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Transforming Election Management through Information and Communication Technology: The Nigerian Experience

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Afees Olumide Hassan (PhD)

*Department of Public Administration,
Obafemi Awolowo University, Ile-Ife, Nigeria
aohassan@oauife.edu.ng
+234-805-221-4446*

Abdulrasaq Ajadi Ishola (PhD)

*Department of Public Administration,
University of Ilorin, Ilorin, Nigeria*

&

Kazeem Oyedele Lamidi (PhD)

*Department of Public Administration and Local Government,
School of Government Studies, Faculty of Humanities,
North West University, Mahikeng Campus, South Africa
& Department of Local Government and Development Studies,
Faculty of Administration,
Obafemi Awolowo University, Ile-Ife, Nigeria
53508777@mynwu.ac.za*

Abstract

This study examines the impact of information and communication technology (ICT) deployment on election administration in Nigeria. The objectives are to

assess the efficacy of ICT tools in promoting free, fair, credible, and inclusive elections and to understand how evolving technologies influence specific electoral activities. The methodology involved quantitative data analysis from 11,994 voters and qualitative key informant interviews (KII) with sixteen election stakeholders. Results indicate that ICT use significantly enhances election administration efficiency, fairness, participation, transparency, public trust, and voter well-informedness. Also, the evolution of new technologies influences voter accreditation and vote result validation especially, in the 2019 and 2023 general elections. However, the study also reveals that other factors contribute to the observed parameters. While ICT adoption has improved various aspects of the electoral process, continuous efforts are needed to address challenges and complement technology with other strategies. The findings underscore the potential of ICT to advance democratic consolidation in Nigeria, provided that holistic approaches are adopted.

Keywords: *Information and Communication Technologies, Elections, Election Management, Democratic Consolidation*

Introduction

Elections serve as the cornerstone of democratic governance, embodying the fundamental principle of citizen empowerment through the selection of their representatives. Central to the integrity of elections is the assurance of a process characterised by freedom, fairness, and credibility. Inclusive participation, fairness, and access to information further underpin the essence of free and credible electoral processes, laying the groundwork for good governance. Beyond the mere provision of social services, good governance hinges on the establishment of public trust, which relies heavily on transparency. Transparency mitigates suspicions surrounding governmental actions, particularly those concerning electoral management. Without transparent electoral processes, credibility issues emerge, potentially compromising the legitimacy of elected leaders. In settings where election management agencies are plagued by inefficiency and ineffectiveness, public trust erodes, exacerbating governance challenges.

The Nigerian electoral landscape, like many in the developing world, has long grappled with myriad issues, including inefficiency, rigging, violence, and a lack of credibility. The Independent National Electoral Commission (INEC) was established to oversee free, fair, and credible

elections in Nigeria. However, despite its mandate, elections conducted by INEC have often been marred by allegations of malpractice, undermining public confidence in the electoral process. In response to these challenges, INEC has progressively integrated information and communications technology (ICT) tools into its election management framework. Technologies such as optical mark recognition (OMR), electronic voter register (EVR), electronic voting machine (EVM), electronic voter authentication (EVA), and electronic transmission of results (ETR) have been introduced to enhance the efficiency, transparency, and inclusivity of the electoral process.

This study becomes useful for electoral management at all levels and the efficacy of electoral activities in Nigeria. It assists the decision-making of electoral managers on how effective the electoral administration is as well as the effect on democratic consolidation in Nigeria. It is resourceful in providing a lot of opportunity in Nigerian electoral activities. The study will also be useful for any electoral-related course in determining how far ICT facilities can boost the level of electoral development. It thoroughly deals with a detailed explanation of electoral management in Nigeria as well as the regulation, supervision, and operational framework of electioneering. The study considers the blocked access of a large percentage of people to the electoral system and the need to increase their understanding of the roles that ICT plays in election administration, which will in turn open up their blocked access to democratic consolidation in the Nigerian political landscape, as the major justification for this study.

This study explores the impact of ICT tools on election management in Nigeria, aiming to assess their efficacy in promoting free, fair, credible, and inclusive elections. By examining the evolution of electoral practices in the context of technological advancement, this research endeavours to contribute to the ongoing discourse on electoral reform and democratic consolidation in Nigeria.

Statement of the Problem

In democratic states, the establishment of fair and credible electoral processes is pivotal for earning legitimacy, particularly amidst increasing concerns regarding the inadequacies of traditional methods (Aniekwe & Oraegbunam, 2021). This sentiment is echoed in Nigeria, where successive elections have been marred by extensive legal challenges,

casting doubt on the legitimacy of the outcomes (Ejikeme, 2016). The growing prominence of technological tools in electoral management globally offers a potential solution to these challenges (Osemwota, 2019). However, the efficacy of these tools varies across nations, with some, like Belgium, Russia, France, and the US, successfully implementing electronic voting, while others, including Ireland, Germany, Kazakhstan, and the Netherlands, face political obstacles (Krimmer, 2019). Despite these nuances, several developed countries, such as Estonia, Switzerland, Austria, Norway, the USA, and the UK, have advanced their electoral processes to include internet voting (Ahmad et al., 2015).

While existing literature has explored the deployment of ICT in election management across different contexts (Luiz, 2018), studies in Nigeria often focus on technical aspects, such as e-voting readiness (Ahmad et al., 2015; Omotayo & Adekunle, 2020). Although some research, like Nnamani et al. (2019) and Agunyai et al. (2023), delves into the broader impact of ICT on election management, there remains a gap in understanding how evolving technologies and stakeholder experiences influence specific electoral activities. Given the advancements in electoral technology and the increasing expertise among election stakeholders in Nigeria, it is imperative to investigate the implications of these changes on election administration. Therefore, this study seeks to address this gap by examining the effect of ICT evolution on Nigerian elections.

Literature Review

The Importance of ICT in Election Management

The utilisation of information and communication technology (ICT) in election management is paramount for ensuring the integrity and efficacy of democratic processes (Akwu et al., 2021). Elections serve as the cornerstone of democracy, embodying principles of fairness, credibility, and the expression of voters' will. ICT integration in electoral processes is multi-faceted, addressing various stages of election administration, including voter registration, accreditation, education, and voting. Voting remains particularly susceptible to malpractice, given its pivotal role in determining political leadership (Funmilola & Olasubomi, 2021).

The absence of integrity in any electoral activity undermines the democratic process, eroding public trust and legitimacy (Omoleke, 2018). Scholars have argued that the deployment of ICT in election

management offers a solution to address fraudulent practices and enhance transparency (Ahmad et al., 2015; Osemwota, 2019). This is crucial, as a lack of integrity in elections jeopardises democracy's core values (Omoleke, 2018). Furthermore, the administration of elections significantly influences the quality of democracy, with deficiencies in electoral processes compromising governance outcomes (Pallister, 2017). The integration of ICT in election administration facilitates fairness, transparency, and efficiency, thus safeguarding democratic values (Ejikeme, 2016; Ghaffar & Azhar, 2017). Digital tools enable improved information management and enhance the credibility of electoral processes (Nnamani et al., 2019). Moreover, ICT adoption has a comparative cost advantage over traditional paper-based methods, with benefits such as secret voting, reduced spoilage of ballots, and improved access for disabled voters (Ahmad et al., 2015; Krimmer, 2019).

Brazil's pioneering adoption of e-voting in 2002 exemplifies the transformative potential of ICT in election administration, demonstrating how technology can mitigate logistical challenges and improve electoral accessibility (José, 2010; Luiz, 2018). Despite the undeniable benefits, scholars emphasise the necessity of carefully weighing costs against advantages to ensure the judicious use of ICT in electoral processes (Ghaffar & Azhar, 2017).

The Election Credibility Index (ECI) is a metric created by the ERC Africa to assess the extent to which an election meets the criteria for credibility. The Credibility Indicator offers a framework for practitioners to assess the election convener's conformity with the legal framework, anticipated norms, and procedures. However, it is not comprehensive. Furthermore, political actors, civil society, and development partners may also use the same tool to provide feedback on the entire process and result of the election. This tool would be beneficial for electoral stakeholders and participants to evaluate the overall performance of an election based on important credibility factors.

Effect of ICT Deployment on Election Management

a) Electoral Transparency

Electoral transparency is paramount for ensuring the credibility of democratic processes (Baringer et al., 2021). It serves as the cornerstone upon which public trust and the legitimacy of elected leaders are

established. Transparency entails providing unhindered access to government processes and data, allowing citizens and observers to scrutinise governmental actions and decisions. However, operationalising transparency presents challenges, with scholars emphasising the importance of process openness over outcome transparency (Meijer, 2009).

The integration of ICT in election administration has been touted as a means to enhance transparency and accountability (Ahmad et al., 2015; INEC, 2017). However, it has been argued that overreliance on ICT may not always guarantee transparency (Janssen et al., 2017). Concerns have been raised about the opacity of electronic voting processes and the vulnerability of digital systems to manipulation (Olugbamiye, 2020; José, 2010). Despite these challenges, ICT offers opportunities to improve transparency, as demonstrated by initiatives such as INEC's E-TRAC project, which provides election results to the public via online platforms (Nnamani et al., 2019; INEC, 2020). The transition to digital election administration comes with significant costs and risks (Cheeseman et al., 2018). Governments must carefully weigh these factors against the potential benefits of ICT deployment (Kearns, 2004). Nonetheless, the quest for transparency in election administration remains essential for upholding democratic values and ensuring the integrity of electoral processes.

b) Efficiency in the Administration of Elections

The integration of ICT in election administration has significantly enhanced efficiency, as evidenced by the adoption of digital tools in voter registration and accreditation processes (Osemwota, 2019). For instance, the introduction of online Continuous Voter Registration (CVR) portals by INEC has expedited the registration process, leading to a significant increase in new registrants within a short timeframe (INEC, 2021). This transition to digital registration methods has not only increased efficiency but also reduced the resources, both human and financial, required for the registration process (Osemwota, 2019).

Efficiency in election administration is often assessed in terms of time and cost savings. While the initial investment in ICT infrastructure may appear substantial, scholars argue that digitalising the electoral process is cost-effective compared to traditional paper-based methods (Ahmad et al., 2015; Aniekwe & Oraegbunam, 2021). Despite initial

concerns about the financial and political costs of ICT adoption, the long-term benefits, including improved efficiency and accountability, outweigh these concerns (Cheeseman et al., 2018).

Additionally, ICT has revolutionised election monitoring, allowing political parties to set up ICT-compliant situation rooms to monitor elections in real time (Nnamani et al., 2019). This real-time monitoring saves time and energy, enabling parties to effectively oversee the conduct of elections across various locations simultaneously.

c) Electoral Participation/Inclusiveness

The deployment of information and communication technology (ICT) in electoral processes has significant implications for electoral participation and inclusiveness. Mass participation is fundamental to democracy, reflecting the principle of government by the people (Johnson & Powell, 2019). Traditional democratic systems, rooted in Greek democracy, emphasised direct participation of citizens in decision-making. In recent decades, liberalised democracies have faced criticism for limiting mass participation to voting, leading to the emergence of the concept of participatory democracy (Afolabi, 2011). This shift underscores the importance of citizens actively engaging in governance beyond mere voting.

ICT has emerged as a catalyst for enhancing democratic participation and inclusiveness (UNCTAD, 2011). Digital tools facilitate advocacy, social change, and political awareness, enabling citizens to engage in debates and express their views remotely. Social media platforms, in particular, have democratised political discourse, allowing marginalised groups to voice their concerns without fear of intimidation or violence (Abayomi, 2020).

In Nigeria, the Independent National Electoral Commission (INEC) has leveraged ICT to address barriers to electoral participation (Ogunmola, 2021; INEC, 2021). Initiatives such as online voter registration and digitalised election administration processes have widened access to the electoral process, particularly for marginalised and disabled persons. The adoption of ICT devices like the Integrated Voter Enrolment Device (IVED) has streamlined voter registration and accreditation, reducing time, cost, and errors while promoting transparency (Ejikeme, 2016; Nnamani et al., 2019).

Despite these advancements, challenges remain, particularly in translating increased voter registration into actual voter turnout (Afolabi & Ogunne, 2018; Afolabi, 2020). Technical issues, the loss of Permanent Voter Cards (PVCs), and harassment at polling units contribute to voter apathy during elections. The effect of ICT deployment on electoral participation and inclusiveness is profound. Digital tool challenges are essential to realising the full potential of ICT in enhancing democratic participation and inclusiveness.

d) Voter Education

The use of information and communication technology (ICT) in voter education has become an increasingly prominent practice across various sectors (Dekker, Brink, & Meijer, 2020). Voter education is crucial for the success of elections and the promotion of good governance and democracy. Online technologies have reshaped traditional organisational boundaries, fostering virtual communities and altering perceptions of value creation (Scott et al., 2016).

Access to information is integral to democracy, underpinning values such as transparency, integrity, and accountability (Pallister, 2017). The Independent National Electoral Commission (INEC) recognises the importance of voter education, as evidenced by its strategic plans and initiatives (INEC, 2017). ICT tools, particularly social media, have been instrumental in enhancing communication and voter enlightenment (Valle-Cruz, 2019).

Social media platforms serve as interactive channels for information dissemination, transforming the way people engage with politics and governance. Political activities have surged on social media, with notable examples like the 2008 US presidential elections demonstrating its potential for productive engagement (Yang & DeHart, 2016). INEC has increasingly utilised social media for voter education, alongside physical campaigns and press briefings (INEC, 2020; Situation Room, 2022).

Effective voter education requires not only the use of ICT tools but also the understanding and acceptance of these technologies by the electorate. Social media has facilitated citizen engagement and raised awareness of electoral processes, with governments leveraging it to foster informed citizenship (Nnamani et al., 2019).

Despite its advantages, challenges exist, including the sustainability of social media use due to associated costs (Dekker et al., 2020). However,

the primary focus should be on providing essential services and promoting citizen well-informedness, which is crucial for democracy (Scott et al., 2016). Social media platforms have empowered participatory citizens who contribute to election monitoring and reporting.

e) Fairness in the Administration of Elections

Fairness is crucial for fostering public trust in the electoral process. The integration of information and communication technology (ICT) tools has been pivotal in enhancing fairness within elections and addressing issues of electoral malpractice and irregularities (Osemwota, 2019). Scholars have lauded the adoption of digital tools, such as biometric and Smart Card Reader (SCR) devices, for their role in promoting free, fair, and credible elections (Ejikeme, 2016).

The use of biometric and SCR devices in electoral processes, exemplified by the 2012 Ghanaian elections, has demonstrated significant reductions in malpractices, contributing to the perceived fairness and acceptance of election outcomes (Osemwota, 2019). ICT integration has ensured the secrecy of votes and sustained participatory democracy, aligning electoral outcomes with the will of the people (Ejikeme, 2016).

However, challenges persist despite the positive impact of ICT deployment. Instances of registration and accreditation failures have been reported in various countries, including Nigeria, Kenya, and Zambia, highlighting the need for robust infrastructure and skills to support the effective use of technology (Osemwota, 2019). In Nigeria, for example, issues with device recognition and accreditation were encountered during the 2015 general elections, underscoring the importance of addressing technological limitations and organisational deficiencies (Ejikeme, 2016).

f) Public Trust in Election Administration

The erosion of public trust in governments observed globally necessitates strategic interventions to reverse this trend. Literature across Africa has documented a decline in public trust, attributed to various factors including service inefficiencies, corruption, and opaque election administration (Omoleke, 2018; Ntale & Ngoma, 2021). In response, governments have turned to information and communication technology (ICT) as a means to bridge this trust deficit.

ICT deployment in public service delivery, financial management, and election administration has emerged as a promising avenue to restore public trust (Colesca, 2009). The effectiveness of ICT in addressing governance challenges has garnered attention, particularly in enhancing public service delivery and fostering citizen-government relationships (Srivastava & Teo, 2005). By aligning citizens' needs with government projects and programmes, ICT facilitates cordiality in relationships, potentially reversing the decay of public trust.

In the context of election administration, ICT has played a crucial role in improving processes and fostering trust between citizens and governments (INEC, 2017). By introducing innovative tools and frameworks, such as monitoring and evaluation (M&E), election management bodies aim to enhance effectiveness, accountability, and credibility (Ejikeme, 2016). This shift towards ICT-driven election administration signifies a move towards institutionalising democratic values and promoting good governance (Omoleke, 2018).

Theoretical Framework

The e-democracy theory is adopted in this research. This is in recognition of the various postulations of the theory that align with the objective of the study. The theory proposes that the integration of ICT into the democratic process facilitates the attainment of true democracy, which guarantees good governance. Election as one of the cardinal aspects of democracy operates on the conventional values of transparency, efficiency, and participation (Valle-Cruz, 2019), fairness, trust (INEC, 2017; Aniekwe & Oraegbunam, 2021), and informed voters (INEC, 2020; Scott et al., 2016). The electoral process, devoid of these values, does not have the possibility of facilitating legitimacy for the government set up through it. It is from these values that the framework in Figure 1 below is constructed.

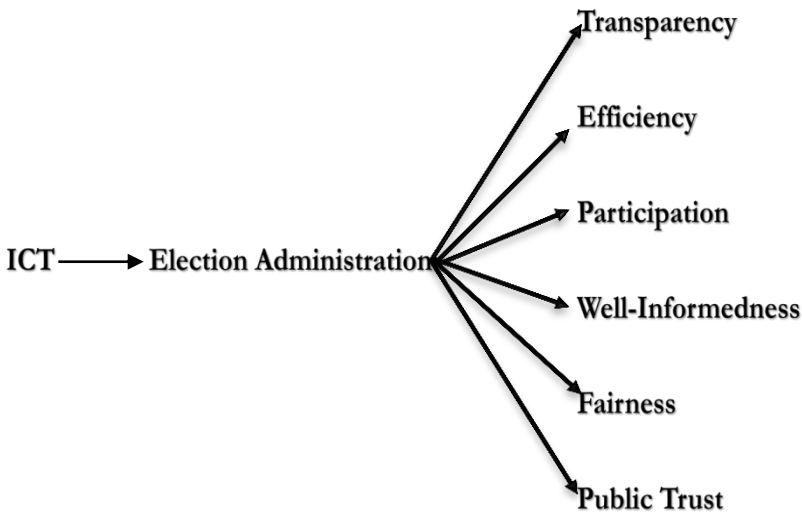


Figure 1 Model showing the Relationships among the variables in the study
Source: researcher's construct (2024)

The findings of this study confirmed the relationship patterns proposed by e-democracy theory. This is given the findings that confirmed that ICT use in election administration tends to enhance democratic governance through the promotion of the core values of a democratic system. These values, as captured in related literature, were transparency, efficiency, and participation (Seok-Jin, 2014; Okechukwu, 2015; INEC, 2017; Osemwota, 2019; Valle-Cruz, 2019); fairness and trust (INEC, 2017; Valle-Cruz, 2019; Aniekwe & Oraegbunam, 2021), and informed voters (INEC, 2020; Scott et al., 2016).

As established in this study, 48% of efficiency, 55% fairness, 53% participation, 36% transparency, 61% trust, and 40% of well-informedness. Even though the theory is validated by the findings of the study, there is also the realisation that several other factors contributed to the achievement of these values. For efficiency, for instance, ICT use explains only 48% of the efficiency observed in the administration of elections, while other factors not captured in this theory explain the remaining 52%. The same goes for the other adopted parameters. Arising from this is the need to identify the other factors important to the achievement of the core democratic values adopted in this study.

Overview of ICT Deployment in Electoral Activities in Nigeria

ICT Tools Deployed in the Administration of Elections in Nigeria

a) Voter Registration

Voter registration, a critical component of election administration, has historically suffered from numerous challenges when conducted manually, including errors, inefficiencies, and susceptibility to manipulation (Afolabi, 2020). To address these issues, the Independent National Electoral Commission (INEC) of Nigeria introduced information and communication technology (ICT) tools to enhance the process. Initially, optical mark recognition (OMR) was employed in 2003, followed by the electronic voter registration (EVR) system in 2007, which later evolved into the direct data capturing machine (DDCM) (Adebimpe et al., 2020). The DDCM, complemented by the Automated fingerprint identification system (AFIS), significantly reduced instances of multiple and underage registrations during the 2007 elections (Afolabi & Ogunne, 2018).

However, despite its initial success, the DDCM faced challenges such as bulkiness, fragility, and complexity, particularly in rural areas with fingerprint-damaging occupations (Afolabi & Ogunne, 2018). In response, INEC introduced the INEC Voter's Enrolment Device (IVED), which incorporated biometric technology (BT) to digitally identify voters based on their biometric data (Adebimpe et al., 2020). The IVED's utilisation of BT contributed to the success of INEC's 2015 elections, enhancing accuracy and credibility.

b) Voter Accreditation

Voter accreditation, a crucial aspect of election administration in Nigeria, has historically faced challenges due to manual processes, leading to increased incidents of electoral fraud (Afolabi, 2020). To combat this, many countries, including Nigeria, have turned to biometric devices for voter identification and accreditation. Key tools adopted for this purpose include the Permanent Voter's Card (PVC) and the Smart Card Reader Machine (SCRM).

The PVC, encoded with voter information gathered using AFIS/DDCM and IVED, serves as a tamper-proof and counterfeit-resistant means of voter authentication. Designed to last at least ten

years, the PVC is not only crucial for electoral participation but also widely accepted as a valid form of identification in Nigeria.

The SCRM, introduced in the 2011 and 2015 elections, validates voter registration by scanning the barcode on the PVC, employing sophisticated cryptographic technology (Alebiosu, 2016). Considered a groundbreaking innovation, the SCRM enhances the efficiency and accuracy of voter accreditation, contributing to the integrity of the electoral process.

Moreover, the Bimodal Voter Accreditation System (BVAS), integrated with the IVED, has emerged as a vital tool for preventing double voting. Widely deployed in the 2023 general elections, the BVAS performs voter accreditation swiftly and accurately, utilising fingerprint and face recognition technology (Osun State Situation Room Report, 2022). With its effectiveness and efficiency, the BVAS has significantly influenced the conduct of elections in Nigeria, ensuring fairness and transparency in the electoral process.

c) Voting with an 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 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 the 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 is to ensure transparency in the election result collation. 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.

The extent of ICT use in the Administration of Elections in Nigeria

A critical examination of INEC's reports and literature concerning the use of ICT in the administration of elections in Nigeria indicated that only a few activities in election administration have received consistent ICT use in Nigeria. These areas are discussed below.

a) Constituency Delimitation

In the conduct of elections, there is a need for a comprehensive delimitation of constituencies into manageable sizes for EMBs. These constituencies are the basic units of representation in the legislative arm of government. In Nigeria and most democratic countries, the agency in charge of election management usually embarks on periodic adjustments of these constituencies to ensure maximum representation of the various groups and constituents in the country. Over the years, several democratic countries have leveraged the opportunities embedded in the Global Positioning System (GPS) for the effective division of the country into constituencies (Kimura, 2015). However, in Nigeria, significant ICT commitment in this regard is lacking, and this has limited the extent to which proper population balancing among the constituting constituencies in Nigeria is achieved.

b) Voter Education

Voter education is an essential prerequisite for any electoral process, irrespective of whether digital tools are employed or not (INEC, 2017). The electorate must be well-informed about election timelines, registration requirements, and polling locations, disseminated through various mass media channels available to the electoral commission. Electoral management bodies are tasked with educating voters on the technicalities of participating in elections rather than teaching them.

Social media, enabled by ICT, offers immediate and effective learning opportunities, unlike traditional media (Van de Donk & Tops, 2015). In Nigeria, the recent prominence of ICT in information dissemination led INEC to launch social media accounts on platforms like Twitter, Facebook, and Instagram, facilitating widespread information sharing and effective voter education.

Graphical illustrations and videos demonstrate voting procedures in local languages, ensuring comprehension across all voter demographics. Continuous sensitisation and enlightenment efforts must span the entirety of the electoral process (Valle-Cruz, 2019; Osemwota, 2019). INEC's online portal regularly updates voters on developments, while Information Technologies (IT) enables stakeholders to contact the commission for information and reporting via phone calls, SMS, emails, and social media comments. Sustained voter education is paramount for the success of the electoral process, fostering informed participation, and enhancing democratic integrity.

c) Voter Registration

In Nigeria, the digitalisation of voter registration began in 2011 under Prof. Attahiru Jega's chairmanship. The objective was to establish a credible voter register, essential for preventing electoral fraud like over-voting. Notably, INEC's use of biometric devices, such as the Direct Data Capturing Machine (DDCM), paved the way for credible elections in 2011 and 2015 (Ejikeme, 2016). Subsequent improvements, including the introduction of the INEC Voter's Enrolment Device (IVED), aimed to enhance voter registration and accreditation processes, minimise errors, and promote transparency (Aniekwe & Oraegbunam, 2021).

ICT integration in voter registration streamlines processes, reduces time and costs, enhances transparency, and mitigates human errors (INEC, 2020). The use of IVED, with advanced features like an in-built fingerprint scanner and facial detector, underscores INEC's commitment to credible elections (Aniekwe & Oraegbunam, 2021). Online registration and verification platforms provide convenient access for voters, ensuring the accuracy and integrity of voter information remotely (INEC, 2022). Overall, ICT deployment in voter registration aligns with INEC's mandate to uphold free, fair, and credible elections in Nigeria.

d) Voter Accreditation

The adoption of ICT tools for voter accreditation has gained traction in various democratic nations, including Nigeria, where the Bimodal Voter Accreditation System (BVAS) was introduced during the 2023 general elections. BVAS employs biometric data, utilising both fingerprint and facial recognition software for voter identification.

During accreditation, the Smart Card Reader Machines (SCRMs) are crucial for verifying the authenticity of voters' Permanent Voter's Cards (PVCs). Equipped with sophisticated cryptographic technology, SCRMs ensure swift authentication of PVCs and correlate the data stored on the microchip with the holder's fingerprint within seconds (Nnamani et al., 2019). While SCRMs played a pivotal role in Nigeria's 2015 and 2019 elections, challenges like low voter turnout and technical glitches prompted the introduction of BVAS to replace SCRMs (Aniekwe & Oraegbunam, 2021).

e) Voting, Sorting, Counting, and Transmission/Collation

Voting using ICT tools in Nigeria was only confirmed in the isolated states of Edo in 2020 (Aniekwe & Oraegbunam, 2021), and Kaduna in 2018 and 2021 (EmpTech, 2021). Subsequently, in Ekiti, Anambra, and Osun State, where elections were also conducted, only BVAS and IReV were deployed for voter accreditation and result declaration, respectively. The basic stages where ICT was consistently deployed in Nigeria were voter registration and data capture; voters' authentication, which comprises voter verification and accreditation, and then voter information management, which comprises voter education.

Methodology

In assessing the effect of ICT deployment on election administration in Nigeria, six parameters of efficiency, fairness, participation, transparency, trust, and well-informedness were adopted. This was because these are the core values of an effective electoral process capable of promoting a healthy democratic system. The study relied on quantitative data sourced from 11,994 voters across the country through online questionnaire administration, using an unrestricted self-selected survey technique and key informant interviews (KII) (qualitative data) conducted with sixteen (16) purposively selected election stakeholders in Nigeria. As shown in Table 1, the interview respondents included five (5) INEC directors (ICT, Voter Education, Publicity, Voter Registry, and Gender and Inclusivity Departments), and representatives of six leading accredited observer groups that have consistently participated in general elections in Nigeria, namely, the Centre for Transparency Advocacy (CTA), the National Institute for Legislative and Democratic Studies (NILDS);

National Assembly; Nigeria Bar Association (NBA), the International Foundation for Electoral Systems, the British High Commission, and the European Union. Others were the Public Relations Officers (PROs) of five purposively selected political parties in the country, namely, the All Progressives Congress (APC), the Peoples Democratic Party (PDP), the Labour Party (LP), the New Nigeria Peoples Party (NNPP), and the Social Democratic Party (SDP). In addition, secondary data consisting of the data released by the Nigerian Bar Association (NBA) in its interim report of the 2023 Presidential and National Assembly Elections of the Federal Republic of Nigeria were utilised. The quantitative primary data were analysed using Partial Least Square Structural Equation Modelling (PLS-SEM) with SmartPLS version 4.0.9.2 software.

Table 1: Socio-Demographic Characteristics of KII Respondents

Code Name	Organisation	Unit	Rank
Respondent 1	INEC	ICT	Senior Computer Analyst
Respondent 2	APC		Public Relations Officer
Respondent 3	INEC	Voter Education	Deputy Director's office
Respondent 4	PDP	Campaign Council	Director of Media
Respondent 5	INEC	Publicity	Resident Electoral Commission
Respondent 6	INEC	Voter Registry	Deputy Director's office
Respondent 7	INEC	Gender and Inclusive	Administrative Secretary
Respondent 8	LP		Public Relations Officer
Respondent 9	NNPP	Campaign Council	Member
Respondent 10	SDP	Campaign Council	Member
Respondent 11	CTA	Programmes and Communications	Member of the Management Team
Respondent 12	NILDS	Democracy and Governance	Deputy Director's office
Respondent 13	National Assembly	House of Representatives	Committee Member
Respondent 14	NBA	State Branch	Chairman
Respondent 15	International Foundation for Electoral Systems		Country Representative's office
Respondent 16	British High Commission		A Senior Member of Staff

Source: Fieldwork, 2023

Data Analysis

Effect of ICT Deployment on Election Administration in Nigeria

Using Partial Least Square Structural Equation Modelling (PLS-SEM), according to Hair et al. (2019), requires that the outer model be tested with measurement model assessment, in addition to indicator loading, internal consistency reliability, convergent, and discriminant validities. This is to be followed by a structural model evaluation to ascertain the

path relationships, significance levels, coefficient of determination, effect size, and predictive relevance.

a. Measurement Model Assessment for Reflective Constructs

In this assessment, several tests that range from indicator loading, internal consistency reliability, and convergent and discriminant validities were observed as follows:

i. Indicator Loadings

This is primarily concerned with the assessment of the items' loading of the constructs adopted in the study. The assessment required that a threshold of 0.708 (which amounted to at least a 50% variance in the indicator) be attained for the data to be satisfactory. As held by Hair et al. (2019), a threshold of 0.4% is acceptable for exploratory research, especially with a significant level of at least $p < 0.01$. The indicators with loadings below 0.708 would have been removed, but since the AVE is above 0.5, removing them would not make any difference.

ii. Convergent Validity

This examined the AVE value, which determines the extent to which the constructs adopted in the study explain their respective items. This value is to be at least 0.50, and the AVE value for all constructs is within the threshold of ≥ 0.50 . Reliably, therefore, the measurement model confirms the convergent validity of the data adopted in the study.

iii. Internal Consistency Reliability

The internal reliability of the data adopted in this study was examined using a combination of Cronbach alpha and ρ_0_A . This is given that in SmartPLS version 4, composite reliability (CR) is no longer calculated. In the sequel, a threshold of 0.7 must be recorded for each of the constructs adopted in the study. All the constructs have values above the threshold, invariably; the latent variables in the study have satisfactory internal consistency and reliability.

iv. Discriminant Validity

The focus of this test is to ascertain the extent to which the constructs adopted in the study differ from one another even though they are within the same model. The discriminant validity was assessed using the heterotrait-monotrait ratio of correlation (HTMT) criterion as depicted in Table 2. HTMT required that the calculated values of the constructs be less than 0.9 to avoid a lack of discriminant validity, and this is evident in the table below, as the constructs sufficiently met the discriminant validity benchmark as they are all below 0.9.

Table 2: Discriminant Validity (Heterotrait-Monotrait Ratio of Correlations (HTMT) Criterion)

	1	2	3	4	5	6	7
1							
2	0.63						
3	0.79	0.83					
4	0.697	0.746	0.854				
5	0.861	0.618	0.699	0.627			
6	0.712	0.887	0.863	0.716	0.731		
7	0.643	0.605	0.739	0.726	0.741	0.652	

Source: SmartPLS Output

1= efficiency; 2= fairness; 3= ICT use; 4= participation; 5= transparency; 6= trust; and 7= well-informedness

b. Structural Model Assessments

The basic components of a structural model assessment in PLS-SEM include the calculation of collinearity, the relevance of the path coefficients, the coefficient of determination (R^2), effect sizes (f^2), statistical significance, and predictive relevance (Q^2). Each of these is presented in subsequent sections of this analysis.

Table 3: Results of the Collinearity Assessment (Variance Inflation Factor)

	ICT use
Efficiency	1.000
Fairness	1.000
Participation	1.000
Transparency	1.000
Trust	1.000
Well-Informedness	1.000

Source: *Fieldwork, 2023*

The VIFs assess multicollinearity among the variables in a study. For collinearity to be detected, according to Hair et al. (2019), a value of 3.3 and above must be obtained. However, as observed in Table 3, there is no indication of any collinearity given that all the values are below the 3.3 threshold. In addition, the value of 1.000 is because there is only one independent variable to which all the constructs of dependent variables are linked.

i. Path Coefficient of the Structural Model

In testing the hypothesis in this study, PLS-SEM was adopted using SmartPLS 4.0.9.2 version. The software was deployed with a 5000-resample bootstrapping function to generate t-values (*t value* > 1.645), p-values (*p-value* < 0.001), f^2 and confidence intervals for the hypothesised paths. The results are presented in Table 4 and Figure 2.

Table 4: Test of Hypotheses

Relationships	B	T-Value	P values	Confidence Interval	
				1.00%	99.00%
ICT use -> Efficiency	0.696	153.967	0.001	0.688	0.703
ICT use -> Fairness	0.744	189.914	0.001	0.738	0.751
ICT use -> Participation	0.730	193.779	0.001	0.724	0.736
ICT use -> Transparency	0.600	100.661	0.001	0.590	0.610
ICT use -> Trust	0.782	214.722	0.001	0.775	0.787
ICT use -> Well-Informedness	0.637	101.768	0.001	0.625	0.646

Source: *Fieldwork, 2023*.

From the table, all relationships were significant, as ICT use has a significant positive effect on election administration. This is evident in the result of the PLS-SEM analysis that showed the effect of ICT use on each of the adopted parameters of efficiency ($\beta = 0.696$, $t = 153.967$, $p < 0.001$); fairness ($\beta = 0.744$, $t = 189.914$, $p < 0.001$); electoral participation ($\beta = 0.730$, $t = 193.779$, $p < 0.001$); electoral transparency ($\beta = 0.600$, $t = 100.661$, $p < 0.001$); public trust ($\beta = 0.782$, $t = 214.722$, $p < 0.001$); and voter well-informedness ($\beta = 0.637$, $t = 101.768$, $p < 0.001$). Derivable from this presentation, therefore, is that ICT use has a significant positive effect on election administration in Nigeria.

Even though ICT use has significant positive effects on the adopted parameters, the finding also showed that several other factors not covered in the study equally contributed to the prevalence of the adopted parameters. In Table 5, for instance, the R^2 report showed that ICT use in election administration explains just 48% of election administration efficiency. Invariably, several other factors account for the remaining 52%. These factors may be the conduciveness of the working environment, the availability of motivational packages for the electoral officials, or other factors.

Also, for fairness, ICT use only explains 55% of the observed electoral fairness, while the remaining 45% is due to other factors aside from ICT use. These factors may include the presence of security forces, media houses, or related election monitoring bodies to prevent misconduct. This can force the election officials to behave to avoid preventable chaos. In addition, ICT use explains 53% of electoral participation, while other factors account for the remaining 47%. Similarly, ICT use explains 36% of electoral transparency, 61% of public trust in the electoral process, and 40% of voter well-informedness in Nigeria. Other factors aside, ICT use accounts for the remaining 64%, 39%, and 60%, respectively.

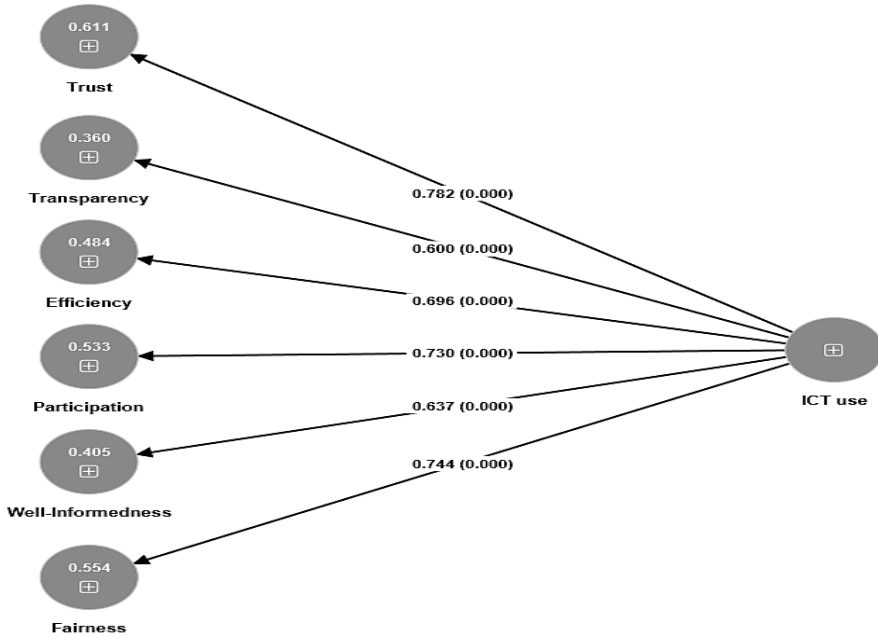


Figure 2 Structural Model

Source: Fieldwork, 2023.

ii. Coefficient of Determination (R^2)

R^2 is a statistical measurement that ascertains the values of endogenous constructs, usually in the PLS algorithm report. To read meaning to these values, scholars have proposed varied benchmarks, prominent among which is that of Hair et al. (2014, 2017; 2019), which categorised R^2 values into 0.70 (substantial), 0.50 (moderate), and 0.25 (weak). As shown in Table 5 below, ICT use explains 48%, 55%, 53%, 36%, 61%, and 40% of the total variance for efficiency, fairness, participation, transparency, trust, and well-informedness, respectively.

Table 5: Coefficient of Determination (R^2)

Constructs	R-square	R-square adjusted
Efficiency	0.484	0.484
Fairness	0.554	0.554
Participation	0.533	0.533
Transparency	0.36	0.36
Trust	0.611	0.611
Well-Informedness	0.405	0.405

Source: Fieldwork, 2023.

iii. Effect Size (f^2)

f^2 represents the contribution of the exogenous construct to the value of R^2 and it is calculated using the thresholds of Cohen (1992). The f^2 is categorised as either large (0.35), medium (0.15), or small (0.02). As captured in Table 6, all the relationships in the model have large effect sizes.

Table 6: Results of Effect Size (f^2)

	ICT use
Efficiency	0.939
Fairness	0.843
Participation	0.841
Transparency	0.562
Trust	0.873
Well-Informedness	0.681

Source: Fieldwork, 2023.

iv. Assessment of Predictive Relevance (Q^2)

Q^2 determines the predictive power of a model, and it is calculated using PLSpredict. Primarily, Q^2 is expected to be more than zero. As shown in Table 7 below, the model has predictive values as the Q^2 values are all greater than zero.

Table 7: Summary of Predictive Relevance (Q²)

	Q ² predict
Efficiency	0.484
Fairness	0.554
Participation	0.533
Transparency	0.360
Trust	0.611
Well-Informedness	0.405

Source: *Fieldwork, 2023.*

In complementing the quantitative data presented above, interview responses from sixteen purposively selected respondents were also presented as follows:

In the opinions of respondents 1, 3, 4, 5, 7, 8, 9, and 10, ICT use in election administration promotes fairness in the conduct of elections as it reduces the prevalence of electoral malpractices. These respondents further stated that it enhances credibility in elections, which translates to the promotion of trust in the process. More importantly, respondent 2 noted that:

The argument that voter turnout is low in the 2023 general elections compared to those of 2011, 2015, and 2019 is suspicious, instead, the use of BVAS has broken the established ballot stuffing style of traditional politicians who connive with electoral officials to share unused ballot papers instead of returning them to the commission.

This observation was corroborated by respondent 12, who argued that the use of ICT in the 2023 elections has given the country a clue of the exact population in each region of the country compared to the 2011, 2015, and 2019 elections, where AFIS and SCRM were less sophisticated than BVAS. Other effects of ICT adoption in election administration by respondents 4, 8, 9, and 10 were that it promotes transparency and inclusiveness, reduces the rate of election petitions and litigation, and prevents voter harassment. Also included was the fact that ICT adoption in election administration reduces the paperwork of INEC and enhances voting result auditing.

In corroborating the findings from the primary data presented above, the NBA released the data in its interim report of the Presidential and National Assembly Elections of the Federal Republic of Nigeria. This data is presented in Table 8 below.

Table 8: NBA’s Interim Report on the Effect of ICT Adoption on the 2023 Presidential and National Assembly Elections in Nigeria

disability and senior citizens get assistance?		In general, how was the conduct of the poll at the station?	
Could have been better	75	Excellent	107
Great Support	288	Not so great	48
No support	45	Ok	220
Did you observe any vote buying?		Poor	15
No	399	Very poor	18
Yes	9	Were the BVAS working efficiently?	
Did you observe any underage voting?		No	44
No	403	No BVAS in sight	8
Yes	5	Yes	356
Did you observe any violence?			
No	397		
Yes	11		

Source: <https://analytics.zoho.com/open-view/2668635000000169824>

The data in the table above showed that persons with disabilities and senior citizens received the required attention and assistance during voting. This assistance was principally in the use of ICT tools for elections. Given the capabilities of these tools, 399, 403, and 397 NBA election observers reported that vote-buying, underage voting, and electoral violence were not observed in the 2023 elections across the country, respectfully. In addition, a significant number of NBA observers noted that BVAS worked effectively in the elections. In general, 107 and 220 NBA election observers captured the conduct of the elections as excellent and ok, respectfully. These data confirmed that ICT use in election administration promotes voter participation, electoral efficiency, transparency, and fairness, and it has the potential to facilitate public trust, especially in INEC. However, there are other factors that contribute to the observed parameters that could be challenging to the adoption of ICT in election administration, which include, but are not limited to, mass illiteracy in rural areas, the operationalisation of electoral ICT facilities, and human capacity development for ICT usage. Various explanations have been proposed to explain INEC's inability to expand the utilisation of ICT in voting during general elections in Nigeria. Ilaya (2021) argued that an inconsistent power supply was a significant hindrance to the use of ICT in the gubernatorial elections conducted in several states. The fluctuation in the electrical supply throughout the election period resulted in the electoral officials being unable to use electronic card readers. At a certain juncture, the process of accrediting

manual voters was reversed. This undermined the transparency initiative of INEC throughout the election. A significant problem is the insufficient proficiency in ICT skills among the ad hoc workers involved in elections, since they often lack the fundamental knowledge and abilities to handle the digital equipment used for electoral purposes. This issue extends beyond INEC officials, since there are several Nigerians who lack the necessary technical skills to proficiently use the various ICT services provided by INEC.

Discussion

The study's analysis reveals a significant positive impact of ICT utilisation on election administration in Nigeria. Specifically, ICT positively influences efficiency, fairness, participation, transparency, trust, and voter well-informedness across the 2011, 2015, 2019, and 2023 general elections. These findings are corroborated by qualitative data from sixteen selected election stakeholders in Nigeria. Qualitative data further indicates reduced election petitions, paperwork for INEC, and voter harassment as additional effects of ICT adoption.

Previous studies (Seok-Jin, 2014; Okechukwu, 2015; INEC, 2017) have established the promotion of democratic values like transparency, efficiency, and participation through ICT use in election administration. However, this study uniquely combines these values, advancing knowledge in the field.

Concerns about transparency in electoral processes have been longstanding, with studies by Ahmad et al. (2015) and Omoleke (2018) highlighting the impact of transparency on democracy's credibility in African countries. The integration of ICT tools, as noted by Ahmad et al. (2015), Kimura (2015), and INEC (2017), addresses these concerns by enhancing both process and outcome transparency in Nigerian elections. This study builds upon previous findings and eliminates doubts about ICT's ability to ensure transparency.

Furthermore, the study establishes a significant positive influence of ICT use on electoral transparency in Nigeria, aligning with Baringer et al.'s (2021) assertion that credible elections necessitate transparency. This finding is supported by previous research, such as that by Olugbamiye (2020) and Akwu et al. (2021), emphasising the crucial role of transparency in electing credible leaders. Following Seok-Jin's (2014) and Meijer's (2009) procedural approach, this study elucidates transparency

through public monitoring of government processes facilitated by ICT adoption.

Despite concerns raised by José (2010), Van de Donk & Tops (2015), and others regarding ICT's ability to ensure transparency due to opaque electronic processes, this study showcases how new technological devices like IVED, CVR, and BVAS significantly contribute to transparency in Nigeria's electoral process.

Debates over the efficiency of ICT adoption in election administration have persisted, with Ahmad et al. (2015), Hossain et al. (2015), and others arguing for its cost-effectiveness, countered by Kearns' (2004) assertion of high procurement costs. This study adds to the discourse by confirming that ICT use significantly enhances efficiency by reducing time, effort, and costs associated with elections, despite INEC's escalating budgetary requirements.

Moreover, ICT adoption promotes mass participation in the electoral process, countering previous findings indicating declining participation due to intimidation and violence. Initiatives like the use of ICT in the 2023 general election have boosted voter participation, challenging earlier research.

In terms of voter well-informedness, ICT-based platforms, as found in this study and corroborated by INEC reports, play a crucial role in educating voters and enhancing their understanding of the electoral process.

Lastly, the study highlights how ICT tools have bolstered electoral fairness and trust, aligning with Osemwota's (2019) findings in Ghana's 2012 elections. By reducing electoral malpractices, ICT enhances credibility and trust in electoral processes.

In conclusion, the integration of ICT in election administration in Nigeria has multifaceted benefits, from improving efficiency and transparency to promoting voter participation and trust. Despite some lingering concerns, ICT remains instrumental in shaping democratic processes and ensuring credible elections.

Conclusion and Recommendation

In conclusion, the integration of information and communication technology (ICT) tools into election management in Nigeria has yielded significant improvements in various aspects of the electoral process. The adoption of ICT tools, ranging from voter registration to result

presentation, has enhanced efficiency, transparency, and credibility in elections. The implementation of systems such as optical mark recognition (OMR), electronic voter register (EVR), smart card reader machine (SCRM), and bimodal voter accreditation system (BVAS) has streamlined processes, minimised errors, and mitigated electoral malpractice.

Furthermore, ICT deployment has facilitated broader electoral participation by providing access to information and ensuring the inclusion of marginalised groups such as persons with disabilities and senior citizens. The transparency and accountability fostered by ICT tools have contributed to building public trust in the electoral process, which is crucial for democratic governance.

While the study underscores the positive impact of ICT on election administration, it also highlights the need for continuous improvement and the consideration of other factors beyond technology alone. Factors such as the conduciveness of the working environment, security measures, and stakeholder engagement complement ICT deployment in enhancing the overall integrity of elections. Thus, the ongoing evolution of ICT in election management presents a promising avenue for advancing democratic consolidation in Nigeria, provided that efforts are sustained to address existing challenges and adapt to emerging needs.

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