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Original Research Article

Election technology in Nigeria's Fourth Republic: a comparative analysis of smart card reader and bimodal voter accreditation system

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Abstract:

Electoral technology in Nigeria has been studied in general terms. However, no effort is made to conduct a comparative study of voter accreditation technology. This study fills the gap by identifying the factors that necessitated the adoption of the Smart Card Reader (SCR) and the Bimodal Voter Accreditation System (BVAS), the functionality of the SCR and the BVAS, and the effectiveness of the SCR and the BVAS. The research is anchored in instrumentalist theory, with qualitative data obtained from primary and secondary sources. SCR and BVAS were introduced in 2015 and 2023 to curb multiple voting, impersonation, and fake election results, and to improve the overall credibility of the election process. SCR has an unfriendly user interface, low memory, and uses fingerprint technology. In contrast, the BVAS has a user-friendly interface, high memory capacity, supports 3G and 4G networks, and enables faster accreditation via either facial or fingerprint recognition. To this end, BVAS is more effective than SCR. The research concluded that challenges such as low-speed accreditation and a single accreditation model associated with SCR were addressed in adopting the BVAS. BVAS should be upgraded to 5G, and network availability should be a criterion for the placement of polling units.

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1. Introduction

There is hardly an aspect of life that is not influenced by technology in the 21st century (Debos, 2021). State technological development and vision determine the rate at which technology can be used in a particular aspect of life. Globally, countries' technological innovation, application, and kinds differ. Another segment of life in which technology gained value between the 20th and 21st centuries was elections (Uzedhe & Okhaifoh, 2016). The legitimacy of elections predicts the type of administration that will emerge, which in turn defines a country's security and peace. The electoral administration must integrate technology into its election process. Election technology has evolved and can take many forms, including voter registration, voter accreditation and verification, vote collation, and more (Murphy et al., 2022).

Although elections are not new in Nigeria, liberal democracy was introduced in Nigeria following the promulgation of the 1922 Clifford constitution. During the colonial epoch, elections in Nigeria were conducted manually. Manually, the electoral process continues in post-independent Nigeria, and electoral violence has been part and parcel of Nigeria's political culture, making it complex (Anyika & Ani, 2022). Integration of technology in elections has not seen the light of day from the first to the aborted third republic. The fourth republic is the longest in Nigeria's history, with seven election cycles and increasing technological integration. Debos (2021) aptly observed that election technology is booming in Africa, and Nigeria is no exception.

There is corresponding literature on election technology, similar to how the technology is integrated into the electoral system. Studies such as Layiwola (2024), Shaibu et al. (2024), Ayeni et al. (2023), and Olurode (2017) focused on the general integration of technology in elections, while Ogieva & Ajisebiyawo (2023), Idris and Yusof (2015), Basu et al. (2024), Olufunmilayo and Ibukunoluma (2023), Uzedhe & Okhaifoh (2016), and Nnamani (2020) contributed to the knowledge center on e-voting. Scholars who focused on technologies for voter accreditation and verification include Ayeni & Aweh (2023), Nwafor (2017), and Nwangwu (2015). These suggest a lack of literature on comparative election technology in general, and on voter accreditation and verification technology in particular. Hence, there is a need for this research. The article's general thrust is a comparative analysis of Nigeria's voter authentication and accreditation technologies. At the same time, the specific objective is to identify the factors that necessitated the adoption of the Smart Card Reader (SCR) and the Bimodal Voter Accreditation System (BVAS), the functionality of SCR and BVAS, and the effectiveness of SCR and BVAS.

2. Theoretical anchorage: instrumentalism theory

John Dewey, an American Hegelian, developed instrumentalism. Dewey's instrumentalism derived inspiration from Charles Darwin's theory of evolution (Maduabuchi & Nwafor, 2021). In 1925, Dewey published an article, "The Development of American Pragmatism," in which

he employed the theory of instrumentalism and differentiated between pragmatism and experimentalism. Philosophically, instrumentalism is a synthesis of inductive and deductive reasoning. It established the relationship between the mean and an end. Technology is conceived as a means to an end. Instrumentalism argues that technology is neutral and created to solve problems. To this end, technology is a tool that is inherently neither good nor bad (Shamsudin, Adelaja, & Owoseni, 2020). The postulation of instrumentalism is relevant in appreciating the place of election technology. It is innovative to ensure election credibility. Voter accreditation technologies (hereinafter referred to as the Smart Card Reader and the Bimodal Voter Accreditation System) are tools used to verify the INEC-issued voter card and the cardholder. These devices are neither good nor bad, nor effective nor ineffective. Such is the question of technical know-how.

3. Methodology

The research data used in this manuscript are qualitative and informed the content analysis. The data was drawn from primary and secondary sources. The primary emanated from the author's experiences as a participant observer in Nigeria's elections and 2015 as a party Registration Area Agent. This served as an opportunity for the authors to distribute all election materials to presiding officers and monitor the conduct of the election in all polling units in the ward. And observation of the election process from 2011 to 2023. Secondly, data were sourced through key informant interviews with INEC staff, election ad hoc staff, security officers, election observers, and voters.

4. Analysis

4.1. Perspective of election technology

Technology is a practical application of science, and science is verified knowledge. In other words, technology can be seen as science in practical form. From the Middle Ages to the present day, scientific discovery and its application can be seen as a revolution that has influenced life in holistic ways. Some of the technology, such as the internet and computers, was not designed for the purposes for which they are used today. Election technology is not an exception. Election technology is technology designed or used in the process of an election, from voter registration to vote collation. According to their functions, such technologies can be grouped into registration, accreditation, voting, and collation. Some literature, such as Olufunmilayo and Ibukunoluwa (2023) and Nwangwu (2015), has misconceived election technology as e-voting. Electronic voting, which is divided into polling-station e-voting, kiosk e-voting, and remote e-voting (Nwamani, 2020), is just one aspect of election technology. States like Germany and the Netherlands have rejected e-voting, while Chile, Finland, Costa Rica, Ghana, Nigeria, and many others, but few to mention, are considering e-voting, as states like Austria, Estonia, Japan, Peru, among others, are using e-voting (Uzedhe & Okhaifoh, 2016).

The peak of election technology is e-collation. For a state to attain e-collation, other election technological infrastructure is a precondition. Nigeria has acquired election technology such as Optical Mark Recognition (OMR), Direct Data Capture Machine (DDCM), Smart Card Reader (SCR), Bimodal Voter Accreditation System (BVAS), INEC Result Viewing Portal (IReV), INEC Voter Enrolment Device (IVED), Voter Registration Online Portal, and, among several others, the Observer Group Portal (Goar & Madugu, 2023; Olufunmilayo & Ibukunoluma, 2023). According to Ogieva and Ajisebiyawo (2023), conducting free, fair, and credible elections is a daunting task for most African election management bodies. The omen is political apathy and mistrust of election management bodies. The authors concluded that states adopted technology in order to conduct credible, free, and fair elections. This is what Sibe & Kaunert (2023) termed the quest for election reform.

In Nigeria, Nwafor (2017) asserted that voter registration was previously conducted manually. Manual registration is difficult to update and can cause duplicate registrations. Nwafor observed that in 2002, INEC introduced Optical Mark Registration for voter registration, which was later upgraded in 2011 to the Direct Data Capture Machine (DDCM). Basu et al. (2024) affirmed Ogieva and Ajisebiyawo's quest for credibility of election; on the other hand, election fraud, violence, rigging, and voter intimidation were identified as motivations for the adoption of election technology in Nigeria (Basu et al., 2024; Goar & Madugu, 2023; Tobi, 2020). In another study by Layiwola (2024), technology in Nigeria's election is a solution to intentional manipulation and legitimacy, which is a vital element of democracy.

According to Idris and Yusof (2015), Nigeria has been bedeviled with election irregularities and post-election violence, which account for SCR to curb the ugly trend. Consonant with Idris and Yusof's violence, Olufunmilayo and Ibukuroluwa (2023) further elaborated that violence resulting in uncertainty, waste of resources, and loss of lives contributed to the low level of development in Nigeria. They conceived technology as a solution with the potential to enhance electoral processes by improving transparency, efficiency, and credibility. Nnamani (2020) observed that the absence of some registered voters, destruction of ballot boxes, multiple voting, hijacking of ballot boxes, attacks on election officials, vote buying, and falsification of election results can be reduced by election technology. To this end, election integrity is identified by Olurode (2017) as the brain behind the introduction of election technology in Nigeria.

4.2. Smart Card Reader (SCR) versus Bimodal Voter Accreditation System (BVAS): a comparative analysis

The Smart Card Reader, commonly known as the Card Reader, was the first election technology INEC deployed for voter authentication and accreditation during the 2015 and 2019 elections. In 2023, INEC adopted the Bimodal Voter Accreditation System, which Arulogun (2023) described as a vaccine to vote rigging in Nigeria. There were many infrastructures that SCR leveraged. The major ones are the Permanent Voter Card (PVC) with a chip, updated

voter registration, and internet facilities. Nwangwu (2015) argued that SCR was designed to read biometric information on PVC and to ensure that voters could vote only where they had registered. This made card authentication cumbersome. BVAS was developed to verify voter PVCs using multiple methods, such as entering the last six digits of the Voter Identification Number (VIN), entering the last name, scanning the QR code on the Voter register, and scanning the Barcode on the PVC (Arulogun, 2023).

Tobi (2020) cited the chief press secretary to INEC Chairman, Mr Kayode Idowu, who described the features of SCR as verification of genuine PVC issued by INEC, authenticating the person who presented the PVC as the legitimate owner, provision of disaggregated data of accredited voters, and sending the data of all accredited voters to the INEC central server to curb fraudulent act. In other words, Ayeni & Aweh (2023) described SCR as a fingerprint unimodal accreditation device. It reads voter information embedded in the PVC, it uses a 2G network, an unfriendly user interface operating system, small storage of less than 50 MB, and more than one (1) minute accreditation speed.

According to Ayeni and Aweh (2023), BVAS stores voters' data to enable bi-modal accreditation that uses face and fingerprint. The device has a memory capacity that supports 3G and 4G networks, and it features a user-friendly interface. They further assert that the device's internal storage is up to 40GB, enabling voter accreditation in less than 30 seconds. BVAS authenticates voters using fingerprint or facial recognition, aided by polling unit voter records already stored on the device (Goar & Madugu, 2023; Arulogun, 2023). BVAS is programmed to scan and upload polling unit (PU) results to Form EC8A or Form EC40G into the IReV portal for elections that were not held or were canceled. It also keeps a record of accredited voters (Arulogun, 2023; Goar & Madugu, 2023).

To ensure a smooth transition from manual to electronic accreditation, INEC conducted a reliability test prior to deployment in the 2015 general elections. The test was conducted in two states from the six geopolitical zones: Rivers and Delta (South-South), Anambra and Ebonyi (South-East), Ekiti and Lagos (South-West), Kano and Kebbi (North-West), Niger and Nasarawa (North-Central), and Bauchi and Taraba (North-East) (Nwangwu, 2015; Tobi, 2020). Tobi (2020) further asserted that the test recorded 100 percent success in the authentication of genuine PVC and 59 percent in fingerprint verification. Fingerprint verification test results account for the use of the Incident Form, whereby the card is genuine, but SCR could not verify the holder. INEC procured 182,000 SCR for USD 188 each for 152,000 polling points (Nwafor, 2017).

Likewise, a pre-deployment test of BVAS was conducted in 2021. The commission conducted the Isoko South constituency bye-election (Ayeni & Aweh, 2023; Olufunmilayo & Ibukuniluwo, 2023). Isoko South test, followed by the Kaduna local government election and the Anambra gubernatorial election in November of 2021 (Olufunmilayo & Ibukunoluwa, 2023; Arulogun, 2023). Prior to the 2023 general elections, INEC ran further tests in June and

July 2022 during the Osun and Ekiti state gubernatorial elections, respectively (Arulogun, 2023).

For the effective functioning of SCR, INEC had not relied solely on the test conducted. The commission surveyed the most effective network across all voting points, resulting in the allocation of the best network for SCR and the voting point. Layiwola (2024) and Olurode (2017) observed that SCR prevented multiple voting. However, there were incidents of multiple voting at different polling stations in 2015 and of impersonation.

Olurode (2017) further observed that the use of PVC and SCR has reduced the number of ghost voters, thereby reducing the number of people voting. The tradition was that all family members who had registered must vote either in person or by proxy. Moreover, at the end of voting, party agents, in collaboration with election officials, shared the remaining ballot papers in accordance with the political parties' strength in the polling unit. This became difficult because the total votes cast must tally with the number of electronic ballots recorded and the number on the Incident Form. Many results were canceled because the total number of votes exceeded both the number of accredited voters and the number recorded on the incident form.

The commission deployed over 200,000 BVAS in the 2023 general elections (Sibe & Kaunert, 2023). Arulogun (2023) observed that the use of BVAS curbs election malpractice and makes rigging impossible, thereby enhancing confidence in electoral processes. During the 2023 election, the mastermind of election malpractice and rigging shifted to vote buying, and, due to the absence of e-collation, rigging allegations arose during the manual collation process.

Idris & Yusof (2015) attributed the opposition party's victory in the presidential election and in 20 of 29 state gubernatorial elections to SCR. The 2015 general election was competitive, as evidenced by a narrow margin (Olurode, 2017). However, the non-do-or-die attitude and political ambition of former President Goodluck Jonathan contributed positively to the opposition's success. On the other hand, Nigeria clamored for change due to rising insurgency in the country, and economic crises aided the success of the opposition. The third factor, especially in northern Nigeria, is that people often vote for a gubernatorial candidate from the party that has won the presidency.

According to Ayeni and Aweh (2023), BVAS has been highly effective in reducing failed authentication cases through multiple means. This success has ensured a reliable voter accreditation process by preventing multiple votes and the use of stolen PVCs. Facial and fingerprint accreditation sped up the process.

Democracy in other states in the cosmos operates with the principle of one person, one vote. Whereas in Nigeria, there has been one person with multiple votes. This can be seen in a hundred percent voter turnout in previous election circles. To this end, a lack of credibility, integrity, and transparency is among the factors that necessitated the adoption of election

technology. Olurode (2017) concluded that SCR has improved the levels of credibility, integrity, and transparency in the Nigerian electoral system. However, the effectiveness of SCR is without challenges. Findings from Layiwola (2024) and fieldwork revealed that BVAS has brought transparency to the electoral process by ensuring the principle of one person, one vote.

The BVAS authentication and accreditation model has solved the problem for those who have not collected PVCs or have lost or destroyed them. They were able to vote in 2023 without a PVC. Such voters' surnames and VIN provided at each polling unit by INEC were used to authenticate and accredit them. This has reduced tension at polling units by allowing those who would have been disqualified in the previous election circles to vote.

Election is the heart and blood of democracy. Every step must be constitutional. The introduction of SCR was a welcome innovation in Nigeria's electoral history, despite the absence of an enabling law (Sibe & Kaunert, 2023; Olufunmilayo & Ibukunoluwa, 2023). Sibe and Kaunert (2023) aptly sum up the state of affairs: post-election litigation centers on the lack of a law that recognizes the use of SCR. The 2022 Electoral Act served as the legal framework for BVAS in 2023. However, Sibe and Kaunert (2023) observed ambiguity in the Act, which hindered effective use of the functional capacity of BVAS (Sibe & Kaunert, 2023).

Failure of the SCR to read some voters' fingerprints was an expected obstacle, as evident from the 59 percent mock test (Tobi, 2020). Moreover, the commission made an alternative Incident Form. During the 2023 election, Ayeni and Aweh (2023) highlighted BVA's inability to distinguish identical twins, and only one voted despite their details being on the BVA. However, this is more of a technical know-how error than a technology issue. Their surname and face can be identical, but their VIN and fingerprint are different, which would have been used for their authentication and accreditation.

Contrary to Nwangwu's (2015) assertion that elderly and farmer fingerprints were difficult for SCR to read, Tobi (2020) observed that even the then-incumbent President Goodluck's fingerprint failed to be verified by the device. In some cases, there was impersonation, resulting in multiple voting or citizens voting without a voter's card.

The functional capacity of SRC should read voters in a minute (Ayeni & Aweh, 2023). On Election Day, it sometimes takes more than 10 minutes to read a voter's fingerprint (Tobi, 2020). In some places, it was the official's failure to remove the protective film covering the lens face, which might have blocked the camera. In some places, voters' details or pictures were not in the SCR (Nwangwu, 2015). Moreover, administrative challenges hindered the effectiveness of SCR; there were a few low-battery incidents.

Despite surveys aimed at improving network coverage, there were instances of poor or no coverage (Basu et al., 2024; Goar & Madugu, 2023). However, this challenge is not peculiar to BVAS and is a national problem in Nigeria due to poor network infrastructure. Closer to the

network, a password failure (Basu et al., 2024) can be attributed to human factors, including errors in coding and password allocation, as well as the recruitment and training of ad hoc staff.

5. Findings

Nigeria's election in the fourth republic appears to have been marred by numerous factors. Despite the longevity of the fourth republic, there have been incidents of multiple registration and voting, impersonation, questionable election results, crises of legitimacy, and a lack of confidence in INEC. The commission, in its quest to conduct free, fair, and credible elections, began introducing technology into the electoral process in 2002. Leveraging existing technologies, SCR and BVAS were introduced in 2015 and 2023 to curb, among other things, multiple voting, impersonation, and the production of fake election results.

SCR and BVAS are devices INEC adopted for the conduct of the 2015, 2019, and 2023 general elections. The devices contain particular polling unit voters' information. The information was used to verify the voter card's authenticity and to accredit the voter. It keeps a record of accreditation activities. Furthermore, the device has a camera that helps snap the election results on form EC8A, and, where the election was canceled or did not take place, form EC40G will be snapped, and the inserted network will be used to send the results. On the other hand, BVAS uses facial and fingerprint accreditation rather than SCR fingerprint, which causes tension and the use of the Incident Form in 2015 and 20219. BVAS has a user-friendly interface and runs on 3G and 4G networks, with internal storage of up to 40GB, enabling accreditation in less than 30 seconds. SCR has an unfriendly user interface and uses a 2G network with internal storage of less than 50 MB.

The study shows that SCR and BVAS have reduced the incidence of multiple voting, impersonation, and use of fake PVCs. Accreditation with SCR was slow, which caused tension, and some voters did not vote in the 2015 election due to the delay. On the other hand, BVAS accreditation was obtained more quickly. The use of VIN and voters' surnames for authentication has increased voter turnout in the 2023 election, alongside facial and fingerprint accreditation. There was no electoral law that empowered the commission to use SCR in 2015 and 2019; the Electoral Act 2022, 41(1), empowers the commission to use BVAS.

6. Conclusion and recommendations

The use of technology in Nigeria's electoral process has improved Nigerians' confidence in INEC. Authentication and accreditation of voters with SCR and BVAS have reduced the prevailing malpractice of multiple voting and impersonation that was the order of the day. The use of BVAS in 2023 has shown that INEC has addressed challenges such as low speed and the single accreditation process associated with SCR. BVAS is more effective than SCR in reducing multiple voting, impersonation, and fake election results, and it overall improves the credibility of the election process. Some of the obstacles that hinder the effective functioning

of SCR and BVAS, such as poor/no network, political interference, and a lack of technical know-how, are more human than technical.

As Nigeria aims to use technology in the entire election process, the following recommendations are made:

a) The commission should upgrade BVAS to 5G or switch to another device with a 5G network.

b) Availability of the network should be a criterion for the placement of the polling unit.

c) BVAS should contain information on all Nigerians registered voters.

d) Recruitment of INEC and ad hoc staff should be based on expertise; and

e) Nigerians should work with the commission in order to conduct free, fair, and credible elections.

Declaration of conflict of interest

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