Electronic Voting; A Possible Solution for Sub-Saharan Africa?

A focus on the Ghanaian Electoral System

Bachelor Thesis Within Informatics
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Jönköping, June 2010
Abstract

One of the major reasons for political instability in Sub-Saharan Africa originates from the way elections are conducted. Most African countries have quite a handful of electoral malpractices which lead to political instability, civil wars and low economic growth. Electronic voting might be a solution to the election problems and thus bring in a stable political atmosphere which attracts investors.

This thesis looks at the prospects and challenges of implementing e-voting in Ghana and Sub-Saharan Africa as a solution to the current manual paper-based system and proposes a framework and requirements which can be used as guidelines for its adoption and implementation.

The thesis has been conducted by studying literature on electronic voting and Diffusion of Innovations Theory. Furthermore, a case study has been conducted on the Ghanaian electoral process, by conducting interviews with the Danquah Institute of Ghana and through questionnaires to some Ghanaian citizens in both the rural and urban areas of Ghana.

The main results from the thesis show that the adoption and subsequent implementation of e-voting in SSA countries, can only be possible if the governments show strong commitment and support by securing funds through donor organizations, and providing the necessary IT infrastructure and other resources needed to support the project. Voter education too is an absolute necessity. The adoption of e-voting is mainly based on how the innovation will be diffused and the perceived benefits that will be derived from the investment. Hence, particular attention should be paid to the various communication channels, especially the media, through which messages are passed across to the citizens.
Acknowledgements

We would like to express our appreciation and gratitude to the people without whom we would not have been able to make this thesis a success.

Firstly, we thank the Almighty God for having given us strength and wisdom to do this work.

We equally have to be grateful to our supervisor, Associate Professor Jörgen Lindh, for his incessant support, encouragement and guidance throughout the writing of this thesis.

Special thanks go to Ulf Larsson, our program coordinator and Dr. Richard Boateng (Director of Research and Operations, ICITD) who offered their time, comments and motivation which helped us progress with our work.

We will always be grateful to the Danquah Institute for granting us audience and answering our interview questions without which we would not have been able to arrive at our conclusions. Thanks go to the respondents of our questionnaires who provided us with valuable data to fulfill the purpose of our thesis.

Finally, we express our sincere gratitude to our families and friends who contributed in one way or the other to give this thesis the value it deserves.

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1 INTRODUCTION

Information and Communication Technology (ICT) has in recent years grown into one of the basic building blocks of our modern society. The world is rapidly changing and institutions everywhere are using ICT tools to computerize their systems and meet up with the challenges of modernization and globalization. Consequently, electronic voting (e-voting) is slowly gaining ground and countries are embracing it as a part of their democracy, modernization and a way forward for peace and development. Most organizations today focus on globalization, and this can be affected by the business environment. The political atmosphere of a nation would determine its economic growth. A stable political atmosphere would imply a rapid and high economic growth while an unstable political atmosphere would imply a low and slow economic growth.

This chapter covers a general overview of the thesis by looking at the background, problems and research questions. It also explains our motivation for this topic and a brief description about democracy and elections in sub-Saharan Africa in general and Ghana in particular. The discussion ends by looking at the purpose and the delimitation of the thesis.

1.1 BACKGROUND

Most of the countries in sub-Saharan Africa achieved independence in the early part of the 1960s. The post-colonial period was characterized by military rulers and coups d’état in many of the African countries like Ghana, Nigeria, Gabon, Niger, Burkina Faso and Cote D’Ivoire just to name a few. African countries have been practising democracy since the introduction of multi-party democracy in the early 1990s (Lindberg, 2004). However, the system of government actually practised in Africa today is not as it is defined. Most if not all, of the leaders do practise Personalistic Leadership; in which leadership styles are indistinguishable from monarchial political styles (Mazrui, 2007). African personal rule can be characterized as authoritarian, arbitrary ostentatious and inefficient. Many of these leaders regard themselves as ‘father’ of their nation. Individual challengers are intimidated or even assassinated by the security forces, while group challenges are countered by bannings, harassment, election manipulation and the withholding of state resources from regions where dissidents draw their support (Thomson, 2004, p. 116).

According to Tadayoshi (2003), election is an important element of any democracy where citizens decide how they wish to be governed and who will be their representatives (cited in Ayo & Ekong, 2008). Thus, elections must not only be free and fair, but efficient, transparent, cost-efficient, and credible to the electorate, in order for the results to be acceptable. In the past and today, elections are conducted manually in sub-Saharan Africa. Such a practice requires that the voters cast their votes using paper-based ballot boxes which have proven to be inefficient owing to the disgruntlement of citizens after proclamation of results (African Elections Database, 2007). As such, this thesis will investigate if electronic voting is a better alternative in order to avoid manipulation of elections and ameliorate the electoral system. Some countries around the
world have successfully adopted and implemented a change in their electoral system, rendering it more credible. Some of these countries include Switzerland, India, USA, Canada, Brazil, Japan, France, Australia (ACE Electoral Knowledge Network, 2010). The aforementioned countries have actually implemented electronic voting, if not entirely, as a pilot system. Countries like Kenya, experienced post-election conflicts due to allegations of election malpractices (Dagne, 2009). This now has led to a few SSA countries like Ghana, Kenya, Nigeria and South Africa 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. (E-voting Database, 2010).

1.2 OVERVIEW OF THE GHANAIAN ELECTORAL SYSTEM

The Republic of Ghana, a free democratic country, gained its independence in 1957 and has been organizing general elections since the return of multi-party democracy with the first one held in 1992 (African Elections Database, 2007). According to the 1992 Constitution of Ghana, the Electoral Commission is one of the governance institutions (Electoral Commission of Ghana, 2000). General elections are held in Ghana every four years with the electorate choosing representatives in the form of parliamentarians and a president. An independent body, the Electoral Commission, (hereafter referred to as EC), established by the Electoral Commission Act (Act 451) of 1993, manages and conducts the elections. The job of the EC is as follows:

a) To compile the register of voters and revise it at such periods as may be determined by law;

b) To demarcate the electoral boundaries for both national and local government elections;

c) To conduct and supervise all public elections and referenda;

d) To educate the people on the electoral process and its purpose;

e) To undertake programmes for the expansion of the registration of voters and

f) To perform such other functions as may be prescribed by law (Electoral Commission of Ghana, 2000).

According to the Commonwealth Secretariat, the electoral system in place in Ghana is one of the best in Africa due to its independent and unbiased nature but that notwithstanding, the electorate still think it is open to manipulations since the process is manual. The general elections of 2008 were marred in some constituencies by tribalism and some acts of vandalism, which the EC claimed to be isolated incidents. These could easily have led to post-elections conflicts if it had happened in any other African country. A typical case to be cited is that of Kenya which was plunged into conflict after the presidential elections of December 2007 which was severely marred by allegations of fraud and rigging (Dagne, 2009). It should be noted that International observers like the Commonwealth Observer group which witnessed the last elections in Ghana held in
2008, commended the EC for organizing credible elections and for its free, fair and transparent nature (Commonwealth Secretariat, 2008).

In spite of the above mentioned qualities of Ghana’s electoral system, e-voting implementation can add to the credibility and transparency of the electoral system. The government is also decentralized which advocates of decentralization believe leads to positive outcomes in development and democracy. In February this year, the Danquah Institute in Ghana which is a media, research and policy analysis center, alongside the EC, held a workshop to assess the viability of an electronic voting system in Ghana for the next general elections in 2012 (Danquah Institute, 2010). Hence, this is suggestive that the EC is exploring paths towards implementing e-voting. Consequently, it is not too premature to look at the prospects and challenges and also carry out a research to assess Ghana’s e-readiness.

Previous studies and research on teledemocracy and governance in SSA which is discussed in the literature review, have mentioned e-voting or the use of some form of technology in elections as an improvement on the current manual process. Hence, emphasizing its necessity. However, this thesis takes a step further in bridging the gap by providing a model which SSA countries can adopt whenever they are ready for e-voting.

1.3 PROBLEM DISCUSSION

The electoral processes in SSA are experiencing a lot of irregularities. A case worth mentioning is that of Cameroon where elections are conducted under the supervision of a body appointed by the ruling government to both conduct and observe the elections. The absence of an independent electoral commission gives way to irregularities (PICAM Electoral Reform in Cameroon, 2006). These have led to post-elections conflicts as was the case recently in Kenya’s last general elections in 2007 (Dagne, 2009). There were also some challenges in the previous elections in Ghana which were held in 2008 hence, the EC is exploring measures to increase transparency and credibility. The challenges faced by the ECs of SSA have been categorized below into two main groups; Registration Problems and Problems Associated with Conduct of Elections.

1.3.1 Registration Problems in SSA

Redundancy in voter information or bloated registers is a delicate and ever present issue. This often occurs either by accident, ignorance or intention to fraud. It is very common to find voters’ information appearing more than once and in different parts of the country. According to the Carter Center (2008), which observed the 2008 general elections in Ghana, the EC had to remove 349,000 names in order to correct the bloated voter register.

In the same way, missing voter information is a problem when conducting elections and as such should be addressed. Some citizens register to vote but cannot find any information about their registration anywhere. This could stem from misspelled names and pho-
tos not matching names as was the case in Ghana (US Department of State, 2007) . Some voters are assigned to wrong polling stations or electoral areas. Hence, they are ineligible to vote or denied their civic rights to vote and this goes to affect voter turnout too.

Deceased persons still on electoral roll (ghost names) and persons on the roll who are ineligible to vote due to identification problems like the absence of a voter’s ID card.

Under or over registration of different segments of the population; Usually, the women, young voters and the minority are the victims of such practice. This goes to affect voter turnout and impersonation thereby increasing bias in the registration process (PICAM, Electoral Reform in Cameroon, 2006).

The process of manual elections always begin with the registration of political parties and their candidates interested in participating in the elections through the voting process on election day, to the proclamation of results. A very crucial and tedious exercise is the registration of voters which takes place before election day. During voter registration period, citizens who are eligible are required to present themselves at the various registration centers and get registered for the upcoming elections. After registration, a voter’s identity card (ID) is issued to the individual which has to be kept safe until election day. Although this seems like a straightforward exercise, in actual fact, it is an expensive and complex issue.

The decentralization and distribution of election materials to the various polling stations on election day is not without its own problems. Ballot papers and boxes are sometimes hijacked by thugs no matter how secured they are whereas in some areas, election materials are always in short supply (International Crisis Group, 2007). Could the solution for managing registration and logistics lie in the use of ICT?

1.3.2 Problems with Conduct of Elections in SSA

Demographic manipulation appears to be a common phenomenon. The ruling power sets a committee that is answerable to them. As such, the results of elections are almost fixed, favouring one party and disfavouring the others (PICAM, Electoral Reform in Cameroon, 2006).

Disenfranchisement: The composition of a constituency can be altered such that it makes it impossible for some people to vote through disenfranchisement (PICAM, Electoral Reform in Cameroon, 2006).

Intimidations and Attacks on Polling Stations: This seriously affects the citizens as they get scared to go out and thus are indirectly denied their rights to vote. In the same way, it goes to reduce voter turnout as well and gives more room for impersonation (Zimbabwe Election Watch, 2008).

False counting of votes: This is a typical and voluntary malpractice by some leaders to rig elections and stay in power. The leaders do this to increase their votes and emerge with a landslide victory (Dagne, 2009).
Ballot paper problems: During elections, some areas do not have the actual number of ballot papers required. Some polling stations do not receive ballot papers on time and have to settle for late voting. This leads to disenfranchisement and citizens are not able to exercise their civic rights. There is also a problem of misleading or confusing ballot papers; using ballot papers to discourage votes for a particular party or candidate. Besides, there is the problem of ballot stuffing whereby a voter can cast more votes than they are entitled to (International Crisis Group, 2007).

Time lags in the electoral process: Some parts of the country receive ballot papers too late and the elections do not commence at the same time at all polling stations. The electoral process as a whole is very slow and takes a great deal of time for the process to end with all voters having participated (Jinadu, 2007).

There are also problems such as impersonation, misrecording of votes and misuse of proxy votes as well as destruction or invalidation of ballots.

E-voting as described above, could be a solution to some of these problems with the electoral processes in SSA. This thesis investigates and sets up a framework which will act as a guide for Ghana and other SSA countries interested in implementing e-voting.

1.4 RESEARCH QUESTIONS

The research questions in this thesis relate to how e-voting if implemented can reduce election malpractices hence increasing voter turnout. How electronic voting can also reduce logistic and other problems encountered during elections in sub-Saharan Africa with particular reference to Ghana. The thesis also discusses the major requirements both technical and non-technical, which need to be met in order to deploy e-voting in Ghana and SSA. The main research questions are:

a) What are the requirements that must be met in order to deploy an e-voting system in Ghana?

b) Why are there irregularities and malpractices whenever elections are conducted?
   ➢ How can e-voting system reduce election malpractices?

c) What are some of the drawbacks of such a system?
   ➢ How can these drawbacks be minimized?

1.5 PURPOSE

The purpose of this thesis is to look at the requirements, prospects and challenges of implementing an e-voting system, to propose e-voting as a possible solution to the malpractices with the current manual electoral process in Ghana. The thesis also focuses on other countries especially India which have already used e-voting and how it has helped improve on their electoral systems. Emphasis has been laid on India’s e-voting system
and model of electronic voting machine to see if it can be applicable in the Ghanaian environment because of cultural and social similarities.

The adult literacy rate in Ghana that is 71.7% for males (UIS estimate, 2007) and 58.3% for females (UIS estimate, 2007) also plays a big role and hence is discussed in this paper. The thesis also focuses on the level of Information and Communication Technology (ICT) infrastructure and usage in Ghana.

1.6 DELIMITATION

This thesis is limited to the prospects and challenges of implementing electronic voting hence, does not discuss deeply the security issues involved. The study does not cover electronic voting over the internet and is only limited to electronic voting with the use of machines. Even though the study focused on India’s model of electronic voting machines, the critical success factors leading to its successful implementation and the drawbacks encountered are not discussed in this paper. The study is limited to sub-Saharan Africa and does not cover the northern part of Africa which is predominantly Arab and culturally different from the countries in sub-Saharan Africa.

1.7 STAKEHOLDERS

Our stakeholders or interested parties could be the governments of Ghana and other sub-Saharan African countries interested in adopting and implementing e-voting in order to improve on their electoral systems. In the academic field, researchers and students who are interested in researching more on this topic will find this thesis useful as it has been written it in a simple way, based on a scientific study.

1.8 DEFINITIONS

Democracy is a system whereby the supreme power depends on the citizens or electorate who elect people to represent them.

Election is an act of democracy whereby a population chooses someone to govern or represent them.

Electronic Voting (e-voting) refers to a process whereby people can cast their secure and secret ballots through a large-scale communication system by electronic means with vote counting also being carried out electronically.

Electronic Voting Machine (EVM) is a small device used to carry out elections electronically.

Information and Communication Technology (ICT) encompasses all the different forms of telecommunication, network and computing devices used for data processing, storage and transmission.
Sub-Saharan Africa (SSA) refers to all the countries in Africa, which lie south of the Sahara. It is worth noting that, the countries of North Africa are predominantly Arab, relatively more developed than SSA and most of the residents identify themselves with the Middle-East.

1.9 DISPOSITION OF THESIS

**Chapter 1:** A general overview of the thesis which looks at the background, problems and research questions. A brief description about democracy and elections in sub-Saharan Africa in general and Ghana in particular is discussed.

**Chapter 2:** This chapter of the thesis looks at the different theories in relation to the purpose and research questions which is further used to analyze the empirical findings. A framework is developed for e-voting adoption based on our aim, literature study and research questions.

**Chapter 3:** The choice of research method, data collection techniques and the various types of interviews, literature study and questionnaires are the sub topics discussed here.

**Chapter 4:** This chapter, gives a report on the interviews conducted and the questionnaires administered.

**Chapter 5:** An analysis of the empirical findings was made with the help of theories, to arrive at conclusions.

**Chapter 6:** This is a summary of what has been discussed in the entire work and concludes with reflections and proposals for further research.

Fig 1.1: A diagrammatic representation of the chapters
2 FRAME OF REFERENCE

This chapter of the thesis looks at the different theories in relation to our purpose and research questions which were used to analyze the empirical findings. A framework is also developed for e-voting adoption based on our aim, literature study and research questions.

2.1 SOME E-VOTING ADOPTION STORIES

All new technologies have a degree of uncertainty and risk in relation to how they will diffuse or be perceived by an organization and the society at large. With e-voting being an innovation, hence a new technology in SSA, we have therefore chosen to use the Diffusion of Innovations theory to analyze the rate at which the adoption of e-voting will diffuse into the SSA region. 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 a 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 (Global Research, 2009).

Nevertheless, there have been success stories on e-voting with some countries like India and Brazil, adopting the technology on a large scale and using it during elections throughout the entire country. The case of India is of particular interest to this study because of some cultural and social similarities which the country shares with SSA.

2.2 HOFSTEDE’S CULTURAL DIMENSIONS

Culturally, the people of India are still tied to their tradition and culture just like the people of SSA and despite the country’s growing economy, poverty is still widespread. This is seen in Hofstede’s Cultural Dimensions ranking where both India and Ghana as well as other SSA countries show a high Power Distance Index (PDI), indicative of a society with a high inequality of power and wealth. Another proof of cultural similarities between India and SSA is the Uncertainty Avoidance Index which is low and indicative of a society that is tolerant and open to ideas and unstructured situations as long as they believe in those ideas to be the ‘Truth’ they have been searching for. In terms of Masculinity, India scores higher than Ghana (Hofstede Cultural Dimensions, 2009). The low score for Ghana shows the extent to which the Government of Ghana and other Non-Governmental Organizations have gone to empower women through education and other similar programs. Inspite of the above mentioned characteristics, India has em-
braced ICT tools with e-voting being chosen over the traditional paper-based manual voting systems in elections.

Socially, like all developing countries, India’s urban regions are more advanced in terms of infrastructure and internet connectivity than the rural areas and the digital divide between these two regions is very similar to what is being experienced in SSA. However, the benefits of ICT have been spread to the deprived rural regions and according to the Indian Express (2007), it is believed that ICT will bridge the digital divide. We therefore take a look at the EVM as it is the type of ICT that has been implemented by India for e-voting and which Ghana and other SSA countries are planning to adopt.

2.3 THE ELECTRONIC VOTING MACHINE

Traditional voting entails casting a vote by inserting a ballot paper into a sealed box. This is the kind of voting that SSA countries use and more often than not, the general electorate and observer groups witness irregularities and a lot of weaknesses in the system which leads to results being contested (African Elections Database, 2007). The advent of the electronic voting machine (hereafter referred to as EVM) was probably to save time, money and manpower (Indian Elections, 2009). The EVM in an attempt to solve these problems does not disregard the characteristics of voting by ballots, it makes polling a lot more expedient as well. Besides, the EVM maintains voting secrecy as is the case with ballot papers. The EVM is said to be 100 percent tamper proof and with a single press of a button at the end of polling, the results of the elections are obtained for that poll (Indian Elections, 2009). The EVM has such good qualities owing to its design, reliability and structure. It is for this reason that it has been and is being used successfully in India.

The electronic voting machine comprises basically of two units inter-linked. The EVM has a Ballot Unit for the voters and a Control Unit for the polling officers.

**The Ballot Unit:** This could be likened to the ballot box, but the main difference is that it is electronically operated. The ballot box and ballot unit of the EVM are used for the same purpose, to cast votes. This unit is quite simple and it displays the list of candidates contesting in the elections. It has an inbuilt facility, designed to incorporate party names and their symbols (Indian Elections, 2009). During the voting process, the voter only has to push on one button, pointing to his/her desired candidate. This thus explains the simplicity of EVM, its ease of use and its speed in carrying out elections. One would wonder and doubt the capacity of the ballot unit. However, a single ballot unit can hold and display the names of sixteen candidates. If four of such were connected together, then we would have sixty four candidates to be displayed in a single election. (Election Commission of India, 2009). The EVM can record a maximum of 3,840 votes (Indian Government, 2009).

**The Control Unit:** This has total control of the polling and is used by officials. It displays the total votes polled or cast, marks the end of the elections and finally declares the results (Indian Elections, 2009). It requires only a few buttons to be pushed in order to obtain the necessary information. For example, a touch on the result button to display results. Hence, it is easy to use.
As mentioned previously, the structure and design of the electronic voting machine give it particular characteristics, making it perfect for the purpose for which it was made.

The EVM is good for its independence and reliability. It is sold and delivered in a compact and reusable pack. Besides, it operates on a 6V alkaline battery power source, making it cheap to run and independent (Indian Elections, 2009).

It is a high-tech, but user-friendly. At the beginning of the elections, the polling officer only presses the power button to switch on the ballot and control units. The voter, in order to cast his/her vote, only has to press a button of their choice after choosing the candidate they want to vote for. The voter then hears a beep, as a signal to indicate their vote has been cast (Indian Elections, 2009). To prepare the machine for the next voter and maintain ballot secrecy, the officer who is required to always be at post, presses on the ballot switch. This process is iterated until all voters have participated.

The super-sensitive circuitry of the EVM does not allow for invalid votes. Embedded in the control unit, is a super-sensitive circuitry responsible to monitor election errors\malpractices such as vote duplication (Indian Elections, 2009). Suppose a voter presses two or more buttons at the same time, no matter how fast (talking about micro-seconds here), the EVM has the ability to determine which was pressed first and hence, no vote is cast.

Buried in the sealed compartment of the control unit is the result button (Indian Elections, 2009). At the end of the polling, this is pushed and the results of the elections for that poll\constituency are obtained instantly. This is quite a time saving process as it is quite easy.
How can we be sure that the EVM has not been manipulated? This was taken into consideration during the manufacture. It is for this reason that each package of the EVM comes with a sophisticated programme in assembly language that is hard to manipulate (Election Commission of India, 2009). To ensure that the programme is tamper proof and inaccessible, it has been fused onto a customized micro-processor chip at the manufacturer’s end (Indian Elections, 2009).

The results need not only be displayed, printing them out would be better, even at a distant place. Therefore, with the aid of a Download Adapter Unit (DAU), connected to the control unit and a standard printer and with the use of a modem, the results are transmitted to a distant centralised computer. The EVM could be very good at solving electoral problems and make elections a lot easier and faster.

However, it has its own shortcomings just like any other form of technology. In the same way, if not properly used, there is bound to be bigger problems than stipulated. In this thesis, we would pinpoint some of the problems associated with the EVM and propose solutions to them. We would not lay emphasis on the security aspects of the system as mentioned earlier in the delimitation section of this thesis. The solution we are trying to propose to the ECs of SSA countries comprises of a biometric scan (finger scan) for biometric registration and the EVM itself. These are both ICT components that have been made by man and as such are prone to some disadvantages. These disadvantages will be discussed in the analysis chapter.

## 2.4 Biometric Registration System

The registration process described earlier in chapter one is very similar to what takes place in countries that practise e-voting with the only difference being that the former is paper-based and slow, since it is done manually. To solve the registration problems in Ghana and other SSA, we propose that registration of voters be carried out electronically by the election officials. Hence a biometric-based voter registration should be a feasi-
ble 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 are 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) A mature and proven technology;
b) Deployable in a range of environments;
c) Easy to use devices;
d) 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). Finger scans could be cheap, but can the ECs of SSA countries afford it? Do they see it as useful? Will it be easy for them to use as defined?

The theory used in this thesis which is discussed below gives a better understanding of how these technologies can be adopted.

2.5 DIFFUSION OF INNOVATIONS THEORY

Everett Rogers, the father of Diffusion of Innovations theory, defined diffusion as “the process in which an innovation is communicated through certain channels over time among the members of a social system” (Rogers 2003, p. 5). Diffusion is a special type of communication, in that the messages are concerned with new ideas. “Communication is a process in which participants create and share information with one another in order to reach a mutual understanding” (Rogers 2003, p. 5). The innovation does not necessarily have to be new in terms of discovery and invention; it only has to be perceived as new by the organisation (Zaltman, Duncan, & Holbeck 1973). The newness thus, means that some degree of uncertainty is definitely involved in diffusion (Rogers 2003, p. 6). Uncertainty is the degree to which a number of alternatives are associated with the occurrence of an event but the relative probability of the alternatives is unknown (Rogers 2003, p. 6). Uncertainty in this context means that it is difficult to predict the structure of information, which is a means to reduce uncertainty (Rogers 2003, p. 6). In the case of e-voting, it has been around for quite sometime now in the developed countries but relatively new in SSA since it has not yet been adopted, therefore, diffusion of innovations theory in our opinion, is best suited for researching the adoption and implementation of e-voting in SSA. Diffusion theory generally studies the factors which increase or
decrease the likelihood that a new idea, in this case e-voting, will be adopted by members of a given culture.

“Diffusion is a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system” (Rogers 2003, p. 6). E-voting is a new idea and could be viewed as an innovation in SSA; its diffusion and subsequent adoption or rejection will definitely lead to social change and other consequences. Various studies have looked into the factors affecting innovation adoption and have classified them (Kim and Galliers, 2004). Rogers (1983), grouped the factors under characteristics of innovation whilst three different categories of factors were identified by Tornatzky and Fleischer (1990); organizational, technological and environmental. Searching the literature on technology innovation, three different categories can be identified: Organizational, Technological and Environmental. It is of utmost importance to consider each of these factors in detail, in order to understand how they affect the adoption of a new technological invention.

Generally speaking, these factors discussed below, will affect the rate of diffusion of an innovation, either by speeding up or slowing down its rate. Knowing the diffusion rate of an innovation, it is possible to determine the dimensions and the various strategies that account for low rate. This now gives an insight of the recommendations for a higher rate and requirements to be met in order to deploy the system. Hence, this would provide answers to our research question on requirements needed to deploy e-voting.

**Organizational Factors**

Organizational factors which researchers mostly cite include: technological capabilities of members of the organization, IT users’ community, organizational structure and size, the financial resources available, and organizational culture, management backing and support for the project, the project team and leader (Aguila-Obra & Padilla-Melendez, 2006). When Ghana finally decides to implement e-voting, the EC will be the organization at the helm of implementation. A good top management backing and support for the project will be a big boost for its success and will eventually lead to a higher and faster rate of diffusion. In relation to the technical capabilities of the members of the EC, a good training system has to be put in place to effectively train the officials who will operate the new system and the Electronic Voting Machines.

**Technological Factors**

Innovations that are perceived by individuals as having a greater ease of use and usefulness, less complexity, relative advantage, observability, compatibility and triability will be adopted more rapidly than other innovations. Questions that an individual will ask pertaining to a new idea include: “What is the innovation?” “How does it work?” “Why does it work?” “What are the innovation’s consequences?” and “What will its advantages and disadvantages be in my situation?” (Rogers 2003, p. 14). These factors are related to barriers to technology adoption and its perceived benefits. Users must perceive the positive effects and benefits of an innovation before accepting to adopt it otherwise, it will be rejected. The technology infrastructure which will support the design and deployment of e-voting has to be in place before the project can take off. The technology infrastructure in the urban areas in Ghana like in other SSA is more developed than in the rural areas where basic amenities like electricity is inadequate, talkless of internet network connectivity. The digital divide is very apparent between the rich and the poor.
and also between the urban regions which are more developed and the rural areas which are less developed. This digital divide has to be bridged with the help of ICT and poverty reduction in order for the country to be able to benefit from the ‘Information Age’.

In February 2007, the Ghana government in a bid to improve the ICT infrastructure and bridge the technology gap in the country, launched a project to install optic fibre facilities in the whole country. This was to ensure affordable access to high speed broadband connectivity throughout the country. The first phase was to reach only the middle part of the country and the second phase was to extend the facility to reach the northern sector (Ghanaweb, 2007).

The adult literacy rate in Ghana according to UNESCO statistics is 71.7% for males (UIS estimate 2007) and 58.3% for females (UIS estimate 2007). The literacy rate plays a very important role in terms of technology innovation diffusion in a given society. In fact, the higher the literacy rate of a given society, the less difficult it becomes to communicate information and create awareness about an innovation. In order to embark on e-voting, the government has to raise the literacy rate of the country by educating the masses and sensitize them about the importance and benefits of ICT and how the country cannot be left behind whilst others are advancing with digitization.

**Environmental Factors**

Various researchers have identified the following environmental factors pertaining to IT adoption (and to be more specific, adoption of internet technologies): pressure from competitors, customers or suppliers, the role of government, technological infrastructure, partners’ alliances, technology consultants, image of internet technology and users’ expectations (Aguila-Obra & Padilla-Melendez, 2006).

Some researchers have incorporated all these factors into one model (Kamal 2006; Mehrtens et al, 2001; Kuan & Chau, 2001) and treating them as one dynamic framework. Most of these researchers base their studies on developed countries, however, there are a few conference papers as cited below in the literature review, which also focus on the adoption and implementation of e-voting in SSA.

Rogers (1995), intergrated the above factors into one model referred to as the Diffusion Innovations model.

**2.6 E-VOTING ADOPTION AND ITS REQUIREMENTS**

We define e-voting adoption and implementation in this study as a process whereby people can cast their secure and secret ballots through a large-scale communication system by electronic means with vote counting also being carried out electronically. The likelihood of e-voting adoption depends on a number of requirements that have to be met before its deployment. We therefore discuss below, the following requirements and how they will either positively or negatively impact the adoption and deployment of e-voting in order to answer our research question.
Top Management Support

Tolbert and Zukar (1983), state that IT innovation will be highly possible if the political environment within an organization, is in support of the new changes. Top management support is crucial in the acquisition and diffusion of innovation (Orlikowski, 1993). Top management has to support the new change by setting aside the required resources for the new project which according to this study, is e-voting.

In order to have a guideline for our study based on the research questions, we made some assumptions or research hypotheses, which helped us collect the right kinds of data. The choice of research hypothesis over statistical hypothesis was simply because we adopted a qualitative approach in the thesis as opposed to a quantitative method. We have used ‘H’ to stand for hypothesis, thus H1 stands for hypothesis 1 and so forth.

Therefore, our hypothesis is that:

**H1:** If there is top management support, then it will positively influence the adoption of e-voting.

IT Capability and Competency

By IT capabilities, we mean the IT resources and IT know-how of personnel in an organization. The organization that has to implement e-voting should have members who are technically competent in knowledge and expertise. According to Cohen and Levinthal (1990), an organization’s ability to appreciate an innovation, assimilate and apply it to new ways, is largely due to its pre-existing knowledge in areas relating to the intended innovation.

E-voting adoption requires that the implementing organization possesses the necessary IT related skills, knowledge and resources like telecommunication knowledge and IT security and maintenance knowledge. Therefore, our hypothesis is that:

**H2:** If there is a high level of IT knowledge with availability of IT resources at the EC, then it will positively influence the adoption of e-voting.

2.6.1 PERCEIVED ATTRIBUTES OF INNOVATIONS

The characteristics of innovations as perceived by individuals, help to explain their different rates of adoption (Rogers 2003 p. 15). The characteristics include relative advantage, compatibility, complexity, triability and observability.

Relative Advantage

Rogers defines relative advantage as “the degree to which an innovation is perceived as better than the idea it supercedes” (Rogers 2003, p. 15). “The degree of relative advantage could be measured in economic terms but social prestige factors, convenience and satisfaction are also important factors” (Rogers 2003, p. 15). If an individual considers the innovation to be advantageous, in terms of its perceived benefits, then its adoption rate is very likely to be higher. The advantages e-voting has over the traditional paper-based manual voting cannot be over emphasized.
E-voting allows faster collation of results, lesser cost, reduces spoilt ballots, environmentally friendly as paper is not wasted, greater accuracy, improved accessibility and also reduces human and mechanical error (Election Commission India, 2009). Therefore, our hypothesis is that:

**H3: If there is a high level of relative advantage thus perceived benefits, then it will positively influence the adoption of e-voting.**

**Compatibility**

This is the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters. An idea that is incompatible with the values and norms of a social system will not be adopted as faster as an innovation that is compatible (Rogers 2003, p. 15).

If e-voting is considered relevant and compatible with the environment, cultural and social beliefs of the people of Ghana, then its adoption rate would be rapid. In order to ensure compatibility, Government should carry out a mass referendum. Therefore, our hypothesis is that:

**H4: If there is a high level of compatibility, then it will positively influence the adoption of e-voting.**

**Complexity**

This is the degree to which an innovation is perceived as difficult to understand and use. Some innovations are readily understood by members of a social system whilst others are more complicated and are adopted slowly (Rogers 2003, p. 16).

If the e-voting machines which will be used for elections are intuitive and not complicated, then it is highly likely that their adoption rate will be faster. Therefore, our hypothesis is that:

**H5: If there is a high level of complexity, then it will negatively influence the adoption of e-voting.**

**Triability**

This is the degree to which an innovation may be experimented with on a limited basis (Rogers 2003, p. 16). New ideas that can be tried on the installment plan will generally be adopted more quickly than innovations that are not divisible (Rogers 2003, p. 16).

If e-voting has to be adopted in Ghana, the innovation has to be tried as a pilot project in a few constituencies in order to test how efficient, effective and reliable the idea is, before being rolled out in the entire country. E-voting implementation is a new technology in Ghana. Like every other innovation, it is accompanied by huge risks. To minimize the risks, it is therefore advisable to run a pilot project. Therefore, our hypothesis is that:

**H6: If there is a high level of triability, then it will positively influence the adoption of e-voting.**
Observability

This is the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it (Rogers 2003, p. 16).

There have been many complaints about the absence of public scrutiny of EVMs and also the fact that some of these devices used for e-voting do not issue receipts as proof that one has voted (Vyuha, 2010). These issues undermine the credibility of e-voting and hence have to be resolved. Therefore, our hypothesis is that:

**H7: If there is a high level of observability, then it will positively influence the adoption of e-voting.**

Government E-readiness

This refers to the government’s assessment of readiness in terms of technology infrastructure, economic resources, ability to secure fund from donor organizations and the nations general state in its contributions to create awareness, promote, and support e-voting adoption and implementation.

If the government plays a strong role and provides an enabling environment for e-voting implementation, then the full potential of the innovation can be realized. Therefore, our hypothesis is that:

**H8: If there is a high level of government e-readiness and support, then these will positively influence the adoption of e-voting.**

Re-invention

This is the degree to which an innovation is changed or modified by a user in the process of adoption and implementation (Rogers 2003, p. 17). An innovation is not necessarily invariant during the process of its diffusion (Rogers 2003, p. 17). Consequently, many adopters want to participate actively in customizing an innovation to fit their unique situation (Rogers 2003, p. 17).

Although, we have suggested that the Indian model could fit into the Ghanaian system and hence SSA because of some cultural and social similarities, modifying or customizing the whole process to suit the needs of implementing countries in SSA, will increase the rate of adoption. Therefore, our hypothesis is that:

**H9: If there is a high level of re-invention, then it will positively influence the adoption of e-voting.**

Communication Channels

Finally, the communication channels through which the messages get from one individual to another have to be used effectively. The messages in the diffusion process are concerned with new ideas and thus their communication is more appropriately carried out through the use of mass media channels due to their efficiency and rapidity. The use of mass media channels is designed to enable one individual to reach a target audience of many. Televisions, radios, newspapers and so on are some of the mass media channels which are used to transmit messages. In addition to mass media and interpersonal communication channels, interactive communication via the Internet has become more
important for the diffusion of certain innovations in recent decades (Rogers 2003, p. 18).

### 2.7 SUGGESTED FRAMEWORK

Based on the literature review and other studies, we have come up with a model which draws inspiration from the Diffusion Innovation Model and technology innovation literature. The research question incorporated in this model is: “What are the requirements that must be met in order to deploy an e-voting system in Ghana?” The requirements in the model have been discussed above in relation to how they will either negatively or positively impact on the implementation of e-voting.

![Diagram of model on the speed of e-voting adoption]

Fig 2.3: Our model on the speed of e-voting adoption

The various requirements in the model are interlinked and cannot be addressed or used in isolation. All the requirements stated under the three groups of factors are critical areas that have to be addressed in order to increase the rate of diffusion of e-voting before it can be successfully adopted. Addressing them in isolation could lead to failure.
3 METHODOLOGY

This chapter discusses how the research was conducted. The choice of research method, data collection techniques and the various types of interviews and questionnaires are the sub topics discussed here.

3.1 CHOICE OF RESEARCH METHOD

The choice of approach used to carry out a research is a critical issue as the method used should be able to help you achieve the purpose of the research. There are several methods to choose from when conducting a research, as well as many factors to be considered. We chose to use a case study and to approach our research in an inductive manner with interviews and questionnaires as part of our qualitative data collection method.

3.1.1 Case Study

According to Yin, case study research has been used extensively in the social sciences as a means to develop an understanding of social phenomena in their natural settings. A case study could be described as “an empirical enquiry which investigates a contemporary phenomenon within its real-life context especially when the boundaries between phenomenon and context are not clearly evident” (Yin 1994, p. 13). This thesis is based on a case study since the type of research carried out is both explanatory and exploratory. The research questions of “how” and “why” can best be answered by using one of the following strategies: case study, experiments or histories (Yin 2003, p. 7). While history deals with past events, a case study deals with contemporary events (Yin 2003, p 7). Besides, sources of evidence for a case study include direct observation and interviews of persons involved, whereas sources of evidence for a historical method are basically archival. In this thesis however, data was obtained from secondary sources, questionnaires and interviews but due to time and other constraints, the observation technique could not be used. Experiments on the other hand are done with possibilities of the investigator to manipulate behavior directly, precisely and systematically and employ the use of a control group to aid the investigation (Yin 2003, p. 8). The choice of a case study was made in order to have unbiased results.

In accordance with Saunders, Lewis & Thornhill (2007), this thesis fulfills the characteristics of a case study. Case study is used to provide evidence which is used for hypothesis generation and to explore areas where existing knowledge is limited. An approach such as grounded theory may be used to develop theory which emerge with theoretical concepts and propositions as the researcher gathers data to investigate the phenomena (Williamson, 2002).

Data for this thesis were gathered from multiple sources which encompass literature study, secondary data and primary data from interviews and questionnaires. Besides, the study entails a real life episode within a certain context (what has to be done in order to implement e-voting).
Most if not all SSA countries have an electoral system and are supposed to practise a good level of democracy which unfortunately is not the case in many of the countries. Consequently, this gives a good range to carry out a multiple case research. However, due to time constraints as well as unavailable financial resources, only a single case was used which focused on the Ghanaian electoral system although using multiple cases would have been more rewarding and better to make generalized conclusions. It is worth mentioning that the case of India and the reform that its electoral process underwent with the implementation of e-voting have been discussed above. By regional standards, Ghana is a well administered country and is often seen as a model for political and economic reform in Africa (The Carter Center, 2008). It is for this reason that Ghana was chosen as the case study.

3.1.2 Deductive vs Inductive Research

In designing the research project, it is important to know what approach would be used. There are two distinguishable approaches, theory-creating and theory-testing. Theory-testing or deductive research is defined in Saunders et al (2007, p. 596) as “Research approach involving the testing of a theoretical proposition by the employment of a research strategy, specifically designed for the purpose of its testing”. “With deductive reasoning, the argument moves from general principles to particular instances”. Whilst inductive reasoning commences with particular instances and concludes with general principles (Williamson, 2002). Theory-creating or inductive research is “research approach involving the development of a theory as a result of the observation of empirical data” (Saunders et al. 2007, p. 599).

Combining both approaches (mixed approach) can give better results to generalize on and thus increase credibility of the research (Saunders et al, 2007).

In this thesis, an inductive approach was adopted because there has not been any adoption nor implementation yet of e-voting in any part of SSA. Since the way of discovery was chosen, interviews were conducted and questionnaires with both open-ended and closed questions were issued, with an insight into the adoption of e-voting and the hinderances to its adoption and implementation. Data collection through questionnaires from the citizens, e-mail and telephone interviews with the Danquah Institute, provided enough knowledge in order to support the hypothesis generated. Therefore, exploratory and explanatory knowledge were generated to explore and explain the factors necessary for the implementation of e-voting, the hinderances that could be encountered and how to deal with them, thereby improving the electoral system of Ghana and SSA in general.
3.2 DATA ACQUISITION

There are a lot of techniques, ways, sources and methods of data collection. Examples include personal or group interviews, case studies or questionnaires. In this thesis, a case study was used and data was collected from semi-structured interviews and questionnaires with open ended and closed questions which constituted the primary data. Sources used for secondary data acquisition are discussed below under literature review.

3.2.1 The Different Data Types

Saunders et al (2007, p. 607) defined primary data as “data collected specifically for the research project being undertaken” and also defined secondary data as “data used for research project which was originally collected for some other purpose”. Primary data were obtained from questionnaires and interviews which were analyzed to arrive at conclusions. That notwithstanding, the primary data was complemented with some secondary data so as to be able to fulfill the purpose of the study.

3.2.2 Literature Review

The literature search and review involve identifying, locating, synthesising and analysing the conceptual literature and also completed reports, conference papers, books, theses and other materials about the research topic and its specific problems (Williamson, 2002). The literature review had an important part to play in this thesis and helped to
identify the gap from previous research in the chosen topic and also assisted in understanding the problem specification and its context. The thesis investigated the challenges that might be encountered in implementing an e-voting system in Ghana and SSA as a whole. To propose e-voting as a possible solution to the current Ghanaian Electoral System and those of other SSA countries who are interested in deploying such a system.

The internet, conference papers, related webpages and books as important sources of materials in our literature review for secondary data, alongside other sources which are listed below:

**Databases**

- a) ACE Electoral Knowledge Network
- b) Advanced Google Scholar
- c) African Elections Database
- d) DIVA Essays
- e) E-voting Database
- f) Google
- g) JULIA (Jönköping University Library)
- h) Science Direct

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<td>Electronic voting</td>
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Table 3.1 Key words and search phrases

Since e-voting in SSA is a relatively new topic, it was difficult to find other publications in this area. Most of the papers on e-voting focus on the developed countries. However, searching the literature, we came across a few articles and conference papers on teledemocracy in SSA and just a few on e-voting in SSA. Le Blanc et al 2004 in their paper on ‘TeleDemocracy in developing countries; a focus on SSA’, emphasized that for SSA to fully benefit from teleDemocracy, a continual upgrade of the infrastructure by which it is supported and operated is necessary. They argued that the use of ICT in governance, facilitates democracy and stability in SSA. In their conference paper on ‘E-voting implementation in Nigeria; Prospects and Challenges’ (2008), Ayo and Ekong stated that the level of power (electricity) generation poses a serious threat to e-voting adoption in Nigeria.
Based on the literature reviewed, we added to the existing knowledge by creating a model with requirements for e-voting adoption and proposing EVMs, which run solely on batteries and do not rely on electricity.

3.2.3 Qualitative vs Quantitative

These are two distinct research types which should not be confused. There might be some similarities as well as differences between these two types, qualitative and quantitative research. To be able to analyze data in a meaningful way, Saunders et al (2007), pointed out that it would be easier if a clear distinction is made between the two as to what method has been used to collect and analyze the data. They boiled it down with differences between qualitative and quantitative data and grouped them into three categories. A triangulation of interview techniques with questionnaires as qualitative data methods was used. While quantitative data is based on meanings derived from numerals, qualitative data is based on meanings expressed through words.

3.3 COLLECTION OF RESULTS

When collecting quantitative data, we obtain numbers and standardised data, contrary to the collection of qualitative data which results in non-standardised data and requires categorical classification. From Saunders et al (2007, p. 472), it was deduced that quantitative data analysis is conducted through the use of diagrams and statistics whereas qualitative data analysis on the other hand is conducted through conceptualizations.

3.3.1 Interviews

In Saunders et al (2007) are cited three distinct interview types; Structured, semi-structured and unstructured. For the purpose of this thesis, semi-structured interviews were used.

Semi-structured interviews

In this type of interview, the interviewer starts with a set of pre-determined questions, but not compelled to ask questions chronologically. Here, the interviewer has the freedom to deviate from the original interview questions in order to follow up on new questions that come up as the interview proceeds. This form of interview is best suited for a research that has an explanatory orientation, as well as for exploratory research. (Saunders et al., 2007). Semi-structured interviews and questionnaires were used in gathering data for this thesis due to its exploratory and explanatory nature and have been attached as appendices. The people we intended to interview initially were officials of the EC and the Danquah Institute and initial contacts were made through e-mail and telephone calls. It was difficult getting into contact with the EC for reasons unknown to us. After several attempts to contact the EC for interviews proved abortive, due to time con-
straints, we decided to collaborate with the Danquah Institute for the information we needed from the EC, since they have been holding conferences together on e-voting.

Semi-structured interviews were used because of the inductive approach adopted. Thus, the interview was not only influenced by predetermined questions, but by follow up questions and other questions which came up as the interview proceeded. E-mail and telephone interviews were conducted with persons we could not make physical contacts with. The rights of participants with respects to integrity, confidentiality and all what embodies ethical issues as far as interviews are concerned were taken into consideration when conducting the interviews.

3.3.2 Population\Sample

The questionnaires for this thesis contained both open ended and closed questions and targeted one hundred Ghanaians who are eighteen (18) years and above (the minimum age required to be able to vote in Ghana). The interviews on the other hand targeted members of the Danquah Institute who are advocating e-voting in Ghana. The Republic of Ghana, with a total population of 23.8 Million, has an urban population of 50.74% and a rural population of 49.26% (African Development Bank Group, 2009). The total number of registered voters according to the 2008 general elections voters’ register was 12,472,758 Million out of which 8,671,672 Million casted their votes (Electoral Commission of Ghana, 2000). These figures indicate that about half of Ghana’s population are registered voters.

Based on the figures of urban and rural dwellers which are almost equal, stratified sampling was used to issue the questionnaires. This meant that the stratified sampling was equally based on geographical regions in order to ensure that both the rural and urban regions are covered with equal representation.

Acknowledging the fact that it will be practically impossible to reach the millions of registered voters due to lack of resources like money and time, the population sample was narrowed down to target only one hundred (100) Ghanaians. Fifty (50) questionnaires were issued to urban dwellers in different urban regions of the country. For the rural dwellers in different regions of the country, they received fifty (50) questionnaires as well. In total, one hundred (100) questionnaires were issued to the citizens. This sampling technique was chosen to make the selection unbiased, giving both classes of elements, equal chances to be selected. At the end of the day, the response rate gotten from the questionnaires was 100%. This was probably due to the fact that the questionnaires were structured in a simple way and were given by hand and not over the internet. The respondents were assured of anonymity and other ethical issues whilst waiting for them to fill the questionnaires. Besides, to be able to know the extent to which the e-voting system being investigated can reduce election malpractices, information was needed from the ordinary Ghanaian citizens who are eligible to vote in elections.

3.4 CREDIBILITY OF RESEARCH

When writing a paper of this nature, in designing the approach, one must prioritize its credibility in terms of quality. Three concerns on credibility include reliability, generalizability and validity.
3.4.1 Generalizability

As an important aspect of credibility, Saunders et al (2007), define generalisability as “the extent to which the findings of a research study are applicable to other settings”. The generalisability of this research on the implementation of e-voting in the Ghanaian electoral system is usually difficult to manage as there are hinderances to be encountered. Nonetheless, principled processes for this research in accordance with the frame of reference, could be generalized. The limitation here is that only those countries whose electoral systems are similar to those of Ghana in terms of maturity and who have similar problems with elections with the aim of improving the system would benefit from this thesis. The case being studied here is not very unique and can thus be generalized as most SSA have similar problems. However, it would have been better if the electoral systems of three or more countries could have been studied, to increase generalizability. The authors acknowledge the fact that due to some constraints, it was not possible to study the electoral systems of other SSA countries.

3.4.2 Validity

According to Saunders et al (2007), validity is the extent to which data collection methods measure what is intended to measure. The fact that the questionnaires for this thesis were formulated according to the research questions and frame of reference is evidence for the validity of the paper, as what is being measured is known. The interview questions as well were designed based on the research questions and frame of reference with each question specifically targeting certain aspects of the research goals.

3.4.3 Reliability

Reliability as defined by Saunders et al (2007), is the extent to which data collection techniques or analysis procedures yield consistent findings. This implies same or similar results can be obtained by another researcher, using the same methods. To ensure reliability, the questionnaires were structured and formulated to ensure clarity. The questionnaires were issued and effort was made to get the responses on the spot. This was done so as to avoid changes in respondents’ thoughts with time. Semi-structured and guided interviews were performed so as to avoid interviewees from being deviated. To establish anonymity and make respondents comfortable, questionnaires were designed to avoid extracting personal data from citizens. This also prevented participants from being biased.

This thesis was limited to using interviews and questionnaires to produce the qualitative data which were analyzed. However, the authors would have preferred to also observe the electoral process and voter behaviour in order to better understand the problems and draw conclusions. Unfortunately, we just had a couple of months to write this thesis (January to June 2010) and Ghana will not be organizing general elections until 2012. Hence, the authors regret the fact that they could not use the observation technique to study the whole election process in its natural settings.
4 EMPIRICAL FINDINGS

In this chapter, we have presented results obtained from the respondents of the questionnaires and interviews. For easy interpretation and understanding, the results have been highly classified. Answers from the questionnaires issued to citizens have been reported separately from those obtained from the interviews which have equally been separated accordingly.

4.1 RESULTS FROM QUESTIONNAIRE TO CITIZENS

The questionnaires were designed to find out if there are malpractices in conducting elections and the extent to which e-voting could reduce election malpractices. Two groups of citizens were interviewed; urban and rural dwellers. The results are given below according to the stratification.

A) Urban Dwellers:

Question 1 was just to find out if the respondent was qualified to vote or not. There were 50 respondents on this question. All respondents had reached the minimum voting age. Ten of the respondents were just 18 and the rest were above 18. No one was less than 18; otherwise they were not allowed to answer the rest of the questions. The results obtained can be seen on the pie chart below.

![Pie chart](image)

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Question 2 was to find out if the respondents exercised their civic voting rights through elections. If they do not have the interest in voting, then no matter what system is introduced, it will have no impact on them. Ten respondents had never exercised voting rights, while 40 had voted before. The results obtained can be seen on the pie chart below.
Question 3 was to find out if the existing electoral system has flaws or not. This question was a critical one as it implies that the respondent may have a thought for a change in the system. This change is of importance as it would be a solution to the malpractices. Forty respondents replied with a “yes” to this question and 8 said they did not know and there were 2 non-responses. The results obtained can be seen on the pie chart below.

Question 4 was a follow up to question 3. It gave proposals to curb the malpractices that exist with the present system. To this question, there were 8 non-responses. The other 42 respondents gave many answers among which we had the following:

a) Voter registration and compilation of registers is too manual.

b) There has to be an independent and transparent body to organize elections, not appointed by the president.

c) Computerization of voter IDs and database to store voter information. The EC should manage all matters from voter registration through result proclamation.

d) Civil society and human rights groups should monitor the organization of elections and the electoral process.

e) Citizens should be informed about the importance of them exercising their civic voting right through elections.

f) Results from each polling station should reach the central electoral commission the quickest time possible or almost immediately.
g) It should be made possible for citizens in the diasporas to participate in elections as well without necessarily having to go home.

To be able to investigate how easily the system would be accepted, question 5 was designed. The more people have heard about e-voting, the more anxious they might become and seek to know more and actually use the system. Four respondents had not heard about e-voting from anywhere, the other 46 had heard about it from various sources. The results obtained can be seen on the pie chart below.

![Information on E-voting](image)

The sixth question was aimed at finding out how the respondents got informed. This tells whether their thoughts could have been influenced or not. There were 4 non-responses to this question; 14 had heard from the media only; 10 had heard from the media and colleagues and friends; 5 had heard from colleagues and friends; 4 respondents had heard from friends only and 13 respondents had heard from all four sources. The results obtained can be seen on the pie chart below.

![Information Source](image)

Question 7 was asked to determine whether the citizens see e-voting as a remedy to the problems with the electoral process. To find out if e-voting can be used to realize the answers suggested in question 4. Forty of the respondents believed e-voting would be a good remedy to the situation; 6 respondents did not know and 4 said no. The results obtained can be seen on the pie chart below.
Question 8 was an open question giving respondents the freedom to express their thoughts about the present system and the one to follow. There were 8 non-responses on this question. Different responses were gotten from the other 42, who gave suggestions as follows:

a) The EC in Ghana is inefficient and needs to be improved.
b) They expressed doubts about the new system and its ease of use.
c) Since e-voting is automated, electoral malpractices can be controlled.
d) There will be need to educate the staff of the EC on how to effectively use the EVM.
e) The present system has a lot of flaws, marred by massive fraud, dependent on whims of the incumbents which are used to rig in favour of selected persons.

B) Rural Dwellers:

Question 1 was just to find out if the respondent was qualified to vote or not. There were 50 respondents on this question. All respondents had reached the minimum voting age. None of the respondents was exactly 18. None was less than 18.

Question 2 was to find out if the respondents exercised their civic voting rights through elections. If they do not have the interest in voting, then no matter what system is introduced, it will have no impact on them. Eight respondents had never exercised voting rights, while 42 had voted before. The results obtained can be seen on the pie chart below.
Question 3 was to find out if the existing electoral system has flaws or not. This question was a critical one as it implies that the respondent may have a thought for a change in the system. This change is of importance as it would be a solution to the malpractices. Forty six respondents replied with a “yes” to this question and 2 said no while there were 2 non-responses. The results obtained can be seen on the pie chart below.

![Pie Chart](image)

Question 4 was a follow up to question 3. It gave proposals to curb the malpractices that exist with the present system. To this question, there were 4 non-responses. The answers were similar to those from the urban population. The other 46 respondents gave many answers among which we had the following:

- a) Voter registration and compilation of registers is too manual and the registration period could be made longer.
- b) There has to be an independent and transparent body to organize elections, not appointed by the president. Besides, a closer surveillance of the overall process is required.
- c) Civil society and human rights groups should monitor the organization of elections and the electoral process.
- d) Citizens should be informed about the importance of them exercising their civic voting rights through elections.
- e) Make available ink of better quality that is used during the voting process.
- f) Voting materials should be made available and delivered on time.
- g) Results from each polling station should reach the central electoral commission the quickest time possible, not more than twenty four hours.

To be able to investigate how easily the system would be accepted, there was a need to design question 5. The more people have heard about it, the more anxious they might become and seek to know more and actually use the system. Most of the respondents had not heard about e-voting from anywhere, 28 in all, the other 22 had heard about it from various sources. The results obtained can be seen on the pie chart below.
The sixth question was aimed at finding out how the respondents got informed. This tells whether their thoughts could have been influenced or not. There were 28 non-responses to this question; 4 had heard from the media only; 4 had heard from the media and colleagues and friends; 3 had heard from media and friends; 5 respondents had heard from colleagues and friends and 6 respondents had heard from all four sources. The results obtained can be seen on the pie chart below.

Question 7 was asked to determine whether the citizens see e-voting as a remedy to the problems with the electoral process. To find out if e-voting can be used to realize the answers suggested in question 4. Nineteen of the respondents believed e-voting would be a good remedy to the situation and ticked yes; 28 respondents did not know and 3 said no. The results obtained can be seen on the pie chart below.
Question 8 was an open question giving respondents the freedom to express their thoughts about the present system and the one to follow. There were 2 non-responses on this question. Different responses were gotten from the other 48, who gave suggestions as follows:

a) The EC in Ghana is inefficient and needs to be improved.
b) They expressed doubts about the new system and its ease of use.
c) There will be need to educate the staff of the EC on how to effectively use the EVM.
d) The present system has a lot of flaws.
e) With the present system, people can vote more than once, the names of the deceased are still on the voters’ register.
f) Transparency has to be improved by changing from the present system to an IT-oriented way of voting, e-voting perhaps.
g) The present system is inadequately supervised, with poor information usage, missing data and lots of logistic problems.
h) Others expressed their opinions about the insecurity associated with e-voting and losing parties would site e-voting as a reason for their loss.
i) The system now is good but could be better if both the government and citizens have to help make the present system better.
j) Foreign bodies brought in to monitor the elections should be provided with the resources and logistics to do so.

4.2 INTERVIEW WITH THE DANQUAH INSTITUTE

The Danquah Institute is a Media, Research and Policy Analysis center which is located in Accra, the capital of Ghana. The Danquah Institute researches into governance, economic and media issues with an aim to improve the quality of the decision-making process and the efficaciousness of economic, political and social policies in Ghana and other African countries.

The results of the interview with the Head of Research at the Danquah Institute, Nana Attobrah Quaicoe are classified as shown here below.

Organizational Factors

The first question was to find out if the Heads of the EC were in favour of such an IT investment.

Information from the Danquah Institute stipulated that the EC boss had categorically stated publicly that he does not endorse the use of electronic voting in Ghana at the moment citing general low level education of voters and Ghanaians as the main challenge and thinks 2016 or sometime later would be better. The EC boss has however committed the commission to the adoption and implementation of a biometric based voter register for the 2012. This looks like a good start especially if the EC will keep to its promise.
In question 2, we sought to find out if the EC has the necessary IT infrastructure for adopting and implementing e-voting.

The interviewee made us understand that there are various types and models of electronic voting available in the market and so depending on the type the EC decides to adopt, then it would be possible to know if they indeed need to invest further into what or additional information system. However, it was deduced from the interview that with the peculiar challenges with power (electricity), and telecommunication which Ghana faces at the moment, it is most feasible for it to adopt the Indian model which operates on dry cell batteries and does not rely on telecommunications. Also India equally has a huge illiterate population just like Ghana. And in this case, the EC would have to invest into the EVM technology and applications.

The third question had to determine the available technical skills and competencies of the EC staff.

To this question, the interviewee acknowledged the importance of training the EC staff who would be using the new system if implemented. However, he made us aware of the fact that the EC currently has a competent IT department and would not need to manufacture the devices or applications since they are already in use. Nevertheless, the EC will still need to invest in some form of education and training to be able to equip the numerous electoral officers that would be operating the electronic devices at the various polling stations.

**Technological Factors**

Question 4 sought to know the potential benefits with using e-voting against traditional paper-based ballot voting for the entire community.

The Danquah Institute believes e-voting using the Indian EVM model can help resolve some of the major drawbacks associated with the current system which are listed below;

a) A bloated electoral register
b) Conspiracy theories
c) Multiple voting
d) Voter impersonation
e) Dud ballot papers
f) Ballot box stuffing
g) Ballot box theft
h) Spoilt ballot papers (2.5% or 205,000 votes of 2008 elections were declared spoilt )
i) Violence
j) Intimidation
k) Disenfranchisement of prospective voters arising from difficulties in registering during voter registration exercises and last but not the least, long periods between the time voting ends and when results are declared.

The drawbacks with using e-voting in Ghana was our concern in question 5.

To this question, the interviewee emphasized on the fact that they do not see any drawbacks with the adoption and implementation of e-voting in Ghana. On the contrary, its adoption and implementation could be used as a tool to resolve the illiteracy challenge as identified by the EC.

The risks of e-voting and how they can be minimized was what we tried to find out from the interviewee in question 6.

The Danquah Institute believes that one of the main risks involved with the adoption of e-voting in Ghana, lies in the ignorance of voters. A party or candidate may exploit the ignorance or illiteracy of the people to reject results from the machine for whatever reasons including fear of defeat. Voter education is very important just as the pilot based experiments was what the interviewee had to say about this question.

Question 7 was designed to find out the possibilities of pilot testing e-voting before implementation.

The interviewee reiterated the fact that pilot testing is of absolute importance. He went further to stress on the point that pilot based projects of e-voting will bring up practical, local or peculiar challenges that it will similarly help to resolve as well. Pilot testing e-voting will also help to build the confidence of the people in the system.

The eight question was a socio-cultural one, in that it sought to find out if e-voting has an effect on the socio-cultural norms of the nation.

The interviewee had a very interesting answer to this question. He believes Ghanaians seem to trust machines to be better reliable than humans. “Even the supposed illiterate adult trusts the money counting machine to be more credible and computer based diagnosis at the hospital more reliable” he remarked. Also the EVM is well suited for the Ghanaian environment as it overcomes the barrier and challenge hitherto in the form of unreliable and poor electricity as well as telecommunication.

Question 9 was to find out the compatibility of the EVMs used in India with the Ghanaian environment and if there would be a need for modification.

The Danquah Institute believes unlike the Indian model, the Ghanaian model should be modified to accommodate the pictures, party symbols and names of the candidates as displayed on the machines.

Question 10 was designed to find out how easy the EVMs would be to use.

The interviewee indicated that the EVMs are very easy to use. The EVMs have simple interfaces and are intuitive and do not pose any challenge to the illiterate or physically challenged as has been observed in India.
External or Environmental Factors

The government has to be prepared otherwise, it might not be possible to adopt and implement e-voting. The availability of adequate IT infrastructure as well as other resources to finance and support the project, were our concern in question 11.

The interviewee made us aware that the government has not shown much keenness in electronic voting debate, but says it is committed to the adoption and implementation of a biometric based voter register for the 2012 elections. The government is the main financier or source of funds for the EC so a lot will depend on its political will to fund the project.

The government has to be in support of the system otherwise, it might not be possible to adopt and implement e-voting. It is for this reason that we saw the need for question 12.

The interviewee indicated that the adoption of e-voting has become a hot political debate. The government in power seems not to be so enthused about it but the opposition parties are. There is the strong perception out there that any incumbent government with the state machinery of security forces, media and funds at its disposal, it is possible to manipulate oneself into government much easier and better without electronic voting. He thinks the EVM, if strictly adhered to would certainly reduce the incidents earlier listed above in this thesis. It appears too risky for an incumbent government to support e-voting especially if it fears it is not popular with the masses. These are all perceptions although they are very strong and the interviewee wondered why the government drags its feet about e-voting implementation whilst the opposition parties are the ones calling for it.
5 ANALYSIS

The objective of this chapter is to analyze the empirical findings in relation to our theory and research questions which form the basis of our thesis. Furthermore, the empirical findings are interpreted and compared to our framework, proposed in the frame of reference. One of the hypothesis could not be supported, largely because e-voting is still at the feasibility stage in Ghana and has not yet been adopted.

To answer the first research question on the requirements needed to deploy an e-voting system in Ghana, results from the empirical findings are analyzed below and related to Rogers’ diffusion of innovations theory.

5.1 ORGANIZATIONAL FACTORS

Top management support

The responses gotten from the interviews acknowledged the fact that top management support for e-voting is crucial for its adoption. This is not surprising and confirms Orlikowski’s (1993) argument that top management support is crucial in the acquisition and diffusion of innovations. According to Tolbert and Zukar (1983), IT innovation will be highly possible if the political environment within an organization is in support of the new changes. With the political parties in Ghana calling for some kind of technology to be adopted when conducting general elections and the EC confirming that biometric registration will be used for the next general elections, we can state that this is consistent with Tolbert and Zukar’s assertion. Top management support for the implementation of a biometrics based voter registration system and low support for e-voting currently confirms the importance of this criterion.

Hence, this supports our hypothesis number 1 that:

Top management support and backing will positively influence the adoption of e-voting.

5.2 TECHNOLOGICAL FACTORS

The EC of Ghana currently has an IT department which is well equipped. However, with some form of upgrading and additional IT infrastructural inputs, e-voting can be adopted and used in future elections. The staff of the EC is competent in IT but with the adoption of a new technology, more education and training on a continuous basis is an absolute necessity in order to better manage the new system. This is consistent with Cohen and Levinthal’s (1990), argument that an organization’s ability to appreciate an innovation is largely due to its pre-existing knowledge in areas relating to the intended innovation.

Hence, this supports our hypothesis number 2 that:

A high level of IT knowledge and availability of IT resources at the EC will positively influence the adoption of e-voting.
5.2.1 Peceived Attributes of Innovations

Relative Advantage
From the various responses gotten from the questionnaires issued to the citizens, majority of them based in both the rural and urban areas who had heard about e-voting, admitted that the new technology has numerous advantages over the traditional paper-based voting system. Their main argument was that being a system that is computerized and not manual, it will be difficult to manipulate and can curb malpractices and rigging, which occur solely because the incumbents want to hold on to power and remain leaders of their nations for as long as possible. On the other hand, the few who thought the current paper-based system should be maintained were more concerned about the security issues involved with e-voting.

The responses from the interviews also indicated that security issues and the high initial cost involved with e-voting were of primary concern but however, it carried a lot of advantages over the traditional paper-based system which cannot be emphasized.

Hence this supports our hypothesis number 3 that:
A high level of relative advantage, thus perceived benefits, will positively influence the adoption of e-voting.

Compatibility
The responses from the questionnaires and interviews to this question were very interesting. Even though e-voting has not yet been implemented and with the idea still being at the feasibility stage, the Indian model of the EVM is very compatible with the Ghanaian environment since it runs on dry-cell batteries. With the unreliability of electricity supply, the EVMs best suit this kind of environment. Moreover, Ghanaians seem to trust machines and have confidence in them and believe them to be more reliable than humans. Nevertheless, we carried out some comparisons between India and SSA using Hofstede’s Cultural Dimensions and can categorically state that, the two environments have a lot in common. EVMs used in India are very compatible with the social norms and values of Ghanaians based on Hofstede’s Cultural Dimensions but this can only be proven after e-voting has been implemented. Hence, until e-voting is adopted, it would be difficult for the response to this question to be used to support our hypothesis number 4.

Complexity
The complexity of any innovation obviously has a negative impact on its adoption. The responses gotten from this question showed that the EVMs currently being studied have user-friendly interfaces and do not pose any major challenges to illiterates and the disabled as they are easy to use.

Hence, this supports our hypothesis number 5 that:
A high level of complexity will negatively influence the adoption of e-voting.

Triability
With the risky nature of technologies, the responses from this interview question were not surprising. Rogers (2003, p.16), asserts that new ideas that can be tried on the in-
stallment plan will generally be adopted more quickly than innovations that are not di-
visible. This is consistent with what was found out that a pilot test is an absolute neces-
sity before e-voting can be adopted since it helps bring out challenges and also build
confidence in the system.

Hence, this supports our hypothesis number 6 that:

A high level of triability will positively influence the adoption of e-voting.

**Observability**

Responses gotten from both the questionnaires and interview questions indicated that it
is currently difficult to publicly scrutinize the EVMs used for e-voting and if this is
made possible, then it would be a good idea. This is consistent with Rogers’ argument
that the easier it is for individuals to see the results of an innovation, the more likely
they are to adopt (Rogers 2003, p. 16).

Hence, this supports our hypothesis number 7 that:

A high level of observability will positively influence the adoption of e-voting.

**Re-invention**

This is the degree to which an innovation is modified or customized by a user in the
process of adoption and implementation (Rogers 2003, p. 17). The response from this
interview question indicated that customization is necessary since the environments and
election processes are different. For instance, the Ghanaian model should be modified to
accommodate the pictures, party symbols and names of the candidates as displayed on
the machines.

Hence, this supports our hypothesis number 9 that:

A high level of re-invention or modification will positively influence the adoption of e-
voting.

### 5.3 ENVIRONMENTAL/ EXTERNAL FACTORS

**Government support and e-readiness**

The responses to the questions on external factors had to do with government support
and e-readiness in terms of IT infrastructure, finance, and general public awareness on
e-voting. The responses indicated that government support for e-voting is still at a low
level but high for biometric registration which has been endorsed recently. Due to this
latest development, the necessary infrastructure which currently are inadequate to sup-
port the biometric system of registration, are being put in place especially in some of the
rural areas, which are lagging behind in terms of basic amenities like electricity. The
digital divide is of primary concern and efforts are being made to bridge the gap.

Hence, this supports our hypothesis number 8 that:

A high level of government e-readiness and support will positively influence the adop-
tion of e-voting.
Communication Channels

Most of the respondents of the questionnaires who had heard about e-voting selected media as the main source through which the message had gotten across to them. This confirms that the media is an effective tool used for broadcasting or communicating a message across to individuals as many of the media sources like television, radio, newspapers and recently the internet, reach out to a lot of people at almost the same time. Hence, the media has a very important role to play in relation to the diffusion and adoption of e-voting in Ghana.

With the EC of Ghana citing low voter education as one of the main reasons why e-voting cannot be adopted for the upcoming general elections in 2012, the importance of communication cannot be overemphasized. The role of the media especially, in informing the public and creating general awareness about e-voting, will positively help its diffusion and subsequent adoption at a faster rate.

5.4 REASONS FOR ELECTION MALPRACTICES IN SSA

In relation to the second research question on electoral malpractices and irregularities, the responses from our questionnaires indicated that the main reason for malpractices was because the leaders are not willing to give away their seats. This is clearly seen in the fact that many leaders of SSA try to change the constitution in their favour and allow them to keep running for president.

Holding on to power is the order of the day as exhibited by some leaders in Africa. During elections, in order to stay in power, these leaders do everything in their power to rig the elections which is possibly due to the fact that elections are conducted manually. Typical examples of leaders who held on to power for decades until their deaths are Omar Bongo of Gabon (42 years), Gnassingbe Eyadema of Togo (38 years) and Houphouet Boigny of Cote d’Ivoire (33 years). Currently, leaders who have been in power for decades are Eduardo Dos Santos of Angola (31 years), Teodoro Obiang Nguema of Equatorial Guinea (31 years) and Paul Biya of Cameroon (28 years). Others include Yoweri Museveni of Uganda (24 years) and Robert Mugabe of Zimbabwe. All these leaders have one thing in common; they organize elections in their respective countries and always emerge winners with the opposition parties and general electorate crying foul. These leaders, not only have they not established a proper voting system in their respective countries, but have made sure if there is a body as such, then it is answerable to them.

The respondents of the questionnaires remarked that these malpractices could be reduced or avoided if certain practices are adopted. First and foremost, elections should not only be conducted in a free and fair manner but they should be credible and transparent to the voting public or electorate. The issue of transparency is a technical one when it comes to e-voting since voters need to be able to verify that the system is working correctly and that the votes casted are secure. The Administration and Cost of Elections (ACE) Project have a set of principles for elections with transparency as a very critical criterion. They go on to argue that if elections are transparent and monitored, its credibility is upheld and it will be difficult for participants and voters not to accept the results. The electoral commission should be independent of the ruling party.
5.5 RISKS ASSOCIATED WITH E-VOTING

This thesis will be incomplete if we do not discuss some of the security issues involved with e-voting and how they can be minimized. This is in relation to the third research question. With the risks associated with all investments and technology in particular, we propose that governments in SSA should consider the security issues and loopholes of e-voting before implementation.

In our opinion, the EVM like every other technology, has its own drawbacks associated with its use and implementation. The EVM runs on a 6V alkaline battery and is subject to battery failure as well. The battery can become weak before the elections are over. There could be procurement problems, acquisition costs, maintenance costs as well as training costs. There could be mechanical damage of the ballot unit by deranged or disgruntled people without the intervention of the Polling Officer. This is possible because the ballot unit is not so often close to the officer. Or sometimes, a voter might forcefully press on buttons without following instructions and ends up freezing the machine. The cable linking both units could experience mechanical damage too and this will have to stop polling for a while or maybe for that constituency. The control unit is open to mechanical damage as well as technical malfunction. These will interrupt the polling and the election results would have to wait or some other means adopted to continue polling. Like every other electronic equipment, EVMs can be jammed. Moreover, EVMs make no provisions for receipts after a vote has been cast. Owing to its portability, the EVM can easily be stolen by some persons who for some reasons do not want the polling to continue. Furthermore, the EVM could contain the following flaws; incorrect algorithm, erroneous data flow, error in circuitry, mistakes in software code, database mistakes as well as faulty logic.

The voting populace should be given the opportunity to publicly scrutinize the EVMs’ software used for e-voting. The programmes are highly susceptible to the manipulations of third parties storing and printing forms, different from the ones appearing on the screen (ACE Electoral Knowledge Network, 2010). This means that open source software, running on the EVMs will be a better idea in order to ease the insecurity issues since they will be open and available to the public. Moreover, it is more difficult to identify the source of errors and malfunctions e-voting in general than the traditional paper-based system, hence, there should be a manual backup system always available for replacement in case of a system breakdown or failure.

So far, we have discussed and answered all our research questions which were put forward in chapter one and have related them through the analysis of our empirical findings to our model and the Diffusion of Innovations theory, used in the frame of reference. For easy rememberance and clarification, we present below our research questions, which form the basis of this thesis;
a) What are the requirements that must be met in order to deploy an e-voting system in Ghana?

b) Why are there irregularities and malpractices whenever elections are conducted?
   ➢ How can e-voting system reduce election malpractices?

c) What are some of the drawbacks of such a system?
   ➢ How can these drawbacks be minimized?
6 CONCLUSION

This chapter concludes the whole thesis work. It sums up the analysis based on the empirical findings while proposing areas for further research.

The adoption and subsequent implementation of e-voting is mainly based on how the innovation will be diffused and the perceived benefits that will be derived from the investment. If governments of SSA decide to implement e-voting as a remedy or an improvement on their electoral processes, then particular attention must be paid to the various ways through which the innovation will be diffused. The factors proposed in this thesis will influence the speed of adoption of e-voting depending on their level as seen in the results collected. We have so far established in this thesis, that the adoption of e-voting by SSA countries, can only be possible if the following requirements are strictly adhered to;

a) The governments show strong commitment and support by securing funds through donor organizations, providing the necessary IT infrastructure and other resources needed to support the project.

b) The communication of the idea of e-voting could be made better especially through the media with the aid of the internet, television, newspapers and radio as the message will be transmitted simultaneously to the masses.

c) The system adopted needs to be customized to fit with the Ghanaian way of doing elections. As is the case with the EVM, then the symbols have to be modified according to the parties running for the elections.

d) There is the need for some education and training of staff on how to conduct elections with the new IT infrastructure.

e) Moreover, there is the need for a pilot project to test the efficiency of the EVM.

f) The presence of security on election day will still be needed and elections must be monitored by external observers.

There are often irregularities when elections are conducted because some of the the governments in SSA are not willing to make elections transparent and want to hold on to power for as long as they deem necessary. With the adoption of e-voting, the overall credibility of the election process can be guaranteed to an extent.

Paper-based balloting should always be available as a back up in case of system failure from the EVMs so as to allow the elections to still proceed normally.

6.1 Reflections

We chose this topic because some SSA countries including Ghana are exploring paths towards e-voting adoption and as African students studying abroad, we thought it would be important to apply our knowledge gained while studying as Informatics students at Jönköping International Business School, in solving a social problem back in our home countries. Whilst writing this thesis, we did not encounter many problems. An issue of concern which we consider a limitation to our thesis is that we could not observe voters
and the entire election process in its natural settings. The reason is that general elections in Ghana will be held in 2012, whereas we had just a couple of months from January to June 2010 to write this thesis.

Furthermore, worth mentioning was the fact that we could not make contact with the Chairman of the Electoral Commission of Ghana. Unfortunately, he was very busy at the time we were writing this thesis, and so could not grant us the audience for an interview. That nonetheless did not have any effect on our work. However, we believe if we had had enough time and other resources, we could have been able to gather more data to make our work more credible. Nevertheless, the purpose of this research has been achieved as the requirements necessary for the implementation of e-voting in Ghana have been established.

Moreover, the results gotten would have been more credible, interesting, reliable and generalizable, based on different opinions, if we had had the opportunity to issue more questionnaires to cover all the urban and rural regions in Ghana.

Last but not the least, we had a very high response rate from the questionnaires (100%) because they were issued by hand and we waited for the respondents to answer the questions.

6.2 Further Research

This thesis is based on a scientific study and could be used as a base for further research since e-voting has not yet gained grounds in SSA. With some countries in SSA exploring paths towards e-voting implementation, it would be a good idea for further research to be carried out on e-voting adoption before its implementation.

Since we could not gather enough data to support all our hypotheses, we propose that further research should be done in the area of compatibility of the EVMs with the socio-cultural norms of Ghanaians when e-voting is finally implemented. Moreover, further studies can be conducted as a complement to this thesis or as a follow-up on this work and it would be more appropriate for it to be done when e-voting has been adopted to find out whether the factors proposed in this thesis, actually influenced e-voting adoption rate. The government seems to play a vital role in the support of e-voting implementation, we suggest a further research to find out the reasons why the government of Ghana does not strongly support its implementation. So far, not many researches have been carried out to investigate the fact that the EVMs of India are tamper proof, we hereby suggest a further research on the security issues in using the EVMs.

Finally, Everett Rogers’ (2003), Diffusion of Innovations theory identifies five different adopter categories of the population and the rate at which they adopt a new technology. However, this can only be tested using quantitative analysis and so we propose that further research could be carried out based on the different adopter categories, using a quantitative analysis to analyze the data.
REFERENCES


APPENDIX 1 – Questionnaire

QUESTIONNAIRE FOR THE CITIZENS

PURPOSE: We are embarking on an effort to assess the prospects and challenges of implementing an e-voting system to help improve the current paper-based manual system of elections in Ghana. As part of our work, we are conducting a survey and your honest response to the following questions will be of immense help to us and to the entire community. Please tick just one answer unless otherwise stated and you can also use the back of the page if the space for the answer is too small.

NB: PLEASE DO NOT WRITE YOUR NAME ON THIS QUESTIONNAIRE.

1. What is your age group?
   - □ Less than 18 years
   - □ 18 years
   - □ Above 18 years

2. Have you ever voted in any of the general elections conducted in Ghana since 1992?
   - □ Yes
   - □ No

3. In your opinion, is there anything to be improved with the existing election sys-
   [Blank Space for Answer]

4. What are your recommendations?
   [Blank Space for Answer]

5. Have you heard about electronic voting (e-voting)?
   - □ Yes
   - □ No
   - □ Don’t know

6. How did you hear about e-voting? You can tick more than one answer.
   - □ Media
   - □ Colleague/Friend
   - □ Family
   - □ Schooling/Education
7. Do you trust e-voting technology to reduce the election problems we have in Ghana?
   [ ] Yes
   [ ] No
   [ ] Don’t know

8. Feel free to state your general opinion below if any, about the electoral system in Ghana.
APPENDIX 2 – Interview Questions

INTERVIEW QUESTIONS FOR THE ELECTORAL COMMISSION (EC) AND DANQUAH INSTITUTE

Organizational Factors

1. Is there top management support at the EC for electronic voting? If so how?
2. Are there any additional Information system infrastructural inputs to be made at the EC for electronic voting to be adopted?
3. Does the EC have the technical know-how to manage e-voting?

Technological Factors

4. What are the benefits that Ghana stands to gain if e-voting is adopted and implemented?
5. Do you foresee any drawbacks or disadvantages regarding the adoption and implementation of e-voting?
6. Are there any associated risks and if so, what will be done to manage the risks involved?
7. Is it necessary for e-voting technology to be tested as a pilot project before adoption?
8. What do you think about the compatibility of the electronic voting machines and the values and social norms of Ghanaians?
9. Is there a need to change or modify the electronic voting machines to ensure compatibility to suit the Ghanaian environment?
10. What is your opinion about the electronic voting machines? Are they easy to use?

External or Environmental Factors

11. How is the government getting ready for this project in terms of the availability of ICT infrastructure and other resources?
12. Does the government support the implementation of e-voting?