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An Assessment of the Impact of Technological Innovations on Electoral Credibility in Nigeria, 2015 to 2023

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Abstract

Although the Nigerian government has introduced a range of technological innovations between 2015 and 2023, including the Smart Card Reader, Bi-modal Accreditation Voter System (BVAS), the INEC Result Viewing Portal (IReV), and Result Transmission Platforms to curb electoral malpractice, concerns about electoral credibility persist. This study aims to assess the extent to which these technologies enhanced electoral credibility in Nigeria's 2015, 2019, and 2023 general elections. Drawing on institutional theory as the analytical lens, the study employs a documentary secondary analysis of journal articles, election reports, academic literature, and international election observer reports to evaluate the performance and limitations of electoral technologies. The findings reveal that the introduction of these technologies has reduced manipulations and fraud, including multiple voting, inflated results, and related irregularities, thereby contributing to improved transparency and electoral integrity. However, the study also identifies persistent constraints, such as infrastructure deficits, political interference, technical failures, weak institutional frameworks, insecurity, poor logistics, and pervasive vote buying, which collectively undermine the effectiveness and

credibility-enhancing potential of these innovations. Despite these challenges, the 2023 general elections recorded notable progress in the deployment and acceptance of electoral technologies. The study concludes that although technology is necessary for improving the electoral process, it is insufficient to guarantee electoral credibility without robust political will, comprehensive legal and institutional reforms, and active public engagement. The study contributes to the literature on electoral governance and technology by highlighting the conditions under which technological innovations can genuinely enhance electoral credibility and by underscoring the need for civic education, transparent and efficient technological deployment, and stronger institutions to support democratic consolidation.

Keywords: Electoral Technology; Electoral Credibility; General Elections; Nigeria; Institutional Theory

Introduction

Elections in every democracy thrive on free, fair, credible, and periodic elections. There can be elections without democracy, but there cannot be democracy without free, fair, and credible elections. Democracy will survive well when elections are credible (Katz, 1997; Levitsky & Way, 2010; Ninsin, 2006; Ojo, 2021). Electoral credibility is viewed by many people as a key sign of democracy. Elections are a traditional way for people to express their views, exercise their sovereignty, and hold political elites accountable (Diamond, 2019). Elections that are free and fair give legitimacy to the government and maintain the social contract between the state and its citizens (Lindberg, 2006). However, when they are manipulated, rigged, or overly restricted, they undermine trust in democratic processes, deter participation, and create social instability (Omotola, 2010).

In Nigeria, the question of electoral credibility has remained a persistent concern since the country's return to democratic rule in 1999. While successive electoral cycles have witnessed reforms aimed at addressing fraud and malpractice, recurring problems such as vote buying, ballot stuffing, multiple voting, falsification of results, and weak institutional enforcement have continued to undermine trust in the electoral system (Ibeanu, 2020; Suberu, 2019). Thus, the 2023 elections were widely viewed as the most unprecedented in terms of reform efforts in Nigeria because of the introduction of new technologies. However, these elections sparked debates about credibility due to allegations of non-compliance with the provisions of the Electoral Act of 2022. The introduction of the

Bimodal Voter Accreditation System (BVAS) and the electronic transmission of results to the INEC Result Viewing Portal (IREV) marked a significant step toward digitalizing voting and the dissemination of real-time results. Nonetheless, these reforms, which were backed by the electoral body, appear to have faced significant obstacles, hindering their successful implementation (Amadi, 2023).

The Independent National Election Commission (INEC) is a part of the rapid global trend towards implementing technological advancements to support election integrity in the face of these persistent problems. To minimize human intervention, increase credibility and transparency, and ensure accuracy throughout the voting process, several technologies were introduced into Nigeria's electoral processes between 2015 and 2023 (Nwankwo, 2021; INEC, 2023). These included the Smart Card Readers (SCR), INEC Result Viewing Portal (IReV), the Bimodal Voter Accreditation System (BVAS), identification for voters, and biometric voter registration (BVR). These technologies were implemented with the hope that they would provide legitimate remedies for Nigeria's pervasive electoral fraud, particularly by resolving disputes between the major political parties.

In the 2015 general elections, the PVC system for biometric voter identification and preventing multiple voter registration and voting, as well as Smart Card Readers, were first implemented nationwide. In an otherwise turbulent political history, this was praised as a major innovation and a positive development because it allowed for the first-ever transfer of power between rival parties via the ballot. Nevertheless, it cast doubt on the viability of some electoral changes due to issues like card reader malfunctions, insufficient network connectivity, and inadequate training for ad hoc workers. The results of the 2019 elections were delayed; there were several complaints about ad hoc workers' malfunctioning in their operations, and the logistical planning was inadequate. However, the elections were built on the achievements of the previous elections. To improve its efficacy and integrity, INEC improved its voter accreditation and election results collation systems for the 2023 elections. Among them were IReV and BVAS. In order to authenticate accredited voters, the BVAS used both fingerprint and facial biometrics, and the IReV allowed results from polling places to be uploaded in real time to INEC's publicly available website. Public trust in the electoral process was anticipated to increase with the implementation of these additional safeguards.

Despite these reforms, the controversies that characterized the 2023 general elections highlighted the limits of technology as a panacea for electoral credibility. While the BVAS largely improved voter accreditation, reports of failure in some locations and the delay/incomplete uploading of results to IReV fuelled post-election disputes among political parties and eroded confidence in the process (Centre for Democracy and Development [CDD], 2023).. These outcomes exposed the continuation of the gap between technological optimism and the realities of Nigeria's electoral process, which is shaped by infrastructural deficits, institutional weaknesses, and entrenched political interests. However, this study assesses the impact of technological innovations on electoral credibility in Nigeria; therefore, it is the paradox of technological innovation in Nigerian elections: while innovations have reduced certain forms of fraud and introduced new layers of transparency, their overall impact on credibility remains contested.

Conceptualising Electoral Credibility

Electoral credibility indicates how free, fair, and transparent an election is and how well it represents the will of the people (Norris, 2015). Credible elections are expected to be inclusive, transparent, competitive, and accountable in nature. Lindberg (2006) asserts that electoral credibility considers both the integrity of the process and the degree to which citizens believe the results. Nigeria has witnessed a longstanding credibility crisis due to vote rigging and vote buying, ballot fixing, voter intimidation, disenfranchisement, and electoral manipulation, among other challenges (Omotola, 2010; Ibeanu, 2020). Public trust and perception about electoral processes have been contingent upon the levels of reforms introduced across cycles.

International Foundation for Electoral Systems (2020), a credible election is considered credible if it is free from fraud, permits equal participation, upholds transparency, keeps participants accountable, and encourages just political competition. Electoral processes that exhibit a number of essential characteristics are considered credible elections. First, universal suffrage, which would allow all eligible individuals to cast ballots without being discriminated against based on gender, ethnicity, religion, or any other arbitrary factor, is necessary for credible elections.

According to the International Institute for Democracy and Electoral Assistance (2012), freedom of expression is essential for legitimate elections because it allows people to express their views without worrying about persecution or intimidation. In support of

the above-indicated viewpoints, Lindberg (2001) defines a credible election as one that is democratic. Credible elections in this sense are those that adhere closely to the guidelines outlined in the constitution and electoral law. They should have little intervention from the current leadership and be distinguished by openness, justice, equity, and fairness. In essence, electoral violence should not occur during a democratic election.

A credible election, according to Oyeneye (1998), is free from electoral fraud and rigging. Eligible voters are free to cast their ballots for the political parties and candidates of their choice in such an election without fear of intimidation or coercion. Credible elections are characterized by the following:

1. **Inclusiveness**: Elections should provide equal opportunities for all eligible citizens to participate as voters and candidates, allowing them to choose their representatives in government.

2**. Transparency**: Credible elections ensure that every step of the process is transparent and open to/for scrutiny. Stakeholders should be able to independently verify that the election is conducted honestly and accurately.

3. **Accountability**: Citizens have the right to hold various electoral stakeholders, including the government, election management bodies (EMBs), political parties, candidates, and security forces, accountable for the outcome of the election.

3. **Competitiveness**: Credible elections allow citizens to compete fairly and equitably for government positions. It ensures that political competition reflects the genuine will of the people (Okoye &Oyinmiebi, 2021, p. 213).

Technological Innovations in Electoral Processes

The use of technology to curb election malpractices and enhance credibility has been adopted globally. The application of biometrics, electronic transmission of results, and online monitoring tools across several countries affirms this trend (Norris, 2015; Diamond, 2019). Nigeria's electoral technology has seen a gradual evolution since the country's return to democracy in 1999. Biometric voter registration was first experimented with ahead of the 2011 general elections to curtail multiple registrations; the use of Smart Card Readers (SCRs) for voter verification was the highlight of the technological innovation in the 2015 elections (Durotoye, 2016). The latest phase of technological

innovation is the deployment of the Bimodal Voter Accreditation System (BVAS) and the INEC Result Viewing Portal (IReV). These tools were first piloted in the November 2021 off-circle elections and were widely deployed during the 2023 general elections (Orji, 2023).

Fatai (2023) claims that INEC also unveiled the INEC Result Viewing Portal (IReV), a digital platform that facilitates the collection and dissemination of results (Kwen, 2022). The results of the polls have left academics and the general public perplexed and even more worried about the legitimacy of future elections in Nigeria's technological age, even though these technologies are meant to guarantee legitimate elections (Egbejule, 2023; Rajvanshi, 2023). The MIT Election Data Science Lab (2023) claims that "voting technology" is another name for technological innovation. "Electronic voting" or "e-voting," "ICT-driven elections," "online voting," and "cyber elections" are other terms used to refer to electoral technologies. Haibo (2019) defines electronic voting as an election voting system that uses electronic systems for both vote submission and vote tallying. Particularly when handling massive volumes of data in real-time, electronic voting is efficient and economical, but it also highlights the necessity of strong security measures. The possibility of fraud, anomalies, and manipulations that could change the election's outcome is eliminated with this kind of voting.

Maurer (2020) claims that electoral technology consists of digital solutions for resolving the democratic problems associated with holding elections. It is clear from Maurer's argument that electoral technology encompasses a wide range of "digital solutions" used during the election cycle, including voting, registration, collation, and other tasks. Numerous stakeholders, including voters, political parties, election management organisations, the media, and others, already use digital technologies at various points during the election cycle. These solutions include technologies such as electronic voting machines and registers, optical scanners, electronic results transmission, electronic signatures for candidate lists and initiatives, result consolidation and visualisation systems, statistical techniques for fraud detection and result evaluation, and geographic information systems. The foundation of these digital solutions is digital data. According to Ogunyemi (2023), electoral technology is defined as the use of biometric technologies, such as fingerprints and facial recognition, to guarantee voter authentication, the accuracy of the results, and the effectiveness of the election management organisations. This helps to prevent fraud and other practices that compromise credibility. Adopting electoral

technology is predicated on making sure that the requirements for legitimate elections are met.

Lijphart *et al.* (2007) opined that the emergence of a series of technological innovations like Cyber-citizenship, E-politics, and Web-democracy, among others, encouraged the development and deployment of electronic information processing networks to help shape and determine the political environment all over the world. In the late 1800s, a set of electoral technologies invaded the electoral space to bring about new political representation, as standardized and government-issued electronic ballots were deployed together, with voting machines, to create a free and fair election (Anderson and Kreiss, 2013).

Empirical Review of Literature on Technological Innovations and Electoral Credibility

The empirical literature on technology innovations in Nigeria reveals a growing body of research assessing the impacts of digital innovations on electoral credibility. Scholars and observers have explored different aspects of election technology deployment in Nigeria.

The 2015 general elections mark a turning point in Nigeria's electoral history. The election witnessed the introduction of Smart Card Readers. According to a survey conducted by Adesina (2016) among voters in Lagos and Abuja, 78% of participants said that the use of SCR increased the elections' legitimacy. But the study also found that SCR effectiveness differed across urban and rural areas, mostly as a result of inadequate infrastructure. Overall, it was determined that technology can enhance election results, but only if it is accompanied by sufficient staff training and logistics. Similarly, Ibuanu (2015) conducted scientific research on the outcome of the 2015 general elections using SCRs. Ibeanu (2015) evaluated INEC's use of SCRs after the election and discovered that, particularly in cities, the technology greatly reduced instances of multiple voting and voter impersonation. According to the study, which used a combination of techniques, such as key informant interviews and incident report analysis, voter confidence was typically higher in places where SCRs operated efficiently.

Empirical studies on the 2019 elections paint a more mixed picture. In a study, Udochukwu and Abiola (2020) interviewed political party agents and INEC officials in three states and came to the conclusion that voter trust was damaged by the SCRs' failure

in numerous voting places. Their research indicates that around 60% of voters in the States surveyed questioned the process's impartiality, pointing to both political and technological anomalies. This implies that although technology was still a component of INEC's toolkit, public confidence declined as a result of its uneven application, especially among civil society organisations and first-time voters. In another study, Okonkwo and Ibrahim (2020) demonstrated that although SCRs were still in use, their impact was lessened by operational issues, such as frequent malfunctions and inadequate network coverage in remote regions, using content analysis of election observer reports and media narratives. They also observed a sharp rise in voter repression and political violence, which overwhelmed any potential benefits of technology.

The 2023 general elections are characterised by high expectations by the electorate as a result of the introduction of the INEC Result Viewing Portal (IReV) and the Bimodal Voter Accreditation System (BVAS). INEC (2023) states that these tools were designed to improve transparency by offering data on accreditation and results aggregation in real-time. Mixed results are found in empirical reviews, nevertheless. According to a comprehensive post-election survey conducted by YIAGA Africa (2023) with over 6,000 participants in 36 states, only 45% of voters thought that BVAS operated efficiently in their polling station, and 58% were disappointed that IReV was unable to upload the presidential results instantly. Although voters liked the concept of technology, the study found that poor implementation severely damaged confidence, particularly in the presidential poll. Similarly, a meta-analysis of observer reports by the Centre for Democracy and Development (CDD, 2023) revealed extensive discrepancies in BVAS deployment and ad hoc staff training. These problems confused polling places and delayed accreditation, which fuelled public doubt about the process's legitimacy. Voters in states like Lagos and Edo, where BVAS and IReV operated effectively, showed greater levels of confidence in INEC and the election results, the study also found. According to Mark (2023), Nigeria implemented the Bimodal Voter Accreditation System (BVAS), a cutting-edge technology, for the 2023 elections. In accordance with Section 47 of the 2022 Electoral Act and Section 18 of the 2022 Regulation and Guidelines for the Conduct of Elections, BVAS authenticates the Permanent Voter Card (PVC) to confirm voter registration. Scan the QR code on the PVC, use the card's last six numbers to search online, and then use the card bearer's last name to search again as part of the BVAS authentication procedure. In order to increase electoral transparency, BVAS also sought to upload certified results from every

polling station in real-time throughout election hours to the INEC Result Viewing Portal (IReV). But the experience with the 2023 elections in Nigeria demonstrated shortcomings in establishing the political environment required for election technologies to produce results that can be trusted.

A series of empirical research has been done in each election cycle, but not many studies have systematically compared the elections in 2015, 2019, and 2023. The majority of the work now in publication considers each election separately, making it difficult to identify trends in the advancement or reversal of public trust and technology implementation. Olowojolu (2020), for example, discusses electoral technology's theoretical effects on democratic outcomes without doing an empirical comparison of several elections. In a similar vein, Adeyemi and Bello (2023) study voter responses to BVAS, although they only consider the 2023 elections and provide no background information. Despite growing scholarship, significant gaps remain. First, most studies focus on either the promise of technology or its failures, with fewer comprehensive assessments that balance both perspectives across multiple election cycles. This study seeks to address these gaps by providing a longitudinal assessment of Nigeria's electoral innovations from 2015 to 2023, while examining their impact on electoral credibility in practice.

Theoretical Framework

The study adopts institutional theory as the theoretical framework. The Institutional Theory highlights that both formal and informal institutions play a significant role in determining political behavior and, ultimately, policy outcomes. Institutions, in this context, the rules, procedures, norms, and organizations that govern political life serve to constrain and enable actors, shaping the dynamics of how specific policies are proposed, enacted, and received (North, 1990; Hall & Taylor, 1996). Within the electoral arena, institutions such as electoral management bodies, legal frameworks, political party structures, and judicial systems influence whether reforms are adopted in good faith or are superficial attempts at distortion.

The Institutional Theory posits that election credibility is contingent not solely upon the technologies employed but also on the capacity, autonomy, and legitimacy of the institutions implementing them (North, 1990; Hall & Taylor, 1996). Within Nigeria's electoral framework, the INEC emerges as the principal institution through which various

electoral technologies and innovations, such as the SCR, BVAS, and IReV, are operationalized. While these technologies have ostensibly facilitated improvements in voter accreditation and election transparency, the overall credibility of the electoral process has been systematically undermined by the failure of both the institution and the electoral reforms to fulfill their mandates, a reality exacerbated by widespread political interference, under-investment in physical infrastructure, and variations in the implementation processes before, during, and after the elections. Consequently, the theory identifies a critical gap in the analysis, namely, that technological innovations alone are insufficient to guarantee credible elections; rather, it is the integrity of the institutions governing their implementation, coupled with the political will to promote change that determines whether such reforms can achieve their desired effects.

The Relevance of the Theory to the Study

The application of Institutional Theory is highly relevant to this study on the impact of technological innovations on electoral credibility in Nigeria (2015–2023). First, the theory provides a framework for understanding how the success or failure of electoral technologies such as the Smart Card Reader (SCR), Permanent Voter Cards (PVCs), the Bimodal Voter Accreditation System (BVAS), and the INEC Result Viewing Portal (IReV) depends on the strength and capacity of the institutions managing them. In this case, the Independent National Electoral Commission (INEC) is the central institution responsible for designing, implementing, and enforcing the rules governing electoral technology. Second, Institutional Theory emphasizes that credible outcomes are shaped by **i**nstitutional **rules, norms, and enforcement mechanisms** (North, 1990; Hall & Taylor, 1996). This is relevant because while technology can minimize fraud and irregularities, it cannot operate independently of the institutional environment. For instance, BVAS and IReV promised greater transparency, but their effectiveness in 2023 was undermined by technical failures, weak enforcement of guidelines, and perceived political interference. Finally, Institutional Theory is relevant because it shows that reforms in Nigeria's electoral process require more than technical fixes. The sustainability and credibility of innovations depend on strengthening INEC's autonomy, improving legal frameworks, ensuring transparency, and enhancing accountability mechanisms. Thus, the theory situates technological innovations within broader institutional dynamics, helping to explain why technology alone cannot deliver credible elections without strong and effective governance structures.

Methodology

The study relies exclusively on secondary data obtained from a wide range of credible sources, which include official INEC reports, documentation from local and international elections observers, reports from civil society organizations, and articles journals. Using qualitative content analysis, the study examines how technological tools like BVAS and IReV influenced electoral credibility in Nigeria.

Historical Background of Technological Innovations in Nigeria's Electoral Process

The adoption of technology in Nigeria's electoral process has been gradual, evolving in response to persistent electoral malpractice and demands for credible elections. Since the return to democratic rule in 1999, Nigeria has faced recurring challenges of ballot stuffing, multiple voting, rigging, and result manipulation, which have undermined the legitimacy of elections (Akinboye, 2019). To address these concerns, the Independent National Electoral Commission (INEC) began experimenting with technological tools aimed at improving voter registration, accreditation, and result management. The earliest use of technology in Nigeria's elections can be traced to the adoption of a computer-based voters' register in 2003, aimed at eliminating duplicate registrations. However, poor implementation, lack of biometric features, and widespread manipulation weakened its credibility (Ojo, 2008). In 2006, INEC introduced Direct Data Capture (DDC) machines for biometric voter registration ahead of the 2007 elections, marking the first formal deployment of biometric technology. Despite technical hitches and allegations of manipulation, this reform laid the foundation for subsequent innovations (Jega, 2013).

Ahead of the 2011 general elections, INEC upgraded the voters' register to include biometric data such as fingerprints, which helped reduce instances of multiple registrations (Ibrahim, 2015). However, accreditation on Election Day still relied on manual processes, which remained prone to abuse. In 2015, INEC introduced the Permanent Voter Card (PVC) and the Smart Card Reader (SCR) to electronically verify voters. This innovation marked a watershed in Nigeria's electoral history, as it significantly reduced impersonation and over voting, contributing to the credibility of the 2015 elections that resulted in Nigeria's first democratic transfer of power between rival parties (Durotoye, 2016). The 2019 elections continued with the use of PVCs and SCRs but revealed serious challenges. Malfunctioning devices, poor training of staff, and inconsistent application led to irregularities in some polling units (European Union Election Observation Mission [EU

EOM], 2019). Furthermore, INEC's proposal for electronic transmission of results faced resistance from political elites, preventing a full transition to digital election management (Nwankwo, 2021).

In response to these challenges, INEC introduced the Bimodal Voter Accreditation System (BVAS) in 2021, which combined fingerprint and facial recognition for more reliable accreditation. Alongside BVAS, the INEC Result Viewing Portal (IReV) was developed to enable real-time online access to polling unit results. These innovations were fully deployed during the 2023 general elections. While BVAS largely succeeded in curbing identity fraud, controversies over the failure to promptly upload presidential results to IReV sparked public mistrust, showing both the potential and limitations of electoral technology in Nigeria (Orji, 2023).

Impact of Technological Innovations on Electoral Credibility in Nigeria

The Independent National Electoral Commission (INEC) is committed to using technology to enhance free and fair elections as well as credibility and transparency. Technological innovations have been introduced to curtail voter fraud and electoral manipulations, including ballot stuffing, multiple voting, and mutilation of results, among others, which have characterized Nigeria's electoral processes. The Independent National Electoral Commission (INEC) introduced various technology-driven devices, including the Permanent Voter Card (PVC), Smart Card Reader (SCR), Bimodal Voter Accreditation System (BVAS), INEC Result Viewing Portal (IReV), etc., from 2015 to 2023 to foster transparency, reduce electoral fraud, and enhance the trust of Nigerian citizens in the electoral process (Orji, 2023; Nwankwo, 2021). The impacts are as follows;

Reduce Electoral Fraud and Enhance Voter Accreditation: The introduction of technologies into electoral processes is to reduce electoral fraud and manipulation that have become a common practice during election periods in Nigeria. To dismantle the systematic rigging and manipulation of elections, the Independent National Electoral Commission (INEC) initiated the Smart Card Reader (SCR) and later, the Biometric Voter Accreditation System (BVAS). The former, introduced in the 2015 elections, aimed to reduce cases of multiple voting by authenticating Permanent Voter Cards (PVCs) and cross-referencing biometric information with INEC's register. While there were some initial issues with the machines, the introduction was generally seen as improving voter authentication, which many considered a success. The 2015 presidential elections facilitated

what many saw as Nigeria's first successful transfer of power from one party to another in a peaceful manner (Durotoye, 2016). The latter, the BVAS, was introduced in 2021 and saw extensive usage in the most recent 2023 elections. It built upon the SCR's framework by integrating fingerprint and facial verification, effectively closing some vulnerabilities exploited by electoral thieves (Orji, 2023). The use of technology plays a major role in enhancing free voter accreditation. The democratic principle of "one man, one vote" is safeguarded by these technologies (Goar & Madugu, 2023). According to Goar & Madugu (2023), given INEC's rapid technological development, it is anticipated that the problem of numerous registrations would either be eliminated entirely or drastically diminished in upcoming elections. By eliminating the recurrence of inflated voter counts based on fictitious and invalid identities, INEC's biometric technology effectively reduced the likelihood of voter manipulation and impersonation. Voter fraud and cases of persons casting their ballots more than once could be prevented with the use of the biometric technology built into the BVAS.

Reduction of Result Manipulation at Collation Center through Result Management: Technological innovations have impacted electoral credibility through result collation management. The IReV portal played a major role in reducing result manipulations. The Results Viewing Portal (IReV) was first launched in 2020, and it was used in the general elections that took place in 2023 to upload polling unit results in real time and was also a mechanism through which scanned figures on the result sheets were uploaded to the portal because INEC felt that this provided an alternative avenue for data transmission from polling units to the central server. With the introduction of the portal, there was hope that transmission of results in real time would increase transparency, reduce potential for manipulation during transmission, and enhance citizens' independent access to election data (Ibrahim, 2020). In the past, when elections were still conducted manually, the results of the votes cast would be taken to the ward level for collation, then to the local government level for the collation of all ward results, and finally to the state level before being collated for announcement (Goar & Madugu, 2023). With the introduction of technologies, the issue of fraud and manipulation of results has decreased. The BVAS machine was primarily designed to fulfil this function. Instead of using ward transit or state-level transit, votes can now be routed straight to an INCLEC central server after being cast and counted at the polling places. This has made it possible for correct

results, free from political tampering, to be transmitted straight to the server where they are calculated, hence decreasing the frequency of result manipulation.

Strengthening Public Trust and Confidence in the Electoral Process: The adoption of PVCs, SCRs, BVAS, and IReV during the general elections was interpreted publicly as INEC's positive response to demands for credible, free, and fair elections by the Nigerian citizenry in general. Voter confidence was expected to be high in election years when all or most of the aforementioned electoral technological innovations were in place. Conversely, voter confidence would be expected to be low when none or few of the innovations were in place. In a situation where the innovations were in place, voter confidence could be high, but negativity or low confidence could arise if any of the innovations malfunctioned or were not deployed appropriately (Nwankwo, 2021). For instance, although INEC's introduction of the BVAS system in the 2023 general elections was widely commended for accurate voter authentication, the failure to deploy IReV as promised led to questions about the electoral body's commitment to and objectivity in institutional reforms. Consequently, these actions adversely affected the overall perception of electoral credibility (Orji, 2023).

Challenges of Technological Innovations and Electoral Credibility in Nigeria

The technological innovations have significantly improved Nigeria's electoral process from 2015 to 2023, but their effectiveness has been undermined by technological, institutional, systemic, and environmental challenges. These challenges are as follows;

High Cost of Procurement of Technologies for Elections: The high cost of digital technology facilities in the conduct of elections has been one of the major challenges facing the conduct of credible elections in Nigeria (Goar & Madugu, 2023). From 1999 to 2018, the Independent Electoral Commission of Nigeria gave N730.99 billion to the Independent National Electoral Commission (INEC) as budgetary support. Beginning at N1.5 billion in 1999, election expenditures rose to N29 billion in 2002, N45.5 billion in 2006, N111 billion in 2010, and finally N87.8 billion in 2014. President Muhammadu Buhari also unveiled a N242 billion election budget in 2019. A significant portion of this expenditure is allocated to financing the technologies used to conduct the elections. Because increasingly advanced technologies are being used for electoral purposes, you see that the budget grows with each subsequent election (INEC, 2023; Goar & Madugu, 2023).

Unfortunately, these funds cannot be accounted for. Elections are still poorly conducted despite the huge resources budgeted for elections.

Infrastructural Deficits: The inadequate digital and physical infrastructure of Nigeria has negatively affected the deployment and use of electoral technologies, including the 2015 use of the SCR and the 2023 BVAS. Limited Internet penetration, particularly for rural communities, frequent power outages, and poor network coverage were pivotal in disrupting these systems, not only in Nigeria's 2015 general elections but also in the 2023 elections that relied heavily on the BVAS (Omotola, 2022). The lack of internet masts in many regions of Nigeria, particularly in rural areas, is not new. These devices cannot function, or there is an unacceptable delay in the transmission due to a bad or weak connection. The ability to utilise the BVAS offline, which would have allowed results sheets to be posted even in cases of spotty internet connectivity, either completely malfunctioned or was widely ignored by those in charge, according to election-monitoring organisations like the European Union Observer Mission (EUOM). Overall, the limitation of physical and infrastructural support has rendered the use of electoral technology inconsistent, creating escape routes for electoral malpractice in areas where electoral technology could not be trusted to provide a conclusive outcome.

Technical Issues and Logistic Challenges: INEC has consistently faced issues regarding the technical performance of devices. During the 2015 elections, problems with the battery and fingerprint verification led to the manual accreditation of voters in some locations after SCRs failed (Durotoye, 2016). Similarly, in 2023, there were reports of BVAS malfunctioning in numerous polling units, failures to upload results during the IReV operations, as well as server issues and slow service during the uploads, which raised the ire of numerous groups in the election (Orji, 2023). Technical issues like these undermine public confidence in the electoral process and bolster claims of partisanship.

Political Resistance and Elite Manipulation: Political figures benefiting from electoral malpractice have resisted or undermined the adoption of electoral technology. In 2019, the National Assembly rejected INEC's proposal for full electronic transmission of results, citing constitutional issues and logistical challenges, though critics alleged that this was a ploy to prevent elites from using and controlling vote-buying and manipulation (Ibrahim, 2020). Then, in 2023, the controversy over the delayed IReV uploads gave rise to narratives accusing INEC of working against transparency in the voting process.

Limited Training of INEC Personnel: The functionality of electoral technologies is also contingent on how well trained the INEC ad hoc staff are to operate these technologies. However, in years past, the lack of adequate training negatively impacted the smooth operation of devices, leading to delays and other hitches during the course of elections. Nwankwo (2021) notes that in the 2019 general election, the failure of many SCR officials to operate the SCR effectively during accreditation and voting was cited as one of the reasons the printed voter register was used to authenticate voters, leading to the disenfranchisement of many eligible voters. Additionally, Nwankwo observes that, although the devices were functioning properly, many SCR officials did not utilize them effectively, which led to the rejection of a presidential candidate in the same election. These incidents raise the question of whether similar outcomes could result from the above-mentioned training challenges. The events of the 2023 general elections serve as a suitable illustration. The IReV was intended to start operating as soon as the voting process was over. Ballots from polling stations were initially processed, tallied, and approved by an officer of INEC. The raw result sheets were then captured by the BVAS device's camera function and sent in real time to a result-viewing portal. However, this ostensibly smooth process was tarnished by controversies that affected the transmission process. Many INEC officials said that they couldn't recall their IReV portal credentials at the end of the voting process. Many people who were able to remember theirs reported that the passwords were incorrect and that they were unable to upload the polling unit results in real time as a result.

Risks to Cybersecurity and Data Privacy: With the growing amount of electronic data, there are risks associated with cybersecurity and protecting sensitive data about the election. Less often considered, the threat of hacking election data and tampering with the results would substantially damage the credibility of the election in a country that doesn't invest in cybersecurity (Ibrahim, 2020).

Recommendations

Based on the assessment of technological innovations and electoral credibility in Nigeria, the study recommends the following;

Infrastructural Development: The federal government should partner with the telecommunications companies to provide strong digital coverage across the country, like network coverage, electricity supply, and a secure data system, or provide an offline system

that will work with BVAS and IReV that will not require internet services. These will help to reduce technical failures that hindered BVAS and IReV operations.

Enhance Training for INEC Officials: INEC officials and Ad hoc staff should be equipped with extensive and continuous training to improve their technical capacity in handling devices and managing unexpected issues with BVAS and IReV during elections.

Voters Re-validation Exercise: Before any general election, voter revalidation and registration updates should be completed. This will enable INEC to detect and remove dead voters from the register. Additionally, sufficient time should be set up for ICT-based tasks, such as printing registers, configuring smart card readers, and cleaning and installing computers for Continuous Voters Registration (CVR). Rushing at the eleventh hour will always allow for preventable errors that could cause needless stress and issues. Additionally, it will lessen the strain on technical support employees.

Strengthen cybersecurity and Data Privacy: INEC and the government should invest in cybersecurity measures to safeguard electoral data from hackers and manipulation, as these increase reliance on digital technological innovations.

Promote Voter Education on Technology Usage: periodically, INEC should engage in public campaigns to enlighten the general public on the usage of BVAS and IReV. This awareness will reduce misinformation and strengthen citizens' trust and confidence in the electoral process.

Conclusion

The period from 2015 to 2023 witnessed the application of electoral technology in Nigeria, which produced mixed results. While the introduction of the SCRs for voter registration and the deployment of the BVAS for biometric verification helped to reduce electoral misconduct, especially in the area of over-voting, the controversy surrounding the IReV and the failure of the INEC to effectively transmit results from the polling unit to the server and their subsequent limitation to the Collation Room exposed the pitfalls of relying exclusively on technology for electoral accountability. Thus, while technology innovations, if properly harnessed, can enhance electoral credibility, institutional weakness, poor infrastructure, lack of political and elite commitment, and other factors can undermine the use of technology to achieve credible elections. Ultimately, electoral credibility is a function

of institutional strength, transparency mechanisms, and citizen trust in the independence of the electoral management body.

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