



Article

Information and Communications Technology (ICT) and Election Administration in Nigeria: A Systematic Review

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Abstract

The integrity and credibility of electoral processes remain central to democratic governance, particularly in developing countries where electoral fraud and public mistrust continue to undermine civic participation. This systematic literature review examines the deployment of Information and Communications Technology (ICT) in election administration in Nigeria, with comparative insights drawn from similar developing-country contexts. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework, 17 peer-reviewed articles, reports, theses, and institutional documents published between 2001 and 2023 were identified, screened, and synthesised. The review addresses two research questions: what ICT tools have been deployed in Nigerian election administration, and to what extent ICT adoption has been implemented across the electoral cycle. Findings reveal an incremental but progressive adoption of ICT tools spanning voter registration (DDCM, AFIS, and IVED),

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voter accreditation (PVCs, SCRM, and BVAS), electronic voting (piloted at sub-national levels), and result transmission (the I-REV Portal). While these innovations have enhanced transparency and reduced certain forms of electoral fraud, implementation has been constrained by inadequate technological infrastructure, cybersecurity vulnerabilities, digital literacy gaps, and legislative bottlenecks. The review identifies critical areas for policy intervention and charts directions for future research aimed at deepening ICT integration in Nigerian election administration.

Keywords: Information and Communications Technology (ICT); Election; Election Administration; Systematic Review; Nigeria.

Introduction

Elections are a vital component of democratic governance, serving as a means for citizens to take an active part in selecting their leaders (Funmilola & Olasubomi, 2021; Hassan & Ishola, 2024). However, traditional election processes have been plagued by various challenges, including electoral malpractices, violence, vote-buying, and a lack of trust in the electoral system (Omoleke, 2018; Osemwota, 2019; Akwu et al., 2021), making political leaders less accountable to the people (Madueke & Enyiazu, 2025). In Nigeria, particularly since her democratic transition, successive elections have been marred by these issues, leading to numerous post-electoral litigations and a widening trust gap between citizens and the government (Hassan & Ishola, 2024; Madueke & Enyiazu, 2025). In addressing this trend while enhancing the credibility and transparency of elections, countries are turning to Information and Communications Technology (ICT) tools for election management.

Innovative technologies are transforming the way things are done across all facets of human endeavour (Zissis, Lekkas & Papadopoulou, 2009; INEC, 2017; Luiz, 2018; Badri, Badri & Cham, 2019; Aniekwe & Oraegbunam, 2021). Particularly in procedural tasks such as elections, ICT provides effective and efficient means for conducting them, thereby enhancing their processes. More emphatically, José (2010) and Sarkar (2012) argued that hardly any government can survive in this age without the use of technology or without ensuring digital access to information. Engaging the capability of technology in public administration and the electoral process is not a new development, as ancient Romans and Greeks used counting devices to speed up their electoral processes in the medieval period (Krimmer, 2019). José (2010) furthered that ICT integration in governance can boost citizens' participation, promote public service delivery, and enhance democratic values.

Developed nations, such as Estonia, Switzerland, Austria, Norway, the USA, and the UK, have advanced their electoral processes beyond electronic voting (e-voting) to internet voting (i-voting) (Luiz, 2018). In contrast, developing countries, including Nigeria, have lagged in adopting ICT in election administration, despite its potential. The adoption of ICT in election administration has the potential to improve

efficiency, reduce costs, enhance transparency, and increase public trust in the electoral process. However, its successful implementation requires a systematic approach, addressing various technological, legal, and societal challenges. While literature has explored the challenges confronting Electoral Management Bodies (EMBs) in Nigeria (Madueke & Enyiazu, 2025) and the potential of ICT tools for enhancing electoral credibility in the country (Hassan & Ishola, 2023; Hassan et al., 2024), sufficient scholarly works have yet to profile the various ICT tools deployed for election management in Nigeria and their performance over the years. Such an assessment could provide ICT performance feedback for INEC, the government, election stakeholders, and the general citizens. This could provide a systematic platform for assessing e-election administration performance between Nigeria and other countries. Furthermore, it could enable cost-utility evaluation of ICT investment in Nigeria, providing a basis for future ICT investment decisions. This systematic literature review aims to bridge this gap by profiling the ICT tools deployed in election administration in Nigeria and across countries with similar contexts.

Methodology

This study conducted a systematic review of literature on the use of ICT for election administration in Nigeria, drawing on election-enabled devices used across similar contexts. To ensure adequate literature coverage, while avoiding literature selection bias, the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) developed by Liberati et al. (2009) and updated by Page et al. (2021) was adopted.

The research questions that guided this review were:

- i. What are the ICT tools deployed in the administration of elections in Nigeria?
- ii. What is the extent of ICT adoption in election administration in Nigeria?

A comprehensive literature search was conducted using a string of search words on prominent research databases, including Taylor and Francis, Emerald Insight, Google Scholar, and Research Gate. The search was limited to peer-reviewed journal articles, research theses, and relevant reports published between 2001 and 2023, with a focus on English-language sources. While the use of ICT for election administration in Nigeria began officially in 2015 (Madueke & Enyiazu, 2025), the literature search was relaxed to 2001 to include the period of ICT adoption in peculiar electoral activities in Nigeria, creating adequate background for this study.

The literature search yielded 17 documents (see Figure 1), which were analysed and synthesized following the PRISMA guidelines. The analysis included examining the distribution of literature by year of publication, document types, sources, impact factors, publishers, locations, respondents, data sources,

research instruments, research designs, sampling techniques, theoretical frameworks, and methods of data analysis.

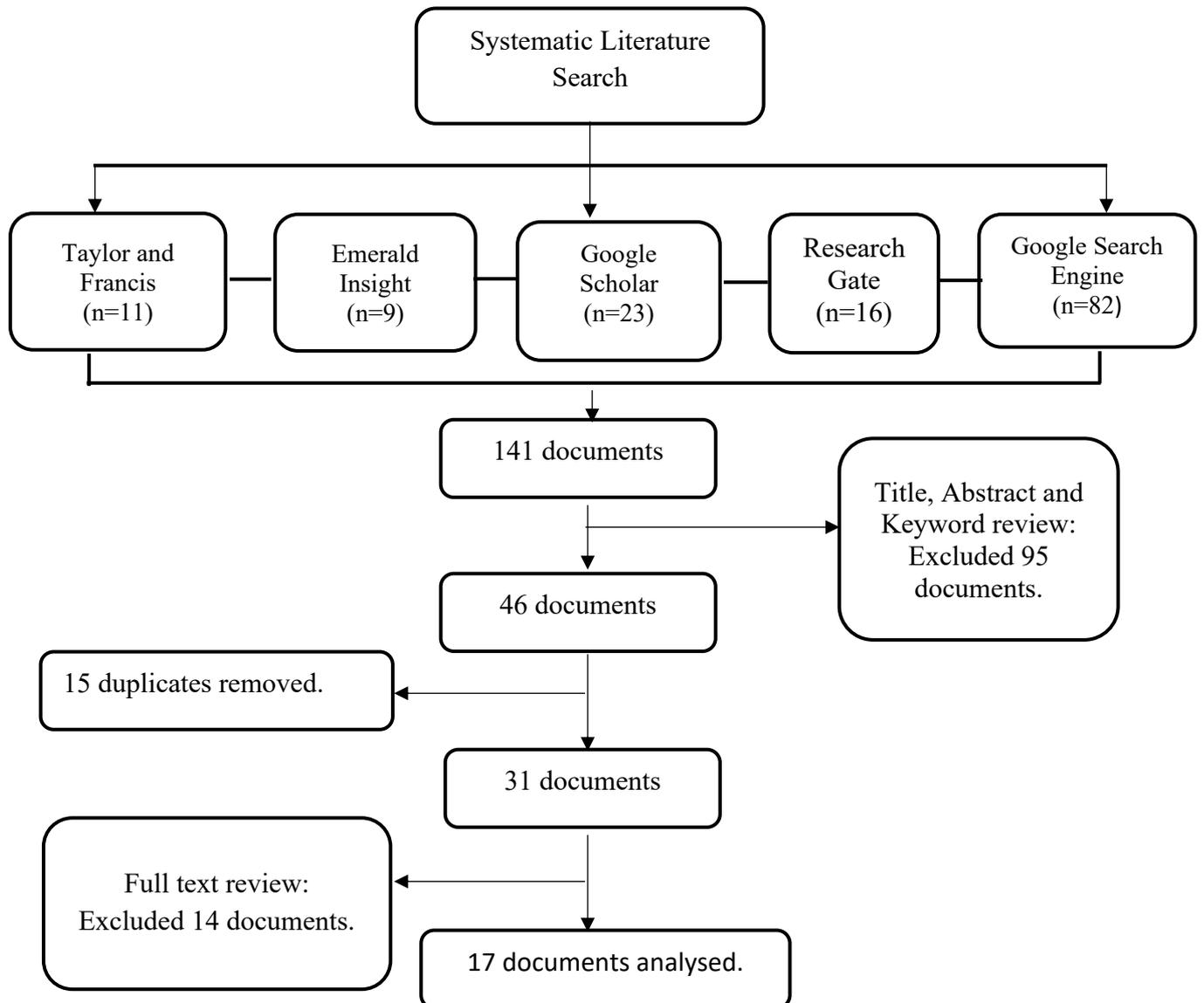


Figure 1 PRISMA Flow
Source: Fieldwork, 2023

Literature Analysis and Synthesis

In this section, the literature adopted in this study is quantitatively analyzed and synthesized in line with the recommendations of Page et al. (2021). The items in the recommendation are presented below.

Distribution of Literature by Year of Publication

The 17 papers adopted in this review are presented below, showing the spread of the papers across their various years of publication as shown in Figure 2 below:

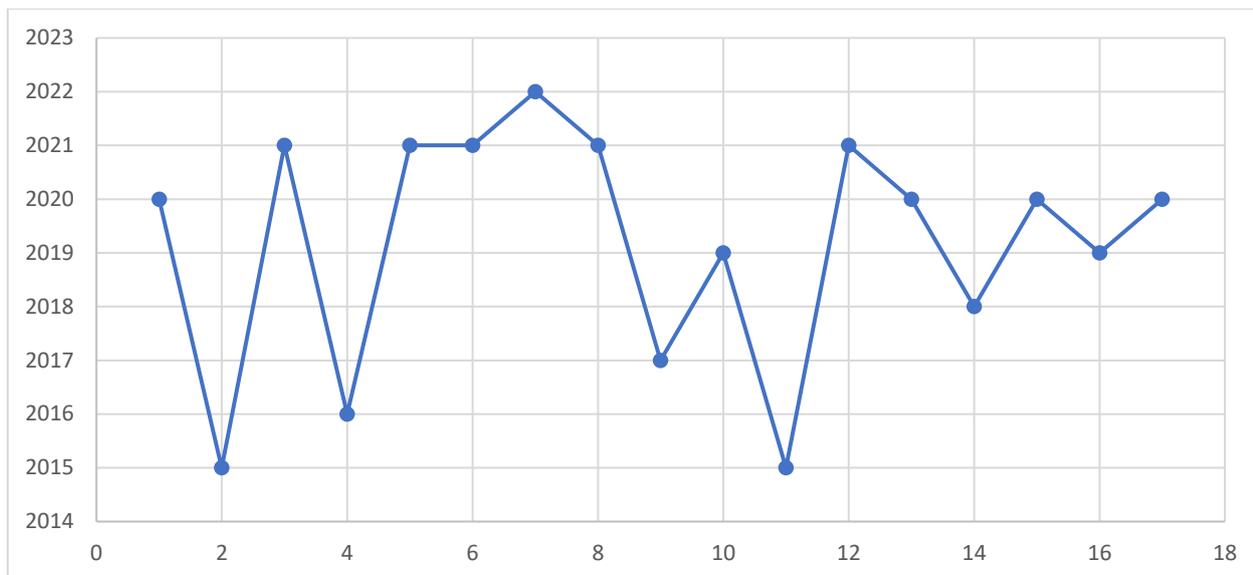


Figure 2: Distribution of Papers by Year of Publication

Source: Fieldwork, 2023

In the preparation of this empirical review, 17 documents were used, out of which 2 papers were published in 2015, 1 paper in each of 2016, 2017, and 2018. While 2 papers were published in 2019, 4 papers in 2020, 5 papers in 2021, and 1 paper in 2022. From the foregoing, most of the literature adopted in this study is recent.

Literature Types, Sources, and Impact Factor

The papers adopted in this review were sourced from reputable journals in the field of Social and Management sciences, and ICT. Other documents adopted were Bulletin, Conference Papers, Reports, Seminars, and Theses, as shown in Table 1 below:

Table 1: Distribution of Literature according to Document type

Document Format	Count of Document Format	Percentage
Bulletin	2	11.8
Conference	1	5.9
Journal	10	58.7
Seminar	1	5.9
Strategic Plan	2	11.8
Thesis	1	5.9

Source: Fieldwork, 2023

A further analysis of the 10 journal articles adopted in this review showed that five articles were published in reputable journal outlets such as Medwell with an Impact Factor of 6.253), IISTE (IF 5.54), MCSER Publishing (IF 3.69), and Emerald (IF 1.8). Evident from the IF of the adopted journals is the extent of quality of both the articles and their publishers.

Distribution of Respondents, Data, Sources, Research Instrument, and Design

In the analysis of the methodologies adopted in the papers adopted in this review, it was found that 5 papers adopted primary data, 2 papers adopted secondary data, 2 papers adopted primary and secondary sources combined, 7 papers adopted review, while only 1 paper did not use any data. Within the 17 papers, 4 papers used qualitative data, 4 papers used quantitative data, 1 paper adopted a combination of qualitative and quantitative data, while the remaining did not adopt any data as they were review papers. In the aspect of the adopted research instruments, out of the 5 papers with primary data and 2 papers with secondary data, 3 papers adopted interviews, 2 papers adopted a questionnaire, 1 paper adopted a combination of questionnaire and interview, while both questionnaire and documentary evidence were adopted in the remaining one paper. In the choice of research designs, 5 papers adopted a survey research design, 2 papers adopted an explanatory design, 1 paper adopted a descriptive design, and 1 paper adopted a case study, as captured in Table 2 below.

Table 2: Distribution of Respondents, Data, Instrument, Design, Theories, Sampling Techniques, and Method of Data Analysis

RESPONDENTS	F	NATURE OF DATA	F	RESEARCH INSTRUMENT	F
Electoralates	2	Qualitative	4	Interview	3
Election stakeholders	2	Quantitative	4	Questionnaire	2
Nigerians	2	Quali & Quanti	1	Interview and Questionnaire	1
Youth	1	Not Applicable	7	Questionnaire and Documentary Evidence	1
Not Applicable	10			Documentary	2
Total	17	Total	17	Not Applicable	8
Sources of Data	F	Theories	F	Total	17
Primary	5	TAM	2	Research Design	F
Secondary	2	e-Democracy	2	Survey	5

Primary and Secondary	2	Context, Content, and Process (CCP)	1	Exploratory	2
Review	7	Not Applicable	12	Descriptive	1
Not Applicable	1	Total	17	Case Study	1
Total	17			Not Applicable	8
				Total	17
Sampling	F			Method of Analysis	F
Stratified	1			Descriptive	3
2-Stage	2			Correlation	2
Purposive	3			Content Analysis	2
Multi-Stage	1			Thematic Analysis	1
Not Applicable	10			Not Applicable	9
TOTAL	17			TOTAL	17

Source: Fieldwork, 2023

Also, on Table 2 above, several theories were adopted in the papers adopted in this review. E-Democracy theory, for instance, was adopted by 2 of the papers, TAM by 2 papers, and CCP by 1 paper, while others did not adopt any theory. In addition, 3 of the papers adopted a purposive sampling technique, 1 paper adopted a stratified sampling technique, 2 papers adopted a 2-stage sampling technique, while the last paper adopted a multi-stage sampling technique. In the aspect of data analysis, 3 papers adopted descriptive statistics, 2 papers adopted correlation, 2 papers settled for content analysis, and 1 paper adopted thematic analysis.

The characteristics of the adopted literature provided evidence to the diverse nature of literature harvest for this review. In combined published qualitative and quantitative research papers and reports, indicating broad context coverage of election management technologies in Nigeria. Sequel, subsequent sections in the review focused on the question raised in this paper. This is to create a sequential presentation of arguments put forward by the authors of the papers adopted in the review.

Analysis and Synthesis

The analysis of the literature revealed several key findings regarding the use of ICT in election administration in Nigeria:

ICT Tools Deployed in Election Administration

In the administration of elections, several ICT tools have assumed prominence. Although most of these tools perform similar functions, disparity exists in their names and designs across countries. This is given

the difference in the ideology and aesthetic inclination of their manufacturers and the interest of the adopting country. Distinctively, this review emphasized e-election management tools in Nigeria, with occasional comparison with tools found in similar developing contexts. As there are several activities in election administration, this review was sectioned into these activities.

a. Voter Registration

Voter registration encapsulates all activities revolving around the documentation of the personal details of prospective voters in the database of an EMB. In this exercise, given the volume of people to be captured and the few staff of election agencies, especially in developing economies, there is bound to be several errors, aside from the associated time, energy, and financial costs when the process is manually observed. As reported by Afolabi (2020), manual voter registration is associated with several problems, prominent among which are underage registration, voter record alteration, and mutilation. Given these issues, ICT tools were incorporated to enhance the process in Nigeria and similar contexts. These devices are as described below.

i. Direct Data Capturing Machine (DDCM) and Automated Fingerprint Identification System (AFIS)

In the registration of voters, several ICT tools have been used in Nigeria, with each building on its predecessor. At first, as posited by Afolabi (2020), it was the OMR in 2003; later in 2007, the EVR was introduced to mitigate the limitations of the OMR. DDCM, according to Adebimpe et al. (2020), was introduced as an embodiment of the EVR initiative. Aside from having the facility to capture voter information electronically, it can also detect and prevent multiple registrations. DDCM is used in conjunction with AFIS, which captures the fingerprint of voters (Afolabi & Ogunne, 2018). The use of these devices in the 2007 elections in Nigeria recorded a tremendous reduction in the cases of multiple and underage registration.

For the first time in Nigeria, the combination of DDCM and AFIS enabled a widely acceptable voter register across Nigeria, giving credibility to the process. Despite the lofty outcome projected by INEC for this device, it fell short in several areas, including being too bulky and fragile, expensive, and too complex for non-experts to operate. In addition, it failed woefully to accept fingerprints from people in rural areas, where a significant number of polling units are dominated by farming, fishing, and other fingerprint-damaging jobs. The electoral officers must revert to manually capturing the rejected voter's hand on camera, further providing room for possible human interference.

ii. INEC Voter's Enrolment Device (IVED)

Despite the recorded achievements of the DDCM in mitigating most of the challenges associated with the manual registration of voters, Adebimpe et al. (2020) noted that the device was short in addressing several problems, prominent among which were its failure to digitally identify voters using their biometric data

and reduce underage and over-voting. It is sequel to this that an advanced device, IVED, was introduced to replace DDCM. Unlike the DDCM, IVED incorporated BT in its operational capability, and this significantly contributed to the successful outing of INEC in 2015, where a sitting president was ousted in a competitive election that was adjudged to be free, fair, and credible by local and international observers.

Equally, in Zimbabwe, BT was adopted in the registration of voters in 2017 (Afolabi, 2020). BT covers all scientific verification of physical, anatomical, and biological features of voters. It can eliminate related fraudulent activities like multiple registrations associated with voter registration in the developing countries of Africa, most especially.

b. Voter Accreditation

At the inception of democratic governance in Africa, and in Nigeria in particular, the use of a manual approach to election administration has continued to promote an increase in the incidences of electoral fraud (Afolabi, 2020; Hassan & Ishola, 2024). These incidences were prominent during the accreditation of voters, where people impersonate one another, giving rise to multiple voting. In checking this menace, Nigeria and many countries have resorted to the use of biometric devices for the identification and accreditation of voters. Some of the basic tools adopted in this regard, especially in Nigeria, are as follows:

i. Permanent Voter's Card (PVC)

PVC is a smart card that contains basic information on each voter. This information was gathered using AFIS/DDCM and IVED and encoded into the smart card using a computer chip (Alebiosu, 2016). With these details, especially the barcode and related security features, adjoining electronic devices, such as the smart card reader, can authenticate the genuineness of the voter and the card (Afolabi & Ogunne, 2018). Afolabi (2020) added that PVCs are designed to be tamper-proof, not susceptible to counterfeiting, and durable for at least ten years. Apart from its use in the electoral process, this card in Nigeria is also accepted as a valid means of identification for individuals.

ii. Smart Card Reader Machine (SCRM)

Given the associated benefits of engaging ICT tools in voter registration by INEC, SCRM was introduced in the 2011 and 2015 elections in Nigeria (Alebiosu, 2016; Adebimpe et al., 2020). This machine, as noted by Afolabi (2020), was an embodiment of the EVA launched in 2007, and according to Alebiosu (2016), it remained the greatest technological innovation in the Nigerian 2015 elections. The SCRM can validate voters' registration through the Permanent Voter's Card (PVC). This is given its sophisticated and secure cryptographic technology of a frequency of 1.2GHz and an Android 4.2.2 Operating System (Alebiosu,

2016; Nnamani et al., 2019), known mostly to financial institutions. The machine scans the barcode inscribed on the card to authenticate and accredit voters for participation in voting (Alebiosu, 2016).

A similar device to the SCRM in Uganda is identified as the Biometric Voter Verification System (BVVS). It was deployed for voter accreditation in Uganda in the 2021 general elections in the country. It can capture, store, retrieve, and accredit voters using their fingerprints.

iii. Bimodal Voter Accreditation System (BVAS)

BVAS has assumed prominence in voter accreditation, given its effectiveness in preventing double voting. This device represents the accreditation platform of IVED. As captured by the Osun State Situation Room Report (2022), the device performed effectively in about 93.7% of the polling units in the state during the Governorship election. Aside from its effectiveness in accrediting voters within 2 minutes, the number of devices distributed to polling units was proportional to the number of registered voters in each. More prominently, this device is the most important ICT device that shaped the 2023 general elections in Nigeria. Aside from having the facility to recognise voters with their fingerprints, it can also do face identification.

c. Voting with Electronic Voting Machine (EVM)

There are several electronic devices applicable to voting. In Nigeria, a few states, like Kaduna, have attempted to use the Electronic Voting Machine for voting in their local government elections. In the Nigerian general elections, however, INEC has yet to integrate ICT into this important electoral activity. As ICT use in election administration across countries is incremental in design, it is hoped that before the 2027 general elections in Nigeria, INEC will have strategically created the needed infrastructure and atmosphere for the effective deployment of the EVM. The EVM is a complex technological device that can record, collate, sort, count, and transmit vote figures to the central server of an EMB.

d. Election Result Presentation through INEC Result Viewing Portal (IReV)

IReV is a result viewing portal of INEC meant for updating citizens on election results on a real-time basis. This portal, according to Situation Room (2022), is to ensure transparency in election results. The portal, despite its strategic position in promoting electoral integrity and voter education, is susceptible to cyber threats, especially as claimed by INEC during the 2023 Presidential election in Nigeria. While there is a renew call for the electronic transmission of election results, argument from the National Assembly has centred on the unevenness in ICT infrastructure across the country.

Conclusively from the review on the use of ICT for election administration in Nigeria, the following devices have been adopted with each recording performance success, although not without their respective limitations:

- Biometric Voter Registration and Identification Systems
- Electronic Voting Machines (EVMs)
- Online Voter Registration and Database Management Systems
- Geographic Information Systems (GIS) for Constituency Delimitation
- Results Transmission and Collation Systems
- Election Monitoring and Observation Tools
- Voter Education and Information Dissemination Platforms

Extent of ICT Deployment in Election Administration

The extent of ICT deployment varies significantly among countries, ranging from partial adoption in specific stages to comprehensive integration across the entire electoral cycle. The literature review highlighted diverse experiences and levels of ICT adoption in election administration across countries, particularly Nigeria. Some key observations include:

- i. **Developed Countries:** Many developed nations, such as Estonia, Switzerland, Austria, Norway, the USA, and the UK, have successfully integrated ICT tools into various stages of their electoral processes, including online voter registration, electronic voting, and results transmission and collation systems.
- ii. **Developing Countries:** In contrast, developing countries, including Nigeria, have experienced slower adoption and implementation of ICT in election administration. While some ICT tools, such as biometric voter registration and electronic voting machines, have been introduced, their implementation has often been plagued by challenges, including technical glitches, logistical issues, and public mistrust (Madueke & Enyiazu, 2025).
- iii. **Regional Variations:** The extent of ICT deployment in election administration varies across regions and countries, influenced by factors such as technological readiness, legal frameworks, political will, and public acceptance.
- iv. **Challenges and Barriers:** Despite the potential benefits of ICT in election administration, several challenges and barriers have hindered its widespread adoption and effective implementation. These include technological infrastructure limitations, cybersecurity concerns, legal and regulatory frameworks, digital literacy levels, and resistance to change from various stakeholders (Hassan et al., 2023; Hassan & Ishola, 2024).

Recommendations and Future Research Directions

Based on the findings of this systematic literature review, the following recommendations and future research directions are proposed:

- a. **Strengthen Legal and Regulatory Frameworks:** Develop comprehensive legal and regulatory frameworks to govern the use of ICT in election administration, addressing issues such as data privacy, cybersecurity, and electoral integrity.
- b. **Enhance Technological Infrastructure:** Invest in robust technological infrastructure, including reliable internet connectivity, secure data centres, and resilient systems, to support the effective implementation of ICT tools in election administration.
- c. **Promote Digital Literacy and Public Awareness:** Implement educational campaigns and training programs to enhance digital literacy among voters, election officials, and other stakeholders, fostering public trust and acceptance of ICT in election administration.
- d. **Foster Stakeholder Collaboration and Engagement:** Encourage collaboration and engagement among relevant stakeholders, including government agencies, civil society organizations, and international partners, to ensure transparency, accountability, and effective implementation of ICT in election administration.
- e. **Conduct Comprehensive Feasibility Studies:** Undertake comprehensive feasibility studies to assess the technological, legal, societal, and economic implications of adopting ICT in election administration, tailored to the specific context and needs of Nigeria.
- f. **Prioritize Cybersecurity and Data Protection:** Implement robust cybersecurity measures and data protection protocols to safeguard the integrity and confidentiality of electoral data and systems, ensuring public trust and confidence in the electoral process.
- g. **Continuous Monitoring and Evaluation:** Establish mechanisms for continuous monitoring and evaluation of ICT initiatives in election administration, allowing for timely identification and resolution of issues, as well as iterative improvement of the processes.
- h. **Comparative Studies:** Conduct comparative studies to examine the experiences of other countries, both developed and developing, in adopting and implementing ICT in election administration, drawing lessons and best practices that can be adapted to the Nigerian context.
- i. **Interdisciplinary Research:** Encourage interdisciplinary research collaborations involving experts from various fields, such as computer science, political science, law, and social sciences, to holistically address the multifaceted challenges and opportunities associated with ICT in election administration.

Conclusion

This systematic review has profiled the trajectory of ICT adoption in election administration in Nigeria, documenting a gradual but consequential shift from entirely manual electoral processes towards increasingly technology-driven administration. The evidence synthesised from 17 documents spanning two decades demonstrates that the Independent National Electoral Commission (INEC) has made measurable strides in deploying ICT tools across key stages of the electoral cycle, from voter registration and accreditation to result transmission and public information dissemination. The introduction of devices such as the DDCM, AFIS, IVED, SCRM, BVAS, and the IReV portal each represents deliberate institutional responses to specific electoral vulnerabilities, and their cumulative effect has contributed to a more credible electoral environment, as evidenced by the widely acclaimed 2015 and 2023 general elections.

Notwithstanding these achievements, this review underscores that ICT adoption in Nigerian election administration remains partial and uneven. The electoral cycle has not been comprehensively digitised: electronic voting, for instance, has yet to be integrated into general elections, and the electronic transmission of results, a critical component of electoral transparency, continues to face legal, infrastructural, and political resistance. These gaps reflect the broader challenges that confront ICT-driven electoral reform in developing countries, including inadequate and unevenly distributed technological infrastructure, cybersecurity threats, low digital literacy among voters and electoral officers, and an unsupportive legislative environment. The comparative evidence from other developing nations, such as Uganda and Zimbabwe, further illustrates that these challenges are not unique to Nigeria but require context-sensitive solutions.

The findings of this review carry important implications for policy, practice, and scholarship. For INEC and the Nigerian government, they provide an evidence base to justify sustained investment in electoral technology, strengthen the legal framework governing e-election administration, and prioritise digital infrastructure development in underserved regions. For election management researchers, the review highlights the relative scarcity of robust empirical studies specifically focused on ICT performance evaluation in Nigerian elections, pointing to a significant gap in the literature. Future research should employ longitudinal and comparative designs to rigorously assess the cost-utility and democratic outcomes of specific ICT interventions, while interdisciplinary collaboration will be essential to address the technological, legal, and sociological dimensions of electoral digitalisation holistically. As Nigeria looks ahead to the 2027 general elections, the imperative to deepen and broaden ICT integration across the entire electoral cycle has never been more urgent. The lessons documented in this review offer a

foundation upon which more ambitious, inclusive, and technologically robust election administration can be built.

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Conflicts of Interest: The authors of this manuscript declare no conflict of interest.

Data Availability: The data presented in this study are available on request from the corresponding author.

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