

**EFFECT OF ELECTORAL INFORMATION COMMUNICATION
TECHNOLOGIES ON EMPLOYEES PERFORMANCE: A CASE OF
INDEPENDENT ELECTORAL AND BOUNDARIES COMMISSION IN
NAIROBI COUNTY, KENYA**

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**A Research Project Submitted to the Graduate School in Partial Fulfillment of
the Requirements for the Award of the Degree of Masters in Human
Resource Management of Egerton University**

EGERTON UNIVERSITY

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DECLARATION AND APPROVAL

Declaration

This Research Project is my original work and to the best of my knowledge has not been presented for examination or submitted for the award of any degree or diploma in any institution or university.

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Approval

This Research Project Report has been submitted with my approval as the university supervisor.

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DEDICATION

I dedicate this research project to my dear wife, Adho G. Godana and children, for their support and help throughout the period of research.

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This research project is the result of efforts of several people who have assisted me in various ways to complete it. I thank Almighty GOD for giving me strength throughout the research period and success this far. I also thank Egerton University for the opportunity and truly acknowledge the efforts of my supervisor Dr. Simon K. Kipchumba, for guiding me throughout the entire process of this research project. I also thank the Dean of the Faculty of Commerce Dr. D.O Auka and the COD of the Department of Business Administration Dr. Henry Kombo for their wise guidance and mentorship. May God bless you for your support, dedication and wise counsel I also acknowledge the inspiration from my classmates who continuously encouraged me during the challenging process of developing this document.

ABSTRACT

A proper electoral system reflects the true voice of the people in a nation and thus, a better government which respect and uphold the ideals of constitutionalism. The advancement of information and communication technologies allow for a fully automated online computerized electoral process. In addition to overcoming commonly encountered election pitfalls, electoral vote counts are done in real time that by the end of elections day, the results are automatically out. (Njogu, 2014). Employees' performance is key to organization goal delivery. Such performance can be enhanced using modern technology so that the employee improves on work efficiency, quality, timeliness and productivity. The main objective of this study was to analyze effect of electoral information communication technologies on employees' performance, a case study of Independent Electoral and Boundaries Commission in Nairobi County, Kenya. The study particularly analyzed effect of Biometric Voter Registration System (BVR), Electronic Voters Identification Device (EVID); Electronic Results Transmission (ERT) System and Electronic Voter Verification (EVV) System on IEBC permanent employees' performance in Nairobi County. The study used descriptive survey research design. The target population of the study was the 203 permanent Independent Electoral and Boundary Commission employees working in Nairobi Region and the IEBC headquarter. The study used sampling formula recommended by Nassiuma (2000) to arrive at 98 of employees working in Headquarters and Nairobi Region leaving out other regions because the Headquarters is the custodian of electoral technologies and therefore have all the information of interest to the study. Nairobi region is the nearest region to the headquarters and therefore accessible to the technologies equally of interest to the research. Respondents were randomly picked to form the 98 sample. The researcher used close ended questionnaires based on Likert Scale as the main mode of data collection. The data analyzed through the use of descriptive statistics and inferential statistics. The relationship between each of the elements of electoral technologies and employees performance was tested using a Pearson's Correlation. The combined effect of all the technologies and employees performance was tested with the Regression Model. The study was important since Kenyans expressed complaints from the public about the electoral technology, the study therefore analyzed whether the technologies were important in enhancing employees' performance. The study established that BVR, EVID and EVV had a positive effect on employees' performance whereas ERT had no effect. the study recommends that although there is a debate on the use of electoral technology in results delivery as a national concern, with one side of the debate observing that technology makes electoral process complex and therefore not necessary and the other side observing that electoral technology leaves behind auditable foot print of electoral process and therefore must be enhanced the parliament should legislate laws that entrenches electoral ICT technologies in the Election Acts to give way for policies adjustment at IEBC level and strategies which should make the implementation of such technologies easy for the benefit of staff performance. Such policies and strategies should also embrace and enhance the use of other technologies; Biometric Voter Registration (BVR), Electronic Results Transmission (ERT) and Electronic Voter Verification (EVV) Systems that the study found to have a negative effect on employees performance.

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LIST OF ABBREVIATIONS AND ACRONYMS

AMO	- Ability, Motivation and Opportunities
BVR	- Biometric Voter Registration System
DOI	- Diffusion of Innovation
ODIHR	- Office for Democratic Institutions and Human Rights
DRE	- Direct Recording Electronic
EC	- Electoral Commission
ECK	- Electoral Commission of Kenya
EDRI	- European Digital Rights
EMB	- Election Management Bodies
ERT	- Electronic Results Transmission
ESI	- Electoral Service International
EVID	- Electronic Voters Identification Device
E-Voting	- Electronic Voting
EVV	- Electronic Voter Verification
HR	- Human Resource
ICT	-Information and Communication Technology
ID	- Identification
IEBC	- Independent Electoral and Boundaries Commission
NRB	- National Registration Bureau
ODIHR	- Office for Democratic Institutions and Human Rights
OSCE	- Organization for Security and Co-operation in Europe
PDA	- Personal Digital Assistant
PII	- Personally Identifiable Information
PIN	- Personally Identifiable Number
PO	- Presiding Officers
SPSS	- Statistical Package for Social Sciences
SSA	- Sub-Saharan Africa
RTS	- Results Transmission Systems
TAM	- Technological Adoption Model
UK	-United Kingdom
VRA	- Voter Registration Assistants

CHAPTER ONE

INTRODUCTION

1.1 Background

Election is the process that gives the citizens the rights to select candidates to represent them in a democratic pattern. Election deals with the democracy and freewill of citizens, for this reason voting process is considered to be very critical and sensitive process, therefore election implementation must serve many requirements in order to deliver a trustworthy election. These requirements can be defined as user conventions requirements and delivery of secure voting process requirements (Taha, 2011).

A proper electoral system reflects the true voice of the people in a nation and thus, a better government which respect and uphold the ideals of constitutionalism. The advancement of information and telecommunications technologies allow for a fully automated online computerized election process. In addition to overcoming commonly encountered election pitfalls, electoral vote counts are done in real time that by the end of elections day, the results are automatically out. The election process can be easily enhanced with various features based on the demand and requirements of different countries around the world (Njogu, 2014).

The introduction of electronic voting has been the biggest change in electoral process. E-Voting may soon become a global reality or a global nightmare. Besides reliable e-Voting technologies, there is a dire need for international standards to govern the technology, the software reliability and accuracy, the processes and algorithms deployed within the technology, and the verification of all hardware, software and protocols involved. Such standards will eventually allow elections to proceed in any part of the world without the need for monitoring bodies (Njogu, 2014). The design of a good voting system, whether electronic or using traditional paper ballots or mechanical devices must satisfy a number of sometimes competing criteria including a high degree of security and accuracy, eligibility and authentication, integrity, verifiability and auditability, reliability, flexibility, performance and scalability. More importantly, there is a real need for a good simulation model which can guide the deployment of e-Voting resources such that the election process can proceed with minimal faults and performance issues.

Due to the fast development of network technology the world is going toward the use and implementation of the e-technology in every aspect of our life including e-governments. Evoting becomes one of these technologies. E-voting refers to the use of hardware and software to establish an electronic system, useful in voting process, by generating an electronic ballot that replaces the paper ballot. E-voting was introduced by e-governments especially in Europe in order to serve voting convention by providing remote system so the voter can cast his/her vote whenever and wherever he/she can. These systems will increase voter's participation and will speed up the votes counting Due to the fast development of network technology the world is going toward the use and implementation of the e-technology in every aspect of our life including e-governments. Evoting becomes one of these technologies

The introduction of a new voting technology to an existing electoral process requires more than taking the paper-based process and making it e-enabled. Developers must also change the whole back-office process and reorganize the whole business process. As in e-government, supporting the complexity of e-voting requires an expansion of thinking. Technological progress and developments in the field of e-voting are increasing over time, and so are abilities of application of this technology. However, the multidisciplinary nature of elections presents a natural challenge. This section therefore presents a conceptual model that helps identify the areas that influence and are affected by the application of ICT in elections.

Motivating factor behind electoral technologies discussions was to enable secret voting. Later, those in charge of determining the process of elections – election administrators – tried to devise ways to conduct elections in the best way available to them. Therefore, their aim has been to limit the number of unintentionally spoilt ballots due to human error (The Spectator 1837a; Churov 2010), to organize elections more effectively (and combating fraud, see Saltman 2006), and to count the votes quicker and more accurately (Arnold 1999). They were supported by inventors who proposed technological advancements during phases of electoral reform (Jones and Hall 2006) and were interested in selling their patents and machines.

1.1.1 Global, Regional and Local use of Electoral Technologies

Globally, electronic voting and counting technologies are increasingly being used around the world with India and Brazil taking the centre stage. Belgium and the Philippines also use electronic voting and counting technologies for their national elections. Countries such as Estonia, Norway, Pakistan, and United States are at various stages of piloting partially using electronic voting and counting technologies, including the use of internet voting. Brazil and India have successfully implemented e-voting to address various challenges associated with the manual paper based electoral process (Achieng and Ruhode, 2013).

Even though e-voting has been around for some time in the developed countries, its adoption diffusion rate has been somehow slow with countries like Germany abandoning the project after implementation. The reasons for the rejection were the fear of the risk of electronic errors and the potential for abuse (EDRI, 2009). The German court ruled that voters should be able to verify how votes are recorded without having detailed computer knowledge; something not possible with Direct Recording Electronic (DRE) voting machines which were being used at that time. A case worth mentioning is that of Florida in the United States of America, where it was reported that computer malfunctions locked up the screens of some electronic voting machines on Election Day during the 2000 elections. Moreover, some irregularities and rigging with the direct counting system of the voting machines in Ohio in the 2004 elections subsequently gave more votes to one candidate in favour of the other whilst some votes were not counted at all (Achieng and Ruhode, 2013).

The Philippines adopted an electronic counting solution to deal with issues related to fraud during the counting process. Factors that argue for or against the use of electronic voting or counting technologies in a particular country are specific to that country and will have many different sources – legal, cultural, political, logistical, environmental, etc. Technological developments in South Africa have opened the possibility of e-voting technologies and this clearly provides some opportunities and challenges. Svensson and Leenes (2003) argue that on the one hand, the electronic voting technology may help make voting more cost effective and more convenient for the voters and may even increase voter turnout. However, on the other hand, e-voting may introduce new risks and affect the electoral values such as secrecy of the vote

and placing of voting as an observable institution in modern democracies (Achieng and Ruhode, 2013).

In Africa, countries like Ghana, Kenya, Nigeria and South Africa, Namibia have in the past used electronic voting systems and are now exploring the possibilities of E-voting as an improvement on their electoral systems. In simple terms, Electronic Voting (E-voting) refers to any process whereby citizens can cast their votes by electronic means. For the purpose of this thesis, we will limit this definition to electronic voting with the use of machines and not over the internet. E-voting accelerates the counting of results, reduces cost in the long term, provides easier election participation especially for those living abroad and also leads to higher reliability of results (Achieng and Ruhode, 2013).

In an electronic voter registration pilot program for Kenya's 2013 General Election, IEBC successfully registered 1.5 million Kenyans in 18 of 210 constituencies. Fingerprint and facial biometrics for voter identification were used to ensure a clean voter list. The challenges associated with electronic voter registration technology came as a result of second tendering which arose from the misunderstandings and squabbles within IEBC during the procurement stage (Rono, 2013).

As part of the exercise, a pilot project in selected constituencies using biometric voter identification was also conducted to avoid ballot stuffing. Kenya, ICTs is not left out, the Electoral Commission of Kenya (ECK) recorded increased participation by registering the highest number of voters in the elections with an informed mind (Kenya: ICT Polls, 2007).

1.1.2 Employees Performance

Organizational performance is a sign of the capacity of a company to efficiently achieve independent goals (Venkatraman & Ramanujam, 1986). One of the elements towards this is the employees' performance through the level of their productivity. Several researches have been introducing various methods to evaluate organisational performance (Wong & Wong, 2007; Prajogo, 2007). This includes the quality, quantity, knowledge or creativity of individual towards the accomplished works that are in accordance with the responsibility during a specified period- in other words, the assessment systems must have some standard parameters that can be relied upon.

The study adopts Arinanye (2015) measurement of employees performance that include; efficiency, quality, timeliness and productivity. Arinanye (2015) found out that organizational culture motivates employees; promotes good performance; improves on employee/supervisor relations; demonstrates fair and equal treatment; and improve on teamwork; efficiency and effectiveness. Smooth communication within the College makes employees identify with it and also feel a vital part of it, hence improving on the way conflicts are handled within the communication brought about by improper communication channels.

1.1.3 Evolution of Electoral Process in Kenya

The electoral process in Kenya has evolved over time. The first general elections at Independence in 1963 were held under a multi-party system. At the same time, the Kenya Independence Order-in-Council created the first Electoral Commission with the Speaker of the Senate as Chairman. Other members included the Speaker of the House of Representatives as the Vice Chairman and nine others appointed by the Governor General.

A Constitutional Amendment of 1966 (The Turn-Coat Rule), required that a Member of Parliament seeks re-election at the end of the session on defection. This development made Kenya a de facto one-party state; and in 1982, another Constitutional Amendment made Kenya a de jure one-party state.

Following the abolition of the two-tier parliamentary system in 1966, elections were managed by the Supervisor of Elections from the Attorney General's Chambers. During this period, Civil servants became increasingly involved in the management of elections. The Provincial Administration assumed some key roles with District Commissioners and other civil servants being designated as Returning Officers during elections.

The introduction of the queue-voting system (mlolongo) in 1988 further weakened the electoral process by removing secret balloting-a hallmark of any credible electoral system. This initially touted as easy and transparent method of affirming the will of the people ignored the cardinal principle of secrecy and exposed the electoral process to flagrant abuse.

In 1991 after the repeal of section 2 (A) of the Constitution, Kenya reverted to a multiparty state and the Electoral Commission of Kenya (ECK) was established. However, the process of appointing Commissioners to the ECK remained contentious with political parties questioning its impartiality and independence. It was subsequently agreed by the Inter Party Parliamentary Group (IPPG) that political parties recommend names of persons to serve on the ECK as Commissioners, prior to their appointment by the President. This arrangement was however, not anchored in the Constitution and was, therefore, still susceptible to manipulation.

Following the disputed results of the Presidential elections in 2007 and the resultant post-election violence, a National Accord Implementation Committee (NAIC) was established. The NAIC made far reaching recommendations among them, a review of the electoral process. This led to the establishment of the Independent Review Commission (IREC), popularly known as the Kriegler Commission to undertake the exercise.

The IREC recommended a new or transformed ECK with a lean policy- making structure and a professional secretariat. IREC also recommended a review of the entire constitutional and legal framework in line with the political and legal aspirations of Kenyans. Following these recommendations, Parliament in 2008, amended Section 41 of the Constitution thereby disbanding ECK. Section 41 created the Interim Independent Electoral Commission (IIEC), while Section 41B created the Interim Independent Boundaries Review Commission (IIBRC), to review electoral boundaries.

The Independent Electoral and Boundaries Commission (IEBC) was established under the Constitution of Kenya Article 88 and Article 248. The Commission is responsible for conducting or supervising referenda and elections to any elective body or office established by the Constitution, and any other elections as prescribed by an Act of Parliament. IEBC takes over from the Interim Independent Electoral Commission (IIEC) and the Interim Independent Boundaries Review Commission (IIBRC).

1.2 Statement of the Problem

The electoral processes in Sub-Saharan Africa have experienced a lot of irregularities because most of electoral systems have been manual associated with post-elections conflicts as was the case Kenya's 2007 general election (Dagne, 2009). Challenges associated with manual electoral process; manipulation of results in order to influence their outcome, manual counting error, allegations of violence, intimidation, ballot stuffing, under-age and multiple voting and complicity of the security agencies often trail elections conducted negatively (Omolaye et al, 215). A good electoral technology therefore should satisfy a number of criteria including; a high degree of security and accuracy, eligibility and authentication, integrity, verifiability and auditability, reliability, flexibility and scalability, all of which makes employees work easier and therefore increases employees performance (Dagne, 2009). In the 2013 general election, the Independent Electoral and Boundary Commission adopted electronic voting systems using many technologies; Biometric Voter Registration System (BVR), Electronic Voters Identification Device (EVID), Electronic Results Transmission (ERT) System and Electronic Voter Verification (EVV) System which were meant to overcome the above challenges associated with manual voting system.

There is a growing consensus among scholars and ICT practitioners in the literature indicated that ICT delivers significant and persistent improvements in public sector workplace performance in developing countries (Dimelis & Papaioannou, 2010). Improved performance of organizations and individuals remain evident by incorporating and adopting technology as an enabling mechanism (Dimelis & Papaioannou, 2010). Dimelis and Papaioannou (2010) explored the possible effects of ICT in reducing cost, communication, performance inefficiency, and an increase in productivity. Employee performance is a reasonable outcome directly associated with the extent of internal fit among HR practices. Internally aligned HR practices operate to influence employee Abilities, Motivation, and Opportunities (AMO) in a potentially harmonious manner (Delery & Shaw, 2001). The fact that manual electoral systems is associated with negative outcome like tedious information search, voting process and physical results delivery lowers performance of employees who work with such systems. Key performance indicators required in electoral operations include; work quality, work timely delivery and productivity through achievements of work related targets. Information technology is applied generally to enhance

employees work performance. Electoral process is a complex system where employees are involved in faceted operation which requires timely and accurate delivery of results. Information technology therefore can enhance employees' performance in such a complex system. In order to ascertain employees' performance, information related to their work quality, how fast they deliver assigned tasks and how far they meet their targets are captured and computed.

Some studies have been done on the procurement of the electoral technologies used in the 2013 Kenya general election; (Achieng', 2015), shortcomings of IEBC during the 2013 general elections (Karogo, 2013) but none has been conducted on technology based electoral voting systems and its effect on employees performance leading to limited research that has been carried out specifically to determine from IEBC employees on the effect of the electoral technologies on their performance. Therefore to bridge this gap, the study seeks to analyze effect of electoral information communication technologies on employees' performance, a case of independent electoral and boundaries commission in Nairobi County, Kenya. The study will pursue this aim by analyzing effect of Biometric Voter Registration System (BVR), Electronic Voters Identification Device (EVID), Electronic Results Transmission (ERT) System and Electronic Voter Verification (EVR) System on employees' performance by IEBC in Nairobi County.

1.3 Objective of the Study

The main objective of the study was to analyze effect of electoral information communication technologies on employees' performance, a case of independent electoral and boundaries commission in Nairobi County, Kenya

The specific objectives of the study were;

- i. To establish the effect of use of Biometric Voter Registration (BVR) system on IEBC employees performance
- ii. To assess the effect of use of Electronic Voters Identification Device (EVID) system on IEBC employees performance
- iii. To determine the effect of use of Electronic Results Transmission (ERT) System on IEBC employees performance

- iv. To establish the effect of use of Electronic Voter Verification (EVV) System on IEBC employees performance
- v. To determine the combined effect of use of BVR, EVID, ERT and EVV Systems on IEBC employees performance

1.4 Hypotheses of the Study

HO₁: The use of Biometric Voter Registration (BVR) system does not have significant effect on IEBC employees' performance

HO₂: The use of Electronic Voters Identification Device (EVID) system does not have significant effect on IEBC employees' performance

HO₃: The use of Electronic Results Transmission (ERT) System does not have significant effect on IEBC employees' performance

HO₄: The use of Electronic Voter Verification (EVV) System does not have significant effect on IEBC employees' performance

HO₅: The combined use of BVR, EVID, ERT and EVV Systems do not have significant effect on IEBC employees' performance

1.5 Significance of the Study

The finding from the study will elicit a lot of readership interests. First the findings from the study will inform election policy makers which is the Parliament, IEBC which the policy implementers on the performance of electoral technologies and how they affect IEBC employees performance. The findings will also help the policy makers to reflect on Election Act 2011 as far as the use of electoral technologies is concern in enhancing employees' performance. Second, the findings from the study will be of interest to a lot of scholars including Electoral ICT scholars on the effect of the technologies on employees' performance as the users of such technologies. Human Resource scholars will also find the findings from the study important in relating how technologies affect employees' performance. Political science scholars will also find the findings important in relating politics to technologies and human resource performance. Third, developers of electoral technologies will also find the study important in observing how empirically IEBC employees related to the technologies and how such technologies affect their performance. Last, election being a political process that cuts across societal strata and also is of great interest to wide readership, the findings from the study will be of important to such a wide spectrum

readers in understanding how electoral technologies affect employees' performance and by extension electoral process performance.

1.6 Scope of the Study

The study analyzed effect of electoral information communication technologies on employees' performance. Specifically, it covered the following elements of electoral technologies; Biometric Voter Registration System (BVR), Electronic Voters Identification Device (EVID), Electronic Results Transmission (ERT) System and Electronic Voter Verification (EVR) System on one hand and on the other hand the following performance indicators; efficiency, quality, timeliness and productivity. The main respondents of the study were IEBC employees working in the Headquarters and Nairobi Region. The study was conducted between 15th August to 30th August 2017.

1.7 Limitation of the Study

Some of the bottlenecks that were expected in this study were lack of corporation from the respondents to fill correctly the questionnaire as they may overlook the significance of the study to their career. The researcher planned and took time to meet with potential respondents and clarified to them the scope of the study and its significance to the organization and work performance. This was instrumental to the study as it contributed immensely to respondents' corporation and input to the study.

Secondly, the success of undertaking this study involved IEBC that regulates policies on dissemination of information. Due to sensitivity of some of the information at hand, some respondents were reluctant to fill questionnaires due to fear of victimization which became a challenge to the researcher in finding information from the targeted respondents. The researcher overcame this by assuring the respondents that the information provided would be handled with a lot of confidentiality and only used for academic purposes only.

Thirdly, the study was carried out from one county which means that generalization to the other counties would be carried out with caution.

1.8 Assumptions of the Study

This study assumed that the employees working in IEBC understood electoral technologies used by IEBC and also the indicators of employees' performance that include; efficiency, quality, timeliness and productivity. Further, the study assumed that the respondents would give the required information intended to achieve the set objectives without fear of victimization.

1.9 Operational Definitions of Terms

Audit-trail	This is a systematic traces of voting information in the electoral system
Authentication:	The provision of assurance of the claimed identity of a person in voter verification system
Ballot :	The is a printed paper that the voter casts to express his choice of voting option
Ballot box:	This is where the voted ballot paper is stored after cast before counting.
Biometric Voter Registration System:	This is a system used for registering voters' details including voters' biometrics like finger print.
Confidentiality:	This is protecting sensitive information against unauthorized individuals, entities, or processes
Electoral roll:	A registry of all eligible voters with all the required voting details
Electoral Technology:	This is conducting voting exercise using information and communication technologies
Electronic Results Transmission System:	Is a system for transmitting provisional results electronically to an observation centre.
Electronic Voter Identification Device:	This is a system that identifies a voter at the polling station by retrieving the captured voter information from BVR
Electronic Voter Verification System:	This is a system that helps to verify whether a voter who voted in time and space during election was actually a registered voter
Employees Performance:	This is the job related activities expected of an employee and how well he/she executes the activities.
Validation:	(Verification) Finding or testing the truth of something, checking if it satisfies a certain criterion. The process of establishing a valid proof of something Zero Knowledge

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review on effect of electoral technologies on employees' performance by IEBC. The section presents; theoretical review, electoral technologies, employees' performance and conceptual framework.

2.2 Theoretical Review

The study adopted Diffusion of Innovation Theory', Technological Adoption Model and Two-Factor Theory. Diffusion of Innovation, Technological Adoption Model addressed the electoral technologies adopted by IEBC whereas Two-Factor Theory addressed employees' motivators which are a crucial factor in their performance.

2.2.1 Diffusion of Innovation Theory

Rogers' (1995) Diffusion of Innovation (DOI) theory is a popular model used in information systems research to explain user adoption of new technologies. Rogers defines diffusion as 'the process by which an innovation is communicated through certain channels over time among the members of a social society' (Rogers, 1995). An innovation is an idea or object that is perceived to be new (Rogers, 1995). According to DOI, the rate of diffusion is affected by an innovation's relative advantage, complexity, compatibility, trialability and observability. Rogers (1995) defines relative advantage as 'the degree to which an innovation is seen as being superior to its predecessor'. Complexity is the degree to which an innovation is seen by the potential adopter as being relatively difficult to use and understand'. Compatibility refers to the degree to which an innovation is seen to be compatible with existing values, beliefs, experiences and needs of adopters. Trialability is the 'degree to which an idea can be experimented with on a limited basis'. Finally, observability is the 'degree to which the results of an innovation are visible' (Rogers, 1995).

The diffusion model is relevant because it explains the reason IEBC adopted BVR, EVID EVV and ERT technologies in conducting electoral process in Kenya. One of the reasons why IEBC adopted these technologies was to gain relevant advantage

related the complex manual electoral process including authentication of voting process, information security and real time results delivery.

2.2.2 Technological Adoption Model

Davis (1989) proposed TAM to predict the adoption and use of new innovations in organizations (Hernandez & Mazzon, 2007). The information systems model shows how adopters end up accepting an innovation and how they eventually they use the innovation (Gordon, 2013). In the theory, which derives from Theory of Reasoned Action, behavioural intention is determined by the attitude towards perceived usefulness of the system and its ease of use. Attitude towards acceptance of the system can be determined by both perceived ease of use and its perceived usefulness (Hernandez & Mazzon, 2007). Perceived usefulness denotes the degree by which users consider accepting certain technology is likely to improve their job accomplishment while perceived ease of use denotes degree to which adopters believe adopting a certain system will necessitate little or no effort (Davis, 1989). A major drawback to this model would be that it only employs two constructs namely perceived ease of use and perceived usefulness to predict behavioural intent to adopt. However, behavioural intention has also been found to be explained by other factors like subjective norms (Yoghoubi & Bahmani, 2011). Moreover, though users have a strongly intend to implement a behaviour, they may not be in a position to perform it without required skills and resources (Behavioural Control) (Ajzen, 1991). As per Aljezen (1991), Theory of Planned Behaviour resolves this issue by providing more variables as discussed below.

This theory is important in this study in that the constructs presented by this model have been found to influence actual use or adoption of electoral technologies by employee at IEBC. The theory was used in the conceptual framework to predict the effect of the use of BVR, EVID, EVV and ERT electoral technologies on employees performance.

2.2.3 Herzberg Two-Factor Theory

Herzberg (1959) developed a Two-Factor Theory which addresses the issue of workplace motivation. The theory introduces two elements or “factors” to account for overall job satisfaction; motivators and hygiene factors. While the presence of

motivators in a job can contribute to the increase in the level of satisfaction, the absence of hygiene factors in the workplace can be the cause of dissatisfaction. Hygiene factors allude to the environment and the context of the work. This can include salary and safe working conditions, among others. Motivators are related to the characteristics of the job itself. According to the theory motivators and hygiene factors are non-exclusive. Satisfaction and dissatisfaction cannot be considered as the opposite ends of one continuum. Therefore an increase in the level of job satisfaction does not necessarily imply a decrease in job dissatisfaction, since the elements affecting satisfaction and dissatisfaction are different. The Two-Factor Theory is also often referred to as the Motivation-Hygiene Theory (Davies, 2008).

This theory is also relevant to the study because it uses motivators which describe the characteristics of the job and hygiene factors which is actually the environment in which the job is performed. The theory is relevant for the study because IEBC employees performance is based on the level of job satisfaction brought about by hygiene factors which included achievement in use of electoral technology brought about by BVR, EVID, EVV and ERT which improves employees work environment taking responsibilities on the actual electoral work which already is enhanced by the electoral technologies.

2.3 Electoral Technologies

Njogu (2014) observes that the advancement of information and telecommunications technologies allow for a fully automated online computerized election process. In addition to overcoming commonly encountered election pitfalls, electoral vote counts are done in real time that by the end of elections day, the results are automatically out. The election process can be easily enhanced with various features based on the demand and requirements of different countries around the world. The introduction of electronic voting has been the biggest change.

E-Voting may soon become a global reality or a global nightmare. Besides reliable E-Voting technologies, there is a dire need for international standards to govern the technology, the software reliability and accuracy, the processes and algorithms deployed within the technology, and the verification of all hardware, software and protocols involved. Such standards will eventually allow elections to proceed in any

part of the world without the need for monitoring bodies. The design of a good voting system, whether electronic or using traditional paper ballots or mechanical devices must satisfy a number of sometimes competing criteria including a high degree of security and accuracy, eligibility and authentication, integrity, verifiability and auditability, reliability, flexibility, performance and scalability (Njogu, 2014).

According to Krimmer (2012) the introduction of a new voting technology to an existing electoral process requires more than taking the paper-based process and making it e-enabled. Developers must also change the whole back-office process and reorganize the whole business process. As in e-government, supporting the complexity of e-voting requires an expansion of thinking. Technological progress and developments in the field of e-voting are increasing over time, and so are abilities of application of this technology. However, the multidisciplinary nature of elections presents a natural challenge. This section therefore presents a conceptual model that helps identify the areas that influence and are affected by the application of ICT in elections.

Applying ICT to such processes comes with several crucial questions, e.g. the problem of how a system can guarantee fundamental principles is central. In controlled environments, poll workers check the eligibility of voters against the voter register, and the workers also use dedicated machines to record the cast votes in an electronic ballot-box. In uncontrolled environments, checking eligibility is a bit more complicated, because the workers must unequivocally determine the voter's identity while preserving the voter's anonymity (Krimme, 2012).

Other considerations include assuring that the system does what it is supposed to do (Volkamer 2009; Barrat 2008) and allowing the general public to check the validity of results produced by e-voting technologies. The latter consideration led to the major question that gained momentum after the Florida 2000 experience and the German ruling (Federal Constitutional Court 2009): How can voters verify whether their votes have been counted as they intended? This concern created a new area of research in end-to-end verifiability (Chaum et al., 2008; Rivest and Smith, 2007), where only limited practical experience exists (OSCE, 2012). This remains a new challenge for

the field, yet the promising stream of inquiry could enhance regular paper-based elections.

2.3.1 Global Perspective of Electronic Voting

Biometric technologies, allowing the automatic identification of people using voice patterns, eye scans, handwriting style, faces, hands or fingerprints, have been suggested for use in the election process for eliminating fraud (Gentles, 2011). Fingerprinting, hand shape, and eye scanning have been used in the United States in driver licensing. Fingerprinting systems are being introduced into the election process in several countries, such as the Philippines, Jamaica, Argentina, and Cambodia (Gentles & Suresh, 2011).

Voting process in today's era is behind its time in respect of the usage of modern ICT. The voting process is being seen mostly as a manual and paper based one. This process can be overwhelming, time-consuming and prone to security breaches by hackers and electoral fraud. Over the years technology related systems were being developed to resolve some of the issues like electoral fraud, impersonation, double voting etc (Pfitzmann & Ahmad-reza, 2010). One such system is Electronic based voting that has been actively used for voting in countries like India. However, these systems seem to be prone to electoral frauds and voters have to make tremendous effort to cast their ballots.

In countries that are better developed like in India, electronic voting (E-Voting) is made possible and this technique encapsulates both electronic means of casting of votes and also counting of votes (IEBC, 2009). This process cleared up lots of problems and barriers faced by the paper based voting process. Just recently in 2012, the Fijian Government in the south pacific chose ESI Inc. (Electoral Services International) from among 11 proposals, consisting of four Fijian firms and seven international firms from Australia, Bangladesh, Belgium, Canada, Spain, and two from the United States. The decision process took more than three months, with presentations and extensive question and answer sessions. In choosing to use the ESI Inc. solution, Fiji has followed recommendations made by the European Union's report on Fiji's 2006 elections, which cited irregularities with voter registration and voting practices.

2.3.2 Electronic Voting in Africa

There are different types of electronic voting systems with the advent of technology to avoid electoral frauds like paper based electronic voting; Direct Recording Electronic Voting and public network Direct Recording Electronic Voting. Very few researches have been carried out on mobile voting. One such system proposed is where the voting machine works on an embedded system with a touch pad and a memory unit kept at the server in the main office. In another development, a voter is identified using a wireless certificate without additionally registering (Kim & Hong, 2007) when a user votes using his mobile terminal such as a cellular phone or a Personal Digital Assistant (PDA)

2.3.3 Electronic Voting in Kenya

As a pilot program for Kenya's 2013 Presidential Election, IEBC successfully registered 1.5 million Kenyans in 1600 registration sites in 18 of Kenya's 210 voting constituencies. Completed in time for a 2010 Kenyan referendum, participants were able to use their new voter cards for the first time to vote in the referendum. Kenya chose fingerprint and facial biometrics for voter identification, and to ensure a clean voter list also elected to do multi-biometric matching. As part of the exercise, a pilot project in selected constituencies using biometric voter identification was also conducted to avoid ballot stuffing. Kenya, ICTs is not left out, the Electoral Commission of Kenya (ECK) recorded increased participation by registering the highest number of voters in the elections with an informed mind (Kenya: ICT Polls, 2007).

Electronic voting (also known as E-Voting) encompasses both electronic means of casting votes and counting of votes. It can include punched cards, optical scan voting systems and specialized voting kiosk, transmission of ballots via telephones, private computer networks or the internet (Mythili & Kanagavalli, 2014).

2.4 Electoral Information Communication Technology

Electoral Information Communication Technology has many technologies including; Biometric Voter Registration Technology, Electronic Voter Identification Device, Electronic Results Transmission System and Electronic Voter Verification System.

2.4.1 Biometric Voter Registration Technology

According to Krimmer (2012) the introduction of a new voting technology to an existing electoral process requires more than taking the paper-based process and making it e-enabled. Developers must also change the whole back-office process and reorganize the whole business process. As in e-government, supporting the complexity of e-voting requires an expansion of thinking. Technological progress and developments in the field of e-voting are increasing over time, and so are abilities of application of this technology. However, the multidisciplinary nature of elections presents a natural challenge. This section therefore presents a conceptual model that helps identify the areas that influence and are affected by the application of ICT in elections.

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Wayman and Kirnberling (2001) reports that Biometric technologies use physical characteristics, such as voice tone or hand shape, to identify people automatically. Behaviors, such as handwriting style, can also be used by computers in this way. The term "identify" is used here quite loosely. There is actually nothing in the voters' voice, hand shape or any biometric measure to tell the computer the voters' name, age or citizenship, or to establish the voters' eligibility to vote. External documents such as passport, birth certificate, naturalization papers or the voters' good word establishing these facts must be supplied at the time the voters' initially present himself to the biometric system for "enrollment". At this initial session, the voter biometric characteristic; such as an eye scan, is recorded and linked to this externally-supplied personal information. At future sessions, the computer links the voter to the previously supplied information using the same physical characteristic. Even if the biometric system works perfectly, the personal data in the computer, such as voting eligibility, is only as reliable as the original source documentation supplied.

A positive identification system requires one to identify self when submitting a biometric measure. The voter's submitted measure is then checked against the measure given when the voter enrolled in the system to affirm that they match. Biometric measures are always "fuzzy" to some extent, changing over time and circumstance of collection. If the submitted and stored biometric measures are "close enough", it is assumed that one is indeed the person enrolled under the identity claimed. If the presented and enrolled characteristics are not "close enough", one will generally be allowed to try again. If multiple attempts are allowed, the number of users "falsely rejected" can be under 1%, although there are always some people chronically unable to use any system who must be given alternate means of identification. The possibility that an impostor will be judged "close enough", even given multiple attempts, is usually less than one in ten. The threat of being caught in 9 out of 10 attempts is enough to deter most impostors, particularly if penalties for fraud are involved (Wayman and Kirnberling, 2001).

Hand geometry systems have been in use for twenty-five years and have seen the largest number of fielded applications. The users place their right hand on a reflective surface and an electronic image is captured of its shape. No details, such as fingerprints, are seen; only the shape (similar to a shadow) of the non-reflecting hand. Error rates for regular users can be considerably under one percent, although error rates for infrequent users are higher due to their unfamiliarity with proper hand placement. A small percentage of people (perhaps 1%) cannot use these systems effectively due to hand irregularities (Wayman and Kirnberling, 2001).

Biometrics technology has been successfully used to increase the integrity of the driver's licensing and social service benefit distribution processes in many States. There is no question that it is technically possible to use biometrics to limit fraud in voting processes as well. The 14th, 15th, 19th, 24th, and 26th Amendments to the U.S. Constitution establish voting as the right of all citizens 18 years of age or older who have not been convicted of a disqualifying crime. The recognition of voting as a "right", however, separates it from the identified "privileges" of driving and receiving social service benefits (Wayman and Kirnberling, 2001).

To solve the registration problems in Ghana and South Africa, it is propose that registration of voters be carried out electronically by the election officials. Hence a biometric-based voter registration should be a feasible idea despite its expensive nature. This could be the take-off point for the EC of Ghana in their quest for transparency and credibility. The EC of Ghana can adopt the biometric registration system for the next general elections in 2012. Biometric registration is defined as the use of technologies like fingerprinting and photo identification to uniquely identify an individual during the registration process. Whilst biometrics is not 100% guaranteed, their use will enable duplicate registration to be easily detected and also avoid impersonation, thereby rendering the voter register more credible. The fingerprint scan is the cheapest and most common of the biometrics. It is being used widely in most countries of the world, Ghana and SSAs not an exception. If you look on the surface of the finger, you will find ridges and furrows which make the fingerprint unique (Jain, & Prabhakar, 2005).

Some of the strengths of finger scan according to Nanavati, Nanavati & Thieme (2002), include: A mature and proven technology; Deployable in a range of environments; Easy to use devices; High level of accuracy. The finger scan identification has associated problems with its use as pointed out by Moore (2005). He argued, alongside Nanavati et al (2002), that the devices get dirty and degrade with time. Besides, scars, cuts and burns will obviously affect the scan results (Liu and Silverman, 2001).

The administrative tool of voter registration software provides the following capabilities: Register and Remove Registration Officer, Registration Assistant and Data entry operator. Setup polling stations, Load polling station data, Restore polling station data. Anyone with access to such capabilities has the ability to effectively remove voters, transfer voters, edit voter data, and replace voter ID functions. There is no auditing/monitoring or logging requirement in tender process for any of these functions. It is technically infeasible to use asymmetric algorithms to encrypt several bytes of data due to how complex asymmetric algorithms are designed; it is typically very labor intensive thus the reason why it is used to encrypt only small blobs of data. If public/private key pairs are to be used what specific mechanism is to be implemented, what algorithms will be used, what are the key strength requirements?

EC Biometric Tender process document states that each polling station will have its own key pair, in this instance, what secure key management techniques (restricting access to keys, logging and alerting on unauthorized access to keys, key splitting etc..) is the EC proposing to ensure that encryption keys do not fall into wrong hands and are restricted. Access to centralized servers should be restricted and logged. All access requests for any maintenance needs to be formally reviewed and all approvals documented. Since master and provisional lists will be derived from central server, the server has to be heavily fortified, monitored and secured to prevent any breaches (IEBC, 2009).

Biometric technologies allow the automatic identification of people using voice patterns, eye scans, handwriting style, faces, hands or fingerprints; have been suggested for use in the election process for eliminating fraud (Gentles, 2011). Fingerprinting, hand shape, and eye scanning have been used in the United States in driver licensing. Fingerprinting systems are being introduced into the election process in several countries, such as the Philippines, Jamaica, Argentina, and Cambodia (Gentles & Suresh, 2011). Voting process in today's era is behind its time in respect of the usage of modern ICT. The voting process is being seen mostly as a manual and paper based one. This process can be overwhelming, time-consuming and prone to security breaches by hackers and electoral fraud.

Over the years technology related systems were being developed to resolve some of the issues like electoral fraud, impersonation, double voting etc (Pfitzmann & Ahmadreza, 2010). One such system is Electronic based voting that has been actively used for voting in countries like India. However, these systems seem to be prone to electoral frauds and voters have to make tremendous effort to cast their ballots. In countries that are better developed like in India, electronic voting (E-Voting) is made possible and this technique encapsulates both electronic means of casting of votes and also counting of votes (Electronic Voting, 2009). This process cleared up lots of problems and barriers faced by the paper based voting process.

In elections, biometric products remove the need for passwords and Personal Identification Numbers or PINs. Biometric systems exchange knowledge with individual's features such as finger print or proximity identification. It makes it

comfortable and fast to record features. Contrary to passwords and PINs, biometric features are dynamic – meaning that they have the capability to change overtime. This continues to be the most challenging property of the biometric system itself (Ortega et al, 2004).

Around the world, and in advanced civilizations, or in the developed world, E-Voting is probably the most security sensitive process handled electronically nowadays. This is so because the worst-case scenario is really very catastrophic (National Science and Technology Council, 2007). One of the main issues to stress is the difference between biometric authentications compared to ‘classic’ authentication such as those with smart cards. The well-known concept of card readers with fingerprint authentication is different from biometric authentication. In other words, biometric inputs on smart cards are read not to authenticate the voter’s information on the smart card, but to authenticate the smart card itself. In that regard, the voting system in this manner does not interact in any shape or form with the biometric characteristics of the voter, but helps in authenticating the voter’s smart card. Other issues with the biometric system are its young age, with a set of standardization effort going on (Jain et al, 2006).

The introduction of a biometric voter identification system that captured the most attention (Barnuevo, 2012). (Gentles & Sankaranarayanan, 2012) found that over the years, technology related systems were being developed to resolve some of the issues like electoral fraud, impersonation, double voting etc. The study revealed that these systems seem to be prone to electoral frauds and voters have to make tremendous effort to cast their ballots. It was also clear that there are still a few very important areas which have to be identified and addressed in relation to the Security which involves a person being able to vote in a secure manner, the time spent for voting by voters, the efficiency in counting of votes and the cost involved in employing people towards monitoring the voting process. So taking these areas/issues into consideration, biometrics authenticated mobile voting system was introduced (Gentles & Sankaranarayanan, 2012).

All over the world, Election Management Bodies (EMBs) deploy various new technologies with the aim of improving efficiency and effectiveness of the electoral process. Kenya’s Election Act 2011 allows the Electoral Commission "to use such

technology as it considers appropriate in the electoral process". In doing so, IEBC has, and will, pursue electoral technology to the extent that it answers to some compelling need, such as the need to eliminate double registration and the need to fasten the transmission of results. The Kenyan Constitution (2010) dictates that whatever system that the Commission adopts must be simple, accurate, verifiable, secure, accountable and transparent (IEBC, 2016).

In developing and rolling out electoral technology, IEBC is cognizant to two issues that always characterize technological innovations-the huge public expectations and the limitations of technology. There is a growing demand that electoral technology provide convenient and mobile services just like other modern application of technology in business and even in social life. The Commission does not only seize the opportunity technology offers for accountably and transparency, it also builds the integrity of the people working with these technologies. The strategy is to enhance the capacity of both the processes and the people. Computerization alone does not validate the data. The Commission has so far implemented four key election technologies. There are plans to integrate these systems so as to have one gadget performing multiple functionalities. This would reduce costs, the logistics of deploying several technologies and the complexity in training staff (IEBC, 2016).

The BVR system is used for registering voters. It comprises a laptop, a finger print scanner and a camera. BVR captures a voter's facial image, finger prints and civil data or Personally Identifiable Information (PII)-Name, gender, identity card/passport number, telephone number etc. The registration takes place at the registration centres where an individual is expected to vote. The BVR method of registration was the only system deployed by IEBC to register voters just before the 2013 general elections (IEBC, 2016).

Electronic registration of voters in Kenya began in 2009 with a pilot project that involved 18 constituencies countrywide. The pilot program was a big success. Some voters, who had registered manually in constituencies adjacent to the 'BVR constituencies' were enticed by technology and demanded that they too be registered "properly" using biometric features. Encouraged by this success IEBC rolled out a fresh, all biometric voter registration, in all the 290 constituencies in the country, in

2012. It was important that the registration personnel have the prerequisite skills in the use of the technology. A total of 15,000 BVR kits were deployed to 24,614 registration centres. The Commission recruited 30,000 registration clerks to conduct the exercise for thirty days. 1,450 Voter Registration Assistants (VRAs) were recruited to assist in the supervision of registration clerks and coordination of registration at the county assembly ward level. In barely a month, IEBC managed to register 14,352,545 voters. The machines were found to be fast and reliable (IEBC, 2016).

2.4.2 Electronic Voter Identification Technology

EVID is an electronic poll book two technologies, the laptop with attached finger print reader and the handheld device with in-build finger print reader. EVIDs were used for the first time during the March 4th General Elections (29,000 laptops and 4,600 handhelds). The EVIDs verify and confirm voters electronically as registered by BVR. They are used to “check-in” voters at polling station on polling day and is helpful in streamlining. EVID curbs impersonation and ensures that only those who registered to vote are allowed to vote. However some challenges were experienced in the March 4th polling day when some of the machines failed to work largely due to inadequate training and running out of battery charge. In such cases, the polling officials carried out verification of voters using the voter register print outs (IEBC, 2016).

2.4.3 Electronic Results Transmission Technology

The result of election must be secret before the end of election. Only the processing in Votes Counting Server can decrypt encrypted ballots. For counting encrypted ballots, adversaries need to decrypt ballots with the private key of e-voting. The transmission of encrypted ballots to Votes Counting Server takes place after the end of the voting period. Hence, no one knows the tally before the end of voting. Another theoretical possibility is to obtain a control over all voters’ processes. The result of election must be secret before the end of election is justified in the Estonian e-voting system. The last security property says that It must be possible to repeat the computation of the final tally. Assumption VI states that the phase of votes’ counting behaves exactly as specified. In the design of the Estonian e-voting system it is claimed that the

computation of the final tally must be repeatable. Therefore, the security property is justified for the Estonian e-voting system (Magi, 2007).

Votes Counting Server is an online technology which downloads the list of voters and encrypted ballots from Votes Storing Server. We analyze the threat that the adversary obtains the public key of Votes Counting Server and adds the encrypted ballots to Votes Counting Server or the transmission session between Votes Storing Server and Votes Counting Server. For attacking Votes Storing Server it is possible to obtain the public key of Votes Counting Server (Magi, 2007).

ERT system is a system for transmitting provisional results electronically to an observation centre. At the end of voting and when votes have been counted and tallied, the Presiding Officers (POs) enter the data on the signed results sheet (Form 35) into a specially configured mobile phones and transmits the results simultaneous to the election results centres at the constituency, county and national level. ERT system is used to: Enhance transparency through electronic transmission of provisional results from the polling stations; Display and visualize provisional results at the tally centers; Provide access to provisional elections data to media and other stakeholders in real time (IEBC, 2016).

The ERT system has been a great success. The public been able to watch live streams of results at the big screens set up by IEBC at observation centres or on national television. It has been used successfully in all by-elections since 2009, the 2010 Referendum and the last general election. Although the electronic results are "provisional" because it they lack legal recognition, the outcomes reflect the final hard copy results. There have been cases of candidates conceding defeat on the basis of the electronic results although IEBC only declares winners on the hard copy tally. ERT system gives quick trends on how the voting went. Obviously, it is the results from the polling stations with fewer voters that are the first to come in. Where the telecoms service provider signal is weak or absent, the IEBC polling officials use satellite phones or travel to where there is adequate signal presence. The points of transmission are often identified in advance. In some cases, IEBC works with mobile phone service providers to enhance the signals at the polling centres (IEBC, 2016).

During the March 4th polls, only 17,000 of the 33,000 polling stations managed to transmit results before it was overwhelmed by some technical hitches. This alternative way of getting results had to be discontinued when it became too slow and although the problem was identified and fixed, a number of officials had abandoned the transmission as they took hard copies of the same to tallying centres. The Commission is working towards strengthening the RTS system by setting up faster connectivity and better servers. This is demonstrated by the efficient way results for by-elections conducted thereafter have been successfully transmitted. Provisional results have always tallied with the final results (IEBC, 2016).

2.4.4 Electronic Voter Verification Technology

Data from the BVR machines are transferred to a centralized storage server from which hard copy registers are printed. The physical register, which has thumbnail photo of the voter, is distributed to polling centres for people to check and verify their registration details. IEBC also provides for the register verification online and via SMS. The printed registers are also used as back-ups during voting. Often confused for electronic voting, BVR nevertheless provides a basis or foundation for possible future implementation of e-voting by use of biometric technologies. The Commission is exploring ways of linking and cross-matching data from BVR with that of the National Registration Bureau (NRB) to ensure that those who have died are removed and those who have attained the voting age are identified and contacted for registration. BVR ensures that: There are multiple methods of identifying voters uniquely (other than names and IDs, there are finger print and facial features); That capture of voters' records is fast, efficient and direct; Security and privacy of information is enhanced; Integrity and reliability of information is improved e.g. elimination of duplicates (IEBC, 2009).

When the digitally signed encrypted E-Vote is received at the Vote Collection Server, the correct construction of the encrypted e-vote has to be verified (through several validation processes) (ErgoGroup, 2011). The Vote Collection Server verifies the digital signature to ensure the validity, integrity and authenticity of the encrypted e-Vote. The Vote Collection Server executes the server side of the secure electronic voting protocol. This part for instance validates the voter authentication and the opening token, as well as ensures a secure storage and processing of the e-vote

received. The vote collection server also verifies the cryptographic zero knowledge proofs to ensure the encrypted e-vote contains valid options and that it has not been duplicated, for instance using an old session token (Stenbro, 2010).

When the validation has succeeded, the E-Vote is stored and the voter is marked off in the Electoral Roll. The system then sends a receipt message back to the voter that his vote was cast and successfully recorded. This feedback includes a hash of the encrypted e-vote and is digitally signed by the Vote Collection Server. The digital signature proves the integrity and authenticity of the receipt code, while the hash of the encrypted e-vote is used to guarantee voter privacy and vote secrecy, because it cannot be used in any way to reveal any vote options issued by the voter (ErgoGroup, 2011).

After the vote casting process is done, a hash of all encrypted e-votes is generated. This hash is sent to the cleansing process. The system also publishes a list of all generated hash values, to provide voters with the possibility of verifying their e-votes were recorded correctly and successfully reached the electoral authorities (Stenbro, 2010).

2.5 Employees Performance

Job performance has been defined in three dimensions; performance as a function of outcomes, performance as a function of behavior and performance as a function of personal traits (Milkovich et al, 1991). The majority of the studies have shifted their focus on defining job performance in terms of outcomes and behaviour, since these are easier and more objective to define and to observe than personal traits (Hersen 2004). In this study, employees' performance was measured in terms of quality and timely delivery the job given.

2.5.1 Employees Work Quality

Quality is the characteristic of products or services that bear an ability to satisfy the stated or implied needs (Kotler & Armstrong 2002). It is increasingly achieving better products and services at a progressively more competitive price (Stoner 1996). The delivery of good service quality by front-line staff is crucial to the organizations' overall success, simply because delivering poor service is depreciated by customers, who can choose and reason what and from whom they purchase (Baum, 2006). Being

leader in quality delivery requires employees who are committed to delight customers, meaning to exceed their expectations through service performance. Committed employees are one potential benefit brought by the successful implementation of empowerment (Lashley, 2001).

Lashley (2001) links the importance of good service quality to increased customer satisfaction and retention, which in turn leads to employee satisfaction and lower turnover. Reduced turnover again leads to customer satisfaction as well as to good service quality and thus, the virtuous cycle is closed. Managers often use the advice from employees, gained through, for instance quality circles or team briefings as tool for making educated decisions. The aims of such initiatives are to motivate employees to look for quality improvements and to use their full capabilities to meet customer needs as well as providing suggestions for problem solving and thus, improving service quality (Lashley, 2001).

2.5.2 Employee Work Timely Delivery

The study of performance management has been popular within human resource management study. Performance is deploying and managing the components of the causal model that lead to the timely attainment of stated objectives within constraints specific to the firm and to the situation (Lebas, 1995).

The origin and essence of the concept of time management can be traced back to the old period. In order to manage time effectively, the need of time study becomes essential in organization. Time study experts can assist managers and administrators in making better use of time, whereas return in time may become in future as important as success criterion as return on capital (Gupta, 2001).

Time management refers to a process constituted a series of steps in which involves the analysis of our time habits, clarification of our objectives, establishment of our priorities, planning for appropriate results and taking positive action against time wasters. Time management is nothing but it is an issue which is fundamental to job performance. Effective use of time is the most precious and scarcity resource that cannot retrieved once it goes, hence managers as well as subordinates must take necessary measures to ensure that there is no lost of time (Gupta, 2001). Time

management can be especially useful strategy for managers trying to cope with numerous and sometimes conflicting demands. Time management includes various techniques that help people to make better use of and accomplish more with their time making lists of what needs to be accomplished in a certain relatively short time period (such as a day or a week), prioritizing tasks to clarify which ones are most important and which ones could be delegated or put off and dividing ones day(s) accordingly.

2.6 Empirical Review

Kumar and Markeset (2007) study on development of performance-based service strategies for the oil and gas industry. The study framework considered various influencing factors and their attributes, as well as performance factors categorized as critical success factors, performance killers and cost drivers. The study findings were operators of complex O&G production facilities are becoming increasingly dependent on service providers to support their efforts to perform according to demands; when developing a performance-based service strategy one needs to consider influencing factors and attributes: needs to measure service delivery process performance and the gaps between required and delivered services, and to periodically reassess the service strategy influencing factors. The proposed framework can reduce cost and improve performance. Data were collected through questionnaire, interviews, available documents and literature survey. The study did show the importance of service performance for involved parties to compete in the market and need for monitoring of the contractors performance. The study did not consider effect of electoral technologies on quality service delivery which is one of the key issues this study will analyze.

Osho et al. (2016) carried out a study on Framework for an E-Voting System Applicable in Developing Economies. They found out that the benefits of electronic means of voting as against the use of manual voting method cannot be overemphasized. This study has contributed to existing knowledge primarily by presenting a system with a architectural framework that guarantees accessibility to virtually all categories of voters to be enfranchised, and supports security of voting data and processes. The architecture of the system presented inherently supports security of voting data, by separating and assigning duties to different servers. However, this assertion was not evaluated. Hence, this area is open for further studies.

This study has focused on two elements of information security – integrity and availability. It is suggested that future research endeavours could consider confidentiality in the entire process. Another area worthy of further exploration is the consideration of different cryptographic schemes to determine which would best be suitable for the system, especially considering its cloud nature.

Al-Dabbagh (2015) carried out an empirical investigation on The effect of ICT connectivity on individual work productivity: investigating the influence of ICT self-discipline. The study established that ICT self-discipline showed a positive effect on the relationship between ICT connectivity and individual work productivity only for employees with jobs requiring low-medium interdependence. The results from the quantitative phase indicated that employees that have jobs with low-medium interdependence or are working in structured and/or highly inter-connected organisations can afford to apply strict ICT self-discipline at work. Employees that have jobs with medium-high interdependence or are working in small and/or unstructured organisations should be lenient with their ICT self-discipline at work. These results indicate that the employee's job type and organisation type are critical factors to assess prior to investing in ICT self-discipline strategies for work, to enhance the effect of ICT connectivity on individual work productivity. The study did not consider effect of electoral technologies on employees' performance which this study hopes to analyze and abridge the knowledge gap.

Case (2012) carried out an empirical study on the impact of communication technologies on individual workers' productivity. The study established that to seek how productivity can be improved with the use of communication technologies one has to apply a holistic view to unify the whole organizations communication process. Today's users have a fairly good understanding of the capabilities and possibilities that technologies offer to enhance their work. The question remains are these used up to the potentials they offer. Most of the challenges that organizations face are due incoherently applying technology upgrades. If the tools used and how these are used in practice, vary throughout the organization, productivity gains are hampered. To actually realize these gains, organization must invest in training at build up an organizational communication culture. The time factor is of essence as well. Updating or getting rid of old practices and communication manners is likely to take time;

typically it is harder for employees that are older and have worked in the organization for a long time. It is also problematic that today's organizations and employees are overloaded with e-mail traffic and many workers have difficulties with organizing and control her/his e-mails. E-mail is also used for such purposes for which it is not the most identical tool, for instance, in group communication and archiving. The study did not crystallize key issues of productivity produced from electoral technology based system that this study hopes to analyze and fill in the research gap.

Geetanjali (2011) carried out an empirical study on Application in service delivery: a case of Inland Revenue Department, Nepal. Data analysis revealed that organizational factors (human resources, „ICT infrastructure, financial resources and attitude of service providers) found to be associated to the effectiveness of e-services, while customers' factors (customers' demand and customers' knowledge) were not found to be associated with the effectiveness of e-services. The findings of the study conclude the following points: The non association of customers factors with the effectiveness of e-services shows that customers have a small role to play to make effective e-service delivery. There might be several explanations. However, some distinct features of Nepal as that of low level of internet penetration, poor right consciousness of public customers, patron – client relationship, and a sense of fear with the revenue department might have made customers dormant with the role they can play for making e-services effective. Though the theory of governance and New Public Management focus on vibrant participation of customers in public affairs, it seems that in a country like Nepal which has poor literacy and rampant poverty, it is a challenge to transform customers in real active agent. This study supported that capable human resources influence the effectiveness of e – services, and this finding goes well with the Human Capital theory which advocates the role of trained and capable human resources for the better national productivity. As the study came with the finding that the organizational factor influence the effectiveness of e-services, so it sounds logical to assert that the role of organizational factors is significant for making e-services effective and if the organizational factors are more emphasized and strengthened, then the e-services' effectiveness would be more. The study pointed out that the average response of service providers and seekers towards the e-services as positive, nevertheless the degree of assertiveness differed, whereby unlike service providers, seekers viewed „effectiveness“ in moderate manner. During the interaction

and questionnaire survey with service seekers, the study had identified major area of their grievance. The study did not consider effect of electoral technologies on service quality offered by employees as a measure of employees' performance that this study hopes to analyze and fill the exiting gap.

Hagsten and Sabadash (2017) conducted correlation study on; a neglected input to production: the role of ICT-schooled employees in firm performance. The study established that ICT-schooled human capital relates significantly and positively to firm productivity in all countries considered: Denmark, Finland, France, Norway, Sweden and the UK. However, the strength of the association varies according to industry and by country. Generally, the relationship between firm performance and ICT-schooled employees is stronger for services firms. Norway and Sweden have the largest estimates for ICT-schooled human capital, while France and Denmark show stronger links to generally skilled employees.

Further finding established that ICT intensity is also positively and significantly related to productivity, although on a smaller scale than the human capital, in all countries except the UK. This might indicate differences across countries in underlying institutional settings, affecting for instance the labour market functionality or disparities in the ability to benefit from unmeasured complementary intangible assets. The channel through which ICT-schooled human capital may translate into productivity gains seems to be narrower than for generally skilled human capital, and the potential impact on productivity of the former may not be fully achieved until the real capital setting is as specific as the human capital. The "right" kind of schooled employees is particularly important for manufacturers. Services firms are more indifferent to the field of specialization of their employees. Here, productivity associations with generally schooled human capital may instead stem more from its high level of flexibility and its ability to generate spillover effects than from narrowly specialized skills. Some limitations arising from the distributed approach used to access the micro-data and the linked data sets should be noted. Remote access to official statistics does not allow more advanced analyses than each data supplier tolerates, manages to operate or provides IT support for. This means that there is a restriction on the number of variables which each data set bears. In this case, data on investments at the level of the firm are not available at all in a homogeneous format

across countries, while detailed information on type of intermediate inputs are absent in the data sets at hand.

Although this study analyzed the training side of ICT application towards productivity, the study did not analyze application of ICT in electoral process and directly compared it with employees' performance. Specifically, the study was conducted in developed countries which are far ahead as ICT application is concerned. The study also did not analyze specific application technologies as BVR, EVID, EVV and ERT and also did not analyze performance in terms of employees work quality and timely delivery which the current study analyze, creating the research gap that has been filled.

Apentsui et al (2015) carried out empirical study on evaluation of effective use of information and communications technology (ICT) in election administration in Northern Ghana Region. The survey method was adopted for this study targeting all the staff of the Electoral Commission in the Northern region of Ghana. The study showed that the majority of the respondents were aware of the ICT policy of the electoral commission; however, only few of those who were aware of the policy affirmed that it had been communicated to them. The common means by which the ICT policy was communicated to staff was during formal briefing, during seminars and symposiums. Consequently, the EC used diversified means to communicate information on ICT policy to the staff. The level of understanding of the staff on ICT policy was mixed. This ranged from being poor, average and excellent. This implies that being aware of ICT policy may not necessarily lead to understanding of the contents.

On the whole, majority of the respondent had used ICT tools over the past decade. Most of them had no prior training in ICT before they joined the EC, This implies that majority of the staff were given ICT training by the Electoral Commission. The study reveals that training in ICT skills were inadequate. A few of them went through training once a year, while it took four years for others to be trained. In terms of effectiveness of ICT on the operations of the EC, majority of the respondents stated the use of ICT was more effective on the declaration of results than the other administrative activities. Improving the use of ICT at the EC will require the

acquisition of modern ICT equipments, provision of computers; network all operational offices, proper supervision of ICT work.

Rodney (2016) carried out an empirical study on confidence in paper-based and electronic voting channels. The study established that the voters who are most likely to take up the options of EVMs, internet voting and smart phone voting are those who have positive attachments to the Australian political system and who are already familiar with the new technologies involved. The pattern of younger voters having greater confidence than older voters in electronic voting channels suggests that confidence in those channels is likely to grow over time among enrolled voters, as new generations familiar from infancy with new social media come of age and enter the electorate. Negative assessments of voting channels might grow if episodes such as the lost 2013 Senate ballots recur in future elections (Packham 2013). Exposure of flaws in electronic voting systems might similarly reduce confidence in those new channels, as occurred in the Netherlands in 2006. Politics and administration, as well as demographics, are likely to be important in longer-term trends in Australian attitudes to voting channels.

Despite the fact that this study analyzed the training side of ICT application towards productivity, the study did not analyze application of ICT in electoral process and directly compared it with employees' performance. The study also did not analyze specific application technologies as BVR, EVID, EVV and ERT and also did not analyze performance in terms of employees work quality and timely delivery which the current study analyze, creating the research gap that has been filled.

Avgerou et al (2009) carried out empirical study on interpreting the trustworthiness of government mediated by information and communication technology: lessons from electronic voting in Brazil. The study found some indication for caution about the assumption of possibility of such scaling up. Simply put, the perception whether elections are trustworthy may weigh little for categories of poor population who do not expect that a democratically elected government will improve their life conditions. We came across anecdotal stories of people in remote poor communities willing to 'sell' their vote for the promise of a job in a local factory, or for a 'gift' such as the payment of a medical treatment. These stories indicate that fair elections may not be

considered important if democratic government is not seen to bring about satisfactory life conditions. In such a case, belief in the trustworthiness of electronic elections will probably make little difference for those citizens' trust in democratic government.

Distinction between trust and trustworthiness and the differentiation among a number of interrelated entities whose trustworthiness may be at stake are analytical steps for the unpacking of the hypothesized overarching relationship of ICT and trust in government. Our focus on beliefs about the trustworthiness led us to identify additional judgments that affect citizens' views about the electronic elections. Specifically, we discussed briefly the facilitating influence of the perception ICT as a technology with modernizing potential in multiple spheres of public life, and of the electoral agency as a competent guarantor of the elections.

The Brazilian citizens' view of the trustworthiness of the electronic elections relies on their belief of the TSE itself being trustworthy and committed to its mission of fair elections. Moreover, this case of e-government built on existing technological competence and a propensity of citizens to welcome government initiatives for ICT innovation. Such conditions of ICT competence and culture are not common in many developing countries, most of which rely on transferring ICT from abroad and often face suspicion about its appropriateness. The study did not analyze specific application technologies as BVR, EVID, EVV and ERT and also did not analyze performance in terms of employees work quality and timely delivery which the current study analyze, creating the research gap that has been filled.

Achieng and Ruhode (2013) carried out an empirical study on the adoption and challenges of electronic voting technologies within the South African context. The study revealed the importance of the three DoI constructs in the adoption and diffusion process of e-voting within the South African context. The study also reveals some of the factors that could influence the adoption of e-voting technologies from the perspective of both the voters and the Independent Electoral Commission officials. These factors should be given much consideration before the adoption of e-voting technologies can be considered. This research has revealed that although e-voting has many potential benefits over the manual voting system, there should be careful deliberation by the decision makers (IEC). The IEC must take into consideration all

the factors that could influence the voters both positively and negatively into consideration. This study is of the view that should the ICE successfully explore and address all the factors regarding the adoption of e-voting then South Africa would be able to leverage on the opportunities that e-voting technologies present.

This factor can be compared with the DoI construct complexity. When a technology is perceived by potential adopters as being relatively difficult to use and understand. Based on the findings some participants thought electronic voting system would be difficult to use or understand especially amongst elderly citizens who have no knowledge of such a technology. There was also a concern from the IEC regarding the illiterate citizens in informal settlement who have not had prior use or experience of such technologies might find e-voting difficult to use.

The findings show that trust in the technology is a likely factor that could influence the adoption of electronic voting. The participants thought security and privacy issues were factors that might prevent them from trusting and therefore adopting electronic voting technologies. Based on their knowledge or experience of other electronic systems that have been affected by security and privacy issue, these participants thought that if e-voting were not secure enough, their voting right could be under threat and their voting information altered or misused by hackers.

The provision of resources and infrastructure to facilitate the implementation of any innovation is of importance and could influence the adoption of a technology in this case electronic voting. Increased resources would be needed to either provide additional staff training or funding to administer the new voting channel. The findings from the interview with the IEC revealed that the availability of ICTs infrastructure and resources especially in the informal settlements is a factor that could influence their decision where or not to adopt electronic voting. Lack of infrastructure and resources would hinder the adoption of evoting. Finally, the Environment factor, findings from the interview also revealed that the environment within which the potential innovation is to be introduced could influence the adoption of that technology. The interview data showed that before the IEC can decide on adopting an electronic voting technology, they should put into consideration the political environment and the citizens' environment as well. The extent to which both these

environments accept the technology is crucial in the IEC’s decision on whether to implement electronic voting or not.

The study did not analyze specific application technologies as BVR, EVID, EVV and ERT and also did not analyze performance in terms of employees work quality and timely delivery which the current study analyze, creating the research gap that has been filled.

2.7 Conceptual Framework

The conceptual framework is a diagrammatic presentation of relationship between the independent variables of the study which is electoral voter technologies and the dependent variables which is IEBC employees’ performance is the effect as illustrated in figure 2.1

Independent Variables

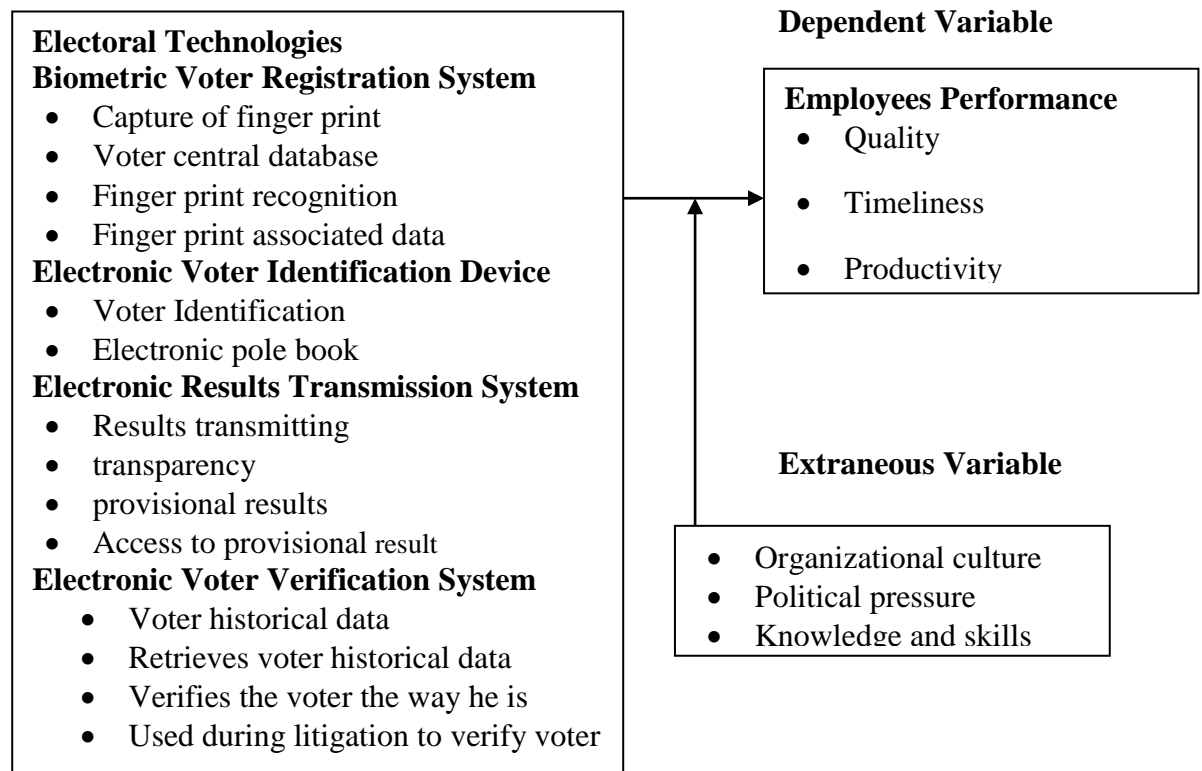


Figure 2.1: Effect of electoral technologies on employees performance

Source: Own conceptualization

The independent variables were the electoral systems including; Biometric Voter Registration System (BVR), Electronic Voters Identification Device (EVID),

Electronic Results Transmission (ERT) System and Electronic Voter Verification (EUV) Systems. The dependent variable was employees' performance measured in terms of efficiency while conducting electoral related jobs, quality of job output, timeliness of delivering the job and productivity of the employee. The extraneous variables were organizational organization culture, political pressure and knowledge and skills in using the electoral technologies. During voting process, electronic voter identification device is used to identify the registered voter for purposes of voting. Electronic results transmission system transmits results to the central server which is later broadcast to all stakeholders. Lastly electronic voter verification system is used to verify voting process whenever such information is required. All these systems are the complex of electoral process when done manually can be cumbersome introducing errors that leading to poor employees performance. The study hypothesized that when systems are used by employees in managing electoral process then the employees job performance will increase due to systems speed, accuracy and secure transmission controlling organization culture, political pressure and knowledge and skills in using the electoral technologies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents research methodology including the research design, study population, sampling size and sampling procedures, data collection instruments and analysis of the data collected.

3.2 Research Design

The research design that the study adopted is a descriptive research design. According to Mugenda (2009) survey research design describes relevant aspects of the phenomenon of interest from various perspectives. Orodho (2004) asserts that survey design allows a researcher to present and interpret collected data about a certain phenomenon for the purpose of clarification. The descriptive design describes the phenomenon, examines actions as they are or as they happen rather than manipulation of variables (Orodho, 2005). Data in a descriptive study is presented in a meaningful form that enable the researcher undertake options in a given scenario and making decisions. A survey research design entails collection of data so as to obtain solution on the subject under study.

3.3 Population of Study

The study collected information from all employees working in Independent Electoral and Boundary Commission (IEBC) in the Headquarters and Nairobi Region. Nairobi County houses the employees working in Nairobi Electoral Region and IEBC headquarters. Employees working in Nairobi Electoral Region are charged with the duty of conducting elections in Nairobi County whereas employees at the headquarter co-ordinate all the IEBC regions countrywide. Nairobi Region had a total of 51 employees including regional coordinators, constituency co-ordinators and other support staff whereas the headquarter had a total of 152 staff including the Chief Executive Officer, head of departments and all other support staff. The total number of employees including headquarters and Nairobi Region was 203 which formed the target population for this study.

3.4 Sample Size and Sampling Procedure

The study used purposive sampling method of employees working in Nairobi Region and headquarters leaving out other regions because the headquarters is the custodian of all the electronic electoral technologies under the study and also it is was easy to collect information from Nairobi region and make quick references to the headquarters wherever such situations arose. Normally, it could have been preferable to collect data from all the 203 employees working in IEBC in Nairobi Region and headquarters, however, due to cost, time and logistics constraints, sampling was inevitable. Systematic random sampling technique was used to select the respondents. To determine the sample size, formula recommended by Nassiuma (2000) was used:

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

Where ‘n’ is the required sample size of IEBC employees, ‘N’ is the total number of employees working in employees working both in Nairobi Region and Headquarters, ‘C’ is the coefficient of variation and ‘e’ is the margin error (Nassiuma, 2000)

$$s = \frac{203 \times (0.2)^2}{(0.2)^2 + (203 - 1)(0.0146)^2} = 98$$

Random sampling was used to pick the 98 required samples from the list of the IEBC Employees Master Roll 2016/2017 and the contacts was used to arrange the questionnaire delivery and collection.

Given the target population of 203 employees, 98 employees working at IEBC in the Headquarters and Nairobi Region formed the sample for the study. The unit of analysis therefore was employees working in IEBC headquarters and Nairobi Region. Proportionate stratified sampling of employees in each category was derived as shown in the table 3.1.

Table 3.1: Sample Size of Employee Working IEBC Nairobi Region and Headquarters

Category	No. Employees	Sample	%
Headquarters	152	73	74
Nairobi Region	51	25	26
Total	203	98	100

3.5 Data Collection Instrument

The researcher used closed-ended questionnaires based on Likert Scale as the main mode of data collection. The use of questionnaires was justified because they assured an effective way of collecting information from a population in a short period of time and at a reduced cost. The questionnaires also facilitated easier coding and analysis of data collected (Kothari, 2004). The closed-ended questions ensured that the respondents were restricted to certain categories in their responses for easy data collection, analysis and interpretation. The questionnaires were personally administered by the researcher, dropped and picked after one day for purposes of higher response rate.

3.6 Validity and Reliability of the Instruments

3.6.1 Validity of the Instruments

Validity is the degree to which results obtained from analysis of the data actually represent the phenomenon under study (Mugenda and Mugenda 2003). It is the accuracy and meaningfulness of inferences, which are based on research results. It means the agreement between value of measurements and its true value. Validity is quantified by comparing measurements with values that are as close to the true values as possible. Poor validity also degrades the precision of a single measurement, and it reduces the ability to characterize relationships between variables in descriptive studies.

There are three types of validity; content, criterion-related and construct. Content validity is the extent to which a measuring instrument provides adequate coverage of the topic under study. Criterion-related validity relates to the ability of an individual to predict or estimate the existence of some current condition. Validity was tested through expert judgment of research supervisors from Department of Business Administration, Egerton University.

3.6.2 Reliability of the Instruments

Reliability is the measure of the degree to which a research yields consistent results or data after repeated trials. Poor reliability degrades the precision of a single measurement and reduces the ability to track changes in measurement in a study

(Mugenda and Mugenda 2003). In order to ensure reliability of the instruments, a pilot study was conducted in IEBC Thika Region using the same tool to gauge responses for the purposes of improving the tool. The Cronbach's coefficient alpha was applied on the results obtained to determine how items correlate among them in the same instrument. Cronbach's coefficient Alpha of than 0.81 was obtained from piloted questionnaires and was found reliable above the 0.7 threshold.

3.7 Data Analysis and Presentation

The questionnaire was first edited and coded to ensure completeness and accuracy. The computer application package for social sciences Statistical Package for Social Sciences (SPSS) was used to aid in the data analysis. The data was analyzed through the use of descriptive statistics and inferential statistics. The descriptive statistics involved the use of frequencies, mean and percentages. The inferential statistics that was used in the study was Pearson's Correlation and multiple regression analysis at 0.05 significance. The data was presented using tables and charts. The combined effect of all the technologies and employees' performance was tested with the Regression Model below.

$$y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where;

Y= employee performance

α =constant

$\beta_1 \dots \dots \beta_{4d}$ = parameter estimates

X_1 = BRV

X_2 = EVID

X_3 =ERT

X_4 = EVV

ε = the error of prediction.

Table 3.2: Summary of Data Analysis

Research Hypotheses	Independent Variable	Dependent Variable	Statistical Methods
HO₁: Biometric Voter Registration System (BVR) does not have significant effect on employees' performance	BVR	<ul style="list-style-type: none"> • Quality • Timeliness 	Pearson's Correlation.
HO₂: Electronic Voters Identification Device (EVID) does not have significant effect on employees' performance	EVID	<ul style="list-style-type: none"> • Quality • Timeliness 	Pearson's Correlation.
HO₃: Electronic Results Transmission (ERT) System does not have significant effect on employees' performance	ERT	<ul style="list-style-type: none"> • Quality • Timeliness 	Pearson's Correlation.
HO₄: Electronic Voter Verification (EVV) System does not have significant effect on employees' performance of IEBC in Nairobi County	EVV	<ul style="list-style-type: none"> • Quality • Timeliness 	Pearson's Correlation.
HO₅: BRV, EVID, ERT and EVV Systems do not have significant effect on employees' performance of IEBC in Nairobi County	BRV, EVID, ERT and EVV	<ul style="list-style-type: none"> • Quality • Timeliness 	Multiple Regression analysis

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.1 Introduction

The chapter covers the results of data analysis on the effect of electoral information communication technologies on employees' performance, a case of independent electoral and boundaries commission in Nairobi County, Kenya. The chapter contains; the Response Rate and Demographic analysis of the respondents, effect of Biometric Voter Registration (BVR) on IEBC employees performance, effect of Electronic Voters Identification Device (EVID) on IEBC employees performance, effect of Electronic Results Transmission (ERT) on IEBC employees performance and effect of Electronic Voter Verification (EVV) on IEBC employees performance the chapter also presents the analysis of combined effect by BVR, EVID, ERT and EVV Systems on IEBC employees performance.

4.2 Response Rate and Demographic Characteristics Analysis

The study was set to analyze the effect of electoral information communication technologies on employees' performance. The study distributed a total of 98 questionnaires to the respondents and managed to collect back 91 representing 93% which was significant enough to meet the set objective. The analysis was done by using descriptive statistics including frequency and percentages. The study analyzed the respondents' demographic information that included; work station, age bracket which was mapped between 18 years and 55 years and above, respondents' gender, their work experience and highest level of education which was designed between O-level as the lowest level and PhD as the highest level. The results of the analysis are presented in Table 4.1.

Table 4.1: Demographic Characteristics Analysis

Characteristics		Frequency	Percentage
Work Station	Headquarters	22	24
	Nairobi		
	Region	69	76
	Total	91	100
Gender	Male	67	74
	Female	24	26
	Total	255	100
Age Bracket	26-35 Years	32	35
	36-45 Years	48	53
	46-55 Years	10	11
	55 years and above	1	1
	Total	91	100
Level of Education	O-Level	10	11
	A-Level	1	1
	Degree	61	67
	Masters	19	21
	Total	91	100
Work Experience	No.	Mean	Stdev
	91	8	2.098

Source: Field Data (2016)

As shown in Table 4.1, the study established that majority of the IEBC employees 76% were from Nairobi Region compared to 24% who were from IEBC headquarters. Secondly, majority of the employees were men representing 74% compared to 26% who were women. Majority of the employees were within the age bracket of 36-45 years representing 53% of the total workforce in both the Headquarters and Nairobi Region, 35% were 26-35 years, 11% were 46-55 years and 1% were 55 years and above. Majority 67% had degree qualification, 21 % had masters' degree, 11% had O-levels and 1% had A-Levels qualification. Majority of employees had worked for an average of 8 years which was the mean age of 2.098 standard deviation.

The above findings indicated that IEBC had not complied with the Constitution of Kenya 2010 requirement that organizations should employ at least 30% gender representation. This was because of women working in the Headquarters and Nairobi Region represented 24% compared to men who were 76%. Secondly, majority of

employees (65%) were aged above 35 years, which is likely to cause skills gap and also succession challenges compounded by the current Government Policy of freeze on employment in the Civil Service because of the high wage bill. Lastly, the findings showed that the average employees in IEBC had worked for 8 years indicating that they were part and parcel of the introduction of electoral voting technologies introduced five years ago. The IEBC secretariat was constituted in January 2010 with minimal staff turnover; therefore the mean work experience of 8 years was within the period the research was conducted. The minimum number of years employees had worked for were 3 years whereas the maximum number of years worked were 8.

4.3 Descriptive analysis of Electoral Technologies variables

4.3.1 Awareness of Electoral Technologies

The Electoral Technologies variables presented in this analysis included; respondents awareness of Electoral Technologies, use of Biometric Voter Registration (BVR) system by employees in electoral process, use of Electronic Voters Identification Device (EVID) system by employees in electoral system, use of Electronic Results Transmission (ERT) System by employees in electoral process and use of Electronic Voter Verification (EVV) System by employees in electoral process.

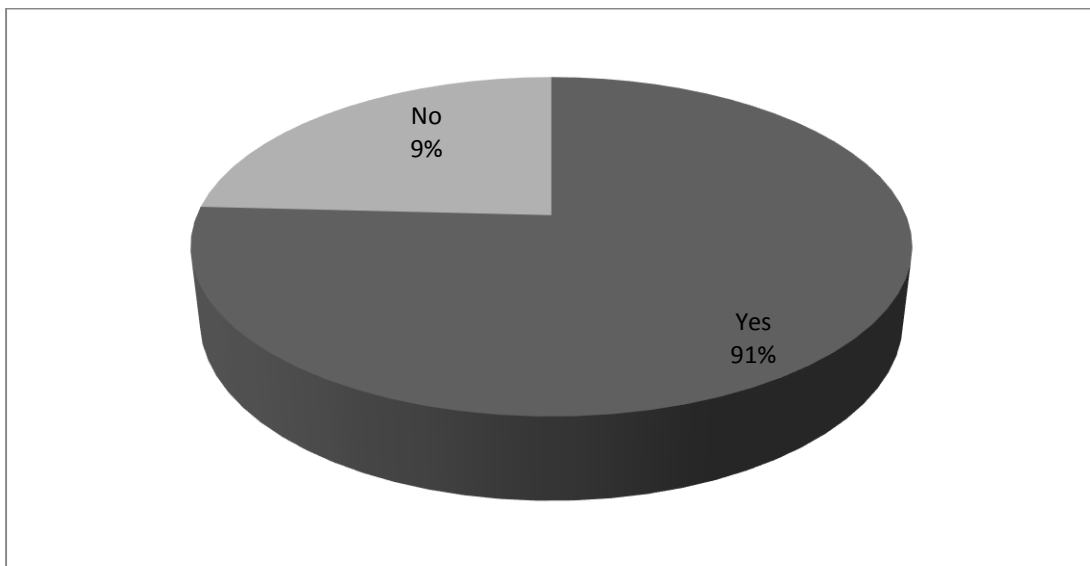


Figure 4.1: Employees Awareness of Electoral Technologies

Figure 4.1 aimed at analyzing employees' awareness of Electoral Technologies. The study established that majority employees 91% were aware of Electoral Technologies compared to 9% who were not aware.

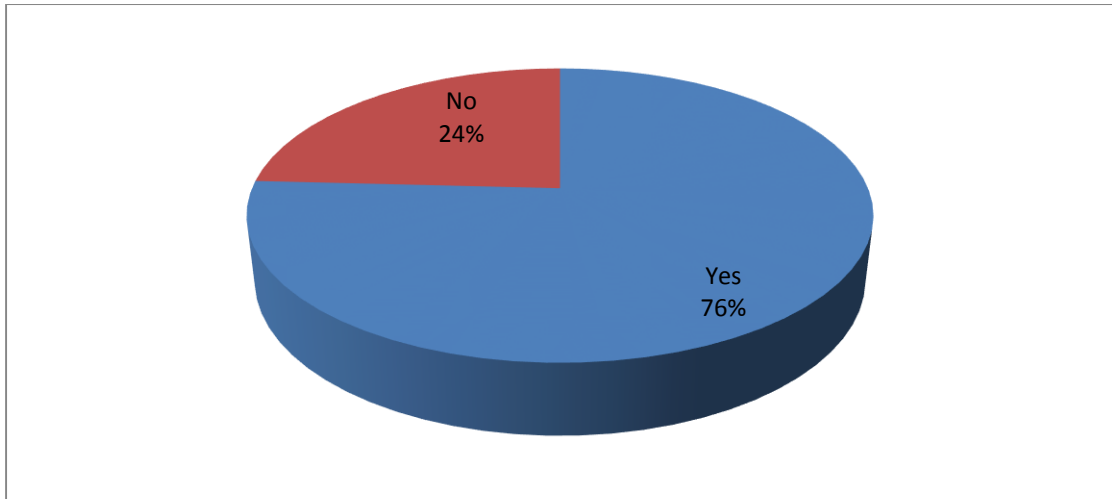


Figure 4.2: Electoral Technologies Enhances Employees' Performance

Figure 4.2 was used to present the analysis of how Electoral Technologies Enhances Employees' Performance. Majority of employees 76% confirmed affirmatively that Electoral Technologies Enhanced their Performance compared to 24% who did not affirm.

4.3.2 Use of Biometric Voter Registration (BVR) System by Employees in Electoral Process

The variables used to analyze this objective included; knowledge of BVR components, employees' ability to quickly map voter details using fingerprint unique identifier, BVR system recognizes voters finger prints, captured voter data from BVR is transmitted to central database, working with BVR makes work output error free and registration information from BVR is tamper free so my job is trusted. The study used Likert Scale to analyze effect of electoral information communication technologies on employees' performance where 5- Strongly Disagree, 4- Disagree, 3- Neutral, 2- Agree and 1- Strongly Agree.

Table 4.2: Use of Biometric Voter Registration (BVR) System by Employees in Electoral Process

Biometric Voter Registration System (BVR)	SA (%)	A (%)	NS (%)	D (%)	SD (%)	Mean
Components of BVR	53	21	0	11	15	3.5
Map voter details using fingerprint unique identifier	54	17	0	13	16	3.5
Register voter from anywhere	59	26	6	5	4	3.8
The system recognizes voters finger prints	60	22	0	10	8	3.7
Captured data is transmitted to central database	63	19	0	14	4	3.8
BVR makes work output error free	58	18	4	8	12	3.7
The voter is immediately given voters card	42	39	11	2	6	3.7
The registration information is tamper free	35	47	6	5	6	3.7

Source: Field Data (2017).

Table 4.2 was used to present findings on use of Biometric Voter Registration (BVR) System by employees in electoral process. Majority of respondents 74% agreed that they knew all components of BVR compared to 26% who disagreed. Majority of respondents 71% agreed that BVR was able to map voter details using fingerprint unique identifier compared to 29% who disagreed. Concerning voter registration from anywhere, the study established that majority of respondents 85% agreed that BVR was able to register voters from anywhere compared to 9% who disagreed and 6% who were not sure. Concerning voter identification and data transmission, the study established that majority of respondent 82% agreed that BVR system recognizes voters finger prints and captures data is transmitted to central database and also makes registration information is tamper free respectively compared to 18% who disagreed. Concerning work related errors, the study established that majority of respondents 76% agreed that BVR makes work output error free compared to 20% who disagreed and 4% who were not aware. Concerning giving voters cards the study found out that majority of respondent 81% agreed that BVR system is able to process voter immediately compared 19% who disagreed. The mean score in each element of BVR ranged between 3.5-3.8 tending towards 4 which according to Likert Scale was interpreted to mean respondents agreement with the elements.

The findings on use of Biometric Voter Registration (BVR) System by employees in electoral process showed that; the study established that employee knew all components of BVR meaning that they understood most of its functionalities and therefore were able to use the technology to register voters which is the main functionality of the kit. BVR was able to map voter details using fingerprint unique identifier which the main biometrics that the technology captures. BVR was able to register voters from anywhere making voter registration mobile and therefore taking registration to voters rather than the voters coming to a centralized place for registration. BVR system recognizes voters' finger prints whenever they wanted to verify that the registration details were saved in the system. After the registration, captures data is transmitted to central database in the IEBC servers. After the data has been transmitted to a centralized server, it is not possible to delete or edit the captured information without the necessary access rights making captured information tamper free. BVR makes work output error free since of the strict controls and at the same time making BVR system able to process voter immediately.

4.3.3 Use of Electronic Results Transmission (ERT) System by Employees in Electoral Process

The variables used to analyze this objective included; EVIDs verifies and confirm voters electronically, EVID ensures that only those who registered to vote are allowed to vote, retrieval of the voters from EVID is faster, EVID acts as electronic pole book, EVID helps me to share voter information across the network, EVID enhances employees confidence since the information is accurate and that EVID reduced the work load compared to paper system.

Table 4.3: Use of Electronic Voters Identification Device (EVID System by Employees in Electoral Process

Electronic Voters Identification Device (EVID)	SA (%)	A (%)	NS (%)	D (%)	SD (%)	Mean
The EVIDs verifies voters electronically	68	19	0	8	5	3.5
EVID ensures registered voters are vote	42	46	0	4	8	3.7
Retrieval of the voters from EVID is faster	39	41	8	5	7	3.6
EVID acts as electronic pole book	47	36	0	11	6	3.7
EVID share information across network	52	39	0	2	7	3.5
EVID enhances confidence accurate	42	46	0	8	4	3.7
EVID reduced the work load	35	49	0	7	9	3.6

Source: Field Data (2017).

Table 4.3 was used to present the analysis of use of Electronic Results Transmission (ERT) System by employees in electoral process. The study established that majority of respondents 87% agreed that the EVID is able to verify and confirm voters electronically compared 13% who disagreed. Concerning voter verification, the study found that majority of the respondents 88%. The mean score in each element of EVID ranged between 3.5-3.7 tending towards 4 which according to Likert Scale were interpreted to mean respondents agreement with the elements.

Agreed that EVID ensures registered voters are allowed to vote and enhances confidence accuracy accurate compared to 12% who disagreed. Majority of respondents 80% agreed that Retrieval of the voters from EVID is faster compared 20%. Majority of the respondents 83% agreed that EVID acts as electronic pole book compared to 17% who disagreed. Concerning information sharing, majority of respondents 91% agreed that EVID enhances confidence accuracy accurate compared to 9% who disagreed. Lastly, the study established that majority of respondents 74% agreed that EVID reduced the work load compared to paper system compared to 26% who disagreed.

This finding indicated that the EVID is able to verify whether the voter who presents himself is actually a registered voter by IEBC so that he can either be allowed to vote or when the voter presents himself to check his registered details, a process called electronic voter verification. When the voter realizes that his voting details are safely

saved in the IEBC system, the confidence level of the IEBC systems is enhanced based on EVID electoral technology. Accuracy of voter information even after many years and the ability of the system to retrieve the voters' information from EVID faster is expected to enhance employees work performance. EVID acts as electronic pole book which can be printed in hard copy just like the manual pole book reducing the work load that comes with manual paper system hence making the employees to work faster.

4.3.4: Use of Electronic Results Transmission (ERT) System by Employees in Electoral Process

The key variables analyzed under Electronic Results Transmission (ERT) System include; Instant results transmission, transparent results transmission, visualized provisional results, access to provisional information, tamper free, ERT enhances public confidence and faster speed of results transmission.

Table 4.4: Use of Electronic Results Transmission (ERT) System by Employees in Electoral Process

Electronic Results Transmission (ERT)	SA (%)	A (%)	NS (%)	D (%)	SD (%)	Mean
Instantly transmit voters results	34	26	0	28	12	4.0
ERT Enhance transparency	32	41	0	20	7	4.0
Display and visualize provisional results	34	32	8	16	10	3.8
ERT Provide access to provisional elections data	39	43	0	14	4	3.8
ERT is tamper free and therefore transparent	39	41	0	7	13	3.7
ERT give public confidence	31	42	0	15	12	4.0
ERT fast in availing results	42	39	6	7	6	4.0

Source: Field Data (2017).

Table 4.4 was used to present the analysis of use of Electronic Results Transmission (ERT) System by employees in electoral process Electronic Results Transmission. The study established that majority of the respondents 60% agreed that ERT can instantly transmit voters' results to results centre compared to 40% who disagreed. Majority 73% agreed that ERT Enhance transparency through electronic transmission of provisional results compared to 27% who disagreed. Concerning results display

and visualization, the study established that majority of respondents 68% agreed that ERT can display and visualize provisional results at the tally centers compared to 26% who disagreed and 8% who were not sure. Majority 82% agreed that ERT Provide access to provisional elections data compared to 18% who disagreed. Majority 80% agreed that ERT is tamper free and therefore transparent compared to 20% who disagreed. Electoral process is dependent on public confidence and therefore majority of the respondents 63% agreed that ERT give public confidence on my work compared to 37% disagreed. Last, the study established that majority of the respondents 81% agreed that ERT took very short time to make everybody know results compared to 13% who disagreed and 6% who were undecided. The mean score ranged from 3.7-4.0 tending towards 4 which according to Likert Scale meant that the respondents agreed on the use ERT technology.

The finding established that ERT was able to instantly transmit voters' results to results centre immediately they captured at the constituency level therefore achieving the minimum transparency by electronically transmitting results and also reduces voters' anxiety when it took days for the results to be physically delivered to the National Tallying Centre from the Constituency Tallying Centre. Concerning results display and visualization, ERT displays and visualize provisional results at the National Tallying Centre for the benefit of the public viewing and also broadcast by the media houses. ERT is also tamper free and therefore transparent compared to manual electoral voter system therefore the actual votes at the Constituency Tallying Centre is the same vote transmitted to the National Tallying Centre. Electoral process is dependent on public confidence and ERT achieves this by restoring public confidence on electoral staff work and also making them efficient because ERT takes very short time to make everybody know results.

4.3.5: Use of Electronic Voter Verification (EVV) System by Employees in Electoral Process

The main variables used in the analysis included; EVV ability to keep and retrieve voters' historical data, EVV ability to verify the voter the way it is, EVV ability during litigation to verify voter, EVV ability in automatically ordering voters list according to end user needs and the fact that EVV takes short time to give the required output.

Table 4.5: Use of Electronic Voter Verification (ERT) System by Employees in Electoral Process

Electronic Voter Verification (ERT)	SA (%)	A (%)	NS (%)	D (%)	SD (%)	Mean
EVV keeps voters' historical data	56	28	0	5	11	3.8
EVV can retrieve voter historical data	49	31	0	11	9	3.7
EVV can verify the voter the way he is	37	43	8	6	6	3.9
EVV can be used during litigation	35	42	0	14	9	4.0
EVV automatically orders voters list	53	37	0	3	7	4.0
EVV takes short time to give output	51	38	0	5	6	3.9

Source: Field Data (2017).

Table 4.5 was used to analyze respondents view on how the use Electronic Voter Verification (ERT) System by Employees in Electoral Process. The study established that majority of respondents 84% agreed that EVV had ability to keep and retrieve voters' historical data compared to 16% who disagreed. Concerning voter verification, majority of respondents 80% agreed that EVV had ability to verify the voter the way it is compared to 20% who disagreed. Sometimes elections end up in court of law and therefore majority of respondents 77% agreed that EVV was a useful tool during litigation compared to 23% who disagreed. End user data access, organization and manipulation are end user activities available in electoral technologies which the study established that the majority 90% agreed that EVV had ability in automatically ordering voters list according to end user needs compared to 10% who disagreed. Last, information verification speed is paramount for accurate data use which the study established that majority of respondents 89% agreed that EVV took short time to give the required output compared to 11% who disagreed. The mean for EVV technology ranged between 3.7-4.0 tending towards 4 which according to Likert Scale was respondents' agreement on the use EVV.

The above findings indicated that EVV had many benefits in enhancing employees work performance. Some of the distinct advantages that EVV passed on to employees work environment included; EVV ability to keep and retrieve voters' historical data, EVV ability to verify the voter the way it is, EVV ability during litigation to verify

voter, EVV ability in automatically ordering voters list according to end user needs and the fact that EVV takes short time to give the required output.

4.4 Hypotheses Testing

This section presents results of hypotheses testing about the relationship between electoral technologies: Biometric Voter Registration (BVR), Electronic Voters Identification Device (EVID), Electronic Results Transmission (ERT) and Electronic Voter Verification (EVV) System; and employees' performance. The section also presents results on the electoral information communication technologies on employees' performance.

To determine the effect of effect of electoral information communication technologies on employees' performance, Pearson's product-moment correlation was used. The results of the analysis are presented in Table 4.6.

Table 4.6: Correlation of electoral information communication technologies and employees' performance

	BVR	EVID	ERT	EVV	Performance
BVR	1	.204	.006	.311**	.447**
		.053	.959	.003	.041
EVID	.204	1	-.033	-.006	.509**
	.053		.757	.955	.000
ERT	.006	-.033	1	.192	-.061
	.959	.757		.069	.565
EVV	.311**	-.006	.192	1	.757
	.003	.955	.069		.000
Performance	.447**	.509**	-.061	.757	1
	.041	.000	.565	.000	

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

HO₁: The use of Biometric Voter Registration (BVR) system does not have significant effect on IEBC employees' performance.

The study established a weak positive correlation ($r=0.447$) and significant relationship ($P=0.041<0.05$) between Biometric Voter Verification System and employees performance indicating that Biometric Voter Registration System significantly affected employees performance at IEBC. Hence, the HO_1 was rejected. This finding indicated if IEBC enhances the use of Biometric Voter Verification System in the electoral technologies, it will significantly affect employees' performance. This finding is supported by Case (2012) who carried out an empirical study on the impact of communication technologies on individual workers' productivity. The study established that to seek how productivity can be improved with the use of communication technologies one has to apply a holistic view to unify the whole organizations communication process. Today's users have a fairly good understanding of the capabilities and possibilities that technologies offer to enhance their work.

HO₂: The use of Electronic Voters Identification Device (EVID) system does not have significant effect on IEBC employees' performance.

The study established a strong significant positive correlation ($r=0.509$), ($p<0.05$) between Electronic Voter Identification (EVID) and employees performance. Therefore HO_2 was, rejected. This finding indicated that when IEBC enhances the use of Electronic Voter Identification (EVID) System in the electoral technologies, it will significantly enhance employees' performance in terms of employees' efficiency, job quality, timely delivery and productivity.

HO₃: The use of Electronic Results Transmission (ERT) System does not have significant effect on IEBC employees' performance

The study established a weak negative insignificant correlation ($r=-0.061$), ($p>0.05$) between Electronic Voter Transmission (ERT) System and employees' performance indicating that Electronic Voter Transmission (ERT) System did not significantly affected employees performance at IEBC. Hence, the HO_3 was accepted. This finding indicated that the use of Electronic Voter Transmission (ERT) System in the electoral technologies did not significantly enhance employees' performance measured in terms of job quality, timely delivery and productivity.

HO₄: *The use of Electronic Voter Verification (EVV) System does not have significant effect on IEBC employees' performance.*

The study established a strong positive correlation ($r=0.757$) and significant relationship ($P=0.000<0.05$) between Electronic Voter Verification (EVV) System and employees' performance indicating that Electronic Voter Verification (EVV) System significantly affected employees performance at IEBC. Hence, the HO₄ was rejected. This finding indicated that the extent to which IEBC enhances the use of Electronic Voter Verification (EVV) System in the electoral technologies significantly enhance employees' performance measured in terms of job quality, timely delivery and productivity.

HO₅: *The combined use of BVR, EVID, ERT and EVV Systems do not have significant effect on IEBC employees' performance.*

The study used a multiple regression analysis to test HO₅. The results of the analysis are presented in Tables 4.7 and 4.8.

Table 4.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.792 ^a	.627	.610	.668

The R² value indicates how much of the dependent variable, employees performance, was explained by the independent variables, Biometric Voter Registration (BVR), Electronic Voter Identification (EVID), Electronic Results Transmission (ERT) and Electronic Voter Verification (EVV) Systems. In this case, the R Squared is 0.627 indicating that 62.7% of the variation in employees' performance is explained by the independent variable. The difference, that is, 37.3% of the variation in employees' performance is explained by factors that are not included in this study.

Table 4.8: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	64.483	4	16.121	36.121	.000 ^b
Residual	38.382	86	.446		
Total	102.864	90			

The predictor were “ BVR, EVID, ERT and EVV” predicting the outcome which was employees performance measured in terms of “quality of work, timeliness of delivery and productivity”. Table 4.8 indicated that the regression model predicted the outcome variable significantly with $p=0.000$, which was less than 0.05, and indicated that; overall, the model statistically and significantly predicted the outcome variable.

Table 4.9: Full Regression Model

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig (p).
		B	Std. Error	Beta		
	(Constant)	0.842	0.748		1.125	0.264
	BVR	0.020	0.130	0.015	0.150	0.881
	EVID	0.790	0.147	0.504	5.366	0.000
	ERT	-0.017	0.078	-0.020	-0.212	0.833
	EVV	-0.144	0.110	0.129	-1.303	0.196

a. Dependent Variable: Employees' Performance

As indicated in Table 4.9, from the unstandardized coefficients, the following equation was developed:

$$y = 0.842 + 0.015x_1 + 0.504x_2 - 0.020x_3 + 0.129x_4 + \varepsilon$$

From the full regression model, the standardized coefficients indicate that Electronic Voter Identification (EVID) System has a significant positive, effect on employees' performance whereas Biometric Voter Registration (BVR), Electronic Results Transmission (ERT) and Electronic Voter Verification (EVV) Systems have a negative effect. Further, the results indicate that Electronic Voter Identification (EVID) System has greatest effect on employees performance ($\beta=0.790$) followed by Biometric Voter Registration (BVR) System ($\beta =0.020$), Electronic Results Transmission (ERT) System ($\beta =-0.017$) and Electronic Voter Verification (EVV) System ($\beta =-0.144$). In conclusion, therefore, the hypothesis (HO₅) that the

combination use of BVR, EVID, ERT and EVV Systems do not have significant effect on IEBC employees' performance is rejected. This is because Electronic Voter Identification (EVID) System has a positive effect on employees' performance.

The above finding is contrary to a study conducted by Apentsui et al (2015) on evaluation of effective use of information and communications technology (ICT) in election administration in Northern Ghana Region. The survey method was adopted for this study targeting all the staff of the Electoral Commission in the Northern region of Ghana. In terms of effectiveness of ICT on the operations of the EC, majority of the respondents stated the use of ICT was more effective on the declaration of results than the other administrative activities.

The difference in finding could have been brought about by the use of mobile network technology in transmitting electoral results. In the Kenya case, some of the polling centres did not have mobile network coverage required for such transmission which could differ with the case in Ghana.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The aim of this study was to analyze effect of electoral information communication technologies on employees' performance, a case of independent electoral and boundaries commission in Nairobi County, Kenya. The study established the following findings;

On demographic characteristics, the findings indicated that IEBC had not complied with the Constitution of Kenya 2010 requirement that organizations should employ at least 30% of either gender. Secondly, majority of employees were past middle age, which is likely to cause skills gap and also succession challenges compounded by the current Government Policy of no more employment in the Civil Service because of the high wage bill. Lastly, the findings showed that on average the employees in IEBC had worked 8 years indicating that they were part and parcel of the introduction of electoral voting technologies introduced five years ago.

The study established that (BVR, EVID and EVV) had significant effect on employees' performance apart from Electronic Result Transmission (ERT) Systems which had insignificant affect employees' performance. However, it was established that H_{O1} which stated that the use of Biometric Voter Registration (BVR) system does not have significant effect on IEBC employees' performance was rejected since there was a strong positive correlation. This indicates that the use of Biometric Voter Registration System in the electoral technologies had significantly affected employees' performance.

Further, H_{O2} which stated that the use of Electronic Voters Identification Device (EVID) system does not have significant effect on IEBC employees' performance, after computation of a Pearson correlation, there was a strong positive correlation between Electronic Voter Identification (EVID) and employees' performance. The H_{O2} was, therefore, rejected. This finding indicated that the use of Electronic Voter Identification (EVID) System in the electoral technologies significantly affected

employees' performance in terms of employees' efficiency, job quality, timely delivery and productivity.

HO₃ which stated that *The use of Electronic Results Transmission (ERT) System does not have significant effect on IEBC employees' performance*, the computation of the Pearson correlation, indicated insignificant correlation between Electronic Voter Transmission (ERT) System and employees' performance indicating that Electronic Voter Transmission (ERT) System did not significantly affected employees performance at IEBC, hence, the HO₃ was accepted.

HO₄ which stated that the use of Electronic Voter Verification (EVV) System does not have significant effect on IEBC employees' performance was rejected since there was positive correlation between Electronic Voter Verification (EVV) System and employees' performance indicating that Electronic Voter Verification (EVV) System had significant affected employees' performance at IEBC.

5.2 Conclusions

The main objective of the study was to analyze effect of electoral information communication technologies on employees' performance, a case of IEBC in Nairobi County. The study established that Biometric Voter Registration Technology, Electronic Voter Identification Device Technology, Electronic Voter Verification Technology had positive effect on employees performance. These three technologies (BVR, EVID, EVV) when used by employees during electoral process enhanced their work quality in terms reducing errors associated with such work. The employees are also able to deliver their work based on the set standards to make such work as precise as are expected. Using the three technologies the employees were able to deliver their work on time compared to manual electoral process. These technologies also improve employees work out put which is required in modern work environment.

Although the study established that the three technologies (BVR, EVID, EVV) positively affect employees performance, Electronic Result Transmission (ERT) did not have a positive effect on employees performance. Based on literature review, ERT was faced with challenges associated with mobile network in some parts of Kenya making the results not relayed real time. Failure of ERT system directly affects

employees' performance in terms of timely work delivery which leads to demotivation.

5.3 Recommendations

5.3.1 Recommendation for Practice and Policy

On the basis of the findings of this study, the following recommendations are important as far as analysis of effect of electoral information communication technologies on employees' performance is concerned;

First, Based on the findings of the study that EVID System had a positive effect on employees' performance, in practice, the study recommends enhancement of training on use of EVID with an aim to enhance further employees job quality, timely delivery and productivity. There is therefore a need of Human Resource Policy change at IEBC to encompass electoral technology as a conveyance not only to electoral results output but also enhancing employees performance mirrored on job quality, timely delivery and productivity.

Secondly, although there is a debate on the use of electoral technology in results delivery as a national concern, with one side of the debate observing that technology makes electoral process complex and therefore not necessary and the other side observing that electoral technology leaves behind auditable foot print of electoral process and therefore must be enhanced, the parliament should legislate laws that entrenches electoral ICT technologies in the Election Acts to give way for policies adjustment at IEBC level and strategies which should make the implementation of such technologies easy for the benefit of staff performance. Such policies and strategies should also embrace and enhance the use of other technologies; Biometric Voter Registration (BVR), Electronic Results Transmission (ERT) and Electronic Voter Verification (EVV) Systems that the study found to have a negative effect on employees performance.

5.3.2 Recommendation for Further Studies

A study on the factors contributing to the slow adoption of electoral technologies by IEBC employees, a gap that this study has identified should be conducted. This is because the study was not expansive in its objectives to address these factors which are equally important.

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APPENDICES

Appendix I: Letter of Introduction

Egerton University,
P.O. Box 536
Egerton

Dear Sir/Madam

I am a postgraduate student pursuing a Masters of Human Resource Management of Egerton University. I am currently carrying out a research project entitled “**Effect of Electoral Information and Communication Technologies on employees performance in Nairobi Region and IEBC Headquarters**”

The purpose of this questionnaire is to gather information from employees working in the IEBC employees working the Headquarters and Nairobi Region. You have been selected as one of the respondents with that kind of knowledge and experience which will assist the researcher in providing the necessary data for the study. I wish to assure you that the information supplied will be used for research purposes only and will be treated with confidentiality.

Thank you for your cooperation.

Peter Ibrae Molu
MHRM student

APPENDIX II: QUESTIONNAIRE

Section A: Respondents Demographic Characteristics

1. Please indicate the whether you work for Nairobi Region or HQs
.....
2. Write down you age 18-25 26-35 36-45 46-55 >55
3. Write down your gender M F
4. For how many years have you been working.....
5. What is your level of education? O-Levels A-Levels
Degree Masters PhD

Section B: Knowledge of Electoral Technologies

6. Are you aware of electoral technologies? Yes No
7. Please tick the technology you are conversant with
Biometric Voter Registration
Electronic Voters Identification Device
Electronic Results Transmission
Electronic Voter Verification
8. In your opinion, please tick which IEBC used in the 2013 general election
Biometric Voter Registration
Electronic Voters Identification Device
Electronic Results Transmission
Electronic Voter Verification
9. If you compare these technologies with the paper electoral system, do you agree that the enhance your job performance
Yes No

Section C: Effect of Electoral Information Communication Technologies on employees job performance

The table below shows the effect of Electoral Information Communication Technologies on employees job performance. You are required to give your level of agreement on each of the technologies by ticking where; 5 – SA – Strongly Agree, 4 – A – Agree, 3 – NS – Not Sure, 2– D – Disagree, 1 SD – Strongly Disagree

Biometric Voter Registration System (BVR)	5	4	3	2	1
	SA	A	NS	D	SD
I know all components of BVR					
I can quickly map voter details using fingerprint unique identifier					
I can register voter from anywhere					
The system recognizes voters finger prints					
The captured voter data is transmitted to central database					
Working with BVR makes my work output without any error					
The voter is immediately given an electronic voters card					
The registration information is tamper free so my job is trusted					
Electronic Voters Identification Device (EVID)	5	4	3	2	1
	SA	A	NS	D	SD
The EVIDs helps me to verify and confirm voters electronically the way he/she is					
EVID ensures that only those who registered to vote are allowed to vote					
Retrieval of the voters from EVID is faster					
EVID acts as electronic pole book					
EVID helps me to share voter information across the network					
EVID enhances my confidence since the information is accurate					
EVID reduced the work load compared to paper system					
Electronic Results Transmission (ERT)	5	4	3	2	1
	SA	A	NS	D	SD
I can instantly transmit voters results using ERT to results centre					
ERT Enhance transparency through electronic transmission of provisional results					
Display and visualize provisional results at the tally centers					

ERT Provide access to provisional elections data					
ERT is tamper free and therefore transparent					
ERT give public confidence on my work					
ERT took very short time to make everybody know results					
Electronic Voter Verification (EVV)	5	4	3	2	1
	SA	A	NS	D	SD
EVV keeps voters' historical data					
EVV can retrieve voter historical data					
EVV can verify the voter the way he is					
EVV can be used during litigation to verify voter					
EVV automatically orders voters list according to end use needs					
EVV takes short time to give the required output					

Section D: Employee Job performance

The table below shows employee job performance indicators in in relationship to electoral technologies. You are required to give your level of agreement on each of the factors by ticking where; 5– SA – Strongly Agree, 4 – A – Agree, 3 – NS – Not Sure, 2– D – Disagree, 1 SD – Strongly Disagree

Employee Job performance	5	4	3	2	1
	SA	A	NS	D	SD
Efficiency					
I am very efficient in my job due to the electoral technologies					
In input little effort for huge output					
I deliver my job beyond expectation					
My job workflow streams because of the electoral technologies					
Quality					
I deliver my work based on standards due to the electoral					

technologies					
My work is precise as very precise					
the electoral technologies is a replica of my standards					
I deliver my work and is willing to stand by it due to the electoral technologies					
Timeliness					
I deliver my work before set time					
I put in less time compared to paper system					
I have improve my time management ability due to the electoral technologies					
each job is timed and it timed out when delay					
Productivity					
My work output has improved					
My productivity justifies my compensation since introduction of the electoral technologies					
the electoral technologies has naturally created productive work environment					
the electoral technologies has brought about innovation which has is a measure of my productivity					
Employees complements and value each other's productivity due to the electoral technologies					