Does the use of a biometric system guarantee an acceptable election’s outcome? Evidence from Ghana’s 2012 election

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Does the use of a biometric system guarantee an acceptable election’s outcome? Evidence from Ghana’s 2012 election

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ABSTRACT

The article examines how the deployment of a biometric technology in Ghana’s 2012 election ended in confusion and put the legitimacy of the election outcome in jeopardy. Analysing data drawn from 100 interviews and 500 surveys on the extent to which the use of a biometric voter registration and electronic voter verification technology impacted the election’s outcome, the article found that the biometric system stimulated high voter participation and confidence in the electoral process; and served as a forensic measure against election fraud such as impersonation and multiple voting. However, the problem caused by electronic voter verification malfunction, human error and policy manipulation by polling officials neutralised the efficacy of the biometric technology as an instrument for achieving an election outcome.

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KEYWORDS

biometric system; election result; Ghana; 2012 election

Why, contrary to the initial optimistic expectations about the efficacy of a biometric system to achieve elections’ legitimacy, did it become so hard to implement a biometric voter registration and electronic voter verification for Ghana’s 2012 election? Ghana passed the Constitutional Instruments (CI) 72 and 75 respectively to incorporate the use of a biometric system into the electoral process. The impetus for introducing a biometric system in the election was derived from claims by some scholars that it has the potential to stimulate democratic engagement (Diamond 2010); make participation in elections more convenient (Alvarez, Levin & Sinclair 2012); ‘speed up and streamline several procedures in the electoral process such as registration of voters, casting of votes, and processing election results’ (IDEA 2015: 1); and thereby contribute to the building of a stable political order (Dahl 1989). In particular, the Institute for Democracy and Electoral Assistance (IDEA 2015) notes that the application of information technology (IT) in a democracy promotes efficient organisation, processing, communication, storage and retrieval of information needed by election management bodies. For instance, across much of the developed democracies such as the United States of America, United Kingdom and France, the use of some forms of IT in the hope of affecting voting behaviour of the electorate, has improved transparency of their electoral processes (Lee 2003; Xenakis & Macintosh 2008: 15) and changed significantly, the way voters express their voting intent and how
their votes have been counted and consolidated (Kimura, Kimura, Ho & Kubota 2012; Norton 2007).

On the contrary, in much of Africa, the phenomenon of a biometric system innovation in the electoral processes that gained momentum a decade ago has rather produced mixed outcomes. Yet, Ghana’s Electoral Commission (EC) and the political parties insisted that a fraud-free election was possible by the deployment of a biometric voter registration and electronic voter verification system onto the electoral process. Despite this assurance, the election ended in a controversial outcome with the biometric system lying at the heart of the election legitimacy dispute. Given that the biometric technology formed the basis of the election petition at the Supreme Court, and a caustic public debate has arisen over it, there is sufficient basis for an empirical inquiry to establish the causative factors that pushed the election’s outcome into legitimacy crisis. Yet, anecdotal claims rather than empirical data have dominated the analysis of the critical factors that led to the election conflict and the rejection of the presidential election results by the losing opposition candidate. Besides, the salient question of whether the electoral process did not possess the capacity to implement the biometric technology has not received any attention. The neglect of this vital issue in the election by scholars has been noted by Robert Pastor, ‘when people think of electoral systems, they do not think of the conduct of elections but rather of constitutional questions’ (1999: 123) because ‘developing-country scholars focus on big questions like designing democratic institutions rather than on the outwardly procedural issue of whether nations possess the capacity to implement free and fair elections’ (Eisenstadt 2002: 47).

The few scholars who have explained why elections go bad in developing countries tend to focus on the structure of electoral governance (Mozaffar & Schedler 2002) rather than homing in on the salient factors that force contestations of election results. Therefore, this article gauges the extent to which the application of a biometric system endangered the 2012 Ghanaian election’s outcome. It argues that the failure of a biometric system to achieve an acceptable election outcome is not only caused by biometric technology malfunction but also human error and policy manipulation by election officials. Against this backdrop, the article examines the following empirical questions: Why has a biometric system formed a salient feature of electoral processes of neo-democracies? How has the biometric system transformed the electoral landscapes of developing democracies? Why did the application of a biometric system in the electoral process provoke election controversies and lead to the rejection of the results? What effect did the contestation of the election results in the Supreme Court have on the democratic process?

The article begins by explaining the basis for deploying biometric technology in Ghana’s election. It then examines the application of biometric technology in the electoral process; discusses how the biometric technology impacted the electoral process and the election’s outcome; and examines the ramifications of the use of the biometric system on the democratic development. The article concludes by drawing lessons from the study about a biometric system and elections in emerging democracies.

We begin by interrogating the theoretical and empirical literature in order to determine how these issues are addressed in the study.
The theoretical and empirical literature

Arguably, the theoretical connection between biometric technology and elections is somewhat weak. However, most scholarly works have articulated a link between technology and democracy/politics, albeit insufficient. A more familiar one is the technological determinism paradigm, which portrays the relationship between technology and politics (Ellul 1990), in which Langdon Winner (1986) found that technologies embody specific forms of power and authority, i.e. properties of certain kinds of technologies are intrinsically linked to particular institutionalised patterns of power and authority. Also, the empirical work by Ott & Rosser (2000) as well as Hill and Hughes (1999) have revealed that democratisation has been propelled by IT or the use of some specific functions that are based on the same technology. Hence, in several studies on democracy in advanced societies, ITs have gained popularity in the study of political communication because of their strong influence on the democratic behaviour of the electorate (Lee 2009). For instance, across much of the western world where information technologies have formed an essential part of their democratic processes, political actors and election bodies alike have exploited optical mark recognition (OMR) and electronic voting systems, among others, to improve on the efficiency of the electoral process and the elections’ outcome (Kimura, et al 2012). As in several western democracies, IT has potentially shaped the British/Westminster politics by facilitating new organisational forms that have enabled citizens to interact with their legislators/members of parliament (MPs) (Norton 2007).

Similarly, political life in neo-democracies has been gradually affected by the IT phenomenon. For instance, in South Korea, the phrase ‘Internet election’ is common because politicians have resorted to the use of the Internet in political campaigns and as a means of influencing voting choices (Lee 2009: 1). As in Asia, Ott & Rosser (2000) have noted the particular influence of IT on African democratisation. Through donor-supported initiatives aimed to promote good governance, there has been improvement in the use of IT such as the Internet among large segments of the population in Africa. For instance, the use of IT has enhanced the expansion of policy debates and deliberations between citizens and governments thereby lowering obstacles to participation (Tettey 2001). Christopher Kedzie (1997) who asked whether the status of IT diffusion was a factor in explaining levels of democratisation found after analysing data across 141 countries that, it has helped to dislodge entrenched social and political cleavages, unleashed new patterns of citizen consciousness and civic engagement by hitherto marginalised masses, thereby generating new and decisive political outcomes (Mossberger, Tolbert, McNeal & King 2008; Oates & Gibson 2006).

Despite enhancing the progress of democratisation in Africa, scholars have been sceptical about the overreliance on IT/biometric systems to solve every conceivable problem in the electoral process. Writing on the subject of IT, Robert Dahl cautioned ‘the evolving technology is bound to be used somehow, for good or ill. It can be used to damage democratic values and the democratic process, or promote them’ (1989: 339). On his part, Manuel Castells (2004) has expressed fears about the ‘hope’ that information technology has the capacity to alter political institutions and democratic processes, and Robert Putnam (2000) warned that it can potentially erode social capital. Similarly, the social construction of technology theory has highlighted the importance of human factor in
technology (Joerges 1999). Its advocates regard technology as an ‘interpretable sign’ that only makes meaning through social actions (Hoff 2000). According to Castells, ‘the Internet is a malleable technology that is susceptible to modification by its social practice, thereby leading to a whole range of potential social outcomes’ (2001: 5).

Furthermore, what is often forgotten is that electoral governance rather than the application of IT such as biometric systems has a direct influence on the attainment of election legitimacy. This is because electoral governance, which is about rule implementation tend to evoke an idealised image of bureaucratic routine and mechanical execution of coherent sets of known and tested rules. This, therefore, requires the exercise of discretionary power by field staff (election officials) because of the possible ambiguity and indeterminacy that is inherent in the formal electoral rules and regulations. Thus, partly due to the complex implementation of rules (usually under severe pressure) and partly due to logistical and time constraints, electoral governance often tends to be susceptible to human error and manipulation. Given the innumerable responsibilities that have to be performed in order to achieve an election’s legitimacy, lapses in rule execution are a potential risk for achieving this goal even in the careful application of the most ‘efficient’ IT such as biometric registration and electronic voter verification (Mozaffar & Schedler 2002).

The method

The study adopted a qualitative method to analyse empirical data to ascertain how the use of a biometric system influenced the outcome of Ghana’s 2012 election. The qualitative approach is suitable for this investigative kind of study because it allows the researchers to interrogate the facts that would have been difficult to discover through the quantitative method. Thus, by deploying the qualitative approach, the researchers were able to obtain in-depth information, including follow-ups and feedback from the key informants. The study focuses on the 2012 elections because it was the first time biometric technology entered Ghana’s election since returning to democratic rule in 1992. Besides, the legitimacy of the presidential election result was contested in the Supreme Court.

In order to explain why the biometric system failed to produce a satisfactory election’s outcome, the researchers, first, engaged in face-to-face interviews with 100 key informants. The interviewees were chosen based on the purposive and systematic random sampling methods. Of the total sample, 40 were EC officials (members and staff – permanent and temporary) chosen through the purposive approach. In other words, the EC officials were chosen because of their active involvement in the making and implementation of the biometric system used for the election. Similarly, 40 political party officers and activists3 were selected because they participated in the making of the key electoral decisions regarding the use of the biometric system. In addition, 20 individuals comprising lawyers, IT experts, media anchors, lecturers and civil society activists/CODEO were identified and interviewed. This latter group were members of the legal team of the petitioners and defendants, media anchors and nonpartisan individuals that expressed opinions on the election issues and observed the implementation of the biometric system (all knowledgeable in the use of biometric technology).

In addition, 500 ordinary voters were drawn from 50 polling stations in ten constituencies for a survey. The systematic random sampling method used was similar to the one adopted for the CODEO survey4 which deployed a two-stage stratification method to
sample constituencies and polling stations from the EC’s 2012 constituency and polling station database. The first stage was the national level stratification, which involved the distribution of a target of the ten constituencies across the ten regions on the basis of each region’s estimated percentage share in the total number of constituencies in the country. Next, each constituency in a given region was assigned a serial number and a simple random sampling technique was used to select a constituency. At the second stage of stratification (also at the national level), the estimated percentage shares of each region in the total number of polling stations in the country were used to distribute the targeted number of 50 polling stations across the ten regions. Then, the allocated number of polling stations for each region was distributed across the constituency sampled for that particular region. Lastly, a target of 50 interviews per polling station was set to achieve the overall total of 500 interviewees. Using the voters’ register for each polling station, the researchers picked every other third name on the roll until a total number of 50 voters had been obtained. The interviews and survey were conducted from Monday 1 February 2016 to Tuesday 4 July 2017. In order to address how the biometric technology affected the election’s outcome, the researchers asked questions regarding why it was introduced into the electoral process, implementation, why the technology malfunctioned/failed, the element of human error and policy manipulation by election officials, and the implication of the disputed election results and how the legitimacy crisis it generated and how it affected the democratic process?

The data obtained through the face-to-face interviews and survey were supplemented with a comprehensive literature review on elections/politics and technology. These were then subjected to rigorous content and thematic analysis based on the central question of the study.

**Why was biometric technology introduced in the election?**

It is commonly acknowledged that because democratic elections entail the performance of several electoral tasks, they are almost always infested with technical, human and administrative errors that could result in defective ballots, incomplete and inaccurate voters’ rolls, exclusion of registered voters, inaccuracies in counting and tabulating of votes (Mozaffar & Schedler 2002: 5–6). But some scholars have observed that while these electoral deficiencies also occur in developed democracies, electoral governance crises have been more pronounced in developing democracies (Schaffer 2002: 69). They contend that electoral processes of developing democracies suffer manipulations because authoritarian leaders and some elected incumbents seeking democratic legitimation and re-election respectively often circumvent the electoral structures and processes in the hope of securing favourable outcomes. For instance, in Ghana’s transition election of 1992, the carefully orchestrated introduction of certain indemnity clauses in the constitution, the politically motivated appointment of the Interim National Electoral Commission (INEC) and the refusal of the regime to undertake fresh registration of voters was part of the official design to undermine the attainment of democratic elections (Interviews, Party officers, February 2016; also see Commonwealth Secretariat 1992; Debrah 2011; NPP 1992; Oquaye 1995). In the absence of depoliticised administration of elections, particularly when the incumbent also participated in the election contest, the opposition parties read technical failures as orchestrated fraud (Mozaffar & Schedler 2002; Oquaye 1995).
Hence, as was the case of Ghana’s 1992 elections, the intersection between political suspicion and technical incapacities sparked a colossal dispute that had the potential to derail the democratic process. In consequence, the four opposition parties that lost the November 1992 presidential election and boycotted the December parliamentary polls (since they were held one month apart) contended that the results of the election had been rigged to deny the NPP presidential candidate victory (Interview, NPP official, February 2016). Among the charges filed against the election management body by the losing opposition parties included impersonation, double voting, under-aged voting, ballot box stuffing and a bloated voters’ roll (Commonwealth Secretariat 1992). According to the opposition parties, the inadequate attention to operational details of the management of the election seriously compromised the credibility of its outcome (Interviews, Party activists, March 2016).

In consequence, the opposition parties set stringent conditions that had to be met before returning to the electoral field. In particular, they demanded ‘completely new voters’ register to be compiled and identification cards issued to voters’ (Ayee 1998: 61). According to the opposition, the bloated voters’ register led to impersonation, under-aged voting and multiple voting by agents of the regime (NPP 1992: 16). They further alleged that the manual registration of voters and the paper-based storage of voter information, which led to double entries of names and omissions of eligible voters, disenfranchised a large segment of the citizenry (most of whom were opposition supporters), thereby undermining the integrity of the elections (Interviews, Party activists, February 2016).

To obtain a credible electoral process and unproblematic voting, these constraints dictated a high degree of attention not only by the election management body, the EC, but also political parties and citizens alike. Thus, in March 1995, the electoral actors agreed to implement radical changes in the election mechanics, which began with the compilation of a new voters’ register nationwide in some 16,000 designated centres (Interview, EC official, February 2016). In sharp contrast to the past manual registration of voters, the register was computerised. The process involved the initial capturing of voters’ personal information on OMR forms/sheets, which were later sent to the EC’s head-office for processing. The photograph of each prospective voter was also taken instantly and attached to the form. The overall voters’ data, namely the OMR sheet and photograph were scanned at the IT department of the EC onto the computer and electronic storage devices. The list of those eligible to vote was electronically generated and alphabetically arranged by region, constituency and polling station, and later produced in both soft/CD-Rom and computer printed hard copies (Interview, EC IT director, February 2016). Each voter received a computer printed voter ID card and by 2008, all eligible voters had been issued a photo voter identification card (Interviews, Party officers & EC officials, March 2016).

However, it must be emphasised that instituting full-proof measures to prevent technical, human and administrative problems in developing countries’ elections that are often soaked in corrosive suspicion is a gigantic effort with many uncertainties. Thus, despite the gains made regarding the restoration of voter confidence in the election process, deep-seated distrust of the integrity of the election administration to achieve democratic outcomes persisted, thereby impeding pragmatic tradeoffs between organisational efficiency and the establishment of institutional safeguards against fraud and
manipulation (Mozaffar & Schedler 2002). Against the backdrop of a growing public outcry for superior electoral measures to address the re-occurrence of fraud – despite the reform initiatives – compilation of an electronic voters’ roll, provision of photo-identification cards and transparent ballot boxes, the issue of election fraud did not go away (CDD 2000), the political elite reached a consensus through the Inter-Party Advisory Committee (IPAC) platform to adopt the technological solution. A key ingredient in the pre-election IPAC debates was the introduction of biometric technology for the 2012 elections. Indeed, reference to the use of the biometric technology in the election entered the electoral reform debate through the political parties’ platforms. Arguably, the domination of biometric technology in the election debates was, in part, a reflection of the parties’ conviction that ‘it was the major authentic mechanism against election fraud’ (Interviews, Party officers, July 2017). IPAC consensus affirmed that, ‘including biometric technology in the elections was necessary in order to deal authoritatively with practices of multiple voting and impersonation that tends to undermine public confidence in declared election results’ (IPAC minutes, May 2016).

Also known as a biometric system, biometric technology refers to an automated method of verifying or recognising the identity of a living person based on physiological or behavioural characteristics (Wayman 2000). It is a system that establishes a person’s identity based on pattern analyses carried out on specific human traits. Basically, biometric technology relies on measurable physiological or behavioural characteristics that can be utilised to verify the identity of a person (Rhodes 2003). The physiological-based biometric system includes fingerprint, retina, iris, hand geometry, hand vein, ear shape and facial recognition systems. The basis for depending on these features is that they are usually unalterable without causing trauma to the individual. On the other hand, behavioural biometric characteristics such as voice recognition, keystroke dynamics and signature are traits that are deemed to be generally stable and unique (Jain, Ross & Prabhakar 2004). A biometric system works by linking a person to a biometric pattern and identity data (common name), personal attributes (age, gender, profession, residence, nationality, polling station, constituency, district, region, etc) with samples such as fingerprints (Wayman 2000). When an enrolled person wants to use the system later, he/she must show his/her biometric characteristics by presenting him/herself to some form of scanner, which compares the characteristics to the previously-stored biometric ‘template’. If the characteristics match correctly with the database, then the user is granted access to the system (Shen-Pei Wang 2007: 2).

In spite of this, it has been argued that there is no single biometric system that effectively meets all the requirements such as accuracy, practicality and cost of the applications. The match between a specific biometric and an application is determined depending upon the requirements of the application and the properties of the biometric characteristics (Uludag, Pankanti, Prabhakar & Jain 2004). Simply put, determining the ‘true’ identity of a person is beyond the scope of any biometric technology. Similarly, the performance of a biometric system and its suitability for any particular task largely depends on the interaction of the individual with the automated mechanism (Wayman 2000). Since all biometric systems, regardless of the underlying technologies, heavily depend on input devices which are subjected to operational constraints, there are occasions where the captured samples are of insufficient quality (Prabhakar, Pankanti & Jain 2003). In such a situation, they may fall short of the ‘collectability’ requirement which in turn hinders
recognition (Jain, Ross & Prabhakar 2004). In particular, scholars have explained that a biometric authentication system makes two types of error: first, mistaking biometric measurements from two different persons as one person (false match); and second, mistaking two biometric measurements from the same person as from two different persons (false non-match). These two types of error are often termed, false accept and false reject respectively (Uludag et al 2004).

While acknowledging the pervasiveness of errors inherent in all technology, it is expected that an ideal biometric system would satisfy the ‘universality’ requirement, which essentially implies that it should be usable to all or at least, the majority of the population because the fundamental goal is with the cost effectiveness of a biometric investment (Jain, Ross & Prabhakar 2004). The biometric system was administered in two-fold, a biometric voter registration, and electronic voter verification.

The biometric voters’ registration

After having served African democracies for decades, the manual voter registration is gradually being replaced by technologically more advanced ways of voter registration in many countries. For instance, in March 2012, Ghana’s EC implemented a biometric voter registration that involved the use of computers, fingerprint scanners and digital cameras to capture the bio-data of voting applicants. The electoral stakeholders were convinced that because fingerprints are unique to every individual once they are captured together with other personal information and stored on the computer from which a voters’ register is produced, the method would prevent election fraud such as minors and multiple registrations (Interviews, Party officers & EC officials, March 2016). While the voters’ personal data were captured onto a laptop, their ten fingerprints were scanned and stored on the biometric device (BD) (Interviews, Registration officials, March 2016).

Public exhibition of provisional voters’ registers is an essential component of voter registration processes in developing countries such as Ghana. The overall rationale was to clean the register: first, it allowed those who registered their names to check the authenticity of their registration information; second, those whose names had been inadvertently omitted were included; and, third, names of deceased were deleted from the roll (Interview, EC official, February 2016). In sharp contrast to the previous voter exhibition exercises where registered voters walked to registration centres to verify the authenticity of their data on the provisional register, the current system allowed for an electronic check. Registered voters could send text messages of their ten-digit voter ID numbers issued to them during the registration to a mobile short-code (1413), which instantly confirmed their voter registration status (Interviews, EC officials & voters, February 2016).

Biometric voter registration has been generally hailed as the modern way to capture and store biostatistics of voters, which is similar to what pertains at visa sections of high commissions/embassies and criminal divisions of the police, and providers of driving licenses and passports (Interviews, IT experts, March 2016). Findings from this study show that the general voting public regards the inclusion of the biometric voter registration as a milestone in Ghana’s electoral reform effort. Asked why they think the introduction of the biometric voter registration was a major step forward in Ghana’s democratic elections, more than half (54.7%) said it helped improve the quality of the election
process. Some interviewees shared similar opinions when they noted, ‘the use of the biometric voter registration signalled to the political stakeholders that the electoral process would produce an acceptable election outcome’ (Interviews, EC officials & voters, February 2016). When interviewees were further asked to indicate how it enhanced the integrity of the election process, the EC staff that participated in the implementation of the biometric voter registration at the centres said, ‘it instigated voter confidence in the election’ (Interviews, EC officials, March 2016). Indeed, on the crucial rating of confidence-building, an absolute majority of respondents (92.4%) said the biometric registration convinced them that the election would be free and fair. Views gathered from some interviewees did not differ from the fact that the ‘integration of the biometric voter registration into the electoral process assured voters that the election would be democratic’ (Interviews, Voters, February 2016). As one junior high school teacher interviewee revealed, ‘it was the biometric voter registration that boosted my family’s confidence in the election’ (Personal communication, Kofi Kyei, February 2016). Similarly, a small number of civil society activists indicated that the biometric voter registration ‘stimulated popular/voter trust in the election process’ (Interviews, Civil society activists, March 2016).

The biometric voter registration further engendered the political parties and their ardent supporters’ faith in the election. Specifically, it altered the parties’ perception about the possible occurrence of election fraud. As the political parties’ interviewees rightly admitted, ‘it helped to change our attitudes and posture from hostility to collaboration’ (Interviews, NPP & NDC respondents, February 2016). In particular, the opposition parties (NPP, PPP & CPP) that were ‘distrustful of the election process to produce a credible outcome held separate press conferences in which they publicly announced their support for the election process’ (Interviews, Party officers, February 2016). Even ‘the incumbent NDC that had earlier expressed doubt about its capacity to transform the electoral mechanics made a “U-turn”, and persuaded its supporters to have confidence in the election process, and actively participated in its implementation’ (Interviews, NDC officers, March 2016). Hence for 78 per cent partisan respondents, the biometric voter registration set the tone for party enthusiasm in the election process. The same group of respondents remarked that the party caucuses recognised the technological innovation the biometric system brought to the electoral process and consequently gave their approval for its inclusion.

The overwhelming support given by the political parties for the inclusion of the biometric voter registration in the election process ignited a general euphoria to the effect that ‘it would be the principal antidote to the lingering election fraud conundrum’ (Interviews, Voters, February 2016). Convinced that it has the capacity to achieve a ‘fraud-free’ election outcome, civil society groups (policy think-tanks) such as the Danquah Institute, Institute of Economic Affairs (IEA) and the Centre for Democratic Development organised workshops to sensitis the public on its efficacy. Hence, when asked to indicate the influence the biometric voter registration had on the election, some interviewees said, ‘the voters’ roll produced from the biometric database was somewhat accurate’ (Interviews, EC & NDC officials, February 2016); ‘it made cleaning of the register relatively easy’ (Interview, EC IT director, March 2016); ‘the search for names on the list was done electronically and at a faster rate’ (Interviews, EC & party activists, March 2016); ‘statistical reports were produced from it’ (Interview, IT expert, March 2016); and ‘it made for easy update of registration files and therefore less costly to the taxpayer’ (Interview, Lecturer,
March 2016). Thus, more than half of the respondents (67.8%) rated the biometric voter registration higher over the manual registration because unlike the traditional registration system, which involved manually filling out voters’ information on varieties of forms, the biometric voter registration was computer-based (Interview, EC IT director, February 2016). Above all, it widened the scope of voter participation in the registration process (Interviews, EC officials, March 2016). As can be seen from Table 1, which shows trends in voter registration turnout, there was an extremely higher voter turnout during the biometric registration than in previous registration exercises. The exponential increase in turnout, numerically from 69.5 per cent in 2008 to 79.43 per cent in 2012 out of a total population of 25-million is a reflection of remarkable popular confidence in the biometric voter registration (Interviews, EC official & lecturer, March 2016).

Despite these, the use of the biometric voter registration was not uncontroversial. The fundamental question worth asking is whether the biometric system used had a superior functioning capability to neutralise election fraud? Evidence gathered from this study demonstrates the pliability of the biometric technology as an instrument for achieving a credible voters’ register. For instance, some party activists maligned the biometric technology as having ‘obstructed the attainment of democratic elections because it failed to act as a powerful check against multiple registrations’ (Interviews, Party officers, February 2016). Indeed, the EC admitted after the registration exercise that ‘4,000 multiple registrations and other irregularities occurred’. Some voters managed to register at several centres thereby bloating the voters’ roll. More disturbing was the omission of names of some eligible voters and the inclusion of minors (under age) on the voters’ roll. Some interviewees confirmed the fact that, at least, ‘nine police personnel could not vote in the special/early voting because they could not locate their names on the voters’ roll at the District Administrative Block of the Jomoro constituency’ where they registered (Interviews, Police officers & media anchors, March 2016). Also, the researchers discovered that close to two-thirds (70) of potential voters who registered at Hedonits Centre at Ayigya and Silicon Centre at Kentinkrono in the Kumasi metropolis could not locate their names on the provisional voters’ roll during the voter exhibition exercise (Interviews, EC officials, February 2016). Similarly, a whopping 129 interviewees/respondents disclosed that ‘they did not find their names on the voters roll’. Yet, the EC’s manual and electronic records showed that the prospective voters were biometrically enrolled at their respective registration centres.

In order to establish the perceived weaknesses in the biometric voter registration process, we asked respondents whether they thought the biometric system malfunctioned. Both respondents and interviewees affirmed that the biometric technology did

<table>
<thead>
<tr>
<th>Registration/election year</th>
<th>Number of voters registered</th>
<th>Voter registration turnouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>7,401,370</td>
<td>50.2</td>
</tr>
<tr>
<td>1996</td>
<td>9,279,596</td>
<td>78.2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2000</td>
<td>10,696,652</td>
<td>61.9</td>
</tr>
<tr>
<td>2004</td>
<td>10,354,970</td>
<td>75.12</td>
</tr>
<tr>
<td>2008</td>
<td>11,472,758</td>
<td>69.5</td>
</tr>
<tr>
<td>2012 &lt;sup&gt;*&lt;/sup&gt;</td>
<td>14,831,793&lt;sup&gt;a&lt;/sup&gt;</td>
<td>79.43&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>The biometric registration was introduced in the 2012 election.
<sup>b</sup>This was the first time voter registration was computerised (Source: Interview, EC IT director, March 2016).
not function as expected. For instance, when asked to indicate whether the biometric system failed to function, close to two-thirds (63.1%) responded in the affirmative, while 37.9 per cent blamed the issue on non-technological factors. Similarly, a number of interviewees ‘attributed defections in the voter register to the inability of the biometric instrument to function efficiently’ (Interviews, voters, February 2016). In explaining the nature of the biometric voter registration problem, a considerable number of voters said, ‘the biometric machine could not efficiently scan the figure prints of some voters’ (Interviews, voters, February 2016). Another group of interviewees observed that, ‘the ten fingerprints of the voters were scanned by the biometric device but unfortunately the machine failed to capture them’ (Interviews, Registration officials, March 2016). Also, a majority of respondents (68.7%) revealed that in several registration centres, the biometric device could not run continuously for more than four hours. This is because ‘when exposed to direct sunlight, the biometric device/scanner heated and suddenly went blank – and failed to respond’ (Interviews, Registration officials, February 2016). This slowed the registration process thereby causing frustration among those seeking to enrol. For instance, more than two-thirds (83%) noted that it took between six and eight minutes to complete the enrolment process. Yet, it has been observed that a successful biometric enrolment of voters is largely contingent upon the speed of operation of the biometric system. For instance, in a study that examined the time needed to use a ten-fingerprint system, as used in the Ghanaian election, it was found to take an average of two minutes (one minute for instructions and one minute for the biometric scanning) (Jain, Ross & Prabhakar 2004; Shen-Pei Wang 2007). Yet, voter registrants spent not less than eight minutes being enrolled biometrically to vote (Interview, Registration official, February 2016).

The problems enumerated above have been found to be common with the use of biometric systems. For instance, some interviewees (IT experts) noted that ‘biometric malfunction often leads to the “failure to enrol rate (FER)” syndrome, which refers to the rate at which people are not able to enrol in a biometric system’ (Personal communication, Joyce Buah & Joshua Nertey, February 2016). It was further explained that such problems were caused by ‘missing or weak biometric characteristics such as missing fingers and faint fingerprints’ (Interviews, EC officials, March 2016; also see Shen-Pei Wang 2007: 2). To be sure, of those who had challenges with their biometric voter registration, 72 affirmed the fact that they had defections on their fingers while 34 said the body lotion used on their palm left oily substances on their fingers thereby impeding the scanning process’ (Interviews, Voters, February 2016). Another reason was the ‘failure to acquire rate (FTA)’, which occurred because ‘the biometric system failed to capture the records/particulars of those who were “supposedly enrolled” due to environmental conditions such as bad lighting and dirty sensors, among others’ (Interview, EC IT director, February 2016).

Yet, another observation from the study shows that the failure of the biometric registration to perform the expected function of safeguarding against election fraud was a consequence of human error. For instance, close to half of respondents (47.3%) attributed the problems associated with the biometric voter registration to the incompetence of the EC temporary registration staff. According to these interviewees, ‘the plausible explanation to the double registration problem was that the EC staff did not possess the capacity to operate the biometric machine/device’ (Interviews, Voters, February 2016). For instance, some interviewees said ‘the EC did not ensure that the biometric technology perform a coordinating function to link one registration centre to another in order to detect
double registration, rather it chose to solve the problem of multiple registrations post facto’ (Interviews, IT experts, March 2016). Similarly, a majority of respondents (84.7%) argued that ‘by programming the biometric system to act independently of each other at the registration centres, the EC made it possible for the election fraudsters to implement their plans’ (Interviews, Voters & civil society activists, March 2016). By the biometric system set up, double registration could only be detected after the registration database from the various centres were assembled and processed by a central server (Interviews, EC IT director & ICT experts, March 2016).

Furthermore, what accounted for the inadvertent deletion of names of genuinely registered voters and the registration of persons below the voting age of 18 years were partly errors committed by EC registration officials. The researchers found that the EC officials committed many mistakes during the enrolment process, which led to the wrongful deletion of names of some voters from the voters’ roll. Interestingly, many such problems were human rather than technological errors. For instance, according to 52.8 per cent of respondents, some of the registration officials spelt names incorrectly, inconsistently arranged names by family names/surnames, or recorded residential addresses and ages of applicants incorrectly. The more egregious aspect of the error was ‘the failure by some EC registration officials to save/store the registration particulars/data of the voters on the computer’ (Interview, EC IT director, March 2016). A group of interviewees, largely EC registration officials confirmed the fact that ‘the case involving deletion of names arose from official negligence’ (Interviews, Registration officials, March 2016). The researchers discovered from the EC’s registration records that some of the ill-trained EC registration officials did not save/store some of the voters’ registration information on the computer’ (Personal communication, EC IT director, March 2016). Therefore, in the opinion of a little over half of the respondents (53.4%), ‘it was the laxity of the EC registration officials, which led to the deletion of the names of prospective voters’ from the roll.

On the other hand, the registration of minors was instigated by some of the political parties. One of the key strategies of the political entrepreneurs, particularly in most rural and suburban constituencies involved the mobilisation of the under-aged to register to vote. As some interviewees rightly explained, ‘local party elites sponsored mass recruitments of under-aged persons in the constituencies, and falsified their registration information in order to get them on the voters’ roll’ (Interviews, Voters, February 2016). A majority of respondents (56.4%) who confirmed the prevalence of minor registration insisted that ‘the local politicians were motivated by self-serving interests to instigate the minors’ registration’ (Interviews, Voters, February 2016). However, the researchers found that the extent to which the minors were able to enrol on the biometric system largely depended on the collaboration of the EC registration officials with the politicians. For instance, a minority (48.7%) of respondents charged that the EC registration officials connived with some of the political parties to register the minors. They opined that, ‘some of the EC registration officials ignored objections raised by the party agents against the inclusion of some minors’ (Interviews, Voters, March 2016). As one respondent retorted, ‘if the EC registration officials had not agreed with some of the parties to rig the election, they would not have registered the minors’ (Personal communication, Martha Dubartey, March 2016). Of the 150 party agents’ respondents, a whooping 142 indicated that the EC registration officials refused to act upon their complaints concerning the registration of the under-aged persons’ (Interviews, Party activists, March 2016). Hence,
53.6 per cent of respondents even alleged that the EC registration officials obtained monetary considerations from some of the political parties in exchange for the enrolment of the minors.

The failure of the biometric voter registration to produce a clean voters’ roll fuelled suspicion among the opposition parties, particularly the NPP that ‘the biometric voter registration process opened up new frontiers for the perpetration of election fraud’ (Interviews, Party activists, March 2016). Hence, a few months to the 2016 elections, the integrity of the voters’ roll became a subject of controversy with the opposition NPP leading a nationwide crusade for the rejection of the biometric voters’ register because it contained names of unqualified voters.7 According to some respondents, the scathing attacks levelled against the voters’ register by the critics annulled the earlier claim that, ‘the biometric device is a superior technology for enrolling voters’ (Personal communication, EC former director, March 2016). Similarly, 41.3 per cent of respondents lamented, ‘the growing popular dissatisfaction with the current register is indicative that the biometric system lacks the capacity to eliminate multiple and minors’ registration’ (Interviews, Voters, March 2016). However, 48.3 per cent of respondents contended that it was largely the complicity of the EC registration officials with the parties that robbed the biometric voter registration’s capacity to produce a voters’ register that is ‘accurate, complete and acceptable to all the actors’ (Commonwealth Secretariat 1992).

The electronic biometric voter verification

As already noted, concerns about vote rigging on polling day such as impersonation, multiple voting and ballot box stuffing led the EC to introduce the biometric voter verification system. It refers to the use of electronic devices to verify the identity of voters by fingerprints at polling stations (DRI 2015: 1). The fingerprint verification method is widely regarded as more efficient than the use of photo identification cards because it can help find duplicate records in the electoral roll and conduct post-election audits so as to confirm voters’ participation in the voting. The most efficient way of using a voter verification instrument on large populations requires having the electronic verification device at several points. As a result, the EC allocated an electronic biometric voter verification device to each polling station for purposes of ‘verifying the fingerprints of all voters before they cast their ballots’ (Interviews, EC officials & party agents, March 2016).

To what extent did the electronic biometric voter verification enhance credibility of the election? As already explained, the expected outcome of deploying the electronic biometric verification system in the election was to prevent polling-day fraud. On this score, some interviewees said, ‘the polling-day verification of voters represented a significant improvement towards eliminating election malpractices in Ghana’ (Interviews, Voters, February 2016). Civil society activists that were part of the CODEO group confirmed, ‘the verification of voters before they cast their ballots obviated possible double voting’ (Interviews, Civil society activists, March 2016). Even many partisan interviewees acquiesced to the NPP presidential candidate’s conviction that:

The inclusion of a biometric verification system would do away with the phenomenon of multiple voting because the deep mischief that has to be cured if there is to be constant support for the electoral process in Ghana is to prevent multiple voting.8
Apart from acting as a check against multiple voting some interviewees indicated that ‘the electronic voter verification system limited voters’ ability to impersonate, and discouraged polling officials’ ability to falsify voter turnout figures’ (Interviews, Voters, March 2016).

A priori, one would have thought that an electronic biometric verification system sets the standard against which all other methods of voting are judged. After all, according to some interviewees, ‘many people who have obtained passports, driving licenses and travelling visas are familiar with its vitality’ (Interviews, Voters, February 2016). As 84 per cent rightly explained, ‘one of the most important factors in the success of a biometric system is its accuracy’ – a measure of how well the system is able to correctly match the biometric information from the same person and avoid falsely matching biometric information from another (Shen-Pei Wang 2007). Indeed, it was anticipated that the biometric verification would achieve a high ‘True Acceptance Rate (TAR)/True Match Rate (TMR)’ (Interview, EC IT director, March 2016). In other words, it was expected that the biometric system would be able to correctly match the biometric information from the same voter. Yet, the majority of respondents (56%) did not think that the biometric voting verification system safeguarded the integrity of the voting because there was a relatively high ‘false non-match rate’ known as ‘Type I error’ (Interviews, IT experts, March 2016). For instance, one in 20 voters confirmed the prevalence of False Rejection Rate (FRR)/False Non-Match Rate (FNMR) (Interviews, Voters, February 2016). In other words, there were many voters whose fingerprints failed to match against their biometric records in the database. This was confirmed by more than two-thirds of respondents (78%) who said, the biometric verification device failed to recognise or match some voters’ fingerprint images. This implied that by the ‘No verification, No vote’ rule, ‘those affected by the “false rejection rate”, i.e. voters whose identities could not be verified by the biometric verification device were disenfranchised ab initio’ (Interviews, Lawyers, March 2016).

Admittedly, one of the greatest lapses in the use of the electronic biometric voting verification system, which led to the low popular confidence rating of the election was ‘the difficulty of assisting the “false rejected” to vote by other means of voter identification’ (Interview, EC IT director, March 2016). As the majority of respondents (87%) rightly noted, the EC failed to provide alternative means for those whose identities could not be verified by the biometric machine to vote even though they were genuinely enrolled as registered voters – they had their names on the voters’ register and possessed valid voter ID cards. In the past, possible disenfranchisement was averted by the inclusion of manual verification of voters as backups (Interviews, Party activists, March 2016). Also, unlike in the 2012 elections, electoral instruments that governed previous elections contained provisions where voters who made mistakes on their ballot papers obtained a new ballot. For instance, if a voter made a wrong choice on the ballot, he traded the spoilt ballot for a fresh one. However, in the biometric verification dispensation, those who received extra ballot papers and voted (as close to 2,000 voters did) caused mathematical calculation difficulties for most polling officials – the numbers did not add up, thereby leading to what became known as over-voting – a phenomenon in which the ballot papers cast in a polling centre were more than the number of voters verified by the electronic voter verification machine (Interviews, EC officials & CODEO, March 2016). Arguably, the issue of over-voting attracted considerable attention at the Supreme Court hearings. It was clear from this study that of the 600 interviewees that commented on the election, more than two-thirds (497) raised the issue of over-voting. While a small number of
interviewees (103) said over-voting did not happen in the election, a colossal 352 said ‘vote 
“rigging” (voting irregularity) occurred around over-voting’ (Interviews, Voters, February 
2016).

The findings further showed that the EC temporary polling staffs were partly respon-
sible for the operational lapses of the electronic biometric verification device. More than 
half of respondents (62%) said, the EC polling staff that managed the electronic biometric 
verification did not have the wherewithal to operate the technology. Overwhelmed by its 
complexity, many of the polling staff adopted the “try and error” approach in the handling 
of the electronic biometric device’ (Interviews CODEO, party agents & IT experts, March 
2016). According to 62 per cent of respondents, it was the lack of professional handling 
of the biometric verification devices, exemplified by the intermittent removal and 
wrong replacement of batteries by the EC temporary recruited staff which caused the 
abrupt system failures at many polling centres on voting day (Interviews, IT experts & 
CODEO, March 2016). As some interviewees confirmed, ‘in several polling stations, some 
polling staff removed the batteries out of curiosity, others could not replace them when 
the machine suddenly went off, and others forgot to carry the backup batteries’ (Inter-
views, Voters & CODEO, March 2016). Researchers discovered that the plausible expla-
nation for the mishandling of the electronic biometric voter verification device was the 
‘inadequate pre-polling training and education given to the EC temporary polling staff’ 
(Interviews, CODEO, IT experts & party activists, February 2016). For instance, of the thou-
sands recruited, ‘only about one-tenth had sufficient knowledge in computer applications’ 
(Interviews, IT experts, February 2016). According to 56 per cent of respondents, the 
polling staff drawn largely from teachers and junior public servants did not have 
sufficient understanding of the use of the biometric voter verification device. Also, inter-
actions with some respondents by the researchers revealed that out of 126 polling staff 
who were interviewed (because they were among those that operated the biometric 
voter verification machine), only 13 had some fair understanding of how the electronic 
device functions. While it is generally acknowledged that enforcing ideal human-
machine interactions is difficult, ‘the poor manner in which the EC temporary staff inter-
acted with the electronic biometric voter verification machine because they failed to 
acquaint themselves with the instruction manuals was partly responsible for their break-
downs in many polling centres’ (Interview, IT expert, March 2016). Indeed, Wayman, Jain, 
Maltoni & Maio (2005) and Seo, Kim & Kim (2012) have already explained that the deploy-
ment of biometric technology to the electoral process will often take a while for the 
general users to get accustomed to its operation. Yet, ‘the EC failed to recognise the 
fact that the introduction of new technologies in elections comes with extensive training 
for those who will use the electronic devices because of the likelihood that a controlled 
environment always presents a great potential for system malfunction’ (Interview, IT 
expert, February 2016). The EC also ignored the fact that technological infrastructure 
such as delivery, installation and maintenance, among others, that support the use and 
function of a biometric verification machine largely depends on electrical power, 
backup batteries and replacement devices (Interviews, IT experts, February 2016).

Another factor that contributed to the election dispute was the manipulation of the 
administrative policy governing the election by the EC temporary polling staff. Over-
whelmed by the problems caused by the electronic biometric verification malfunction, 
the EC issued a memorandum on the evening of 7 December 2012, directing that:
At polling stations where the biometric verification of voters could not be completed and as a result, some voters in the queue could not be processed to vote …, polling should continue tomorrow, Saturday 8th December, 2012 to give the opportunity to the affected persons to vote. Presiding Officers should arrange with the police for the safe custody of all ballot boxes and election materials. (Safo-Kantanka 2012: 1)

Did the EC’s statement reinforce the pre-polling policy of ‘No verification, No vote’? Yet, there was no uniformity in the implementation of this directive. Field officials exercised operational discretion in carrying out the administrative order from the EC headquarters. Hence in some constituencies such as Dome-Kwabenya in Accra, polling officials adjourned voting to 8 December 2012. On the other hand, officials in some constituencies ignored the EC’s administrative instruction and extended voting beyond 5pm on 7 December 2012. For instance, in Tamale Central constituency, the EC field officers extended voting in 413 polling stations from 5pm on 7 December 2012 to dawn on 8 December 2012 (Interviews, Voters & EC officials, March 2016). Similarly, ‘voting occurred in some 2,240 polling stations without the voters being verified biometrically’ (Interviews, Lawyers, March 2016). Similarly, in Bekwai Experimental JHS polling station, 294 out of the 395 registered voters voted without being verified by the electronic biometric verification (Bawumia 2012).

The incongruity in the application of the EC election order/policy on voting was interpreted by the NPP as a ‘manipulation of the polls in favour of the NDC’ (Interview, NPP executive, March 2016). For instance, the NPP charged that only in its strongholds such as Dome-Kwabenya constituency in Accra was the EC’s policy of ‘No verification, No vote’ implemented to the letter. According to the NPP, elsewhere such as ‘the NDC throttlehold of Tamale Central constituency, voting went on after 5pm on December 7, 2012 uninterrupted – without adjournment of the polls’ (Interviews, MPs, March 2016). Hence, a small number of voters and partisan interviewees totalling 276 believed the ‘widely reported cases of electronic biometric verification device malfunction was a deliberate manipulation triggered by the EC temporary polling staff to circumvent the polling process in order to give advantage to their preferred political party’ (Interviews, Party activists, March 2015).

It has been suggested that deficiencies with elections in many African countries may be related to cost. In particular, elections form one of the huge budgetary expenditures of the government of Ghana. While donors have consistently provided funding support to Ghana’s elections, the huge capital outlays involved in the elections have weighed heavily against the scarce government resources. For instance, it was estimated that the cost for holding credible elections in 2012 would be between US$70- and US$80-million. Of the estimated budget of GH¢243,528,305 for the 2012 election, GH¢148,942,378 was earmarked for biometric voter registration, GH¢7,477,966 for exhibition of the provisional register and the remaining GH¢87,107,961 was allocated to other logistics, public education, hiring and training of election staff, among others. Yet, budget inflows from government to the EC have been slow, delayed, and reviewed downwards to the detriment of quality elections. For instance, at the close of 2011, a little over 50 per cent of the total election budget had been released to the EC.11

Findings from the study also reveal a relationship between funding for election and the result it produces. Some interviewees, albeit few noted, ‘the quality of the 2012 elections was compromised because of paucity of funding’ (Interviews, Party officers, July 2017). For
instance, they explained that it would have cost the EC more to obtain efficient software for the biometric technology. However, given the dwindling domestic revenues and stress over scarce funds, the EC’s election budget could not support the acquisition of high performing biometric technology (Interviews, IT & financial analysts, July 2017). They opined that the efforts made to upgrade the biometric software bolstered the quality of the 2016 election (Interviews, IT & financial analysts, July 2017). The same budgetary constraints forced the IPAC to reduce the projected 30,000 polling stations to 29,000 in the 2016 election (IPAC minutes, May 2012).

**Ramifications on Ghana’s democratic development**

To what extent did the disputed presidential election result affect the democratic process? It must be emphasised that while the biometric system opened up frontiers and offered innovative possibilities for the electoral processes’ efficiency, there were unforeseen risks associated with its application that virtually distorted the smooth democratic process. For instance, the overwhelming majority of respondents (93%) said the legal challenge to the legitimacy of the presidential election results at the Supreme Court led to general uncertainty about the future prospects of Ghana’s democracy that had already attained a high level of international credibility. Asked why they thought the legal challenge to the election result posed a threat to the enviable democratic accomplishment, 95 per cent said, the voters’ anxiety regarding whether their candidate would be declared the winner by the Supreme Court or not affected their perception about the prospect of achieving a peaceful political transition. This is because according to a majority of respondents (96%), the intense post-election inter-party conflict presented a bleak picture of any hope of sustaining political order. Indeed, the political temperature, which reached its apogee, gave a ‘false’ impression of a looming political-cum-ethnic conflict. The perception of an imminent political conflict affected the extent to which citizens enjoyed and exercised their fundamental rights and freedoms. For instance, the majority of respondents (87%) confirmed how the inter-party conflict imposed unregulated restrictions on group mobility (76%), personal censorship of free expression (82%), and criticism of government (93%) throughout the duration of the determination of the winner by the Supreme Court. These popular apprehensions were largely informed by experiences of post-election violence in countries such as Kenya, Côte d’Ivoire, Liberia and Sierra Leone, among others, where disputes over election results triggered mass ethnic violence leading to state collapse, famine, disease, squalor and truncation of their democracies (Interviews, Lecturers, March 2016). Hence, a majority of respondents said they restricted their political participation in the governance process during the period because of the fear of a possible repeat of the post-election carnage which occurred in the neighbouring countries that decimated the population (73%), created extreme insecurity (84%), and forced psychological trauma (82%) on the people.

The findings show that the election dispute virtually truncated parliamentary debates on the critical national issues that needed action of the authoritative decision-makers. According to some interviewees, ‘from the beginning, it became evident that the unco-operative attitude of the opposition parliamentarians with the “hanging government” would derail the legislative process’ (Interviews, Lecturers, MPs & lawyers, March 2016). The conduct of the opposition MPs in the House when the incumbent president delivered
the State of the Nation Address signalled the depth of the inter-party gulf. The expression of their rejection of the government was not only dramatised through written placards but also in insults and hate speeches (Interviews, MPs, March 2016). In the opinions of some opposition MPs, ‘the group behaviour against the government in the House demonstrated our resolve to remain uncooperative with the “illegitimate” government’ (Interviews, MPs, March 2016). Opposition-government conflict exacerbated any time new issues emerged at the Supreme Court regarding the election petition. Even when conflict abated because lawyers involved in the election petition completed their ‘legal gymnastics’, parliamentary affairs ran into deadlocks as opposition coalition discredited the ruling government’s prescriptions regarding how to overcome the conflict. Besides, the uncertainty about the outcome of the election dispute restrained the government from introducing new policy proposals. As each side of the political divide looked forward to becoming MPs of the ruling government, they hardly took active interest in parliamentary discourses during the politically intense period (Interview, Mike Oquaye, former deputy speaker of parliament, March 2016).

The uncertainty about the future of Ghana’s democracy was further reflected in the inability of the president to form the government due to lack of a mandate. With the fate of the government that hanged in the balance, it was impossible for the president to choose his cabinet and appoint ministers of state and exercise executive powers to recruit other persons to state institutions and boards (Interviews, Lecturers & MPs, March 2016). At the local level, district chief executives and other political appointees to the district assemblies lost the power to dispense responsibilities. Chief executives of para-statals felt powerless to make critical decisions and initiate policies to drive their organisations. Thus, the inability of the president to appoint his cabinet and direct policy decisions led to a policy vacuum, and implementation of programmes came to a halt, albeit temporarily (Interviews, MPs, March 2016).

The more serious aspect on the debit side of the disputed election result was the difficulty it imposed on the national integration project. Given the fact that party competition did not witness any significant change in its violent outlook since 1992, the disagreement over the presidential election result reinforced sharp cleavages in the body politic. The inter-party turbulence that obstructed the formation of government and the exercise of a mandate penetrated the corridors of parliament into society by polarising not only the electorate but also families and acquaintances. With the unity of the social structure destabilised, Ghanaian society came to the verge of virtual collapse. Political animosities largely framed along ethnic lines reinforced groups and personal hatred, generated extreme tension and suspicion that proved too costly to the building of a peaceful political order. Thus, by the time the Supreme Court delivered the verdict and pronounced the winner, the political tension the disputed election result generated had reinforced ethnic stereotypes, widened the gulf of personal animosities and polarised the electorate and society along hostile political and ethnic structures. The observation made by some of the respondents vividly captures the realities:

The outcome of the election petition derailed the formation of government, created extreme tension, and polarized society into two hostile political camps, in which anti-government and pro-government supporters engaged in verbal tussles. At the centre of government-opposition conflict was the inability of the biometric system to achieve efficient election outcome. (Interviews, Voters, February 2016)
In consequence, the demand for electoral reform to guide future democratic elections gathered momentum after the Supreme Court verdict. Conclusions reached at IPAC forums indicated that changes in the structural underpinnings of the electoral system and processes would be required for holding the 2016 election. A reform committee composed of representatives from political parties, civil society and experts was established ‘to synthesize the Supreme Court’s recommendations for implementation towards the 2016 election’ (Osei 2016: 2). Of the whooping 29-point reforms, the EC accepted 27 for implementation. High among the measures to improve the quality of the 2016 election was a reconfiguration of the biometric technology. Based on experts’ proposals, the EC upgraded the software of the biometric devices and revised the electoral regulations. The technological rehabilitation measures provided adequate safeguards against the resurgence of the 2012 election problems (Interview, EC director of training, July 2017). The authenticity of the upgraded biometric device was tested in the local government election and the exhibition of the 2016 provisional voters’ register (Interview, EC director of public relations, July 2017). Also, the previous ‘No verification, No vote’ clause in the electoral regulation was amended by IPAC consensus to incorporate manual verification as an addendum to biometric verification of voters, and a redefinition of over-voting to mean the numbers of verified ballots in the ballot box had been exceeded (IPAC minutes, May 2012).

**Conclusion and lessons learnt from the study**

Elections contribute to democratic development, particularly when its outcome – the results it produces, is acceptable to all competing actors (Galbreath & Rose 2008). On the other hand, it undermines the democratic order when election results fail to produce a winner, and degenerates into violent conflict. Overall, this study has provided an in-depth inquiry into how the use of a biometric system in the electoral process contributed to an acceptable election’s outcome or not. It has noted that the potential for deploying biometric technology to cure election fraud is enormous. In particular, the inclusion of biometric voter registration and electronic biometric voter verification represented a significant breakthrough in the modernisation of the electoral process and enhancement of its integrity – it stimulated high voter confidence, trust and interest in the election process. At the same time, it has revealed that the application of the biometric system led to a peculiar outcome of election results because the opposition candidate who lost the presidential election contested the result in the Supreme Court. The corollary of this contestation of the election result was inter-party conflict, tension, polarisation, lack of cooperation and delay in the formation of government as well as the general demobilisation of government machinery to drive socioeconomic development. The study delineated three critical factors such as biometric technology malfunction, human error, and manipulation of electoral policy as being the causes of the election result dispute, which led to the legitimacy crisis. Given that many African countries have shown interest in the biometric system for their elections, this study highlights a number of theoretically and empirically relevant issues as lessons to be learnt.

First, the introduction of biometric technology in elections is not a simple add-on to the existing electoral process, but rather involves a systematic change of the electoral mechanics that ought to be managed with caution. Where election management bodies
become overly sanguine about the use of a biometric system and therefore fail to make appropriate operational contingencies that would diffuse potential threats to the election process, the credibility of the election suffers. The EC’s unrealistic expectations in the biometric technology’s efficacy to surmount every conceivable problem inherent in the electoral process constrained its ability to establish additional remedies to safeguard the integrity of the elections. Therefore, when it faced challenges involving the malfunctioning of the biometric verification device, it led to catastrophic consequences such as contestation of the election result.

Second, applications of a biometric system in elections do not necessarily eliminate human error and policy manipulations in the electoral process. The possibility that human error can potentially obstruct the efficient functioning of a biometric technology, and undermine the integrity of an election’s outcome remains a reality. Similarly, the manipulation of policy decisions by polling officials has the capacity to weaken the potency of biometric technology to transform the landscape of an electoral process and make an election’s outcome legitimate. The behaviour of polling officials towards the execution of policies, administrative and operational instructions/guidelines regarding the management of the biometric systems led to the election dispute.

Third, biometric technology has a modernising impact on developing countries’ election processes that had depended on traditional modes of voter registration and voting. Its capacity to stimulate voter confidence in the electoral process could translate into high voter participation and nurturing of democratic values, and serves as the catalyst for deepening nascent democracies in Africa and elsewhere (Birch 2010; Schedler 2006). Evidence from ‘failed democracies in other African countries indicate that without deep trust in the election instruments by the electorate, democracy is bound to suffer’ (Interviews, MPs, March 2016). Thus, what is needed is the robustness of the biometric technology to surmount election management challenges in order to avert democratic catastrophe. This requires improving the superiority of the human and technical instruments to achieve the integrity of elections.

This study admits it did not have the extensive range of measures that would have permitted an exhaustive assessment of the public’s knowledge and perceptions of how biometric technology shapes elections in developing democracies. It is important for future research to consider technological errors in terms of the nature of software and mechanical complexions used in a biometric system in order to obtain a richer and deeper picture about the relationship between biometric technology and politics/democracy.

Notes
1. Over the last decade many African countries such as South Africa, Nigeria, Mali, and Cote D’Ivoire have held elections with voters using some form of biometric system. However, many of these efforts have failed to achieve the intended outcome of improving the elections’ integrity. See ‘Biometric technologies have failed to guarantee integrity of elections in Africa’ Homeland Security News Wire 1 April 2015 <http://www.homelandsecuritynewswire.com/dr20150401-biometric-technologies-have-failed-to-guarantee-integrity-of-elections-in-africa> (accessed 3 December 2015).
2. According to The Economist, the incumbent, John Mahama, won by a whisker, with 50.7 per cent of the vote. His opponent, Nana Akufo-Addo of the New Patriotic Party (NPP), claimed that technical glitches which prolonged voting allowed the ruling National Democratic
Congress (NDC) to tamper with the votes and contested Mahama’s victory in court. His party urged its supporters to take to the streets <www.economist.com/news/middle-east-and-africa/21568385> (accessed 7 October 2015).

3. Even though the electoral controversies over the use of the biometric system involved the NDC and the NPP, the Convention Peoples Party (CPP) and Peoples National Convention (PNC) were added to the sample because they actively participated in both the presidential and parliamentary elections and have representatives in the legislature which passed the CI 75. Only the general secretaries, national organisers, constituency and polling station chairpersons and MPs of the four parties (NDC, NPP, CPP & PNC) were contacted for interview.

4. The CODEO (Coalition Of Domestic Elections Observers) survey is consistent with the Afrobarometer survey method that uses a clustered, stratified, multi-stage, area probability sample design and random selection method that allows inferences to national adult populations with a margin of sampling error of no more than plus or minus 3 per cent with a confidence level of 95 per cent.

5. In October 2015, the NPP alleged that the voters’ register was bloated with names of nationals of some ECOWAS countries. The EC created a committee to investigate and make recommendations without achieving a consensus. See <www.myjoyonline.com/ ... /live-updates-forum-on-ghanas-voters-register> (accessed 16 January 2016).

6. See ‘EC admits multiple registration of voters’ Daily Guide 6 January 2016 <www.ghanaweb.com/GhanaHomePage/ ... /EC-admits-multiple-registration>. Also see ‘The Chairman of the Electoral Commission (EC), Dr Kwadwo Afari-Gyan, says about one million voters who registered during the biometric voters’ registration exercise were not given polling stations by registration officials. The EC had to assemble the biometric registration device to verify their registration status in order to know the polling stations of the voters’ <https://www.modernghana.com/ ... /1/13628817-voters-registered-ec.html>.

7. See note 5 above.

8. ‘Nana Addo insists on biometric voter verification’ Daily Graphic 1 November 2011: 1.

9. Stakeholders in the election process reached a consensus at an IPAC meeting with the policy directive for every voter to be verified before casting the ballot. See Ghana News <myjoyonline.com/ ... /ec-insists-no-verification-no-vote-in-talensi-by-elect ... > <www.africanelections.org/ghana/news_detail.php? ... Electoral%20Commi ... > (accessed December 2015).

10. Among other things, the election petition filed by the NPP noted that some voters were not verified by the electronic voting verification device. See for instance, ‘Supreme Court verdict: 2012 presidential election petition’ Easy Guide 2015: 1–8.

11. See Afari-Gyan comments (note 6 above).

Disclosure statement

No potential conflict of interest was reported by the authors.

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