

UNIVERSITY OF GHANA
COLLEGE OF HUMANITIES

**ASSESSING THE EFFECTS OF ELECTORAL REFORMS IN GHANA: THE CASE OF
BIOMETRIC VOTER REGISTRATION AND VERIFICATION**

BRIGHT ANSAH ADJEI

DEPARTMENT OF POLITICAL SCIENCE

INTEGRI PROCEDAMUS

JULY 2018

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BIOMETRIC VOTER REGISTRATION AND VERIFICATION**

BY

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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN
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DECLARATION

I, Bright Ansah Adjei, declare that except for the works of other authors duly acknowledged, this research is the result of my own original study under the supervision of Prof. Emmanuel Debrah and Dr. Hassan Wahab towards the award of MASTER OF PHILOSOPHY IN POLITICAL SCIENCE. I therefore, bear full responsibility for any lapses, marginal or substantial, which may be found in this work.

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ABSTRACT

Ghana returned to constitutional rule in 1993 and has made tremendous strides in its democracy. This has won the country international acclaim. The country has often been described as the beacon of democracy in the West African sub-region. This has been made possible with the smooth conduct of peaceful elections coupled with electoral reforms. The adoption of these electoral reforms has gone on to ensure a relative sense of electoral integrity albeit with challenges particularly in the 2008 and 2012 general elections. This study sought to examine the effects of the 2012 and 2016 biometric voter registration and verification system introduced into Ghanaian elections as a mechanism against multiple voting, multiple registrations, unqualified voter registrations and voting and other electoral irregularities that plagued elections in the past. The study adopted the mixed method approaches to gather data for this research.

The study found that, the integration of biometric technologies into Ghana's electoral process have substantially reduced multiple voting and voter impersonation; checked against multiple registrations, ballot stuffing, carousel voting, and over voting; and consequently helped enhanced electoral credibility and trust among electoral stakeholders' particularly political parties. The study also shows that the current biometric system is unable to detect and prevent registration by minors and foreigners, and also have verification challenges particularly among pregnant women. It is therefore recommended that the biometric voter registration and verification system for now should be well consolidated and used in future elections.

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DEDICATION

This work is dedicated to Mr. Collins Kofi Agyei and Major Emelia Asante Appiah. Final dedication goes to my inspirational uncle Mr. Kwaku Amakye and the entire Agyei family.

TABLE OF CONTENTS

DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENT	iii
DEDICATION	v
TABLE OF CONTENTS	vi
LIST OF FIGURES.....	xiii
LIST OF TABLES	xv
LIST OF ABBREVIATIONS	xvii
CHAPTER ONE.....	1
INTRODUCTION AND BACKGROUND.....	1
1.1 Research Background.....	3
1.2 Research Problem.....	6
1.3 Research Questions	9
1.4 Research Objectives	9
1.5 Conceptualization.....	9
1.6 Significance of the Study	12
1.7 Justification of the Study.....	12
1.8 Scope of the Study.....	13
1.9.1 Organization of the Study	14
1.9 Chapter Summary.....	14
CHAPTER TWO.....	15
2.0 Introduction	15
2.1 Democracies and Elections	15
2.2 Electoral Reforms Explained	19

2.2.1 Electoral Reforms in Ghana: A General Discourse	21
2.2.2 Electoral Reforms in Ghana Before 2012	24
2.3 Biometric Systems (Biometric Registration and Identification)	30
2.3.1 Characteristics of a Good Biometric System	31
2.3.2 Forms of Biometric Verification/Identification	32
2.3.3 Physiological Biometric Identification.....	32
2.3.4 Behavioural Biometric Identification.....	35
2.4 The 2012 and 2016 Biometric Voter Registration and Verification	36
2.4.1 Rationale behind Ghana’s BVRV Adoption and Implementation.....	38
2.5 Strengths of Biometric Voter Registration and Verification.....	45
2.5.1 Contributions of BVRV to Elections in Ghana.....	46
2.6 Challenges, Weaknesses, and Criticisms of Biometric Elections	47
2.6.1 Challenges and Criticisms Peculiar to Ghana’s 2012 and 2016 Biometric Elections.....	50
2.7 General Perception of voters toward the 2012 and 2016 Biometric Elections	53
2.8 Chapter Summary.....	56
CHAPTER THREE	57
THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY	57
3.0 Introduction	57
3.1 Diffusion of Innovations Theory (DOIT).....	57
3.2 Characteristics of the DOI Theory	59
3.3 Conceptual Framework	62
3.4 Research Methodology.....	63
3.4.1 Research Design.....	64
3.5 Research Population.....	64

3.5.1 Sampling Frame	65
3.5.2 Sample Size	66
3.5.3 Sample Size Determination	66
3.5.4 Sampling Technique.....	67
3.6 Types and Sources of Data.....	67
3.6.1 Data Collection Instrument	68
3.6.2 Data Collection Procedure	69
3.6.3 Data Analysis and Presentation.....	69
3.7 Limitations and Challenges.....	70
3.8 Ethical Considerations.....	71
3.9 Chapter Summary.....	72
CHAPTER FOUR	73
4.0 Introduction.....	73
Data gathered from the voters across the selected constituencies.....	73
4.1 Demographic Characteristics of Respondents.....	73
4.1.1 Geographical Distribution and Social Characteristics of Respondents.....	73
4.1.2 Age and Gender of Respondents.....	74
4.1.3 Educational Background of Respondents	75
SECTION A: PUBLIC AWARENESS AND PARTICIPATION IN THE BIOMETRIC VOTER REGISTRATION AND VERIFICATION	77
4.2 Participation in Elections	77
4.2.1 Awareness of BVRV among Respondents	78
4.2.2 Sources of Information on BVRV.....	79
4.2.3 Receipt of Prior Notice on the Registration and Verification Exercises.....	80

SECTION B: FACTORS THAT INFLUENCED THE ELECTORAL COMMISSION TO EMBARK ON BVRV	83
4.3.1 Table 4: To Detect and Prevent Multiple Registrations	84
4.3.2 Table 5: To Prevent Multiple Voting	84
4.3.3 To Prevent Voter Impersonation	85
4.3.4 To Check Unqualified Voter Registrations	85
4.3.5 To Ensure a Clean Voters Registry	86
4.3.6 To Ensure the Principle of One Man One Vote	87
4.3.7 To Reduce Human Errors in Voter Registration and Verification.....	88
4.3.8 To Provide a Reliable Registration and Verification of Voters	88
4.3.9 To accelerate voter identification processes and eliminate delays.....	89
4.4 To check Ballot Stuffing	90
4.4.1 Increase Voter Participation	91
4.4.2 To Cut Down Cost.....	91
4.4.3 Pressure from Election Stakeholders.....	92
SECTION C: CONTRIBUTIONS OF BIOMETRIC VOTER REGISTRATION AND VERIFICATION TO ELECTIONS IN GHANA	94
4.5 Statement 1: The BVRV system helped to reduce multiple registrations and voting.....	94
4.5.1 Statement 2: BVRV has eliminated registration and voting by unqualified voters	95
4.5.2 Statement 3: The BVRV system has reduced voter impersonation	96
4.5.3 Statement 4: The Biometric system helped clean the electoral register and consequently checked over voting	97
4.5.4 Statement 5: The BVRV has improved voter registration and verification accuracy	98
4.5.5 Statement 6: BVRV added simplicity and speed to the electoral process	99
4.5.6 Statement 7: The BVRV has enhanced stakeholders trust and confidence in Ghana’s electoral system.....	100

4.5.7 Statements 8: BVRV served as a fool proof measure against electoral irregularities that has plagued elections in the past	102
4.5.8 Statement 9: BVRV has Strengthened Ghana’s Democracy	103
4.5.9 Level of trust in the Electoral Commission to deliver credible elections	103
4.6 Quality of Elections Conducted with the Biometric Technology	105
SECTION D: CHALLENGES/WEAKNESSES/CRITICISMS OF BIOMETRIC VOTER REGISTRATION AND VERIFICATION	106
4.7.1 Biometric Officials Control over the BVRV Kits	106
4.7.2 Malfunction and Breakdown of BVRV Machines	108
4.7.3 Inability of the Machine to Register and Verify some Voters	109
4.7.3b Grounds of Biometric Voter Registration and Verification Challenges	111
4.7.4 Weak Enforcement of Registration and Verification Criteria.....	111
4.7.5 Voting Without Biometric Verification	112
4.7.5.2 Criticisms and Weaknesses	114
4.7.5.3 Rumors of BVRV Kits Causing Cancer.....	115
4.7.5.4 Time spent on the BVV was too much at my polling station	116
4.7.5.5 Cumbersome Registration Procedure and Paper Work.....	117
4.7.5.6 Burdensome Verification Process	117
SECTION E: GENERAL PERCEPTION OF VOTERS TOWARD BIOMETRIC VOTER REGISTRATION AND VERIFICATION	119
4.7.6.1 Preference for MVRV to BVRV	119
4.7.6.2 Consolidate and continue to use BVRV in Future Elections	121
4.7.6.3 EC should Consider Adopting Electronic Voting in Future Elections	122
Interview Responses from the Electoral Commission of Ghana.....	123
4.7.7 Reasons for introducing Biometric Voter Registration and Verification in Ghana	123

4.7.7.2 Contributions of BVRV to Credible Elections in Ghana	126
4.7.7.3 Challenges to BVRV implementation and Mitigation Measures	128
Discussion of Results	133
4.7.8 Objective 1: Reasons for Introducing BVRV in Ghana.....	133
4.7.8.1 Objective 2: Contributions of BVRV to Credible Elections in Ghana	134
4.7.8.2 Objective 3: Challenges that have accompanied Ghana’s BVRV Implementation	136
4.7.8.3 Objective 4: General Perception of Voters toward the BVRV	139
4.7.9 Chapter Summary.....	140
CHAPTER FIVE	141
5.0 Introduction	141
5.2 Major Findings of the Study	142
5.2.1 Research Objective 1:.....	142
Factors that influenced the Electoral Commission to embark on BVRV	142
5.2.2 Research Objective 2:.....	143
To Determine the Challenges, Criticisms, or Weaknesses associated with Biometric Voter Registration and Verification Implementation	143
5.2.3 Research Objective 3:.....	146
To identify BVRV’s Contributions to Credible Elections in Ghana.....	146
5.2.4 Research Objective 4:.....	147
5.3 Conclusion.....	148
5.4 Recommendations	150
To the Electoral Commission (EC):	150
To Political Parties:	153
To Ghana Police Service:	153

To the Government.....	154
5.5 Suggestions for Future Research.....	154
BIBLIOGRAPHY	155
APPENDICES.....	173
APPENDIX A: FURTHER DETAILS ON DATA COLLECTION INSTRUMENTS	173
APPENDIX C: INTERVIEW GUIDE FOR ELECTORAL COMMISSION OF GHANA ..	176
APPENDIX D: SURVEY QUESTIONNAIRE FOR VOTERS.....	177

LIST OF FIGURES

Figure 1: Fingerprint under verification	38
Figure 2: Optical Mark Registration Process.....	40
Figure 3: Regional and Constituency Distribution	74
Figure 4: Age Group of Respondents	75
Figure 5: Gender Profile of Respondents	75
Figure 6: Educational Background of Respondents	76
Figure 7: Participation in Previous Elections	78
Figure 8: Have you heard of biometric voter registration and verification?	79
Figure 9: Receipt of Prior Notice on the Registration and Verification Exercises.....	81
Figure 10: Informed about biometric voter registration and verification were going to be carried out?.....	82
Figure 11: Previous voter registration and verification system facilitated Electoral Fraud	83
Figure 12: To Prevent Voter Impersonation.....	85
Figure 13: To Prevent the Registration of Unqualified Voters.....	86
Figure 14: To Ensure a Clean Voters Register	87
Figure 15: To Ensure the Principle of One Man One Vote	87
Figure 16: To check Ballot Stuffing	90
Figure 17: To increase Voter Participation.....	91
Figure 18: To Cut Down Cost.....	92
Figure 19: Pressure from Election Stakeholders.....	93
Figure 20: The BVRV system reduced multiple registrations and voting.....	95
Figure 21: The BVRV helped to eliminate registration and voting by unqualified voters.....	96
Figure 22: The biometric voter registration and verification system reduced voter impersonation	97

Figure 23: The BVRV helped to clean the electoral register and consequently helped check over voting	98
Figure 24: The BVRV helped to improve the accuracy of voter registration and verification ...	99
Figure 25: BVRV added simplicity and speed to the Electoral Process.....	100
Figure 26: BVRV has strengthened stakeholders trust and confidence in Ghana’s electoral system	101
Figure 27: Level of trust in the Electoral Commission to deliver credible elections before the adoption and use of BVRV in 2012 and 2016 elections.....	101
Figure 28: The BVRV served as a foolproof measure against electoral irregularities that has plagued past elections in Ghana.....	102
Figure 29: Level of trust in the Electoral Commission to deliver credible elections	104
Figure 30: Quality of Elections Conducted with the Biometric Technology	105
Figure 31 Figure 32	107
Figure 33 Figure 34	109
Figure 35 Figure 36	113
Figure 37: Opinion on whether the EC should go back to the manual voter registration and verification system or not.....	120
Figure 38: Opinion on whether the BVRV is better than the MVRV	120
Figure 39: It will be prudent for Ghana to consolidate and continue to use the BVRV for future elections	121

LIST OF TABLES

Table 1.0: COMPARATIVE STATISTICS ON VOTER REGISTRATION CHALLENGES FROM 1995-2008..... 44

Table 2: Sample Frame 65

Table 3: Source of Information about Biometric Voter Registration and Verification 80

4.3.1 Table 4: To Detect and Prevent Multiple Registrations 84

4.3.2 Table 5: To Prevent Multiple Voting 84

Table 6: To Reduce Human Errors in Voter Registration and Verification 88

Table 7: To provide reliable registration and verification of voters 89

Table 8: To accelerate voter identification processes and eliminate delays 89

Table 9: The biometric voter registration and verification helped to strengthen Ghana’s democratization process which began in 1992 103

Table 10: Malfunction and Breakdown of BVRV Machines 108

Table 11: Malfunctioning and breakdown of biometric machines-2016..... 108

Table 12: Failure of biometric machines to verify some voters at my polling station-2012 110

Table 13: Failure of biometric machines to verify some voters at my polling station 110

Table 14: If yes to Q16iii and Q16iv what was the grounds of these challenges? 111

Table 15: Weak enforcement of Registration and Verification Criteria-2012..... 112

Table 16: Weak enforcement of Registration and Verification Criteria-2016..... 112

4.7.5.1 Table 17: Again if yes to Q16iv what form of identification document was used to enable the voter(s) to vote? 114

Table 18: Voters stayed away from registration and voting because rumors indicated that the biometric device could cause cancer to those who are exposed to it..... 115

Table 19: The paper work and procedure on the biometric voter registration are quite cumbersome 117

Table 20: The verification process at my polling station was burdensome to me 118

4.7.5.7 Table 21: The BVV procedure slowed down the voting process at the polling station where I voted.....	118
Table 22 Statement 4: Ghana should plan and adopt electronic voting in future presidential and parliamentary elections	122

LIST OF ABBREVIATIONS

BVR	Biometric Voter Registration
BVV	Biometric Voter Verification
BVRV	Biometric Voter Registration and Verification
CDD	Center for Democratic Development
CIDA	Canadian International Development Agency
CODEO	Coalition of Domestic Election Observers
DANIDA	Danish Development Agency
EC	Electoral Commission
EU	European Union
ECG	Electoral Commission of Ghana
EMB	Election Management Bodies
EMS	Election Management System
GCPP	Great Consolidated Peoples' Party
IDEA	Institute for Democracy and Electoral Assistance
IFES	International Foundation for Electoral Systems
INEC	Interim National Electoral Commission
MVRV	Manual Voter Registration and Verification
NCD	National Commission for Democracy
NDC	National Democratic Congress
NDI	National Democratic Institute
OMR	Optical Mark Recognition
PNDC	Provisional National Defense Council
UNIGOV	Union Government
USAID	United States Agency for Development

CHAPTER ONE

INTRODUCTION AND BACKGROUND

My goal in this study is to assess the effects of the biometric voter registration and verification system introduced in Ghana's 2012 and 2016 elections. The study focused on these key research questions: Why did the Electoral Commission of Ghana embark on biometric voter registration and verification? To what extent has the biometric voter registration and verification system contributed to credible elections in Ghana? What challenges have accompanied Ghana's biometric voter registration and verification implementation? What is the general perception of voters towards the biometric voting system introduced into Ghanaian elections?

Following the third wave of democratization in Africa, Ghana returned to democratic dispensation in 1992 after years of military regime. Ever since, the country has proven to be one of the most progressive electoral democracies in Sub-Saharan Africa (Okrah, 2015). By 2016, the country has conducted seven relatively successful elections at four years interval beginning from 1992. Until 2012, when biometric voter registration and verification (BVRV) system was first introduced for Ghana's general elections, the country used the Optical Mark Recognition (OMR) system to register eligible voters. The registration of voters was computerized but the registration process did not include collecting the biometric details of prospective voters. Equally, during elections voters were verified manually by an electoral officer absent a biometric or computerized identification system (CODEO, 2012). Using this voting system the Electoral Commission (EC) of Ghana conducted five relatively successful elections. These elections were generally recognized by both domestic and international election observers like CODEO and NDI as peaceful, credible, and successful (CODEO, 2012; NDI, 2016).

Within this period, two of the elections resulted in successful transition of power from a ruling party to an opposition party. These success stories however were not without challenges to election administration. A recurring theme of the (traditional) voting system¹ encompassed unqualified voter registrations (registration by minors and non-Ghanaians), voter impersonation, multiple registrations, multiple voting, ballot stuffing, carousel voting, and bloated electoral register, inter alia (Debrah, 2015). CODEO (2012) generally found that the failure of the Electoral Commission to produce a voters' register and verification system regarded by all stakeholders as credible presented a major setback in Ghana's electoral administration.

In the bid to promote transparent and credible elections the Electoral Commission received concerns from individuals, civil society organizations, political parties, and other electoral stakeholders toward the need to adopt new reforms to solve the problems associated with the electoral system (Oquaye, 2012; CODEO, 2012). With the Authority vested in the Electoral Commission to make reforms in Article 45 (a) and (f) of Ghana's 1992 Constitution² coupled with the search for a solution to the aforementioned electoral irregularities associated with the electioneering process, the Electoral Commission on 24th March, 2012 introduced the biometric voting system which was in two sections: the biometric voter registration and biometric voter verification (CODEO, 2013; Friedrich Ebert Stiftung, 2017). This reform was primarily expected to overcome the major challenges associated with the traditional voter registration and verification system (CDD-Ghana 2012). However, according to Gelb and Diofasi (2016) biometric

¹ Traditional voting system in this study refers to the Optical Mark Recognition system and the manual voter verification system that were employed for Ghanaian elections before 2012 (i.e. from 1992 to 2008).

² Article 45 (a) and (f) of the 1992 Republican Constitution of Ghana stipulates that: The Electoral Commission of Ghana shall have among others the following functions – (a) to compile the register of voters and revise it at such periods as may be determined by law; (f) to perform such other functions as may be prescribed by law

technologies in elections when not properly handled may undermine voters trust and confidence; give rise to allegations of electoral fraud; and consequently aggravate the very problems they were supposed to prevent. This study therefore seeks to investigate Ghana's experience with the 2012/2016 biometric voter registration and verification system and the dynamics that have transpired over the years.

1.1 Research Background

The democratization process of many developing countries particularly Africa began to unfold after the demise of the cold war. Fukuyama (1992), notes that the era marked the adoption of western liberal democracy as the final form of human development. By 2003, about sixty percent of the world's states were considered formal democracies (Diamond, 2006; Van de Walle, 2005). In lieu of the minimalists' definition of democracy³, about one hundred and twenty-three (123) states including fifty (50) African countries had become electoral democracies as of 2007 notwithstanding how imperfect they might be (Lindberg, 2007; Schumpeter, 1947; 1954).

Matlosa (2003) argues that, the general impression that can be deduced from the "third wave of democratization"⁴ that swept Africa in the 1990s as described by Samuel Huntington, is that, the transition helped to reorient the African political system away from despotism and authoritarian rule towards; increasing political freedoms, growth and organization of political parties, competitive political governance, and the era of holding elections on a relatively even playing field

³ Minimalists-(a faction of Marxist Social Democratic Party in prerevolutionary Russia that advocated for a gradual approach to social reform) defines democracy as a system of government in which the principal positions of political power are filled through regular, free, and fair elections irrespective of how imperfect they may be (Lindberg, 2007).

⁴ The unfolding process of democratic transition in Africa is what Harvard political scientist Samuel P. Huntington termed the "third wave" of democratization. See Huntington (1997:4), Mozaffar (1997:7) and Raknar et al., (2007:7) for more explanations on Samuel Huntington's first, second, and third wave of democracy.

(Huntington, 1991;1997; Mozaffar, 2002). This development among others heralded the departure from the era of military coups d'états to the holding of elections sometimes even for the mere sake of it (Etannibi, 2007). Thereafter, African countries became more predisposed to holding elections and the maxim of “bullets to ballot” became a common parlance (Okrah, 2015; Handley, 2008).

In Ghana, the emergence of the third wave of democratization led to the liberalization of the political space, the return to multiparty politics and elections, the drafting of the Fourth Republican Constitution, and the strengthening of the electoral processes, among others (Boafo-Arthur, 2008; Frimpong, 2008). Extant literature posit that this development was induced by both internal and external factors. Fundamental to these factors as identified by Ninsin (1998) and Handley (2008), were the agitations by the Movement for Freedom and Justice - a pro-democratic force, which to some extent influenced Flt. Lt. Jerry John Rawlings and the Provisional National Defense Council (PNDC) to tolerate some form of political space, ultimately, the operation of opposition groups. In addition, pressure from International Financial Institutions (IFIs), making democratization a pre-condition for foreign aid forced Ghana and many other developing countries to liberalize their political environment (Boafo-Arthur, 2008; Gyimah-Boadi, 2004; Handley & Mills, 2001; Badu & Larvie, 1996; Oquaye, 1995; Sandbrook & Oelbaum, 1991).

The liberalization of the political space in Ghana began with the conduct of non-partisan but competitive District Assembly (DA) elections in 1988. Later, regional consultations were hosted by the National Commission for Democracy (NCD) under the leadership of the late Justice Daniel Francis Annan to pronounce the future direction of Ghana's political processes (Ninsin, 1998). A Consultative Assembly was subsequently inducted to draft a new constitution for the country; and

by the end of March 1992, a revised draft constitution was submitted to the Chairman of the Provisional National Defence Council (PNDC), Flt. Lt. Jerry John Rawlings. The proposed constitution was subjected to a referendum on 18th April, 1992, and was approved by more than ninety percent of the total voters (Handley, 2008; Ayee 1997; Badu & Larvie, 1996).

Boafo–Arthur (2008), Ayee (1997), and Ninsin (1998) argue that the environment prior to the framing of Ghana’s Fourth Republican Constitution in 1992 was not favorable. Ninsin (1998) noted that the Rawlings’ regime was much interested in self-succession than opening up the political space for competitive elections. He intimates that the entrenched Rawlings’ military regime which held the reins of power for over a decade succeeded in intimidating and suppressing political groupings, civic organizations, professional associations, and the middle class of the society. However, in November 1992, the first general election was held (Ninsin, 1998). The National Democratic Congress (NDC) led by Rawlings, contested against the New Patriotic Party (NPP) led by the late Professor Albert Adu Boahen and other political parties and won even though some members of the opposition parties cried foul (Etannibi, 2007; Gyimah-Boadi, 2004; Oquaye, 1995). It is quintessential to note that, after that period, peaceful and successful elections have been held every four years, and the role played by electoral reforms cannot be overlooked (CODEO, 2012).

However, in the run up to the 2008 December elections, Mike Oquaye asserted that, Ghana went to the brink of war, because, the credibility of the electoral process was contested (Oquaye, 2013). On the basis of this argument he noted that, the NDC led by the late Prof. Mills complained that they have uncovered a conspiracy between the Electoral Commission and the NPP to rig the 2008

elections. Consequently, Prof. Mills warned that a Rwanda-style civil war was imminent (Ibid). Macho men were engaged by candidates to become part of the electoral process. While a number of people were maimed and deaths occurred, others sought asylum abroad, and many more stored food against the expected war. As the final results were being awaited, Rwanda was rehearsed in the capital - NDC youth in the city of Accra, dreadfully armed invaded the Electoral Commission head office and burnt vehicle tyres (Oquaye, 2013:5).

The panic scenario became rife in 2008 and demands for credible elections heightened as concerns over failed electoral processes and procedures were largely reiterated in media commentaries and political discourses (Debrah, 2015; Oquaye, 2013). The 2008 elections experience among others was the last straw that influenced demands toward the adoption of a more credible electoral reform to address the challenges bedeviling elections over the years (Ibid). The Electoral Commission of Ghana therefore accepted suggestions for electoral reforms and introduced the biometric voter registration and verification system into Ghanaian elections (EISA, 2012).

1.2 Research Problem

Over the past two and half decades (after 1992) several electoral reform policy initiatives have been expended to enhance transparency and electoral credibility in Ghana. These include the introduction of transparent ballot boxes to replace opaque ones; the replacement of the Political Parties Law (PNDCL 281) of 1992 which was seen as obtrusive to the conduct of competitive and credible party politics and democratic progress with the Political Parties Act 574 of 2000 to ensure greater participation of the citizens; the issuing of photo identity cards to replace thumb printed ID cards; and the holding of both parliamentary and presidential elections on the same day (Ayee

2017; 1998; 1997b; Oquaye, 2013; Frempong, 2008). However, the most significant electoral reform occurred in Ghana's 2012 and 2016 general elections. These elections featured the use of biometric voter registration and verification systems with expectations of addressing the registration of unqualified voters, multiple registrations, multiple voting, voter impersonation, and over bloated register associated with the manual voter registration and verification system used in past elections (CODEO, 2013; Friedrich Ebert Stiftung, 2017).

Although elections conducted with the biometric voter registration and verification systems have been largely argued among scholars to have substantially reduced multiple registrations and voting (Debrah, 2015; CODEO, 2012) the biometric technology has not been wholly successful in addressing the major challenges that necessitated its adoption. Notwithstanding the fact that the 2012 biometric elections was challenged and disputed on several fronts at the Supreme Court by the main opposition (NPP) over allegations of over voting, rigging, and unqualified voter registrations etc. (Jahateh, 2012), experiences of biometric machine breakdowns, and its ability to disenfranchise some voters among others (p.125 of the written address of the counsel for the petitioners in the 2012 election petition in Ghana) have drawn questions to its credibility and relative advantage over the one it superseded. Allegations of rigging and bloated voters register recorded under the manual voting system were further replicated in 2012 and became rife in the run-up to the 2016 general elections. The general impression was that, the integration of BVRV into Ghanaian elections has not been robust enough to instill the desired stakeholder trust and confidence (Debrah, 2015). In light of this argument Ayee (2017) stated that, in spite of the reforms thus far, elections in Ghana have been characterized by some malpractices and alleged rigging. The Electoral Commission (EC) is therefore often criticized for its inability to prevent the

registration of unqualified voters, voter impersonation, multiple registrations and voting, ballot stuffing, and the bloated voters register associated with Ghana's voting system.

Though there is a considerable growth in the literature on technology and elections across the globe and still remains a persisting and significant feature of contemporary works in Ghana, there are no clear cut ideas about the effects of biometric technologies on elections, especially biometric voter verification technologies. There are doubts about the costs and benefits of introducing biometric technologies into elections, criticisms about its adoption, and untested assumptions on voters' perception towards biometric elections in Ghana. Most of the studies regarding electoral reforms in the growing body of literature largely focus on the state of electoral reforms, electoral reform laws,⁵ and biometric voter registration (since perhaps Ghana happens to be the first country in the world to incorporate biometric voter verification system in its elections in 2012). In the limelight of Ghanaian elections, no single study has made particular efforts to understand and assess the 2012 and 2016 biometric voter registration and verification elections so as to draw a comparative outlook of the dynamics that have transpired over the years. With so many unresolved questions and untested assumptions on Ghana's biometric elections, there is the need for a stronger evidence base to build policy and practice. This study therefore seeks to investigate Ghana's experience with the biometric voter registration and verification used in the 2012 and 2016 general elections and the extent to which this reform has contributed to Ghana's pursuit of credible elections.

⁵ See pages 21-30 of this thesis for more details and discourse on electoral reform studies conducted in Ghana.

1.3 Research Questions

The main research questions for this study relates to assessing Ghana's experience with the biometric voter registration and verification elections. To arrive at this purpose, the following research questions will serve as a guiding preamble.

1. What factors influenced the Electoral Commission of Ghana to embark on BVRV?
2. To what extent has BVRV contributed to credible elections in Ghana?
3. What challenges have accompanied Ghana's BVRV implementation?
4. How can the challenges associated with BVRV be mitigated?
5. What is the general perception of voters toward the BVRV system?

1.4 Research Objectives

Within the context of electoral reforms and Ghana's 2012 and 2016 biometric elections, this research study seeks to:

1. Determine the factors that influenced the Electoral Commission to embark on BVRV.
2. Establish BVRV's contribution to elections in Ghana.
3. Identify the challenges associated with the BVRV system.
4. Proffer measures to resolve the challenges associated with BVRV.
5. Determine the general perception of voters toward the BVRV system.

1.5 Conceptualization

For the purpose of this study, the following concepts will be understood in these contexts:

- I. Election: According to the National Democratic Institute for International Affairs (2009), election refers to a decision-making process through which citizens of a state

who are eligible to vote choose an individual or group of individuals to hold public office and work on their behalf. Lindberg (2007) defines an election as the process of choosing leadership and disposing of old governments in a political system. In the context of representative democracy, he maintains that elections provide the means of deciding who should hold executive or legislative power and that a repetitive form is even enough for entrenching democracy. For the purpose of this study the concept of election would be understood as any mechanism that permits citizens to choose their governments freely and fairly devoid of violence, intimidation, and fraud; where the wishes of the people are expressed in the votes counted.

- II. Electoral Reforms: Butler (2004) defines electoral reforms as changes in the electoral system aimed at improving public desires. According to him such reforms may occur in either the voting and counting processes, rules governing political parties, ballot design, voting kits, how political parties and their candidates may contest for elections, safety of election officials and voters, measures against electoral fraud, funding of candidates, and or an alteration in election laws. For the purpose of this research, electoral reform may be viewed as the introduction of fair electoral processes and procedures at where they do not exist for the sake of credibility and or improving the efficiency and effectiveness of an existing system.
- III. Biometrics: Biometrics according to Mwithusa (2015) refers to the use of measurable, biological traits or characteristics such as voice, fingerprints, or iris patterns among others to identify a person to an electronic system. The concept of biometrics in this study will be understood to mean a specialized way of identifying an individual or a

user by processing unique behavioural or physiological characteristics of the individual.

- IV. Biometric Voter Registration (BVR): Mwighusa (2015) contends that, biometric voter registration is the use of biometric technologies such as computers, fingerprint scanners, digital cameras etc. to capture the biometric data (e.g. fingerprints, facial structure etc.) of voters for the purposes of identification. In this study biometric voter registration is operationalized as the process of capturing an eligible voter's (18 years of age or above, sound minded, citizen of the country) personal information (name, date of birth, hometown, language, address, family, photograph etc.), via the use of biometric devices for the purpose of verification on election days.
- V. Biometric Voter Verification (BVV): Gold (2012), argues that biometric voter verification is any means by which an eligible voter can be uniquely identified by evaluating one or more distinguishing biological traits of the individual. He contends that, the process should involve a one-to-one comparison of stored biometric templates to a claimed identity of the individual. Accordingly, biometric voter verification in this study is defined as the process of comparing the biometric feature(s) of a prospective voter to previously captured biometric data to ascertain a confirmation for his or her identity.

1.6 Significance of the Study

The significance of this study rests in the following reasons:

1. The study will raise awareness of electoral reforms in Ghana's Fourth Republic and the effects of the 2012 and 2016 biometric elections.
2. The findings of this study will help electoral stakeholders to appreciate voters' attitude towards the incorporation of biometric voter registration and verification in Ghana's electoral process.
3. This research will aid policy makers, political parties, and the Electoral Commission in identifying biometric voter registration and verification challenges and how best they can be resolved to improve electoral credibility.
4. The findings of this research will serve as a basis that the researcher will use to make recommendations which will provide useful knowledge to inform practice and policy formulation concerning biometric voter registration and verification.
5. This study will contribute to existing literature on biometric elections and also provide a valuable resource to academics and researchers; especially those in political science and information technology.

1.7 Justification of the Study

Ghana returned to constitutional rule in 1993 and has ever since made tremendous strides in its democracy. This has earned the country international commendation as the beacon of democracy in the West African sub-region. Arguably, this acclaim is made possible amidst the smooth conduct of peaceful elections and electoral reforms. The adoption of electoral reforms in Ghana's electioneering process has gone a long way to ensure a relative sense of electoral integrity albeit

challenges especially in the 2008 and 2012 general elections. There is no gainsaying that, the journey to becoming an advanced democracy is a process. Thus, it is imperative that research is conducted to identify and examine the effects of electoral reforms on Ghana's electoral and democratic development. This research study therefore sought to come out with findings and recommendations that will add to inform the existing body of knowledge on elections and electoral reforms, and project the need for quality reforms towards electoral administration and credibility.

1.8 Scope of the Study

The study was conducted in the Central, Western, and Greater Accra regions of Ghana with key focus on the 2012 and 2016 biometric voter registration and verification. The study was limited to the Electoral Commission of Ghana and voters in three selected coastal swing constituencies (Gomoa East, Ablekuma Central, and Shama). The swing regions and their constituencies were selected because, they are known for their inconsistent voting pattern with no inclination towards a particular party or candidate. Again, these constituencies have been swinging every eight years since the inception of Ghana's return to democracy in 1992. Essentially, these constituencies will help provide a fair assessment of the subject under study without any biases towards a particular political party since none of the constituencies in the regions is a stronghold to any of the political parties.

1.9.1 Organization of the Study

This study was organized into five (5) chapters. The first chapter discusses the introduction, background of the study, the research problem, the research questions and objectives, operationalization of key concepts in the study, significance of the study, scope of the study, and the chapter organization. Chapter two provides a review of relevant literature in the subject area. Chapter three discusses the theoretical framework and the research methodology and approaches employed in this study. The fourth chapter captures the data analysis of the information gathered from the field survey and further presents a discussion of the research findings. The final chapter, chapter five presents a summary of the research findings, draw conclusions from the research, and finally make recommendations for future research studies.

1.9 Chapter Summary

This chapter took a look at the background from which the research topic became relevant for an academic study, moving from a general perspective to the specific research problem. It also highlights the research objectives, and corresponding research questions adopted for this study. This is followed by a definition of key concepts employed in the study, and a justification for the decision to study the chosen research area among others.

The next chapter presents a discussion of relevant and current literature employed in the study. It covers perspectives on electoral reforms and related issues on biometric voter registration and verification.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter covers a review of relevant and related literature on electoral reforms and biometric voter registration and verification. The review is structured on these thematic areas: democracies and elections, electoral reforms in Ghana, biometric systems, and biometric voter registration and verification (BVRV). The rest include, the underlying reasons behind Ghana's BVRV adoption and implementation, the strengths and contributions of BVRV, the challenges and criticisms of BVRV, and the general perception of voters toward Ghana's BVRV system.

2.1 Democracies and Elections

Huntington's concept, third wave of democracy, which depicts the unfolding process of democratic transitions in Africa has been remarkably noticed as many African countries continue to make significant strides with elections and democratic governance (Luckham et al. 2003; Huntington, 1991; UNDP, 2002; Hyslop, 1999; Bratton & Van de Walle, 1997). Since Huntington's 1991 treatise on the third wave of democratization, elections have been regarded as the right and acceptable means through which regimes are changed in Africa. Periodic and competitive elections are considered central to democracy because they provide opportunities for citizens to either endorse or reject the performance of an incumbent government. In other words, the opportunity to choose through periodic and competitive elections as to who is deemed capable of governing a country is widely held as the hallmark of representative democracy.⁶ Elections are

⁶ There are, however, those who would disagree with this assessment. See for instance, Collier P, 'Democracy', <http://www.washingtonpost.com/wp-dyn/content/article/2009/11/06/AR2009110601906.html> (accessed 2 July, 2018).

therefore widely held as necessary components for democratic consolidation and development. In that, they provide the dominant avenue for citizens' participation in political life and as well facilitate the realization of what Bargiacchi et al. (2011) refers to as the twin objective, human development and poverty alleviation (Ayee, 2017).

Some of the grounds for justifying the holding of elections include the opportunity it offers citizens to influence the conduct of politicians, the compensation for private inequalities by public or state resources, the consolidation of new democracies, and promotion of legitimacy (Ayee, 2017). Ninsin (2006) argues that, democratic elections enhance mass participation in political governance and as such help eliminate citizen apathy. According to Freedom house (2006), fair competition among political parties and the granting of political and civil liberties; including freedom of the press, expression, and association, necessary to promote the integrity of political competition and participation may be realized through elections. Sandbrook (1998; 2000), Sorensen (1993), and Diamond et al. (1989) argue that, in a liberal democratic setting (that is, a political system which guarantees adequate political and civil rights with regular free and fair elections held for virtually all adult citizens who have the right to vote), elections should be seen as the fulcrum around which democracy revolves. Accordingly, Princeton (2005:2) also proudly opines that whatever is necessary to make democracy efficient, effective, and sustainable, elections are the lifeblood.

Rose (1978) similarly maintains that the more consent leadership and authority is achieved via elections the better leaders and or rulers can manage resources to compel obedience from the citizenry. Bratton (2004) also intimates that electoral alternations have significant effects on public confidence and support for democracy. Lindberg (2006) on the other hand places so much

emphasis on elections and makes the claim that; even without recourse to fairness and transparency, competitive and repetitive elections will enhance civil liberties by ensuring democratic consciousness of the citizens. He argues that, elections even if “imported” remain one of the critical tenets necessary for democratic development. The holding of elections and ensuring their continuance are therefore recognized as institutionalized attempts to realize the essence of democracy as identified by Abraham Lincoln as the rule of the people, by the people and for the people (Okrah, 2015). By and Large, frequent and competitive elections in democracies are designed to supply legitimacy and to solve principal–agent problems (that is, the voters as principals holding their representatives as agents in check) and as well ensure governmental responsiveness.⁷

After a consideration of the above, it is also important to recognize that, commonly debated among scholars is the argument that, elections alone do not amount to democracy. Rakner and Van de Walle (2009) in critiquing elections as an instrument of democratization pointed out the situation in Africa; where opposition parties are largely unable to compete effectively with incumbent regimes. They argue that, although elections became regularized in Africa in the late 1980s, the weakness of opposition parties to effectively compete with incumbent governments represent a serious challenge for democratization. A growing number of scholars including Collier (2009), Fawole (2005), Carothers (2002), and Santiso (2001) have all criticized the emphasis on elections as the major sine qua non for democracy. Fawole (2005) in particular asserts that the idea that elections promote popular participation cannot be entirely true. To this end, he indicates that, vote

⁷ See National Democratic Institute, *Making Every Vote Count: Domestic Election Monitoring in Asia*. Washington, DC: NDC, 1996; Goodwill-Gill GS, *Free and Fair Elections: International Law and Practice*. Geneva: Inter-Parliamentary Union, 1994. Hayward F (ed.), *Elections in Independent Africa*. Boulder, CO: Westview Press, 1987; Butler CH, *Democracy at the Polls*. London: Oxford University Press, 1987; Ginsberg B & A Stone (eds), *Do Elections Matter?* New York: Sharpe, 1986.

buying and rigging are common features of elections and as such elections are mere political formalities which reduce interest and increase civil apathy. Bratton and Van de Walle (1997) and Luckham (1994) also criticize the prospects of elections in Africa arguing that, before the demise of colonial rule, most independent African states even though were holding elections became cases of one-party rule and military regimes. Luckham indicates that, on the account of cold war politics the culture of “massaged” or adulterated elections became a common practice in Africa. He consequently referred to such incidents as “garrison socialism” littering the continent, and placing little or no value on the importance of elections and electoral processes.

Bratton (1985) and Bratton and Van de Walle (1997) however maintain that, no other mechanism precedes a competitive, participatory, and legitimate elections as a fundamental importance for self-government. The German Philosopher, Karl Marx, asserts that, the institutions of liberal democracy encompassing periodic elections must be taken serious because they constitute the process of political emancipation necessary for achieving human freedom and liberation (Adejumobi, 1998; Marx, 1975). Levitsky and Way (2002) captured the importance of elections and democracy more succinctly when they averred that there can be elections without democracy, but there cannot be democracy without elections. Dumor (1998) reiterates that while democracies and periodic competitive elections are necessary for political development and growth, it is obligatory for all stakeholders to act accordingly by putting in place mechanisms that will help consolidate the democratic culture and practice.

In Ghana, a state which has been identified as part of Huntington’s third wave of democratization in the 1990s, the country has held seven successful elections since that time (1992, 1996, 2000,

2004, 2008, 2012 and 2016). Notably, three of these elections (2000, 2008 and 2016) resulted in a peaceful alternation of power from one major political party to another. Amidst Ghana's progressive electoral successes, electoral reforms have played significant roles, and have further contributed to her feat as the beacon of democracy in West African sub-region (Ayee, 2017).

2.2 Electoral Reforms Explained

According to Odion (2012), electoral reforms may be defined as the introduction of fair electoral policies and machineries at where they do not exist and or improving the effectiveness and fairness of an already existing system. Butler (2004) on the other hand views electoral reforms as changes in electioneering processes to enhance the expression of public desires in elections. Butler (2004) contends that these changes may include changes in the voting system and procedures, changes in ballot designs and voting equipment, changes in election laws, measures against electoral fraud in the form of bribery, and coercion, as well as measures streamlining sources of funding for political parties and their candidates inter alia. For Dalton and Gray (2003:27), electoral reforms refer to changes in the legislations (versus practice) that regulate the process of voting, including who can vote and how such votes are translated into seats. In light of this argument, Rafic (2012) maintains that, owing credence to the corrupt and tyrannical nature of some vote based system and electoral frameworks, for a credible and sound election, electoral frameworks must be in a state of constant reforms whenever deemed necessary. He argues that, in patterns of evolving times the electoral system must be reformed in order to avoid putrefactions with the existing system so as to easily adjust to evolving times. In this regard, Okrah (2015) also maintains that, it is crucial for any country which seeks to ascertain electoral credibility to periodically adopt mechanisms and processes aimed at ensuring transparent, free, fair, and acceptable elections.

Katz (2005) and Lijphart (1994) conceptualize electoral reforms into minor, major, and technical forms. Lijphart (1994:3) in particular refers to major electoral reforms as those changes that considerably affect the electoral formula, district magnitudes, and or an electoral threshold. However, a critique of this definition by Katz (2005) postulates that, when working with Lijphart's definition, findings will prove only a few major electoral reforms in established democracies. Jacobs and Leyenaar (2011:496) additionally demonstrate their difference to Lijphart's definition by opining that it may be "unproductive" not to recognize minor and technical electoral reforms. Jacobs and Leyenaar (2011:496) further echo that whether an electoral reform would be categorized as major, technical, or minor should primarily be dependent on its contents and impact.

Inferring from extant literature there are two main schools of thought with contrasting views on what constitutes an electoral reform. The first school of thought consists of those who believe that electoral reform encapsulates a whole replacement of an electoral processes (Gyampo, 2017; Lijphart 1994; Katz 2007). This means a detailed review of an electoral process, including the formula for allocating seats and other voting arrangements. While the second school of thought is made up of those who believe that electoral reform comprises all major and minor changes that serve to improve the electoral processes. This position is captured by the studies of Jacobs and Leyenaar (2011), and International IDEA (2006). They argue that electoral reforms may not necessarily entail a total overhaul of national electoral processes. And as such any change in electoral process that improves it, and makes it responsive to the expectations of the electorate constitutes electoral reforms (Gyampo, 2017; International IDEA 2006). Consequently, when a

process fosters and enhance transparency, integrity, impartiality, accuracy, and inclusiveness, in an electoral process it can be considered an electoral reform (Jacobs and Leyenaar 2011).

2.2.1 Electoral Reforms in Ghana: A General Discourse

Since 1993, electoral reforms in Ghana have not taken the form of wholesale replacement of the electoral processes along the lines of the first school of thought discussed above. On the contrary, reforms have been implemented with the aim of improving and ensuring that the electoral processes deliver results acceptable to the citizenry and all stakeholders concerned (Gyampo, 2017). General studies conducted on electoral reforms in Ghana include Ayee (1997; 2001; 2017), Debrah (2015), Okrah (2015), Frempong (2008), Oquaye (2013), and Gyekye-Jandoh (2013). Following the history of electoral reforms in Ghana's Fourth Republic, these scholars depict that the peaceful transition of power from an undemocratic government to an electoral democracy in 1992 presented a progressive phase in Ghana's democracy and governance system. They all corroborate that the founding elections of 1992 however praiseworthy uncovered deficiencies in Ghana's electoral processes including the general population and the major political parties' mistrust about the impartiality, independence, and integrity of the Electoral Commission, allegations of bloated electoral register, and the usage of opaque ballot boxes which facilitated electoral fraud etc. These scholars point out a number of reforms made to Ghana's electoral process to ensure that trust and acceptability of successive elections are ascertained. Goodwin-Gill (1994), Frempong (2008), Gyekye-Jandoh (2013), and Debrah (2015) identified that, in order to enhance democracy and strengthen trust and acceptability of election results, electoral reforms became a necessary tool for safeguarding Ghana's electoral system and democratic consolidation.

Ayee (1998:54) and Goodwin-Gill (1994:36) argue that the tradition of setting up an independent Electoral Commission in Ghana (either as sole electoral commissioners as in 1968, 1969-74, 1977, 1978, 1979-82, or as a collective body as in 1982-1992, 1992, 1993, except for 1950-1968 and 1974-1977 where the electoral body was a department under the ministry of Local Government) were all reforms geared towards promoting electoral credibility; because, an independent Electoral Commission was viewed in many circles as important steps for building traditions of impartiality, trust, and confidence in the electorates and political parties in an electoral system. Where citizens and political parties have doubted the independence, impartiality, and integrity of the Electoral Commission in their actions and inactions, reforms have been introduced to address such concerns (Ayee, 1998:54). For instance Gyekye-Jandoh (2013) and Crabbe (1975:136-137) identified that, during the 1969 elections in Ghana, the main political opposition parties demanded for reforms which required a compilation of a new voters' register, a new elections, and a call for the procurement of photographic equipment for voter identification processes.

Gyekye-Jandoh (2013) however argue that, the call for electoral reforms in Ghana in the past years before 1992 were largely influenced by concerns over governments' intervention in the activities of the Electoral Commission as typified in the March 30, 1978 Referendum on Union Government.⁸ She argues that, during the UNIGOV referendum, Justice Abban, the sole Electoral Commissioner of the time, is reported to have engaged in series of heated arguments with government officials over issues of vote counting, where he consequently wrote to the Secretary of the Supreme Military Council complaining about threats to his life and attempts to interfere with the selection of electoral officers (Chazan and Le Vine, 1979; Gyekye-Jandoh, 2013:79).

⁸ UNIGOV was a government of national unity composed of the army, police, and civilians proposed and pushed forward by the then military head of state, General I.K. Acheampong in an attempt to legitimize his rule

Similarly, allegations of government's involvement and influence which defeats the independence of the Electoral Commission were also leveled against the PNDC's National Commission on Democracy (NCD) (1982-1992) that oversaw the District Assembly elections in 1988/89. In contrast to the electoral functions that were assigned to the NCD, they transcended their electoral functions to include political ones. For instance, in addition to conducting public elections, it was further set out to disseminate information on government policies, embark on political education, and also collates the views of citizen on how best the PNDC regime can design a new local system. These suggest that the National Commission on Democracy served as both an electoral body and a political instrument of the state (NCD Document 1991:32; Gyekye-Jandoh, 2013:6).

Also, prior to the early 1990s, Ghana's democratization process brought forth the need to introduce an enhanced electoral management body to steer the transition process from military rule to a multi-party constitutional one. Accordingly, an Interim National Electoral Commission (INEC) was established by the PNDC government in 1991 to conduct the 1992 general elections. Gyekye-Jandoh (2013) noted that, before and soon after the 1992 general elections, the EC was perceived by the public and opposition political parties as being in league with the Rawlings government, due to INEC's establishment by a PNDC military decree and its alleged negligence or complicity with the government. These incidents were believed to have permitted interferences and massive rigging in the 1992 elections (Commonwealth Secretariat, 1992). On the contrary, Gyekye-Jandoh (2013) revealed that, the EC Chairman debunked such allegations insisting that the Electoral Commission since the days of INEC's creation has remained independent and therefore have had no experiences of interference from the PNDC or the NDC governments. The EC consequently attributed the woes and allegations of the opposition parties to the use of the 1988 District

Assembly elections voters register to conduct the 1992 presidential elections (Ibid). Ironically, it is precisely on this voters' register, and the fact that the EC went along with the PNDC law that mandated its use that the opposition parties based their denunciation of the 1992 election results, and further contended the untrustworthiness and complicity of the Electoral Commission. Notwithstanding the lack of trust in the INEC by the opposition political parties and sections of the Ghanaian populace in 1992, Gyekye-Jandoh (2013) argues that, the creation of this institution by the Rawlings' regime to oversee the 1992 transitional elections somehow represented a substantive move which has stabilized Ghana's elections and democratization process since the inception of her Fourth Republic in 1992.

2.2.2 Electoral Reforms in Ghana Before 2012

The 1992 Elections conducted by the INEC generated lots of controversies which led the New Patriotic Party (NPP) which lost the presidential elections to boycott the ensuing parliamentary elections and later publish the Stolen Verdict to catalogue a number of pitfalls in the electoral processes (Oquaye, 2012). According to the New Patriotic Party the 1992 elections was a broad daylight robbery yet the political atmosphere and circumstances at play prohibited the NPP to seek redress at the law court (Ibid). The electoral irregularities catalogued by the NPP in 1992 included the following allegations: no ID cards were issued to registered voters and thus before a registered voter gets to the polling station a procured voter might have voted in his or her name already, yet, no protestations could however change the situation; the wooden ballot boxes that were used for the elections were not allowed to be inspected before the polls began; thumb-printed ballot boxes were found in many homes and places on the election day; arresting of NPP polling agents and executives; counting of votes were not done at the polling stations on spot but were conveyed to

centers and counted under PNDC's control; cadres, soldiers, and commanders were in full control of the voting process and also directed the electorates as to how to vote; ballot stuffing; multiple voting; and also the allegation that members of the INEC out of which the majority came from the PNDC were influenced to rig the 1992 elections. The NPP called for reforms before it would participate in future elections.

Consequently, several reforms including the use of transparent ballot boxes, photo ID cards, counting and announcing votes at polling stations, and other reforms were implemented to enhance the integrity of successive elections (Oquaye, 2013:22). In regard, NPP opined that, "If we had allowed ourselves to be led as sheep to the slaughter without reforms, we could never have won a nation-wide presidential election. We could win very few strongholds and be cheated throughout Ghana" (Oquaye, 2013:22). In March 1994, an Inter Party Advisory Council (IPAC) was formed to bring representatives of the political parties together with the aim of building consensus on electoral matters in partnership with the Electoral Commission (EC). The co-option of the political parties into the electoral management process itself through the Inter-Party Advisory Committee created a sense of involvement and further enhanced the trustworthiness of the electoral process (Gyekye-Jandoh, 2013; Oquaye, 2012). Following this period, Ghana's electoral process has undergone several reforms with the goal of fine-tuning the electioneering processes to ensure that issues or challenges with previous elections are addressed for a better election management in the future (Gyamapo, 2017). Some of the reforms undertaken by the Electoral Commission of Ghana before the biometric voter registration and verification in 2012 include the following:

First, in 1995 the Electoral Commission of Ghana (ECG) discarded the existing electoral register and compiled a new one over allegations that, the 1988/89 electoral register that was used to conduct the 1992 elections voters register was over bloated due to the EC's failure to purge the records of the deceased since its first compilation; inconsistent registration of names; and double entries (Gyekye-Jandoh, 2013; Debrah, 1998). The new register that was compiled in 1995 witnessed an active participation and collaboration of the existing political parties from October 1-15, 1995. By 1996, dialogue between the Electoral Commission and the political parties had increased and political parties could tender in to the EC whenever they are confronted with challenges. More so, party agents, consisting of reps from the incumbent and opposition parties were allowed to monitor the registration exercises in the various polling stations (Ayee 1998; Gyekye-Jandoh, 2013). This reform introduced by the EC helped enhanced transparent voter registration which was in contrast to the 1992 elections where party agents were not allowed to observe or monitor the voter registration exercises (Ayee 1998:61). Noteworthy is the fact that, DANIDA and USAID provided a helpful hand in the 1995 voters registration exercise. Also the EU, CIDA, China, and Friedrich Ebert Foundation etc. also gave motorcycles and bikes to support the exercise (Gyekye-Jandoh, 2013:81). Consequently, appealing to the interest of the opposition parties, the new voters' register became widely accepted as an authoritative and legitimate record of eligible voters. Eventually, a major factor that undermined the legitimacy of the 1992 elections was removed.

In 1996, voter identity cards (photo ID cards) bearing the name, sex, age, and a unique number were given to registered voters to replace thumb-printed IDs that were used in past elections. However, due to inadequate funds at the EC's disposal, only a limited number of voters in ten

regional capitals in ten selected rural communities (representing one-third of the voting populace) were issued with the photo ID cards with the rest receiving thumb-printed cards. Inscribed on the new voter ID card was the voter's polling station number so that those who happen to miss their polling stations on the day of elections could easily be directed to their polling stations (Ayee, 1998). Resulting from this reform was a high voter turnout shoot-up from 50% in 1992 to a close 80% in 1996.

Also, in the 1996 elections, the existing opaque ballot boxes were replaced with transparent ballot boxes (Oquaye, 2013). This was mainly informed by the intent to forestall suspicions and allegations of pre-stuffing of ballot boxes with already thumb-printed ballot papers. This practice saw the demise in the use of opaque wooden and metal boxes in elections which elicited countless rumors and allegations regarding stuffed ballot boxes (Ayee, 1998:62; Badu & Larvie, 1996).

Moreover, the electoral process again witnessed the introduction of cardboard voting screens (Gyekye-Jandoh, 2013). In previous elections, voters generally go into a room alone to make their choice of candidates before they come out to vote in the public. This practice was reported on several fronts to make it easier for some voters to conceal ballot papers on their bodies and remove them while alone in the room only to be folded together with the given ballot and later casted into the ballot boxes when they came out to vote. This however was not the case in the 1996 elections as voting screens were erected on top of tables to protect the integrity of the ballot, so that both voting and candidate choice will take place in the full view of the public (Gyekye-Jandoh, 2013; Ayee, 1997a).

More so, the next significant electoral reform in Ghana's fourth republic before the introduction of biometric voter registration and verification dealt with vote counting and declaration of election results. Contrary to 1992 where ballots were counted at the constituency centers, vote counting in 1996 was institutionalized to take place at every single polling station under the supervision of the presiding officer witnessed by the general public right after the end of the polls. In cases of unresolved controversies over vote counts at polling stations, the returning officer is required to recount the votes at the constituency center in the presence of the party agents (Ayee 1997a; Badu & Larvie 1996). This counting procedure happened to be a by-product of IPAC's negotiations with the EC and opposition political parties after the 1992 disputed elections. Further in 2000, the Electoral commission took a number of steps to enhance its image of competence, fairness, and independence, to foster a complete public confidence (Ibid):

To begin with, the EC aimed at ensuring an even playing field by promoting freedom of speech, adequate mass media coverage, inter-party recognition, equal access to logistics and funding, non-discrimination and a fair opportunities for all the political parties (Ayee 1998; Debrah 1998; Goodwin-Gill 1994). Again, the Political Parties Act 2000 (Act 574) was introduced to check restrictions on party member donations and also make it an obligation for all political parties' to submit their returns to the Electoral Commission for auditing (Political Parties Law 2000:10).

Also, an eight-page code of conduct document was launched to regulate political parties' behavior. The code of conduct was developed by the political parties themselves and later forwarded to the Inter-Party Advisory Committee (IPAC). However, Gyekye-Jandoh (2013) reveals that the code of conduct is only morally binding to the political parties but not legally. The EC impress upon

political parties the need to be conscious of the fact that “peace, public order, freedom of political campaigning, and compliance with electoral laws and regulations are essential to the conduct of free, fair, and credible elections, and ready acceptance of election results” (Code of Conduct for Political Parties, 2000:3). By signing the code of conduct, political parties bound themselves to work towards peace, tranquility, and clean elections (Gyekye-Jandoh, 2013; Debrah, 2001). 402.94

Furthermore, the optical mark recognition system (OMR) was introduced to boost the integrity of the electoral system. According to the EC, a scanning feature of the OMR system was vital for ensuring voter information accuracy when transferring voter details to the electoral register. The OMR system is also maintained to save time and minimize costs (CODEO, 2013). In addition to this reform, serial numbers were introduced and assigned to ballot boxes to build trust and eliminate suspicions of ballot stuffing. Political parties were also allowed to add their own seals if they wished. Consequently, vote count and declaration of results were done at the polling stations. Movements of ballot boxes and papers to central counting points were no longer applied (Agbesi, 2015; Oquaye, 2012). To enhance additional transparency, political parties were further permitted to police ballot papers in the printing houses and after (Oquaye, 2013).

It is important to recognize that, most of these reforms that have taken place since the inception of Ghana’s Fourth Republic owes much of its successes to donor assistance. International donors have played a major supportive role in this area over the years. The compilation of a new voters register in 1995, the provision of photo ID cards, the introduction of transparent ballot boxes, the usage of voting screens and print materials for voter information among others were all partially realized with donor support (Gyekye Jandoh, 2013; Ayee, 1998). Ayee (1998:66) for example

indicates that, the USAID spent more than USD \$650,000,000 to help Ghana procure electronic communication and computer gargets, and technical support for the registration of voters and the exhibition of the voter's register. According to (Ayee 1998), such intervention came as part of USAID's efforts to assist in getting Ghana's electoral process programs off the ground.

In spite of the reforms discussed above, elections in Ghana have been characterized by allegations of malpractices and rigging (Ayee, 2017). In 2008, allegations of bloated electoral register, multiple voting, registration and voting by unqualified voters became rife after the December 7, elections. The electoral commission upon receiving reform proposals to enhance electoral credibility introduced the biometric voter registration and verification system into Ghanaian elections (Ayee, 2017; CODEO, 2012; EISA, 2012).

2.3 Biometric Systems (Biometric Registration and Identification)

A biometric system relates to a pattern recognition system that captures and compares a feature either physiological or behavioral peculiar to an individual to predefined templates of the same characteristics (Lodinova, 2016; Akin-Laguda, 2010). Mwithusa (2015) defines biometric systems as electronic systems specialized on identifying a user by means of processing unique physiological or behavioral characteristic of the user. Both definitions prove useful for a working definition in this study as they clearly and succinctly capture the concept in light of the subject matter. Dr. Kwadwo Afari-Gyan however argues that a biometric system encompasses a biometric technology which involves the use of computerized procedures to identify persons by means of their unique behavioural or physical features, such as voice, face, finger, palm, iris, and so on. By

and large, biometric characteristics of individuals that can be measured include fingerprints, palm prints, retina, iris, voice patterns, and DNA (Bolle & Pankanti, 2004; EISA, 2016).⁹

2.3.1 Characteristics of a Good Biometric System

A good biometric system must fulfill some necessary requirements: These according to Akin-Laguda (2010), Mwithusa (2015), Lodinova (2016), and IDEA (2017) include but not limited to: fairness (that is, the biometric system must be built to ensure that no one can learn the voting outcome before tally); collectability (the required biometric trait should be acquirable and harmless to the user); acceptability (the population should be willing to accept or use the required biometric trait); universality (the required biometric trait should be possessed by everyone); performance (the level of speed and accuracy of the biometric kit and the resources or cost required to do it); and robustness (the level of resistance of the biometric system against fraudulent methods. A good biometric system must therefore be robust enough to handle various fraudulent attempts. Hence no spiteful individual must be able to frustrate or disturb the system so easily).

More so, good biometric system must ensure that, the biometric trait required should be unique from one individual to the other. When biometric traits do not overlap with one another it helps check multiple access and failed logins. Equally, the biometric traits required by the biometric system should be able to endure over time. Thus submitted biometric traits should be permanent and invariant over the long run. Again, the information provided and fed into the biometric system must be accurate without error and as such correspond with the feedback generated by the biometric system. Lastly, privacy or secrecy of information provided by users should be ensured

⁹ See Akin-Laguda (2010), Lodinova (2016) and IDEA (2017) for more discussions on biometric systems and biometric technology

and that biometric provided should not be ably directly linked to them (Akin-Laguda 2010; Visvalingam & Chandrasekaran, 2011).

2.3.2 Forms of Biometric Verification/Identification

There are different traits of biometric characteristics that are unique to individuals for classification and identification purposes. Such unique biometric traits include facial structure, fingerprints, deoxyribonucleic acid (DNA), odour, iris, palm-print, retina, signature, and voice etc. Mwithusa (2015) and Akin-Laguda, (2010) classify these unique features under two major forms of biometric identification namely, physiological biometric identification and behavioural biometric identification.

2.3.3 Physiological Biometric Identification

Physiological biometrics as a form biometric identification involves subjecting any part of the body that is touchable to recognition Akin-Laguda (2010) and Agyemang et al., (2014). Such biometric traits and recognition include:

Facial Recognition: This form of identification involves extracting a feature set from a user's face and matching it with templates stored in a database. Facial recognition systems analyses the shape, pattern, and positioning of facial structures to recognize a person. This form of biometric identification is able to operate "hands free" and users' identity can be confirmed by simply looking at a screen thereby rendering it more appropriate when considering covert identification or verification. However this recognition system has shortcomings which include: difficulty in verifying a face from images captured from two different angles under different ambient

illumination conditions, and the fact that the human face is a social expressive organ that is subject to change and display of different expressions.

Fingerprint Recognition: Fingerprints are patterns of furrows and ridges located on the tip of fingers. Fingerprint recognition systems thus involve the use of one or more fingers on a live scan fingerprint machine to verify the fingerprint of a person. This biometric verification technology has proved more convenient for adoption because fingerprints are generally recognized as a primary and accurate identification biometric trait (Akin-Laguda, 2010). However, this form of biometric verification is susceptible to damages (such as burnt ridges, print degradation, scars etc.) and also requires large amount of computational resources.

Iris Recognition: Iris recognition involves the scanning of the iris, a colored ring tissue surrounding the pupil of an eye, no two alike. This is based on visible features such as rings, furrows, freckles, and corona of the eye. These features and their locations are used to form the iris code which is in turn used to identify a person. Akin-Laguda (2010) argues that every individual iris exhibits a distinct pattern which is formed randomly in utero, in a process called chaotic morphogenesis. He argues that, iris scanning and verification is less intrusive compared to retinal scanning because the iris is readily visible several meters away as compared to the retina. Also he maintains that, with a change in light, the iris can provide a secondary verification module. Notwithstanding, the iris is only consistent throughout adulthood, but varies somewhat up to adolescence (Ibid).

Retina Recognition: The retina is a light sensitive membrane at the back of the eye containing cones and rods that receives an image from the lens and send it to the brain through the optic nerve.

Retina recognition systems create an “eye signature” from a vascular configuration of the retina which is a supposed trait of every individual and eye. The retina is protected within the eye itself, and not readily subject to replication or change, hence making it one of the most secured biometric traits with resistance against alterations. Yet, retinal image acquisition requires the user to look through a verification lens at an alignment target, and therefore needs the individual’s cooperation. More so, retinal identification systems may reveal medical conditions of users and as such public acceptance may be required.

Hand Geometry: A hand geometry system is generally available in two main forms, namely full hand and two fingers read only geometry system. The former takes an image of the entire hand for comparison while the latter only reads two finger images of the hand for recognition. A camera is used to capture the image of the hand to verify the person. The essence of hand geometry rests with the argument that, the technique is relatively simple, easy to use, and inexpensive. Dry weather conditions or individual anomalies such as dry skins do not appear to have any adverse effect on verification accuracy. However, hand geometry information may vary during growth periods among children and teenagers. This biometric characteristic is also considered not to be very distinctive, hence, not recommended for identification among individuals of a large population.

Concomitant to the above, rarely used physiological biometric identification systems include ear recognition systems and deoxyribonucleic identification systems. Ear recognition systems use the shape of the ear to perform identification. Studies suggest that the shape of the ear and the structure of the cartilaginous tissue of the pinna are widely different among individuals, hence rendering it

a possible biometric trait for recognition. However, Akin-Laguda (2010) avers that, this form of recognition is not very distinctive and thus, captured traits may overlap. Deoxyribonucleic (DNA) on the other hand is probably the most constant and reliable biometrics; it is in fact a one-dimensional code unique for each person. However no real time application in large volumes has been possible because DNA matching requires complex chemical procedures and methods involving expert skills. Its weaknesses are exposed in cases of identical twins (Ibid).

2.3.4 Behavioural Biometric Identification

Behavioral biometric identification is informed by using biometric traits and or devices to ascertain the behavioral pattern of untouchable parts of a person for recognition Agyemang et al. (2014). This identification system includes voice recognition systems, signature recognition systems, and odour identification systems. During voice recognition, a person is verified by the sound that he or she makes. Such traits of speech are invariant for individuals, however, the behavioural pattern may change over a period due to medical conditions, age, emotions, and stress. The manner in which a person signs his or her name is arguable a characteristic peculiar to the individual. The identification system uses the movement and sound of the pen during the signing process for authentication (Jia, 2005:1-33). However the weakness of this identification system is that, signatures as behavioural biometrics are subject to rapid change over time under influence of physical conditions and emotions of the subject and hence are never truly consistent or constant. Conversely, an individual's odour which is a characteristic of his or her chemical composition can be used to distinguish individuals and objects. Nonetheless, deodorants and perfumes can lower its distinctiveness.

2.4 The 2012 and 2016 Biometric Voter Registration and Verification

On 24th March 2012, the Electoral Commission of Ghana (ECG) commenced a process to compile a new voter roll for the 2012 general elections. In a departure from the manual registration and verification system the ECG introduced the use of biometric technology to capture the fingerprints of eligible voters for registration and verification. That was the first time in the world biometric technology was used to authenticate voters identity on Election Day. Three years later, the Electoral Commission used the biometric technology, this time to conduct Ghana's municipal elections. Subsequently, in 2016, the biometric technology was once again used to register and authenticate the identities of over sixteen million voters during the December 7 general elections. The lead contractor for Ghana's biometric voter registration and verification technology was Ghana-based STL Supertech, partnering with GenKey for the biometric verification process.

The biometric voter registration processes in Ghana was conducted in four stages: (1) providing bio data: such as name, date of birth, sex, age, hometown etc. by the voter to the registration officers; (2) electronic capture of fingerprints: the fingerprints of all the ten fingers of the prospective voter are electronically captured using fingerprint scanners. The four fingerprints of the right hand are taken first followed by the left hand and finally the two thumbprints. In the case of an applicant having lost some fingers, the fingerprints of the available fingers will be captured; (3) photo taking: in addition to the taking of fingerprints, voters' photographs were also taken on the spot. The photographs are printed on the voter ID card as well as the voters register; (4) issuance of voter ID card: consequently, unless a voter's application is challenged, a new voter's ID card containing his or her photograph and a barcode with a unique ID card number is printed

out and issued to the applicant at the registration center (Anowu & Oyetunji, 2015; Ameyibor, 2012).

Qualification for participation in the biometric voter registration exercise required that, the prospective voter must be a Ghanaian citizen of eighteen years or above, must be of a sound mind, must be a resident of an electoral area, and must not be prohibited by any law in force from registering as a voter. To proof ones eligibility for registration, the aspiring registrant may provide a Ghanaian passport ID, a National Identity Card, a Baptismal Card, a National Health Insurance Card, a Birth Certificate, a Driver's License, or an old voter's identity card at the point of registration. Registrants who could not provide any of the required identity cards were made to complete a guarantee form which was to be endorsed by two registered voters. Guarantors were however not permitted to endorse for more than five registrants (Government of Ghana, n.d.). An applicant who meets these criteria at the period set aside for the voter registration was eligible to have his or her name in the overall voters register (Ghanaweb News, February 17, 2012).

Generally, the biometric voter verification was not part of the registration process however it was used during the elections to authenticate the identity of voters (IDEA, 2017; EISA, 2010). In Ghana's 2012 and 2016 elections, the fingerprints were the main biometric traits for identification. The voter verification process involved a scan of the thumbprint and one or more fingers (generally the index finger of the person) on a live scan fingerprint machine (Anowu & Oyetunji, 2015; Gold 2012). The system required that the biological features, that is, photograph, and fingerprints of qualified voters which were captured electronically into the electoral register corresponds with what the individual claims (Dorpenyo, 2016; "Revision of the Voters Register: User Manual for

Data Entry Clerks," 2014). The biometric voter verification process involved the following: a prospective voter presents his or her voter's ID card to a polling assistant for a crosscheck in the voters' register (constituency register); a verification officer uses a fingerprint scanner to scan the left index finger of the prospective voter; the individual's fingerprint is captured and compared to the previously captured biometric database so as to obtain a match for the feature stored on the biometric voters register; if a matching is confirmed, the voters is believed to belong to the constituency and is therefore issued with ballot paper to proceed with the voting.



Figure 1: Fingerprint under verification

2.4.1 Rationale behind Ghana's BVRV Adoption and Implementation

Ghana is not the first country in Africa to go high-tech with voter registration and verification. Since 2000, countries such as South Africa, Kenya, Nigeria, Sierra Leone, Democratic Republic of Congo, Burkina Faso, Zambia, Uganda, and Tanzania, etc. have incorporated varying degrees of biometric technology into their electoral process to enhance accuracy (Cooper-Knock, 2012; Mantey, 2012; Debrah, 2015). Ayeni and Esan (2018) identified that the incorporation of biometric technologies in elections across Africa are geared towards attempts to address multiple

registrations, multiple voting, voter impersonation, registration of unqualified voters, vote rigging, and varying levels of disputes about election results etc. (Mantey, 2012). The major reasons identified in the literature that are purported to have informed the Electoral Commission's adoption and eventual incorporation of the biometric voter registration and verification system into Ghana's electoral processes are highlighted below.

Until 2012, voter registration in Ghana was conventionally carried out through the Optical Mark Recognition (OMR) system. Although the voters' register was computerized, the registration process did not encompass the collection of biometric details of the aspiring voter. Eligible voter were mandated to present themselves at registration points where the OMR scannable form is completed with the voters personal information. The completed forms were then used to generate a computerized voters list for the various polling stations (CODEO, 2012). On the voting day, prospective voters go along with their voter ID cards to their voting location where they are manually verified by polling assistants and verification officers. The polling assistant scans through the constituency voter list for the polling station to ascertain a match on the name reference list compiled for the polling station while the verification officer ensures that the voter's particulars are the same as the one on the voters list or register. Once a match is established and the processed documentation is confirmed by the election officials, the voter is believed to belong to the same constituency and is presented with a ballot to proceed with the voting (Electoral Commission of Ghana, 2018).¹⁰

¹⁰ Visit: <http://www.ec.gov.gh/voting2/how-tovote.html> for more information on voter registration and verification in Ghana



Figure 2: Optical Mark Registration Process

The Optical Mark Recognition processes and the manual verification system were however identified to be surrounded with a number of dire challenges and limitations that facilitated electoral fraud as complaints of bloated electoral register, unqualified voter registrations, multiple registrations and voting, voter impersonation, and ballot stuffing from political party officials, electoral stakeholders, and the entire Ghanaian public became rife (Debrah, 2015; CODEO, 2013).

Multiple registrations and voting: The method failed to allow for the transfer and sharing of voter information across the over 23,000 polling; thus, making the detection of multiple registrations and voting extremely difficult, if not impossible (CODEO, 2013). Friedrich-Ebert-Stiftung, Ghana (2010) reported that the 2008 limited voter registration exercise received a turnout far exceeding the EC's expectations by over 800,000 new voters, with Ashanti and Upper West regions recording the highest and lowest turnouts respectively. The 2008 voter registration grew by 290.4% over that of the 2006 limited registration exercise. Friedrich-Ebert-Stiftung, Ghana (2010) found that, notwithstanding the hefty number of voters who turned out to register, a significant proportion of the turnout was largely ascribed to multiple registrations. It was further established that, the huge

growth was caused by the huge re-registration of voters who claimed to have misplaced or lost their voter ID Cards, and the large number of persons claiming to be first time voters' absent mechanism to detect and check multiple registrations. These incidents gave credence to allegations of rigging and over-voting after the 2008 elections (Ibid).

Bloated Electoral Register: Allegations of bloated electoral register which has been the bane of Ghana's voters register were largely recorded under the optical mark recognition and manual verification system. In 2008, the presidential and parliamentary elections voters register was not spared this unfortunate perception. The 2008 voters register was compiled ahead of the 2004 polls and updated in 2006 prior to the year's local government elections. The register contained 12,822,474 registered voters out of a total national population estimated around 23 million. At the time, two opposition parties, the NDC and the Great Consolidated Popular Party (GCPP) argued that the voters register was deliberately bloated in thirteen constituencies of the Ashanti region (a strong-hold of the ruling NPP). A committee of inquiry was consequently set up to probe into the allegation. The GCPP in particular alleged it obtained hard copies of bloated voters register list from the Information Technology department of the Electoral Commission prior to the 2008 elections (Friedrich-Ebert-Stiftung, Ghana, 2010:25).

Similarly, the 2004 voters register which has been in existence since its compilation in 1995 was reported to have accumulated expired data and hence undependable for the conduct of the 2004 elections. The 2000 population census, which put Ghana's total population at a little over eighteen million (18,000,000) suggested that the registered voter population of over ten million persons at that time was statistically untenable hence bloated. Both the political parties and the Electoral

Commission in a like manner agreed that the voters register was bloated and therefore should be replaced (Friedrich-Ebert-Stiftung, Ghana, 2008:20). More so, the 1988/89 electoral register that was compiled by the OMR system used to conduct the 1992 elections was contended by the opposition NPP as over bloated due to the EC's failure to purge the records of the deceased, and other inconsistent names, and double entries since its first compilation in 1988 (Gyekye-Jandoh, 2013; Debrah, 1998).

The registration of unqualified voters: Persons who are considered to be below the required voting age (minors), non-Ghanaians (foreigners), and of unsound mind are defined as unqualified voters by the 1992 constitution of Ghana. However, prior to 2012, such individuals were captured to vote by the voting system without detection. An analysis of the 2008 voters register during the registration review exercise revealed that persons aged twenty and above who should have ordinarily been registered by the 2006 limited registration exercise formed the majority (46.9%) of the newly registered voters captured during the 2008 exercise. Hence, lending credence to the suspicion that political parties eager to win or retain power aided and abated massive unqualified voter registration schemes. Friedrich-Ebert-Stiftung, Ghana observed that the eighteen year olds outnumbered the nineteen year old group in both age and sex, owing to the inclusion of minors in this age group. It was further reported that parents of some minors voluntarily went to the Electoral Commission to remove names of their wards from the register as not being of voting age (2008:20).

Voter impersonation: Voter identification or authentication under the OMR and the manual verification system was also critical challenge. In 1992, the NPP the following presidential elections boycotted the parliamentary elections owing to the allegation that, the voting system facilitated voter impersonation as there were no ID cards issued to registered voters and thus before

a registered voter gets to the polling station, a procured voter might have already voted in his or her name. No protests could however change the situation (Oquaye, 2013). Later in 1996 through to 2008 when photo voter identity cards bearing the name, sex age, with unique number assigned to registered voters to replace the thumb-printed IDs used in past elections, the new voter IDs were argued to facilitate voter identity theft particularly among twins as the voting system lacked mechanisms to check this irregularity (Oquaye, 2013; Friedrich-Ebert-Stiftung, Ghana, 2008).

A comparative analysis of these challenges (unqualified voter registrations, voter impersonation, multiple registrations, multiple voting etc.) from 1995 through 2004 to 2008 reveals an uneven pattern. The sum of challenged voters out of the total registered voters in 2004, fell from 0.012% to 0.04% in 1995. However, this figure steeply rose to 0.40% after the 2008 voter registration period. According to the report by Friedrich-Ebert-Stiftung, Ghana, (2010:10), a probable justification to this unsettling trend is that either more unqualified people attempted to register to vote or there was increased antagonism between the political parties in the regions where such challenges were recorded, and that supporters of differing parties tried to undo one another by reporting supporters of the other party to have facilitated unqualified voter registrations. Table 1.0 below illustrates the trend and facts presented above.

**Table 1.0: COMPARATIVE STATISTICS ON VOTER REGISTRATION
CHALLENGES FROM 1995-2008**

REGIONS	YEAR								
	1995			2004			2008		
	1995 OCT. MAIN REG	NO. OF CHALLENGES	% CHALLENGED OVER TOTAL REGD	MARCH 2004, MAIN REG.	NO. OF CHALLENGES	% CHALLENGED OVER TOTAL REGD VOTERS	JULY/AUG 2008 REVISION	NO. OF CHALLENGES	% CHALLENGED OVER TOTAL REGD VOTERS
WESTERN	967,631	350	0.04	1,007,816	119	0.01	185,400	295	0.16
CENTRAL	796,984	108	0.01	857,287	50	0.01	141,351	135	0.10
GT. ACCRA	1,555,945	1,121	0.07	2,098,780	634	0.03	340,694	641	0.19
VOLTA	891,820	74	0.01	819,466	124	0.02	151,718	189	0.12
EASTERN	1,055,064	1,269	0.12	1,142,390	952	0.08	186,708	788	0.42
ASHANTI	1,591,935	6,752	0.42	1,893,527	1,360	0.07	374,451	3,591	0.96
B/ AHAFO	904,045	1,093	0.12	939,228	737	0.08	186,604	1,339	0.72
NORTHERN	797,004	385	0.05	894,342	436	0.05	153,793	290	0.19
UPPER EAST	432,687	82	0.02	425,756	9	0.00	69,988	9	0.01
UPPER WEST	271,885	120	0.04	276,378	6	0.00	44,710	93	0.21
TOTAL	9,238,009	11,354	0.12	10,354,970	4,427	0.04	1,835,417	7,370	0.40

Source: EC Research and Monitoring Department (2018)

In addition to the above identified challenges, several other reasons have been cited by scholars and experts as the motivation behind the Electoral Commission’s incorporation of the biometric voter registration and verification technologies into Ghanaian electoral process. These largely encompass: to reduce human errors in registration and verification process (Cooper-Knock, 2012; Lodinova, 2016), to accelerate voter identification process and eliminate delays (Golden et al., 2015), to cut down electoral cost by reason of the extreme reduction of paper usage, and the possibility of biometric device auctioning biometric, to increase voter turnout, to readily recognize fraudulent ballot, and to ensure the principle of one man one vote (GenKey, 2012).

Similarly, Debrah (2015) found that the incorporation of the BVRV reform in the electioneering process to register and authenticate voters was a project to build trust and confidence in the electorate and citizens at large. He maintains that, the conviction among stakeholders was that the biometric voter registration and verification system will provide the extra layer of proof that registered voters are who they claim they are and hence eliminate voter fraud to enhance the integrity of Ghana's electoral process.

2.5 Strengths of Biometric Voter Registration and Verification

Arguments in literature appear to tout the implications of biometric voter registration and verification in elections. The advantageous alignment to biometric voter registration and verification according to Ashok and Ummal (2011:13), and Agyemang et al. (2014) is buttressed with such factors as: accuracy, privacy, availability, and collusion resistance. Debrah et al., (2018), Apentsui (2015) and Boateng and Akaba (2015) among other proponents of biometric elections argue that if biometric technologies are properly customized and implemented to suit a country's needs, they will yield significant benefits; reduce election cost, enhance transparency, improve accuracy of voter registration and verification, reduce multiple registrations and voting, lessen the possibilities of impersonation, identity theft, ballot stuffing, carousel voting (Wolf, 2017), make electorates and commissions more confident about the accuracy, reliability, quality, and completeness of their voter registry data, add simplicity and speed to the election process, and consequently increase electoral administrative efficiency (Gelb & Clark, 2013).

2.5.1 Contributions of BVRV to Elections in Ghana

In the Ghanaian context, Debrah (2015) found that the biometric voter registration and verification that was integrated in Ghana's 2012 and 2016 elections contributed enormously in enhancing the credibility of the elections. To buttress this position he noted that, the biometric voter registration and verification system adopted in Ghana paved a critical contribution to Ghanaian elections by enhancing stakeholders' confidence and trust in the electoral process. According to Debrah (2015) and CODEO (2012) allegations of past elections depicted enormous electoral malpractices which led to stakeholders mistrust and lack of confidence in the electoral process. However, Debrah (2015) emphasized that the high level of mistrust in Ghana's election administration was diffused when the Electoral Commission of Ghana resolved to integrate the biometric voter registration and verification onto Ghana's electoral process. It is also worthy to note that, according to Debrah (2015) the biometric voter registration and verification succeeded in serving as a fraud-proof check against electoral irregularities that had plagued elections in the past. Debrah (2015) concluded that, the use of the biometric voter registration and verification system resulted in a substantial reduction in multiple registrations, multiple voting, and voter impersonation. In support of this argument, CODEO (2012) and Debrah et al., (2018) affirmed that, the biometric voter registration and verification system undoubtedly has easy to control access, easy to authenticate identity features, and easy data retrieval features compared to the less high-tech voter registration and verification methodologies employed in past elections which lacked such features and capacity to check the challenges of the voting system.

The 2012 and 2016 biometric voter registration and verification system stimulated high voter turnouts in Ghana. This feat owes credence to the high voter preference, trust, and confidence in

the application of the biometric technology. More so, most electorates as argued by Debrah (2015) registered and voted because they were convinced that their votes would be counted. The, biometric voter registration and verification system further helped consolidate Ghana's democracy. By garnering high voter participation and turnout in the elections, it is maintained that the BVRV provided the incentive for voters to cast their ballots rather than resorting to other means thereby helping to sustain and deepen the democratization process which started in 1992 (Ibid).

2.6 Challenges, Weaknesses, and Criticisms of Biometric Elections

According to experts and traditional bioethics the application of biometrics to elections has been hounded to feature many shortcomings and criticisms. Among these include the following:

Biometrics by its nature is naturally connected to what makes us human by bringing together the various elements which make up our individual unique identities (skin color, gender, ethnicity etc.). It is therefore maintained that capturing and analyzing such innate and personal data are de-humanizing because they reduce the individual to a set of mere zeros and ones (Brobeck & Folkman, 2005). More so, scholars like Wolf (2017) and Vanguard (2011) also argue that, biometric elections may give room to a possible voter disenfranchisement when traits used to identify a voter becomes unavailable due to either a fingerprint quality degradation, a finger loss, or a technological failure.

Biometric elections have been identified to bring logistical and procedural new problems to an election cycle. This may occur in the form initial purchase cost of biometric readers and devices, maintenance cost, data storage and upgrade cost, data security cost, resource allocation cost (time, material, etc), and cost of training for election officials and staff (Holtved, 2011; Aceproject,

2017). Experts also warn against hardware and software problems that may result from incorrect programming errors, equipment malfunctioning, malicious tempering, hacking, and inadequate accountability (Nikhil et al., 2013:357).

Biometric systems may be compromised and abused by for example by third parties like individuals, external and internal institutions, and interest groups equipped with the necessary personnel and technological know-how. Amponsah (2011) argues that, if such actors for whatever reason decide to influence the fate of a particular election, where proprietary software¹¹ and hardware systems are used (with or without the knowledge of the vendor(s) of the hardware and software), it is possible to have voters been rejected when they show up to vote on Election Day. The critical question then is who decides the fate of the electorates at such circumstance. Consequently, he contended what if such incidents happen in particular regions significant enough to influence the outcome the elections. Critics therefore argue that with proprietary biometric systems used in elections, it becomes impossible (at least legally) to freely check what the biometric system is actually doing at each stage of a process. To remedy this challenge, Amponsah (2011) recommends a preference for an open source biometric system to propriety.

Traditional bioethics also argue that, using biometrics for election purposes raise concerns over voters human dignity, privacy, and personal information (Woodward, 1997; Lodinova, 2016;

¹¹ Proprietary software is non-free computer program for which the software's publisher or another person retains intellectual property rights. Follow the link below for more details on propriety software <https://www.techopedia.com/definition/4333/proprietary>

Jonietz, 2004). A report by the RAND¹² Institute published in 2001 identified informational privacy, physical privacy, and religious objections as key critical ethical and social concerns associated with the use of biometric systems. Informational privacy denoted by RAND as the function creep connoted the slow widening of the use of information and technology “the purpose for which it was originally created” (Joseph, 2013:51). After decades of biometric application, the UNHCR for example still does not have a publicly devised policy available to set the terms and conditions for its application concerning delicate issues such as with whom the biometric data collected should be shared (Lodinova, 2016).

Also, physical privacy invasion according to RAND are possible risks associated with the use of biometric systems. This comprises possible harm of the biometric system to its users, and the hygienic nature of the biometric devices which may give rise to readily communicable disease absent simple hygienic measures (RAND, 2001). Woodward (2001) also found that, literary, some Christian groupings consider biometrics to be a brand of evil. He noted that, groups such as the American Civil Liberties Union and the Christian Coalition in Alabama all strongly protested against efforts to place a fingerprint biometric on all driver licenses. Lodinova (2016) however stated that it is unlikely that religious objections will be widespread yet cautions that such concerns should be taken seriously due to societal and legal emphasis on respect for religiously held beliefs.

¹² RAND: An American nonprofit global policy think tank created in 1948 by Douglas Aircraft Company to offer research and analysis to the United States Armed Forces.

2.6.1 Challenges and Criticisms Peculiar to Ghana's 2012 and 2016 Biometric Elections

The study by CODEO (2012) argues that fingerprint machines that were employed to undergird Ghana's biometric elections were generally ineffective particularly during midday; presumably, high temperatures at certain areas got the devices overheated and would as a result not work. This made some officials naive about the functionality of the devices remove the batteries and reinserted them back in those machines only to have worsened the case as the devices got frozen when the batteries were put back in them again. Consequently, incidents of equipment malfunctioning and breakdown (Debrah et al, 2018) including screen freezing, printer breakdowns, and login difficulties) became part of the electioneering process. These inefficiencies further caused some voters not to be able to register within allotted time period while others were forced to abandon the processes out of frustration.

Concomitantly, disenfranchisement and illegitimate franchise have been cited to have crippled smooth biometric elections in Ghana. The sources of this challenge a plethora; For instance, the ambiguity as to who is an "...ordinarily resident in an electoral area" as contained in Regulation 1(1) (d) of C.I. 72, 2012, proved very argumentative and consequently allowed or disallowed ineligible and eligible persons to register and vote in an electoral constituency. Equally, the challenge of regular biometric equipment breakdown and the lack of ample information to resolve such challenges contributed to disenfranchise many prospective voters (Cooper-Knock, 2012). Some legitimate voters were also denied the opportunity to cast their ballot because the biometric device could not establish a link between their fingerprint and their live biometric data on the database.

As anticipated by most stakeholders, prospective voters from different vicinities in a cluster all rushed to the first polling station that had opened for registration stroking a lot of strain on the electoral officials (CODEO, 2012). This incident is credited to the inadequate education and misinformation of voters on the part of the Electoral Commission. Also, poor voter education and misinformation caused many prospective registrants to stay away from registration and verification as rumors in some electoral areas indicated that the biometric devices could cause cancer and diseases to those exposed to it CODEO (2012:43). However, research reports assert that such mongering of rumors which served a deterrent to mass voter registration in some areas were deliberate and politically motivated calculated steps for scoring political points. Inadequate staff training was also identified as a major challenge of Ghana's biometric elections. As a result of poor staff training there were a lot in misinformation and controversy about kit movements, effective handling or resolution of challenges caused by malfunctioning biometric devices, how to handle prospective voters suspected to be minors and non-Ghanaians, and how to ascertain whether a person is from an electoral area and could register there and vote or not, among others (CODEO, 2012; Cooper-Knock, 2012).

Weak enforcement of registration and verification criteria at some polling stations is argued to have permitted the registration by some well-known persons who did not have in possession the required documentary proofs of eligibility. Again, the policy of securing guarantors in the absence of eligibility documents for the biometric registration was vastly abused at many registration centers. CODEO (2012) for instance found that some strange persons availed themselves as guarantors to needy registrants without the slightest trace of personal relationships or knowledge. In as much as no background inquiries were conducted by the Electoral Commission, many of

those guarantors facilitated fraudulent registrations. More so, bogus registration challenges caused by party officials who failed to follow the EC's procedure for filing complaints resulted in unnecessary chaos at some registration centers (CODEO, 2012).

Propriety and security issues were also documented under Ghana's 2012 and 2016 biometric election experience. The 2012 biometric voter registration exercise kicked off on 24th March, six months late to the assigned date. This occurred due to a cloud of controversy after one of the bidding companies not shortlisted for international procurement processes took the Electoral Commission to court. After several months of motions and counter motions, the case was resolved in the Commission's favor paving way for the biometric voter registration to be carried out (Cooper-Knock, 2012). In addition, the biometric registration exercise encountered security challenges as political party agents and supporters at some registration centers decided to take the law into their own hands to stop people who they presumed did not reside in a community from registering. This led to a number of violent incidents particularly at most urban voter registration centers (Ibid).

Conversely, Debrah (2015) argues that the biometric voter registration and verification system checked against electoral fraud that plagued past elections, Cooper-Knock (2012) indicated that, the biometric voter registration and verification system adopted by the ECG was not a fool-proof to electoral fraud as it failed to fully detect and prevent the registration of non-Ghanaians and minors that has been prevalent in previous registration exercises in Ghana. This emanated from the fact that, the 23000, and 28992 polling stations used in the 2012 and 2016 general elections respectively were not interconnected to share registration information thereby leaving room for

duplications (Mantey, 2012). One could therefore go to Station A, register, clean any indelible ink and still be able to go to center 'B' and register with a different shirt probably and still be able to get two ID cards (Ibid).

Another major challenge to Ghana's 2012 and 2016 biometric elections rest with funding. However, according to Agyemang et al. (2014) the former Electoral Commissioner, Dr. Afari Djan alleged that no government of Ghana has ever refused to give funds that would place the Commission in difficulty in fulfilling its obligations; but what sometimes happen is the late release of such funds thereby making it difficult for the Commission to systematically roll out an orderly electoral process. Moreover, he noted that the training of personnel to register millions of voters has not cost the Electoral Commission less than Ghc 100,000,000, all of which are supposed to come from the government.

2.7 General Perception of voters toward the 2012 and 2016 Biometric Elections

The adoption and eventual implementation of biometric voter registration and verification in Ghana's electoral process partly aimed to encourage citizens' trust and participation in the electoral decision making processes of the country. Developing countries around the world have incorporated several forms of biometric identifiers in election administration to enhance variant aspect of their electoral process to build trust, confidence, and to add credibility to election results and the overall electoral process (Mensah, 2016). A recent scenario of this case in Africa is the adoption and implementation of iris recognition in the 2017 elections of Somaliland.

Ghana's experience with the biometric voter registration and verification system in 2012 and 2016 General elections raised a lot of concerns for future elections (Mensah, 2016). Moving forward, expectations by political parties, leading national personalities and the general public at large implores the Electoral Commission of Ghana to go a step further beyond biometric voter registration and verification to electronic voting. Such proposals captured the attention of major election stakeholders, think tanks, thereby informing most current research studies on elections in Ghana including Mensah (2016) and Agbesi (2013). The debate in literature surrounds whether the use of an electronic voting system for Ghana would provide a more credible transparent elections which would be accepted by all stakeholders and citizens at large.

Research studies indicate that, a portion of Ghanaian voters express displeasure with the biometric voter registration and verification system due to the perceived challenges encountered at the aftermath of the 2012 biometric elections and the failure of the biometric system to fully address the challenges that initiated its inception in the likes of unqualified voter registrations and voting by minors and non-Ghanaians (Mensah, 2016; IDEA, 2011; Agbesi, 2013). Chiefly to this dissatisfaction rests with the biggest opposition party registering their displeasure with the presidential election results at the supreme court demanding the annulment of votes of certain polling stations due to alleged electoral irregularities despite the application of biometric technologies in the electoral process (Mensah, 2016; Oquaye, 2012). In 2012, CODEO observed that while some Ghanaians argued that the biometric voter registration and verification system should be consolidated and used in future elections others gravely contended that Ghana should abandon the biometric system and rather focus on implementing electronic voting in future

elections. Similarly, a small proportion of its respondents demanded a revisit to the traditional voting system which employed the OMR technology and the manual verification system.

More so, with respect to reform proposals to the Electoral Commission to initiate an immediate adoption and implementation of an electronic voting system (Agbesi, 2013), Gradualists¹³ are however of the view that, the EC should carefully and cautiously proceed by undertaking a detailed investigation of electronic voting best practices around the world for future implementation in Ghana (Mensah, 2016:2). Such relentless concerns and demands invariably contributed to the EC's implementation of twenty-seven (27) new reforms out of the thirty-one reforms proffered by the Supreme Court before the 2016 general elections. The twenty-seven list of reforms was a byproduct of a special reform committee set up by the Electoral Commission after the 2012 Supreme Court election petition. The committee was tasked to synthesize the various reforms proposed by the panel of Justices of the Supreme Court, political parties, and individual citizens. The 27 list reforms agreed by the committee for implementation included reducing the number of voters per polling station, steps to reduce rejected ballots, and deferring the adoption of electronic voting.¹⁴ Amidst these concerns CODEO (2012), Debrah (2015), and Debrah et al., (2018) generally conclude that the biometric voter registration and verification system has considerably helped to enhanced Ghana's electoral process.

¹³ Gradualists: proponents of the gradualism theory which argues that political change should take place gradually rather than suddenly or forcefully.

¹⁴ The Commission was of the view that the implementation of 27 comprehensive lists of reforms will make the outcome of the 2016 elections credible and acceptable to all the stakeholders involved. Visit: <http://www.ec.gov.gh/medias/news/89-ec-implements-27-reforms-for-better-elections.html> for more details

2.8 Chapter Summary

The above discussion in light of the reviewed literature depicts that, Ghana's gradual democratization process has been partially the effect of substantial electoral reforms carried out by the Electoral Commission to hinder electoral fraud and to boost public trust and acceptance. Ghana's experience in this regard, has rendered her creditable and worthy of emulation by sister African countries. There is no gainsaying that this development owes credence to electoral reforms undertaken by the Electoral Commission of Ghana since the country's return to constitutional rule in 1993. Albeit challenges, the role played by the incorporation of biometric voter registration and verification system in Ghana's electoral process, as a drive to boost electoral confidence and credibility cannot be overlooked.

The next chapter will look at the theoretical framework and the research methodology that underpin this study.

CHAPTER THREE

THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the theoretical framework and research methodology that underpin this study. The chapter covers the Diffusion of Innovations theory, its relevant characteristics, and the conceptual framework that supports this research study. The research methods and approaches that were employed to collect and analyze data for this study are also discussed and justified.

3.1 Diffusion of Innovations Theory (DOIT)

The Diffusion of Innovations theory as propounded by Everett M. Rogers (1983) relates to any stock of knowledge or characteristic that is concerned with transmitting and executing new ideas to better inform behaviour, practice, and decision making processes. In the same vein, Roger Clarke (1994) simply defines Diffusion of Innovation (DOI) as the manner through which a new technological idea, or technique migrates from creation to use. Scholars commonly agree that people's attitude and behaviour toward a new technology constitutes a key element to implementing and diffusing an innovation or a new technology. As such, Diffusion of Innovation centers on conditions which increase or decrease the likelihood that a given population will adopt a new technology, an idea, a product, or a practice (Rogers, 1983; 1994).

Innovation as defined by Rogers (1983) refers to a practice, an idea, an object, or a behaviour that is perceived as new by an individual, members of a population, or other units of adoption. However, Rogers (1983) indicates that an idea needs not to be new or recent in origin to be considered an innovation; it can be an erstwhile idea, or behaviour that users perceive to have an

unexamined use. Diffusion, on the other hand is defined by Rogers as the process by which an innovation is communicated through certain mediums or channels over time among members of a social system (Rogers, 1995). Rogers (2003) however argues that the diffusion and adoption of all forms of innovations are not necessarily always desirable. In that, the same innovation or technology may be desirable for one adopter in one situation but undesirable for a possible adoption and implementation in a different situation. Generally, Rogers argues that innovation diffusion decision processes occur over time through five stages: knowledge, persuasion, decision, implementation and confirmation. Accordingly, he argues that,

“the innovation-decision process is the process through which an individual or other decision-making unit passes 1. From first knowledge of an innovation, 2. to forming an attitude toward the innovation, 3. to a decision to adopt or reject, 4. to implementation of the new idea, and 5. to confirmation of this decision” [sic] (Rogers, 2003:161).

The DOI theory focuses on understanding the why of an innovation, and the rate at which new innovative ideas and technologies are communicated or spread among a given population (Rogers, 2003). In the Ghanaian context the new idea or technology is the introduction of biometric voter registration and verification in Ghana’s electoral processes. Since the biometric technology is new in terms of its adoption and implementation the diffusion of innovation theoretical framework presents a suitable option for analyzing the biometric voter registration and verification systems diffused into Ghana’s electoral process. This study therefore establishes the reasons that informed the Electoral Commission of Ghana to introduce BVRV into Ghanaian elections.

More so, the DOI theory studies the factors or characteristics which increase or decrease the likelihood that a new idea will be adopted, implemented, and sustained by members of a given population.

3.2 Characteristics of the DOI Theory

Rogers E.M. (2005) explains innovation as a picture, an idea, or a practice that is considered to be new by an individual or a group of people. The newness of an idea to an individual according to Rogers determines his or her reactions towards it. The characteristics of an innovation perceived by individuals or groups of potential adopters help to explain their different rate of adoption and acceptance. Rogers (2003) among other scholars identified five main characteristics that should inform the introduction and eventual implementations of a new idea or technology in a given population.

First, relative advantage: This is the degree at which an idea or innovation is perceived to be better than the one it supersedes. It is measured in terms of satisfaction, convenience, economic advantage, and what matters to the user population (Rogers, 2003). Rogers (2005) and Kevin Zhu et al., (2006) indicate that, the greater the perceived relative advantage of an innovation, the higher its rapid rate of acceptance and adoption. Kevin Zhu et al., (2006) argue that, the relative advantage of an innovation is widely identified as the major factor driving organizational usage of IT innovations. The biometric technology introduced in Ghana's elections is presumed to eliminate most of the challenges that were recorded in the manual voter registration and verification systems used in past elections.

Second, compatibility: This is the extent to which an innovation is maintained to be consistent with past experiences, existing values, and needs of its potential users. New ideas which seem incompatible with existing values and practices are less likely to be adopted, implemented, and sustained quickly than ones that seem compatible (Robinson, 2009). In the Ghanaian context, the

BVRV adopted by the Electoral Commission is viewed to be consistent with past voter experience and practice. Albeit different technologies, the MVRV used in past elections and the current BVRV both involve voter registration and verification which are key components of Ghana's electioneering process.

Third, complexity: This characteristic relates to the level of difficulty in understanding and using a new idea; the simpler to understand an idea, the more likely its rate of rapid adoption (Robinson, 2009). In general, new ideas that are simpler to understand will be adopted and implemented more quickly than ones where adaptors are required to develop new skills to understand. In context, Ghanaian voters were not required to acquire any special skills before they could be enrolled on the biometric registration and verification processes.

Four, trialability: This has to do with the possibility of experimentation of an innovation on a limited basis. Consequently, innovations that are trialable represent less risk to the group of users or individuals who are considering its adoption and implementation. Such innovations are generally accepted and adopted more quickly than otherwise (Rogers, 2003). In the Ghanaian case, a national pilot was scheduled for November 3 and 4, 2012 by the Electoral Commission. The exercise aimed to investigate how the new BVRV technology would work should it be fully implemented on a national scale (CODEO, 2012).

Five, observability: The more readily it is for potential adopters to see the results of an innovation, the more likely their readiness to adopt. Robinson (2009) and Rogers (2003) argue that, visible results lower uncertainty and stimulate peer discussions and thereby may inform questions and

information about the innovation which may require attention. At the end, citizens would be able to grade the quality of the new technology relative to its predecessor.

Ahmed H. Tolba et al, (n.d.) however categorized the above innovation attributes into Social and Functional dimensions. The Functional dimension comprised relative advantage and complexity, while the Social dimension consisted of compatibility and observability. According to Tolba et al., (n.d.) and Kevin Zhu et al. (2006), complexity negatively affects an innovation's acceptance, while the remaining four attributes have positive impacts. Tayfun Cagan M. et al (2003), also maintain that diffusion of innovation is affected by other variable factors such as: innovative attributes, organizations, and environmental characteristics. Innovative attributes according to Tayfun Cagan M. et al (2003) relate to the specific characteristics of the new idea or technology which makes it a better option for adoption than its predecessor. Organizational and environmental characteristics on the other hand comprise/relates to influences posed by institutions, individuals, the environment, and available resources on the newly adopted technology or practice. Contextually, in the Ghanaian case, such factors include influences posed by the Government, the Electoral Commission, other stakeholders of election administration (individual citizens, high political profile personnel, statesmen, civil society organizations, political parties, the international community etc.), resource capacity (available technology, technical know-how, human expertise) and the available funds required to run the newly adopted biometric voter registration and verification technology. Tayfun Cagan M. et al (2003) therefore argue that, these factors should constitute the focal points of innovation adoption. On the contrary, the DOI theory further argues that, the success of a new idea is dependent much on how well it evolves over time to meet the needs of the user population. In regards DOIT posits that, innovations should be accompanied by

new developments and reinventions so as to address challenges or weaknesses that may show up in the future.¹⁵ Critics however argue that it is very difficult, if not impossible, to quantify or measure the exact causes of adoption of an innovation in a given population.¹⁶

3.3 Conceptual Framework

Based on the literature review and other related studies a conceptual framework which draws inspiration from Rogers’s Diffusion of Innovation models as the requirement for a successful biometric voter registration and verification adoption, implementation, and sustenance is constructed. These qualities make a valuable checklist for discussion and evaluation of the 2012/2016 biometric voter registration and verification (See Figure 1.0 below).

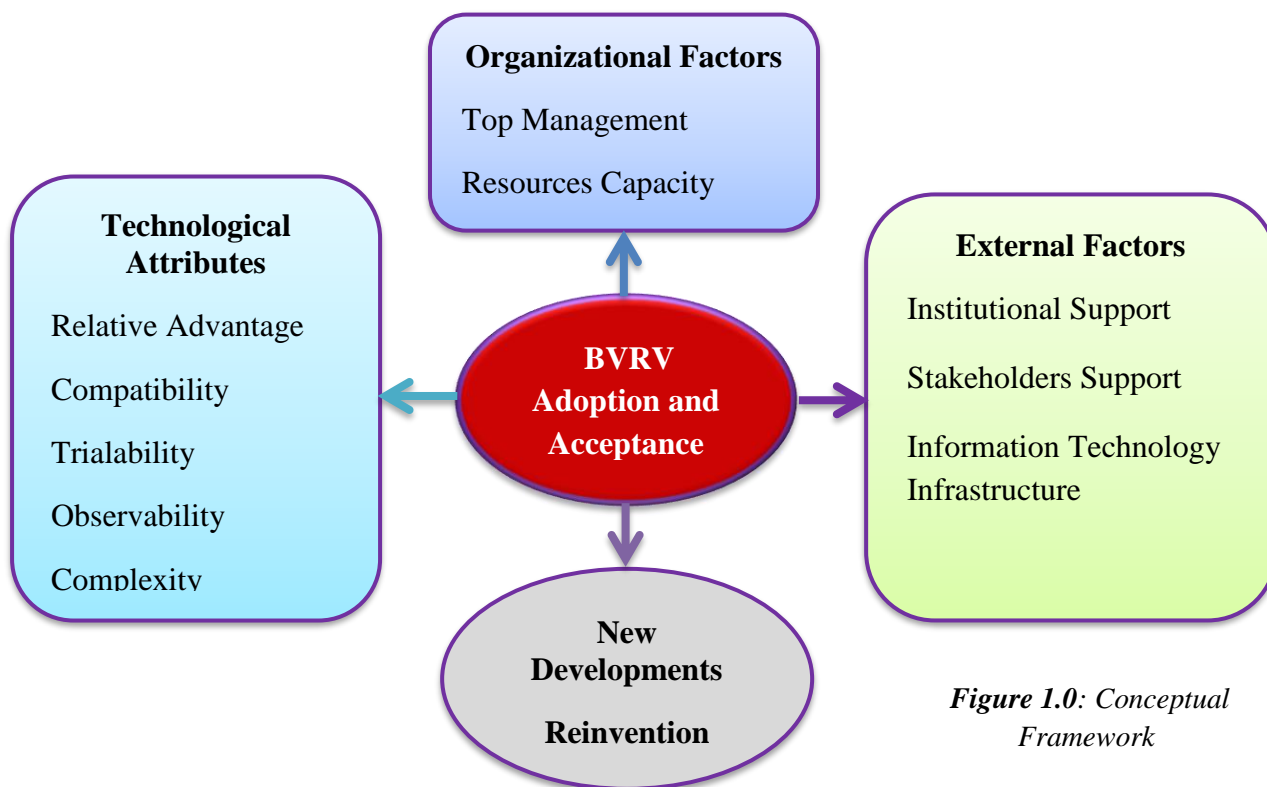


Figure 1.0: Conceptual Framework

¹⁵ See Appendix B for correlation between the research questions and the Diffusion of Innovations theoretical framework employed in this study.

¹⁶ See also: Lyytinen and Damsgaard (n.d.); <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories4.html> for more details on what is wrong with the DOI theory

3.4 Research Methodology

Hegsub (1979) maintains that a research methodology does not only comprise the strategies, tactics, and techniques for investigating a social science phenomenon but also attempts to clarify the logic and justification for using these approaches. The methodology, therefore, enables the researcher to clearly define the areas of interests and adopt the appropriate mechanisms to achieve results. While there is consensus among scholars that research methodology is the appropriate means for gathering research data, scholars hold divergent views with regards to the applicability of the scientific approach of inquiry to the field of social science.

According to Harwell (2011), a research methodology can be qualitative, quantitative or a combination of both as commonly referred to as the mixed method. Qualitative research is basically exploratory in nature. To Strauss and Corbin (1990:17), a qualitative research is “any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification”. Qualitative research according to these scholars allows the researcher to attain a more intimate and richer view of the phenomenon under study. It further provides a deeper understanding of the phenomenon under study than the rigid mechanisms imposed by quantitative research methods (Engel & Schutt, 2009). Conversely, quantitative methods of inquiry are concerned with measurements and quantities meant to facilitate scientific generalizations in a research study (Kothari, 2004; Biggam, 2008). A mixed method on the other hand involves a synergy of quantitative and qualitative methods of inquiry in a single study (Creswell, 2009).

The research methods and approaches employed in this study are outlined and discussed below. They comprise the research design, research population, sampling frame and sample size, sources

of data collection, sampling technique, the data collection instruments, sampling procedure, data analysis and presentation, and key ethical considerations.

3.4.1 Research Design

A research design is the blueprint or a detailed plan of how a research study will be carried out (De Vos 2002a; Burns & Grove, 2003). Ikart and Ditsa (2004) purports that, a well-constructed research design helps to answer research questions validly, accurately, objectively, and economically. In their view, a research design facilitates the giving of a logical order to data collection and analysis, to further enhance the drawing of an effective conclusion from the information to be gathered. This study employed the mixed method approach for both data collection and analysis. The qualitative research approach was employed because the nature of inquiry for this study required the need for opinions, inferences, ideas, and insights about the concepts been studied (Engel & Schutt, 2009). In addition, the quantitative research method which is concerned with figures, measurements, and quantities aimed at making generalizations in a research study (Biggam, 2008) was also employed to quantify data and generalize results from the sample to the research population.

3.5 Research Population

A research population refers to all the elements, objects, events, and individuals that meet the criteria for inclusion in a particular study (Sarantakos, 2005; Burns & Grove, 1993). The target population for this study comprised the entire eligible voters of Gomoa East, Ablekuma Central, and Shama constituencies of the Central, Greater Accra, and Western regions of Ghana respectively. Also, officials of the Electoral Commissions of Ghana who possess expert knowledge in the study area were also selected for interview. The coastal regions and their respective

constituencies were selected because they are known for their inconsistent voting pattern with no inclination towards a particular party or candidate (Frempong, 2016; Hermann et. al, 2016). These coastal swing constituencies have been swinging every eight years since the inception of Ghana’s democracy in 1992 and thus helped provide a fair assessment of the subject under study without any biases towards a particular party since none of the constituencies in the regions is a stronghold of any of the political parties (Mensah, 2016; Nyabor, 2016).

3.5.1 Sampling Frame

Kothari (2007) defines a sample frame as the list of all the items out of which a sample size is drawn for a study. The sampling frame for this research study is the list of all eligible voters of Gomoa East, Ablekuma Central, and Shama constituencies who voted in at least the 2012 or 2016 elections.

Table 2: Sample Frame

Constituency	Registered Voters	Percentage Share	Sample Allocation
Gomoa East	48690	28	57
Ablekuma Central	77922	44	90
Shama	49329	28	57
Total	175941	100	204

Source: Adapted from CODEO, 2012

3.5.2 Sample Size

A sample size refers the number of items selected from a research population (Denscombe, 2003; Kothari, 2009; 2004). Mason et al. (2002) argue that, a good sample size is dependent on three major variables; the desired confidence level, the error margin, and the variability of the research population. Kothari (2004) and Denscombe (2003) also maintain that, the sufficiency or suitability of a sample is dependent on a number of factors connected with the study as may be weighed by the researcher in the process of reaching decision on the sample size. In light of these arguments, this study sampled the views of 204 respondents from all the three swing constituencies (Gomoa East, Ablekuma Central, and Shama) in the coastal swing regions.

3.5.3 Sample Size Determination

The sample size of 204 was arrived as follow:

$$n = \frac{N}{1 + N(\partial^2)}$$

Where:

n = Sample size

N = Sample Frame

∂ = Margin of error (7%)

$$n = \frac{175941}{1 + 175941(0.07^2)}$$

$$n = 204$$

3.5.4 Sampling Technique

According to Kothari (2009), a sampling technique refers to the specific plan or technique for obtaining a sample from a sampling frame. This study employed both probability and non-probability sampling techniques to select the required sample size from the research population. Specifically, the simple random sampling and purposive sampling methods were employed in this respect to sample participants for the study. The simple random sampling method was used to select respondents across the selected constituencies. This gave every individual member of the research universe or population an equal chance of being selected to participate in the study. The non-probability sampling technique, purposive sampling, was also used to select Electoral Commission Officials for interview. The purpose of the purposive sampling method was to allow the selection of specific officials with expert knowledge for specific information. Thus, officials who are deemed capable of answering key questions in relation to the study would be selected for interview.

3.6 Types and Sources of Data

This study made use of primary and secondary data sources. Primary data refers to the “original data collected for a specific research goal” (Hox & Boeje, 2005:593). Given the nature of the study, primary data was gathered through interview schedules with Electoral Commission officials and survey questionnaires administration at the selected electoral constituencies (Gomoa East, Ablekuma Central, and Shama). On the other hand, secondary data, information “originally collected for a different purpose and reused for another research question” (Hox & Boeje 2005:593) were also sourced from books, journal articles, newspapers, magazines, research

reports, and other published works on elections, electoral reforms, and biometric voter registration and verification.

3.6.1 Data Collection Instrument

Data collection is considered to be vital in determining the success of a research (Burnham et al., 2004). This study made use of two major data collection instruments, survey questionnaires and semi-structured interview guides to collect the primary data. The survey questionnaire was partly designed to follow the Likert scale where: 0 = strongly disagree; 1= disagree; 2 = neither agree nor disagree; 3 = agree; 4; strongly agree; and 5 = don't know (Neuman & Robson, 2012). The survey questionnaire was framed to underscore the intended objectives of the study. The rationale for using this data collection instrument is informed by the need to draw direct responses from the respondents under study. Also, with this data collection instrument, large samples of the research population can be contacted at a relatively low cost; respondents will have opportunity to seek clarity on the survey topic; and once again have time to think about their responses as they are not compulsorily required to reply immediately. Equally important, survey results are usually straightforward to analyze (Snap Survey, 2011). In addition to the survey questionnaires, a semi-structured interview guide was adopted to gather information from the Electoral Commission of Ghana. The need to employ this data collection instrument was informed by the need to solicit expert knowledge and theoretical clarification on the topic under investigation.¹⁷

¹⁷ See Appendix A: for more details on the data collection instruments employed in this study

3.6.2 Data Collection Procedure

Secondary data was collected first followed by the primary data. This was to aid in ensuring the verification of the information sourced from books, journals articles and other published works by the data that was gathered from the field surveys and interviews. The primary data collection process was commenced by sending an introductory letter to all the necessary institutions selected for the study. The letter described the intent of the research and the purpose of the responses that were provided by the respondents. An official appointment was also made to meet staff (interviewees) from the Electoral Commission of Ghana. A pilot study was undertaken at Klorley Korle constituency to precede the main data collection; the questionnaires designed for the selected sample constituencies was first administered to five (5) respondents at Klorley Korle constituency after which all the necessary corrections were effected before they were finally sent to the study areas for administration. The responses from the pilot study were not added to the total sample or data analysis section of the study, rather, it informed the aptness of the data collection instrument as it made room for possible corrections to be effected. The Klorley Korle constituency was chosen for the pretest because it has similar electoral characteristics as the selected swing constituencies.

3.6.3 Data Analysis and Presentation

Data collected for this study was analyzed both qualitatively and quantitatively. Qualitative data analysis took the form of transcribing recorded tapes, and a content analysis of written-notes that were gathered from interview schedules with the selected officials. An appropriate content analysis was also made from the open-ended questions from the surveyed respondents (Corbetta, 2003; Babbie, 2004) across the selected electoral constituencies. The quantitative analysis took the form of descriptive statistics such as frequencies, graphs, and percentages (Babbie, 2004; Sarantakos, 2005). Microsoft Excel 2013 and Statistical Package for Service Solution (SPSS 20.0) software

were employed to analyze and organize the survey findings. Further, analyzed data were presented descriptively in statements and quotations, and statistically in percentages, graphs, and tables to enhance readily inferences and deductions.

3.7 Limitations and Challenges

One of the main challenges encountered in this research study was getting access to respondents to participate in the study. While some of the respondents within the three selected constituencies were busy and had very little time to spare, others were reluctant to participate in the study. However, upon conviction and proven essence of the study, the respondents volunteered to provide information for the study. At the institutional level, several attempts were made to interview more than one officials at the Electoral Commission but in the end, the researcher was assigned to one official to turn to for all the needed information. Although this partially prohibited divergent views from the Electoral Commission and prolonged the intended interview time span, it however, did not have any adverse effect on the quality of the work as the official was able to provide all the necessary information required to answer the specified research questions.

Another key challenge encountered in this study was time and financial constraints. The adoption of survey questionnaire administration and interview schedule as principal tools for the primary data collection was time-consuming. Also, there are ten swing electoral constituencies in the coastal swing regions with similar electoral characteristics but the study was limited to three constituencies due to time and financial constraints. This however does not limit a possible generalization, as Kothari (2007; 2009), indicates that 30% of a research population and a 7% marginal error is representative enough to make generalized conclusions in a quantitative study.

3.8 Ethical Considerations

Ethics play an important role in any scientific research. Researchers are therefore expected to consider ethical principles when formulating a research plan. Social science researches bring people into direct contact with each other, and this makes it imperative to follow ethical values (Babbie, 2004). Burnham et al. (2004), notes that there are five (5) ethical principles researchers must employ in the conduct of political researches. These are; ensuring the autonomy of respondents, avoiding deception, avoiding harm, informed consent, and ensuring confidentiality. Babbie (2004) and Okrah (2015) denote that, in social science research, interviewees do not owe researchers any information and as such their participation in any research study must solely be based on their own volition and not compulsorily drafted into it. Equally, the best assurance of respondents' protection is when nothing in the study can be directly traced to them, and that, those who decide to participate in the study do not suffer any ill-effects for it (Snap Survey, 2011).

For this reason, the consents of the respondents involved in this study were obtained and their rights duly respected. Respondents were informed ahead of time, the purpose of the research as an academic work and the essence of the responses that they would provide towards this study. The survey questionnaire used in this study specifically indicated respondents' consent to participate, and the voluntary nature of research participation. Also, during the interviewing sessions, respondents were assured of anonymity and confidentiality. As such, where necessary, names, and addresses were expunged from the final write-up. Where statements through quotations are made, they were only associated with names of interviewees based on their consent. In a nutshell, ethical considerations such as confidentiality, voluntary participation, and informed consent were all

adhered to. This fulfills Burns and Grove (1993:762) assertion that anonymity is attained when subjects cannot be linked, even by the researcher, with his or her individual responses.

3.9 Chapter Summary

This chapter discusses the theoretical framework and the research methodology that were employed in this study. The chapter presents a preview of the Diffusion of Innovations theory and summarizes the various components that make the theory a suitable option for this study. The chapter also discusses how data were collected and analyzed, the research design, the research population, the sample size, sampling techniques, data collection instruments and procedure, and data analysis and presentation. Lastly, the challenges or limitations and ethical considerations of this study are also discussed.

The next chapter captures the analysis, discussion, and presentation of the information gathered from the field survey.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter discusses and analyzes the field survey data and presents the findings in three parts. The first part deals with the data gathered from voters across the selected constituencies. The second part discusses the interview responses from the Electoral Commission of Ghana, and the third part presents a discussion of the survey results in relation to the literature.

Data gathered from the voters across the selected constituencies

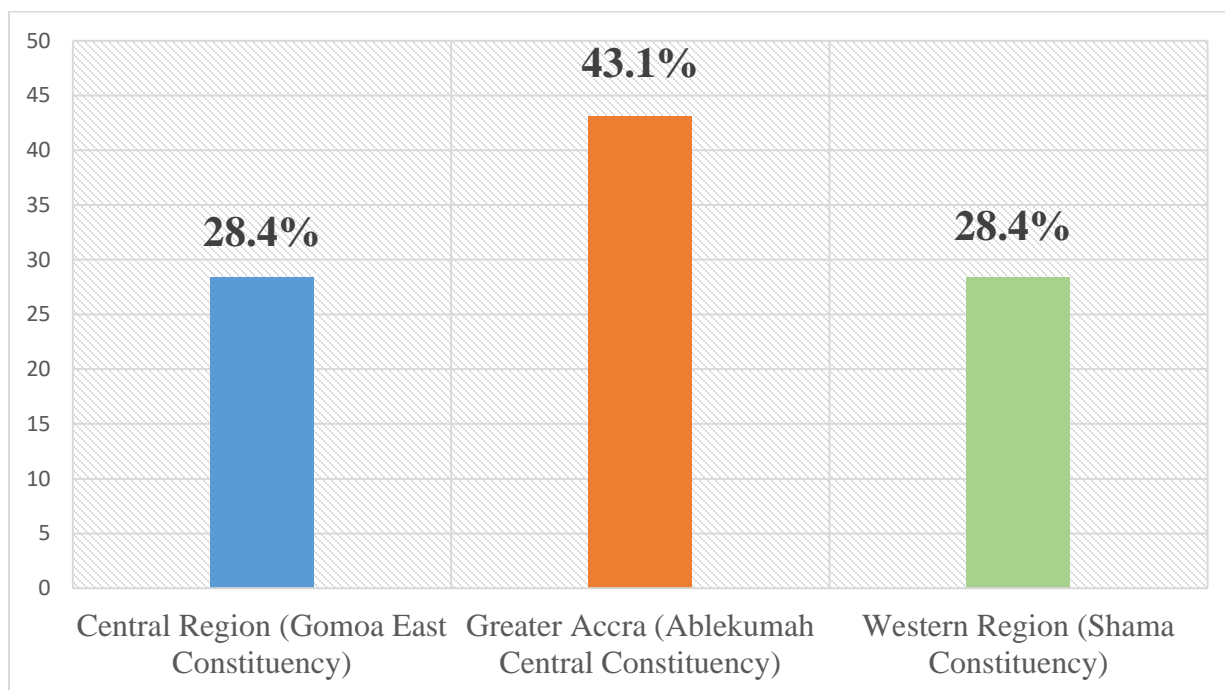
4.1 Demographic Characteristics of Respondents

The survey was conducted in Greater Accra, Central, and Western regions. In all, a total of 204 respondents from the selected regions participated in the study. To put the respondents view into proper perspective of the research study, their bio-data were captured. This section discusses the survey response based on the demographic details of the respondents. This comprises their gender, age, educational background and region.

4.1.1 Geographical Distribution and Social Characteristics of Respondents

A total number of 204 voters within three swing constituencies participated in the survey. In terms of constituency and regional distribution, Ablekuma Central constituency in the Greater Accra region recorded the highest representation (43.1%) while Gomoa East and Shama constituencies of the Central and Western regions respectively recorded 28.4% each of the total respondents (See Figure 1 below).

Figure 3: Regional and Constituency Distribution

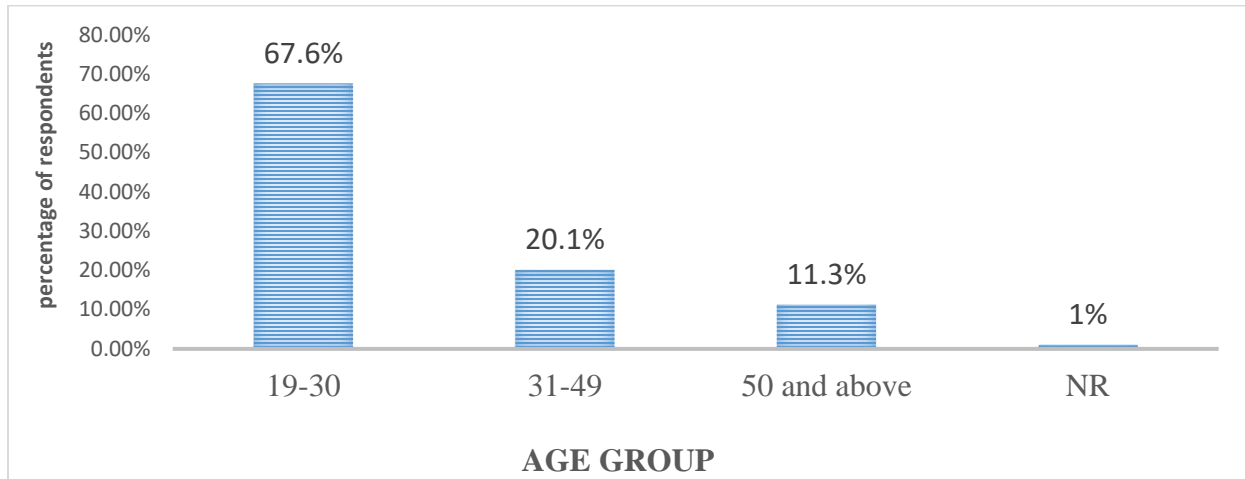


Source: Fieldwork, 2018

4.1.2 Age and Gender of Respondents

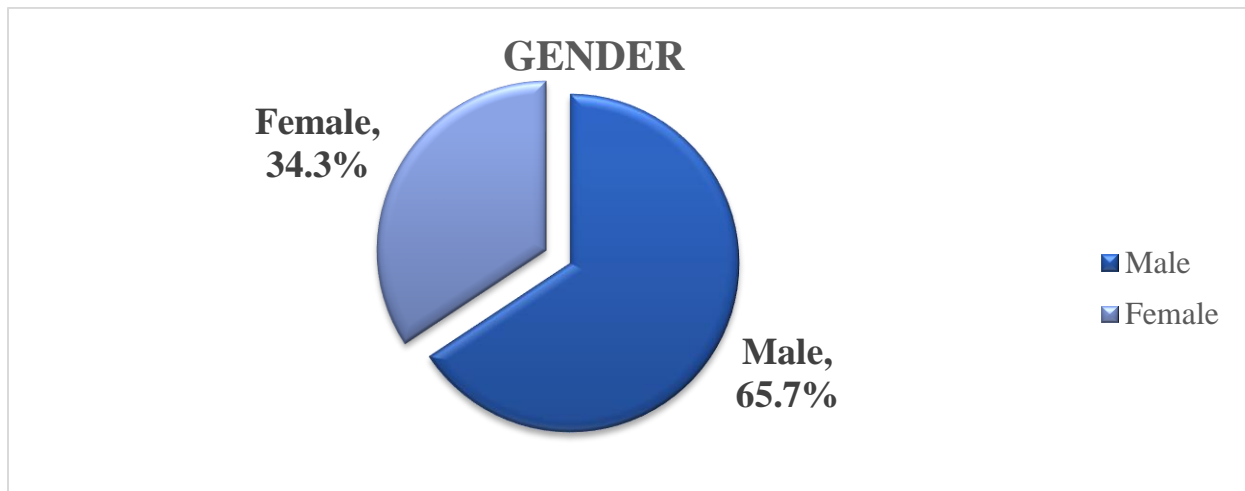
The most primate determinant in every election on the part of voters has always been age. The stipulated age according to Ghana’s 1992 constitution is 18 years and above, and for that matter the study investigated into this phenomenon and discovered that a greater number of the respondents, 67.6% were within the age bracket of 19-30. 20.1% of the total respondents fell between 31-49 bracket, and 11.3% of the total respondents were 50 years and above. Nonetheless, 1% of the total respondents failed to indicate their age bracket (see Figure 3 below). Furthermore, the respondents were split between two sexes, males and females. Majority of the survey respondents were males (65.7%), with females representing a relatively smaller percentage of 34.3% (See Figure 4 below).

Figure 4: Age Group of Respondents



Source: Fieldwork, 2018

Figure 5: Gender Profile of Respondents



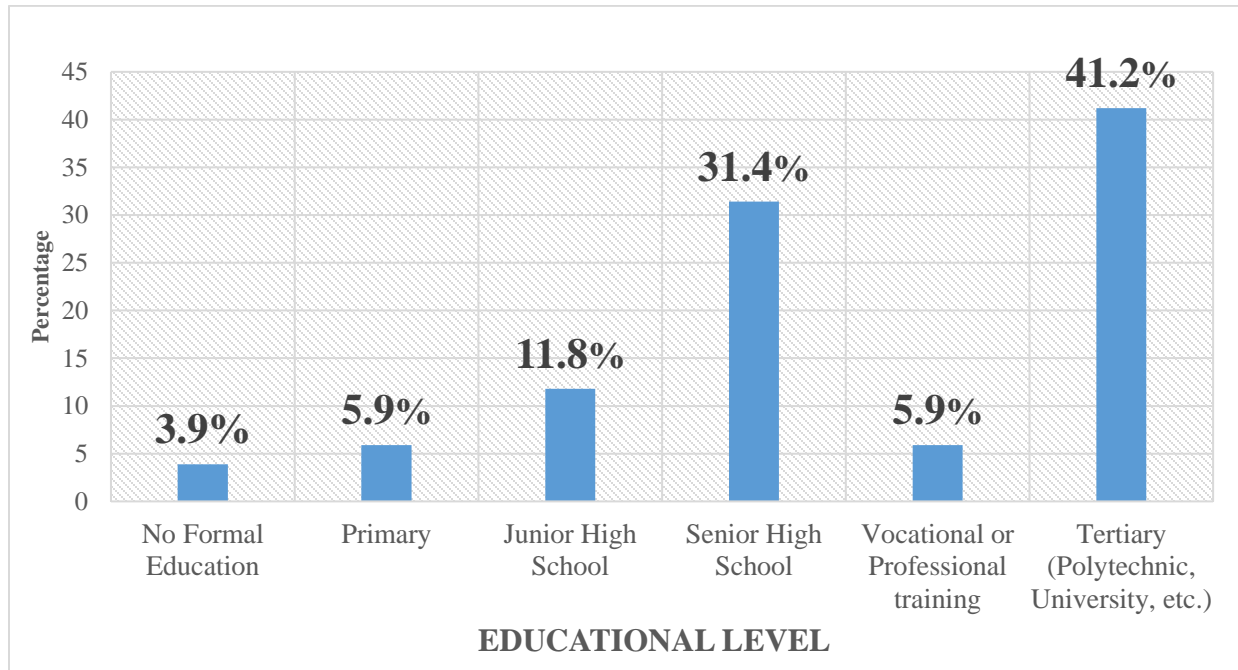
Source: Fieldwork, 2018

4.1.3 Educational Background of Respondents

From Figure 6 below, it can be observed that out of the total sample of 204 respondents, 3.9% had no formal education, 5.9% were primary school dropouts, 11.8% completed junior high school education, 31.4% completed senior high school, and a total of 47.1% completed tertiary education

including a polytechnic, training college, or a university. It can be gleaned that the responses were provided were clear and relevant because majority of the respondents were educated and understood the topic under study. However, introductions and explanations were made for clarity.

Figure 6: Educational Background of Respondents



Source: Fieldwork, 2018

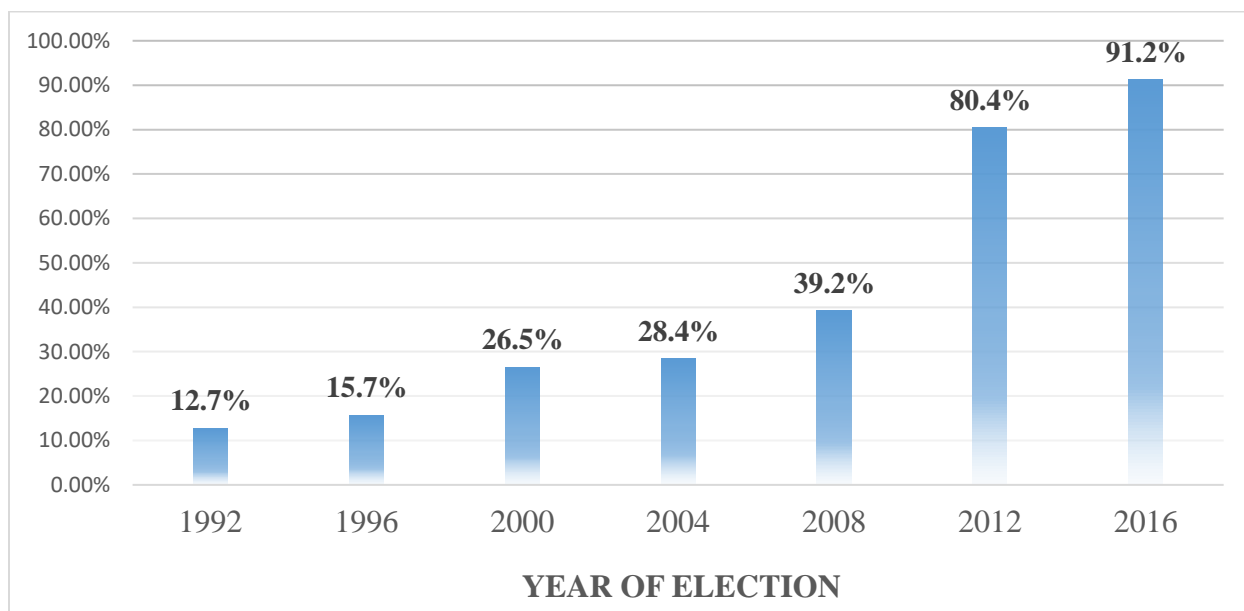
SECTION A: PUBLIC AWARENESS AND PARTICIPATION IN THE BIOMETRIC VOTER REGISTRATION AND VERIFICATION

The survey targeted people who voted in at least the 2012 or the 2016 general elections conducted by the Electoral Commission of Ghana (ECG). In this section, the level of biometric voter registration and verification awareness among the respondents was investigated. This objective was ascertained with the following themes: respondents' participation in elections, awareness of biometric voter registration and verification, sources of information on biometric voter registration and verification, prior notices on the registration and verification exercises.

4.2 Participation in Elections

To compute voters participation in elections held in the past, starting from Ghana's Fourth Republic, respondents were asked to indicate whether they voted in the elections held in 1992, 1996, 2000, 2004, 2008, 2012 and or 2016. Out of the total respondent, 12.7% indicated that they voted in the 1992 elections, 15.7% voted in 1996, 26.5% voted in 2000, 28.4% voted in 2004, 39.2% voted in 2008, 80.4% voted in 2012 and 91.2% voted in 2016 (See Figure 7 below). On average 42.0% and 58.3% of the total respondents participated in the elections conducted with and without the biometric voter registration and verification system, respectively. This is an indication that from 1992-2008, one out of every four of the total respondents participated in at least an election, and one out of every two of the total respondents participated in either the 2012 or 2016 elections.

Figure 7: Participation in Previous Elections



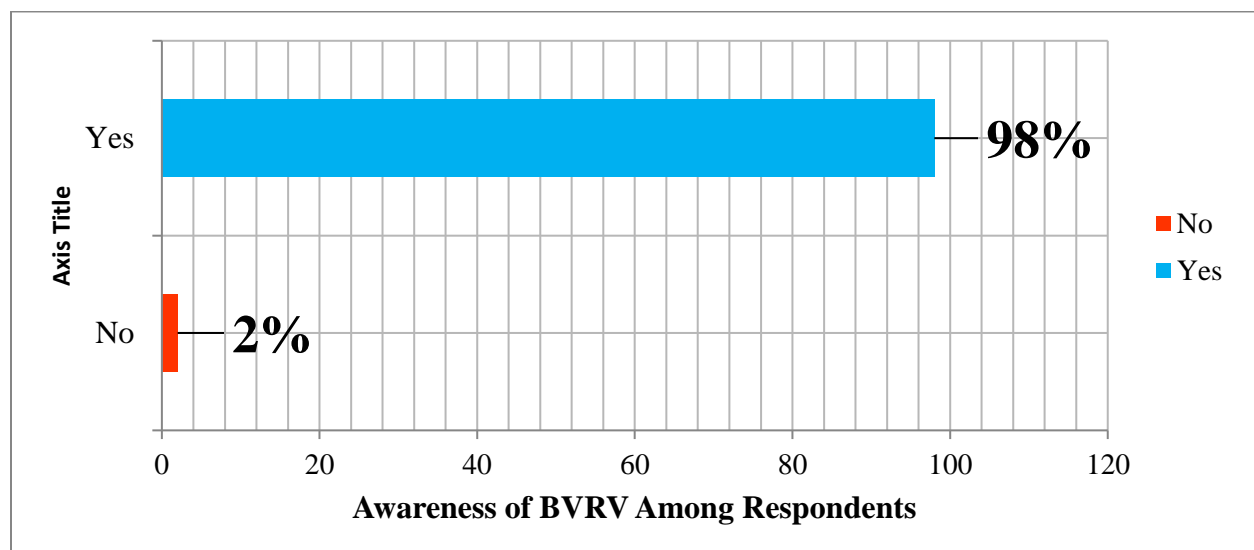
Source: Fieldwork, 2018

Consequently, the respondents were asked to indicate their age when they had their first vote cast. Across the board, 5% of the total respondents were below eighteen (18) years (the constitutionally required voting age) when they had their first vote cast. Out of this proportion 54.5% casted ballots in 2012 and 2016 notwithstanding the integration of biometric voter registration and verification in the electioneering process.

4.2.1 Awareness of BVRV among Respondents

To ascertain respondents' awareness of the 2012 and 2016 biometric voter registration, the respondents were asked whether they have heard of biometric voter registration and verification. From Figure 8 below, majority of the respondents 98.0% responded in the affirmative when they were asked "have heard of the biometric voter registration and verification"

Figure 8: Have you heard of biometric voter registration and verification?



Source: Fieldwork, 2018

4.2.2 Sources of Information on BVRV

Before the beginning of the BVRV exercises, the Electoral Commission embarked on a series of publicity programs on various forums to raise public consciousness of the exercise. Majority of the respondents reported to have gotten information on the BVRV exercise from multiple sources. Radio, 82.5% topped the list of the 506 responses provided by the respondents. This was followed by television 66.0%, social media 35.1%, newspaper 24.7%, family and friends 23.7%, religious groups-churches/mosques 15.5%, and online news outlets 9.3%. Together, radio, television, and social media constituted 70.3% of the set of information sources cited by the respondents – an indication that the Electoral Commission largely relied on the electronic media to disseminate or publicize the biometric voter registration and verification (See Table 3 below).

Table 3: Source of Information about Biometric Voter Registration and Verification

Information Source	Responses		Percent (%) of Cases
	Frequency	Percent (%)	
Radio	160	31.6%	82.5%
Television	128	25.3%	66.0%
Newspaper	48	9.5%	24.7%
Family and Friends	46	9.1%	23.7%
Q1 ^a Religious Groups (Church, Mosque etc.)	30	5.9%	15.5%
Online News Outlets	18	3.6%	9.3%
Social Media	68	13.4%	35.1%
Posters	8	1.6%	4.1%
Total	506	100.0%	260.8%

Note: Multiple Response Results. Total number of responses gathered is 506

Source: Fieldwork, 2018

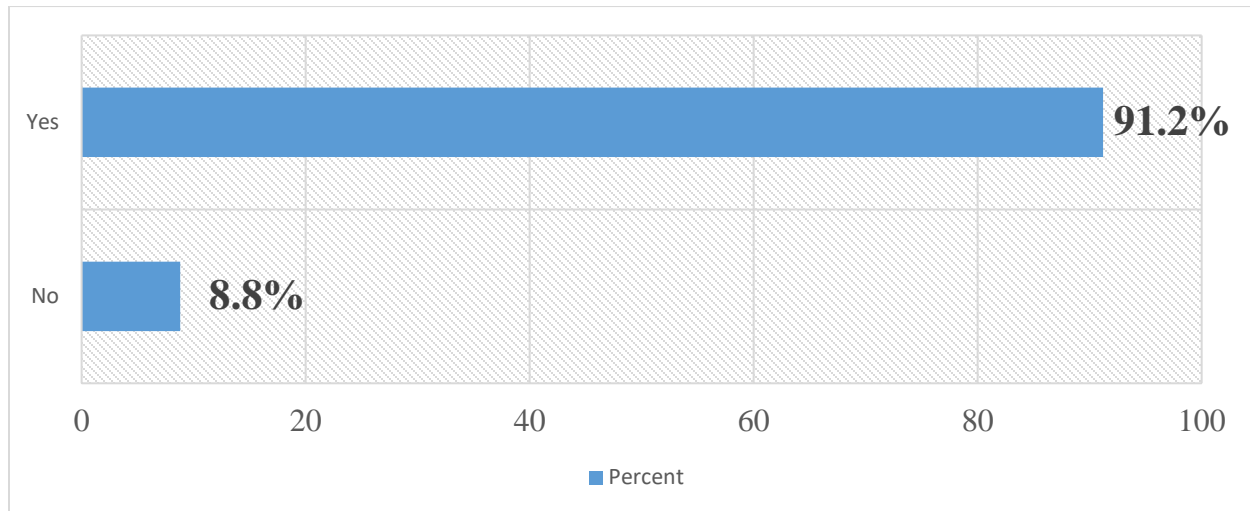
Moreover, more than half of respondents 66.7% got their information from multiple sources (two to five sources, 60.8%; six to eight sources, 5.9%) while 28.4% obtained their information from a single source, predominantly radio or television.

4.2.3 Receipt of Prior Notice on the Registration and Verification Exercises

According to the Electoral Commission’s operative arrangements, voter registration and verification teams were assigned to clusters of polling centers and worked within their jurisdictions for a maximum of ten days. Quite a greater number of the EC’s publicity programs broadcasted the dates the electorates should be expecting the registration and exhibition teams in their electoral area or community. Generally, the survey found that most of the electorates were amply informed about when the registration and exhibition teams would be present in their localities. Nearly a little

over nine out of every ten respondents, 91.2% indicated they knew when and where the biometric registration and verification exercises were going to take place. Just a little below a tenth (8.8%) indicated they never had any information (See Figure 9 below).

Figure 9: Receipt of Prior Notice on the Registration and Verification Exercises



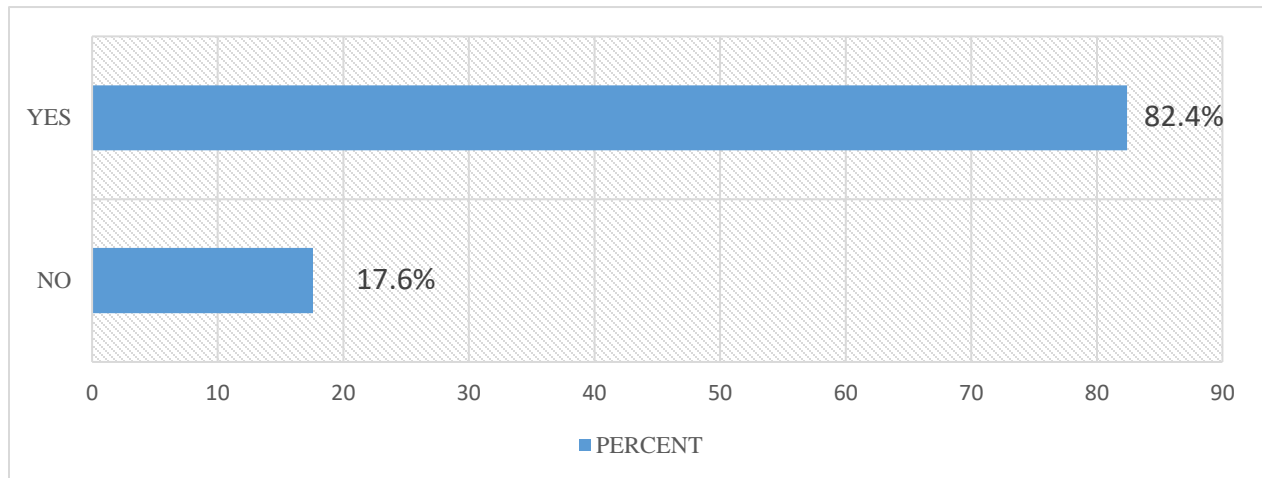
Source: Fieldwork, 2018

Indeed, in Ablekuma Central, Gomoa East, and Shama constituencies, the respective averages for respondents who had prior notice as to when and where the voter registration and verification were going to take place were significantly higher than those who did not. For Gomoa East constituency it was 96.6% about the same as the national average in 2012. The remaining two constituencies, Shama and Ablekuma Central, also had significantly higher positive responses, 89.7% and 88.6% respectively.

When the respondents were further asked to indicate whether they knew how the registration exercises were going to be carried out, majority of the respondents comprising 82.4% reported they knew about how the registration exercise were going to be carried out. However, 17.6% of

the total respondents indicated they had no idea about how the BVRV was going to be carried out (See Figure 10 below).

Figure 10: Informed about biometric voter registration and verification were going to be carried out?



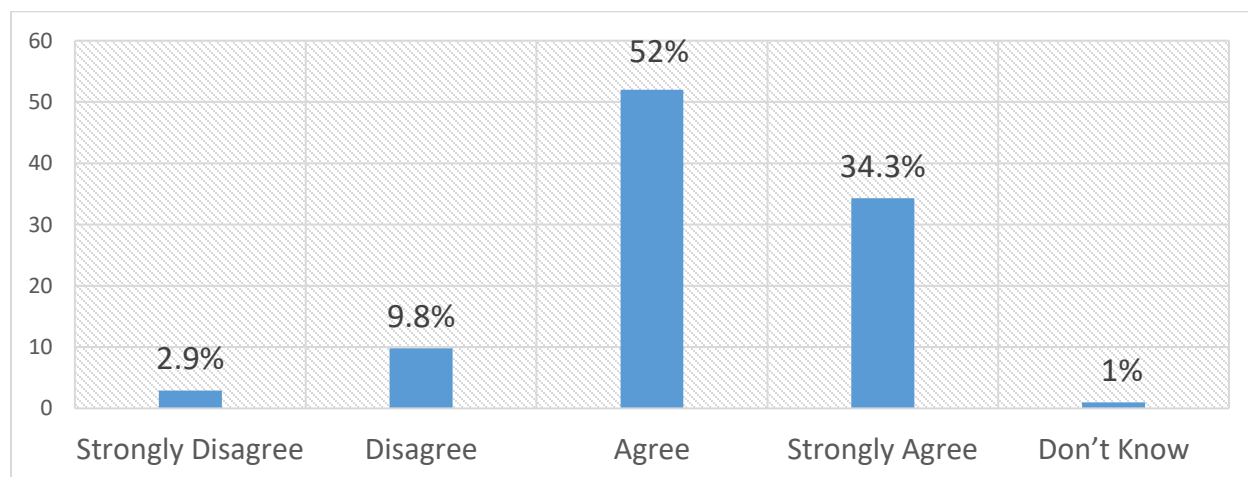
Source: Fieldwork, 2018

More so, out of the 91.2% respondents who affirmed to have received prior notice as to when the BVRV exercise were going to take place, 88.2% reaffirmed they knew how the biometric voter registration and verification exercises were going to be carried and thus informed the documents they submitted to registration centers, while the rest 11.8% of the total respondents indicated that even though they had a prior notice, they had no idea of how the exercises were going to be carried out.

SECTION B: FACTORS THAT INFLUENCED THE ELECTORAL COMMISSION TO EMBARK ON BVRV

One of the key objectives of this study was to establish the very reasons that influenced the Electoral Commission of Ghana to embark on biometric voter registration and verification. Quite a number of reasons were cited by the respondents as the rationale behind the adoption of the BVRV by the EC in the conduct of elections in Ghana. Majority of the respondents referred to multiple registrations, multiple voting, bloated electoral register, voter impersonation, the need to secure the principle of one man one vote, and the need for efficiency and reliability in voter registration and verification as the most push factors that necessitated the call for BVRV in Ghana. Majority of the respondents strongly agreed or agreed that the previous manual voter registration and verification system had facilitated electoral fraud (See Figure 11 below). However, unqualified voter registration (minors and foreigners) and ballot stuffing were less relatively cited by the respondents. It was however observed that, most of the respondents viewed the aforementioned factors as unrelated, and hence must be considered separately.

Figure 11: Previous voter registration and verification system facilitated Electoral Fraud



Source: Fieldwork, 2018

When respondents were asked to respond to the question “What do you think are the reasons for introducing BVRV in Ghana’s electoral process” the following responses were gathered.

4.3.1 Table 4: To Detect and Prevent Multiple Registrations

Degree of Acceptance	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	4	2.0	2.0	2.0
Disagree	4	2.0	2.0	3.9
Agree	124	60.8	60.8	64.7
Strongly Agree	70	34.3	34.3	99.0
Don’t Know	2	1.0	1.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

From Table 4 above, out of the 204 respondents, 95.1% “strongly agreed” or “agreed” that one of the reasons that influenced the introduction of BVRV in the 2012 and 2016 general elections was the need to detect and prevent multiple registrations that has plagued elections in the past. However, 4% of the total respondents “strongly disagreed or disagreed” to this submission.

4.3.2 Table 5: To Prevent Multiple Voting

	Frequency	Percent	Valid Percent	Cumulative (%)
Strongly Disagree	2	1.0	1.0	1.0
Disagree	4	2.0	2.0	2.9
Valid Agree	134	65.7	65.7	68.6
Strongly Agree	62	30.4	30.4	99.0
Don’t Know	2	1.0	1.0	100.0
Total	204	100.0	100.0	

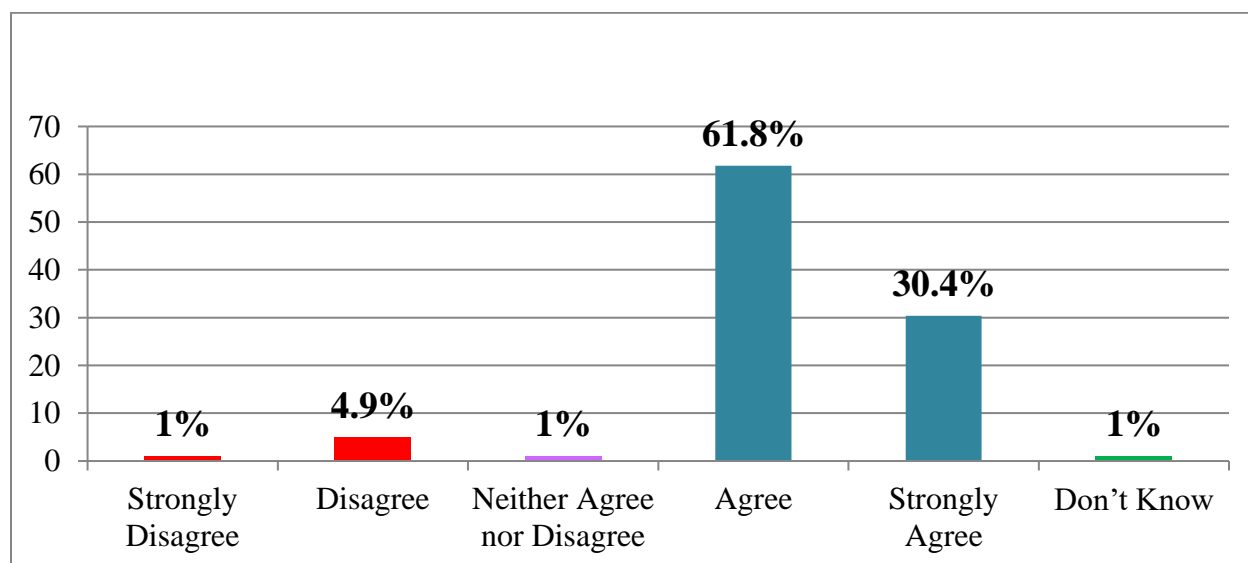
Source: Fieldwork, 2018

Similarly, 96.1% of the total respondents strongly affirmed that, the biometric voter registration and verification system was introduced to prevent multiple voting in Ghana (See Table 5 above).

4.3.3 To Prevent Voter Impersonation

The survey further discovered a positive response among the respondents as a whooping majority of 92.2% “strongly agreed” or “agreed” that the BVRV was introduced to eliminate voter impersonation or identity theft in Ghana’s electoral processes. However, 5.9% of the total respondents disagreed to this position (See Figure 12 below).

Figure 12: To Prevent Voter Impersonation



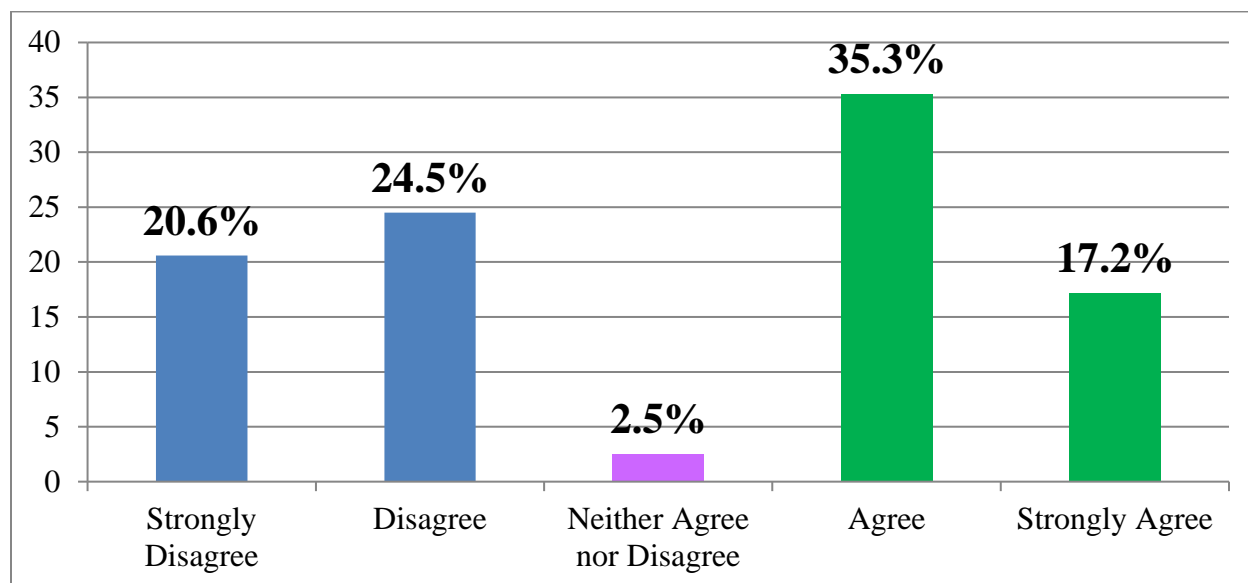
Source: Fieldwork, 2018

4.3.4 To Check Unqualified Voter Registrations

As shown in Figure 13 below, when the respondents were asked to indicate whether the BVRV was introduced to check the registration of minors and foreigners, the majority 52.5% “strongly agreed” or “agreed” that the BVRV was introduced to prevent such ineligible registrations.

However, 45.1% of the total respondents “strongly disagreed” or “disagreed” to this submission while 2.5% respondents were not sure whether the BVRV is capable of addressing such irregularity or not. This is an indication that popular knowledge and education on BVRV across the selected constituencies has not been comprehensively adequate.

Figure 13: To Prevent the Registration of Unqualified Voters

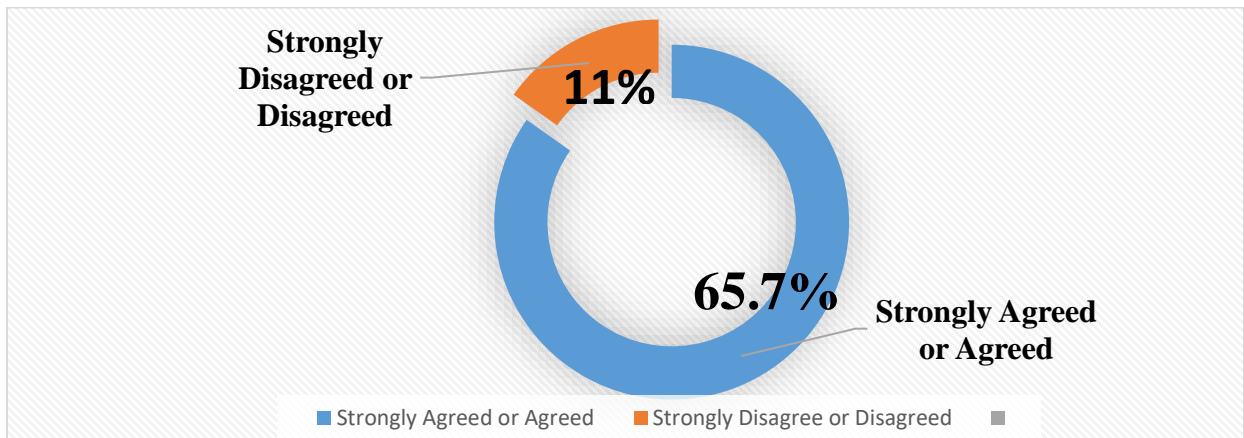


Source: Fieldwork, 2018

4.3.5 To Ensure a Clean Voters Registry

Majority of the respondents, 65.7% “strongly agreed” or “agreed” with the view that, the adoption of BVRV was founded by the desire to rid the electoral register of multiple names, ghost names, and other prohibited entries that add up to bloat the electoral register. However, 11.8% of the total respondents, “strongly disagreed” or “disagreed” the BVRV can make such accomplishments (See Figure 14 below).

Figure 14: To Ensure a Clean Voters Register

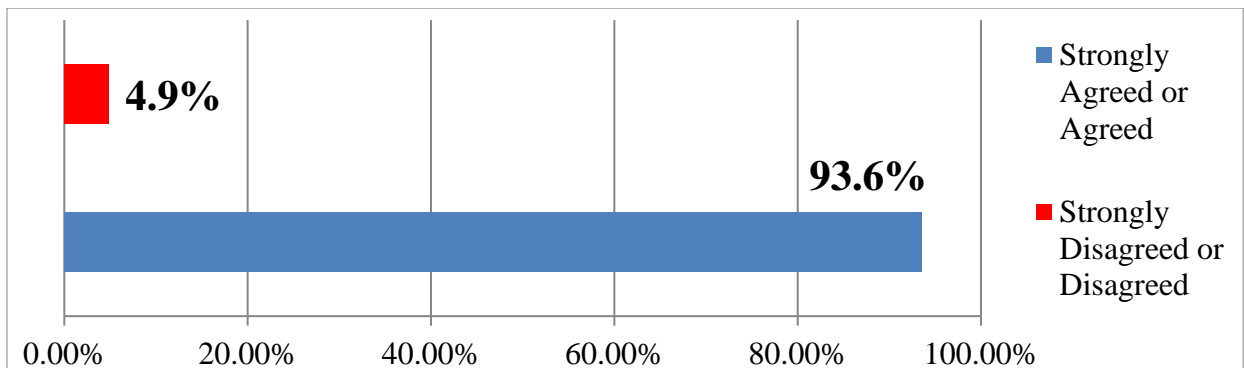


Source: Fieldwork, 2018

4.3.6 To Ensure the Principle of One Man One Vote

From Figure 15 below, a total of 93.6% respondents “strongly agreed” or “agreed” with the assertion that the biometric voter registration and verification was a project to ensure the principle of one man one vote. Conversely, the survey found that a relatively smaller percentage of respondents, 4.9 % “strongly disagreed or disagreed” that the BVRV was introduced to ensure the principle of one man one vote.

Figure 15: To Ensure the Principle of One Man One Vote



Source: Fieldwork, 2018

4.3.7 To Reduce Human Errors in Voter Registration and Verification

Out of the total respondents of 204, 83.4% “strongly agreed” or “agreed” that the BVRV was introduced to reduce inconsistencies and errors that occur in voter registration and verification processes. However, 13.7% of the total respondents “strongly disagreed” or “disagreed” to the submission, that the BVRV was introduced to help reduce errors and inconsistencies for a more enhanced, smooth, and efficient electioneering process (See Table 6 below).

Table 6: To Reduce Human Errors in Voter Registration and Verification

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	6	2.9	2.9	2.9
Disagree	22	10.8	10.8	13.7
Neither Agree nor Disagree	4	2.0	2.0	15.7
Agree	136	66.7	66.7	82.4
Strongly Agree	34	16.7	16.7	99.0
Don't Know	2	1.0	1.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.3.8 To Provide a Reliable Registration and Verification of Voters

Again, from Table 7 below, 91.7% respondents constituting the majority “strongly agree” or “agree” with the view that, the BVRV was introduced to provide a more accurate and reliable registration and verification of voters. Notwithstanding, 6.8% “strongly disagreed” or “disagree”

Table 7: To provide reliable registration and verification of voters

	Frequency	Percent	Valid Percent	Cumulative %
Strongly Disagree	6	2.9	2.9	2.9
Disagree	8	3.9	3.9	6.9
Neither Agree nor Disagree	3	1.5	1.5	8.3
Agree	143	70.1	70.1	78.4
Strongly Agree	44	21.6	21.6	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.3.9 To accelerate voter identification processes and eliminate delays

As depicted in Table 8 below, when the respondents were asked to indicate whether the BVRV was introduced to help accelerate voter identification processes and eliminate delays that characterize elections before 2012 and 2016, majority of the respondents 62.7% affirmed that, the BVRV was anticipated to smoothened voter verification processes and to further eliminate the delays that characterized previous elections. This was followed by 25.5% of the total respondents, strongly agreeing that the BVRV was a step in the right direction to achieve voter verification efficiency. However, a relatively small proportion, 7.8% objected this submission.

Table 8: To accelerate voter identification processes and eliminate delays

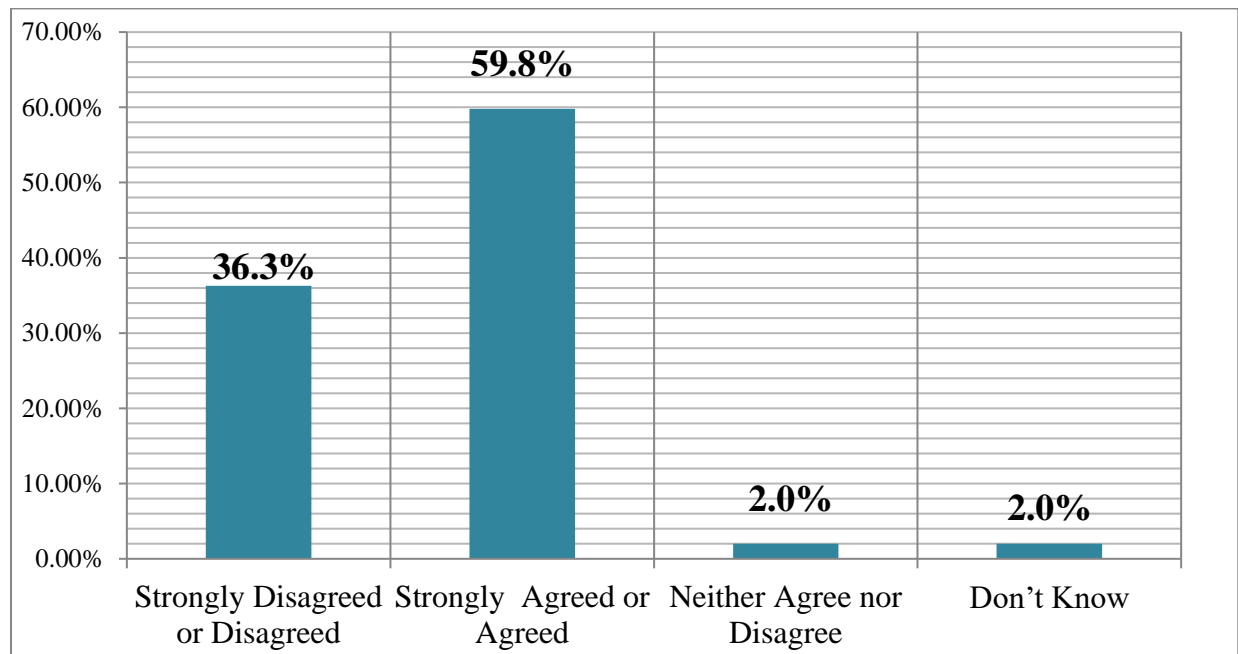
	Frequency	Percent	Valid Percent	Cumulative %
Strongly Disagree	6	2.9	2.9	2.9
Disagree	10	4.9	4.9	7.8
Neither Agree nor Disagree	8	3.9	3.9	11.8
Agree	128	62.7	62.7	74.5
Strongly Agree	52	25.5	25.5	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.4 To check Ballot Stuffing

Ballot stuffing was a common phenomenon that characterized past elections that were conducted without the biometric technology. When the respondents were asked to indicate whether the BVRV was introduced to check ballot stuffing, majority of the respondents 59.8% expressed that, the BVRV was introduced to help check ballot stuffing while 36.3% of the total respondents “strongly disagreed” or “disagreed” to the submission. A total of 4% of the total respondents reported “neither agree nor disagree” or “don’t know” whether the BVRV was introduced to check ballot stuffing. It was observed that, majority of the respondents had little knowledge about ballot stuffing hence influence their choice of answers (See Figure 16 below).

Figure 16: To check Ballot Stuffing

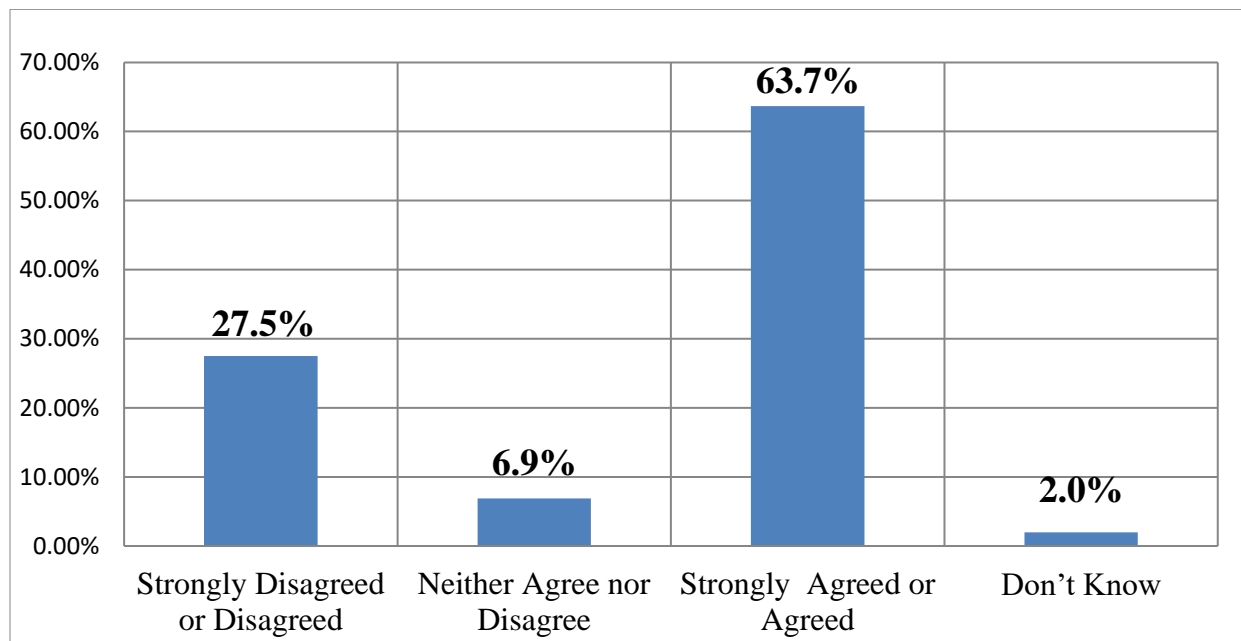


Source: Fieldwork, 2018

4.4.1 Increase Voter Participation

In addition to the aforementioned reasons, although 27.5% “strongly disagreed” or “disagreed”, majority of the total respondents 63.7% of the respondents were of the view that the BVRV was introduced to boost voter turnout and participation in elections (See Figure 17 below).

Figure 17: To increase Voter Participation

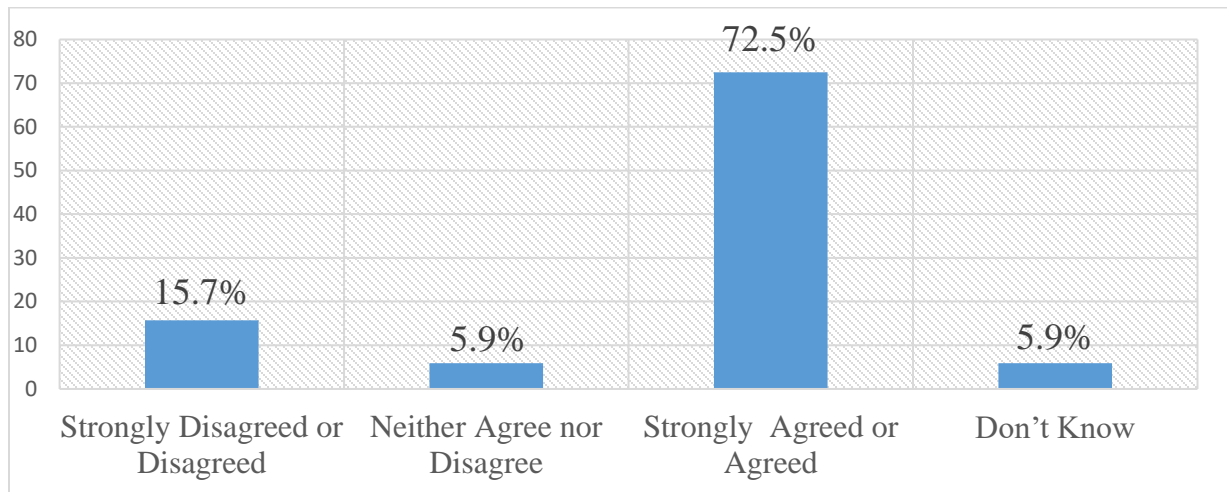


Source: Fieldwork, 2018

4.4.2 To Cut Down Cost

Further, the respondents were asked to indicate whether the introduction of BVRV was a mechanism to cut down costs incurred during elections. A total of 72.5% “strongly agreed” or “agreed” to this submission. However, 15.7% “strongly disagreed” or “disagreed” while 11.8% also indicated “neither agreed nor disagreed”, or “don’t know” to the submission (See Figure 18).

Figure 18: To Cut Down Cost

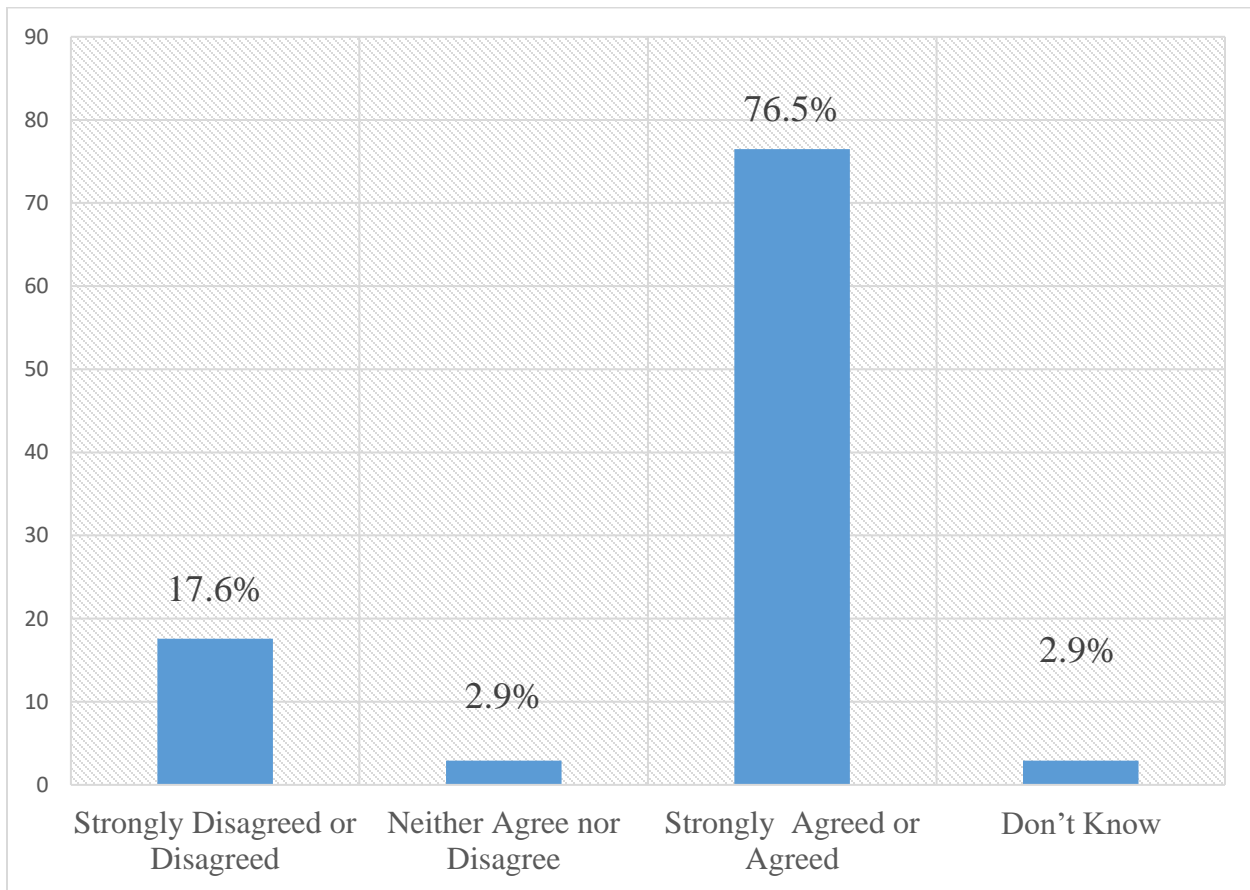


Source: Fieldwork, 2018

4.4.3 Pressure from Election Stakeholders

Finally, pressure from election stakeholders was also identified by the respondents as one of the major reasons that informed the inception of the BVRV in Ghana. Majority of the respondents, 76.5% “strongly agreed” or “agreed” that, the introduction of BVRV was partially informed by mounting pressure from citizens, civil society organizations, high political profile personnel, and the international community on the EC to introduce a more effective electioneering mechanism to reverse the challenges that has grappled election administration in Ghana (See Figure 19).

Figure 19: Pressure from Election Stakeholders



Source: Fieldwork, 2018

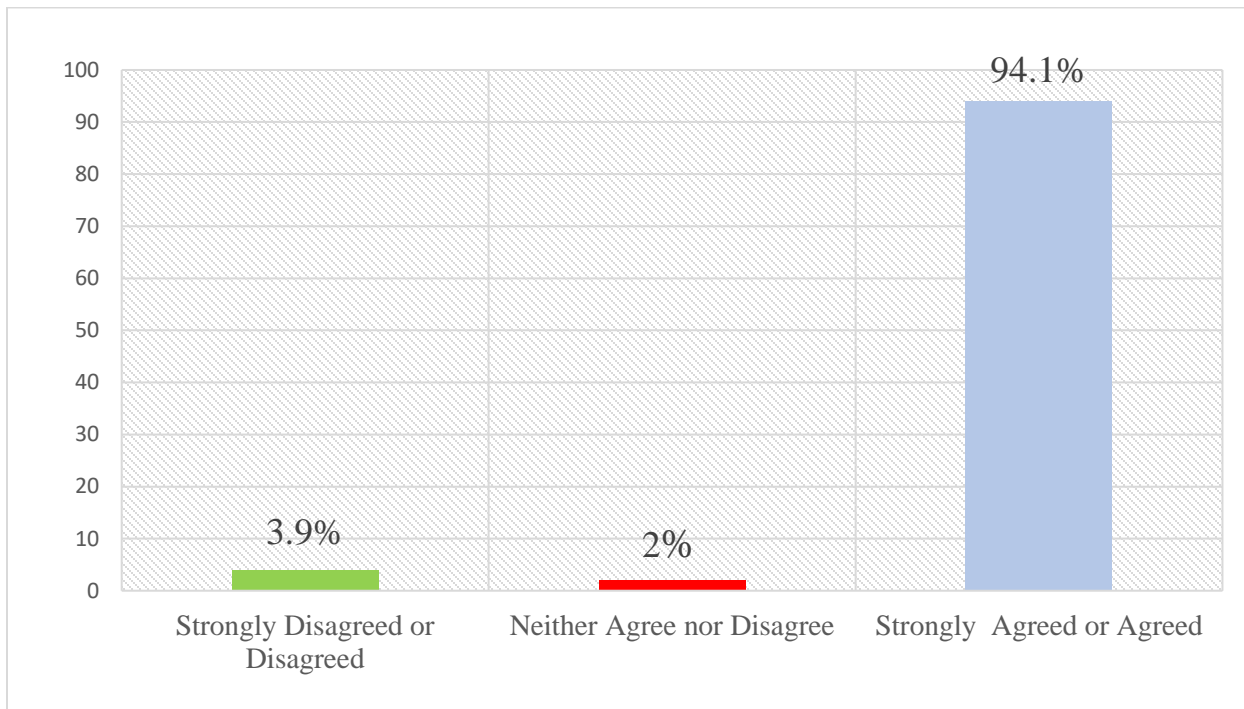
SECTION C: CONTRIBUTIONS OF BIOMETRIC VOTER REGISTRATION AND VERIFICATION TO ELECTIONS IN GHANA

In this section another primary objective of this research study has been analyzed and presented. In addition to the above this study sought to investigate the contributions of BVRV to electoral credibility in Ghana. The impact of biometric process of voting has only been imagined to be highly positive per scholarly reports. In order to ascertain this objective, respondents were asked to indicate whether they “strongly disagree” or “disagree”, “neither agree nor disagree”, “strongly agree” or “agree”, or “don’t know” to statements that were posed to them in relation to the effects of BVRV to Ghanaian elections. The responses gathered from the voters in the field survey towards this objective have been presented below.

4.5 Statement 1: The BVRV system helped to reduce multiple registrations and voting

When the respondents were presented with the statement, “the biometric voter registration and verification system helped to reduce multiple registrations and voting,” 94.1% of the respondents constituting the majority “strongly agreed” or “agreed” that, the introduction of BVRV in Ghana’s elections has helped to minimize the number of multiple registrations and voting that featured in the erstwhile manual voter registration and verification. However, 3.9% of the respondents “strongly disagreed” or “disagreed” with the submission, and 2.9% “neither agree nor disagree” (See Figure 20 below).

Figure 20: The BVRV system reduced multiple registrations and voting

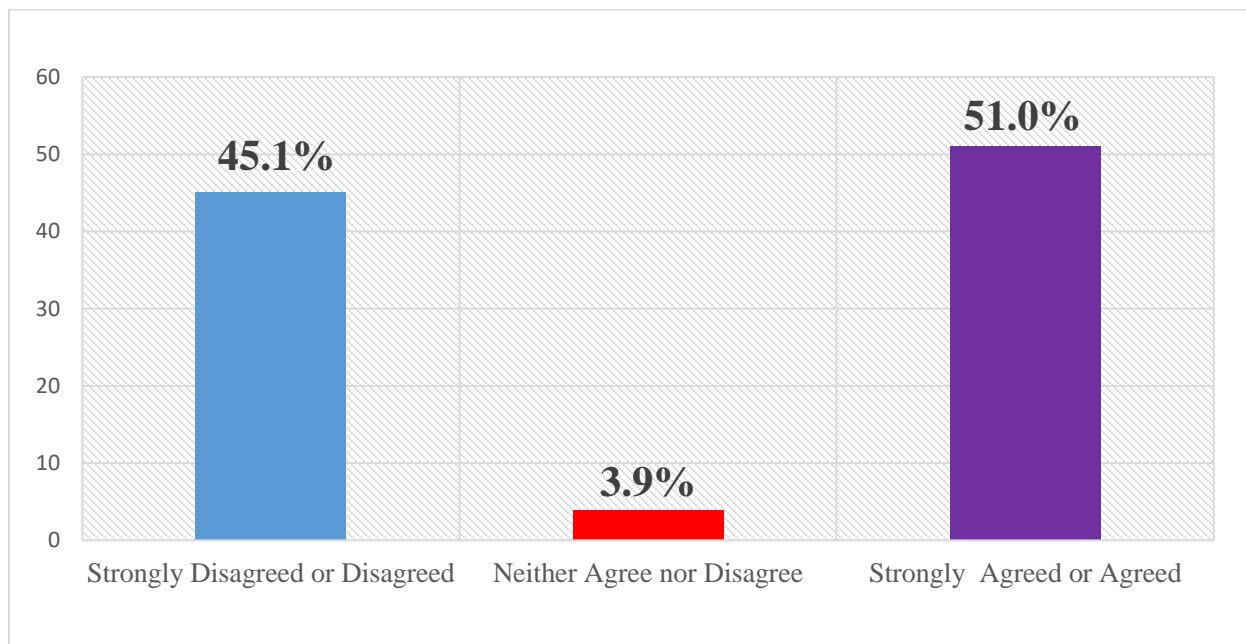


Source: Fieldwork, 2018

4.5.1 Statement 2: BVRV has eliminated registration and voting by unqualified voters

When respondents were asked to indicate whether the BVRV has helped to eliminate the registration and verification by unqualified voters in this case foreigners and minors, a little over half of the total respondents 51.0% “strongly agreed” or “agreed”, 45.1% “strongly disagree” or “disagree”, and 3.9% “neither agree nor disagree.” It is thus certain that, majority of the respondents are convinced that the inception of the BVRV has helped to check against the registration and voting by ineligible voters (See Figure 21 below).

Figure 21: The BVRV helped to eliminate registration and voting by unqualified voters

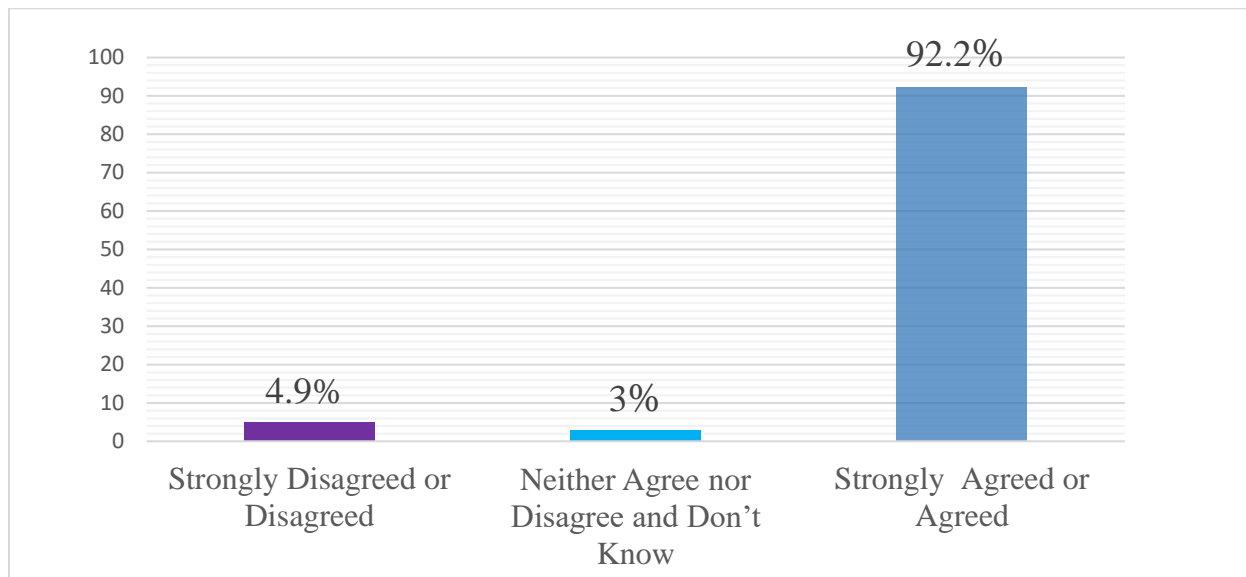


Source: Fieldwork, 2018

4.5.2 Statement 3: The BVRV system has reduced voter impersonation

Voter impersonation relates to a claim and or passing on a voter’s identity to another. This has been an alleged predominant feature in past elections especially among identical twins. When the respondents were asked to indicate their level of acceptance to the statement “The biometric voter registration and verification system helped to reduce voter impersonation” a greater majority of 92.2% “strongly agreed” or “agreed” that indeed BVRV has helped to check voter impersonation in elections in Ghana. Hence, indicating that, greater proportion of the total respondents admit that, the use of BVRV in elections has resulted in a substantial reduction in voter impersonation. However, 7.9% of the total respondents thought otherwise (See Figure 22 below).

Figure 22: The biometric voter registration and verification system reduced voter impersonation

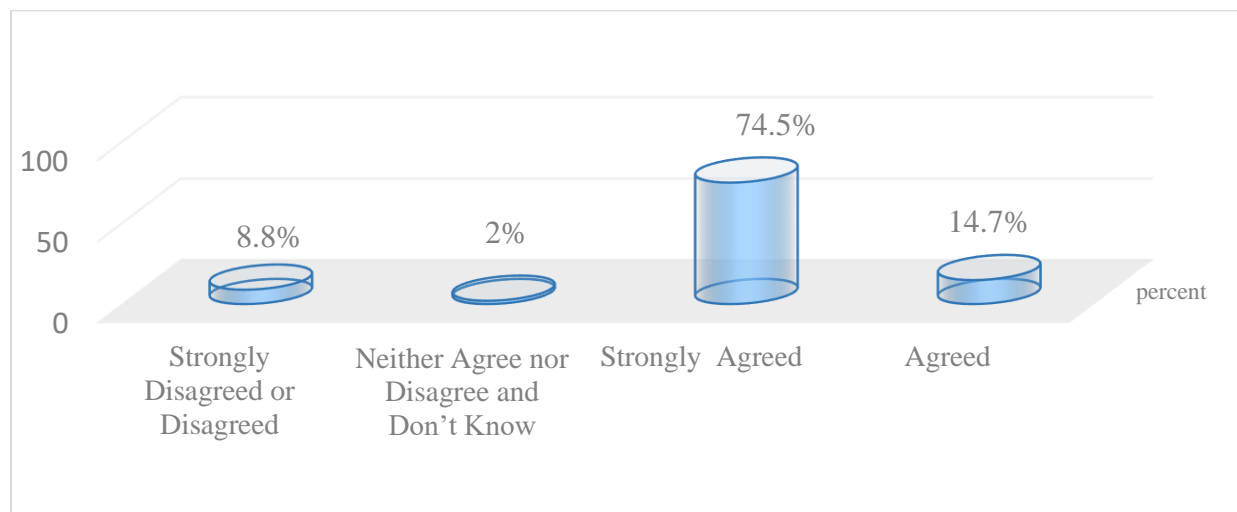


Source: Fieldwork, 2018

4.5.3 Statement 4: The Biometric system helped clean the electoral register and consequently checked over voting

One of the major allegations leveled against the manual voter registration and verification system used in past election has been a bloated voters roll and over voting. Respondents were therefore asked whether they believe “the biometric voter registration and verification helped to clean the electoral register and consequently helped check over voting” in the 2012 and 2016 elections. Responses gathered from the survey revealed that 14.7% “strongly agreed” and 74.5% “agreed” that the BVRV system substantially cleaned their electoral register and checked over voting in their constituencies. Only 8.8% of the total respondents were of the view that the BVRV failed in such respect (See Figure 23 below).

Figure 23: The BVRV helped to clean the electoral register and consequently helped check over voting

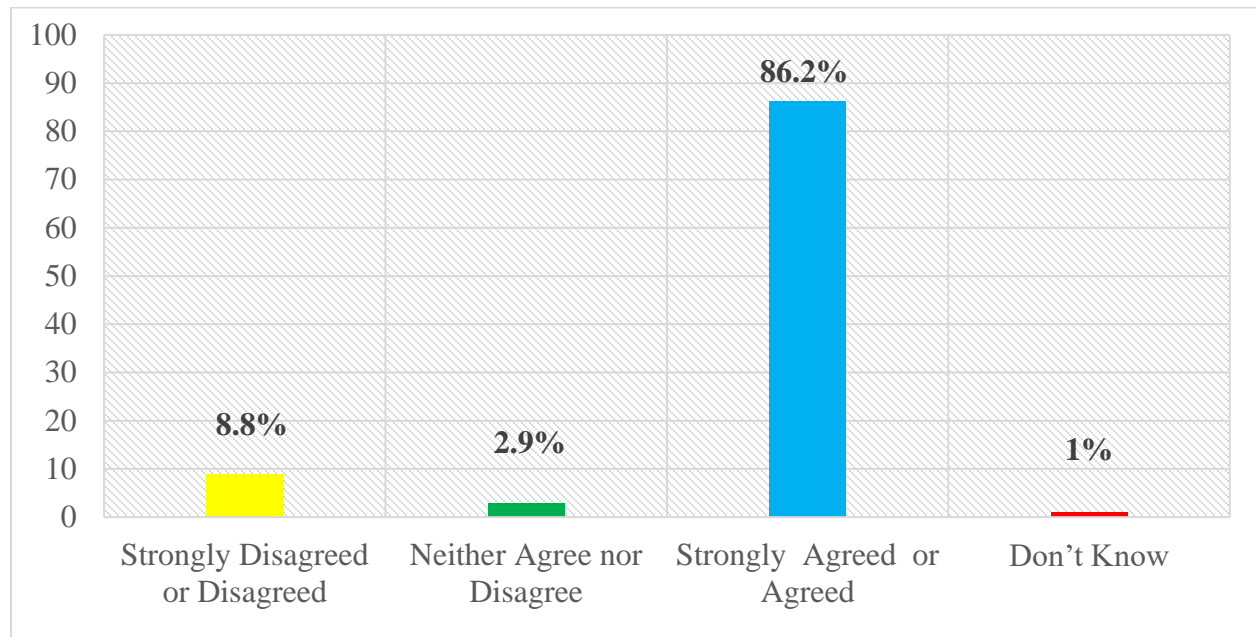


Source: Fieldwork, 2018

4.5.4 Statement 5: The BVRV has improved voter registration and verification accuracy

Among other variables, it was also identified that, out of the 204 total respondents, the majority 86.2% indicated that the BVRV ensured an accurate voter registration and verification as their details were correctly captured and verified smoothly by the biometric devices. However, 8.8% of the total respondents “strongly disagreed” or “disagreed” to this submission. In totality, it can be established that majority of the total respondents interviewed are convinced that BVRV has helped ensured an accurate voter registration and verification processes (See Figure 24 below).

Figure 24: The BVRV helped to improve the accuracy of voter registration and verification

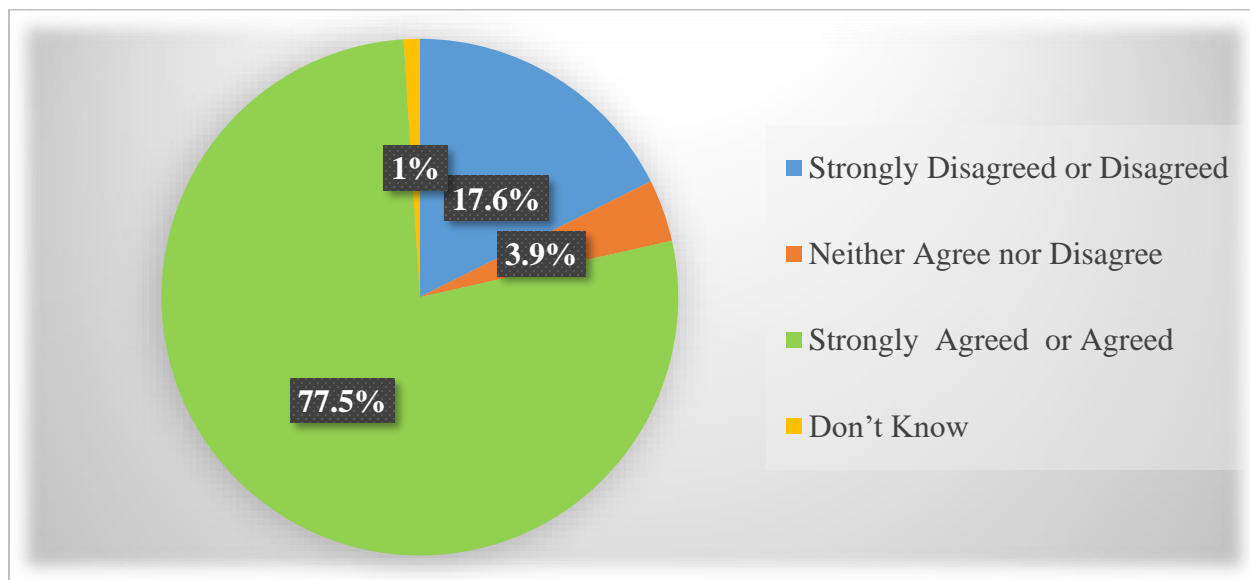


Source: Fieldwork, 2018

4.5.5 Statement 6: BVRV added simplicity and speed to the electoral process

This research study further investigated whether the biometric voter registration and verification added simplicity and speed to the electoral process by eliminating or reducing the long queues and waiting times for registration, verification, and voting. The perception among respondents revealed that 77.5% “strongly agreed” or “agreed” that the BVRV system added simplicity and speed to the electoral process. A little over one-tenth, 17.9% were however of the concern that, the BVV processes were too slow and for that matter delayed the verification processes at the polling stations where they voted (See Figure 25 below).

Figure 25: BVRV added simplicity and speed to the Electoral Process

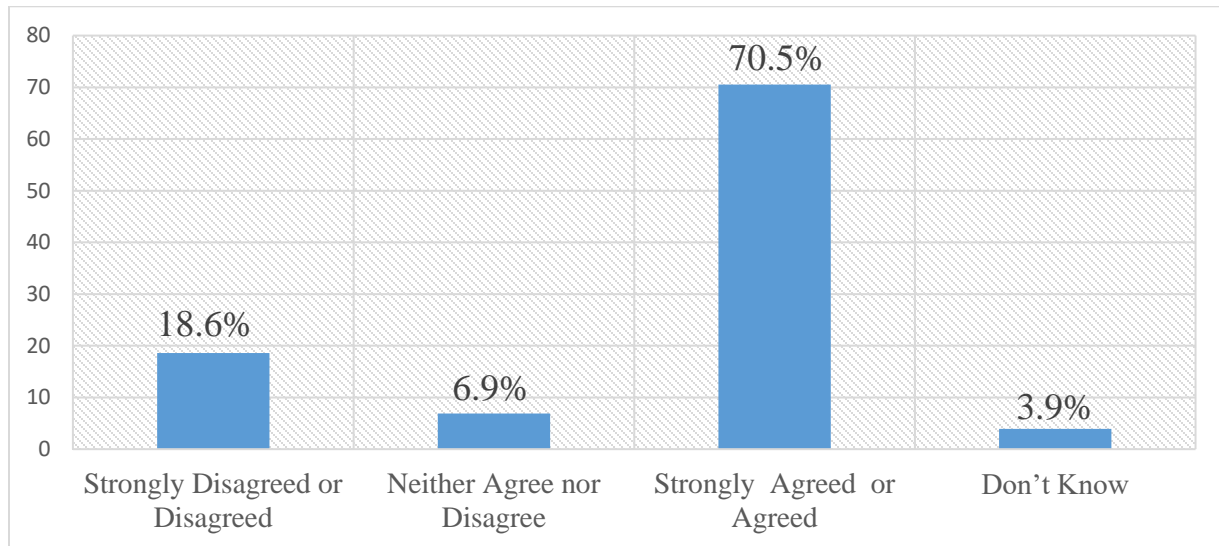


Source: Fieldwork, 2018

4.5.6 Statement 7: The BVRV has enhanced stakeholders trust and confidence in Ghana's electoral system

As part of BVRV contributions towards election in Ghana respondents were asked whether the BVRV has helped to enhance stakeholders trust in Ghana's electoral processes compared to the derailed trust that characterized stakeholders in the past. Out of the total respondents 70.5% "strongly agreed" or "agreed" that the BVRV has helped revived trust and confidence among electoral stakeholders. However, 18.6% "strongly disagreed" or "disagreed" to this submission (See Figure 26 below).

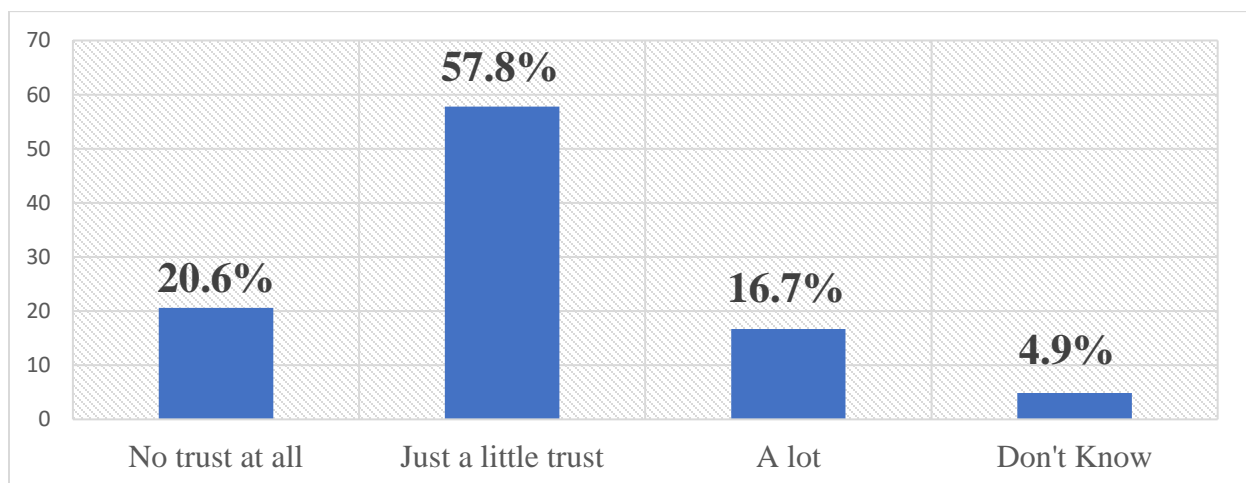
Figure 26: BVRV has strengthened stakeholders trust and confidence in Ghana’s electoral system



Source: Fieldwork, 2018

Furthermore, a comparative assessment of voters trust in the EC before the adoption and implementation of BVRV is presented in Figure 27 below.

Figure 27: Level of trust in the Electoral Commission to deliver credible elections before the adoption and use of BVRV in 2012 and 2016 elections

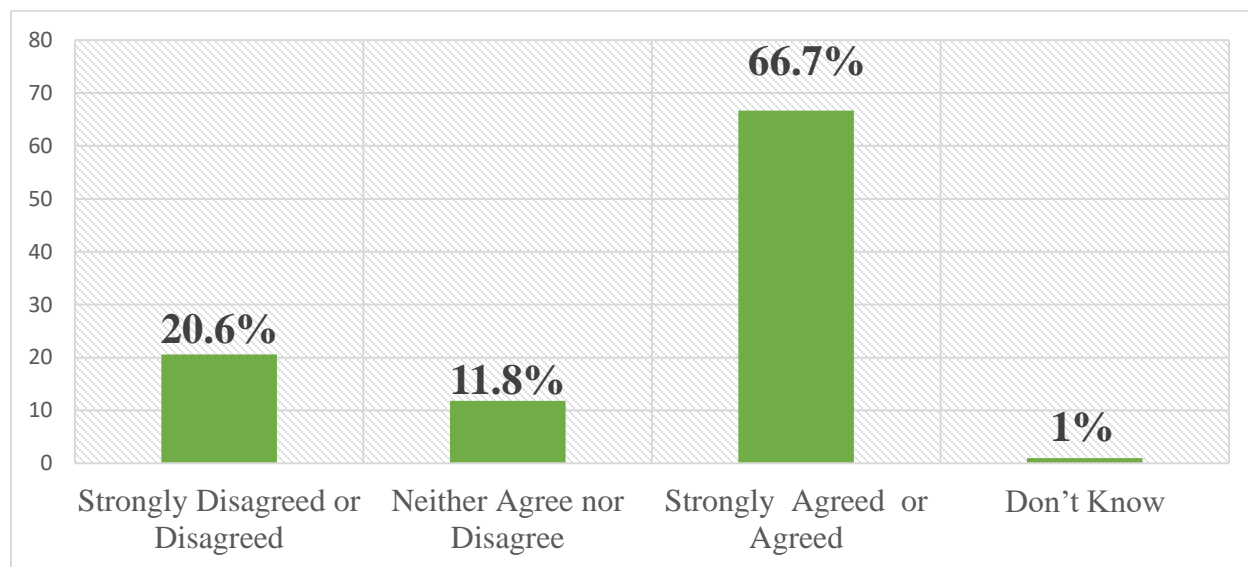


Source: Fieldwork, 2018

4.5.7 Statements 8: BVRV served as a fool proof measure against electoral irregularities that has plagued elections in the past

From the Figure 28 below the respondents were asked to indicate in general terms whether the BVRV has been able to accomplish the very reasons that necessitated its inception. While 66.7% “strongly agreed” or “agreed” that the BVRV has served as a fool proof measure against electoral irregularities that plagued elections in the past, 20.6% “strongly disagreed” or “disagreed”, 11.8% “neither agreed nor disagreed” to the submission, and 1% indicated they don’t know whether the BVRV has made such contributions. It can be readily inferred that, notwithstanding the odds, majority of the total respondents are convinced that the BVRV has been an effective measure against significant electoral irregularities.

Figure 28: The BVRV served as a foolproof measure against electoral irregularities that has plagued past elections in Ghana



Source: Fieldwork, 2018

4.5.8 Statement 9: BVRV has Strengthened Ghana’s Democracy

In addition to the above, respondents were further asked to determine whether BVRV has contributed to Ghana’s democratization process by responding to the statement “The biometric voter registration and verification has helped to strengthened Ghana’s democratization process which began in 1992.” A sizeable majority of 89.2% “strongly agreed” or “agreed” to the statement. However, a relatively small proportion of the total respondents 3.0% were of the view that the BVRV has failed to add anything to Ghana’s democratic credentials. 3.9% and 2.9% of the total respondents also reported they “neither agreed nor disagreed” and “didn’t know” respectively (See Table 9 below).

Table 9: The biometric voter registration and verification helped to strengthen Ghana’s democratization process which began in 1992

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	2	1.0	1.0	1.0
Disagree	6	2.9	2.9	3.9
Neither Agree nor Disagree	8	3.9	3.9	7.8
Agree	134	65.7	65.7	73.5
Strongly Agree	48	23.5	23.5	97.1
Don’t Know	6	2.9	2.9	100.0
Total	204	100.0	100.0	

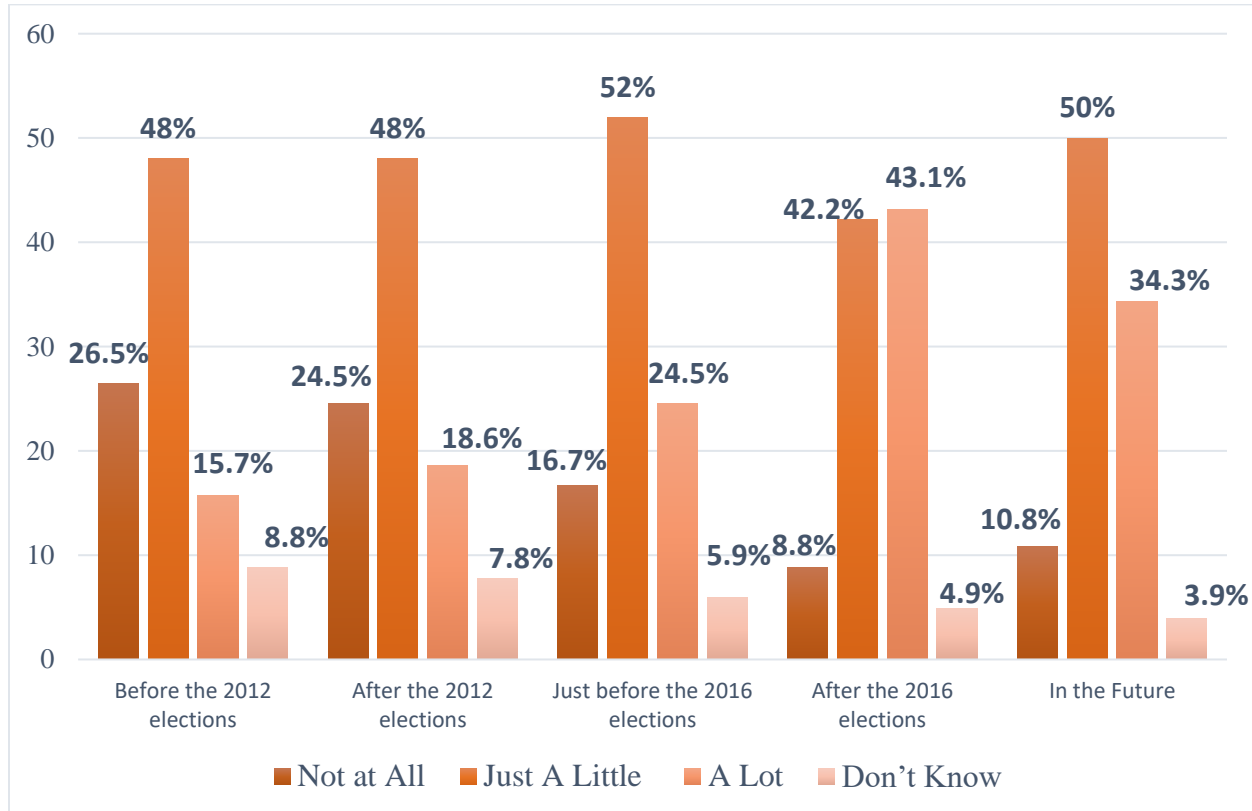
Source: Fieldwork, 2018

4.5.9 Level of trust in the Electoral Commission to deliver credible elections

Further, respondents were questioned to point out the level of confidence and trust they have and had in the Electoral Commission as an independent institution to deliver transparent free, fair, and credible elections prior to 2012 and after 2012, and just before 2016 and after 2016. Generally, it

was observed that, before to the 2012 elections, a majority of 26% of the respondents indicated they had no trust at all in the Electoral Commission to deliver free and fair elections. However the figure significantly dropped to 8.8% after the 2016 elections. Prior to 2012 only 15.7% of the total respondents indicated they had a lot of trust in the EC to deliver free and fair elections. The proportion of voters who trusted the EC ‘a lot’ increased to 18.6% after the 2012 elections, to 24.6% just before 2016, and 43.1% after the 2016 elections. Respondents who trusted the EC ‘a little’ marginally rose from 48% prior to the 2012 elections to 52.0% just before the 2016 elections, but slightly dropped from 52.0% to 42% after the 2016 election. Notwithstanding, a significant majority of 84.3% out of the total respondents now have trust in the EC to deliver credible elections in the future (Check Figure 29 below).

Figure 29: Level of trust in the Electoral Commission to deliver credible elections

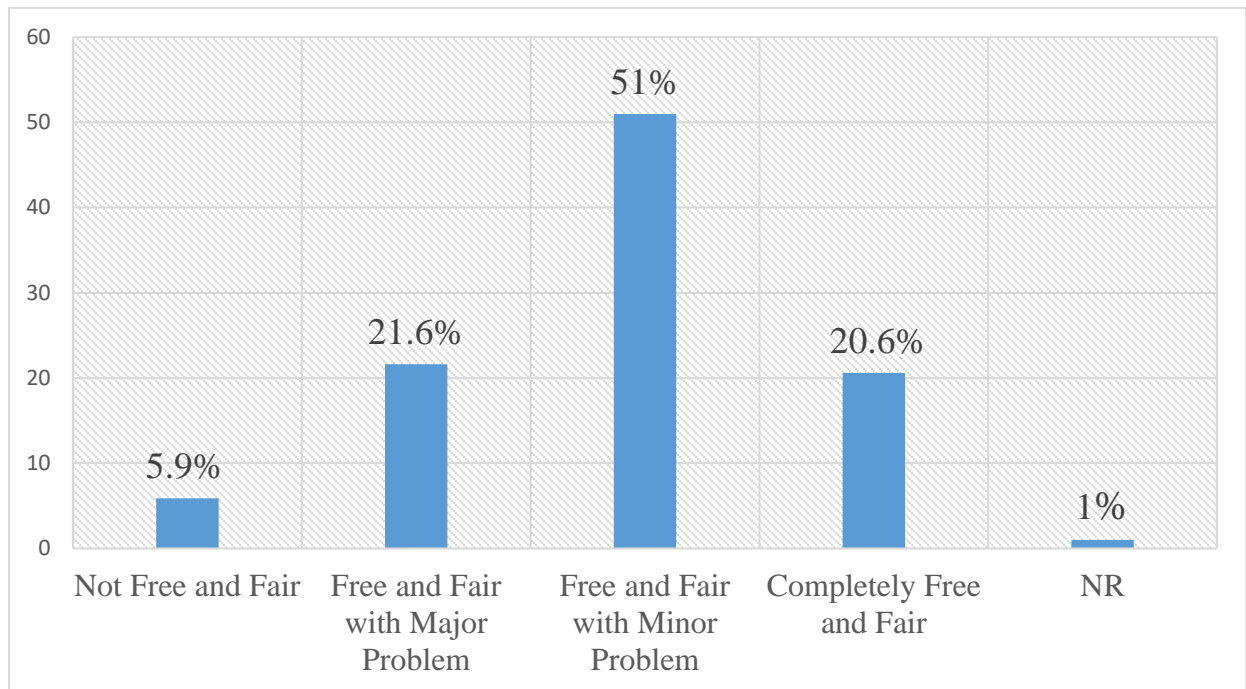


Source: Fieldwork, 2018

4.6 Quality of Elections Conducted with the Biometric Technology

The Figure below depicts the responses provided by the respondents when they were asked the question “How would you rank the quality of the 2012 and 2016 biometric elections?”

Figure 30: Quality of Elections Conducted with the Biometric Technology



Source: Fieldwork, 2018

From Figure 30 above, majority of the respondents indicated that the 2012 and 2016 elections conducted with the biometric technology are relative free and fair compared to the previous manual voting system but with major and minor problems that needs to be resolved to boost efficiency, credibility, and effectiveness in the electoral process. This viewpoint constituted 72.6% of the total respondents. Again, while 20.6% of the total respondents indicated that the biometric system was completely free and fair, 5.9% of the total respondents argued it was not free and fair at all.

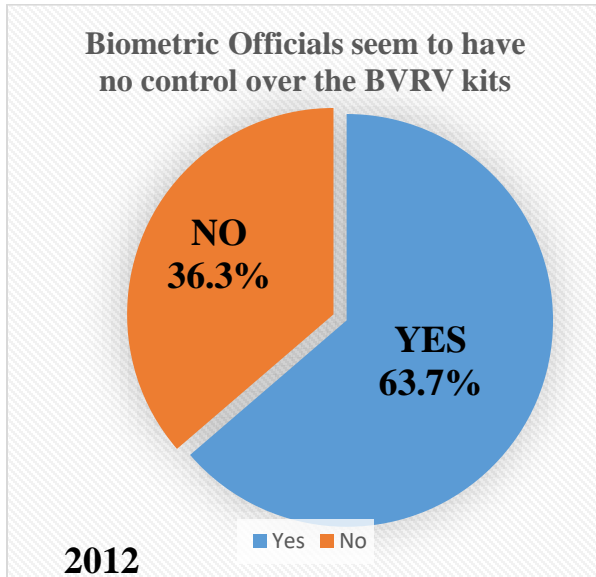
**SECTION D: CHALLENGES/WEAKNESSES/CRITICISMS OF BIOMETRIC VOTER
REGISTRATION AND VERIFICATION**

In addition to the above, this section of the study presents the identified challenges that have accompanied the implementation of BVRV in elections in Ghana. To ascertain this objective, respondents were questioned to indicate the challenges they encountered at their respective polling stations. The challenges, weaknesses, and criticisms leveled against the BVRV by the respondents across the three selected constituencies have been presented below. Generally, 93.1% of the total respondents constituting the majority largely noted that, the biometric voter registration and verification, just like any other has its challenges and weaknesses. However, the remaining 6.9% maintained that, the BVRV was smoothly carried out without any difficulties or challenges.

4.7.1 Biometric Officials Control over the BVRV Kits

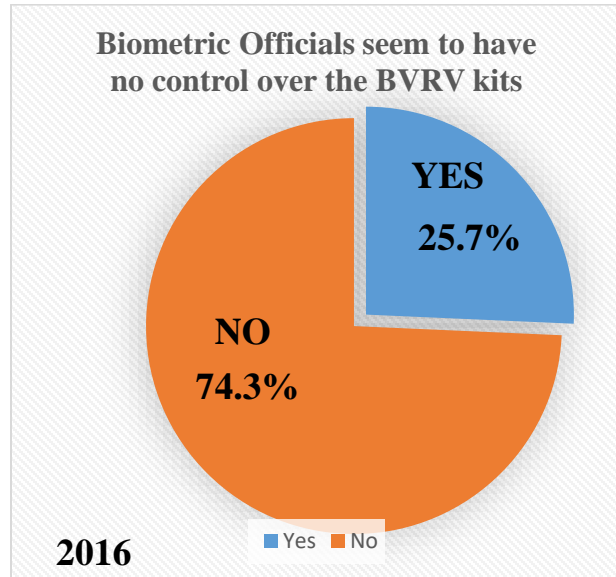
EC Official's capacity to effectively operate the biometric registration and verification kits remains a major factor in ensuring a smooth registration and verification process. Most of the respondents shared the view that the biometric officials actually had a very good and effective control over the use of the biometric devices. 63.7% of the respondents who voted in 2012 and 2016 elections indicated that in 2012 the biometric officials had a good control of the biometric kits. However, 36.3% of the respondents indicated the experiences at their polling stations in 2012 projects the biometric officials seem to have no effective control over the biometric kit.

Figure 31



Source: Fieldwork, 2018

Figure 32



Source: Fieldwork, 2018

In 2016, a progressive development in officials operation and managing skill sets was recorded. Respondents who reported the EC officials had good control of the BVRV devices increased from 63.7% in 2012 to 73.5% in 2016. Deductively, adequate staff training by the EC in 2016 contributed to its officials' effective handling and resolution of the challenges posed by the BVRV devices. Generally the respondents established that the biometric devices did not cause much problems for the electoral officials at their polling stations in 2016 than it did in 2012. Majority of the respondents were of the view that the election officials at their polling stations managed the biometric verification processes with ease, while a few people found that their polling station officials had challenges in operating the BVRV devices accurately (See Figures 31 and 32 above).

4.7.2 Malfunction and Breakdown of BVRV Machines

Similarly, respondents were asked to indicate whether they experienced BVRV device malfunctioning and breakdowns at their polling stations. 61.8% of the respondents reported to have had such experiences at their registration and polling centers in 2012 while 38.2% reported their biometric medicines were in good conditions and therefore had no experiences of breakdown or malfunctioning. In 2016, incidents of BVRV machines breakdown and malfunctioning decreased from 61.8% in 2012 to 51%. Similarly the proportion of surveyed voters that agree they had no experiences of machine breakdown and malfunctioning at their polling station increased from 38.2% in 2012 to 49% in 2016. The indication is that the incidents of high temperature causing biometric equipment malfunction and breakdowns especially during middays which became part of the electioneering process in 2012 rendering some voters unable to register and vote was relatively brought to check in 2016 (See Tables 10 and 11 below).

Table 10: Malfunction and Breakdown of BVRV Machines

2012	Frequency	Percent	Valid Percent	Cumulative Percent
No	78	38.2	38.2	38.2
Valid Yes	126	61.8	61.8	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

Table 11: Malfunctioning and breakdown of biometric machines-2016

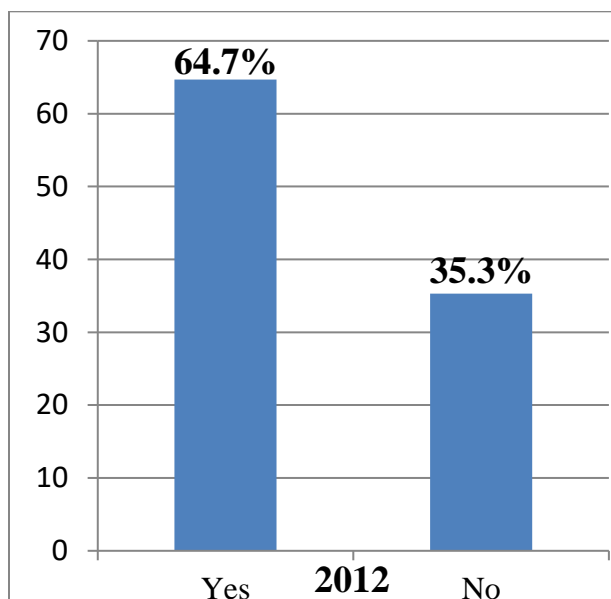
2016	Frequency	Percent	Valid Percent	Cumulative Percent
No	100	49.0	49.0	49.0
Valid Yes	104	51.0	51.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.7.3 Inability of the Machine to Register and Verify some Voters

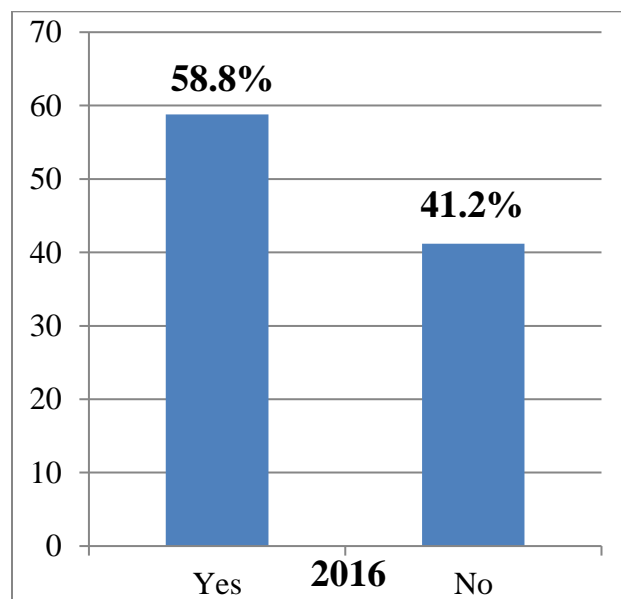
A central component of Ghana’s BVRV exercise is the capturing and cataloguing of fingerprints of all the registrants for verification on the Election Day. Respondents were therefore asked whether they had smooth registrations at their registration centers. Out of the total respondents 64.7% reported they experienced cases of rejected fingerprints at their registration centers in 2012. However, 35.3% of respondents reported there were no records of such instances at the polling stations where they voted. In comparison to 2016, the number of people who reported difficulties or failure in registration decreased from 64.7% in 2012 to 58.3% in 2016. Consequently, there was a percentage increase in cases of smooth registration from 35.3% in 2012 to 41.2% in 2016. Generally, most of the respondents resolved that some of the fingerprint capturing difficulties were readily addressed sometimes after a careful hand wash and cleaning of their fingers (See Figures 33 and 34 below).

Figure 33



Source: Fieldwork, 2018

Figure 34



Source: Fieldwork, 2018

Similarly, when respondents were asked whether they were smoothly verified biometrically during the elections, 38.2% indicated they had no challenges with the verification processes. However, 61.8% of the total respondents claimed that at their first attempt, the biometric device could not establish a link between their fingerprints and their live biometric data on the database. Yet after several attempts and hand wash, they were smoothly verified. Only a few made claims they were disenfranchised in the process due to the principle of no verification no vote. This incident was however a 2012 phenomenon as other verification alternatives were introduced in 2016. In 2016 voters who were not smoothly verified by the biometric machine among others were subsequently verified with the voter register compiled for the polling station and thus were allowed to vote. This slightly helped to reduce verification failure and difficulties from 61.8% in 2012 to 59.8% in 2016. Also, respondents who reported to have had no verification challenges at their polling stations increased from 38.2% in 2012 to 40.2% in 2016 (See Tables 12 and 13).

Table 12: Failure of biometric machines to verify some voters at my polling station-2012

2012	Frequency	Percent	Valid Percent	Cumulative Percent
No	78	38.2	38.2	38.2
Valid Yes	126	61.8	61.8	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

Table 13: Failure of biometric machines to verify some voters at my polling station

2016	Frequency	Percent	Valid Percent	Cumulative Percent
No	82	40.2	40.2	40.2
Valid Yes	122	59.8	59.8	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.7.3b Grounds of Biometric Voter Registration and Verification Challenges

The causal factors that resulted in the registration and verification difficulties or failures were also investigated. The common challenges were identified to be burnt ridges 2.9%, scars 11.8% soiled fingers 17.6%, underdeveloped fingers 5.9% and software problem 31.4%. It was however observed that those who could not establish the grounds of their biometric verification failure tend to blame it on the biometric devices and its operating software thereby resulting in the higher percentage assigned to “software problem” Also the study revealed that, voters whose disposition changed after the biometric registration experienced verification failure during the elections; this was a common case among pregnant women (See Table 14 below).

Table 14: If yes to Q16iii and Q16iv what was the grounds of these challenges?

	Frequency	Percent	Valid Percent	Cumulative Percent
Burnt ridges	6	2.9	2.9	2.9
Scars	24	11.8	11.8	14.7
Soiled fingers	36	17.6	17.6	32.4
Underdeveloped fingers	12	5.9	5.9	38.2
Valid Software problem	64	31.4	31.4	69.6
Others	6	2.9	2.9	72.5
NA	54	26.5	26.5	99.0
NR	2	1.0	1.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.7.4 Weak Enforcement of Registration and Verification Criteria

The survey further found that, there were instances of weak registration and verification criteria enforcement across the selected constituencies. Consequently, some well-known persons who did not have in their possession the required documentary proofs of eligibility were allowed to register

and vote at some polling stations. Out of the total respondents interviewed 29.4% indicated that their polling stations did not strictly enforce the registration and verification criteria. However, the majority indicated that the registration and verification procedures were strictly followed at their polling stations. The responses indicate that in 2012 and 2016 more than 78% and 74% of the total respondents respectively agree that the biometric registration and verification criteria were strictly adhered to at their polling stations. However, 21.6% and 25.5% in 2012 and 2016 respectively thought otherwise (See Tables 15 and 16 below).

Table 15: Weak enforcement of Registration and Verification Criteria-2012

2012	Frequency	Percent	Valid Percent	Cumulative Percent
No	160	78.4	78.4	78.4
Valid Yes	44	21.6	21.6	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

Table 16: Weak enforcement of Registration and Verification Criteria-2016

2016	Frequency	Percent	Valid Percent	Cumulative Percent
No	152	74.5	74.5	74.5
Valid Yes	52	25.5	25.5	100.0
Total	204	100.0	100.0	

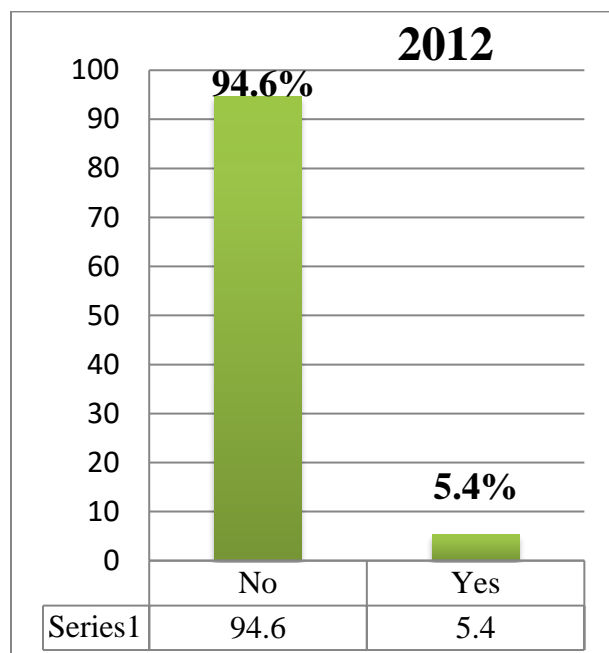
Source: Fieldwork, 2018

4.7.5 Voting Without Biometric Verification

More so, in 2012 and 2016, an average of 5.2% of the total respondents reported that they experienced cases where well-known persons who did not possess the required eligibility proofs were allowed to vote without going through the biometric verification process. Mostly, such voters

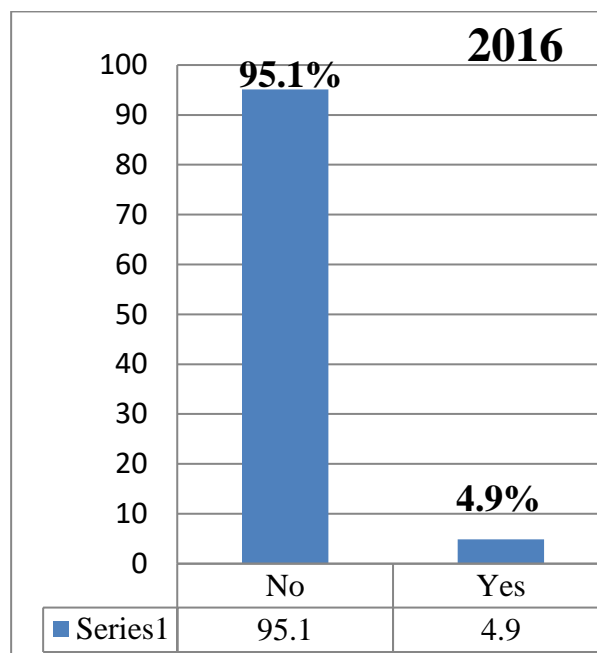
who escaped the biometric verification process were identified to be people who wield power in their communities (for instance Ministers, MPs, and Chiefs) and proxy voters. This trampled upon the much acclaimed principle of no verification no vote which was strictly applied in 2012 (See Figures 35 and 36 below).

Figure 35



Source: Fieldwork, 2018

Figure 36



Source: Fieldwork, 2018

It is also noteworthy that in situations where eligibly registered voters went through the biometric verification process but were rejected by the biometric machine, some voters were permitted to vote using other forms of identification to proof their eligibility while others were prevented from voting at all. In all, 61.8% and 59.8% respondents indicated that they had experiences of biometric voter verification failures at the polling stations where they voted in 2012 and 2016 respectively (Refer to Tables 14 and 15 above). When respondents were probed further to indicate the form of identification that was used to enable them or such voters to cast their votes, it was recorded that,

most of the respondents provided such identification documents as voters ID cards, NHIS Cards, Passport etc. as a proof of their eligibility (See Table 17 below).

4.7.5.1 Table 17: Again if yes to Q16iv what form of identification document was used to enable the voter(s) to vote?

	Frequency	Percent	Valid Percent	Cumulative Percent
Previous Voter's ID Card	58	28.4	28.4	28.4
NHIS	16	7.8	7.8	36.3
Passport	8	3.9	3.9	40.2
I wasn't permitted to vote	38	18.6	18.6	58.8
Valid Other (Birth Certificate; Was permitted to vote after hand wash)	24	11.8	11.8	70.6
NA	58	28.4	28.4	99.0
NR	2	1.0	1.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

Generally, this is an indication that, out of the communities investigated under the three swing constituencies, at least one person was permitted to vote without the biometric verification. The study however revealed that the highest form of voting without biometric verification was recorded in the Ablekuma Central Constituency with the lowest occurring in Gomoa East.

4.7.5.2 Criticisms and Weaknesses

Notwithstanding the challenges identified above, several criticisms and weaknesses have been leveled against the biometric registration and verification processes undertaken by the Electoral Commission. This section further discusses such criticisms and weakness.

4.7.5.3 Rumors of BVRV Kits Causing Cancer

Rumors in some of the surveyed communities indicated the biometric devices could cause cancer to those exposed. However, only 9.8% of the survey respondents indicated they heard such mongering in 2012 but not in 2016. This however dropped from 9.8% in 2012 to 7.8% in 2016. Notwithstanding, it was generally believed among respondents that, such rumor is believed to have caused the elderly especially to stay away from registration and voting. It was largely agreed among the respondents that such deliberate mongering which served as deterrence to voter registration and voting were deliberate and politically motivated. Notwithstanding, majority of the respondents 90.2% and 92.2% who voted in 2012 and 2016 respectively reported to have not heard of such rumors (See Table 18 below).

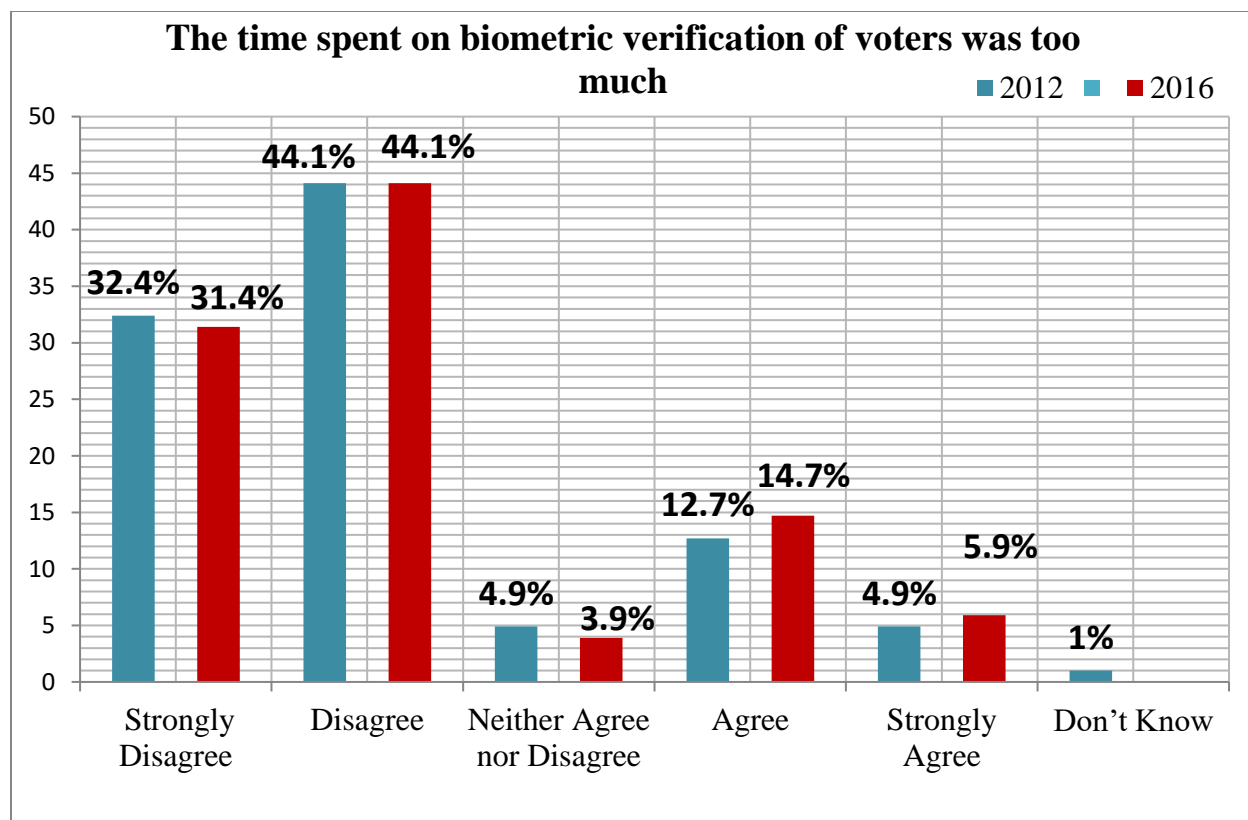
Table 18: Voters stayed away from registration and voting because rumors indicated that the biometric device could cause cancer to those who are exposed to it

2012		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	184	90.2	90.2	90.2
	Yes	20	9.8	9.8	100.0
	Total	204	100.0	100.0	
2016		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	188	92.2	92.2	92.2
	Yes	16	7.8	7.8	100.0
	Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.7.5.4 Time spent on the BVV was too much at my polling station

The respondents were quizzed whether the time they spent on the verification process at the polling stations were too much for them. While 76.5% of the respondent “strongly disagree or disagree” with the statement that “the time spent on the biometric voter verification was too much at the polling station where they voted,” 17.6% “strongly agreed or agreed”, and 4.9% “neither agreed nor disagreed.” However, in 2016 there was a significant decrease in the general view that the time spent on the BVRV was too much (See Figure 37 below).



Source: Fieldwork, 2018

4.7.5.5 Cumbersome Registration Procedure and Paper Work

Generally, the surveyed respondents did not feel weighed down by the paper work and procedures, required to get a voter registered. When the respondents were asked to respond to the statement “the paper work and procedure on the biometric voter registration are quite cumbersome”, a majority of the respondents 69.6% “strongly disagreed or disagreed” with the statement. Nevertheless, a pint-sized over one-fifth (20.6%) “Strongly agreed or agreed” with the statement (See Table 19 below).

Table 19: The paper work and procedure on the biometric voter registration are quite cumbersome

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	54	26.5	26.5	26.5
Disagree	88	43.1	43.1	69.6
Neither Agree nor Disagree	16	7.8	7.8	77.5
Valid Agree	32	15.7	15.7	93.1
Strongly Agree	10	4.9	4.9	98.0
NR	2	1.0	1.0	99.0
Don't Know	2	1.0	1.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

4.7.5.6 Burdensome Verification Process

When the respondents were further asked to express their level of disagreement or agreement with the statement “the verification process at where I voted was burdensome to me as a voter,” Majority of the respondents 83.4% “strongly disagree or disagree” to the statement while only a sizeable minority 13.7% “strongly agree or agree” to the statement (See Table 20).

Table 20: The verification process at my polling station was burdensome to me

	Frequency	Percent	Valid Percent	Cumulative
Strongly Disagree	64	31.4	31.4	31.4
Disagree	106	52.0	52.0	83.3
Neither Agree nor Disagree	6	2.9	2.9	86.3
Agree	26	12.7	12.7	99.0
Strongly Agree	2	1.0	1.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

Generally a significant proportion of the total respondents are of the opinion that the BVV caused no delays. However a few others thought otherwise and argued that the BVV actually resulted in delays and long queues at their polling stations (See Table 21 below).

4.7.5.7 Table 21: The BVV procedure slowed down the voting process at the polling station where I voted

	Frequency	Percent	Valid Percent	Cumulative
Strongly Disagree	72	35.3	35.3	35.3
Disagree	88	43.1	43.1	78.4
Neither Agree nor Disagree	4	2.0	2.0	80.4
Agree	34	16.7	16.7	97.1
Strongly Agree	6	2.9	2.9	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

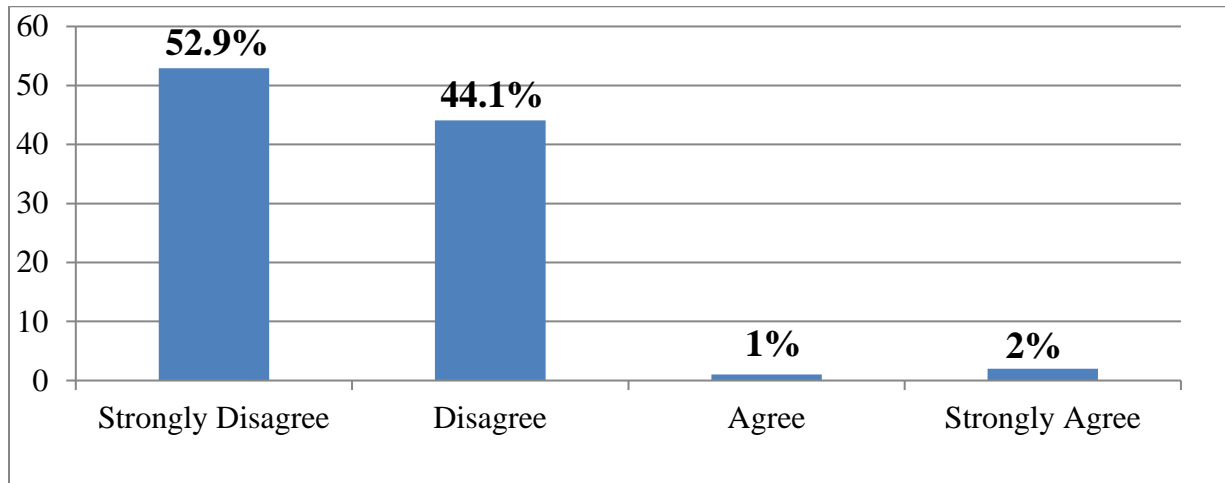
SECTION E: GENERAL PERCEPTION OF VOTERS TOWARD BIOMETRIC VOTER REGISTRATION AND VERIFICATION

The adoption and eventual implementation of BVRV in Ghana's electoral process was to encourage active citizen participation in the electoral decision making process of the country. Ghana's experience with the biometric voter registration and verification in 2012 and 2016 general elections raised a lot of concerns for future elections. Moving forward, expectations by political parties, leading national personalities, and the general public at large implores the Electoral Commission to go a step further beyond BVRV so as to further build trust, confidence, efficiency, effectiveness, and credibility in the electoral processes. However, others are of the view that, the Electoral Commission should revisit the manual voter registration and verification system used in past elections. This section documents the general perception of voters towards the incorporation of BVRV in the electioneering process.

4.7.6.1 Preference for MVRV to BVRV

On the basis of respondents experience with the manual voter registration and verification and the BVRV system, they were asked to agree or disagree with the view expressed in statement as "The manual voter registration and verification used in past elections is far better than the 2012 and 2016 BVRV. Ghana should therefore go back to the manual voter registration and verification in the next elections." Overall, 97.0% "strongly disagreed or disagreed" with the statement whereas a relatively smaller percentage 3.0% "strongly agreed or agreed" to the submission. It was thus observed that the application of BVRV at the selected constituencies was far better than the manual voter registration and verification system employed in past elections (Check Figure 38 below).

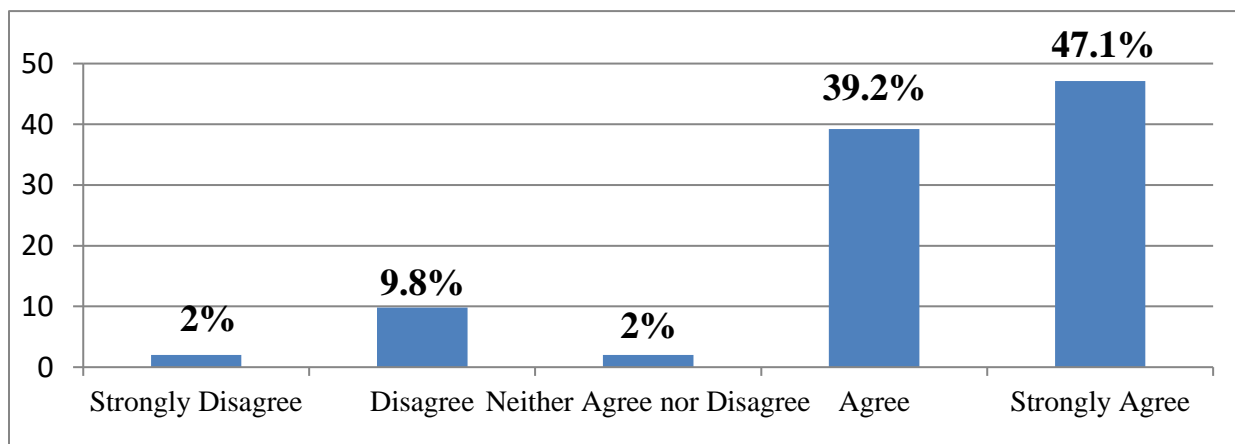
Figure 37: Opinion on whether the EC should go back to the manual voter registration and verification system or not



Source: Fieldwork, 2018

Consequently, majority of the respondents 86.3% “strongly agreed or agreed” that the application of BVRV at their respective polling stations were far better than the manual registration and verification system employed for previous elections (Figure 38 below).

Figure 38: Opinion on whether the BVRV is better than the MVRV

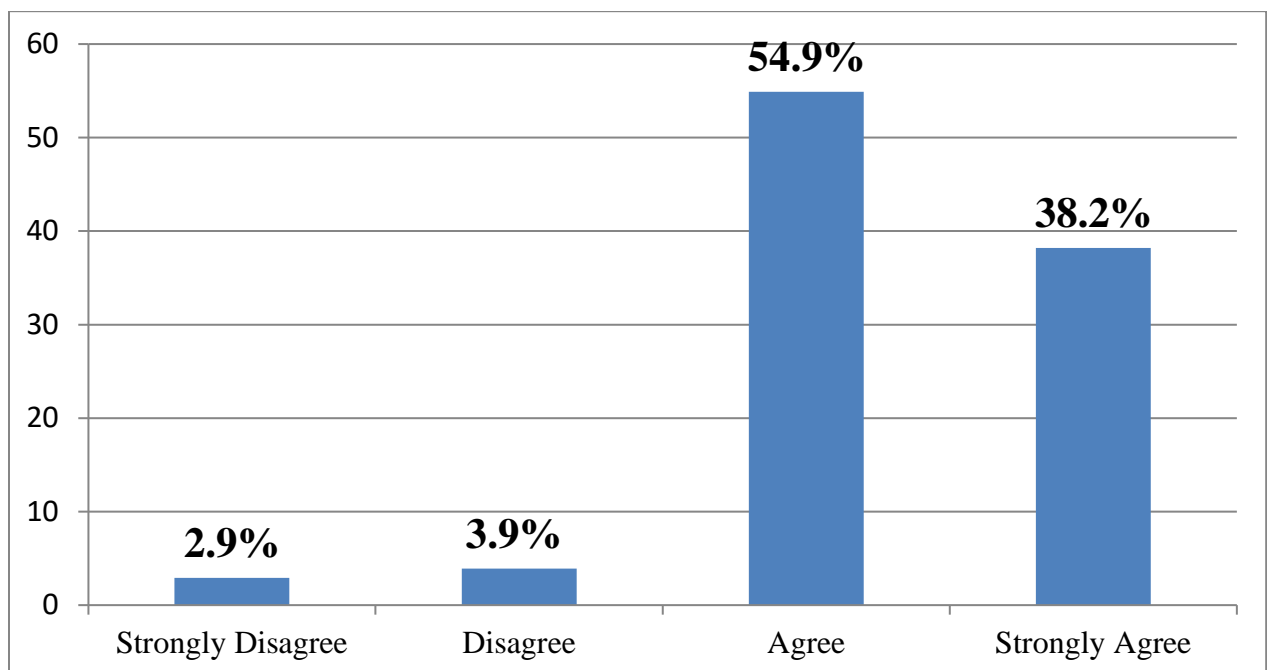


Source: Fieldwork, 2018

4.7.6.2 Consolidate and continue to use BVRV in Future Elections

It was further investigated whether the selected or sampled constituencies would prefer the Electoral Commission to consolidate and continue to use the BVRV in future elections. When the respondents were asked to respond to the statement “It would be prudent for Ghana to consolidate and continue to use the BVRV in future presidential and parliamentary elections,” 93.1% of the total respondents “strongly agreed or agreed” that the BVRV should be consolidated for future elections. However, 6.8% of the total respondents thought otherwise. Although there are concerns about the BVRV over the time it took to verify some voters’ respondents were generally supportive of the biometric voter registration and verification system (Check Figure 39 below).

Figure 39: It will be prudent for Ghana to consolidate and continue to use the BVRV for future elections



Source: Fieldwork, 2018

4.7.6.3 EC should Consider Adopting Electronic Voting in Future Elections

Finally, respondents were asked to indicate whether they would prefer the Electoral Commission to adopt electronic voting in future parliamentary and presidential elections or maintain the current voting system. Although a general majority of 86.3% of the total respondents supported a consolidation and continual usage of the BVRV in future presidential and parliamentary elections, a total of 81.4% respondents further “strongly agreed or agreed” the EC should plan and adopt electronic voting in the near future. The general indication observed among such respondents was that, moving forward the EC should carefully consider this demand for future implementation. Notwithstanding, 12.7% of the total respondents “strongly disagreed or disagreed” to the submission, while 3.9% “neither agreed nor disagreed.” This concern was buttressed with the view that, Ghana’s low literacy rate will gravely affect the process should the EC plan to do so. Generally, majority of the total respondents were both supportive of strengthening the BVRV for future elections and at the same time vouched for electronic voting implementation in the future (See Table 22 below).

Table 22 Statement 4: Ghana should plan and adopt electronic voting in future presidential and parliamentary elections

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	8	3.9	3.9	3.9
Disagree	18	8.8	8.8	12.7
Neither Agree nor Disagree	8	3.9	3.9	16.7
Valid Agree	100	49.0	49.0	65.7
Strongly Agree	66	32.4	32.4	98.0
Don't Know	4	2.0	2.0	100.0
Total	204	100.0	100.0	

Source: Fieldwork, 2018

Interview Responses from the Electoral Commission of Ghana

This subsection presents the findings from the Electoral Commission of Ghana. The responses gathered have been subsumed into three major objectives to enhance consistency and clarity.

4.7.7 Reasons for introducing Biometric Voter Registration and Verification in Ghana

Ghana is not the first country in Africa to introduce biometric technology into its electoral system. Since 2000, countries such as South Africa, Kenya, Nigeria, Sierra Leone, Democratic Republic of Congo, Burkina Faso, Zambia, Uganda, and Tanzania, etc. incorporated varying degrees of biometric technologies into their electoral process for several reasons but predominantly to guarantee the elimination of multiple enrollments on voter registry (Gemalto, 2018). Like other African countries a number of reasons were cited by scholars and experts to explain the rationale behind Ghana's adoption of biometric voter registration and verification. CODEO (2012), IDEA (2015), and Cooper-Knock (2012) aver that, the introduction of BVRV into Ghana's electoral system was founded by expectations to ensure the principle of one man one vote and to improve voter registration and verification accuracy by: preventing multiple registrations, multiple voting, voter impersonation, and unqualified voter registration. These they conclude would help enhance the integrity of Ghana's electoral process.

Nevertheless, an interview with the Electoral Commission Official Mr. Fred Tetteh (R & M DEPT. EC.) further found that, the implementation of biometric voter registration and verification in Ghana's electoral processes were founded by such factors as: the need to introduce cost effective measures to the conduct of elections, a self-introspection by the Electoral Commission, recommendation from individuals and groups, and ultimately, the relentless demand for electronic

voting by election stakeholders. He narrated his views on the inception of biometric voter registration and verification as this:

“Electoral reforms in Ghana over the years have been influenced by several factors. A careful look at the Electoral Commission from its establishment to date will tell you that, after every election, we do an appraisal or introspection of whatever we put into practice, and the impact of whatever we did, our actions and inactions. So I must say that there are things that we know we have to do after every election. However, electoral reforms in Ghana since the inception of Ghana’s Democracy in 1992 have been largely influenced by both internal and external factors such as revolts or violence in other countries (in the likes of Kenya), recommendations by people, or suggestions from individuals, it could be by best practices from other countries, it could be by technological advancement, it could be by agitations from individuals, groups, or political parties, it could be a court case or a judicial directive, and it could also be by self-appraisal, an assessment, or an introspection” (Fieldwork, 2018).

He indicated that, political parties and other individuals for examples have been very vocal in making suggestions to the Electoral Commission from 1993 to date. He recounted that agitations by the two major political parties (NPP and NDC) especially when they in opposition have played influential roles in electoral reforms in Ghana. An account by the Electoral Commission official showed that, the agitations by the major political opposition party in early 1992 were the main triggers of electoral of electoral reforms from 1992 through to 2004. He further expressed his views on this as this:

“In 1992, the major opposition political party boycotted the presidential election, for reasons that, the voters register that was compiled and used in 1988 and carried

down to conduct the 1992 elections was inappropriate because it had many technical challenges.....these agitations precipitated the need to do some reforms in 1995, and later led to the introduction of transparent boxes in the open instead of dark rooms; allowing agents to sign election results sheet before declaration; fresh registration for all eligible voters; the compilation of a new voters register (which witnessed an active collaboration of the existing political parties); and the issuance of photo ID Cards (first, to all the regional capitals and some selected constituencies, and later, with donor support, to all eligible voters across the country)” (Fieldwork, 2018).

“Similarly in 2000 through to 2004, a lot of things happened including multiple registrations and multiple voting.....Out of self-introspection, the EC decided that upon elections all voters’ cuticles should be marked with indelible ink. Notwithstanding this development, some voters were still doing multiple registrations and multiple voting. So in 2008, the best practice the EC adopted from other countries particularly Afghanistan was that, instead of marking voters’ cuticles with indelible ink, voters would be dipping their little fingers in the indelible ink. This drastically helped to reduce cases and complaints of multiple registrations and multiple voting” (Fieldwork, 2018).

“Now, going into 2012, the Electoral Commission realized that the biometric system was the way to go after a lot of agitations that the Electoral Commission should go into electronic voting. So I must say that, several reasons have informed electoral reforms in Ghana, and a lot other reasons influenced the adoption of biometric voter registration and verification but the principal reasons that informed the Electoral Commission to go into biometric elections, were the relentless demands and agitations for electronic voting from people and the need to further maintain trust among political parties over the integrity of Ghanaian elections” (Fieldwork, 2018).

4.7.7.2 Contributions of BVRV to Credible Elections in Ghana

A review of the existing literature reveals that there is no agreement on the exact contributions of the biometric voter registration and verification system to election administration in Ghana but a plethora. According to Debrah (2015), the BVRV in Ghana has enhanced stakeholders' trust in the electoral process, brought about substantial reduction in multiple registrations and voting, and helped to consolidate Ghana's democratic process. Nonetheless almost all the scholars admit that the introduction of BVRV in Ghana's electioneering process has also helped eliminate voter impersonation, ballot stuffing, multiple registrations, multiple voting, added simplicity and speed to the electoral process, improved voter registration and verification accuracy, helped cleaned the electoral register, and substantially reduced unqualified voter registrations.¹⁸

The Electoral Commission confirmed that the inception of BVRV has brought tremendous improvements to the conduct of elections in Ghana. In an interview with Mr. Fred Tetteh (R & M DEPT, EC.), it was revealed that, the BVRV that was incorporated in Ghanaian elections has totally annihilated multiple voting, voter impersonation, ballot stuffing, and over voting from Ghana's electoral process. In addition, he added that the BVRV has substantially reduced multiple registrations and unqualified voter registrations, build trust among stakeholders particularly citizens and political parties, helped cleaned the electoral register, improved voter registration and verification accuracy, and strengthened Ghana's democratic consolidation processes. With the latter he argued that instead of citizens resulting to arms and violence to change political leadership, the biometric elections created another platform for a peaceful power transition. He

¹⁸ See: Tizor-Apentisui (2015), Boateng & Abeka (2015), Agyemang et al., (2014), CDD-Ghana (2012) Cooper-Knock (2012)

expressed the following views to further buttress his position on BVRV's contributions to the conduct of credible elections in Ghana:

“The way technology is fast approaching and the way the BVRV is being consolidated, the use of ID Cards may not even be a necessity in the near future because, if your name and other details are biometrically captured and assigned to a barcode which will authenticate you during elections, then you do not need an ID Card to enable you to vote. Even now, at elections if you happen to have misplaced your voter ID card, so far as you believe that you are at the right polling station where you got registered, your hand would be placed on the verification machine for verification. After being smoothly verified you can then go ahead and vote” (Fieldwork, 2018).

“Again, with the introduction of BVRV, the EC is planning to eliminate the dipping of the finger in indelible ink from the electoral process. This is because, when one gets verified biometrically, the fingerprints are captured and subsequently deactivated from the list of voters; the moment you place your hand on the verification machine and it says ‘verified’ the machine checks you out of the list of voters and places you in the system that you have voted. A subsequent attempt to get verified at the same polling station would generate a rejection feedback indicating that the individual has already voted and thus he or she is checked out from the list of eligible voters” (Fieldwork, 2018).

“On the issue of ballot stuffing, I will say that, after elections all BVDs are retrieved and the figures on them are cross-checked with the total number of vote casts at the polling station. So ballot stuffing can only happen when there is a coalition of all the people at the polling station, but then, how would they account for the excess or the variation in the total vote cast and the actual figure on the BVDs.....Although some people were allowed to vote using other forms of verification other than the biometric, the question is how would the excess be

justified in light of the electoral register for the polling station, and the total ballots recorded on the BVD? More importantly, whose name is going to be ticked for the excess ballots?” (Fieldwork, 2018).

He finally remarked that:

“The moment an election ends, all the BVDs are collected and locked up so that if there is any issue regarding a particular polling station the actual people who voted can be seen on the BVDs.....So, in Ghana now, the issue of ballot stuffing, and multiple voting, I must say they will never happen unless there is a coalition between the agents and the politicians else it will not happen. Even so, when they do happen, measures are in place to easily detect fraudulent ballots” (Fieldwork, 2018).

4.7.7.3 Challenges to BVRV implementation and Mitigation Measures

Regardless of the significant contributions of BVRV towards election management in Ghana, the biometric technology is not devoid of challenges and criticisms. According to Wolf (2017), CODEO (2012), and Agyemang et al., (2014), the criticisms and challenges leveled against the 2012 and 2016 biometric voter registration and verification processes include: frequent malfunction and breakdown of biometric machines resulting in long queues and delays at some polling stations, failure of the biometric verification device to authenticate some voters, lack of officials’ control over biometric machine, failure of the BVR devices to detect and prevent multiple registrations at registration points, and weak enforcement of registration and verification criteria by some polling stations. ¹⁹

¹⁹ See also: Aceproject (2017), Lordinova (2016), Nikhil et al, (2013), International (2015), Cooper–Knock (2012), Mantey (2012), Vanguard (2011), Amponsah (2011), Woodward (1997).

However, when the Electoral Commission was asked to indicate the major challenges that have accompanied the implementation of BVRV in Ghana's elections and to proffer measures that have been adopted to address such challenges, the EC replicated the aforementioned and further referred to the cost and maintenance of the biometric system, as the major challenge that have accompanied the implementation of biometric voter registration and verification. Among other challenging factors cited by the Electoral Commission include inability of the system to detect and prevent registration by minors and foreigners, failure of the biometric system to prevent multiple registrations at registration points, and proxy voting which allows the delegated voter to bypass the biometric verification process.

Responding to the issue of multiple registrations, the EC revealed that, the commission embarks on a de-duplication exercise after every successful voter registration exercise to check multiple registrations and a subsequent multiple voting via computerized programs called ABIS and AFIS – Automatic Biometric Identification System and Automatic Fingerprint Identification System, respectively. According to the Electoral Commission, the ABIS and AFIS (which are conducted in the presence of all political party representatives) match the fingerprints of every single voter or applicant against the entire registered voter list to shortlist and bring out all duplicated fingerprints or details. Afterwards, manual check-ups are done amidst party representatives to rid the voters' register of multiple enrollments (applicants) before the final voter register is compiled. After the ABIS and AFIS, extracts of duplicates with remarks for citing such applicants as multiple registrants are captured, printed out, expunged from the final voters register and quarantined under a multiple-list. Voters quarantined under multiple lists may therefore not have the opportunity to cast their votes as their names would be deleted from the final voters register (Source: Fieldwork,

2018). Notwithstanding the multiple registrations challenge and the mitigation processes it requires, the Electoral Commission however maintained that they have no plans of interlinking the various polling stations to check multiple registrations at registration points. The Electoral Commission confidently insisted that, relative to the EC's present resources, the duplication via the ABIS and AFIS are the best ways to go.

Registration by minors and foreigners were also identified as grave challenges facing the Electoral Commission and the biometric processes. In response to these challenges, the Electoral Commission official, Mr. Fred Tetteh (R & M DEPT, EC.) expressed his concerns as this:

“As it stands now, what I can say is this: currently, we have no concrete measures in place to tackle such illegitimate registrations. However the EC has interagency committees coordinated by the National Development Planning Commission (NDPC) which is working assiduously to help address these challenges. But more importantly, the EC initiated steps and it is now working in collaboration with the National Identification Authority (NIA) to fight against voter registrations by underage citizens and non-Ghanaians. However, the NIA since its establishment in 2006 has been registering only Ghanaian citizens from six (6) years and above and currently they have about seven (7) million registrants as compared to that of the EC with over fourteen (14) million registrants. Hence, if the NIA gets their data well established and they are operating, the EC in consequent would be able to generate from their data all persons of eighteen (18) years and above to easily facilitate its voter register compilation. More so, the idea by the NIA to register all foreigners and their dependents would in turn help solve the problem of registration by foreigners when they get their data well established. So I will say yes! we are in collaboration with the NIA, and this collaboration is hoped to help solve multiple problems as to who is a minor and who is not, and who is a Ghana citizen and who is not” (Fieldwork, 2018).

In addition to the above, another critical challenge that has compromised the operations of the BVRV and the full performance of the Electoral Commission as a whole rests with the funds required to keep the BVRV in operation. The Electoral Commission however explained that, the challenge has not been the availability of funds, instead the late release of funds to the Electoral Commission for its operations. The Electoral Commission expressed its concerns as this:

“No Government has ever refused to give money which would place the commission in difficulty in fulfilling its obligations. But what sometimes happen is the late release of such funds, which makes it difficult for the commission to systematically roll out an orderly electoral process. It must be noted that the training of personnel to register millions of voters at periodic intervals has not cost the electoral commission less than GH¢100,000,000 all of which are supposed to come from the government. But in order to address this challenge, the Electoral Commission is considering an establishment of an independent Election Fund which is expected to be funded by a portion of the value added tax (VAT) paid by citizens” (Fieldwork, 2018).

More so, the EC was asked to respond to the challenge of biometric verification failures that were recorded in some polling stations and also proffer measures instigated by the EC to address the challenge. The Commission admitted that biometric verification failures particularly those attributed to fingerprint degradation, scars, and underdeveloped fingers were recorded in some polling stations in the 2012 general elections. Similarly this study also found that, women whose disposition changed after the biometric registration (particularly pregnant women) also experienced verification challenges. In light of this challenge, the EC maintained that, out of its introspection in 2012, the EC resolved to use the biometric verification machines during the voter exhibition in 2016, so that voters who had challenges with their fingerprints after the biometric

registration exercises could be moved from being verified by the biometric verification device (BVD) to verification by FOs (Face Only). Again, the biometric verification machines employed for the 2016 elections were used in all the by-elections and district level elections that were conducted in 2013 and 2015 respectively, but were without challenges or complaints. The Electoral Commission consequently indicated that, in 2012, it recorded as many as 413 polling stations which could not finish voting on the 7th December due to verification failures and false rejections. According to the Commission, the incident largely informed its need to introduce alternative verification systems aside the biometric verification system. Thus, at an IPAC meeting it was agreed that provisions should be made for manual voter verification. For instance verification by FOs (Face Only) were inducted to topple cases of the biometric voter verification failure so as not to disenfranchise any registered voter (Mr. Fred Tetteh, R & M DEPT, EC., 2018).

In light of the above challenges the Electoral Commission finally averred that the institution of biometric voter registration and verification into Ghana's electoral process has not been a holistic program devoid of challenges. However, its inception has enhanced the conduct of credible elections and further boosted stakeholders trust and confidence in Ghana's electoral system.

Discussion of Results

4.7.8 Objective 1: Reasons for Introducing BVRV in Ghana

On average, 93.7% representing the majority of the total respondents indicated that the BVRV was introduced into Ghanaian elections purposely to prevent multiple registrations, multiple voting, to ensure the principle of one man one vote, prevent voter impersonation, and to provide a reliable registration and verification for voters. Similarly, these reasons were replicated by Genkey (2012) and Agyemang et al. (2014) when they studied biometric elections in Ghana. In a comparative study of biometric elections by Piccolino (2018) in three African countries, Benin, Cote d'Ivoire, and Ghana, it was further revealed that, the Electoral Commission of Ghana purposely introduced the BVRV system to address the lack of trust among political parties over election management and to restore public confidence in the electoral process.²⁰

However, a study by IDEA (2015) on “Certification of ICTs in Elections” in sixteen countries across the world revealed that biometric elections are largely introduced for two main reasons (1) to ensure that all information provided during the electoral process, particularly the election results and the electoral roll are correct and trustworthy and (2) to generate a broad acceptance that the electoral outcome is a true and fair representation of the citizens will. Likewise, in a research study by Piccolino (2015) in Nigeria on “What other African Elections tell us about Nigeria’s bet on Biometrics” it was found that, the Electoral Commission of Nigeria also introduced biometrics into its elections to prevent double voting, ballot stuffing, multiple registrations, eliminate unqualified voter registrations and to ensure a more transparent elections.

²⁰ See Also: Ayeni and Esan (2018) and CODEO (2012)

In an interview with the Electoral Commission of Ghana it was further revealed that the motivation behind the introduction of BVRV into Ghana's electoral process flowed from the relentless demands for electronic voting by individuals and groups, BVRV best practices found in other countries, self-introspection of the Election Commission, recommendation by stakeholders, and the increasing conviction that the biometric system can enhance electoral credibility.

4.7.8.1 Objective 2: Contributions of BVRV to Credible Elections in Ghana

Generally, the study found that, an average of 79.6% of the survey respondents believed that, the incorporation of biometric voter registration and verification into Ghana's electoral process has helped reduce multiple registrations and voting. However, the responses that were provided by majority of the voters centered around a reduction in multiple registration and voting, reduction in voter impersonation, ensured a clean voters register, checked over voting, strengthened Ghana's democratization process, improved voter registration and verification accuracy, added simplicity and speed to the electoral process, and fostered trust and confidence among stakeholders of Ghana's electoral system. Only, 7.1% of the total respondents cited that, the BVRV has helped check against registration and voting by minors and foreigners. This is an indication that majority of the respondents understands that the BVRV system implemented in Ghana's electoral system in and of itself cannot prevent registrations by minors and foreigners.

The above findings confirm Debrah (2015) when he studied "ICT in Elections" where he identified that, the introduction of BVRV has enhanced stakeholders trust and confidence in Ghana's electoral process, brought about substantial reduction in multiple registrations and voting, consolidated Ghana's democratization process, and further served as a fraud proof measure against

electoral irregularities that has plagued Ghana's elections in the past. These were the same ideas expressed by Ayeni and Esan (2018) when they studied the "Impact of ICT in the conduct of Elections in Nigeria" which stated that the incorporation of biometrics into Nigerian electoral system helped to improve their election management as it helped to clean the electoral register, detected and minimized cases of multiple registrations, multiple voting, and manipulation of election results. In addition to the aforementioned, an interview with the Electoral Commission of Ghana further confirmed that, the implementation of BVRV in Ghana has totally annihilated multiple voting and voter impersonation; checked against multiple registrations, ballot stuffing, carousel voting, and over voting; and consequently helped to build trust among electoral stakeholders particularly political parties.

However, a contradiction from Cooper-Knock (2012) revealed that the introduction of biometric technology into Ghana's voter registration and verification system would not solve other types of electoral fraud like ballot stuffing and the registration of non-Ghanaian and minors prevalent in voter registration exercises in Ghana and Africa at large. He averred that even though biometric technologies are incorporated in elections to check major electoral malpractices that political parties and other stakeholders or parties engage in, it is not the panacea to 'fraud-free' elections. He found that, in the Democratic Republic of Congo, the biometric technology that was introduced in their voter registration exercise could not stop ballot stuffing and inflation of election results and thereby called into question the integrity and infallibility of the biometric register, by both international and domestic observers.

Cooper-Knock (2012) therefore advises that, African countries should not completely rely on biometric technologies as a holistic approach to electoral malpractices, but rather it must be viewed as an instrument that has a minute role in the conduct of credible elections in Africa. Although Cooper-Knock (2012) argument on registration by minors and non-Ghanaians may hold valid presently in Ghana absent any cognizant controlling measures, his argument on ballot stuffing in the case of DRC may not wholly merit a fair generalization and comparison to Ghana's biometric technology which includes a verification feature that can readily detect fraudulent ballots should such incidents be recorded and reported in a polling station. In support of this argument Genkey (2012) and the Electoral Commission both corroborated that, whenever there is a recognition that the number of "expected ballots" at a polling station is different from the "physical ballots," prompting the existence of additional or faked ballots, the biometric verification machine or system would be able to provide a proof of all (biometrically) verified voters and as well trace every successful, failed, and rejected interactions when such commands are initiated. In cases where a voter was verified manually, the biometric verification device is used to scan his or her ballot paper which contains a unique barcode serial number only known to the system. Subsequently, the serial number on the issued ballot paper is stored in a pool of valid ballot IDs. Thus, at post elections, a scan of all faked casted ballots by the BVD will generate "Invalid ID" feedbacks and thus be expunged from the pool of valid ballots.

4.7.8.2 Objective 3: Challenges that have accompanied Ghana's BVRV Implementation

On the challenges of BVRV to election administration in Ghana, the study found that, 93.1% of the total respondents constituting the majority strongly agreed or agreed that, the BVRV system has been marred with challenges that need attention. In both 2012 and 2016, the challenge that was

predominantly cited by the respondents was the inability of the biometric machine to capture and verify the fingerprints of some voters. This idea was expressed by an average of 49.5% of the total respondents interviewed. This was followed by malfunctioning and breakdown of biometric machines and weak enforcement of the required registration and verification criteria which constituted an average of, 22.8% and 9.5% respectively. Also an average of 18.4% of the total respondents indicated that the time they spent on the biometric voter registration and verification were too much for them at their polling stations. Gelb and Diofasi (2016) in their study of “Biometric Elections in Poor Countries: Wasteful or a Worthwhile Investment?” added that, delays associated with biometric elections may give rise to accusations of electoral fraud, undermine voters trust, and consequently aggravate the very problems it was supposed to address.

The challenges identified among the voters were confirmed by Boateng and Akaba (2015), CODEO (2012), and Cooper-Knock (2012) in their study of biometric elections in Ghana. Cooper-Knock emphasized that, biometric elections have the tendency of causing illegitimate disenfranchisement especially where “false rejections” and “the principle of no verification (biometrically) no vote,” are unforgivingly at play. This idea was also shared by Wolf (2017), and Lodinova (2016).²¹ Lodinova (2016) in particular argued that, the use of biometric technologies over the years has also warranted challenges and criticisms over propriety, privacy, and religious sentiments.²²

²¹ See: Vanguard (2011)

²² See Lodinova (2016:96-97) for further discussion on propriety, privacy, and religious challenge or criticism posed by biometric technologies

However, in an interview with the Electoral Commission, it was revealed that, the major challenges that have accompanied the implementation of BVRV in Ghana rests with funding and cost and maintenance of the biometric system. These confirmed the findings of Kimery (2018) who argued that biometric technologies used in elections bring “new problems” such as logistical and procedural problems to an election cycle (including cost of initial procurement, cost of biometric readers and cards, maintenance cost, data storage, upgrade and security cost, and cost of training for commissioners and polling officials). In relation to the findings at Electoral Commission, Gelb and Diofasi (2016) similarly found that, a successful deployment of biometric technologies in elections is contingent on at least the country’s administrative and logistical capacity; which may involve costs of roads to deliver biometric kits, cost of electricity to power card readers and scanners, reliable broadband or mobile networks to transmit data for de-duplication and to submit results, a robust data system to store, verify, and tally the data received, and a trained staff to operate biometric machines and perform troubleshooting if issues occur. These examples alone culminate to support the argument by Gelb and Diofasi (2016) that, the 2012 biometric elections cost Ghana not less than USD 194,000,014.²³

The study further revealed that, an average of 8.8% of the total respondents agreed to the argument that the biometric registration and verification devices could cause cancer to those exposed to it. However, an interview with the Electoral Commission and a report by CODEO (2012) both refuted this argument stating that, although this incident deterred many prospective voters from registration and voting in 2012, they were just merely deliberate politically motivated rumors for scoring political points. A study by Jacobs (2008), and Drahansky et al., (2012) however found

²³ See: Gelb and Diofasi (2016:8) - Table 3

that, regardless of the fact that biometric devices could rarely cause cancer if not impossible there is a possible risk of skin diseases transmission absent simple hygienic measures. Equally, UNDP (2010) advises that, many of these problems can be avoided if sufficient time is allowed to tailor make different feasible solutions in the given country in context; for the procurement, delivery, maintenance, and sustenance of such a system.

4.7.8.3 Objective 4: General Perception of Voters toward the BVRV

Overall, 97.1% of the voters strongly disagreed or disagreed that the manual voter registration used in past elections is far better than the BVRV. Consequently, 86.3% of the total respondents strongly affirmed that, the application of BVRV at their polling stations were far better than the manual voter registration and verification system employed in past elections. Generally, the respondents were supportive of the biometric as a majority of 93.1% indicated that, the BVRV should be consolidated and used in the next presidential and parliamentary elections. This re-establishes the conclusion by Debrah (2015) and CODEO (2012) that the biometric voter registration and verification system integrated into Ghanaians electoral process should be consolidated and used in future elections.

More so, a significant majority of 81.4% of the total respondents strongly support the idea of integrating electronic voting into Ghanaian elections. However, the general impression among the respondents indicated that, the Electoral commission should critically study the e-voting system as applied in other countries like India and USA before an eventual implementation in Ghana. This idea is in line with the ‘gradualists’ perception that the Electoral Commission should carefully and cautiously proceed to e-voting by undertaking a detailed investigation of electronic voting best

practices around the world before an implementation in Ghana (Boateng & Akaba, 2015). This concern was however matched with a rival opinion of 12.7% of the total respondents who expressed concerns that, Ghana's literacy rate and technological disadvantage will gravely affect electronic voting implementation and thus the EC should focus on strengthening the biometric voter registration and verification system rather than to shift its attention to e-voting now.

4.7.9 Chapter Summary

This chapter presented and discussed the major findings gathered from the primary and secondary sources in line with the research objectives. This study establishes that the biometric voter registration and verification technology for capturing and verifying voters have provided adequate checks against electoral irregularities that plagued past elections conducted with the manual voter registration and verification system. However, the study revealed that, there are several other challenges that have accompanied the implementation of biometric voter registration and verification in the 2012 and 2016 elections, hence, the need for a more efficient and effective measures to curb such challenges for a more credible elections.

The next chapter, chapter five, presents the summary of the research findings, conclusions drawn from the study, and the recommendations made in an attempt to help address the challenges that have accompanied the incorporation of biometric voter registration and verification in Ghanaian elections.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.0 Introduction

The main objective of this study was to examine the effects of the 2012 and 2016 biometric voter registration and verification system introduced into Ghanaian elections by the Electoral Commission. The study sought to ascertain how much this reform has impacted on the Commission's quest to strengthen Ghana's electoral integrity and democratic development. This chapter presents a summary of the research findings derived from the research study. The chapter revisits the specified research objectives and submits the findings on them. A general conclusion and a list of recommendations for future researches are provided to conclude the study.

5.1 Summary of Findings

This study adopted an exploratory approach to assess the effects of biometric voter registration and verification on elections in Ghana. This research study aimed at coming out with findings and recommendations that will provide policy makers and electoral stakeholders with information which will inform an improved electoral system, practices, and policy formulation strategies on biometric voter registration and verification. Specifically, the study sought to establish the reasons that informed the introduction of biometric voter registration and verification into Ghanaian elections, investigate the benefits and challenges that have accompanied the implementation of the biometric technology and proffer measures for a more effective biometric voter registration and verification system.

This research study employed the mixed method approach to arrive at the intended research objectives. The study was conducted in three (3) electoral constituencies, Ablekuma Central, Gomoa East, and Shama in the Greater Accra, Central and Western regions respectively. The data collection instruments used to gather information for this study were an interview guide and a survey questionnaire; in other words, two set of questions were designed, one set for the Electoral Commission (interview guide) and the other set for the voters within the selected constituencies (survey questionnaire). The survey targeted people who voted in at least the 2012 or 2016 general elections conducted by the Electoral Commission of Ghana.

5.2 Major Findings of the Study

The main findings of this study are summarized under the specified research objectives:

5.2.1 Research Objective 1:

Factors that influenced the Electoral Commission to embark on BVRV

The study found that the major reasons that influenced the Electoral Commission of Ghana to introduce biometric voter registration and verification into Ghana's electioneering processes were:

1. To detect and prevent multiple registrations and voting by same individuals.
2. To detect and prevent voter impersonation practices.
3. To ease the relentless demand for electronic voting.
4. To prevent the registration of unqualified voters (foreigners, minors).
5. To provide reliable registration and verification of voters.
6. To ensure a clean voter register.
7. To prevent over voting.

8. To accelerate voter identification processes and eliminate delays.
9. To cut down cost by reason of the extreme reduction of paper usage, as biometric devices which are used could be re-used or auctioned for sales after an election.
10. To ensure the principle of one man one vote: thus, voters could only vote if their fingerprints were identified and verified by the biometric verification system. This informed the celebrated slogan of “no verification (biometrically) no vote.”

The study further revealed that the inception of the biometric voter registration and verification emanated from an introspection conducted by the electoral commission which aimed to assess its performance after the conduct of the 2008 general elections. The results from the survey and the interview revealed that the introduction of the biometric voter registration and verification system was a practical step to address the challenges and malpractices that characterized previous elections.

5.2.2 Research Objective 2:

To Determine the Challenges, Criticisms, or Weaknesses associated with Biometric Voter Registration and Verification Implementation

The survey found that the main challenges and criticisms that have accompanied Ghana’s 2012 and 2012 biometric voter registration and verification system encompass:

1. Incidents of frequent equipment malfunctioning and breakdown. The study identified that biometric fingerprint machines that were employed to undergird Ghana’s biometric elections were generally ineffective at midday. Presumably, high temperatures at certain

areas got the devices overheated and would as a result not work. This incident is believed to have prevented some prospective voters from registration and voting during designated hours. This incident was however relatively more predominant in 2012 than 2016.

2. Failure to detect and prevent illegal registrations. This emanated from the fact that, the polling stations in both elections were not interconnected to share registration information thereby leaving room for duplications.
3. Inadequate voter education and misinformation. The study revealed that most prospective voters from different polling stations in a cluster all rushed to the first polling station that had opened for registration putting a lot of stress on electoral officials. Also poor voter education and misinformation caused many potential registrants to stay away from registration and verification as rumors in some electoral areas indicated that the biometric devices could cause cancer to those exposed to it. However, a rebutter from the Electoral Commission indicates that all these arguments were just mere politically calculated steps.
4. The study further revealed that, weak enforcement of registration and verification eligibility criteria at some registration centers and polling stations respectively permitted the registration of persons who did not possess the required documentary proof of eligibility.
5. Inadequate staff training particularly in 2012 also generated lots of misinformation and controversy about kit movements, and effective resolution of challenges caused by

biometric devices. Again, how to deal with prospective voters suspected to be non-citizens and minors, and how to determine whether a person is from a community and could register to vote there or not also became a challenge under Ghana's 2012 and 2016 elections.

6. Long queues and delays at some polling stations caused by inefficiencies in the voter registration system (including screen freezing, printer breakdowns, and login difficulties) were identified to have forced some voters to abandon the process out of frustration.
7. The study found that the late release of funds by the government makes it difficult for the Electoral Commission to systematically roll out an orderly electoral process. It was revealed that the training of personnel to register millions of voters alone has not cost the Electoral Commission less than Ghc 100,000,000.
8. From a general observation, some respondents revealed that some strange and unfamiliar persons availed themselves as guarantors to needy registrants without the faintest trace of knowledge or personal relationships. In as much as little or no background investigations were conducted by the Electoral Commission, many of such guarantors' facilitated fraudulent registrations.
9. The biometric registration exercise encountered security challenges as political party agents and supporters at some registration centers decided to take the law into their own hands to prevent people who they believe were not residents of a community from registering. Although a number of violent incidents were recorded, it however appeared to

be an urban phenomenon as most of the rural registration centers were found to have experienced a smooth voter registration exercise.

Notwithstanding these challenges the respondents (voters) were generally supportive and quite satisfied with the biometric voter registration and verification thus far. Concerns were however made that, the biometric voter registration and verification should be improved upon for more effective elections in the years ahead.

5.2.3 Research Objective 3:

To identify BVRV's Contributions to Credible Elections in Ghana

The findings of this survey reveal that the biometric voter registration and verification that was introduced in Ghana's electoral processes elections has contributed enormously to the conduct of elections in Ghana.

1. The biometric voter registration and verification system has resulted in a substantial reduction in multiple registrations, multiple voting, unqualified voter registrations, voter impersonation, or identity theft, carousel voting, and exploitation of records of deceased voters, ballot-box stuffing, and over voting. As such the biometric technology employed in Ghanaian elections has substantially served as a measure against such irregularities that plagued past elections in Ghana.
2. The biometric voter registration and verification has helped paved a critical contribution to Ghana's democratic elections by enhancing stakeholders' trust and confidence in the electoral process. Voters are now relatively more confident about the quality and reliability

of their registry. Majority of the respondents indicated that they registered and voted in the biometric elections because they were convinced that their votes would be counted.

3. This research study found that the biometric voter registration and verification system has helped improve voter registration and verification accuracy. It was revealed that, the biometric system added simplicity and speed to the electoral process thereby helping to avoid long queues and waiting time for registrations, verifications, and voting.
4. This study identified that, the biometric voter registration and verification system through the ABIS and AFIS has further enhanced transparency and fairness in the conduct of elections in Ghana.
5. Overall, the study identified that introduction of the biometric voter registration and verification in Ghana's electioneering process has strengthened its democratization process which began in 1992. By encouraging high voter turnout and participation in the 2012 and 2016 elections, it can be concluded that the biometric system further gave the incentive for voters to cast their ballots in order to sustain Ghana's democratic process.

5.2.4 Research Objective 4:

General Perception of Voters towards the Biometric Voter Registration and Verification

The study found that, in 2012 a portion of the voters expressed displeasure with the biometric voter registration and verification processes due to the challenges encountered at the aftermath of the 2012 general elections. Chiefly to this dissatisfaction rests with the biggest opposition party of the time registering its displeasure of the presidential election results at the Supreme Court demanding

the annulment of votes in certain polling stations due to alleged irregularities over voting within some constituencies or regions. However, after 2016, voters' perception of the biometric system has totally changed. The study found that voters are now generally supportive of the biometric registration and verification system. This development is largely owed to the implementation of 27/31 reforms directed by the Supreme Court in 2012.

1. The study observed that, while the majority of Ghanaian voters maintain that the biometric voter registration and verification should be consolidated and used in future elections, others gravely contend that Ghana should abandon the biometric system and resort to electronic voting in future elections. A very small percentage of the voters however demanded a revisit to the traditional voter registration and verification system.
2. Generally, majority of the voters readily heeded to the call to register and vote. Voters were particularly satisfied with the 2016 biometric registration and verification processes, with the majority been supportive of its use in subsequent elections.

5.3 Conclusion

The biometric voter registration and verification system has by far ensured one of the most successful elections ever carried out by the Electoral Commission since the inception of Ghana's Fourth Republic. The biometric voter registration and verification system among other accomplishments has substantially served as a basis for trust and confidence in the electoral processes. The introduction and implementation of the biometric technology system into Ghanaian elections has thus far reduced the incidence of unqualified voter registrations, carousel

voting, bloated electoral register, the lack of trust among electoral stakeholders, particularly citizens and political parties; checked against multiple registrations, ballot stuffing, over voting; and largely eliminated multiple voting and voter impersonation. The relatively increasing voter turnouts during elections since 1992 is suggestive that electoral reforms over the years have contributed to build trust and interest in Ghana's electoral system and democratization process.

However, the challenges or concerns about the biometric voter registration and verification system highlighted above remain. Accordingly, this research study urges election stakeholders particularly the Electoral Commission to consider the recommendations made in this thesis as part of the efforts to strengthen electoral integrity and as well enhance Ghana's biometric system for increased credibility and acceptability in future elections.

It is important for electoral stakeholders to note that, whether elections will be peaceful and successful or otherwise depends on how committed we are to the principle of transparency and electoral integrity. We cannot go to sleep and expect the biometric system to produce a peaceful and credible results come future elections. What I consider the greatest threat to Ghana's biometric elections is the misconception, deception, ambiguity and flawed interpretation of the biometric voter registration and verification system by individuals or groups for private exploits. However, the biometric system has just a minute role to play in Ghana's pursuit of peaceful and credible elections. We should therefore employ all mechanisms possible to sustain our electoral successes now and in the years ahead. By and large, the biometric voter registration and verification system introduced into Ghanaian elections should be continued but must be improved to eliminate critical challenges and possible electoral malpractices.

5.4 Recommendations

Ghana's experience with the 2012 and 2016 biometric voter registration and verification revealed many veritable challenges. In order to improve upon the biometric voter registration and verification system so as to boost public trust and confidence in future elections and in the entire electoral process, the following recommendations are made to help resolve some of the challenges identified in this study.

To the Electoral Commission (EC):

1. The EC must consider extra steps to safeguard the biometric kits from the weather and other environmental conditions and externalities that cause equipment breakdown. This will help prevent frequent breakdown of biometric machines in future elections where biometric registration and verification devices would be employed.
2. The EC must ensure adequate provision of backups and swift technical assistance at or near all registration and polling centers to aid in the reduction of long delays for repair or replacement of biometric equipment.
3. The Electoral Commission must ensure that its field officers are offered quality training in the operation and management of registration and verification devices in future exercises to avoid or lessen costly mistakes, equipment malfunctioning, unnecessary delays, and long queues.

4. The EC must review and pay critical attention to strictly enforcing its eligibility criteria for voter registration so that they are neither too tight to exclude undocumented Ghanaians, nor too loose to readily facilitate ineligible registrations by people.
5. The EC must consider an enforcement of the “open or a continuous” voter registration system as a substitute for the present periodic revision of the voters’ register.
6. The Electoral Commission should find resources to avoid the tendency of staggering the registration exercise as the ‘cluster’ system only encourages multiple registrations and further entice complicity between polling officials and political parties.
7. The EC should consider an effective collaboration with the National Identification Authority (NIA) on citizenship identification to assist in future voter registration exercises. Such collaboration can help eliminate or minimize registration of minors and non-Ghanaians.
8. The EC must consider a more inventive approach for conducting provisional voter exhibition exercises in the future. A more visual display of the pages of the register at each center would perhaps help attract more people to confirm or correct their particulars and as well object to the inclusion of unqualified entries. This will spare some voters false rejections and other verification problems that occurred at some polling stations.

9. The EC should intensify its dissemination of information and publicity programs through media outlets, particularly, radio and television to increase public and voter awareness on the use of the registration and verification equipment and to bolster confidence and efficiency in the biometric registration and verification process.
10. It will be prudent that the same system used for the registration would be made available for verification on the day of election. Additionally, there should be a central database where the about 28992 (as at 2016) polling stations are going to refer to so as to forestall multiple registrations at registration points.
11. The EC should consider the practice of publishing and broadcasting on the media (both print and electronic) the names and photographs of all declared offenders not only of multiple registrations, but also of illegal registrations, underage persons, and non-citizens. Thereafter, all other measures of sanction against such offenders such as exclusion from the voters' register must be strictly enforced. In this regard, the EC should consider passing a bill that will invest in the commission the power to prosecute both individuals and officials who engage in electoral malpractices.
12. The EC must take initiatives to work with the Ghana Police Service (GPS) to prosecute those who deliberately engage in multiple registrations and other electoral offenses to serve as a deterrent in the future.

13. The EC must consider clarifying or reviewing what exactly is meant by being “... ordinarily resident in an electoral area” as contained in Section 1(1) (d) of the Public Elections (Registration of Voters) Regulations, 2012 (C.I.72). Ambiguity and misinterpretation of this provision continues to pose threat to peaceful biometric elections in the future.

14. The Electoral Commission should create public awareness of how officials should handle “false rejections” and other verification challenges by the biometric verification device so that voters whose disposition change after the biometric voter registration and voter exhibition exercises or otherwise are not disenfranchised during elections. This will help eliminate possible disenfranchisement among pregnant women and other aspiring voters.

To Political Parties:

15. Political parties should take keen interest in all stages of the electoral process (be it registration, verification, review, or exhibition) to ensure that they work hand in hand with the EC to produce credible election results.

To Ghana Police Service:

16. The Ghana Police Service must endeavor to fast track investigations and prosecutions of alleged perpetrators or electoral fraudsters during elections. The investigative processes and the prosecution outcome should be made public in the mass media to serve as a deterrent to others.

To the Government

17. A portion of the value added tax (VAT) paid by citizens should be channeled to establish an independent election fund to enable the commission to systematically roll out an orderly electoral process.

5.5 Suggestions for Future Research

Further work should be conducted on biometric voter registration and verification, and biometric voting so as to raise its awareness in Ghana and to help diffuse stakeholders' mistrust which may create tension during electioneering periods.

Also, studies should be conducted to investigate the feasibility of implementing electronic voting in future presidential and parliamentary elections in Ghana.

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INSTITUTIONAL ACTS

Political Parties Act 574 of 2000

Political Parties Law (PNDCL 281) of 1992

The 1992 Constitution of Ghana, Article 44 (a) and (f)

APPENDICES

APPENDIX A: FURTHER DETAILS ON DATA COLLECTION INSTRUMENTS

The survey questionnaire featured close-ended and open-ended questions. The close ended questions restricted the respondents to a list of answer choices from which they must choose to answer a question. This helped to provide control over participant's range of responses (Sunders et al, 2003). On the contrary, the open ended-questions also helped allow respondents to include their views on the subject matter. This aided in facilitating a better assessment of respondents' true feelings on the topic under study. In addition to the survey questionnaires, a semi-structured interview guide was adopted to gather primary data from the Electoral Commission of Ghana. The need to employ this data collection instrument was informed by the need to solicit expert knowledge and theoretical clarification on the topic under investigation. According to Chilisa (2012:205) "this type of interview allows for flexibility and makes it possible for the researcher to follow interests and thoughts of informants." Also, Semi-structured interviews are neither restrictive like close-ended questions nor is it so open to mishap. This enabled the researcher to probe deeper and attained detailed information on the phenomenon under study.

The survey questions and interview guide were developed based on the literature review and the theoretical framework that underpin this study presented in chapters 2 and 3 of this thesis. The literature review and the theoretical framework informed the research questions presented in Chapter 1. This means that answers to the survey and interview questions corresponded to specific parts of the literature review and theoretical framework, and hence informed the specified research questions this study sought to answer (See table 23 below for the relationship between the theory and the research questions).

The primary data collection at the Electoral Commission commenced by sending an introductory letter from the Department of Political Science, University of Ghana, Legon to the Electoral Commission of Ghana to ascertain permission to embark on interviews. The letter described the intent of the research and the purpose of the responses that were to be provided by the respondents. Subsequently, official appointments were made to meet staff from the Electoral Commission for interviews; this was done to ensure that the interview sections do not affect their normal duties. In all of these, copies of the semi-structured interview guides were given to the respondents prior to the interview date to enable them familiarize themselves with the content of the interview so as to prepare beforehand.

The researcher sought the permission of respondents (officials) and subsequently recorded their responses on a tape recorder for easy clarifications and also to ensure that every important detail is captured. The interview responses were later transcribed and grouped under themes to assist in the answering of the questions posed for the study. Respondents were informed that the study is for purely academic purposes and as such were assured of anonymity and confidentiality where necessary. Consequently, the data collected during the interviews were destroyed immediately after the transcription. Content analysis was done on the transcribed version after it has been grouped into themes which captured the objectives of the study. Generally, the survey questionnaire and the semi-structured interviews were successfully administered within four months due to the different time schedules allotted to the researcher by the Electoral Commission and the no proximity among the geographical locations of the sampled constituencies.

**APPENDIX B: CORRELATION BETWEEN THE RESEARCH QUESTIONS AND
THEORETICAL FRAMEWORK**

Table 23: DOI Theoretical Framework and Research Questions

Research Question	Theory	Survey Question(s)	Interview Question
1. What factors influenced the Electoral Commission to embark on biometric voter registration and verification?	<ul style="list-style-type: none"> • The why of an innovation • Relative Advantage 	7 - 9	2
2. To what extent has BVRV contributed to credible elections in Ghana?	<ul style="list-style-type: none"> •Relative advantage 	10 -14	3
3. What are the challenges associated with the BVRV implementation?	<ul style="list-style-type: none"> • Complexity • New developments 	15 - 19	4
4. How can the challenges associated with BVRV be mitigated?	<ul style="list-style-type: none"> • Reinvention 	-	5
5. What is the general perception of voters towards BVRV?	<ul style="list-style-type: none"> • Degree of Acceptance 	20 - 21	6

Source: Author's Construction, 2018

APPENDIX C: INTERVIEW GUIDE FOR ELECTORAL COMMISSION OF GHANA

- 1) In your professional opinion do you think the manual voter registration and verification used in past elections before 2012 has problems that facilitated electoral fraud?
Yes [] No []

Please give reason(s) to your answer in question one above

- 2) What were the major reasons that influenced the Electoral Commission of Ghana to embark on biometric voter registration and verification in 2012 and 2016?
- 3) To what extent has Ghana's experience with the biometric voter registration and verification in 2012 and 2016 contributed to credible elections and democracy?
- 4) What challenges have accompanied the implementation of biometric voter registration and verification in Ghana's elections?
- 5) How is the Electoral Commission working to address these challenges?
- 6) In your professional opinion do you think Ghana is ready for electronic voting?
Yes [] No [] *(Please explain your choice of answer below)*

APPENDIX D: SURVEY QUESTIONNAIRE FOR VOTERS

**UNIVERSITY OF GHANA, LEGON
DEPARTMENT OF POLITICAL SCIENCE
SURVEY QUESTIONNAIRE**

Dear Respondent,

This survey is meant to collect data for a study titled: ASSESSING ELECTORAL REFORMS IN GHANA: THE CASE OF BIOMETRIC VOTER REGISTRATION AND VERIFICATION. This research is purely meant for academic purpose. Thus, any information provided will be treated as confidential. I will therefore count on your support and cooperation to answer the following questions.

NB: This survey is for voters who participated in at least the 2012 or 2016 General Elections

I give my consent to respond to this questionnaire Yes No

Respondent No: **Voter ID Number:**

Region:	a. Central [1]	b. Greater Accra [2]	c. Western [3]
Constituency:	a. Gomoa East [1]	b. Ablekuma Central [2]	c. Shama [3]
Community/Locality:		
SECTION A: BACKGROUND INFORMATION (PUBLIC AWARENESS AND PARTICIPATION IN THE BIOMETRIC ELECTIONS)			
PLEASE THICK ALL RESPONSES THAT APPLY			
		Yes	No
Q1.	Did you vote in the elections held in: (<i>multiple choice allowed</i>)		
i.	1992	1	0
ii.	1996	1	0
iii.	2000	1	0
iv.	2004	1	0
v.	2008	1	0

vi.	2012	1	0
vii.	2016	1	0
Q2.	Please how old were you when you had your first vote cast		
Q3.	Have you heard of biometric voter registration and verification (BVRV)? Yes >> Q4 No >> Q7	1	0
Q4.	If <i>Yes to Q3</i> how did you get to know about the biometric registration and verification? (<i>multiple choice allowed</i>)		
i.	Radio	1	0
ii	Television	1	0
iii	Newspaper	1	0
iv.	Family members and friends	1	0
v.	Religious Groups (Church, Mosque)	1	0
vi.	Online News Outlets	1	0
Vii.	Social Media	1	0
viii.	Other (please specify)		
	PLEASE THICK ALL RESPONSES THAT APPLY	Yes	No
Q5.	Did you have prior notice about when and where the biometric registration and verification exercises were going to take place?	1	0
Q6.	Did you know how the biometric registration and verification exercises were going to be carried out		

		1	0				
SECTION B: FACTORS THAT INFLUENCED THE ELECTORAL COMMISSION TO EMBARK ON BVRV							
Q7.	How much trust did you have in the Electoral Commission to deliver credible elections before the adoption and use of BVRV in 2012 and 2016 elections?						
i.	No trust at all			0			
ii.	Just a little trust			1			
iii.	A lot			2			
iv.	Don't know			99			
Please tick as appropriate, the option that best describes your opinion to the following statements		Strongly Disagree	Disagree	Neither Agree nor disagree	Agree	Strongly Agree	Don't Know
Q8.	Do you agree with the view that the previous voter registration and verification system had challenges that facilitated electoral fraud?	0	1	2	3	4	99
Q9.	What do you think is the reason(s) for introducing BVRV in Ghana's electoral process (<i>multiple choice allowed</i>)						
i.	To detect and prevent multiple registrations	0	1	2	3	4	99
ii.	To prevent multiple voting	0	1	2	3	4	99
iii.	To prevent voter impersonation	0	1	2	3	4	99
iv.	To prevent the registration of unqualified voters (minors and foreigners)	0	1	2	3	4	99
v.	To ensure a clean voters register	0	1	2	3	4	99

vi.	To ensure the principle of one man one vote	0	1	2	3	4	99
vii	To reduce human errors in voter registration and verification	0	1	2	3	4	99
viii	To provide reliable registration and verification of voters	0	1	2	3	4	99
ix	To accelerate voter identification processes and eliminate delays	0	1	2	3	4	99
x.	To check ballot stuffing	0	1	2	3	4	99
xi.	To increase voter participation	0	1	2	3	4	99
xii.	To cut down cost	0	1	2	3	4	99
xiii.	Pressure from election stakeholders (citizens, civil society organizations, the international community)	0	1	2	3	4	99
xiv.	Other (<i>please specify</i>)						5

SECTION C: CONTRIBUTIONS OF BIOMETRIC VOTER REGISTRATION AND VERIFICATION TO ELECTIONS IN GHANA

Q10. Please tell me, to what extent do you agree or disagree with the following statements regarding the 2012/2016 elections at the polling station where you voted	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know
a. Statement 1: The biometric voter registration and verification system	0	1	2	3	4	99

	helped to reduce multiple registrations and voting.						
b.	Statement 2: The biometric voter registration and verification system helped to eliminate registration and voting by unqualified voters (foreigners and minors).	0	1	2	3	4	99
c.	Statement 3: The biometric voter registration and verification system helped to reduce voter impersonation.	0	1	2	3	4	99
d.	Statement 4: The biometric voter registration and verification helped to clean the electoral register and consequently helped check over voting.	0	1	2	3	4	99
e.	Statement 5: The BVRV helped to improve the accuracy of voter registration and verification	0	1	2	3	4	99
f.	Statement 6: The biometric voter registration and verification added simplicity and speed to the electoral process thereby helping to avoid long queues and waiting time for registration, verification, and voting.	0	1	2	3	4	99

Q11.	Generally, do you agree or disagree with the following statements about Ghana's 2012/2016 biometric voter registration and verification	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know
i.	Statement 7: The biometric voter registration and verification helped to enhance stakeholders trust and confidence in Ghana's electoral system	0	1	2	3	4	99
ii.	Statement 8: The 2012/2016 biometric voter registration and verification served as a foolproof measure against electoral irregularities that has plagued past elections in Ghana.	0	1	2	3	4	99
iii.	Statement 9: The biometric voter registration and verification helped to strengthen Ghana's democratization process which began in 1992.	0	1	2	3	4	99
Q12.	Did you have confidence in the electoral commission to deliver transparent, free, fair, and credible elections at the polling station where you voted:	Not at All	Just A Little	A Lot	Don't Know		
i.	Before the 2012 elections	0	1	2	99		
ii.	After the 2012 elections	0	1	2	99		
iii.	Just before the 2016 elections	0	1	2	99		

iii.	After the 2016 elections	0	1	2	99
Q13.	Now tell me, do you have trust in the EC to deliver credible elections in the future?	0	1	2	99
Q14.	How would you rank the quality of the 2012 and 2016 biometric elections? (choose only one option)				
i.	Not free and fair				0
ii.	Free and fair with major problems				1
iii.	Free and fair, but with minor problems				2
iv.	Completely free and fair				3

SECTION D: CHALLENGES/WEAKNESSES/CRITICISMS OF BIOMETRIC VOTER REGISTRATION AND VERIFICATION

PLEASE THICK AS APPROPRIATE				Yes	No
Q15.	Do you agree with the view that there are challenges with the 2012/2016 Ghanaian biometric voter registration and verification? If No give reason(Go to Q19)			1	0
Q16.	Which of the following did you experience at the polling station where you voted?	2012		2016	
		Yes	No	Yes	No
i.	Biometric officials seem to have no control over the biometric device/kit	1	0	1	0
ii.	Malfunctioning and breakdown of biometric machines	1	0	1	0
iii.	Inability of the machine to register some voters	1	0	1	0
iv.	Failure of biometric machines to verify some voters	1	0	1	0
v.	Weak enforcement of registration and verification criteria	1	0	1	0

vi.	Well known persons who did not have the required documentary proof were allowed to vote	1	0	1	0
vii.	Voters stayed away from registration and voting because rumors indicated that the biometric device could cause cancer to those exposed to it.	1	0	1	0
Q17.	If yes to Q16iii and Q16iv what was the grounds of these challenges? (please thick only one option)			2012	2016
i.	Burnt ridges			1	1
ii.	Scars			2	2
iii.	Soiled Fingers			3	3
iv.	Underdeveloped Fingers			4	4
v.	Software problem			5	5
vi.	Other (please specify)			6	6
Q18.	Again if yes to Q16iv what form of identification document was used to enable you to vote?			2012	2016
i.	Previous Voter's ID Card			1	1
ii.	NHIS Card			2	2
iii.	Driving License			3	3
iv.	Passport			4	4
v.	I wasn't permitted to vote			5	5
vi.	Other (please specify)			6	6

Q19. Do you agree or disagree with the following statements concerning biometric registration and verification?		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know
a.	The time spent on the biometric voter registration is too much.	0	1	2	3	4	99
b.	The time spent on biometric verification of voters was too much at the polling station where I voted	0	1	2	3	4	99
c.	The paper work and procedure on the biometric voter registration are quite cumbersome	0	1	2	3	4	99
d.	The verification process at where I voted was burdensome to me as a voter	0	1	2	3	4	99

e.	The biometric voter verification procedure slowed down the voting process at the polling station where I voted	0	1	2	3	4	99
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SECTION E: GENERAL PERCEPTION OF VOTERS TOWARD BIOMETRIC REGISTRATION AND VERIFICATION

Q20. Which of the following statements is close to your view	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know
---	--------------------------	-----------------	-----------------------------------	--------------	-----------------------	-------------------

a.	Statement 1: The manual voter registration and verification used in past elections is far better than the 2012/2016 biometric voter registration and verification. Ghana should therefore go back to the manual voter registration and verification in the next elections	0	1	2	3	4	99
b.	Statement 2: The application of biometric voter registration and verification at the polling station where I voted was far better than the manual registration and verification used in the previous elections.	0	1	2	3	4	99
c.	Statement 3: It will be prudent for Ghana to consolidate and continue to use the biometric voter	0	1	2	3	4	99

	registration and verification in future elections.						
d.	Statement 4: Ghana should plan and adopt electronic voting in future presidential and parliamentary elections.	0	1	2	3	4	99

SECTION E: SUGGESTIONS TO IMPROVE BIOMETRIC VOTER REGISTRATION AND VERIFICATION

Q21. If you were to suggest three measures to help improve biometric registration and verification what will it be?

1.
.....
2.
.....
3.
.....

SECTION A: BASIC INFORMATION ABOUT RESPONDENT

PLEASE INDICATE YOUR	
B1.	Gender: a. Male [1] b. Female [2]
B2.	Age group: a. 0-18 [1] b. 19-30 [2] c. 31-49 [3] d. 51 and above [4]
B3.	Level of Education: a. No formal education [0] b. Primary [1] c. JHS [2] d. SHS [3] e. Vocational/Professional Training [4] f. Tertiary (Polytechnic, University etc.) [5] g. Other (<i>Please specify</i>)..... [6]
B4.	Occupation: