Technological Innovations and Electoral Integrity in Nigeria's Electoral System: Panacea or Illusion? A Critical Assessment and Future Pathways

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ABSTRACT

Nigeria's electoral system has, for over a decade, experienced notable technological solutions with the Independent National Electoral Commission (INEC) implementing various electoral technologies, ranging from Automated Fingerprint Identification System (AFIS), Smart Card Reader (SCR), Automated Biometric Identification System (ABIS) to the Bimodal Voter Accreditation System (BVAS), INEC Voter Enrolment Devices (IVED) and INEC Results Viewing Portal (IReV) etc. These were deployed to achieve, maintain, and advance electoral integrity in Nigeria. The Nigerian general elections of 2023, widely regarded as the most technologically driven electoral processes, also demonstrated the profound transformative potential of technological innovations, while exposing the structural, institutional, and political limitations of a would-be technocentric approach to democratic governance. Synthesising from the empirical evidence presented by the 2023 electoral cycle, peer-reviewed studies, election observation mission reports, INEC-in-house policy documents, and some comparative African case studies, this paper presents a critical assessment on whether the technological innovations are a panacea for Nigeria's prevalent challenge of electoral integrity or whether, with their configuration at the moment, they are only a decorative illusion that pave ways for electoral manipulations instead of eliminating them, concealing the political pathologies fuelling a veneer of technological modernity. Five thematic domains were engaged in this study, viz: the political economy of electoral technology adoption; the BVAS and IReV demonstrated effectiveness and limitations; structural and infrastructural constraints; cybersecurity vulnerabilities; and the endemic human and institutional factors proving elusive to the resolving grip of technology alone. This study submits that technological innovation is neither a panacea for diseased electoral integrity nor an illusion, but a conditional amplifier of institutional quality, capable of fostering electoral integrity when incorporated in the certainty of a legal framework, institutional independence, suitable infrastructure, dynamic IT-governance, and political will, but not insulated from spectacular failures when adopted without considering the aforementioned. The paper then proposed some tangible pathways for the 2027 electoral cycle and beyond.

Keywords: technological innovation, electoral integrity, Nigeria, BVAS, IReV, INEC, biometric technology, election management, political will, digital divide, 2023 general elections, Africa

INTRODUCTION

The technological innovations in Nigeria's electoral system were adopted with the intention to enhance electoral transparency, improved electoral credibility, reinforce public trust in electoral processes and service

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delivery. They were also deployed to lower human interference in electoral processes. Many empirical pieces of evidence have shown that these innovations have decimated voter impersonations and multiple voting (Ajayi *et al.*, 2026). However, the critical answer-begging question remains: have these adopted technological innovations basically enhanced the Nigeria's electoral integrity or simply complicated the locus of electoral manipulations (Adeleke *et al.*, 2024; Ita & Ibanga, 2025; Peter, 2023)?

The elections, to start with, are the heartbeat of democratic institutions (Chukwudi *et al.*, 2024). They are the basic procedures by which the sovereign power of the people is constituted, renewed, and subjected to popular accountability (Walewicz, 2024). Given its population and registered voters, Nigeria is not just the Africa's most populous country; it is also its largest democracy (Ashindorbe & Danjibo, 2022). However, its electoral space has historically become a war zone for both electoral positivity and huge negativity. Positivity in terms of mobilisation. Negativity in terms of systematic manipulations, endemic electoral fraud, life-threatening violence, and litigated legitimacy (Ejura & Tochukwu, 2024).

Right from Nigeria's 1999 transition to representative and presidential democratic governance, subsequent electoral cycles have suffered badly from electoral malpractices such as ballot stuffing, voter suppression, election result fabrication, electoral official intimidation, multiple voting and other organised electoral distortions (Omojowo *et al.*, 2024). Moreover, as these pathologies continued, credibility in both electoral and democratic institutions had been damaged to such an extent that, by the eve of the 2023 general elections, only 23 per cent of the Nigerian electorate had confidence and trust in the Independent National Electoral Commission (INEC), Nigeria's electoral umpire (Kolade *et al.*, 2023).

In response to this institutional-level trust-eroding trajectory, successive INEC administrative leadership have ambitiously sought technological transformation, convinced that technological innovation could solve electoral problems of weak institutional integrity or, at least, compensate for the political will (Cheeseman *et al.*, 2021).

This conviction has an intellectual pedigree, fuelled by broader scholarship on the transformative potential of technology in general and, more specifically, electoral technologies observed in developing democracies, including digital biometrics, electronic transmission, and a real-time public results viewing portal. All these were deemed capable of prohibiting electoral manipulation to a large extent and transparent enough to allow a public rebuttal (Cheeseman *et al.*, 2021).

Nigeria's perspective of this argument reached its pinnacle in the prime of the 2023 general electoral cycle when the then INEC Chairman, Prof. Mahmood, projected that the adopted electoral technologies, such as BVAS and IReV in particular, would, with certainty, help the umpire to deliver free, fair, credible, and auditable elections. In fact, it was said that most of the highlighted pervasive problematic issues related to election result management processes would be eliminated by those technological innovations (Ochuko-Ogoh, 2025; Peter, 2023).

Alas, the 2023 general elections yielded a complicated experience. Only a few members of the public substantially acknowledged the fact that the deployed technologies, the BVAS in this case, actually decimated voter impersonation and multiple voting problems. Many of the domestic political analysts granting on-air interviews on electoral issues refused to significantly give due credit to INEC, arguing that IReV did not afford the electorate an unprecedentedly access to polling-unit-level election results remotely (Akah *et al.*, 2024; SALAHU *et al.*, 2025).

It was the IReV's failure to transmit and publish presidential election results in real time that was overwhelmingly criticised both on social media and mainstream media. The criticism was hard-hitting on INEC as the IReV's failure was seen as being directly contravening its own electoral guidelines. This was how the legitimacy crisis that snowballed into electoral litigation and several opposing petitions calling for election cancellation was triggered (Akah *et al.*, 2024; Onyekwelu, 2023). The subsequent Supreme Court ruling where it was declared that electronic transmission was not a statutory requirement in Nigeria's electoral system, was the final nail in the coffin for the matter. That was how the electoral framework for electoral technological governance was crippled (Akinola, 2025; Kabir & Wabemo, 2026). This is why the paper argues that the 2023

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electoral cycle was a critical, and rich empirical laboratory that enabled us to examine the relationship between technological innovation and electoral integrity systematically.

TECHNOLOGICAL INNOVATION: WHAT IS IT?

Innovation can be defined as a new or significantly improved market-ready solution. This solution could be in form of a process, product, or service, that solves a problem or challenge (Granstrand & Holgersson, 2020). Innovation is a solution with a transformative ability to accelerate impact (Kahn, 2018; Stenberg, 2017). However, technological innovation is a process. A multi-dimensional and dynamic one (Coccia, 2021). It entails creation, adoption, integration, incremental and disruptive changes, and application of novel or significantly enhanced technologies for the sole purpose of generating value or added value (Yordanova & Todorova, 2025). It is usually created to solve problems, provide services, and transform products, processes or systems, even within the organisational and societal frameworks (Coccia, 2021; Yordanova & Todorova, 2025). Technological innovation transcends mere inventions. It includes the diffusion, utilisation, and recombination of existing technological know-how in pursuit of enhanced performance, usually characterised by openness, interdisciplinarity, and continuous metamorphosis in response to environmentally, economically, and socially induced demands (Sun *et al.*, 2021).

The recent scholarships have also further conceptualised technological innovation as the incorporation of evolutionary and systemic phenomena by which technology synchronises with human, organisational and institutional determining factors to generate entirely new or significantly improved capabilities and productivity (Waheduzzaman, 2026).

History of electoral technological innovation in Nigeria since 1999

In Nigeria, the formation of a Western-style election management system dates back to the colonial era, specifically the 1850s. This was when the Legislative Councils were open to integrating more components of representation in response to the growing anti-colonial struggles. For instance, the Lagos Legislative Council increasingly became a platform for contests between early political associations for seats, a practice that largely underpinned bolder demands for constitutional reforms requiring Nigerians to be represented in the then-administrative affairs (INEC Activity, 2014).

Following the constitutional reforms of 1922, 1946, 1951, 1954, and 1956, Nigeria's electoral system has been administered by several electoral commissions since it gained independence. Nigeria had the Electoral Commission of Nigeria (ECN) from 1960 to 1966, and the Federal Electoral Commission (FEC), later acronymised as FEDECO, which operated between 1979 and 1983. The National Electoral Commission (NEC) operated from 1987 to 1998. NEC later became NECON, i.e., the National Electoral Commission of Nigeria. 1999 was the year Nigeria's electoral umpire metamorphosed into the Independent National Electoral Commission(INEC) (Ekundayo, 2015). Hence, there is a need to review the electoral technologies deployed since the beginning of the present electoral commission.

Between May 29, 1999 (the day Nigeria's Fourth Republic emerged) and 2019, the Independent National Electoral Commission has conducted six general elections (Mohammed & Kura, 2022), implying that there have been many general elections and several off-cycle elections conducted by the INEC to date. To ensure the efficient delivery of electoral services in conducting free, fair, credible, and inclusive elections, INEC has been deploying technologies over the years.

The Independent National Electoral Commission (INEC), in the bid to enhance electoral management that would meet international standards in Nigeria, has introduced several technological innovations, some of which were sophisticated technologies like the Electronic Voters Register (EVR), Automated Fingerprints Identification System (AFIS) and Smart Card Reader (SCR) and other Information Communication Technologies (ICT), which has decimated massive electoral fraud and improve the credibility of Nigeria elections (Umar *et al.*, 2022).

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As documented by Ayeni *et al.* (2018), the first-ever general elections organised by INEC in the Fourth Republic were administered without the involvement of any technology. The Electoral Act at the time had stipulated that the election shall be by one-man-one-vote, and the voters must be eligible Nigerians. A credible national register of voters was needed to support this stance, leading INEC to manually compile the register, writing registrants' details by hand on paper. The modality was that both Commission staff and ad hoc staff nationwide would go to strategic locations across the nation to record registrants' details on the prescribed forms (Ayeni & Esan, 2018).

These forms were later collected and typed to form the national register of voters for the 1999 general elections. No database and no server were deployed. No digital technology was involved at all. The register of voters, despite its limitations, served its purpose but was far from credible because the electoral principle of one-man-one-vote could not be upheld, as there were possibilities of people voting more than once and many other reported cases of voter impersonation during those elections (Umar *et al.*, 2022)

It was a fact that the credible register of voters is pivotal to the credibility of an electoral process. This fact informed the INEC's decision to take a giant leap for the first time and deploy technological innovation to improve the credibility of its register of voters, introducing Optical Magnetic Recognition (OMR) technology in 2003. Though INEC deployed OMR technology, it did not discard its old way of registering voters outright; manual registration remained as a backup for OMR. The OMR technology was introduced to help computerise the compilation of the mini-biodata of each Nigerian eligible to vote, also known as the Registrants, whose mini-biodata had been recorded manually on the EC.1A form (Ayeni & Esan, 2018).

The information from the EC.1A forms would then be transferred and shaded into the computer-readable OMR forms. Each OMR form has a unique number. An OMR machine would then scan the duly shaded computer-readable OMR forms to create a registered voter database. From the database, a small paper card carrying the summarised biodata of the registered voter, the voter's thumbprint, and the unique OMR-form number assigned to that voter would be printed as a voter card for each registrant (Jibril *et al.*, 2024).

The inclusion of the voter's thumbprint as one of the features on voter cards made it necessary for INEC to introduce the Automated Fingerprint Identification System (AFIS) technology to fish out and delete biodata of registered voters who had more than one registration data on the registered voters' database. Moreover, INEC took another leap forward by building on the previous successes of OMR technology and AFIS deployment, procuring and deploying, in the preparatory phase of the 2007 general election, the Direct Data Capturing Machines, DDCM, (Ayeni & Esan, 2018).

This machine uses biometric technologies to directly capture voters' data, aiming to improve the voter accreditation process in a polling system (Galadanci & Abdulwahab, 2020). The deployment of DCCM for the registration of eligible voters in Nigeria drastically heightened the credibility of Nigeria's electoral process by way of ending multiple registrations by a voter, which is associated with electoral malpractices like multiple voting. The components of DDCM are interconnected to register each Registrant, also known as an Applicant (eligible voter), as they present themselves to INEC Registration Officers during the Continuous Voter Registration (CVR) exercise across Nigeria. The Webcam is used to capture the applicant's photo, the USB cable is used to interconnect DDCM components, the laptop is used to capture applicants' biodata, the printer is used to print the Temporary Voter Card (TVC), and the Preliminary Register of Voters, PRV, (CVR-Manual, 2013).

The scanner captures the applicants' fingerprints, the battery pack powers the machine, backup storage stores the registration data externally, and the DDC Casing houses the entire DDCM components. (CVR-Manual, 2013). To improve DDCM's functioning, an upgraded AFIS and a business rule were introduced across the entire voter registration process to enhance the credibility of Nigeria's voter registration. Based on the introduced business rule, the Commission decided only to include the registered eligible applicants with at least two captured fingers in the national register of Voters; this was done to improve the integrity of the Register of Voters

INEC also deployed a Very Small Aperture Terminal (V-SAT) into the Nigerian electoral system, installed in

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all the 774 local government offices and state head offices of the Commission across the nation, to enable smooth transmission of election results from various positions spread across the local government areas of Nigeria. This technology did not achieve its intended purpose due to a lack of transparency that dented the 2007 general elections, and the improper training on the operationality of the V-SAT tech among the Commission's staff (Ayeni *et al.*, 2018).

In 2014, INEC deployed another technology to replace the temporary voter card issued to registered voters by the Commission in 2011. This technology, called the Permanent Voter Card(PVC), was designed and developed to contain electronic information like digitised voter biodata, biometric data, and a passport-sized voter's photograph (Lewis & Kew, 2015). The PVC could be defined as a contactless, anti-counterfeit, secured smart card, embedded with a chip storing electronised biometrics, biodata, and a photograph of a legitimate registered voter, usually called a cardholder.

It was issued by the INEC to the registered voters in Nigeria to primarily serve two functions, viz, as an acknowledgement that the holder is duly registered as a voter in Nigeria and as a form of identification for voters. A few fundamental considerations guided INEC in the production of PVC, including quality, durability, security, and cost-effectiveness. The cards were designed and developed with many specialised features to last a decade on average (INEC-TRAINING MANUAL ON ELECTION TECHNOLOGIES, 2019; Obiora *et al.*, 2025). Some features of PVCs include base substrate, security printing, personalisation, lamination, and chip embedding (Ayeni *et al.*, 2018).

INEC, in its quest to prevent electoral malpractices, allow legitimate votes to truly count, reduce litigation arising from elections, ensure accurate voter accreditation, protect the credibility and integrity of the election, audit election results from polling units across the federation, ensure transparency and accountability, and enable election-related data gathering that would pave way for data analysis, deployed another Smart Card Reader (SCR) into the 2015 general elections for the first time in Nigeria. This technology, which operated on cryptographical technology with ultra-low power consumption, a single core frequency of 1.2 GHz, and an Android 4.2.2 operating system, was designed and developed to carry out voter accreditation electronically and keep a tally of voter accreditation data in each polling unit of its deployment, to be communicated to the INEC central server either intermittently during the poll or at the close of the poll in each local government. (INEC-TRAINING MANUAL ON ELECTION TECHNOLOGIES, 2019).

The INEC SCR is an electronic device that uses Radio Frequency Identification (RFID) technology to identify and track tags attached to objects automatically. These tags usually store electronic information. SCR has both software and hardware components that work together to perform voter electronic accreditation. The main software component is called INEC Voters Authentication System (IVAS), and the hardware components are its charger, USB Cable, lint-free cloth, and the SCR itself. It is with the IVAS Software that the real task of electronic voter accreditation is carried out on the SCR during the polling procedure at the polling units. SCR is specially featured with a Fingerprint window, Speaker and Indicator Display and Touch Panel, Main key Area (Red Button at the bottom right symbolising ON & OFF), Card Reading Area, Battery cover, Side keys, and USB Interface for charging and data transmission(INEC-TRAINING MANUAL ON ELECTION TECHNOLOGIES, 2019).

According to the information provided by Ayeni *et al.* (2018) and the INEC Training Manual on Election Technologies (2019), a few other Mobile Applications (Apps) and web-based online platform technologies were deployed alongside SCR to run on the SCR, as they interoperate. Examples of such technologies include the Electronic-Transparency Mobile Application. The administration and collation (e-TRAC) system was launched to electronically administer election results transparently.(INEC-TRAINING MANUAL ON ELECTION TECHNOLOGIES, 2019).

The Electronic Collation App (e-Collation) was developed and introduced to tabulate and aggregate election results electronically, from polling units to the point of declaration, depending on the election type. Electronic Transmission (e-Transmission), another technology deployed alongside SCR, is installed on the SCR to electronically move the published election results from the polling unit to a centralised database system. It is

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worth noting that the published election result refers to the election result uploaded from the polling units to a centralised database (INEC-TRAINING MANUAL ON ELECTION TECHNOLOGIES, 2019)

The Election Technologies Manual (2022) further explained that the Electronic Voter Register (EVR) was another deployed electoral technology. It is a digitalised electoral roll holding the compiled details of eligible voters on a polling unit basis. It is especially featured with polling unit delimitation details, coded polling unit delimitation data, passport-sized photos of registered voters, their names, QR codes, year of birth, occupation, gender, voter identification number (VIN), and checkboxes for election type. The EVR has several features, with five small boxes representing types of elections that the Poll Officer would check at the poll.

The global Covid-19 pandemic outbreak, coupled with the fact that the DCCM had served INEC for over ten years, was one of the reasons why the Commission had to rework the delivery of its electoral services and operations, to accommodate the realities that were occasioned by the said outbreak, complying with the Covid-19 precautionary measures. This was the rationale that informed the deployment of another technological device, the INEC Voter Enrolment Device (IVED), the Bimodal Voter Accreditation System (BVAS), and the INEC Result Viewing (IReV) Portal, together with other Software, Mobile Apps, and web-based platforms. The IVED/BVAS technology is multipurpose and changes names for each electoral task (Apeloko *et al.*, 2024).

a) INEC voter enrolment device (IVED)

IVED was deployed for voter registration. The Continuous Voter Registration (CVR) exercise is a voter registration process that allows eligible Nigerians to enrol as voters in Nigeria, hence the name INEC Voter Enrolment Device. IVED was deployed to replace DCCM. This deployment introduced cloud computing techniques into the voter registration process, including the capture and storage of voters' biodata and biometric data (Election Technologies Manual, 2022).

The IVED-driven voter registration procedure somewhat enhanced electoral accessibility because every eligible Nigerian who wishes to enrol as a voter in Nigeria could commence the registration process online, anywhere in the world, by logging into the INEC Public Voter Registration Portal at cvr.inecnigeria.org or cvr.inec.gov.ng and entering their biodata as required. Upon submission of the registrants' online enrolment applications, their applications will be automatically scheduled and assigned an appointment date for them to visit the closest or most convenient INEC local office to the polling unit of their choice. It is in that office that the registrants' biometric data (recaptured facial images and fingerprints) would be captured using IVED. This procedure is what INEC calls Voter Pre-registration or Online Registration (Apeloko *et al.*, 2024).

An eligible Nigerian could also walk into the proper local office to register as a voter without pre-registering or registering online, meaning the entire registration process would commence only when he or she walks in person. This procedure is what INEC calls In-person registration. It is noteworthy, however, that either of these voter registration procedures remains cloud-based, meaning they are only possible when IVED is connected to the internet. However, IVED could also be configured to enrol registrants offline. IVED is a game changer (Election Technologies Manual, 2022).

The new technology deployed alongside IVED to replace AFIS (a monobiotic solution introduced to clean up and remove duplicate data from the national database of registered voters) is called the Automated Biometric Identification System (ABIS). It is a more advanced biometric solution that uses multiple unique features to identify a person. It was introduced to undertake the same task that AFIS used to do. ABIS uses de-duplication to sieve the raw registered voters' data, first leveraging the captured photos. After which, the second de-duplication process that leverages scanned fingerprints would also run. Each of the two phases of this process would produce flagged, highly similar scores for registered voters. These are done to determine whether any persons have registered more than once in the system. (Abimbola, 2022).

According to Abimbola (2022), all flagged duplicates would be harvested and deleted from the registered voters' database, while retaining the voter's original data. This is done to prevent any possibility of a voter voting more than once in an election, thereby upholding the provision of the Electoral Act, 2022, as amended, which stipulates that voting in Nigeria's electoral system shall be by one man, one vote.

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b) Bimodal voter accreditation system (BVAS)

The term "Bimodal" in the Bimodal Voter Accreditation System speaks to the fact that BVAS has two ("Bi") modes ("Modal"), or ways of operation, as far as voter accreditation is concerned. This further implies that BVAS uses two or more biometric features to identify a person, and in Nigeria's electoral process, the voter's face and fingerprints (Abimbola, 2022).

Voter accreditation in Nigeria's electoral system is the process of verifying, validating, confirming, or authenticating the eligibility of registered voters at the polling station. It is the process that every voter who approaches his or her respective polling unit to vote must pass through before the appropriate ballot paper or papers, depending on the type of election, are issued to him or her to cast his or her vote (Election Technologies Manual, 2022).

Voter accreditation is the process of verifying a voter's identity before allowing them to cast a vote at a polling unit. The SCR, introduced by INEC to support electronic accreditation, relied on a single modality of human biometric feature for voter identification. However, the reality, as observed by INEC, is that not everyone has fingerprints; some voters' fingerprints were found to be badly damaged beyond recognition at the polls due to accidents or circumstances beyond their control, leaving loopholes for electoral malpractice. It was during the era of SCR that electronic voter accreditation (which SCR was brought in to undertake) was defined as the process by which the genuineness or originality of PVCs is verified. The legitimacy of the PVC bearer or holder is authenticated through fingerprint matching using SCR (INEC-Trainers' Guide, 2022). However, the emergence of BVAS has brought better identification methods, including facial recognition, which was pioneered in the 1960s and has advanced significantly over the last 50 years, with a track record of 99.9% success. The BVAS electronically accredits voters by authenticating them through fingerprint and facial biometrics. This is to guard against voting by identity theft, where one person uses another's Permanent Voter's Card (PVC) to cast a vote.

Adding the facial technology to the existing fingerprint technology would ensure that all voters are authenticated by either of the technologies or both of them, implying that with bi-modal authentication, no person can come to vote more than once, as the face of the person would have been captured during authentication; this further ensures one-person-one-vote. It is worth noting that during this era of BVAS, electronic voter accreditation is defined as voter verification, which involves authenticating that the PVC bearer at the polling unit is the legitimate owner of the card. This is done via fingerprint matching of voters or facial recognition, using the BVAS (INEC-Trainers' Guide, 2022). Thus, BVAS essentially uses fingerprints or facial recognition to determine whether a voter will vote in the poll, and it does so electronically by identifying legitimate voters. The BVAS was deployed at the Osun State governorship election on July 16, 2022, and was deemed a game-changer that would virtually eliminate rigging in the 2023 general elections (ABDULRAHAMAN & EFEBEH, 2023).

c) INEC results viewing (IReV) technology

INEC Results Viewing (IReV) technology was deployed to transmit and publish the election results electronically. This technological innovation was necessitated by observed irregularities, such as results hijacking, tampering, and destruction that often accompany the announcement of election results at the polling unit during elections, and untold election result-related frauds that often occur between polling units and collation centres (INEC-Trainers' Guide, 2022).

INEC has deployed the election results publishing and viewing portals called IReV Portals. The poll officials in charge of the election at a polling unit would launch the IReV App already installed and duly configured to photograph or scan the duly filled and signed result sheet, and then upload and transmit it electronically to the IReV Portal. It should be noted that IReV App is not the same as the IReV Portal (INEC-Trainers' Guide, 2022).

IReV Portal is also an online public portal that enables all categories of electoral stakeholders to have real-time access to the transmitted and published election results (Acheampong, 2023). This implies that IReV is a

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double-end-user electoral technology. Poll officials and the general public use it to publish election results and view them in real time, respectively. This was done to improve the openness and credibility of elections. By this, INEC had made available the electronic copies of the polling units' results for the general public to view, meaning that the uploaded and transmitted results sheet, which have been duly filled and signed by appropriate poll officials from the polling unit level, registration level or local government area level, could now be viewed by the general public (Acheampong, 2023).

d) IVED/BVAS Tablet technology

This technological device (IVED/BVAS), whose technical features were tabularised in Table 1.0, is a mobile solution for both data capture and identity verification. It works in an interconnected manner with a series of peripheral devices connected to the Tablet. The IVED/BVAS is the integrated smart ID and biometric technology that introduces security, efficiency, and convenience to electoral services such as Continuous Voter Registration (CVR), the exercise that gives eligible Nigerians the opportunity to register as voters, and the identity verification process, otherwise known as voter accreditation (Election Technologies Manual, 2022).

Table 1.0: Table showing the specification and description of different types of BVAS features

S/N	TYPE OF FEATURES	ITEM	SPECIFICATIONS	DESCRIPTION
1	Mechanical	Product Type	8 inch Tablet	1280X800 dpi
		Slide Key	on/off	Yes
			volume	Yes
			Rest Key	Yes
		General	Rest Key	Yes
		Platform	MTK6762VWD	Octa-Core 2.0G
		Memory	4GB+64GB	DDR4
		Extend Memory	Micro SD	128G extend
		OS	Android 10	
		System & Band	GSM/GPRS/EDGE Bands	850/900/1800/1900
			3G Bands	WCDMA:W2100
			FDD_LTE Bands	B1/B3/B7/B20/B28
2	Multimedia	LCD	8"HD	
		LCD Resolution	800*1280 dpi	
		TP	Capacitive Screen, Multi-touch	
		Camera	Front Camera	
			Rear Camera	16M;Site records/Auto focus/Read 2D/3D automatically Magnifying scanning
		Torch	Yes (from Flash LED)	1A
		Speakers	Yes	
		Charging Indicator	Yes	RGB Tricolor
3	Power Management	Battery Capacity	8000mAh	Internal Battery
		Charge	Type-C	5V2A, UK Plug
4	External Ports	USB A	Yes	2XUSB2.0
		USB Type C	Yes	Support Charging (charging current 2A)
		SIM Card	NANO SIM*2	
		PSAM Card	4	
		Fingerprint	Yes	Image Area: 19.7 X 19mm; Resolution up to 500dpi
		Accessories	Yes	Charge, UK, 5V2A
			Yes	Type-C Cable
		Temperature	Storage Temperature	
			Operation Temperatrure	
		Dimensions(LXWXH)	202X187X(18+28)mm	Max. high 45.1mm
		Wight (g)	780g	
5	Other	GPS/AGPS	Yes	-20 ~ 70
		Bluetooth	Yes	-15 ~ 50
		Wifi	Yes	BT4.1 with BLE
		FM	Yes	802.11a/b/g/n/ac; Support 2.5G/5G
				Support Type-C Headphone

Source: (Fieldwork, 2023)

This IVED/BVAS technology combines fingerprint scanning and photo-taking into a small device with a rich, flexible communication interface, adopting a scalable system that supports external functional components to enable INEC to provide faster, more secure, and more effective control over voters' identity. (INEC-Trainers'

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Guide, 2022). As shown in the Figure 1.0, the IVED/BVAS tablet has major features such as a fingerprint scanner(1), front camera(2), touchscreen(3), USB type A(4), USB type A(5), USB type C(OTG and Power Port)(6), speaker and microphone(7), back camera (8), LED flash(9), power button(10), volume button(11), dual sim card and psam cards (12). The IVED/BVAS tablet's features are categorised, according to Table 1.0, into five main features: Mechanical features, Multimedia features, Power Management features, External port features, and Other features. These main features and their composites are detailed.

Figure 1.0: The numerically labelled features of the BVAS/IVED tablet (Election Technologies Manual, 2022)

e) INEC training virtual assistant/ INEC training bot

This is a technology deployed by The Election Institute (TEI) of the Commission to enable all categories of INEC Staff (ad-hoc, permanent and others), who would be working as poll officials or carrying out one or more electoral tasks, to have access to the simplified educational or training materials in videos and PDF formats through the virtual training assistant of the Commission. It is an online resource system developed to equip INEC staffers with the information, knowledge, and experience needed to perform their assigned electoral duties effectively (Fieldwork, 2023).

It is a training platform built by leveraging the built-in robotic technology in social media Apps like Telegram, Facebook Messenger, and the like, using responsive, integrated PDFs and explainer videos to teach and illustrate (Fieldwork, 2023). The way it works is such that when a user, in this instance, a poll official who intends to learn more about their duty at the poll, launches the INEC Training Bot Portal, he or she would get linked to the INEC Telegram page where the users interact with all sorts of automated responses either in audio, video and PDF forms. Some of the topics that had been automated on that platform are: 1. The Polling Team and Responsibilities, 2. Non-Sensitive Election Materials, 3. Sensitive Election Materials, 4. Permanent Voter Card, 5. Overview of the Bimodal Voter Accreditation System (BVAS), 6. How to log in to the BVAS device, 7. Use of BVAS for Accreditation, 8. Use of BVAS for Identification, Verification and Authentication, 9. Use of the BVAS for the export of accreditation voters, 10. Using the BVAS to upload the Election Result Form EC.8A, 11. Offline Transmission of Results, 12. Election Day Procedures, 13. Polling Procedure, 14. Setting Up Procedure, among others (Fieldwork, 2023).

f) Other mobile Apps and portal deployed by the Independent National Electoral Commission (INEC)

i. INEC-SANS

According to the INEC-SANS Training Manual (2022), the term "INEC-SANS" stands for the INEC Security Alert and Notification System. It is a mobile App developed by the Commission to enable "on-the-go" communication between election officials and proper Responders. It was designed to enable quick, adequate responses that could mitigate or forestall critical incidents or provide adequate responses to security incidents if they occurred. INEC-SANS was deployed with the intention that its proper use would enhance the rapid provision of preventive and responsive measures towards security challenges during the electoral cycle.

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INEC-SANS was developed to deliver real-time information needed by the Responders to mitigate or end adverse incidents, provide detailed incident reports, and mobilise a coordinated response to security threats. It has two major modes of use, viz, off-election mode and election mode. When running in off-election mode, the Secretariat would remain open, and the INEC Chairman, the National Commissioner in charge of the Security Committee, and the Director of the Security Department would receive the Threat Alert for logged-on users. However, the SOS mode (an online mode of the INEC-SANS would remain active for emergencies (INEC-SANS Training Manual, 2022).

When working in an election mode, it covers all activities in the electoral cycle, especially at General elections and for major off-cycle elections such as the Governorship election. (INEC-SANS Training Manual, 2022) INEC-SANS has two major modes of use, viz, off-election mode and election mode. When running in off-election mode, the Secretariat would remain open, and the INEC Chairman, the National Commissioner in charge of the Security Committee, and the Director of the Security Department would receive the Threat Alert for logged-on users. However, the SOS mode (an online mode of the INEC-SANS would remain active for emergencies. When working in election mode, it covers all activities in the electoral cycle, especially during General elections and major off-cycle elections such as gubernatorial elections (INEC-SANS Training Manual, 2022).

ii. INEC PRES

Another mobile application deployed by INEC is INEC PRES. It was developed by the Commission to make the mass recruitment of ad-hoc staff who would be mobilised at various levels of electoral service delivery during an election easier. The individuals who meet the terms and conditions for recruitment as decided by the Commission, would download the App and complete the registration

Table 2.0: Other INEC Portals and their Functions

S/N	Portals' Names	Portals URL	Portal Functions
1	INEC Candidate Nomination Portal (ICNP)	inecnigeria.org	It is a platform used by Political parties to submit documents for their nominated candidates
2	The Observer Group Portal	inecnigeria.org	It is used by the duly registered CSOs, NGOs, Embassies, or Foreign Observer Groups to apply for a scheduled election or electoral activity, and serves as a platform where accredited Observer Groups get to upload and deploy their personnel at designated locations right on the Portal
3	Media Accreditation Portal	imap.inecnigeria.org	Used by a Media personality or outfit to apply and get accredited to cover a scheduled electoral activity. Examples are Online bloggers, Newspaper Houses, and Television and Radio Stations.
4	The INEC Political Party Polling Agent's Platform	INEC Political Party Polling Agent (inecnigeria.org)	Used by accredited political parties to carry out seamless upload and management of polling and collation agents taking part in an election within an integrated system.
5	Voter Status Verification System	voters.inecnigeria.org	Used by Nigeria's registered voters to check or verify their voting status.
6	INEC CVR Portal (Plate 2.19)	cvradmin.inecnigeria.org	Used strictly by the selected senior staff and some management staff of INEC with different clearance levels to run a digitalized PVC Inventory, register eligible registration applicants and undertake other CVR-related exercises on the portal

Source: (Fieldwork, 2023)

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process before logging in to apply for different ad-hoc job opportunities. Aside from making use of the INEC PRES Mobile App, any intending applicants could also make use of pres.inecnigeria.org Uniform Resource Locator (URL) for the same purpose (Fieldwork, 2023).

ELECTORAL INTEGRITY: WHY IS IT?

As argued by Frank and Coma (2017), many scholars have conceived electoral integrity in terms of organised electoral malpractices or electoral negativities. However, electoral integrity does not necessarily represent negativities in its entirety. A considerable number of scholarly publications, in a bid to explain what is meant by electoral integrity, have conceptualised measures or practices secretly or openly conducted to undermine the true outcomes of elections. A category of scholars also characterised their definitions of electoral integrity in terms of electoral positivity, such as fairness, impartiality, and freedom in the electoral process.

Aligning with the scholars who have conceptualised electoral integrity in terms of its positivity, electoral integrity from the angle of human rights, is a phenomenon that comes to be when the electoral systems satisfy universal resolution and international standards that stretch through a complete electoral cycle. (Norris *et al.*, 2018). It is internationally accepted agreements and universal electoral measures that reflect the global models which are adopted by all countries of the world, spanning the entire electoral cycles (Frank & i Coma, 2017).

As Norris (2018) highlighted, the internationally agreed-upon conventions and standards encapsulated in the definitions of electoral integrity above are not just mere conjectures. They are written declarations and treaties. protocols, case law, and guidelines issued by the organisations of sovereign states and sanctioned by member states of the intergovernmental organisations. Some of these treaties are legally binding under international law, and others, though customary in nature, are effective. The broadness and complexity known with the concept of electoral integrity have always made its operationality and measurement an exceedingly difficult task to undertake or carry out.

Despite this noted difficulty, operationalising electoral integrity in a detailed, effective, and dependable manner has been achieved through the huge and collaborative effort of the scholars. It is noteworthy, however, that as things stand today, measuring electoral integrity in any electoral space has always been addressed through two approaches, viz, making use of mass surveys and/or making use of expert judgments(Fisher *et al.*, 2018).

The Perception of Electoral Integrity (PEI) index is borne out of the Electoral Integrity Project and has, since its emergence, been serving as an indicator to assess the administration and performance of the electoral process the world over. The indicator employed the assessments of the academicians, usually known as experts, to examine the perceived quality of elections. And the whole measurement is hinged on the main notion that elections are broken down into eleven crucial chronological phases, as highlighted in Figure 2.4 below; such that failure to comply with or uphold the international standards at any one of the phases of the electoral integrity cycle has violated the integrity of the whole electoral process (Fisher *et al.*, 2018).

It should be noted, however, that Garnett and James (2021) made a notable departure from the electoral integrity measurement approach as outlined by Norris, and argued that election practitioners like the election administrators and/or election managers, given their exclusive practice-based electoral understanding and experience rooted in the deep knowledge of electoral technicalities and administration, which may be have eluded the public and the so-called experts, could be the reason why the election practitioners are better suited to evaluate and measure the electoral integrity of an electoral process.

The grassroots knowledge of these election practitioners may serve as pointers to revealing how notoriously or outstandingly the elections are being conducted. Having in mind that elections are as good as the acceptability and credibility they enjoy from the electorates, electoral integrity can therefore be defined as the satisfaction of required electoral expectations in the conduct of elections, which is mandatory support for the wider fulfilment of core democratic ideals (Garnett & James, 2021).

Therefore, the electoral integrity speaks to the degree to which the electoral processes and service delivery is conducted and provided respectively in accordance with the established standardised democratic principles

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across the entire electoral cycle, in ensuring that the electoral outcome truly conveys the genuine will of the people (Ikoko & Latif, 2025). These principles include transparency, impartiality, accountability, inclusivity and the rule of law (Schnaudt, 2025).

It is a systemic and multidimensional construct involving legal context, institutional performance, political rights, electoral administration and citizen perceptions of fairness and legitimacy (James & Garnett, 2025). Electoral integrity, via the lens of resilience and governance dimensions, is the capability of an electoral system, institutions, and electoral stakeholders to team up to work out a credible election even under external pressures such as political manipulations, crises and technological disruptions (James & Garnett, 2025).

THE POLITICAL ECONOMY OF ELECTORAL TECHNOLOGY IN NIGERIA: HISTORICAL TRAJECTORIES

The deployment of electoral technologies in Nigeria's electoral landscape was not accidental. It mirrored a repeated trend of electoral crisis, which would result, usually, in a renewed recycling of technological investment, conceived as a definitive panacea to the electoral integrity deficit. As earlier highlighted, the adoption of the Automated Fingerprint Identification System by the then Professor Attahiru Jega-led INEC, for the 2011 Continuous Voter Registration was the first major occasion of the biometric technology intervention. It was designed, developed and deployed to ensure credibility of the national voter register, which was said to have been grossly inflated by the inclusion of the so-called illegitimate registered voters in the previous electoral cycles (Fatai, 2023).

The adoption of the Permanent Voter Card (PVC) and Smart Card Reader (SCR) for the 2015 and 2019 general elections was applauded as another viable solution to the prevalent voter accreditation failures. The techs were designed and developed with the capability to carry out electronic voter accreditation. Despite such capabilities, the SCR was unable to ensure one-man-one-vote. It even failed at blocking proxy-voting and adequate management of the voter accreditation biometric data. This was what informed the adoption of the Bimodal Voter Accreditation System, BVAS, (SALAHU *et al.*, 2025).

This iterative trend of technological innovation adoption has been studied by Cheeseman *et al.* (2018). It was conceptualised as the fetishisation of technology. This is a tendency, as observed across sub-Saharan Africa, to project technological innovations as characteristically democratising, not minding the need for critical assessment of the institutional determining factors within which they are effectively successful.

As shown by the comparative study conducted by Cheeseman *et al.* (2018) Across Ghana, Kenya, and Uganda, the impacts of technological innovations on the electoral integrity were significantly mediated by the independence of the electoral management body, electoral credibility, legal framework strength, and the structure of the political incentive confronting the incumbent elites. In Ghana, where these factors were positive, the technological innovations contributed immensely to electoral integrity. In Kenya, where the impacts were frail, the technological innovations have been subverted by the political gladiators to complicate post-election disputes and worsen the lack of electoral transparency. Nigeria's 2023 general election experiences deflect more towards the Kenyan admonitory tale than the Ghanaian success story.

Another dimension worthy of critical review in this study is the cost dimension of adopting electoral technology in Nigeria. The INEC 's 2023 electoral budget allocated approximately 105.25 billion naira, an equivalent of 34.51% of the whole election budget, to procure BVAS devices alone. And the INEC acquired 200, 000 units from a Chinese company (Shenzhen Emperor Technology) at approximately $795 per unit (Akah *et al.*, 2024; Ezeigbo, 2024; ONWUHARAONYE *et al.*, 2024). It is true that INEC officially reported that over 355 billion naira was spent to manage the 2023 general elections. If the cost of security deployments, the cost of business disruption and the cost of violence-related destruction are factored together, Nigeria's 2023 electoral cycle cost an estimated 500 billion naira (Sambo *et al.*, 2024). These figures triggered some unanswered questions about the democratic resource allocations. Could the substantial capital expended on adopting technological innovations in terms of hardware-based solutions foster electoral integrity if invested in staff capacity building, infrastructure reconfiguration, legal reform and institutional capacity, which are systemic fundamentals for technology to deliver optimally as intended?

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Another dimension deserving of scrutiny is the legal framework governing the operationality of electoral technology. The 2022 Electoral Act, as amended, empowered INEC to deploy electoral technologies as deem fit in pursuit of electoral integrity and yet refused to make electronic transmission a binding statutory requirement (Akinola, 2026). This was a legislative ambiguity that caused an electoral tremor in 2023. The fact that Nigeria's apex Court ruled that IReV was only a viewing platform (Bur, 2024), not legally mandated to transmit and publish polling unit-level election results (Noah, 2024), was the story of how the electoral credibility in the 2023 general elections died. That was how a perverse incentive structure of the INEC's commitments to technological innovations exceeds their legal enforceability. This has since left the guarantee of electoral integrity to the electoral administrative discretion as against a statutory obligation (Akah *et al.*, 2024).

BVAS and IReV: DEMONSTRATED EFFECTIVENESS AND STRUCTURAL LIMITATIONS

What the technologies achieved

The genuine and significant contributions of BVAS and IReV to delivering and promoting electoral integrity in the 2023 electoral cycle were well acknowledged. This contribution was even more profound, particularly at the voter accreditation stage. As highlighted before, BVAS was designed to function as IVED, enrolling eligible Nigerians as registered voters, function as BVAS, conducting electronic voter accreditation using facial recognition and fingerprint biometric technologies, and then export accreditation data to the allocated server, and function as IReV to scan form EC-8A (electoral polling unit result sheet), transmit and publish polling-unit-level election result on the public IReV portal (SALAHU *et al.*, 2025). It is important to stress that the incorporation of voter registration technological innovation(IVED), electronic voter accreditation technological innovation(BVAS), and the election result management technological innovation(IReV) into a single technological device is an authentic, substantial architectural improvement over the previous SCR technology, which was limited to electronic voter accreditation, with no solution to the vulnerabilities related to election result collations.

Several empirical studies covering various geopolitical zones have confirmed that BVAS lowered voter impersonation and helped to ensure one-man-one-vote significantly. It was found, by a quantitative study conducted on the 2023 Federal Capital Territory election, that 85.7 per cent of respondents attested to the BVAS's efficacious capability in solving electoral malpractices in terms of voter impersonation reduction, as documented in polling units across Abuja (Orhero & Okolie, 2024).

SALAHU *et al.* (2025), in parallel research conducted on the 2023 Kwara State governorship election, found that BVAS reduced multiple voting, enhanced the voter accreditation process and lowered electoral fraud. The study recommended institutionalising BVAS to make it a statutory component of Nigeria's electoral framework. It was also found that, at the national level, the electronic voter accreditation process was faster with BVAS than it was with SCR. As conceived by INEC, the IReV was deployed to enable the general public to have real-time access to all the polling-unit election results as scanned, transmitted, and published on the IReV Public Portal. This technological solution constituted a structural innovation of potentially transformative importance towards transparency in the election results management.

The subnational piloting of IReV technology happened in the 2022 Ekiti and Osun gubernatorial elections. And just as intended, the tech's performance met significant expectations. It played a crucial role in how the 2022 Osun governorship election result was invalidated by the election tribunal based on the discrepancies between the IReV exported voter accreditation data and the manually entered data. This was a milestone demonstration, spotlighting the significance of technological innovation to ensure and preserve digital result transparency, serving as an accountability mechanism (Fatai, 2023). It was this successful deployment of these technological innovations (BVAS/IVED/IReV), that reinforced INEC's commitment to deploy the same for the presidential election of February 2023, where 530,538 result sheets were to be scanned, transmitted and published from 176,846 polling units nationwide, to the IReV Public Platform.

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The February 2023 failure and its consequences

It is important to bring to mind the lessons that the February 25, 2023, Presidential and National Assembly elections taught us. The lesson was about the revelation of a catastrophic gap between the technological capability projections and the electoral operational delivery. This was because, in spite of the INEC's prior effort and promise to transmit election results for the general public to view in real-time remotely, it was only a few presidential election results that were available on the Public IReV Portal on election night. This disaster was an INEC direct contravention of its own guidelines and the expectations sold to the public by its own public communication (KUCICI & DALAH, 2025; Peter, 2023).

Reacting to this colossal electoral failure, many Political Party Agents, at the behest of their political parties (Labour Party and Peoples Democratic Party, especially), staged a walkout protest out of the collation centres in Abuja. They also filed petitions against INEC, alleging that the Electoral Act 2022 had been breached by the very institution armed with the constitutional powers to uphold it. The said petition also argued that the presidential election results announced at a higher level of collations substantially differed from the ones transmitted at the polling unit level (TSOKWA & NWANEGBO, 2024; Uwaezuoke & Nwobu, 2023).

Some public technical analysts speculated that the technical failure experienced during the 2023 general elections was multiple and intersecting, as the IReV server's limited bandwidth could not handle the volume of upload traffic from the 176, 847 polling units simultaneously (Oladimeji *et al.*, 2023). However, according to INEC explanations, the technical snags were neither intentional nor man-made, as the national assembly (NASS) election results were effortlessly transmitted and published on the Public IReV Platform, because the IReV application was structured on a state-by-state basis with a folder hierarchy for each result built into the process for the election. However, this was not the case for the presidential election result because it could not be mapped into any state in the database, causing the return of error messages (Ajayi, 2025). The Nigerian Communications Commission (NCC) also confirmed that the INEC portal was subjected to a total of 12 million cyberattacks during the presidential elections, coming from both within and outside of Nigeria (Ajayi, 2025).

As reported by the 2023 European Union Election Observation Mission to Nigeria, the opacity of the INEC electoral technologies, poor pre-election pilot testing of the electoral techs, and the lack of due diligence in INEC staff training were also determining factors (EUEOM, 2023). The International Republican Institute and National Democratic Institute (IRI-NDI) Joint Observation Mission reported that the BVAS fingerprint verification component functioned woefully compared to the facial recognition. This finding had a compelling implication for the elderly voters and those whose fingerprints have aged or worn out due to hard labour (Abumbe & Owa, 2024; Ogbadebo, 2025; Sibe & Kaunert, 2023).

On the other hand, Fatai (2023) argued that attributing the consequential failure of the 2023 presidential elections to electoral technologies was inaccurate, because BVAS and IReV technically performed as expected in the majority of the polling units across the nation where they were adequately deployed. He noted that the failure of electoral integrity happened at the stages where human interactions, such as those from the presiding officers, collation officers and political appointees. They are the ones who subscribed to the excessive discretion against the reconciliation of the electoral data transmitted electronically with manually recorded result sheets. Thus, the intentional decision not to transmit election results in real-time, characterised as a breach of Nigeria’s Electoral Act 2022 and the INEC electoral guidelines(Akah *et al.*, 2024), did not mirror the failure of the deployed electoral technologies, but governance failure, an intentional subversion of electoral technologies by the manpower entrusted with their management and administration.

STRUCTURAL AND INFRASTRUCTURAL CONSTRAINTS ON ELECTORAL TECHNOLOGY

The digital divide and internet connectivity crisis

Assessing the performance of electoral technologies in Nigeria without factoring Nigeria’s severe and uneven digital infrastructure deficit would not be accurate. Nigeria’s internet penetration rate nationally, as of January 2023, was 55.4 per cent (Musa *et al.*, 2025). This figure declined in 2025, leaving the national internet

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penetration in Nigeria at 45.4% (Okocha & James, 2025). Even with this huge declination in just two years, this aggregated figure was somewhat ambiguous as it hid the reality of a profound urban-rural divide. The internet penetration in Nigeria's urban areas stood at approximately 57%, while rural communities recorded only 23% (Aminu, 2025). This implies that Nigeria's 176,846 polling units were located in locations with a disproportionate share of internet penetration. Thus, the BVAS election results transmission suffered chronic internet connectivity limitations (Freedom-House, 2023). It was also reported, based on the broadband analysis conducted by the Nigerian Communications Commission, that there were 4,834 identified communities classified as either the unserved or underserved, concentrated in the very areas (North-East, North-West, and Niger Delta) where the electoral integrity concern was most severe (Aminu, 2025; Freedom-House, 2023).

The IReV's mandate to transmit election results and polling data in real time has a significant implication. It was a critical consequence. In places where 2G and 3G internet connectivity has dominance, or where there were no internet signals, transmission of election results and other polling data became almost impossible logistically without alternative transmission infrastructure. This transmission deficit was further worsen by the prevalent epileptic power supply across Nigeria, as more than 30,000 telecommunication base stations relied on diesel to fuel their power-generating sets for the frequent national power grid collapses; leading to 40 per cent inflated operational cost and a reduction of internet connectivity reliability that was much needed during an extended period of higher demand of election days. This showed that, in contrast to Kenya's method, Nigeria's failure to fully designate electoral systems as a crucial national infrastructure implied that prioritisation of internet connectivity bandwidth for the transmission of election results and other polling data on election day has not been institutionalised (Chatham-House, 2023). The foregoing reveals that is a basic friction between the legality for e-transmission of electoral data and the actual capacity to get it done. This noted tension cannot be resolved by the legislative reform alone without sustained financing of the broadband expansion and the establishment of dedicated transmission nodes.

Security Threats and Electoral Violence

Another area of interest in this discourse is the role that insecurity and electoral violence played in technological innovation deployment and electoral integrity. The 2023 general elections took place right at a time when the security situation was at an exceptional severity. There were Boko Haram crises in the North-East, rural banditry in the North-West and North-Central, intersecting with the Middle Belt genocidal clashes and the separatist agitation in the South-East (International Crisis Group, 2023; Watch, 2023).

These security threats forced a structural limitation on the deployment of electoral technologies. No amount of digital sophistication could solve such a structural constraint. In those areas where the armed groups have effective territorial control, the poll officials could not be deployed, the BVAS devices could not be operated, and the election results could not be transmitted. As presented by the Watch (2023) election violence tracker, there was an observed pattern of attacks on INEC offices, electoral materials, and the INEC manpower in the pre-election and during the 2023 elections. These attacks also targeted election candidates, political party supporters, and election observers in multiple states across the country.

There was also a physical risk threatening the election result collation. There were reports of several collation officers being attacked, Form EC 8A (election results sheet) being stolen, mutilated or destroyed in transit, spread across the Niger-Delta region and the North-East insurgent-affected areas. In Zamfara, Kaduna and Borno, for instance, the election officials transporting election results were attacked despite being escorted by the military operatives (Abdulyakeen, 2022; Udemezue, 2025).All these directly violated the electoral integrity and undermined the INEC framework for electronic election result management. In a situation where actual physical election results get destroyed or substituted in transit between polling units and collation centres, and the physically collated figures used to determine the winner of an election disagree with the IReV's transmitted and published polling data, which accurately conveys the polling-unit level election results. The very discrepancies that instigated the 2023 post-election legitimacy crisis would be fuelled.

Biometric Limitations and Exclusion Risks

There have been specific technical constraints documented empirically as observed from the biometric technological innovation incorporated into the BVAS. This limitation is capable of causing electoral exclusion

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for the vulnerable electorate. The study conducted by SALAHU *et al.* (2025) has documented that the BVAS struggled to authenticate elderly voters and voters whose fingerprints had been worn out or degraded.

It was actually confirmed that the fingerprint verification was, systematically, not as efficient as the facial recognition across several polling stations. This seemed to have defeated the drive for electoral inclusivity and accessibility (Ogbadebo, 2025). For instance, in Adamawa state, BVAS was unable to differentiate between identical twins, leading to a situation whereby only one of the said twins, being incorrectly accredited, was allowed to vote while the other was prevented from voting (SALAHU *et al.*, 2025). There were also cases where the registered voters holding valid Permanent Voter Cards (PVCs) could not vote because the BVAS failed to read their biometrics, complicating the exclusion effect.

CYBERSECURITY VULNERABILITIES AND DIGITAL THREAT LANDSCAPE

Adopting technological innovations to electoral processes and service delivery concurrently widens the scope of electoral vulnerability in terms of cyber-enabled manipulation. It opens up a new, sometimes difficult to detect, system of susceptibility different from the traditional electoral malpractices. The bearing of cybersecurity as related to electoral system in Nigeria has been well documented. For instance, International Telecommunication Union (2020) ranked Nigeria 47th globally in the Cybersecurity Readiness Index, rated Nigeria 5th in Africa (Ogbadebo, 2025). And INEC has repeatedly alleged recurrent attempts to clone BVAS hardware and hack into the IReV system with evidence of such attempts reported in the 2022 Ekiti and Osun state governorship elections where electoral digital fraudsters attempted to change electronic result of elections and voter accreditation data transmitted from the polling-unit to the INEC portal(Chatham-House, 2023).

The manners by which the last cyber-related electoral petitions were adjudicated had shown that both legal and judicial frameworks implemented as responses to cyber-enabled electoral malpractices and manipulations were underdeveloped. The courts arbitrating electoral petitions have practically shown poor capacity when it comes to interacting, at the internationally recognised evidentiary standard, with digital forensic evidence such as the inconsistencies between the IReV-transmitted data and the ones collated manually (Chatham-House, 2023). Itodo (2024) has noted that the technological innovations deployed by INEC were done via its in-house guidelines which the Supreme Court had ruled as non-binding. This was how an electoral paradox was created in which the digital evidence collected from the INEC-deployed electoral technologies was, as definitive proof of electoral output, declared inadmissible. The standard of digital forensic has to be incorporated into the electoral jurisprudence, and legal status of e-result transmission is elucidated by statute, for the electoral technology evidentiary and other electoral data in the post-election dispute resolution secure a legal precarious stance in our electoral system.

The Nigeria’s electoral threat landscape became worsen by the propagation of disinformation through digital platforms. There were report of mis-and-disinformation disseminated by the state-affiliated groups and powerful political actors. Freedom-House (2023), in its report titled freedom on the Net, documented widespread use of social media by political groups such as #Obident movement demonstrating mobilising potential and misinformation vulnerability of digital political communication. Even INEC and some Civil Society fact-checkers reported several instances of organised dissemination of invented result sheets of election and fabricated images of BVAS output being circulated on WhatsApp and Twitter as elections were ongoing. All these were testimonies to digital manipulation that took advantage of transparency architecture created by IReV (Freedom-House, 2023). This was the scholarship of Cheeseman *et al.* (2018) have theorised this dynamic phenomenon as technology's paradox of transparency. Technology innovations were deployed to make election results visible to the public, but also unintentionally made the invented election results visible to the public, but also unintentionally made the invested election results publicly distributable. This was how electoral credibility and integrity of Nigeria’s electoral system was eroding through mis-and-disinformation.

Human, Institutional, and Political Determinants: The Non-Technological Remainder

Arguably, the most significant systematically underappreciated findings projected by the comparative studies of electoral technologies especially the insight brought forward by the experience of Nigeria’s 2023 general

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elections, was that the capability of technological innovations to improve electoral integrity is ultimately bounded by the quality in terms of competence and integrity of the manpower and the institutional ecosystem in which they function. Fatai (2023) has contended that no matter how well-intended an electoral technology was deployed, it still would be operated by people. Meaning that whatever technological innovations were adopted, it could always be defeated by corrupt member of staff, be it permanent or ad-hoc. This observation is not a counsel of hopelessness. It is meant to provoke an analytical drive towards precisely identify which human, and institutional variables influence the relationship between the technological innovation deployment and electoral outputs.

Having critically considered Nigerian case, three important variables emerged. First one, the training and technical competence of both permanent and ad-hoc INEC staff. Several domestic observer groups and the European Union Election Observation Mission (2023) reported poor technical training among INEC's manpower as a significant operational failure in 2023. The poll officials lacking in capacity and technical-know-how to operate BVAS devices in the actual real-world polling stations contributed enormously to the inability of the BVAS to function as intended. In fact, it is safe to contend that such poll officials were part of the reason why BVAS malfunctioned, uploaded and transmitted e-election results improperly. It should be noted that in few cases, the use of personal mobile phones to transmit result to the IReV public portal has led to unintended uploads of unrelated content to the IReV public platform. The deployment and technically supporting over 200, 000 BVAS tablets spread across 176, 846 polling units, speaks to the magnitude of INEC's operational challenge which is big enough to stress the administrative capability of any electoral management body. Knowing fully well that the manpower technically supporting these devices were hired temporarily (Chatham-House, 2023).

The second critical variable is the independence and institutional integrity of INEC itself. It has been emphatically established that technological innovations performed reliably well when implemented by election management bodies with demonstrated outstanding independence away from incumbent influence and entrenched political interests (Stefanov, 2024; Cheeseman *et al*., 2018). Although, Nigeria's electoral umpire is formally independent, it practically operates within a politically intense environment, pressured by historical low public trust with only 23% of Nigerians it just before the 2023 general elections (Chatham-House, 2023). The failure to electronically transmit 2023 presidential election results into the IReV public portal in real-time was attributed to technical snags. However, these snags were characterised by both international and domestic election observers as deliberate sabotage. This further corroborate how failed institutional integrity could render even the well-intended sophisticated technological innovations such as BVAS or IReV unsuccessful (Abowei, 2023; Akah *et al.*, 2024). Thus, any election management body deliberating subverting its own technological innovation commitments in response to incumbent government pressure or political influence would not guarantee the electoral credibility and integrity no matter how sophisticated the technological innovations at its disposal.

The last critical variable is the broader political culture and elite incentive structures. In a political system where the political or state powers translate to disproportionate economic power, and a lack or loss of access to such powers automatically means significant vulnerability, there is bound to be structural and powerful incentive to manipulate electoral results or outcomes. As a matter of fact, Jopd (2025), Agbaje and Adejumobi (2006), and Tenuche (2009) had argued that the Nigerian state peculiar attributes such as limited autonomy, the anomie of political competition among elite politicians, and the personalisation of state or political powers, that sees implementation of technological innovations as an obstacle that needed to be circumvented rather than a solution to embrace. That is why they go all out to push for a systematic incentivisation that would produce anti-democratic behaviour by political gladiators. This is how technological innovation implementation alters modalities of electoral manipulation in this context. The manipulative attentions of these elites are no longer on ballot stuffing and manual over-voting but on digital interference and falsification of election result sheets at the collation, without eradicating the fundamental political incentives that drive it. This observation has been described experts in African democratic system as the digitalisation of electoral integrity deficits instead of their resolution. Abowei (2023) describes as the 'digitalisation of electoral integrity deficits' rather than their resolution.

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It is important to note that 2023 voter turnout data stress the civic dimension of forgoing challenge. It was reported by the Technext (2025) that only 26.7 per cent of registered voters participated in the 2023 presidential election. This was too low, historically speaking. It speaks not only to the already highlighted logistical bottlenecks and security concerns but also to a profound crisis of citizen confidence and badly damaged electoral integrity. These trends have reinforced the narrative that technological innovation, however sophisticated and carefully implemented can restore electoral integrity. To restore public confidence in this regard would requires consistent, demonstrable evidence that electoral institutions act with impartiality; that technological innovations such as electoral technologies improves both integrity and credibility of electoral systems rather than substituting or raising bar of electoral impartiality.

FUTURE PATHWAYS: EVIDENCE-BASED RECOMMENDATIONS FOR 2027 AND BEYOND

The foregoing synthetic analysis has resulted in a body of substantial, evidence-based recommendations, organised across five domains, for Nigeria's electoral system framework ahead of the 2027 general elections. These domains include legal reform, institutional capacity, infrastructure, public trust, and international cooperation.

Legal Reform and Statutory Anchoring of Electoral Technology

The Electoral Act 2022 must be urgently amended to allow for electronic voting with statutory power for real-time transmission of election results right from the polling stations across Nigeria. This will ensure that electoral transparency in terms of managing election results is no more mere administrative guideline, but a scared statutory obligation. As Itodo (2024) and Ogbadebo (2025) argue, the INEC's commitment to deploy technological innovations must stem from desire for enforceability legality. The situation where the Supreme Court ruled that the electronic transmission of election results was non-mandatory created an intolerable vulnerability capable of undermining the entire electoral integrity of Nigeria's electoral architecture. The subsequent amendment should include concise legal definitions of terms such as 'electronic transmission of election results, 'real-time transmission of election results,' and 'electronically transmitted election results.'. A series of explicit penalties for contravening such legal provisions and deliberate interference with other electronic electoral data at any collation level must be enshrined in Nigeria's electoral act (Itodo, 2024). Finally, on this point, Nigeria's electoral systems should be constitutionally designated as critical national infrastructure, aligning with Kenya's approach that prioritised investment in cybersecurity and legal protection equivalent to other critical systems (Chatham-House, 2023).

Institutional Capacity and Staff Training

The INEC's approach to training technical support staff for electoral technologies has to be restructured fundamentally. Instead of the current method of compressed pre-election training activity for a large number of technical staff, the commission should rework its manpower carder system to accommodate the establishment of a permanent cadre of technically certified electoral technology officers capable of supporting and troubleshooting, in real-time, a diverse range of electoral technologies at the state and local government levels.

The commission should consider adopting and institutionalising periodic pre-election forensic screening for both permanent and ad hoc INEC staff throughout an electoral cycle. Strong character and integrity verification should also be a minimum benchmark for deploying and assigning staff who would have access to electoral technology systems. In addition to the deterrence effect that comes with implementing this initiative, other multiplying effects protect electoral integrity, prevent insider threats, build electoral credibility, promote electoral neutrality and non-partisan, reduce operational risk, safeguard sensitive electoral data and materials, and ensure compliance with legal and ethical standards (Fatai, 2023). INEC should also review and significantly improve the ratio of technical experts assigned to BVAS devices on election days from what it was in 2023. INEC should make a policy towards conducting a mandated and independently verified election simulation, including full-scale IReV upload exercises. This should take place at least sixty days before any

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general election, as Kenya's legal framework requires of its electoral commission (Itodo, 2024).

Infrastructure Investment and Connectivity

The INEC, in conjunction with the relevant agencies of the federal government, would have to implement a pre-election internet connectivity infrastructure initiative focusing on those 4,834 underserved polling units identified by the NCC and the ones identified with insecurity-related issues. The initiative should involve adopting portable satellite communication terminals that serve the already identified polling units located in regions beyond terrestrial network coverage. The Digital Command Centres that draw on schools or government facilities with fibre-optic connectivity should be established to serve as the regional result transmission nodes for offline rural areas. There should be a constituted agreement with multiple telecommunications providers mandating a redundancy in data transmission on election day. However, it is noteworthy that 60 per cent of Nigeria's population has unreliable access to internet connectivity according to the 2023 World Bank data, embodying the democratic equity concern in Nigeria and reflecting a practical bottleneck on the framework of the electronic transmission of election results, which cannot be resolved by the reform of electoral law alone.

Cybersecurity and the Judicial Framework

Nigeria’s electoral system is in urgent need of a dedicated electoral cybersecurity framework. A model to be collaboratively developed by the INEC ICT Department and the National Information Technology Development Agency (NITDA). This is with a view to setting minimum technical and cybersecurity standards for both the already adopted electoral technologies, such as BVAS, and the IReV server infrastructure and the soon-to-be-adopted electoral technologies, together with their digital governance protocols, custody protocols, and other protocols governing the transmission, storage, and verification of electoral data.

Furthermore, Nigeria’s judiciary needs to be upskilled to adjudicate digital evidence. There must be a structured training program on digital forensics and data integrity verification for both judicial officers and members of the election tribunal. These trainings include verification and evaluation of the election result evidence in electronic form. This would equip these judicial and tribunal members with adequate tech-analytical know-how that will help them to rigorously interrogate the usual discrepancies between the IReV-transmitted polling units’ data, and the manually collated election results in the post-election proceedings (Chatham-House, 2023). Additionally, Nigeria’s electoral legal instruments should be amended to explicitly recognise electronically transmitted polling-unit results as prima facie evidence of the outcome at that first level of election collation, reversible by the digital evidence of tampering that meets well-defined forensic standards only.

Citizen Engagement and Democratic Culture

No matter how excellently implemented they seem, technological interventions cannot fully compensate for a crisis created by a lack or poor democratic culture. This is in the light of the 26.7 per cent voter turnout in the 2023 general elections, which mirrored certain degrees of civic disengagement, threatening to the credibility of the entire electoral framework regardless of technological innovation performance (AKANDE, 2025). To rework democratic engagement, there has to be an efficient voter education thoroughly driven by sustained efforts and investment from the civil society organisations. This could as well be explaining electoral technology in terms of electoral accessibility in a manner that enables electorates to verify election results on IReV by themselves, thereby enlarging the people’s civic capacity to interactively engage with electoral processes constructively instead of denying them of such access. There has to also be a reform that transcends electoral domains. This reform is such that both constitutional and political cultures incentivising electoral manipulation by political elites, must be affected. It must cut across the disproportionate economic value of political offices and the inability of the accountability institutions, such as the media, to demand structural reform. The reform must reflect stern enforcement of campaign finance regulation, anti-corruption law, and progressive devolution of economic resources away from the centre (AYOBOLU, 2025; Ukwu *et al.*, 2025).

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CONCLUSION

This study has contended that the question coined as 'panacea or illusion' has returned a false binary when employed in Nigeria's electoral technological innovations. Several pieces of evidence from the 2023 general election, through the lens of comparative literature on election technology in Africa rooted in a complex socio-technical system, have supported a restructured claim that state that technological innovation in Nigeria's electoral system operates as a conditional amplifier of institutional quality.

It has been argued that where the conditional factors, such as legal clarity, institutional independence, adequate technological infrastructure, trained electoral manpower, and genuine political will, for efficient technological innovations are in place, electoral technologies such as BVAS and IReV could lower the prevalent electoral manipulation, and provide post-election infrastructure for accountability and transparency. The piloted governorship elections in Ekiti (2022), Osun (2022) and Kwara (2023) showed that these conditions could be met partially to help technological innovation perform as expected.

And when these conditional factors are not put in place, as witnessed in the 2023 presidential elections, electoral technological innovations could become a means of electoral manipulation, thereby defeating their capacity to preserve electoral integrity. What looked like an intentional failure to transmit the presidential election results in real-time, the poor ad-hoc staff training, the subsequent Supreme Court ruling saying e-transmission of election result was not mandatory, and the disinformation campaign weaponised against IReV transparency architecture all reveals the technological innovation failure, electoral institutional failure, and the failures of electoral legal framework, and the political ecosystem within which the technological innovation was embedded.

This perception is not unique to Nigeria. It reflects the Cheeseman, Lynch, and Willis's (2018) basic position regarding the conditional factors that could help technological innovation in the electoral system to ensure and preserve electoral integrity. This synchronises with the increasing pieces of literal evidence positing that institutional quality is the fundamental determining factor of electoral integrity, not just the sophistication of electoral technologies.

Therefore, as Nigeria prepares for the 2027 general elections, abandoning technological innovation adoption or deepening investment in hardware without equivalent investment in a performance-determining technological governance ecosystem is not the forward pathway.

Thus, the study recommends five future pathways. They include making e-transmission of election results statutory, reformation of institutional capacity, digital infrastructure investment, IT-governance reinforcement, cybersecurity improvement, judicial strengthening, and sustained civic engagement.

Implementing these would constitute a comprehensive and evidence-based programme that would be integral to translating INEC's technological innovations ambitions into the ever-growing electoral integrity.

It has been mathematically proven that the output of a system is a function of all its inputs(Tsoukalas *et al.*, 2026). This fact transcends mathematical paradigm; it applies in practically to electoral systems also. BVAS, IReV, IVED, and other electoral technologies deployed without legal clarity, institutional independence, internet connectivity, and political commitment would not yield electoral integrity or its illusion. Creating a systemic electoral process and service delivery, with optimised interoperability of its components, and not just its technological innovation organ alone, is the foundational work required to deliver electoral integrity in Nigeria's electoral system in 2027.

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