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An Analysis of the Readiness of Voters in the Western Region of Ghana for Electronic Voting

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ABSTRACT
The study was conducted to find out how ready voters in the Western region are for electronic voting. It focused on electorates' perspective and also assessed the infrastructural readiness of the Electoral Commission (EC) for e-voting. The Technology Acceptance Model (TAM) was used as the base theory for the study. Using the survey's research design, questionnaires were administered to 400 electorates in Sekondi – Takoradi and 352 of the electorates responded. An interview was also held with the staff of the Electoral Commission (EC) in the Sekondi-Takoradi constituency to ascertain EC's infrastructural preparedness for e-voting.

The study revealed that the majority (70.5%) of the electorates were aware of e-voting through one medium or the other but only a few (10.2%) of the electorates had ever used e-voting in an election. The majority (67.3%) of the electorates perceived the usefulness variables as important characteristics of e-voting that can help mitigate the electoral irregularities in the current electoral process. The majority (72.3%) of the electorates had very high confidence in e-voting. However the response from the interviewee suggested that EC is not in the least prepared for the introduction of e-voting. Perhaps the year "2016 and beyond". Based on the findings, the study concludes that it is feasible to implement e-voting in Ghana but for the lack of infrastructure.

Keywords: Electronic (e-voting), Electoral Commission (EC), Direct Recording Electronic (DRE), Personal Digital Assistants (PDA's), Election Management Bodies (EMBs)

INTRODUCTION

The rapid pace of technological development has created increasingly more powerful information and communication technologies (ICTs) that are capable of radically transforming public institutions and private organizations alike (Yigiteanlar, 2009). These technologies have proven to be extraordinarily useful instruments in enabling governments to enhance the quality, speed of delivery and reliability of services to the citizens and to businesses.

It is therefore not astonishing that many governments world-wide are attempting to increase accountability, transparency and quality of services by adopting ICTs to modernize and change the way decisions are made (Hornickel, 2006). An election is a decision making process by which a population chooses an individual or group of people to hold formal office by voting (Clottey, 2009). Voting is seen as the hub of democracy where citizens are allowed to express their choice of leaders through elections. It is the right and responsibility according to Article 42 of the 1992 Constitution of Ghana for every citizen of Ghana of sound mind to vote and to be registered as a voter for the purpose of public elections and referenda. The entire electoral process in Ghana is the sole responsibility of the Electoral Commission, a government institution provided for under the 1992 constitution. The Commission was established by the Electoral Commission Act (Act 451) of 1993. It was set up purposely to manage the conduct of all public elections and to handle all matters directly relating to the conduct of elections and to advance the course of democracy and good governance for enhanced development of Ghana by institutionalizing free, fair and transparent elections to the acceptance of all stakeholders (EC, 2006). The EC by its mandate undertakes a number of statutory functions in order to organize and supervise free, fair and transparent elections. These functions which are distinctive in nature are also closely interrelated to the extent that the outcome of one function greatly impacts on the outcome of the other processes. These functions include voter education, delimitation and demarcation of electoral boundaries, registration of voters and the issuance of voter identity cards, nomination of candidates and conduct of polls and declaration of election results (Clottey, 2009). Ghana has successfully undergone four presidential and parliamentary elections through the paper-based system where photographs of presidential and parliamentary aspirants are printed on papers for electorates to choose. This is the system of election practiced by most developing democratic nations including Ghana. Due to the significant advancement in technology, an electronic system of voting, termed e-voting, has been introduced in certain parts of the world. According to the ACE Project (2000), e-voting refers to the option of using electronic means to vote in referendums and elections. Benoit (2007) also refers to e-voting as any system where a voter casts his or her ballot using an electronic system rather than a paper ballot (or mechanical machine

to punch a paper ballot). Many countries are planning to adopt or are adopting e-voting on pilot bases to increase the efficiency of the citizen's participation in elections. However, the use of electronic voting worldwide remains a relatively uncommon practice, although this is rapidly changing as countries experiment with various electronic methods or expand their existing use of electronic voting (Benoit, 2007).

There are systems such as Direct Recording Electronic (DRE) voting machines that record the vote without that vote being transmitted over the Internet or another network. The interface of a DRE machine can be a touch screen or a scanner that scans the ballot paper where the voter marked the vote. The vote is then registered and stored in the voting machine. Then there is the voting over the Internet that uses a PC with an Internet-connection to cast the vote and send it to be stored in another remote computer. Personal Digital Assistants (PDA's), telephones or mobile phones can also be used to cast a vote electronically (ACE Project, 2000).

In the past, we have witnessed elections allegations of ghost names, registration of minors, bloated voters' register, introduction of "Macho men" and other electoral malpractices, which have marred the credibility of election results in most developing countries including Ghana. In the recent past, voters entered rooms where no one can see them to thumb print on the official ballot paper before coming out to vote in the public. The allegations were that many people had printed ballot papers in their pocket which they fold with the official ballot paper before coming out to put them into the ballot box. The ballot boxes were of course, opaque and did not reveal the amount of ballot papers that were put into it (EC, 2006). In the paper-based system, ballots are counted by electoral officers who supervise the elections in the electoral area. It is believed by the electorates that, the electoral officers belong to a political party so they would ignore ballots that are likely to be accepted when using an electronic voting system. There are complaints from citizens and political parties that, the human factor of the electoral officers cause ballots to be miscounted. An equally important problem is that even though the infrastructure for ballot box elections are available many of the electorates did not know what it takes to conduct free and fair elections through the paper-based system. Policy makers and advocates of biometric voters register are calling on the EC to adopt and use electronic voting because of the problems that were encountered during voter's registration exercise in the paper-based system. Significantly, few electorates perceive that the technological age has come and most if not all of our daily schedules should be computer-aided. However, many of the electorates are computer illiterates and will find problems with routine jobs that require the use of computers. Although there is the confidence that electronic voting system can be less manipulated by people, the electorates lack adequate education that will enable them to use electronic devices easily and effectively.

In view of this, individuals, social and political groups have proposed the use of biometric voter registration and subsequently, e-voting as the possible means to reduce or eliminate these electoral irregularities. Before and after the 2008 general election in Ghana, many recognised social and political groups had advocated for e-voting. At the Akosombo gathering, Ghana's main political parties endorsed the adoption of a biometric voters' register as the best way to guarantee a credible database of eligible voters. The biometric voters' register is seen as one of the main prerequisite for e-voting. This new system is presumed to have greatly enhanced the credibility of elections in those countries in which they are used.

Today there is no single operation in the electoral process that cannot be computer aided or even be completely taken over by Information and Communication Technology (ICT), but it is important for election administrators to consider which technologies will be most valuable in each electoral situation before spending a lot of money on it (Clottey, 2009). It is in the light of these problems and many others that we need to assess the readiness of Ghanaians for e-voting.

Thus, the main objective of this paper is to assess the readiness of Ghanaian electorates for electronic voting in this fast growing technological age using the electorates of Sekondi- Takoradi, in the Western Region of Ghana. To achieve this objective, we intend to: ascertain the level of awareness of Ghanaian electorates on e-voting among; determine the perception of the electorates on the usefulness or otherwise of e- voting in Ghana; ascertain the confidence of the Ghanaian electorates in e-voting as a possible solution to the perceived electoral irregularities; determine the infrastructural readiness of Ghana for e-voting and make recommendations for the implementation of e-voting in Ghana.

The significance of the paper would be scored on an account that the findings and recommendations would be very useful to the Election Management Bodies (EMBs) in describing the technologies used in e-voting, presenting step by step procedures for evaluating these technologies, choice of these technologies for e-voting adoption and implementation. It will also help identify the most appropriate infrastructure and e-voting systems needed to conduct a successful electronic election. The findings of the study if disseminated to the Ghanaian will

enlighten the general public on the benefits and limitations of e-voting and also boost their confidence in electronic voting (e-voting). It would also assist the government not only to draw her budget in the election year but also to take prudent decision on the adoption and implementation of e-voting. More importantly, policy makers have to know and adopt technologies that will solve current problems and can stand the test of time. The findings in this paper will assist stakeholders and policy makers in the adoption and implementation strategies of e-voting.

METHODOLOGY

This section describes the general research methodology used in this paper together with specific statistical tools that were used in data collection and analysis. It covers the research design, population and sample size, sampling technique, data collection instrument, mode of data collection, method of data analysis and problems encountered in course of the study.

A research design is a framework for conducting a research. It gives details of the procedures necessary for obtaining information needed to solve a research problem (Malhotra and Birks, 2007). There are two main research approaches used in scientific work, quantitative and qualitative. The main difference between the two is that, quantitative research finds out explanations to a phenomenon or a situation that can be generalised while qualitative intends to gain deeper understanding of a phenomenon or situation (Leedy and Ormrod, 2005). This study used both qualitative and quantitative approaches. The quantitative approach for this study involved a questionnaire survey. According to Saunders et al, (2007) the survey method allows the researcher to collect quantitative data which can be analysed quantitatively using descriptive and inferential statistics. Other scholars use the term survey research to refer to almost any form of descriptive and or quantitative research (Gay and Airasian, 2003). Survey research involves acquiring information about one or more people perhaps about their characteristics, opinion, attitudes, or previous experience by asking questions and tabulating their answers. The ultimate goal is to learn about a large population by surveying a sample of that population (Zafar and Pilkjaer, 2007). Considering the large size of the population, survey method was used by the researcher to sample a cross section of the population for the paper.

The population for the study is electorates in Sekondi – Takoradi metropolis. According to Electoral Commission's report on "the 2008 Presidential and Parliamentary Election", Sekondi-Takoradi Metropolitan Assembly (STMA) had four constituencies namely Effia-Kwesimintsim, Essikado-Keten, Sekondi and Takoradi. Under these constituencies are forty-four (44) polling stations and a registered voter population of two hundred and thirty five thousand, one hundred and sixty three (235,163). According to Saunders et al (2007) a population of 2000 and above requires a sample size of 322 to achieve a margin of 5% error so it is assumed that a sample size of 350 representing a sample proportion of 0.01% would be adequate for the study. The study was limited to voting populates of Sekondi-Takoradi Metropolitan Assembly (STMA). This involved four major consistencies; Effia-Kwesimintsim, Essikado-Keten, Sekondi and Takoradi. The population of the study included everybody who had attained the age of eighteen (18) and is of a sound mind to participate in the study.

In this study, it was impracticable for the researcher to collect and analyse data on all the electorates. Sampling is a method that enables the researcher to reduce the amount of data one needs to collect by considering only data from a sub-group rather than all possible cases (Saunders et al, 2007). The researcher used a two-stage sampling process where two types of sampling methods namely simple random sampling, a probability sampling and convenience sampling which is a non-probability sampling. Under probability sampling the researcher assigned numbers to the forty-four (44) polling stations and selected thirty (30) numbers at random. The polling stations corresponding to the randomly selected numbers were used to select thirty (30) out of the forty-four (44) polling stations in the Sekondi-Takoradi Metropolis. The researcher then used convenience sampling method to select at random, at most fifteen (15) electorates in the selected polling stations for the questionnaires. The researcher spoke to electorates at their homes, offices or stations about the purpose and objective of the study and those who responded favourably were counted as one of the randomly selected electorates. The Electoral Commission had two officers mining the four constituencies thus Takoradi and Effia-Kwesimintsim had one head while Essikado-Keten and Sekondi had another. One out of the two was randomly selected to be interviewed. The convenience sampling method was used because it is least expensive and least time consuming (Malhotra and Birks, 2007).

Questionnaire is used for descriptive research. Descriptive research involves the one that is undertaken using attitude and opinion questionnaire which enables one to identify and describe variability of the phenomena. On the other hand, analytical research enables one to examine and explain the relationship between the variables, in

particular cause and effect relationships (Saunders at el, 2007). Questionnaire and interview were used as the main research instruments for the study. Questionnaires are categorised according to how it is administered (Saunders et al, 2007). In this study, the researcher used self-administered questionnaire. The questionnaire was made of four main sections; Section A asked respondents of their social background, Section B asked respondents of their awareness of e-voting, Section C tested respondents on the perceived usefulness of e-voting and the last Section, D, tested respondents of their confidence in e-voting as an alternative to minimize electoral irregularities. The questionnaire contained the closed ended type where respondents were expected to tick the box provided at the end of the most favourable response for them. They were also required to rank some factors and provide answers to few open ended questions. Structured interview also known as interview schedules was used. The interview was conducted for the Electoral Commission staff heading the various constituencies. The researcher met the interviewee and asked questions on the infrastructural preparedness of the Electoral Commission to conduct e-voting. The researcher found out the policy in place for e-voting, acquisition of physical components such as computers, servers, biometric devices and other logistics. The researcher found out e-voting workshops conducted for Electoral Commission staff and the financial commitment made towards the education and implementation of e-voting.

The mode of collecting the data was highly influenced by the validity and reliability of data instrument for the study. The researcher had an official letter from the school introducing him to the respondents and explained the purpose of study to them. This helped the researcher to win the confidence and trust of the respondents and craved their indulgence for the data collection. The researcher delivered questionnaires by hand to respondents. In most instances, the researcher persuaded them to fill it instantly for him. Those that were not ready as at the time the researcher was leaving were collected later. The questionnaire was used for all the sampled electorates in Sekondi-Takoradi metropolis and in situations where the sampled populations are mostly perceived illiterates, the questionnaires are read and interpreted to them and their responses were used to fill the questionnaire. The constituency represent the various polling stations where the electorates were randomly selected from and where they voted or are likely to vote in any national elections. One hundred and fourteen (114) electorates representing 32.4% were randomly selected from Effia-Kwesimintsim, 54 (15.3%) were selected from Essikado-Keten, 73 (20.7%) electorates were from Sekondi and 111 electorates representing 31.5% came from Takoradi constituency. Most of the respondents were obtained from the two most populated constituencies in the metropolis. Interviews with the Electoral Commission staff heading the various constituencies were pre-arranged. Time, place and duration for the interview were used as agreed upon. The interview took place in his office in the form of questions and answers. The researcher used a prepared question guide to ask the question upon which the respondent, in this case the interviewee, answered them. The response rate was very high. For the questionnaire, three hundred and fifty two (352) were collected out of the four hundred (400) that were sent out which represents eighty-eight percent (88%). Since all the respondents for the interview did grant the interview, the response rate for the interview was hundred percent (100%).

There are two reasoning in analysing data obtained from a research: Deductive and Inductive reasoning. In deductive reasoning, theories about the field of interest or area of study are formed or conjectured and these theories are narrowed down into hypothesis that can later be tested. Observations are then collected to address the hypothesis which will lead to the testing of the hypothesis against the original theories. In respect of Inductive reasoning, observations are rather used to detect patterns which are used to develop conclusions of generalizations and theories. This kind of reasoning is open-ended and exploratory (Trochim, 2001).

Based on these two definitions, both deductive and inductive reasoning was used to analyse the collected data from the survey. Inductive reasoning was used to analyse the qualitative data which was collected on infrastructural preparedness of the Electoral Commission (EC); and based on the responses given by the electorates or voters, deductive reasoning was used to analyse the responses from the electorates.

Statistical Package for Social Sciences (SPSS) software was also used to analyse responses from the questionnaire. Tables and charts were used as illustrations where necessary. Also crosstabulation with Chi-Square test were used to ascertain the significance of the relationship between awareness and background characteristics of electorates. After the statistical analysis of the data, the results were then summed up and presented according to the objectives of the study. The main headings for the results were in two fold; the response by the electorates and the responses by the head-staff of Electoral Commission of the various constituencies. Conducting research in general comes with its own problems. The researcher encountered some field problems apart from the study's limitations of a large area of study and population sample.

In the administration of the questionnaires, the researcher found that most of the respondents were reluctant to collect and fill the questionnaire. Those who collected them willingly did not fill it as at the time the researcher came to collect it. The researcher explained the purpose for the study and persuaded the respondents to fill them. In most cases, the interview scheduled for the interviewee was followed according to plan. The researcher went there on the scheduled date and time, met the interviewee and conducted interview as planned. The interviewee was enthused about the study and gave the needed information as requested by the researcher. The only problem encountered with the interviewee was that he gave experiences of previous paper-based elections which were not relevant to the study. In that situation the researcher quickly introduced another question to stop him. Another problem encountered was that some of the respondents tried to seek the views of their friends and relatives before answering the questionnaire. In some situations they even wanted the researcher's opinion. This to some extent impairs the reliability of the research. According to Dillman (1978), respondents to self-administered questionnaires are relatively unlikely to answer to please you or because certain response are socially desirable. They may, however discuss their answers with others thereby contaminating their responses. In this case, the researcher requested independent opinions from respondents and persuaded them to tick the responses that best suits them to eliminate such occurrences. It was also obvious that most of the respondents (especially the perceived illiterate respondent) had little or no knowledge of the subject of study so they wanted to seek external assistance. The researcher in an attempt to avoid that took time to explain each question to them and edged them to make their choices from the possible answers provided. Another problem was time and financial constraints especially where the researcher wanted to administer the questionnaire fairly across the length and breadth of each selected polling station. The researcher sought and got financial assistance from family members. Also to reduce cost of going back for the answered questionnaire, the researcher persuaded the respondents to fill the questionnaire instantly for him since it was difficult to meet them in their homes and stations.

RESULTS AND DISCUSSION

This chapter presents data and analyses the findings of the study. It analyses the findings in two main ways. The responses from the electorates which focused on electorates' readiness were presented and analysed under four main headings. The social background of the respondents, awareness of e-voting, perceived usefulness of e-voting and confidence level of electorates as an alternate solution to electoral irregularities in Ghana. The response from the interview focused on EC's preparedness for e-voting. The chapter also includes a discussion of the findings in relation to the literature reviewed for the study.

According Rogers (1995) one of the key elements by which innovation can be communicated is the social system. Rogers and Shoemaker (1971) also assert that higher economic and social advantage makes an innovation more likely for adoption. In view of this, the socio-economic backgrounds of the electorates were accessed under gender, highest educational attainment, computer competence level and level of use of computer. Results from the data analysis showed that there were more male respondents than females. However, Sekondi constituency turned out to give more females than the others. Out of the 352 electorates that responded to the questionnaire, 153 representing 43.5% were females and 199 (56.5%) were males. This contradicts the national population statistics which indicates a higher proportion of females than males (Provisional Census results, 2011). Most of the respondents were males perhaps they were much interested in the subject matter.

The voting population consisted of respondents who are eighteen years and above. Out of the total respondents, 240 (68.2%) of the electorates were in the age group between 18 and 25 years which represented the lower age group while 13 (3.7%) of the electorates were 50 years and above as shown in Table 1 below. We analysed further that the average age of the respondents was 39 years with a minimum age of 18 years and a maximum of 60 years. The majority (82.7%) of the respondents were below 35 years. This implies that the majority of the electorates were in their youthful age and since the youth seem to be more engaged in computer related games and activities, it gives an indication that the majority of the electorates are likely to accept e-voting. This supports International IDEA's (1999) proposition that young voters could bring new and fresh ideas to the national politics because individuals who are politically active in their earlier age will continue to do so in their adult life.

Table 1: Age of the Electorates

Age	Frequency	Percent
18-25years	240	68.2
26-34years	51	14.5
35-49years	48	13.6
50-59years	10	2.8
60 years and above	3	0.9
Total	**352**	**100.0**

Source: SPSS Output of Field Work, December, 2015.

Education is responsible for stimulating an individual's sense of reasoning and learning in order to bring about a desired social change. Table 2 reveals that, 96 (27.3%) electorates had basic education, 52 (14.8%) electorates had secondary education, 106 (30.1%) electorates had diploma in tertiary education, 67 electorates representing 19.0% had first degrees, 23 (6.5%) electorates had master's degree, 6 electorates representing 1.7% had doctorate degrees. We thus establish that majority (71.6%) of the electorates had up to diploma certification in education. This implies that electorates of Sekondi-Takoradi are highly educated and is a positive sign for the introduction of e-voting. This is in line with Rogers and Shoemaker's (1971) argument that higher economic and social advantage makes an innovation more likely for adoption. Comparatively, respondents had attained considerable level of education.

Table 2: Educational level of the Electorates

Educational Level	Frequency	Percent
MSLC/JSS	96	27.3
GCE 'O'/ 'A' Level/SHS	52	14.8
Diploma	106	30.1
BA/BSc/B.Ed Degree	69	19.6
M.A/MSc/M.Phil/MBA/EMBA	23	6.5
PhD	6	1.7
Total	**352**	**100.0**

Source: SPSS Output of Field Work, December, 2015.

The results in Table 3 show the computer literacy level of the electorates. Novices are electorates with little or no computer knowledge and use. Out of the total of 352 respondents, 14 electorates representing 4.0% had very little or no knowledge of computer use; 234 (66.5%) electorates had fair knowledge of computer use, 77 electorates representing 21.9% were advanced in computer usage and 27 (7.7%) electorates rated themselves as experts in computer use. This implies that on the average, the majority of the electorates had fair knowledge of computer and its use.

The electorates' were also asked to indicate their level of computer use. In response, 130 electorates representing 36.9% indicated that they use computer always, 191 (54.3%) electorates sometimes use computer, 8 (2.3%) electorates use computers once in a blue moon and 23 of them representing 6.5% do not use computer at all. Thus the majority of electorates indicated that they used computers very often. This foretells that the majority of the respondents know how to use computer even though they hardly use it.

Table .3: Computer Competence level of Electorates

Educational Level	Frequency	Percent
Novice	14	4.0
Intermediate	234	66.5
Advance	77	21.9
Expert	27	7.7
Total	**352**	**100.0**

Source: SPSS Output of Field Work, December, 2015.

With regards to e-voting awareness, electorates were asked to indicate their level of awareness, length of awareness and their participation in e-voting. These awareness variables were analysed in terms of gender, education and age of electorates and were used as a proxy to make decision on electorates' readiness for e-voting. When electorates were asked whether they have heard of e-voting (level of consciousness), 104 (29.5%) electorates indicated that they had not heard of it whilst 248 (70.5%) affirmed that they had heard of e-voting. This is an indication that the majority of the electorates have heard of e-voting. The results in Table 4 reveals that, out of 248 electorates that responded that they had heard of e-voting, 151 (75.9%) were males and 97 (63.4%) were females. This difference is significant ($x^2 = 6.473,\ \ df = 1,$ P= 0.011 < 0.05), which establishes that awareness of e-voting is dependent on gender.

Table 4: Gender and Awareness of E-voting

Gender	Yes	No	Total
Female	97 (63.4%)	56 (36.6%)	153 (100%)
Male	151 (75.9%)	48 (24.1%)	199 (100%)
Total	**248 (70.5%)**	**104 (29.5%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

The highest educational attainments of electorates were accessed with respect to their awareness of e-voting. A cursory look at Table 5 further reveals that electorates with higher educational attainments had heard of e-voting than their counterparts with less educational attainment (83.3% of PhD electorates and 84.1% First degree electorates respectively). Since most educated electorates had heard of e-voting than the less educated electorates, education was significantly dependent ($x^2 = 20.386,\ \ df = 7,$ P = 0.005 < 0.05) on awareness of e-voting. Hence, we assert that the higher one's educational attainment the more likely he is to have heard of e-voting. As educational attainment increases the number of electorate awareness also increases. This is a positive sign for implementers of e-voting; in that if formal educational level rises above secondary education for the majority of the electorates, there is the likelihood that the level of awareness would also increase. Our findings affirm Zafar and Pilkjaer (2007) opinion that little ratio of literate people understand what e-voting is all about.

Table 5: Education and Awareness of E-voting

Educational Level	Yes	No	Total
MSLC/JHS	55 (57.3%)	41 (42.7%)	96 (100%)
GCE 'O' Level / SHS	32 (64%)	18 (36%)	50 (100%)
GCE 'A' Level	2 (100%)	-	2 (100%)
Diploma	82 (77.4%)	24 (22.6%)	106 (100%)
BA/BSc/B.Ed Degree	58 (84.1%)	11 (15.9%)	69 (100%)
M.A/MSc/M.Phil/MBA	14 (60.9%)	9 (39.1%)	23 (100%)
PhD	5 (83.3%)	1 (16.7%)	6 (100%)
Total	**248 (70.5%)**	**104 (29.5%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

Table 6 shows the respective age groups of electorates and their awareness of e-voting. This is good news for the implementers of e-voting in the sense that the majority (68.8%) of electorates in the lowest age group (18-25years) were aware of e-voting. This will give implementers ample time to build effective and efficient awareness policy for adoption and use of e-voting. Table 6 further revealed that there was no significant ($x^2 = 2.107,\ df = 4,$ P = 0.716 >0.05) relationship between age and awareness of e-voting thus age is not dependent on awareness of e-voting.

Table 6: Age and Awareness of E-voting

Age	**Yes**	**No**	**Total**
18 -25 years	165 (68.8%)	75 (31.2%)	96 (100%)
26 -34 years	36 (70.6%)	15 (29.4%)	50 (100%)
s35 – 49 years	38 (79.2%)	10 (20.8%)	48 (100%)
50 – 59 years	7 (70.0%)	3 (30%)	10 (100%)
60 years and above	2 (66.7%)	1 (33.3%)	3 (100%)
Total	**248 (70.5%)**	**104 (29.5%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

The electorates were also asked to indicate their participation in e-voting. The result of gender and use of e-voting is illustrated in Table 7. It could 19 (12.4%) female electorates responded in the affirmative as against 17 (8.5%) of the male electorates. There was no significance ($x^2 = 1.415,\ df = 1,$ P = 0.234 >0.05) relationship between gender and use of e-voting. This means that use of e-voting is not dependent on gender. The results in Table 7 further indicate that more females had participated in e-voting than their male counterparts. This result can assure the implementers of e-voting that there is high rate of increasing awareness among electorates since it supports Dr. Kwagyir Aggrey's saying that "If you educate a man, you educate an individual but if you educate a woman, you educate a nation"

Table 7 Gender and Use of e-voting

Gender	**Yes**	**No**	**Total**
Female	19 (12.4%)	134 (87.6%)	153 (100%)
Male	17 (8.5%)	182 (91.5%)	199 (100%)
Total	**36 (10.2%)**	**316 (89.8%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

In considering education and participation in e-voting (using e-voting in an election), Table 8 shows that 10 (10.4%) electorates with basic education had used e-voting, 9 (13.0%) electorates with first degrees had participated in an e-voting exercise whilst 14 (13.5%) diploma holding electorates used e-voting in an election. In the data results below, the majority of the electorates have not used e-voting. The few electorates that indicated their participations in e-voting did so in other elections than the general presidential and parliamentary elections in Ghana. Table 8 further revealed that use of e-voting is not dependents on education ($x^2 = 12.036,\ df = 7,$ P = 0.099 >0.05).

Table 8 Education and Use of E-voting

Education	Use of e-voting in an election		Total
	Yes	No	
MSLC/JSS	10 (10.4%)	86 (89.6%)	96 (100%)
GCE 'O' Level /SHS	1 (2.0%)	49 (98.0%)	50 (100%)
GCE 'A' Level	-	2 (100%)	2 (100%)
Diploma	14 (13.2%)	92 (87.8%)	106 (100%)
BA/BSc/B.Ed Degree	9 (13.0%)	60 (87.0%)	69 (100%)
M.A/MSc/M.Phil/MBA/EMBA	-	23 (100.0%)	23 (100%)
PhD	2 (33.3%)	4 (66.7%)	6 (100%)
Total	**248 (70.5%)**	**104 (29.5%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

The data result in Table 9 reveals the respective age groups and their participation in e-voting. It shows that 25 (10.4%) respondents between the age of 18 and 25 years had participated in e-voting against 7(13.7%) respondents within 26 and 34 years. From the above data results, the young electorates had participated more in e-voting. The table further revealed that there is not significant ($x^2 = 1.858,\ df = 4,\ P = 0.762 > 0.05$) relationship between age and use of e-voting which means that use of e-voting is not dependent on age.

Table 9 Age and Use of E-voting

Age	Use of e-voting in an election		Total
	Yes	No	
18 -25 years	25 (10.4%)	215 (89.6%)	240 (100.0%)
26 -34 years	7 (13.7%)	44 (86.3%)	51 (100.0%)
35 – 49 years	3 (6.2%)	45 (93.8%)	48 (100.0%)
50 – 59 years	1 (10.0%)	9 (90.0%)	10 (100.0%)
60 years and above	-	3 (100.0%)	3 (100.0%)
Total	**36 (10.2%)**	**316 (89.8%)**	**352 (100.0%)**

Source: SPSS Output of Field Work, December, 2015.

An investigation was conducted on the length of awareness of e-voting. In response to the question as to how long the respondents have heard of e-voting, 104 (29.5%) electorates did not respond to the question because they had indicated earlier that they have not heard of e voting. One hundred and eighty-eight (53.4%) have been aware for close to 4 years, 37 (10.5%) and 23(6.5%) have been aware up to 9 years and over a decade respectively. Thus the majority of the electorates have been aware of e-voting for quite some time now.

The length of awareness as per gender is displayed as Table 10 below. It reveals that 75 (49.0%) who have been aware for up to 4years were females whereas 113 (56.8%) of them were males. Fourteen (9.2%) and 15 (9.8%) of the female electorates are conscious of e-voting for up to 9 years and over a decade now as well as 23 (11.6%) and 8 (4.0%) of the male electorates. Thus majority of the electorates who have been aware of e-voting for up to and over a decade are males.

Table 10Gender and Length of Awareness

Gender	Not heard before	1–4 years	5 - 9 years	10 years and above	Total
Female	49 (32.0%)	75 (49.0%)	14 (9.2%)	15 (9.8%)	153 (100%)
Male	55 (27.6%)	113 (56.8%)	23 (11.6%)	8 (4.0%)	199 (100%)
Total	**104 (29.5%)**	**188 (53.4%)**	**37 (10.5%)**	**23 (6.5%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

From the elements displayed in Table 11, most (52.6%) of the respondents in the lower age group (18-25years) have heard of e-voting for at most 4 years, 29 (12.1%) are conscious of it for up to 9 years, with 18 (7.5%) electorates hearing of it over a decade. With the electorates in the '26 – 34' year group, 15 (29.4%) had not heard of it, 27 (52.9%) have been aware for at most 4 years now, 5 (9.8%) of them for up to 9 years whilst 4 representing 7.8% are aware for over a decade now. For those in '35 – 49' year group, most of the electorates (54.2%) had heard of e-voting for about 4 years while 4 (8.3%) are aware for at least 5 years. Nine of the electorates who are 50 years and above were aware for at most 4 years. These responses suggest further that the majority of the youth are aware of e-voting.

Table 11Age and Length of Awareness

Age	**Not heard before**	**1 – 4 years**	**5 - 9 years**	**10 years and above**	**Total**
18 -25 years	67 (27.9%)	126 (52.5%)	29 (12.1%)	18 (7.5%)	240 (100%)
26 – 34 years	15 (29.4%)	27 (52.9%)	5 (9.8%)	4 (7.8%)	51 (100%)
35 – 49 years	18 (37.5%)	26 (54.2%)	3 (6.2%)	1 (2.1%)	48 (100%)
50 – 59 years	4 (40.0%)	6 (60.0%)	-	-	10 (100%)
60 years and above	-	3 (100.0%)	-	-	3 (100%)
Total	**104 (29.5%)**	**188 (53.4%)**	**37 (10.5%)**	**23 (6.5%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

The results in respect of education and length of awareness are displayed I Table12. Observe that 66 (68.7%) of the electorates who had basic education have been aware up to a decade and beyond, 33 (66%) of the electorates having secondary education are aware of e-voting up to and over a decade. Forty-seven (68.1%) electorates who had first degree have been conscious of e-voting whereas 20 (87%) electorates with masters' degree had also been aware for up to and over a decade now. These suggest that most of the electorates who had been aware of e-voting for some time now are electorates with their education above secondary.

Table 12 Education and Length of Awareness

Education	**Not heard before**	**1 – 4 years**	**5 - 9 years**	**10 years and above**	**Total**
MSLC/JSS	30 (31.2%)	50 (52.1%)	8 (8.3%)	8 (8.3%)	96 (100%)
GCE 'O' Level /SHS	17 (34.0%)	25 (50.0%)	3 (6.0%)	5 (10.0%)	50 (100%)
GCE 'A' Level	1 (50%)	1 (50%)	-	-	2 (100%)
Diploma	29 (27.4%)	60 (56.6%)	12 (11.3%)	5 (0.05%)	106 (100%)
BA/BSc/B.Ed Degree	22 (31.9%)	36 (52.2%)	10 (14.5%)	1 (1.4%)	69 (100%)
M.A/MSc/M.Phil /MBA/EMBA	3 (13.0%)	12 (52.2%)	4 (17.4%)	4 (17.4%)	23 (100%)
PhD	2 (33.3%)	4 (66.7%)	-	-	6 (100%)
Total	**104 (29.5%)**	**188 (53.4%)**	**37 (10.5%)**	**23 (6.5%)**	**352 (100%)**

Source: SPSS Output of Field Work, December, 2015.

When the respondents were asked to indicate their perceived best way of casting votes using e-voting machine, the majority of 211 electorates representing 60% suggested "by the use of touch screen", 57 (16.2%) electorates preferred "keyboard", 65 (18.5%) electorates proposed "by using buttons around the screen (like ATM)" whilst 19 (5.4%) electorates also proposed "voice recognition system". The data results reveal that most of the electorates prefer e-voting machine with touch screen facilities.

According to Davis et al (1989) perceived usefulness is one of the key determinants that inevitably lead to the actual usage of a particular technology or system. In the light of this, electorates' perceived usefulness of e-voting were analysed in line with the objectives of the study. Table 13 illustrates the results on usefulness of e-voting. The majority of the respondents supported the statement that e-voting provides little or no ballot waste. Out of the 352 respondents, 157 electorates representing 44.6% agreed, 124 electorates representing 35.2% strongly agreed, 38 (10.8%) electorates were not sure of it, 17 and 16 electorates representing 4.8% and 4.5% disagreed and strongly disagreed respectively. This suggests that electorates are sure that their ballots would not be wasted when e-voting is used in the election.

Table 13 Electorates Perceived Usefulness of E-voting

Variable	SD	D	NS	A	S A	Total
E-voting and ballot waste	16 (4.5%)	17 (4.8%)	38 (10.8%)	157 (44.6%)	124 (35.5%)	352 (100%)
E-voting and electoral malpractices:	25 (7.1%)	60 (17.0%)	77 (21.9%)	113 (32.1%)	77 (21.9%)	352 (100%)
E-voting and counting of ballots:	6 (1.7%)	7 (2.0%)	45 (12.8%)	140 (39.8%)	154 (43.8%)	352 (100%)
Internet voting	28 (8.0%)	34 (9.7%)	78 (22.2%)	145 (41.2%)	67 (19.0%)	352 (100%)
Cost of operating and managing e-voting:	21 (6.0%)	26 (7.4%)	62 (17.6%)	164 (46.6%)	79 (22.4%)	352 (100%)
E-Voting enables people with disability to vote easily.	29 (8.2%)	43 (12.2%)	80 (22.7%)	117 (33.2%)	83 (23.6%)	352 (100%)
E-voting and delivery of final election results	8 (2.3%)	11 (3.1%)	20 (5.7%)	149 (42.3%)	164 (46.6%)	352 (100%)

Source: SPSS Output of Field Work, December, 2015.

In response to e-voting having little or no electoral malpractice, 113 (32.1%) electorates overwhelmingly agreed to the statement, 60 electorates representing 17% disagreed, 25 (7.1%) electorates strongly disagreed while 77 electorates representing 21.9% strongly agreed and were not sure respectively. These responses foretell that more than half of the electorates (190) were sure that e-voting, when used in an election, will have minimal electoral flaws.

When respondents were asked to indicate their opinion on counting of ballots under e-voting, most electorates responded in the affirmative. Out of the 352 respondents, 154 (43.8%) electorates strongly agreed to the statement, 140 (39.8%) also agreed, while 45 electorates representing 12.8% were not sure. However, 7 and 6 electorates representing 2% and 1.7% disagreed and strongly disagreed respectively. These responses suggests that almost all of the electorates (83.6%) believed that counting of ballots in e-voting are instant and more accurate. This is in agreement to Beniot's (2007) opinion that the electronic voting machines are intended both to reduce errors and to speed the counting process.

With respect to Internet voting encouraging more voters to vote remotely, 145 (41.2%) electorates agreed, 67 electorates representing 19% strongly agreed, 78 (22.2%) electorates were not sure, 34 and 28 electorates representing 9.7% and 8% disagreed and strongly disagreed respectively. This implies that when Internet voting is introduced, it would encourage more voters to vote from their respective homes and offices without coming to polling stations where the machines are placed.

With respect to cost, operation and managing of e-voting in an election, 162 (46.0%) of the electorates agreed to the fact that it is quite lesser in cost to operate and manage e-voting, 79 (22.4%) of the electorates strongly agreed, 62 electorates representing 17.6% were not sure while 26 and 21 electorates representing 7.4% and 6.0% disagreed and strongly disagreed respectively. The majority (69.0%) of the electorates supported the notion that it is cheaper (in terms of cost, ballot waste and malpractices) to use e-voting system in an election.

In response to electorates' perceived usefulness of e-voting with respect to the physically handicap, 117 (33.2%) of the electorates agreed to the notion that e-voting would enable the physically handicapped to vote easily. Eighty-three (23.2%) of the electorates strongly agreed, 80 (22.7%) of the electorates were not sure, 43 (12.2%) electorates disagreed while 29 (8.2%) electorates strongly disagreed. This means that the majority (56.8%) of the electorates perceive e-voting to be much useful in the sense that it would enable the physically handicap to vote with ease. Our advancement in respect of internet voting and the physically handicapped affirms Cranor and Cytron (1996) argument that a good e-voting system should be accurate flexible. However, Forsythe et al (2006) advised that Internet Voting presents numerous risks which need to be properly addressed before widespread deployment can take place.

When electorates were asked to indicate their perception on e-voting with regards to declaration of results, 164 (46.6%) of the electorates strongly agreed, one hundred and forty-nine (42.3%) of the electorates agreed, 20 (5.7%) of the electorates were not sure while 11 and 8 electorates representing 3.1% and 8% disagreed and strongly disagreed respectively. The above response indicates that almost every electorate (88.9%) agrees that e-voting would provide a quicker declaration of results.

Table 14: Declaration Agency

Declaration Agency	**Frequency**	**Percent**
Electoral Commission	249	70.7
An Independent electoral body	30	8.5
Judiciary	1	0.3
Automatic	72	20.5
Total	**352**	**100.0**

Source: SPSS Output of Field Work, December, 2015.

Conclusively, Electorates perception of e-voting usefulness were high and this suggest that electorates perceive it to be very effective. This is in line with Chaffin's (2005) argument that a system has social acceptance if it has favourable reception and is perceived as being effective system by the voting population.

The electorates confidence in e-voting were analysed in support of Xenekis and Macintosh's (2005) argument that citizens' trust in e-voting is developed based on the confidence they have to recognize the new and alternate technologies as an acceptable medium of casting vote. Accordingly, analysed electorates' confidence in line with the effect of e-voting on voting pattern, the reliability of e-voting results, declaration agency and appropriate time of introducing e-voting. Electorates confidence was also used a proxy for actual system use.

In considering the way e-voting may affect electorates voting pattern, 202 (57.4%) of the electorates responded that it may affect voting pattern in a good way, 66 (18.8%) of them said it may affect voting pattern in a bad way and 84 electorates representing 23.9% said it may not affect voting pattern in any way. This response gives an indication that using e-voting would positively affect the voting pattern of electorates.

In response to the reliability of e-voting results, the electorates were reliant. Out of the 352 respondents, 287 (81.5%) of the electorates said you can rely on e-voting results while 65 (18.5%) of the electorates responded

otherwise. This means that the electorates are confident that the results obtained from e-voting would be so visible since each vote would be accepted or rejected in the presence of the electorate. This response supports Tornatzky and Klein's (1982) argument that the more visible results of an innovation are, the more likely the innovation will be adopted and implemented.

With respect to the agency to retrieve and declare results from e-voting machines, 249 (70.7%) electorates chose the Electoral Commission, 72 (20.5%) electorates said results should be retrieved and declared automatically, 30 (8.5%) electorates chose an independent body while 1 (0.3%) electorate said results should be retrieved and declared by the judiciary (see Table 14). Thus electorates are confident in the Electoral Commission as the agency to retrieve and declare e-voting results.

In response to replacing the paper-based system with e-voting, It was observed that 279 (79.3%) of the electorates affirmed that the current paper-base system should be replaced with e-voting while 72 (20.5%) electorates responded negatively. This suggests that electorates are so much confident that the current system should be replaced with e-voting. Thus, electorates' trust in e-voting to be a replacement of the current paper-based system has been quite evident. This implies that electorates' have trust in e-voting as the new electoral system that would minimise the inadequacies and flaws in the existing system. This affirms Xenakis and Macintosh's (2005) first level of trust which opines that citizens' trust in e-voting is developed based on the citizens (voters and potential voters alike) recognition that the new and alternate technology is an acceptable medium for casting vote.

In considering the time to introduce e-voting in general elections in Ghana, 166 (47.2%) of the electorates stated 2012, 93 electorates representing 26.4% suggested 2016 while 93 (26.4%) electorates indicated 2020 and beyond (observe from Table 15). Thus, most of the respondents would wish that e-voting is introduced in 2012 general presidential and parliamentary election in Ghana. This urge for early invitation of e-voting by the electorates may be due to their high awareness level, perceived usefulness and their confidence in e-voting.

Table 15: Time to introduce e-voting in Ghana

Time to introduce-voting in Ghana	**Frequency**	**Percent**
2012	166	47.2
2016	93	26.4
2020 and beyond	93	26.4
Total	**352**	**100.0**

Source: SPSS Output of Field Work, December, 2015.

To further probe electorates' reasons why e-voting should be implemented in Ghana, a number of negative variables were written for electorates to indicate their support for or otherwise.. This was multiple responses question and the number of options chosen indicates respondents support or otherwise for it. With respect to this, 52 (14.8%) of the electorates chose an option, 51 (14.5%) of them chose three options while 58 (16.5%) of the electorates chose five options. The majority 85 (24.1%) of the electorates selected seven options indicating their support of the need to implement e-voting in Ghana. Notable among these reasons were that, elections are rigged; there are many complaints from citizens and political parties about the unfairness of elections and the possibility of government influencing the results. Others include the time taken to calculate and declare election results are too long, votes are calculated by people who can cheat or miscount ballots and the possibility of 'macho men' carrying away some of the ballots. These reasons confirms Buchbaurn (2008) argument that e-voting have gained public attention and interest because of the problems associated with domestic election systems such as luck of flexibility with respect to timeframes and progressively preventing citizens' to cast their votes at these stations.

The interview was held with the head staff of EC for constituencies in the Sekondi-Takoradi Metropolitan Assembly (STMA). The interviewee gave his name and the office that he holds currently with the EC. He described his duty as the head of the constituencies' in-charge of general electoral practices in the constituencies. He oversees all national elections conducted and educates the public on new and existing policies, rules and regulations of EC.

On the issue of policy in place for e-voting, the interviewee was simple and straight forward in his response. He said "There is no policy on e-voting as far as I am concern". What is available now is a document on biometric voters register". He went on to describe it as the one the Commission drafted for approval by parliament for subsequent implementation for the 2012 general elections. He added, "if and only if government would make funds available on time". With respect to logistics, he emphatically said they were yet to acquire the one to be used for the biometric voters' register. For e-voting he said perhaps "2020 and beyond". Although the majority of the electorates perceive that Ghana is ready for e-voting, the Electoral Commission (EC) disagrees with the electorates. EC is of the view that most of the entire Ghanaian electorates are illiterates and have different acceptance levels in terms of introducing new concepts. This supports Avgerou et al (2005) argument that e-voting would impact the trust levels of electorates since they do not enjoy the same technology acceptance levels. Besides, the EC has not written any proposal or any document for the introduction of e-voting even on pilot bases. The Commission said that although some political parties and individuals are advocating for e-voting, Ghana is not ready. The Technology Acceptance Model (TAM) suggest that when users are present with a new innovation, a numbers of factors influence their decision about how and when they will use it (Afari-Kumah and Achampong, 2010). According to Agarwal and Karahanna (2000) these factors play a crucial role in understanding individual response to information technology which was evident in the study. In the study, it revealed that the perceived shortcomings in the paper-based system increased electorates' confidence and perceived usefulness in e-voting and hence the electorates' call for adoption and use of e-voting.

CONCLUSION AND RECOMMENDATION

This section constitutes the concluding aspect of the entire paper. It summarised the major findings of the study, and draw conclusions on the social status of electorates, their awareness level, perceived usefulness level of the electorates and their level of confidence in e-voting as well as the readiness level of electorates for e-voting. Recommendations on how and when e-voting can be implemented in Ghana have also been covered.

Buttressing down the points on our findings, we discovered that most (60.4%) of the electorates had average computer knowledge and usage. Additionally, it was also evident that half (50.4%) of the electorates were aware of e-voting in that most of them have heard of e-voting but have not used it in any parliamentary or presidential election. Furthermore, the study evince that quite a good number (67.3%) of the electorates regards e-voting as very useful. Moreover, the results evince that majority (72.3%) of the electorates had high confidence in e-voting as an alternative to curb or eliminate the electoral irregularities in the current paper-based electoral system. Last but not least, it has come to bear that the EC is not prepared now in terms of infrastructure to conduct e-voting in Ghana.

Although most of the electorates aware of e-voting, the majority of them had very little knowledge of it. This suggests that awareness level is not enough to have significant impact on electorates' readiness. With regard to perceived usefulness, credence was given to the fact that e-voting can assist to eliminate flaws and/or malpractices such as double counting, high cost in terms of rejected (or wasted) ballot papers, deliberate rigging by officials and the incidence of 'macho' men running away with ballot boxes. Other usefulness include effectiveness of counting, flexibility in respect of internet voting and major accessibility with ease to the physically handicapped. This illustrates their immense advocacy for e-voting as the best alternative or substitute to the current paper-based electoral system. The relatively high confidence level of the electorates explains the view that although elections in Ghana are fairly democratic, electorates think the current electoral system should be replaced by e-voting. We finally conclude that Ghanaian electorates are ready for e-voting but the EC is not as a result of inadequate infrastructure to conduct e-voting elections.

We recommend that the government should reduce taxes and import duties on computer and its' accessories to enable low income earns to have access to and use computer. Besides, more computers should be supplied to rural schools and communities to upgrade their knowledge in the use of computers. For the older citizens (55years and above who are not computer literate), there should be free education on the use of computers perhaps through workshops, seminars and the media. The government should also increase the nationwide spread of Internet access and introduce a policy that would make Internet access and usage virtually free for all. This would enhance the citizens' access to electronic information and familiarity with electronic issues.

It is our suggestion that a policy be put in place to use e-voting for elections in the secondary and the tertiary institutions in Ghana so as to increase the use of e-voting by voters and potential voters. Besides, e-voting should be used in assembly elections so that the general electorates would have fair experience to participate in the innovation. Even though the electorates are aware of e-voting, there should be a thorough and massive education

on the processes, its security and benefits of introducing e-voting so that electorates would be aware of other aspects of e-voting that this paper did not cover.

We respectfully recommend that government in collaboration with EC should send a team to Brazil, India and USA to study the pros and cons of e-voting before its adoption. Although the electorates perceived e-voting as useful, EC should consider using e-voting machines that have touch screen facilities and can produce paper trail after every vote for audit purposes. The EC should also consider Internet voting for few citizens such as ambassadors and their relatives abroad on pilot bases though electorates perceive it be very useful. Cost and effect analysis should be conducted by government to ensure that e-voting would be beneficiary to the nation in terms of cost.

Finally, to enhance trust in the implementation and use of the e-voting system, all stakeholders should be involved from the policy formulation stage to its implementation stage. Although the electorates are highly confident in e-voting, the researcher recommends that the EC should adopted Direct Recording Electronic (DRE) system of e-voting and implement it in the 2020 presidential and parliamentary elections when some of the recommendations made earlier would have gained grounds in the nation.

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