 6.1 shows the summary of the significant factors and their corresponding t-Value.

Table 6.1

Summary of Significant factors and the T-Values

Hypoheses	**t-Values**
Technological Readiness has significant influence on E-voting adoption	15.602***
Environmental Factors has significant influence on E-voting adoption	3.493***

However, the results indicated that all factors of the study are related and supported the model of E-voting adoption in the organisational context.

3. **Do ICT training and skills mediate or have indirect effect on the relationship between the adoption factors and E-voting adoption in the organisational context?**

To answer this question, five hypothesized indirect relationships with ICT training and skills were hypothesized to have mediated the relationships between technological readiness, organisational readiness, environmental factors, perceived benefits, user participation in systems development and electronic voting technology adoption were not supported for in line with Barron and Kenny (1986) theory of mediation analysis as discussed in section 5.4. For Hypothesis H7, the predictor (technological readiness) has a significant influence on the mediator (ICT training and skills); the predictor (technological readiness) also has significant influence on the criterion variable (E-voting adoption) without the mediator (ICT training and skills), but the mediator (ICT training and skill) has no significant influence on the criterion variable (E-voting adoption) According to Barron and Kenny (1986), the three path relationships must be significant for mediation to occur. This means that there is no mediation.

The result of indirect effect for hypothesis H7 showed that there was zero between the lower and upper bound of a 95% percentile-based bootstrap confidence interval; therefore it can be concluded that the indirect effect of ICT training and skills is zero with 95% confidence interval, as suggested by Hayes (2009). Therefore the null hypothesis (H7) stands rejected while the alternate hypothesis is accepted. This means that, ICT training and skills did not mediate or had indirect effect on the relationship between technological readiness and electronic voting adoption. For INEC to be ready technologically, it must have trained its staff on the requisite knowledge and basic skills necessary for the operation of the technology, otherwise,

the adoption will be deemed to have failed before the actual implementation. ICT training and skills should not be an issue if the organisation is technologically ready.

Results of hypothesis H8 indicated that the path relationship between organisational readiness and ICT training and skills was not significant and, that between ICT training and skills and E-voting adoption was also not significant, likewise that between organisational readiness and E-voting adoption. It means that there is no mediation (Barron & kenny, 1986). Results of indirect effect showed that zero is not between the lower and upper bound, meaning that the indirect effect is not zero with 95% confidence interval (Hayes, 2009). Result of mediation rejected the null hypothesis H8, while the result of indirect effect accepted the null hypothesis. Hair et al (2014) argue that when testing for mediating effect, researcher should follow Preacher and Hayes bootstrap method of mediation analysis because the shape of variables distribution is not assumed or the statistics of sampling distributions can be applied to small sample size with more confidence and that the approach is the best for PLS-SEM method.

In line with the suggestion of Hair et al (2014), null hypothesis H8 was therefore accepted and the alternate hypothesis rejected. Meaning that ICT training and skills have indirect effect on the relationship between organisational readiness and electronic voting adoption. INEC staff need regular and up-to-date training and skills in ICT in order to be organisationally ready for the adoption of the electronic voting

technology. ICT training and necessary skills is still an issue if the organisation is to be considered ready for the adoption of the technology.

Results of mediational analysis indicated that hypothesis H9 did not mediate the relationship between environmental factors and E-voting adoption because path relationship between environmental factors and ICT training and skills was not significant; likewise, that ICT training and skills and E-voting adoption was also not significant, meaning that there was no mediation and hypothesis H9 should be rejected for the alternate hypothesis. However, result of indirect effect indicated that there is no zero between the lower and upper bound of a 95% percentile-based bootstrap confidence interval, meaning that the indirect effect is not zero with 95% confidence interval (Hayes, 2009). Therefore, null hypothesis H9 is therefore accepted and the alternate hypothesis rejected. It Means that ICT training and skills have indirect effect on the relationship between environmental factors and electronic voting adoption.

INEC need to train the ad-hoc staff on how to operate the adopted voting technology when eventually deployed during elections. INEC, in conjunction with ad-hoc staff, civil societies groups need to conduct enlighten programmes for voter and political parties' agents on how to operate the voting machines during elections. INEC also need to conduct appropriate training and enlighten the political parties and the lawmakers so that these key players of democracy will give necessary support for the adoption and implementation of the voting technology. Currently, the lawmaker has

created legal bottleneck for the implementation of the voting technology for the 2015 general elections, despite the fact that INEC has indicated its readiness to deploy the technology for the elections.

Results of hypothesis H10 indicated that path relationships between perceived benefits and E-voting adoption and that between ICT training and skills and E-voting adoption are not significant, only that perceived benefits and ICT training and skills were significant, meaning that there was no mediation in the path relationships between perceived benefits and E-voting adoption since only one out of the three path relationships was significant (Barron & Kenny, 1986). The results of indirect effects equally confirmed that there was no indirect effect of ICT training and skills in the path relationship of perceived benefits and E-voting adoption, because zero value was present in between the lower and upper bound percentile-based bootstrap values at 95% confidence interval, meaning that indirect effect is zero with 95% confidence interval (Hayes, 2009).

The null hypothesis H10 is rejected for the acceptance of the alternate hypothesis. In practical terms, if the benefits of adopting electronic voting technology would be realised, the issues of ICT training and acquisition of basic skills must be part of the pre-planning stage before the organisation is considered both organisationally and technologically ready for the adoption. ICT training and skills should not be an impediment to realising the set benefits of introducing the technology by the organisation.

Results of mediation and indirect effect for hypothesis H11 confirmed that there was neither mediation nor indirect effect of ICT training and skills in the path relationship between user participation in system development variable and E-voting adoption. This is in line with Barron and Kenny (1986), Preacher, and Hayes (2008) submission on mediation and indirect effect. What this means is that ICT training and skill acquisitions should have been implemented long before the staff of the organisation participated in the systems design and developed most specially the ICT staff. ICT training and skills should not be an issue after the adoption decisions have been made by the management of the organisation. In conclusion, ICT training and skills is not a mediating factor in the relationships between all the predictors variables and the criterion variable in the study. However, ICT training and skills is an indirect effect factor in the path model of two predictors (environmental factors and organisational readiness) and the criterion variable of electronic voting technology adoption.

4. **Is there a differential effect in the perception of the employees (staff) based on their position and working experience on the relationships between these factors and E-voting adoption?**

Answering this question requires that multi-group analysis be conducted using the PLS-SEM approach as discussed in section 5.5 (chapter 5). The results of non-parametric multigroup analysis based on position group models indicated that there was no difference in the views of both the managerial and operational staff of the

electoral organisation to affect the results of the path relationships between all the predictors variables and the criterion variable of the study, thereby confirming the results of the path relationships (direct). Therefore, the notion of path heterogeneity in the path model results on the account of difference in position of the staff was rejected. This is in line with the submissions of Henseler (2012).

Results of Finite Mixture-PLS (FIMIX-PLS) multigroup analysis for gender group models, also indicated that, gender did not have moderating or interaction effect on the path relationships between the predictors variables and the criterion variable of the study, confirming the results of the path relationships (direct). It can therefore be concluded that, there was no heterogeneity in the path model to account for the interaction effect based on gender of staff of the electoral organisation. The notion that it has influence on the path results is rejected. This is in line with the submissions of Henseler (2012).

The results of non-parametric multigroup analysis for work experience group models showed that, work experience was moderating factors in the path relationship between the predictor variable (perceived benefits) and the criterion variable (E-voting adoption), meaning that work experience accounts for heterogeneity in the path relationships of perceived benefits and E-voting adoption. By implication, it means that there was a difference of views or opinion of staff of the electoral organisation that have spent more than 10 years in service of the organisation compared to the staff with less than 10 years in the service of the organisation.

The results showed that staff with more than ten years have stronger views on the benefits of adopting electronic voting technology by the organisation than those with less than ten years. It can therefore be concluded that work experience has influence on the lack of significance in the path relationship between perceived benefits factors and electronic voting technology adoption.

5. Can the underpinning model of the study be used to explain E-voting adoption in an electoral organisation setting in Nigeria?

Organisational theories used in the study of adoption of technology have been developed and tested in areas such as E-Commerce, Enterprises Resource Planning (ERP), Internet Banking, and Electronic Data Interchange (EDI) Open Source Software (OSS) among others. The absence of such studies in the area of E-voting adoption in the organisational context especially in Nigeria articulated the need to develop and test the applicability of such model. A research model of E-voting adoption (EVTA) using factors derived from three established theoretical models of DOI, TOE, Iacovou et al and literatures on IT adoption was proposed and validated in the context of the Independent Electoral Commission of Nigeria and results obtained thorough multivariate data analysis using PLS-SEM. PLS-SEM method of analysis was used because the objective of the study is model prediction, therefore to assess the fitness of the model to the data collected within the electoral organisation context, the coefficient of determination or variance explained (R^2) and the predictive relevance (Q^2) of the factors on the electronic voting technology adoption must be assessed in order to draw conclusion on the fitness of the research model.

The results of R^2 suggested that Technological Readiness(TR), Organisational Readiness (OR), Environmental Factors(EF), Perceived Benefits(PB), ICT Training and Skills (ICTSKILL), and User Participation in Systems Development (UPSD) explained about 84% of the variance in E-voting adoption (EAD) is considered to be large. The model has about 41% predictive relevance, which is also considered to be large. These results implied that the model is a robust research tool for predicting the adoption of electronic voting technology in the organisational context and therefore considered fit to the data collected.

6.3 Research Objectives

This section highlights the research objectives with the aims of providing answers to the research questions

Objective One: To determine the factors of E-voting adoption in the organisational context

The model of the study indicates that, the determinant of E-voting adoption are Technological Readiness, Organisational Readiness, Environmental Factors, Perceived Benefits, ICT Training and Skills, and User participation in System Development. Investigating and understanding factors that drive the adoption process in the organisational context is considered essential due to human and financial implications of deploying this complex technology. Knowledge of these key factors and its influences on E-voting adoption by the Independent National Electoral Commission of Nigeria will enhance successful implementation in the

conduct of future elections in the country. Therefore, the obtained factors can be suggested as the success drivers of E-voting adoption in the organisational contex.

Objective Two: To predict the influence and significance among the identified factors on the E-voting adoption in the organisational context

This objective was achieved by examining the relationships between each hypothesized direct factor and the adoption under study based on their algebraic signs, magnitude and significance (t-Values) as shown in the Table 4.22 of chapter four. Technological readiness was found to be the most significant determinants of the organisational adoption of E-voting Technology in the context of Nigeria, followed by Environmental Factors. The staff were of the opinion that these two factors must be the most considered by the management of the organisation if the adoption is to be a success. Staff considered other factors of the study not too important to the adoption success of E-voting technology. Therefore, results obtained from the study indicated that the factors are related, justifying the basis for the research model in the context of E-voting adoption in Nigeria.

Objective Three: To investigate the mediating or indirect effect of ICT training and skill on the relationships between the adoption factors and E-voting adoption in the organisational context

This objective was achieved thorough mediating and indirect effect analysis. The mediating effect of ICT Training and Skills on the relationships between the exogenous and endogenous variables could not be substantiated. However, there was an indirect effect of ICT Training and Skills on the relationship between organisational Readiness and E-voting adoption and, on the relationship between Environmental Factors and E-voting Technology. In conclusion, ICT Training and Skills is considered an intervening variable between these two exogenous variables and the endogenous variable of the study.

Objective Four: To determine the significance difference in the perception of the employees (staff) based on the demographic variables of position and working experience in the relationships between these factors and E-voting adoption

Observed and unobserved multi-group modelling was conducted in order to achieve this objective. The moderating effect of position (observed variable) and gender (unobserved variable) on the relationships between the exogenous variable of the research was not supported. On the other hand, work experience moderates the relationships between Perceived Benefits and E-voting adoption. Staff with more than 10 years in the service of the electoral commission are receptive to the benefits the adoption will bring to the organisation and the conduct of the elections in Nigeria while the staff with less than 10 years think otherwise. This difference of opinion is assumed to have affected the significance of the path model.

Objective Five: To evaluate the applicability of the underpinning model of the study in explaining the determinants of E-voting adoption in an electoral organisation setting in Nigeria

This objective was realized based on the results of coefficient of determination and predictive relevance. These results affirmed that the model explained sufficiently, the adoption of E-voting technology by Independent National Electoral Commission of Nigeria and demonstrated a good fit to the data collected in the context of adoption of technology which can be generalized in similar study. The next sections present the theoretical and practical contribution of the research, its limitations and suggestions of future research.

6.4 Theoretical Contributions of the Research

This study has contributed to the technology adoption in the organisational context and information systems research. The study has developed and tested an organisational model of E-voting adoption which shows that, the model is strongly supported the context of this study and therefore can be suggested to have contributed to body of knowledge. The research combined constructs from three theoretical model of DOI, TOE, and Iacovou et al used in the adoption of technology and validated the derived model structure by incorporating two new determinants of technology adoption, ICT training and Skills, and User participation in Systems Development.

Findings from this research revealed an empirical support for a positive correlation between ICT Training and Skills and E-voting adoption, likewise, between User Participation in Systems Development and E-voting adoption. Although these two constructs are insignificant, they still justify the position of the previous studies (Pilat, 2004; Ndubisi & Kahraman, 2005; Hashim, 2007; Barki & Hartwick 1994; Lin & Shao, 2000; Lawrence et al. 2002; Terry & Standing, 2004; McLeod et al., 2007; Harris & Weistroffer, 2008; Subramanyam et al. ,2010; Menghrajani , 2011). In addition, the research tested mediating and indirect relationships of ICT training and skills on the relationships between the exogenous constructs and the endogenous construct under investigation. ICT training and skills being a critical factors to any successful adoption of technology especially in developing countries of which Nigeria is among has been identified by previous studies (Isabalija, Mayoka, Rwashana & Mbarika, 2011; Touray, Salminen & Mursu, 2013; Adebayo, Balogun & Kareem, 2013). The results suggested that mediating effect of ICT Training and Skills cannot be supported (Barron and Kenny, 1986 approach). However, it has intervening effect (Preacher and Hayes, 2008 approach) on the relationships between organisational readiness and electronic voting technology adoption and between environmental factors and electronic voting technology adoption.

Non mediation role of ICT Training and Skills in the relationships between Technological Readiness, Perceived Benefits, and User participation in Systems development with E-voting adoption supports a direct relationships as suggested by the theoretical models of DOI, TOE, Iacovou et al and other previous studies

(McLeod et al., 2007; Harris & Weistroffer, 2008; Kim, Ferrin & Rao, 2008; Alam & Noor, 2009; Oliveira & Martins, 2010; Subramanyam et al. ,2010; Menghrajani , 2011; Oliveira & Martins, 2011; Bouwman, Van den Hooff, Van de Wijngaert, Lidwien & van Dijk, 2005; Alvar,2011). Organisational Readiness and Environmental Factors did not totally agree with a direct relationships because ICT Training and Skill has intervening effect and it is a critical factor for consideration in their relationships with the E-voting adoption. This results serves as a new contribution to the theory in the context of Nigeria.

Empirical evidences equally suggest a moderating effect of work experience in the path relationship between perceived benefits and E-voting adoption in the organisational context. This is also considered a contribution to the theories used to study technology of IT adoption in the context of organisation. Previous studies have not investigated the issues of moderating effect of demographic variables on the outcome of path relationships in IT adoption studies. Therefore, the inclusion of moderating effect of work experience helped better the understanding of a technology adoption model (See Figure 5.1). Another major theoretical contribution of this research is the design and development of the survey instruments used to measured E-voting adoption.

The instruments are expected to be of benefits to future research in E-voting adoption. This complex multivariate technique of model analysis was carried out in two stages: measurement (outer) model and structural (inner) model with latent variable scores in order to predict the relevance of the research model under study.

6.5 Practical Contributions of the Research

The main practical contribution of this research can be viewed from the perspective of being among the pioneering work and research efforts at investigating the key determinants of electronic voting technology adoption in an electoral management context because literature has shown little or no work in this particular area. Only few studies have looked into electronic voting from the context of people's trust and readiness to adopt the technology (Ayo et al., 2008; Avgerou et al., 2009). The study has contributed to a better understanding of the electronic voting technology adoption based on the perceptions of staff of the Independent National Electoral Commission of Nigeria by identifying the key success factors. The research findings will assist the management with information on those factors that have influence on the electronic voting technology adoption decisions of the Nigeria electoral commission and subsequently equip the management with strategies on how to develop and implement or deploy E-voting technology in future elections to eliminate or eradicate the problems associated with free and fair elections in the Nigeria.

Findings from past studies in the areas of IT adoption have shown that technological readiness, organisational readiness, environmental factors, perceived benefits, user participation in systems development, and ICT training and skills are the factors that influence technology adoption in the organisational context (Tornatzky & Fleischer,1990; Iacovou et al., 1995; Parasuraman ,2000; Pilat, 2004; Ndubisi & Kahraman, 2005; Molla & Licker, 2005; Tan, Tyler & Manica, 2007; McLeod et al., 2007; Hashim, 2007; Harris & Weistroffer, 2008; Kim, Ferrin & Rao, 2008; Alam & Noor, 2009; Ellis & Van Belle, 2009; Oliveira & Martins, 2010; Subramanyam et al. ,2010; Menghrajani , 2011; Oliveira & Martins, 2011; Alvar, 2011; Baker, 2012).

In the context of this study, technological readiness and environmental factors are the most important determinant factors of E-voting adoption. Therefore, these two factors are considered critical for successful adoption of electronic voting technology in the organisational context since hardware, software and other infrastructures such as internet connectivity, power supply need to be put in place by the management. Also, the technical skills already acquired by the staff in preparation for the eventual implementation of the electronic voting technology as well as securing voter's data during elections are very critical to the success of E-voting adoption. There must be adequate voters education and political parties support if the adoption process is to be considered successful.

Among the important practical contribution of the study is the introduction of two IT adoption factors of User Participation in Systems Development and ICT Training and Skills. The results showed that the two factors positively influenced the adoption of electronic voting technology but not significant. This suggests that though these two factors are not important in this study, they are factors that need be considered in the adoption of E-voting technology by the management since they are positively correlated.

The study tested the mediating effects or intervening effects of ICT training and skills in the research model, the results suggested that the research model did not support the mediation of ICT training and skills using the Barron and Kenny (1986). It however, intervened in the relationships between organisational readiness and E-voting adoption, and between environmental factors and E-voting adoption based on Preacher and Hayes (2008) approach. The practical implications of this is that lack of ICT training and technical skills among the staff of the electoral commission on the operations of E-voting technology and lack of voter's education on the need for the adoption of the technology in the conduct of future elections could pose a problem to the successful adoption of the technology by the commission in Nigeria.

Another important practical contribution of the study is the result of multi-group analysis, which suggests a moderating effect of work experience on the relationship between perceived benefits and E-voting adoption. The practical implication of this is that there is the need for the management to educate more staff with less than ten

years work experience at the commission on the benefits (direct and indirect) derivable from adopting E-voting technology in the conduct of future elections in the country in order for the adoption to be considered successful.

In general, the systematic integration of the determinant factors of technological readiness, organisational readiness, environmental factors, perceived benefits, and the extension of these basic factors with two others (User Participation in Systems Development and ICT Training and Skills) into a single drivers of E-voting technology adoption in the organisational context makes difference in literature and it provides richer theoretical basis for explaining and predicting information technology or technology adoption, thereby promoting and facilitating improved explanatory and predictive capabilities of IT adoption. The validated model provides a framework for researchers to further extend the model with other relevant and important organisational factors in order to better the understanding of E-voting adoption. The empirical model offers a strategic decision support for management of the electoral commission on how best to implement the E-voting technology for future election in the country and can be applicable in setting with similar attributes like that of the Independent National Electoral Commission of Nigeria.

6.6 Delimitations of the Study

The assessment of research methods, data analysis and findings of this study recognises possible limitation at different levels of the study. Such limitations could be theoretical, methodological and conceptual in nature; it could also be as results of

financial constraints and time. The following sections present key limitations of this study and suggest areas of future research. The first is that empirical studies relating to modelling the determinants factors of organisational adoption of E-voting technology appear to be limited. This study empirically carried out assessment of E-voting adoption success using only six constructs out of many that existed in literatures on adoption of technology.

Therefore, this study cannot generalize its findings to all constructs of technology adoption used in organisational context. Also, this study is cross sectional and has primarily focused on testing the hypothesized model of E-voting adoption within a timeframe but given the evolutionary nature of adoption of technology, the current identified constructs and the measurements items used in this study could change over time and also vary across similar studies. Incorporations of more factors and measurement instruments are suggested for further research.

Multiple times data collection was not possible in this study due to constraints of time, and cost. If the study can be investigated as longitudinal the constraint of time, cost would have been reduced to the barest minimum. The study was also limited in scope as it only investigated the adoption in the context of the electoral organisations in Nigeria. Further research in this area could explore two or more electoral organisations in different countries in order to make a comparison of the variations in the path significance of the hypothesized model.

There are possibilities of the non- significant factors in this study to be significant when conducted in another country with similar environment and characteristics. The attitude of Nigerians to research as something not too important also posed a limitation to this study. Some respondents, mostly in the managerial cadre believed that, there is no time to respond to any questionnaire because they were too busy.

Also some staff are of the opinion that responding to any questionnaire gives away vital information of the organisation and of which they may be liable later in spite of the fact that the researcher was given official permission by the management for the data collection. The researcher was able to collect up to sample size intended for the analysis by using element of personal persuasions and other staff appealing on behalf of the researcher. Consequently, based on the assumption that E-voting adoption in organisational context will gain more attention among researchers in the field of E-democracy or E-Government in the future which will lead to a substantial increase in the identification and incorporation of more organisational factors which can be used to further extend this study in order to increase the understanding of the technology adoption studies, future research including a replication of this study would further advance knowledge on this subject matter.

Based on previous studies, an empirical study of organisational adoption of E-voting technology model was developed and tested in order to explore the determinants of E-voting adoption from the perceptions of the staff of an electoral management organisation. The findings suggested that technological readiness, organisational

readiness, environmental factors, perceived benefits, user participation in systems development and ICT training and skills jointly predict E-voting adoption.

The results indicated that these determinant factors are adequately related giving justification for the model. Mediating analysis results indicated that mediating effect of ICT training and skills cannot be substantiated from the point of views of Barron and Kenny (1986). However, ICT training and skills intervened in the realionships between E-voting adoption and organisational readiness and environmental factors from the viewpoints Hayes (2009).

Multi-group analysis results suggested a moderating effect of work experience on the relationships between perceived benefits and E-voting adoption if the moderating effects of position and gender on the relationships between all the determinants factors and E-voting adoption could not be established. Based on these results, the revised model of E-voting adoption (Figure 5.1) is considered to have explained and predicted the organisational adoption of E-voting technology. Comprehensive understanding of the research model will aid the electoral managers in taking adoption decisions that assist the successful implementation of the technology for future elections in Nigeria. The model should be applicable to other electoral management organisations in developing countries that shared similar attributes and characteristics to Nigeria.

6.7 Future Research

Firstly, this study on the determinants of E-voting adoption offers new research area and avenues for further research in IT adoption. Not only user participation in system development and ICT training and skills but also all other IT factors need to be considered in addition to the existing factors provided by the theories on IT adoption within the organisational context. Exploring all other IT factors might advance knowledge on determinants of E-voting adoption and related topics which might be beneficial for the organisation under study.

Secondly, in this research, determinant of E-voting adoption from the perspectives of employees of electoral organisation was measured based on data collected at Independent National Electoral Commission of Nigeria. Consequently, in order to provide some further verification of conceptualizations and measurement scales as well as to increase the generalizability of findings, conducting such a study in different electoral organisation and countries would be advisable.

Thirdly, as this study investigated the determinants of E-voting adoption as perceived by the employees of electoral commission in Nigeria, future research that would consider outcomes of determinants of E-voting from two or more countries electoral organisations could provide additional knowledge on IT adoption.

Fourthly, the provision of conceptual framework of the determinant factors and the consequence of E-voting adoption offer the possibilities of shortcomings in this

framework; therefore, further refinement of the conceptual framework in the future is worthwhile.

Lastly, based on the assumption that E-voting adoption among electoral management organisations of countries will gain substantial attention in the future, a replication of this study would further advance knowledge on this subject matter.

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