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Analysis of Driving Forces That Ensures the Sustainability of Voter Accreditation Technology

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Abstract

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by

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MPhil, Walden University, 2019

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Dissertation Submitted in Partial Fulfillment

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Abstract

Nigeria's electoral body, the independent national electoral commission (INEC), deployed a novel information technology (IT) based voter accreditation technology in 2015. Benefits realized included transparency and curtailed electoral malpractices. The purpose of this quantitative correlational study was to examine the relationship(s) between some variables categorized into technological, organizational, and economic factors, and Sustainability of voter accreditation technology (SVAT). The theoretical framework for the study was the e-voting system adoption model in combination with constructs from three other theories. A total of 138 IT experts participated and were asked (via SurveyMonkey) of the relationships between the following factors and SVAT: ease of use, ease of participation, dependability, incremental implementation, prevention of fraud, accountability and transparency, government regulations, voter trust, availability of funds, maintainability, and continuous development of technical employees. Pearson correlation and multiple regression were used to understand the relationships between the independent variables and SVAT. Multiple regression analysis showed that prevention of fraud ($\beta = .64$, $t(126) = 8.40$, $p = .000$) and voters trust ($\beta = .20$, $t(126) = 2.67$, $p = .009$) were the most important factors that should be considered by INEC for decisions that will ensure SVAT. Insights from this study can make INEC and other stakeholders in the electoral process in Nigeria understand the influencing forces that determine SVAT. Incorporating these factors can help SVAT for better, transparent, efficient, and credible electoral processes in the future. This will help sustain democracy in the country, resulting in positive social change.

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Dedication

This doctoral dissertation is dedicated to God Almighty. He has been my source of inspiration, wisdom, knowledge, and understanding. I also dedicate this work to my wife Deborah Bayode and my children Daniel, David, and Dominion who encouraged me all from the beginning to the end of the programme. A special feeling of gratitude to my late father, Mr. Bayode Isaac, and mother, Mrs. Bayode Comfort, for their advice, support, prayers, and encouragement.

I also dedicate this doctoral dissertation to my colleagues both at work place and church for their support and prayers.

I dedicate this work and give special thanks to my mentors Pastor E. A. Adeboye, Prof. Attahiru Jega, and Prof. Mahmood Yakubu, whose words of encouragement and push for tenacity rings in my ears.

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Chapter 1: Introduction to the Study

Elections provide a platform for political succession in various countries, including Nigeria. Elections conducted manually are known for allowing fraudulent individuals and groups to carry out various election malpractices (Agbu, 2016). To deal with the drawbacks of the fully manual electoral system, Nigeria's Independent National Electoral Commission (INEC) decided to adopt a voter accreditation technology. This technology, first used in Nigeria's 2015 general elections, combined the use of smart card readers and permanent voter cards. There were challenges experienced in its usage in some areas of the country, creating mixed reactions among the electorate (Sunday, 2017). However, the general elections conducted in 2015 were viewed by many to have been more transparent and credible (Agbu, 2016). Adoption of voter accreditation technology during the 2015 general elections in Nigeria reduced electoral fraud, such as stuffing of the ballot box with ballot papers and multiple voting. These benefits highlight why studying how to sustain such technology is essential. Without the sustainability of voter accreditation technology for future elections, the credibility and integrity of the electoral process will be weakened, consequently impairing democracy (Shuaibu, Mohammed, & Arthur, 2017).

Background of the Study

After the introduction of the voter accreditation technology for the 2015 general elections in Nigeria, researchers assessed the outcomes of the election. They described some favorable results achieved by the adoption of this technology for the process. For example, Uzodike and Onapajo (2017) revealed that in addition to the transparency it

added, the 2015 Nigerian elections were also fair and credible and served to enhance democracy and democratic values in the country. The authors acknowledged that the technological measures adopted also made accreditation more transparent and less cumbersome, and provided backup information that could be used for legal purposes in case need arises for such processes. Bayode (2017), who focused on the use of voter accreditation technology to prevent electoral fraud, assessed the digital identity in securing the electronic voter accreditation system in terms of fraud prevention, concluding that the technology offered perhaps the best solution in shaping up the electoral arena in Nigeria.

According to Ayodele (2016), the use of voter accreditation technology significantly reduced the probability of bloody electoral violence among voters during the 2015 general elections in Lagos, Nigeria. Sabo, Siti, John, and Rozita (2015) were able to demonstrate that the voter accreditation technology curbed electoral fraud. This assertion was supported by Olurode (2017), who revealed that the introduction of the voter accreditation technology to the electoral process in Nigeria tremendously improved the process, enhanced the detection of electoral fraud, and reduced multiple voting. Sabo et al. also assessed other areas in this new technology, including trust in e-voting systems, e-voting characteristics, computer self-efficacy, and the ability to use the e-voting systems. The authors concluded that e-voting technology is capable of positively turning around the voting process of emerging democracies. There has been no study on how the use of this technology can be sustained for future elections.

Problem Statement

Electoral fraud has been found to weaken the electoral process and reduce voters' confidence in election management bodies around the world (Daxecker, Di Salvatore, & Ruggeri, 2019). Manually carrying out voter accreditation in Nigeria has brought about social issues such as electoral fraud and violence (Addo, 2017). Deployment of voter accreditation technology by the INEC in Nigeria during the 2015 general elections reduced electoral fraud (Bayode, 2017). A survey conducted in 2016 showed that at least 60% of the participants interviewed agreed that the introduction of voter accreditation technology by the INEC in Nigeria to verify voters' identity and to authenticate their biometrics during 2015 general elections improved the credibility of the polls (Ayodele, 2016). The use of voter accreditation technology during the 2015 general elections in Nigeria helped in exposing fake voters and reducing multiple voting, causing a dramatic decrease in the number of voters from 39,469,484 during the 2011 general elections to 29,432,083 during the 2015 general elections (Olurode, 2017). Adoption of voter accreditation technology during the 2015 general elections in Nigeria also reduced electoral frauds such as stuffing of the ballot box with ballot papers and multiple voting. These benefits highlight why studying how to sustain such technology is important. Without the sustainability of voter accreditation technology for future elections, the credibility and integrity of the electoral process will be retarded, consequently impairing democracy (Shuaibu et al., 2017).

The general management problem for this research is that not using voter accreditation technology to support the 2015 voting process in Nigeria could have led to

doubtful credibility of the electoral process, thus marring or jeopardizing democracy. The specific management problem is that researchers do not know if a relationship exists between technological, organizational, and economic factors and the sustainability of voter accreditation technology.

Purpose of the Study

The purpose of this quantitative correlational study was to examine the relationships between technological, organizational, and economic factors, and the sustainability of voter accreditation technology. The independent variables were ease of use (EOU), ease of participation (EOP), dependability (DEPTB), incremental implementation (INCI), prevention of fraud (POF), accountability and transparency (ACT&TR), government regulations (GOVTR), voter trust (VTRST), availability of funds (AOF), maintainability (MTBTY), and continuous development of technical employees (CDOTE). The dependent variable was the sustainability of voter accreditation technology (SVAT). The result of the research will provide the electoral commission in Nigeria with conceptually grounded data to guide in the decision on the sustainability of voter accreditation technology.

The study will contribute to positive social change by providing rich data that election managers may use to make crucial decisions regarding the sustainability of technology to support voter accreditation. As a result of transparency and traceability that the voter accreditation technology brought to the 2015 general elections in Nigeria, issues of electoral fraud, which promotes violence were reduced accordingly, fostering a positive social change.

Research Questions and Hypotheses

The purpose of this quantitative correlational study was to examine the relationship between technological, organizational, and economic factors, and the sustainability of voter accreditation technology. To accomplish this, research questions were formulated to examine the relationships between the independent and dependent variables for the study amongst information technology professionals.

Research Questions

The main research question for the study was What is the relationship of technological, organizational, and economic factors and the sustainability of voter accreditation technology (SVAT) amongst information technology professionals in Nigeria?

The following specific research questions were used to examine the relationship between each of the independent variables and the dependent variable:

1. What is the relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals?
2. What is the relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals?
3. What is the relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals?
4. What is the relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals?

5. What is the relationship between the prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals?
6. What is the relationship between accountability and transparency and sustainability of voter accreditation technology amongst information technology professionals?
7. What is the relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals?
8. What is the relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals?
9. What is the relationship between the availability of funds and sustainability of voter accreditation technology amongst information technology professionals?
10. What is the relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals?
11. What is the relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals?

Hypotheses

Hypotheses are formulated to enable researchers examine the significance of the relationship between variables (Vogt & Johnson, 2016). They are stated to set out the problem a researcher is trying to resolve in a study. Researchers use hypotheses to explain the predictions that are put forward in their study (Rubin & Babbie, 2016). The

following null and alternative hypotheses were constructed based on each specific research question for the study:

H_o 1: There is no statistically significant relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals.

H_a 1: There is a statistically significant relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals

H_o 2: There is no statistically significant relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals.

H_a 2: There is a statistically significant relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals.

H_o 3: There is no statistically significant relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals.

H_a 3: There is a statistically significant relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals.

H_o 4: There is no statistically significant relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals.

H_a 4: There is a statistically significant relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals.

H_o 5: There is no statistically significant relationship between prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals.

H_a 5: There is a statistically significant relationship significant between prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals.

H_o 6: There is no statistically significant relationship between accountability and transparency and sustainability of voter accreditation technology amongst information technology professionals.

H_a 6: There is a statistically significant relationship between accountability and transparency and sustainability of voter accreditation technology amongst information technology professionals.

H_o 7: There is no statistically significant relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals.

H_a 7: There is a statistically significant relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals.

H_o 8: There is no statistically significant relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals.

H_a 8: There is a statistically significant relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals.

H_o 9: There is no statistically significant relationship between the availability of funds and the sustainability of voter accreditation technology amongst information technology professionals.

H_a 9: There is a statistically significant relationship between the availability of funds and the sustainability of voter accreditation technology amongst information technology professionals.

H_o 10: There is no statistically significant relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals.

H_a 10: There is a statistically significant relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals.

H_o 11: There is no statistically significant relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals.

H_a 11: There is a statistically significant relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals.

To test the hypotheses for the study, I used statistical models constructed for conventional patent technology analyses, which consist of various independent variables and one dependent variable (Sunghae, Jacob, & Sangsung, 2018). The variable I predicted in the study was the sustainability of voter accreditation technology (SVAT), which is the dependent variable. The independent variable were ease of use (EOU), ease of participation (EOP), dependability (DEPTB), incremental implementation (INCI), prevention of fraud (POF), accountability and transparency (ACT&TR), government regulations (GOVTR), voter trust (VTRST), availability of funds (AOF), maintainability (MTBTY), and continuous development of technical employees (CDOTE).

Multiple regression analysis was used to test all the hypotheses for the study simultaneously. Multiple regression is put to use when a researcher wants to predict the value of a dependent variable based on the value of two or more other independent variables (Sunghae et al., 2018). I used the multiple regression to understand whether the sustainability of voter accreditation technology can be predicted based on all the independent variables for the study.

The dependent and the independent variables were modeled using the multiple linear regression equation below:

$$Y_i = \beta_0 + \beta_1 X1_i + \beta_2 X2_i \ldots\ldots + \beta_3 Xn_i + \varepsilon_i$$

where Y_i is the predicted or expected value of the dependent variable

$X1_i$ through Xn_i are n distinct independent or predictor variables

β_0 is the value of Y_i when all of the independent variables ($X1_i$ through Xn_i) are equal to zero, and β_1 through β_n are the estimated regression coefficients, while ε_i is the error. Therefore, substituting the independent and dependent variables in this study into the equation above gave multiple regression model for this study as

$$SVAT = \beta_0 + \beta_1 EOU + \beta_2 EOP + \beta_3 DEPTB + \beta_4 INCI + \beta_5 POF + \beta_6 ACT\&TR +$$

$$\beta_7 GOVTR + \beta_8 VTRST + \beta_9 AOF + \beta_{10} MTBTY + \beta_{11} CDOTE + \varepsilon_i$$

Each regression coefficient (β) represents the change in SVAT relative to a one-unit change in the respective independent variable. In the multiple regression situations, β_1, for example, is the change in SVAT relative to a one-unit change in EOU, holding all other independent variables constant (i.e., when the remaining independent variables are held at the same value or are fixed). The detail of the assumptions for this model is stated in Chapter 3.

Theoretical Foundation

Theoretical Framework

Examining the relationship between technological, organizational, economic factors, and the sustainability of voter accreditation technology in Nigeria was the focus of the study. Since the voter accreditation technology assures the voters of quality

electoral standards, they may trust the system, accept it, and even support its adoption (Salimonu, Wan, Abdul, & Jimoh, 2013). Failure to sustain the technology may result in dissatisfaction and disapproval of the electoral system. When technology is deployed to support the voting process, its sustainability can be attained by illuminating the critical processes and collective tools involved **(**Shuaibu et al., 2017). To better understand the relationship between technological, organizational, and economic factors, and the sustainability of voter accreditation technology, the e-voting system adoption model proposed by Salimon et al. (2013) was relevant to the study. The e-voting system adoption model is a hybrid theory constructed through the integration of three other theories: diffusion of innovation theory, technology-organization-environment framework, and electronic data interchange adoption model.

Salimon et al. (2013) concluded that environmental factors, organization readiness, technological readiness, and anticipated benefits influenced e-voting adoption. This model formed the framework of the study. Adjustments of the constructs were made to befit the eccentricity of the scope of the research. Factors that ensure the sustainability of voter accreditation technology were grouped under three dimensions: technological, organizational, and economical.

Nature of the Study

A quantitative method is considered the best method when the research aims to identify factors that best conceptualize and predict an outcome or impact an outcome (Burkholder, Cox, & Crawford, 2016). The purpose of the study was to examine the relationship between technological, organizational, economic factors, and the

sustainability of voter accreditation technology among information technology experts in Nigeria. Accordingly, a quantitative method was preferred. A quantitative method is better favored than a qualitative method when a researcher is determining the relationship between two or more independent variables and a dependent variable (Rubin & Babbie, 2016). The outcomes of quantitative research can be generalized, whereas those of qualitative research are not generalizable (Brett, 2018).

The quantitative study design used for the research was the cross-sectional correlational research design. This research design is suitable for studies that involve a large number of research participants covering a large geographical area. More so, it was important to consider the nature of the association between the independent variables and the dependent variable for the study, as these variables were measured but not manipulated (Van der Stede, 2014). In the study, I generated numerical data from coded survey responses. These were quantitatively analyzed and thus justified the use of a quantitative method over a qualitative method.

Participants for the study were sampled from a group of information technology professionals in the government and private sector that work in different levels such as chief technical officer, data engineer, chief information officers, directors, and network engineers in Nigeria. The group comprises 5140 information technology professionals who implement and deploy information technology systems. A statistical power analysis was used to determine the appropriate sample size for the study

Definitions

Voter accreditation technology: This term refers to a range of innovative anti-rigging biometric devices used in registration, confirmation, and verification of voter identity and information. An example is the Smart Card Reader (SCR) used in the 2015 Nigerian elections for authentication of Permanent Voters' Cards (PVC) and accreditation of voters (Nwangwu, 2015).

Ease of use: This is the property of an electronic voting system that enables operators to use it with minimal or no assistance (Osho et al., 2015).

Ease of participation: This is a property that enables voters and election administration to clearly understand and take part in the accreditation process (Shuaibu et al., 2017).

Prevention of fraud: Abdulhamid et al. (2013) described this term as procedures and mechanisms of overcoming issues such as impersonation of voters, preventing the use of fake or cloned voter identity cards, and mass thumb printing of ballot papers by an individual.

Accountability and transparency: Transparency is a key principle in credible elections, which brings about trust and public confidence in the electoral process (Agbu, 2016). Accountability refers to the ability to detect and hold individuals responsible for having performed a specific action (Adamu, Shatimah, & Aliyu, 2016). Evrensel (2010), in a report by the Electoral Institute for Sustainable Democracy in Africa, mentioned that institutions responsible for voter registration must be subjected to accountability

mechanisms to ensure that objectives and principles of voter accreditation are met and applied.

Sustainability of voter accreditation technology: This is one of the critical determinants of how voter accreditation processes should be designed and maintained even after an election is complete (Evrensel, 2010).

Incremental implementation: This refers to the rolling out of a new system in phases. Sunday (2017) described incremental implementation by giving an example of the gradual replacement of manual voter accreditation with electronic voter accreditation in Nigeria.

Dependability: This refers to the capacity of a voting system to function as expected (Osho et al., 2015)

Government regulations: These are rules or laws by the government that present restrictions and prospects for the adoption of voting technologies (Salimonu et al., 2013).

Availability of funds: Financial ability of an electoral body to adopt, operate, and maintain a voting system (Maiye & McGrath, 2008).

Maintainability: The property of a voting device that enables adopters to effectively manages and maintain the device in a cost-effective way (Maiye & McGrath, 2008)

Assumptions

Assumptions of a study are the untested pieces of evidence that are expected to be accurate and can cause potential risks (Wolgemuth, Hicks, & Agosto, 2017). An assumption for this study was that participants know about the voter accreditation

technology that was adopted by the Nigerian INEC in the 2015 general elections. Another assumption for this study was that the responses provided by the participants in the survey were honest and unbiased, and the survey adequately measured the theoretical model's constructs.

Scope and Delimitations

The scope of a research is defined as the domain of the study. The scope of this study was limited to its specific management problem, which was to examine if a relationship exists between technological, organizational, and economic factors and the sustainability of voter accreditation technology, but will not include implementation of the findings. Participation in the study was also limited to different cadres of information technology professionals from private and government organizations in Nigeria.

Limitations

The adoption of voter accreditation technology may vary from one country to the other (Evrensel, 2010). I focused on INEC and information technology professionals across Nigeria who takes part in decision making to adopt new technologies and innovations. Therefore, the results of this study may apply to Nigeria and possibly other countries with similar electoral challenges. It is not guaranteed that the result of this study may be applicable across all other countries that have adopted or intend to adopt voter accreditation technology.

The variables in the study were only measured but not manipulated, and the study did not go beyond defining the correlation between research variables because correlational designs do not classify reasons for behaviors (Burkholder et al., 2016).

Significance of the Study

Significance to Theory

The study filled the gap in understanding, focusing specifically on the relationship between technological, organizational, and economic factors, and the sustainability of voter accreditation technology.

Significance to Practice

I aimed to understand the nature of the relationship between technological, organizational, and economic factors, and the sustainability of voter accreditation technology with a focus on Nigeria. The result of the study will support the management of the INEC in Nigeria to understand how best to ensure that the voter accreditation technology is maintained and improved to guarantee successful elections in the future.

Significance to Social Change

Sustaining the voter accreditation technology could contribute towards an improved, positive political culture in Nigeria, as well as increased public confidence in the electoral processes and electoral management body. As a result of the transparency and traceability feature the voter accreditation technology brings to the electoral process, issues of electoral fraud that promotes violence will be reduced, thereby fostering a positive social change.

Summary and Transition

This chapter has covered an overview of the core components of the study. These include the problem statement, purpose of the study, research questions, hypotheses, nature of the study, theoretical framework, assumptions, scope and delimitations,

significance, and limitations of the study. A clear description of the problem statement and purpose of the study was given. From the statements, research questions and hypotheses for the study were derived, thus providing the direction for the study. The next chapter covers the review of the literature, methods, and theories related to the problem, which helped in the understanding of the current situation of the problem and existing gaps.

Chapter 2: Literature Review

Adoption of voter accreditation technology during the 2015 general elections in Nigeria reduced electoral frauds such as stuffing of the ballot box with ballot papers and multiple voting. These benefits necessitated the need to study how to sustain such technology. Without the sustainability of voter accreditation technology for future elections, the credibility and integrity of the electoral process will be retarded, consequently impairing democracy (Shuaibu et al., 2017).

The purpose of this quantitative correlational study was to examine the relationship between technological, organizational, economic factors, and the sustainability of voter accreditation technology with a focus on Nigeria. This chapter offers a synopsis of recent and past studies that are relevant to the adoption of election-related technologies and assessment of theories examined by other scholars in technology adoption and sustainability.

Literature Search Strategy

Literature for this study was retrieved from online sources, including Google Scholar, SAGE Research Methods, ResearchGate, Walden library, academia.edu, and ACM Digital Library. The literature search focused on articles related to the adoption of voter accreditation technology that other scholars have published in peer-reviewed journals. Keywords and phrases used for the online search for literature included *adoption of voter accreditation technology, history of election technologies, challenges in the implementation of voter accreditation technology, diffusion of innovation (DOI) theory, technology-organization-environment (TOE) framework, electronic data*

interchange adoption model, need for sustainability of voter accreditation technology, benefits of voter accreditation technologies, and *issues surrounding the adoption of election technologies*.

The literature review for the study was organized around major topics, which include (a) a history of using technology to support voting processes; (b) theories of technological innovations adoption; (c) review of methods; (d) definition, characteristics, and benefits of voter accreditation technology and its contribution to the transformation of the 2015 general elections in Nigeria; (e) challenges in adoption of voter accreditation technology; (f) research model and hypothesis; and (g) the need for sustainability of voter accreditation technology.

Theoretical Foundation

Examining the relationship between technological, organizational, and economic factors, and the sustainability of voter accreditation technology in Nigeria was the focus of this study. Since the voter accreditation technology assures the voters of quality and meeting electoral standards, they may trust the system, accept it, and even support its adoption (Salimonu et al., 2013). Failure to sustain the technology may result in dissatisfaction and disapproval of the electoral system. If technology is deployed to support the voting process, illuminating the critical processes and collective tools may attain sustainability of the technology involved **(**Shuaibu et al., 2017).

Theoretical models have been developed from theories to explain and understand the adoption of technological innovations. The unified theory of acceptance and use of technology and technology acceptance model are frequently used adoption models for

technological innovations (Tavares & Oliveira, 2016). Adoption of technological innovations by election management bodies is significant in the management of electoral process because of transparency and traceability it may bring to the electoral process (Salimonu et al., 2013; Shuaibu et al., 2017). More research is still required on the adoption of voting technologies by election management bodies.

To better understand the relationship between technological, organizational, and economic factors, and the sustainability of voter accreditation technology, the e-voting system adoption model developed by Salimon et al. (2013) was relevant to the study. Salimon et al. proposed that environmental factors, organization readiness, technological readiness, and anticipated benefits influenced the e-voting system adoption. The model formed the basis of the study. Adjustments of the constructs of the e-voting system adoption model were made to befit the eccentricity of the scope of the research. The e-voting system adoption model is related to this study because it has demonstrated its usefulness in evaluating the critical factors for the adoption of technological innovation. In this study, the sustainability of voter accreditation technology was an innovation. The constructs for the adoption of the innovation were grouped under three critical determinants: technological, organizational, and economical.

The e-voting system adoption model is a hybrid theory constructed through the integration of three theories: DOI theory, TOE framework, and electronic data interchange adoption model. These theories are discussed in the following sections.

Diffusion of Innovation Theory

The DOI theory was developed by Everett M. Rogers in 1962 to guide on the adoption of innovations (Kapoor et al., 2014). Rogers (2003) posited that innovations are introduced through particular channels and become known over time within a particular social system. Diffusion occurs as potential users become aware of innovation, judge their value, and make decisions based on their judgment to reject or implement the innovation (Rogers, 2003). Categories of adopters described under the theory include innovators, early adopters, early majority, late majority, and laggards. The DOI recognizes both individual and social factors that may influence the decision to adopt or reject a given innovation. According to Rogers (1962), characteristics influencing adoption put forward by the theory include

- individual/leader characteristics, which describe the attitude of an individual or a leader towards change that may be brought by the introduction of an IT innovation in an organization;
- internal characteristics of an organization, which include the following six constructs: centralization, complexity, formalization, interconnectedness, organizational slack, and size of an organization; and
- external characteristics of the organization.

Apart from the mentioned characteristics, other important factors influence the adoption of technological innovation. These include relative advantage, trialability, observability, compatibility, and complexity of the innovation (Risselada, Verhoef, & Bijmolt, 2014). Zhang, Yu, Yan, and Spil (2015) conducted a study grounded in the DOI

theory on the adoption of consumer e-health innovations. The major factors influencing patients' acceptance and use of the e-appointment service were studied using the DOI theory. The results of the data of 25,616 patients collected for the study showed that the majority of patients did not accept the innovation. This was due to factors related to the low socioeconomic status of the studied population. Relatedly, applying the features of DOI theory, Travares and Oliveira (2018) conducted a study to understand the factors that drive individuals to adopt electronic health record portals. The authors posited that the DOI theory was relevant in providing contributions to understand the electronic health record portals. Partial least squares causal modeling approach was used to test the research model. The authors concluded that including DOI theory in the new integrated model approach was successful because the theory had constructs such as compatibility, habit, and behavioral intention that have an impact on understanding the adoption of electronic health record portals.

Concerning this study, potential adopters included information technology professionals, whereas the sustainability of the voter accreditation technology was the innovation. Proper understanding of the diffusion process can enable decision-makers and managers to accomplish the dynamics of voter accreditation technology sustainability.

Technology-Organization-Environment Framework

Tornatzky and Fleischer (1990) developed the TOE framework. The framework is a technology adoption theory that describes the factors that influence the adoption of

technological innovation. Three contextual aspects that influence the adoption of technological innovations, as identified in the framework, include

- technological context, which defines attributes such as complexity and compatibility;
- organizational context, which contains qualities such as top management support, technological readiness, financial readiness of the organization, skills, and organizational size; and
- environmental context, which may include factors such as government regulations and technical support infrastructure.

Awa, Ukoha, and Igwe (2017) posited that TOE factors determine the adoption of technological innovation because of the statistically significant relationship that exists between factors in the technological, organizational, and environmental contexts and adoption. The authors concluded that the adoption of technological innovation is more controlled by TOE factors than by the personal characteristics of an individual. A study grounded in TOE conducted by Tsou and Hsu (2015) to examine the relationship between TOE openness, digital-resource readiness, service co-production and firm performance in information technology organization showed that, with the service co-production playing an intervening role, there is a relationship between organization openness and environment and performance of the organization.

In this study, I incorporated knowledge from the TOE framework, which was integrated into the adoption of the e-voting systems innovation (Salimonu et al., 2013).

The framework was used to describe the factors that influence the sustainability of voter accreditation technology innovation.

Electronic Data Interchange Adoption Model

The electronic data interchange adoption model was developed by Iacovou, Benbasat, and Dexter (1995) through an analysis of interorganizational systems characteristics that influence the adoption of information technology innovations to the context of electronic data interchange. The model described adoption based on three factors: (a) organizational readiness, which includes factors such as financial resources and IT resources; (b) perceived benefits, which are the expected benefits from the adoption of an innovation; and (c) external pressure, which includes factors such as trading partners and competitors (Iacovou et al., 1995).

In mapping the model to this study, perceived benefits, external factors, and organizational readiness are factors that influence the adoption of any technological innovation and, to an extent, the sustainability of voter accreditation technology. The framework for the adoption of the e-voting system in Nigeria by Salimonu et al. (2013) integrated this model as part of the constructs.

Research Model

Sustainability of voter accreditation technology is an innovation; the research model is an e-voting system adoption model proposed by Salimonu et al. (2013). The e-voting system adoption model was developed to provide a better understanding of determining factors influencing e-voting system adoption in election management body organization. To achieve this, Salimonu et al. integrated some constructs and factors from

three other theories, which are the diffusion of innovations theory, technology-organization-environment framework, and electronic data interchange model.

Models may be extended with new constructs to influence the adoption of specific technological innovations (Ali, Warren, Mathiassen, 2017). Additional constructs that are specific to the adoption of technological innovation suitable to support the electoral process have been integrated into the e-voting system adoption model proposed specifically to adopt e-voting system for the organization of an election management body. The four constructs developed from the e-voting system adoption model are explained in the following sections.

Technological readiness. The technology-organization-environment framework model supports the degree to which an organization is technologically prepared to adopt information technology innovation (Hoti, 2015). This variable, technological readiness, measures technology metrics such as user ability, reliability, and security of e-voting as a key determinant in the adoption process.

Organizational readiness. This is the degree to which an organization is prepared to adopt an innovation in line with its internal structures (Williams, 2011). The diffusion of innovations theory, technology-organization-environment framework, and electronic data interchange adoption model support the organizational readiness variable. Organizational readiness in this model is expected to measure centralization, compatibility, public education, staff attitude to change, organizational slack, interconnectedness, corporate governance, and awareness.

Environmental factors. These are factors external to the organization, which may influence the adoption of information technology innovations. The technology-organization-environment framework supports the environmental factors variable. Environmental factors variables are external to an organization and present limitations, restrictions, or prospects for technological innovations (Awa et al., 2017). Constructs under environmental factors in this model include organizational independence, political party support, voters' attitude, government regulations, and legal framework.

Perceived benefits. These are rewards or gains derivable by an organization when an information technology innovation is adopted; the electronic data interchange model supports it (Oliveira & Martins, 2011). Benefits can either be direct or indirect. Direct benefits may include cost-savings and improved operational efficiency, whereas indirect savings may consist of better service delivery and capacity process for reengineering.

The model formed the basis of this study and enabled me to examine the relationship between technological, organizational, economic factors, and the sustainability of voter accreditation technology. Salimoni et al. (2013) clarified that the innovation adoption model was expected to measure the indirect benefits of e-voting technology to election management bodies. This is in terms of preventing multiple registrations, eliminating multiple voting, improving the accuracy of the vote count, preventing vote manipulation, and ensuring ease of use.

The review of various technological innovation adoption studies and theories revealed some common factors across most of the research studies. Literature concerning

the adoption of technological innovation was extensively reviewed to identify driving forces that ensure the sustainability of the voter accreditation system. The driving forces, which are the independent variables for the study, were identified and categorized into three groups, namely technological, organizational, and economical. The dependent variable is the sustainability of voter accreditation technology. The purpose of this theoretical model (see Figure 1) is to examine the relationship between technological, organizational, economic factors, the independent variables, and the sustainability of voter accreditation technology, the dependent variable.

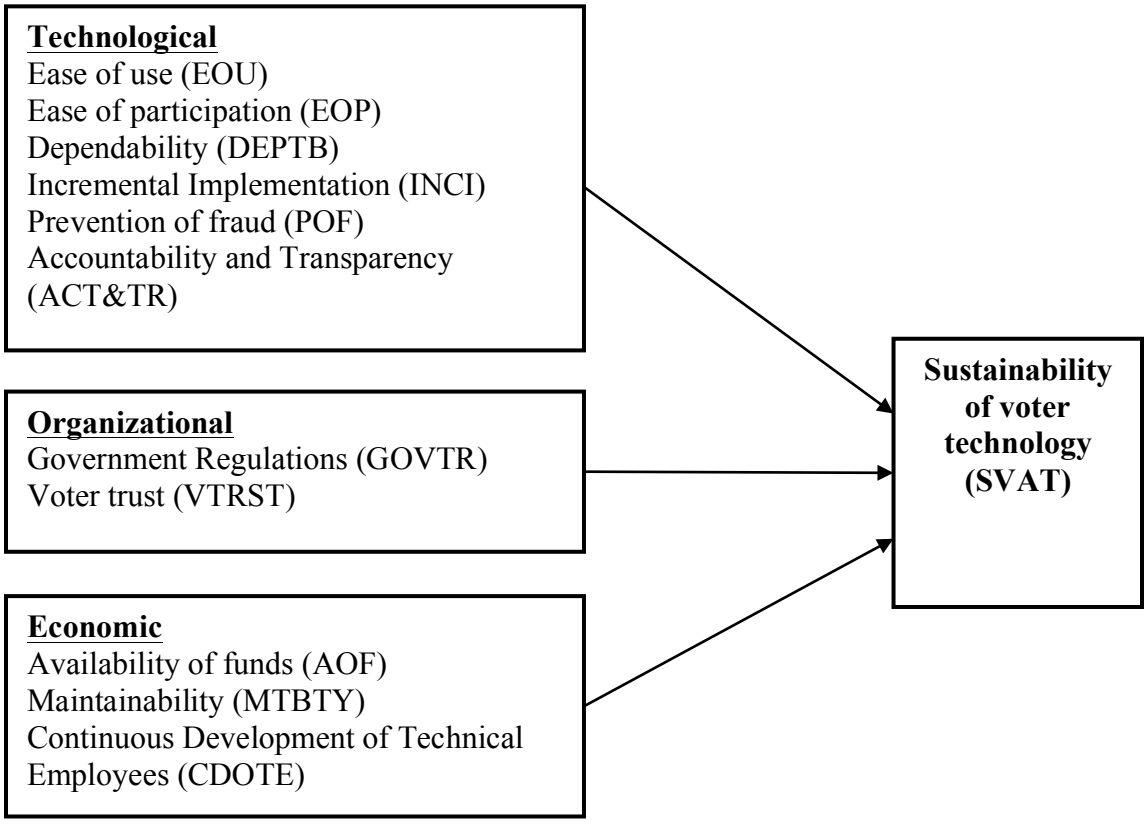

Figure 1: Research model for the sustainability of voter accreditation technology

Sustainability of voter accreditation technology. This is the dependent variable for the study. It aims to determine how voter accreditation technology can be maintained and improved for the success of future elections. Sustainability is one of the key determinants of how voter accreditation processes should be designed and maintained (Kimbi & Zlotnikova, 2014).

Ease of use. This is the property of an e-voting system that makes operators or voters able to use it with little or no assistance (Obiefuna-Oguejiofor, 2018). E-voting systems majorly benefit those with low computer literacy or those with little or technical expertise. If the devices are easy to use under minimal guidance, then more people may opt to be election officials in subsequent elections. They will carry out the accreditation process without difficulties, which usually arise from a lack of skill on the basic operation of devices as experienced in the 2015 general election (Olurode, 2017).

Ease of participation. This is a property, which enables voters and election administration to clearly understand and take part in the registration process (Shuaibu et al., 2017). A clear understanding of the process increases public trust in the procedure and the willingness to participate in elections. Difficult, misunderstood procedures may lead to resistance and faults in registration or voting (Iwuoha, 2018). It is, therefore, important to ensure that the technology is implemented in such a way that both voters and election administrators have an understanding of how registration and elections are operated. This will ensure that they participate in future election procedures without fear of experiencing difficulties during the process.

Dependability. This refers to the capacity of a voting system to function exactly as expected (Osho et al., 2015). The inability of some of the devices to capture voters' fingerprints in the 2015 general elections in Nigeria prompted INEC to allow the use of manual accreditation in areas where the SCRs had malfunctioned. This announcement was made in the middle of the election after some frustrated voters had gone home. The announcement may have eased accreditation in several areas, but also may have opened the door for electrical fraud (Alebiosu, 2016). Some of the eligible voters who could not vote due to failure of the SCRs were probably discouraged and lost trust in the election process. It is upon the election body to put in place mechanisms to ensure that the voting system is dependable and allows every eligible voter to cast their vote in future elections as desired.

Incremental implementation. This refers to the rolling out of a new system in phases. Sunday (2017) described incremental implementation by giving an example of the gradual replacement of manual voter register with smart card readers in Nigeria. It is reasonable to assume that adopting voting technology in faces provides the election body with time to properly plan for changes in the electoral scene through training of voters and potential staff, and through familiarization with the modules of the technology. Rolling out an extensive complex system at once may encounter resistance and poor implementation due to inadequate skill sets and awareness, and this may lead to failure of the technology.

Prevention of fraud. Electoral fraud includes practices such as voter impersonation, ballot snatching, and multiple voting. Election management bodies should

put in place mechanisms to overcome such election practices and other malpractices, which qualify to be electoral fraud (Ayinde & Idowu, 2016). The technology adopted by INEC greatly reduced cases of election malpractices such as multiple voting, impersonation, and ballot box snatching.

Accountability and transparency. Transparency is a key principle in credible elections, which brings about trust and public confidence in the electoral process (Agbu, 2016). Accountability refers to the ability to detect and hold individuals responsible for having taken part in a specific action or transaction (Adamu et al., 2016). Public confidence in the electoral process makes it easier for election management bodies to conduct election procedures without facing resistance from the electorates (Evrensel, 2010). As a result, transparency and accountability should be a key priority of election administration to ensure the success of future elections.

Government regulations. These are rules or laws by the government that present restrictions and prospects for the adoption of voting technologies (Wolf et al., 2017). Governments may put in place regulations that support the continuous adoption of election technologies or may place regulations that restrict the adoption of an entire technology or some functions of technology. It is also possible for governments to approve the adoption of technology and later change the regulatory scene to bar the technology from further use (Cheeseman et al., 2018). It is, therefore, reasonable to assume that government regulations affect the sustainability of VAT

Voter trust. Achievement of public trust has always been one of the core objectives for implementing an e-voting system, and this trust is enhanced when the

system proves its dependability (Osho et al., 2015). Also, a high level of trust in the overall administration of election by the election management body may influence the level of trust of the voting technology (Kimbi et al., 2014). It is, therefore, reasonable to assume that voter trust in the election body and the election technology itself influences the long-term sustainability of the technology.

Availability of funds. This refers to the financial ability of an electoral body to adopt, operate, and maintain a voting system (Wolf et al., 2017). When adopting new technology, a country must evaluate its readiness to sustain the technology by addressing financial costs, available resources, and the capacity of citizens to appreciate the new technology (Nwokeafor, 2017). After the first implementation, the electoral management body should be able to conduct subsequent elections with ease, and any maintenance and operation costs should not exceed their capability.

Maintainability. This is the property of a voting device, which enables adopters to effectively manage and maintain the device in a cost-effective way (Vlachokyriakos et al., 2014). If the election body adopts a technology that overruns its budget, then there is a possibility that the technology may not be sustained for future elections; rather, they will opt for cheaper options.

Continuous development of technical employees. Lack of skill, diligence, and attentiveness by ad hoc staff in the use of SCRs resulted in the failure of several polling units in Southeast Nigeria. Some failures were as a result of staff not adjusting the devices' date and time settings and not removing the cellophane seal on the fingerprint scanner, which sensed the fingerprints (Adeshina, 2016). Well-trained employees are

important not only for the successful conduct of an election but also for allowing the election management body to retain overall control of the e-voting solution and thus taking full ownership of the adopted technology (Omilusi, 2018). It is, therefore, reasonable to assume that the development of technical employees enables an election management body to retain, own, and improve its election technology overtime.

Literature Review

History of Using Technology to Support Voting Process

A democratic election is the right of every citizen to participate in genuine elections through universal and equal enfranchisement and the right to secret ballots (Yablon, 2017). Currently, most elections around the world are conducted using information communication technology to some degree. This technology may be used in voters' registration, summary, and aggregation of votes (Krimmer, 2012). The current adaptation of various voting technologies is the result of a long-term evolution in which not only the voting procedures changed but also the technological means for casting votes. Krimmer (2012) gave an analysis of stages in the development of voting procedures as follows:

Formalization of voting procedures. The majority of early voting procedures included public voting. The first ever-recorded voting procedures occurred in meetings held in face-to-face societies (Etzioni & Etzioni, 1999). Such meetings were set up to enable leaders to know whether or not their citizens would back their decisions. Votes were made either through raising the voice or clapping swords. Other procedures followed in the early days of voting included division following interests and raising

hands. If an election was for making difficult, controversial decisions, casting votes in secret was an accepted alternative method in ancient Athens, Rome, and Venice (Krimmer, 2012). Voting processes gradually became more formalized in the 19th century with secret voting by paper ballots introduced in several voting procedures (Teorell, Ziblatt, & Lehoucq, 2017). There were, however, several complaints of electoral fraud because of a lack of formal criteria for ballots until the introduction of the Australian ballot. This ballot provided voters with all choices on one ballot, representing each option and giving no preference to one option over another. It significantly contributed to the stabilization of the voting process in the United States (Malkopoulo, 2011). The Australian ballot has become the most commonly used voting method for secret vote casting around the world (Krimmer, 2012).

Mechanical voting machines. The United States presented an environment that was hospitable to inventors, who, in the long run, developed many election-related innovations and patented them in the late 19th century. Such inventions included serialized ballot papers, transparent ballot papers made out of glass, and machines that serialized ballot papers to prevent electoral fraud (Jones, 2010). Several machines had been developed since the inception of the first voting machines.

Electronic voting machines. All electronic voting inventions in the 19th century shared a similar fate; politicians found them interesting but did not consider them useful enough to implement. The first electronic voting technology, which counted paper ballots, was applied in the middle of the 20th century. A punch-card system for voting was introduced in 1965 whereby voters punched holes on cards (ballots) to indicate their

choices, and a computer tallied the cards at a centralized location after that (Jones & Simons, 2012). The first direct-recording electronic voting machine was invented in 1974 and used in a legally binding election (Jones & Simons, 2012). Voters would push a button next to a candidate when casting their votes. Other machines were introduced over the years and adopted by several countries. For instance, Belgium developed its version of a direct-recording electronic voting system that consisted of two components; a vote-casting computer that stored the votes on a magnetic card and a computer, which served as an electronic ballot box. Brazil began to use e-voting machines in 1998 and India in 1999 (Krimmer, 2012).

Remote and internet voting. The growing mobility pushed election administrators to offer possibilities of participation when voters were absent from their home constituency during elections. Some countries allowed voters to send their ballots via mail. Most postal voting adopted the double-envelope principle, which required voters to seal their votes in an anonymous envelope and place the envelope into a second envelope, which evidenced the voters' eligibility (Braun, 2006). Christa Slaton and Ted Becker conducted televote projects in 1978, wherein hundreds of participants were involved in voting despite only using the telephone (Becker et al., 2000). Four years after the televote projects, the idea of blind signatures was introduced, which allowed officials to validate the identity and authenticity of voters and still maintain the secrecy of a vote. This invention enabled the implementation of an integrated election to include eligibility checks, vote casting, and counting, thus introducing the most complex form of electronic voting (e-voting) - internet voting (Krimmer, 2012). The first country to cast their vote

online was Estonia, which utilized this method in her 2005 municipal elections (Madise & Martens 2006).

Nigeria first used biometric registration during the 2007 general elections. Voters were issued with temporary voter cards for use at the elections, but no electronic verification was done during voter accreditation (Ayeni & Esan, 2018). Major controversies faced the election, and some observers and scholars described it as the worst election in the history of general elections in the country (Olurode, 2017). Efforts to improve the standards of general elections included conducting new biometric registration of voters, which was used in the 2011 general election. INEC discovered that the voter register had been oversubscribed with nonexistent and fictitious citizens, and several temporary voter cards were fake or cloned (Momoh, 2016). The use of an Automated Fingerprint Identification System by INEC exposed about 870,000 duplications in the register (Nwangwu, 2015). Temporary voter cards were still used in the 2011 election. The discovery of the duplications in the register convinced the INEC, under the new leadership, of the need for using PVCs in general elections. The loopholes of the temporary voter cards in previous elections, along with faulty voter register, the collusion of electoral officials (both permanent and ad hoc), and security personnel had undermined previous elections (Ayeni & Esan, 2018). This led to the introduction of PVCs, used for the first time in the 2015 general elections. The PVCs were to be verified by a smart card reader (SCR) and authenticated through checking of fingerprints and biometric data (Momoh, 2016). The combination of the permanent voter cards and smart card reader make up the voter accreditation technology. The voter accreditation

technology brought in more transparency and traceability of actions to help INEC reduce the issues of electoral fraud (Ayodele, 2016; Bayode, 2017).

Definition of Voter Accreditation Technology

Voter accreditation technology refers to a range of innovative anti-rigging biometric devices used in identifying, verification, and authentication of voter identity and information. An example is the smart card reader used in the 2015 Nigerian elections for verifying of permanent voters' cards and authentication of voters' biometrics (Nwangwu, 2015).

Characteristics of the Voter Accreditation Technology

The voter accreditation technology used in the 2015 general election was characterized by the use of smart card readers and permanent voter cards (Nwangwu, 2015). According to Alebiosu (2016), the motivations for the deployment of the technology in the 2015 general elections by the INEC included

- accurate and reliable authentication and verification of voters,
- reduction of electoral fraud,
- protection of the integrity and credibility of the election,
- transparency and accountability,
- support for litigation processes, and
- audit of results from polling units countrywide.

Permanent voter cards have several components and specialized features; some of these features include a base substrate, chip embedding, security printing, and personalization. The embedded chip in a permanent voter card contains all biometric

information of a legitimate cardholder, which includes facial image and fingerprints (Agbu, 2016). Smart card readers, on the other hand, are used for verifying and authenticating permanent voter cards and the voters (Ayinde & Idowu, 2016).

INEC issued permanent voter cards ahead of the 2015 general election. The commission revealed that the production of these cards was motivated by factors including security, quality, cost-effectiveness, and durability. The voter information on the cards was stored in the biometric voter register. Voter information stored on the chip of the permanent voter card, during elections, would be read by a highly secure smart card reader at a polling unit to identify and authenticate the voter fingerprint before the individual would be allowed to cast a vote. Only voters in possession of the permanent voter cards were allowed to vote in the 2015 general elections (Sunday, 2017). According to Alebiosu (2016), voter accreditation technology was at the core of the electoral success of the 2015 general elections. He outlined the following benefits from the use of voter accreditation technology:

- Ballot box snatching, over-voting, and rigging was significantly reduced.
- The SCR was effective in identifying cloned PVCs.
- General improvement in the voter accreditation process.
- The technology greatly improved credibility and integrity and rekindled trust in the electoral process.
- It supported backup of information, which would be of assistance if legal issues arose.

Challenges in the Adoption of Voter Accreditation Technology

The key to a successful election is a sound voter accreditation process (Wolf et al., 2017). The voter accreditation tends to be the costliest part of conducting elections, and therefore, there is a crucial need to consider possibilities of less costly voter accreditation processes (Gelb & Diofasi, 2019). More focus has been placed on the use of technology, precisely, biometrics in voter accreditation. This technology is accompanied by its challenges, such as false rejection during the authentication of voter biometrics and equipment malfunction. Biometrics in itself increment certainty in voter accreditation process if the electoral body is considered unbiased and competent by the voters (Debrah et al., 2019)

There is no best way to conduct free, fair, and credible elections without the inclusion of voter accreditation technology. A single solution may be effective across nations. Therefore, voter accreditation system designs need to be contextualized within a nation considering factors such as resource limitations, political, social, and economic factors (Cheeseman et al., 2018).

Organizational challenges. Lack of necessary legal and regulatory framework may hurt the implementation of operations of voter accreditation technology. Changing sections of the law to accommodate this technology requires amendments, which is a tedious process (Kimbi et al., 2014). Lack of trust in the election management body may lead to questioning of the integrity of the accreditation process (Osho et al., 2015).

Shortage of experienced and skilled staff in the implementation and management of the technology. It is a concern that if skills are in short supply, then the

use of election technology may be unsustainable. In a study conducted by Kimbi et al. (2014) in Tanzania, 79% of respondents were concerned that skills would not be available in adequate supply and at a reasonable cost in the labor market.

Lack of an independent system testing and certification procedure. Any electronic voting application should undergo a rigorous evaluation process conducted by an independent body before it is used in elections (Wenl & Bucklandl, 2015). Without this, voter confidence may reduce, especially if problems arise during the use of the technology at the time of elections. Agbu (2016) pointed out that when a test-run of the PVCs and SCRs was conducted before Nigeria's 2015 general election, significant failures were recorded in Nassarawa, Rivers, and Ebonyi states. Yet, these failures were also experienced during the general elections. This indicates that the INEC probably did not take adequate measures to avoid the failures observed in the pilot run from occurring again.

Rural challenges. The use of high-level technology in the voter accreditation process has brought about the challenge of transporting fragile electronic equipment across hazardous, undependable terrains. This may, at times, lead to loss of information and damage of equipment (Iwuoha, 2018; Kimbi, 2014). A study by Iwuoha (2018) revealed that voters in Nigeria's remotest communities generally face social deficits such as the absence of proper infrastructure and long distances between polling stations and their dwellings. The lack of adequate power supply and internet services affected the functioning of the voter accreditation technology and related ICT components during the 2015 general election. Also, a majority of these rural voters were not exposed to voter

education, which was mainly promoted through digital media channels; hence they lacked vital voting information. This resulted in little adaption to the new voting methods by the rural electorate. The study findings indicated that rural voters' trust in INEC was quite low and if not addressed, would have consequences in subsequent elections such as extremely low voter turnout in elections and refusal to participate in any political activity.

Rigging. A semi-electronic voting system was used in the 2015 general election. Despite the use of the accreditation technology, there were still riggings in the election, which included underage voters with PVCs in Northern Nigeria, over-counting, cancellations, and hijacked ballot papers experienced in areas such as Cross River and Akwa Ibom states (Agbu, 2016).

Legal concerns. There was a question in the legality of the use of one of the components of the voter accreditation technology, which is the smart card reader in the 2015 general elections. This was specially brought up by the critics of the card reader (Obiefuna-Oguejiofor, 2018). The Nigerian Constitution does not specifically mention internet or electronic voting, rather section 77 of the 1999 Constitution of the Federal Republic of Nigeria states, "every citizen of Nigeria, who has attained the age of eighteen years residing in Nigeria at the time of the registration of voters for purposes of election to a legislative house, shall be entitled to be registered as a voter for that election." (Obiefuna-Oguejiofor, 2018). There is a gap in Nigerian legislation concerning e-voting, and it should be filled to run a credible election. Obiefuna-Oguejiofor (2018) argued that judges should not be left to create laws in the vital matter of elections. He supported this statement by stating that personal beliefs, sentiments, and political preferences of judges

may blind their judgment if the lacuna created by the non-enactment of the e-voting legislation is left unattended by judge-made pronouncements. Especially those that do not undergo rigorous stages, public debates, and scrutiny like other laws before enactment.

Benefits Realized From the Adoption of Voter Accreditation Technology

The introduction of voting technology has greatly improved the electoral process, not just in Nigeria but also in other parts of Africa. Detection and reduction of electoral frauds have become easier with the introduction of electoral technologies (Olurode, 2017). The 2015 elections recorded 10 million voters less than in the 2011 elections. This raised the question of where all the votes came from in the 2011 elections. Furthermore, the presidential election was won by a margin of only 2.5 million voters, which was the smallest margin in presidential elections since the Fourth Republic (Agbu, 2016). Olurode (2017) appreciated the adoption of the new accreditation technology. Ghost names were eliminated from the voter roll. He acknowledged that this technology might not be only useful in the election process but also national planning and verification of existing national data.

The voter accreditation technology drastically reduced ballot box snatching, multiple voting, rigging, and impersonation because cloned cards were identified by the card readers (Agbu, 2016). The technology kept a trail of transactions that was carried out through it, which would be of assistance in electoral adjudication in the event of any legal suits.

Public confidence is critical in an election process. Citizens have the right to know whether or not an election process is valid and transparent. Alebiosu (2016)

observed that the use of voter accreditation technology increased and reinforced public confidence and trust in the electoral process. He further mentioned that election litigation was minimized in the 2015 elections. Most candidates who lost in the 2015 general election did not challenge the results.

The level of violence recorded during the 2015 presidential election was minimal as a result of increased trust in the process, and this showed that the political behavior of the Nigerian electorate was more concerned with consolidating a sustainable democracy (Aminu, 2016).

Need for Sustainability of Voter Accreditation Technology

Public trust in democracy is enhanced when the voter accreditation process is transparent and open to participation by all electoral stakeholders who include civil society organizations, political parties, potential voters, security forces, the media, and the international community (Wolf et al., 2017). Several technological innovations in developing countries were confronted with implementation, sustenance, and maintenance challenges due to the lack of critical evaluation of the economic and social environments where the innovations were adopted. When adopting new technology, a country must evaluate its readiness to sustain the technology by addressing financial costs, available resources, and the capacity of citizens to appreciate the new technology (Ndolo, 2017).

Lack of practicing due diligence to assess the practicability of a new technology may fail the technology. Obiefuna-Oguejiofor (2018) observed that 41% of one of the components of the voter accreditation technology, which is the smart card reader, had failed, and therefore, the INEC had to resort to manual verification and accreditation of

voters. He further stressed the need to address various challenges experienced with the accreditation technology to provide room for full e-voting system adoption in Nigeria.

Great reduction in electoral fraud, litigations arising from results, improved transparency, integrity, and credibility of elections were some of the benefits realized during the 2015 general election in Nigeria. This was attributed to the use of the accreditation technology, which was adopted by the INEC in that particular election (Alebiosu, 2016). Despite the failure of card readers in some sections of the country, the election as a whole was viewed as more credible compared to the previous elections (Agbu, 2016).

There is no doubt that the voter accreditation technology played a significant role in the 2015 general elections in Nigeria. There is a need to ensure that the issues and challenges that arose through the use of technology during the elections do not repeat in future elections (Alebiosu, 2016). INEC should put in place mechanisms for the deployment of the technology in future elections to strengthen the democratic process and increase public confidence in the electoral process. INEC should consult widely and carry out effective campaigns about the technology and any other election technology to be deployed in future elections (Alebiosu, 2016).

Summary and Transition

This chapter covered major areas surrounding the adoption of election technology, including voter accreditation technology. The history of voter accreditation was disscussed, including the inception of the formalization of voting procedures. The e-voting system adoption model, which this study utilized, is a hybrid model consisting of

three popular theories in information technology adoption; DOI theory, TOE framework, and electronic data interchange adoption model.

The voter accreditation technology used in Nigeria's 2015 general elections received much attention since its adoption and has attracted inquiries from various scholars and researchers. One popular opinion is that the use of the accreditation technology in the election contributed to a reduction in election malpractices as compared to previous elections in the country. The use of the voter accreditation system was confronted with a couple of challenges. These include the breakdown of one of the components of the voter accreditation technology (the smart card reader) and the unskilled operations of the devices.

Many studies have addressed the benefits and challenges regarding the use of voter accreditation technologies. Despite this, not many studies have focused on proposing ways of ensuring the sustainability of these technologies to ensure its continuous use for transforming the electoral process in the country. This study addressed this gap by proposing a model for ensuring the sustainability of the voter accreditation technology based on Nigeria's experience in the 2015 general elections. The next chapter detailed the research method used for this study. It addressed sub-sections such as sampling, data collection, data analysis plans, and the ethical procedures followed during the study.

Chapter 3: Research Method

The purpose of this quantitative correlational study was to examine the relationship between technological, organizational, economic factors, and the sustainability of voter accreditation technology. The independent variables were ease of use (EOU), ease of participation (EOP), dependability (DEPTB), incremental implementation (INCI), prevention of fraud (POF), accountability and transparency (ACT&TR), government regulations (GOVTR), voter trust (VTRST), availability of funds (AOF), maintainability (MTBTY), and continuous development of technical employees (CDOTE). The dependent variable was the sustainability of voter accreditation technology (SVAT), defined as the avoidance of the depletion of the technology. The adoption of voter accreditation technology by the INEC in the 2015 Nigerian general elections reduced election malpractices such as stuffing of the ballot box with ballot papers, some citizens voting more than once, absconding with some of the ballot boxes. This chapter describes the overall research design that was employed in the study. Study participants, sampling method, data collection techniques, data collection instruments, and ethical considerations are all explained in this chapter.

Research Design and Rationale

Several research methods have been used over the years in information systems research. These methods can be categorized broadly into two main categories: qualitative and quantitative methods, which can be combined in mixed-method (Noyes et al., 2019). Determining the correlation between one or more independent variables and the dependent variable in a sample is one of the objectives of quantitative research (Spalding

University Library, 2020). In quantitative research, the researcher aims to determine the relationship between an independent variable and a dependent or outcome variable in a population.

Quantitative research designs are either descriptive or experimental (Burkholder et al., 2016). A descriptive study establishes only associations between variables. An experiment establishes causality. For an accurate estimate of the relationship between variables, a descriptive study usually needs a sample of hundreds or even thousands of subjects. In contrast, an experiment, especially a crossover, may need only tens of subjects (Burkholder et al., 2016). Everything about quantitative research is quantifying relationships between variables. Quantitative approaches may be generally recognized as positivism or realism. On the other hand, subjectivism supports qualitative research (Aliyu et al., 2014). According to positivists, any research should be done to expose or support an existing reality, and the researcher should separate himself from the research itself, using methods that ensure the highest form of objectivity to minimize interference from the researcher (Antwi & Hamza, 2015). Positivists test theories to accept or reject them based on certain evidence.

This study employed a positivist approach involving the application of quantitative correlational research design in the collection and analysis of data. The quantitative correlational design was used to determine the relationship between the independent variables and the dependent variable of the study.

Methodology

A quantitative method is considered the best method when the researcher aims to identify factors that help understand and best predict an outcome or impact an outcome (Burkholder et al., 2016). The purpose of the study was to examine the relationship between technological, organizational, economic factors, and the sustainability of voter accreditation technology. As such, a quantitative method was the preferred choice. A quantitative method is better deployed when a researcher is determining the relationship between two or more independent variables and the dependent variable than a qualitative method (Rubin & Babbie, 2016). The outcomes of quantitative research can be generalized, but qualitative research outcomes cannot be generalized (Brett, 2018). In this study, I statistically analyzed numerical data from coded survey responses, which thereby justified the use of a quantitative method over a qualitative method. The quantitative study design appropriate for the research is a correlational research design because understanding the nature of the relationship between the independent variables and the dependent variable for the study is of importance (Burkholder et al., 2016).

Research Question and Hypothesis

Research question. The main research question for the study was What is the relationship of technological, environmental, and economic factors on the sustainability of voter accreditation technology amongst information technology professionals in Nigeria?

The following specific research questions were used to examine the relationship between each of the independent variables and the dependent variable:

1. What is the relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals?
2. What is the relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals?
3. What is the relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals?
4. What is the relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals?
5. What is the relationship between the prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals?
6. What is the relationship between accountability and transparency and sustainability of voter accreditation technology amongst information technology professionals?
7. What is the relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals?
8. What is the relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals?
9. What is the relationship between the availability of funds and sustainability of voter accreditation technology amongst information technology professionals?
10. What is the relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals?

11. What is the relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals?

Hypotheses. The following null and alternative hypotheses were constructed based on each specific research question for the study:

H_o 1: There is no statistically significant relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals.

H_a 1: There is a statistically significant relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals.

H_o 2: There is no statistically significant relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals.

H_a 2: There is a statistically significant relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals.

H_o 3: There is no statistically significant relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals.

H_a 3: There is a statistically significant relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals.

H_o 4: There is no statistically significant relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals.

H_a 4: There is a statistically significant relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals.

H_o 5: There is no statistically significant relationship between prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals.

H_a 5: There is a statistically significant relationship significant between prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals.

H_o 6: There is no statistically significant relationship between accountability and transparency and sustainability of voter accreditation technology amongst information technology professionals.

H_a 6: There is a statistically significant relationship between accountability and transparency and sustainability of voter accreditation technology amongst information technology professionals.

H_o 7: There is no statistically significant relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals.

H_a 7: There is a statistically significant relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals.

H_o 8: There is no statistically significant relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals.

H_a 8: There is a statistically significant relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals.

H_o 9: There is no statistically significant relationship between the availability of funds and the sustainability of voter accreditation technology amongst information technology professionals.

H_a 9: There is a statistically significant relationship between the availability of funds and the sustainability of voter accreditation technology amongst information technology professionals.

H_o 10: There is no statistically significant relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals.

H_a 10: There is a statistically significant relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals.

H_o 11: There is no statistically significant relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals.

H_a 11: There is a statistically significant relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals.

To test the hypotheses for the study, I used statistical models constructed for conventional patent technology analyses. This consists of various independent variables and one dependent variable (Sunghae et al., 2018). The variable I predicted in the study is the sustainability of voter accreditation technology (SVAT), which is the dependent variable. The variables I used to predict the value of the dependent variable were ease of use (EOU), ease of participation (EOP), dependability (DEPTB), incremental implementation (INCI), prevention of fraud (POF), accountability and transparency (ACT&TR), government regulations (GOVTR), voter trust (VTRST), availability of funds (AOF), maintainability (MTBTY), and continuous development of technical employees (CDOTE), which are the independent variables for the study. Multiple regression analysis was used to test the hypotheses. Multiple regression analysis is put to use when a researcher wants to predict the value of a dependent variable based on the value of two or more other independent variables (Sunghae et al., 2018). I used the

multiple regression to understand whether the SVAT can be predicted based on all the independent variables for the study.

Study Population

The population for the study was a group of 5140 information technology professionals in Nigeria who had designed, implemented, and deployed information technology systems and contributed to decisions in the adoption of new technologies and innovations in their places of work. These information technology professionals are members of the computer professional registration council of Nigeria. The computer professional registration council of Nigeria is a government establishment charged with the supervision and control of the computing profession in Nigeria. These information technology professionals work in different positions such as chief technical officer, data center engineer, chief information officer, and information technology director, and network engineer at private and government organizations in Nigeria.

Sampling and Sampling Procedures

Sampling is the process by which observations are identified and selected from a larger population. A larger sample size will yield accurate study results, but it is expensive and time-consuming (Frankfort-Nachmais & Leon-Guerrero, 2018). A sample is defined as a subset of a population; it defines the member of participants that are included within a population. The probability that a study survey will be statically accurate depends on the correct sample size (Uttley, 2019). The methodology used for sampling from a larger population is dependent on the statistics test analysis that will be performed on the data (Uttley, 2019).

A statistical power analysis was conducted to determine the appropriate sample size for the study using G*Power 3.1 software. A priori power analysis, which determines the sample size required based on the effect size before data collection begins, was used (Hager, 2006). A medium effect size (f^2 = .3), and α = .05, indicated that a minimum sample size of 95 participants is required to achieve a power of .95 (see Figure 2). I chose a power of 0.95 as it is generally accepted that power should be .80 or higher. This means an 80% or greater chance of finding a statistically significant difference when one exists (Uttley, 2019). A sample was randomly selected from the population of the information technology professionals (the sampling frame). The simple random sampling method, which is the most basic probability sampling design, was used to select the sample. Simple random sample guarantees that each member of the population can be chosen since they all have an equal chance of being selected (Frankfort-Nachmais & Leon-Guerrero, 2018).

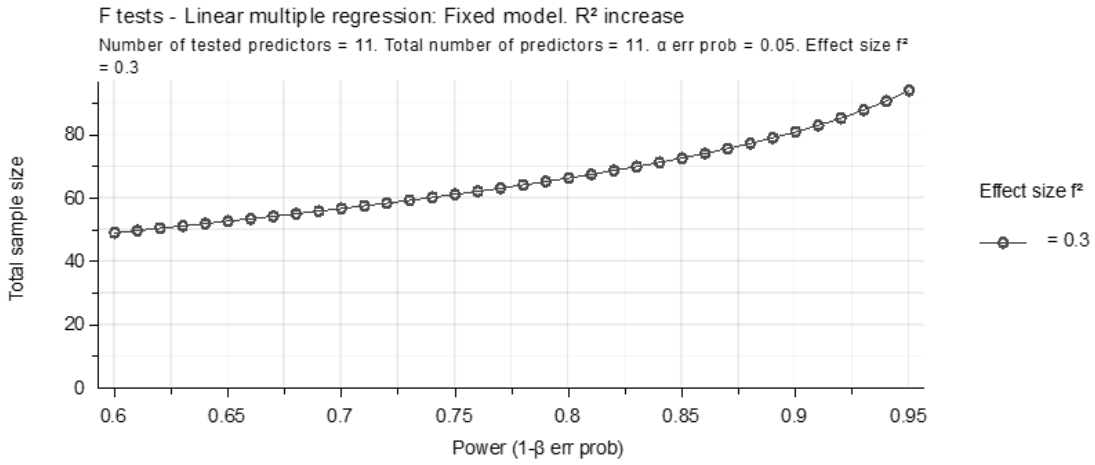

Figure 2. Power analysis in the determination of sample size.

Recruitment and Participants

Invitations were sent to prospective participants from a group of IT professionals who had played a role in influencing information technology adoption decisions in different sectors in the country.

Data Collection Procedure

Survey research has evolved over the years. The rapid development of technology, including inexpensive computing, has created new opportunities for administering surveys (Hays et al., 2015). The use of online surveys, for instance, has increased because of the affordability of the technique when it comes to obtaining input from both close and distant participants (Dillman et al., 2014). According to McPeake et al. (2014), the advantages of online surveys include convenience, ease of use, simplicity, cost-effectiveness, manageability, and speed. A major issue with this technique is the possibility that mail filters in some e-mail programs may flag survey links or blacklist sources of survey requests (Regmi et al., 2016). This study used online surveys in the collection of data from the study participants. The survey questionnaire was hosted on SurveyMonkey and was accessed through a Uniform Resource Locator (URL) link contained in the invitation emailed to the study participants. Contacts were provided to the participants in case they had questions or concerns regarding the study that needs to be addressed.

Instrument Design

A survey questionnaire was designed and created using SurveyMonkey Software as a service (SaaS) platform (see Appendix). Links to the online survey were contained in

the invitation emailed to the study participants. The questionnaire did not collect any identifying information that may be used to trace responders since the study was anonymous. Although, demographics such as age, gender, educational level, industry, and years of experience practicing IT were captured in the survey questionnaire. Research questions in the questionnaire elicited feedback from the participants regarding their views on hypothesized factors that ensure the sustainability of voter accreditation technology including the ease of use, ease of participation, dependability, incremental implementation, prevention of fraud, accountability, and transparency, government regulations, voter trust, availability of funds, maintainability, and continuous development of technical employees.

Types of Variables and Measurement

The variables of interest in this study were demographic, dependent, and independent variables. Independent variables in this study include ease of use (EOU), ease of participation (EOP), dependability (DEPTB), incremental implementation (INCI), prevention of fraud (POF), accountability and transparency (ACT&TR), government regulations (GOVTR), voter trust (VTRST), availability of funds (AOF), maintainability (MTBTY), and continuous development of technical employees (CDOTE). The dependent variable is the sustainability of voter accreditation technology (SVAT). Demographic variables such as age, gender, educational level, industry, and years of experience practicing IT were collected.

Data Analysis Plan

The responses of participants for the online SurveyMonkey questionnaire of main study was downloaded and imported into the Statistical Package for Social Scientists (SPSS) software, Version 24. Variable fields were created, and a codebook generated for the annotations of the variables. A frequency distribution was conducted on the data to check for omissions, double-entry and other errors. Analysis of the data was based on the research questions, measurement scale of data collected, and the research hypothesis. Descriptive and bivariate statistics were done using SPSS.

There were ten questions on the demographics of the respondents. The Likert scale ranged from 1-strongly disagree to 5-strongly disagree and was used to measure each of the 12 questions on the dependent and independent variables. Table 1 shows the coding schema used for each of the independent variables and dependent variables in the design of the survey instrument for ease of analysis and discussions. Table 2 shows the variables of interest and their operationalization:

Table 1

Survey Instrument Constructs and Coding Schemes

Code	Items Measured
EOU	The ease of use of voter accreditation technology will ensure its sustainability
EOP	The ease of participation when using voter accreditation technology will ensure its sustainability
DEPTB	The dependability of the voter accreditation technology will ensure its sustainability
INCI	The presence of incremental implementation in the voter accreditation technology increases its sustainability
POF	The ability of the voter accreditation technology to prevent fraud will ensure its sustainability
ACT&TR	Accountability and transparency of the voter accreditation technology will ensure its sustainability
GOVTR	Government regulations will ensure the sustainability of voter accreditation technology
VTRST	Voter trust of voter accreditation technology will ensure its Sustainability
AOF	Availability of funds will ensure the sustainability of voter accreditation technology
MTBTY	Maintainability of voter accreditation technology will ensure its sustainability
CDOTE	Continuous development of technical employees to manage the voter accreditation technology will ensure its sustainability
SVAT	The sustainability of voter accreditation technology is very important to the success of future elections in Nigeria

Table 2

Variables and Operationalization

Variables	How variable was measured	Measurement scale
Demographic variables		
Age	Number in years	Interval/Ratio
Gender	Male or Female	Nominal
Industry	Private or Government	Nominal
Highest educational level	Basic degree, Masters, PhD	Nominal
Number of years' practicing in IT	Number in years	Interval/Ratio
Independent variables		
Ease of use (EOU)	Ordinal scale of 1 to 5	Ordinal
Ease of participation (EOP)	Ordinal scale of 1 to 5	Ordinal
Dependability (DEPTB)	Ordinal scale of 1 to 5	Ordinal
Incremental implementation (INCI)	Ordinal scale of 1 to 5	Ordinal
Prevention of fraud (POF)	Ordinal scale of 1 to 5	Ordinal
Accountability and transparency (ACT&TR)	Ordinal scale of 1 to 5	Ordinal
Government regulations (GOVTR)	Ordinal scale of 1 to 5	Ordinal
Voter trust (VTRST)	Ordinal scale of 1 to 5	Ordinal
Maintainability (MTBTY)	Ordinal scale of 1 to 5	Ordinal
Availability of funds (AOF)	Ordinal scale of 1 to 5	Ordinal
Continuous development of technical employees (CDOTE)	Ordinal scale of 1 to 5	Ordinal
Dependent variable		
Sustainability of voter accreditation technology (SVAT)	Ordinal scale of 1 to 5	Interval

Demographic data, dependent, and independent variables were summarized using tables. Bivariate analysis of the relationships between the dependent and independent variables was done using Pearson's Correlation analysis. Pearson correlation coefficient (*r*) was used to examine if a correlation exists between independent variables and the dependent variable, and the strength of the correlation between the variables (Hedges & Olkin, 2014). Usually, *r* ranges between -1 to 1. For instance, during data analysis, if *r* is found to be 0 then there is no correlation between the variables whereas if r is found to be greater than 0 then it would indicate a positive correlation between the variables; that is, an increase in the value of one variable would increase the value of the second. A negative value would mean that an increase in the value of one variable results in the decrease of the value of the second variable (Ly et al., 2018).

Multiple regression was used to understand whether the sustainability of voter accreditation technology can be predicted based on the independent variables for the study. The dependent and the independent variables were modeled using the multiple linear regression equation below:

$$Y_i = \beta_0 + \beta_1 X1_i + \beta_2 X2_i \ldots\ldots + \beta_3 Xn_i + \varepsilon_i$$

where Y_i is the predicted or expected value of the dependent variable

$X1_i$ through Xn_i are *n* distinct independent or predictor variables

β_0 is the value of Y_i when all of the independent variables ($X1_i$ through Xn_i) are equal to zero, and β_1 through β_n are the estimated regression coefficients while ε_i is the error. Therefore, substituting the independent and dependent variables in this study into the equation above gave the multiple regression model for this study as:

$$SVAT = \beta_0 + \beta_1 EOU + \beta_2 EOP + \beta_3 DEPTB + \beta_4 INCI + \beta_5 POF + \beta_6 ACT\&TR + \beta_7 GOVTR + \beta_8 VTRST + \beta_9 AOF + \beta_{10} MTBTY + \beta_{11} CDOTE + \varepsilon_i$$

Each regression coefficient (β) represents the change in SVAT relative to a one-unit change in the respective independent variable. In the multiple regression model, β_1, for example, is the change in SVAT relative to a one-unit change in EOU, holding all other independent variables constant (i.e., when the remaining independent variables are held at the same value or are fixed).

Assumptions of Multiple Linear Regressions

Analyzing data using multiple regressions entails ensuring that the data to be analyzed can be done using multiple regression. The data has to fulfill some assumptions, which are required for multiple regression if a valid result is required. Williams, Grajales and Kurkiewicz (2013) posited that multiple regression requires more than one independent variable and revealed that it is suitable to use multiple regression when the data to be analyzed is in tandem with some key assumptions such as the linear relationship between the dependent variable and independent variables, multivariate normality, no multicollinary, and homoscedacity. Since multiple regression was among the statistical tools used to analyze my research data, checking to ensure that the data can be analyzed using multiple regression is paramount. I ensured that my data met the key assumptions revealed by Williams et al. (2013) that are required for multiple regressions to ensure a valid result. There was no sign of multicollinearity problem. This was because each value of variance inflation factors calculated for independent constructs was below 10 (Thompson, Kim, Aloe, & Becker, 2017).

Threats to Validity

External Validity

The goal of external validity is to ensure the generalizability of study results beyond the context of the study setting (Brown, 2015). The generalizability of results would be undermined if the majority of responders provide bias opinions or are coerced to provide responses, which do not reflect their independent point of view (Cooper, 2015). This would imply that the study findings would not be a reflection of the true opinion of the general public. Selection of the sample may also affect the external validity of a study; if the study participants are selected with bias and do not possess the required knowledge and expertise, then the results of the study may not be generalizable to other contexts and would probably be unreliable even to other researchers (Edmonds & Kennedy, 2016). To ensure external validity, I randomly selected the study sample. More so, administration of online surveys prevented my interference, and therefore, responders had the freedom to give their independent views in the most objective way possible. Also, the online platform encouraged anonymity during the study, and therefore participants did not have to deal with the fear of intimidation.

Internal Validity

Internal validity strives to ensure that there is a consistent relationship between the dependent and independent variables (Lukyanenko et al., 2015). Threats to internal validity may include regression validity issues, selection issues, construct adequacy, and statistical conclusions (LoBiondo-Wood & Haber, 2014). Possible internal validity threats to this study include regression validity issues and selection validity. Regression

validity may emerge from extreme study participant scores (Joshi, Kale, Chandel, & Pal, 2015). Iterative statistical functions and descriptive statistics described in the data analysis plan section were conducted on the collected data to evaluate if there was any regression validity issue. Selection validity issues, on the other hand, can emanate from participant bias or predisposition; a formed attitude, dishonest or influenced responses can be a result of this issue, and this can affect the results of the study (Schutt, 2018). Therefore, to help eliminate selection validity issues, the study sample was selected using a probability-based sampling technique.

Construct Validity

The validity of constructs was determined by the competence of the definitions of the study variables and measures (Heale & Twycross, 2015). Clear explanations were given to study variables, and participants were well informed on the study's purpose to ensure that the right data is captured as a measure of the study variables. The following are possible threats to construct validity, which could have been encountered in this study:

Hypothesis guessing. When participating in research, most respondents try to figure out what the study is all about, and they are likely to respond based on their guess about the purpose of the study (Brace, 2018). To avoid hypothesis guessing from the respondents, the participants were well informed about the purpose of the study and their role as responders.

Participant apprehension. Some people get anxious when being evaluated, especially under closed or tensed environments. This may deter them from giving honest,

unbiased opinions. The online survey was, however, more liberal, and due to the anonymous nature in which the interview was conducted, threats due to participant apprehension was significantly reduced (McPeake et al., 2014).

Ethical Procedures

To ensure that participants in the study were adequately protected, the study proposal was submitted to Walden University's Institutional Review Board (IRB) for review and approval. As a requirement for carrying out online surveys, participants were provided with full details of the study's scope, purpose, participation, confidentiality, consent and disclosure requirements, and opt-out procedures (Hewson, 2016). The first thing the participants saw when they clicked on the survey link contained in the invitation mailed to them was an implied consent form that they read before taking part in the survey. The implied consent form also contained contact information, and how participants can seek clarification in case of any questions, privacy, and ethical concerns. Participants exited the survey after completion by merely closing the web browser page. Participants had the option of skipping any question if they consider it too personal.

Data collected for this study did not contain any identifiers that could be used to trace the respondents since the study was anonymous. The survey questionnaires had unique identifiers for the management of responses. Data was archived in comma-separated values (CSV) and Microsoft Excel (XLS) formats and securely stored in an encrypted file in a password-protected computer system. Data will be deleted after five years.

Summary and Transition

This chapter covered the research design and methodology utilized for this study. A quantitative correlational design was used in the study, and the data collection technique used was an online-based survey questionnaire developed using the SurveyMonkey platform. The sample size calculation and the sampling procedure used were outlined. Online surveying was selected for this study as a data collection technique due to its benefits such as the capability of reaching distant participants, simplicity, manageability, and cost-effectiveness.

A detailed data analysis plan was described highlighting the different tests and analyses that were conducted on collected and screened data. Descriptive statistics, Pearson correlation, and multiple regression were part of the procedures utilized in the testing of the hypotheses and answering research questions. Also, threats to construct, internal, and external validity were addressed in this chapter. Ethical procedures before data collection relating to participants and data were outlined. The next chapter described the findings from the study.

Chapter 4: Results

The purpose of this quantitative correlational study was to examine the relationships between technological, organizational, economic factors, and the sustainability of voter accreditation technology. The independent variables were ease of use (EOU), ease of participation (EOP), dependability (DEPTB), incremental implementation (INCI), prevention of fraud (POF), accountability and transparency (ACT&TR), government regulations (GOVTR), voter trust (VTRST), availability of funds (AOF), maintainability (MTBTY), and continuous development of technical employees (CDOTE). The dependent variable is the sustainability of voter accreditation technology (SVAT).

The main research question for the study was What is the relationship of technological, environmental, and economic factors on the sustainability of voter accreditation technology amongst information technology professionals in Nigeria? The research hypotheses for the study were formulated based on the research questions. This chapter presents data regarding these questions and other findings. The chapter also explains the procedures for data collection, the different statistical analyses used for addressing the research hypothesis, and a summary of the findings.

Demographic data, dependent, and independent variables were summarized using tables. Bivariate analysis of the relationships between the dependent and independent variables was done using Pearson's Correlation analysis. Pearson correlation coefficient (r) was used to examine if a correlation exists between the independent variables and the dependent variable, and the strength of the correlation between the variables. Multiple

regression was used to understand whether the sustainability of voter accreditation technology (SVAT) could be predicted based on the independent variables in the study. The level of significance was taken as 0.05 for these analyses.

Pilot Study

A questionnaire is one of the most widely used tools to collect data, especially in social science research. Obtaining valid and reliable information is the main objective of a research questionnaire. After the literature review on the sustainability of voter accreditation technology, key constructs were identified, and a draft sample questionnaire was developed. This was named the Sustainability of Voter Accreditation Technology Survey.

The accuracy and consistency of the survey/questionnaire formed a significant aspect of the research methodology. This is known as validity and reliability. Validity explains how well the collected data covers the actual area of an investigation. At the same time, reliability concerns the extent to which a measurement of a phenomenon provides stable and consistent results (Bolarinwa, 2015). To measure the accuracy and consistency of the research instrument, I conducted a pilot study to validate the instrument designed for the study and find out any defect in the measuring instrument.

Potential participants for the pilot study were any of the 5140 information technology professionals. Because I had the goal of sampling 30 respondents for the pilot study, invitations were sent to 300 of the information technology professionals to get that number; this showed a response rate of 10%. The invitation contained URL links to the pilot study questionnaire and a short assessment questionnaire to assess the pilot study

questionnaire for the purpose of face and content validation. Thirty participants, 16 male and 14 female, located at four geo-political zones in Nigeria, namely North Central, South West, South-South, and North West, who are working in both public and private organizations, completed the questionnaires.

Responses from the 30 participants were used to validate the accuracy and consistency of the pilot survey instrument designed for the study. The measuring instrument was evaluated using internal consistency, face validity, and content validity. A Cronbach's alpha test was done to assess the internal consistency of the questions. The result of the Cronbach's alpha coefficient was 0.894, which is higher than 0.70 considered significant for inclusion (Bolarinwa, 2015). The result of Cronbach's alpha showed that the internal consistency of the constructs was satisfactory. There was no sign of multicollinearity problem. This is because each value of variance inflation factors calculated for independent constructs was below 10 (Thompson et al., 2017).

The face validity of the questionnaire was assessed using the survey assessment questionnaire. The assessment questionnaire designed to validate the pilot study survey was about the instructions, length, and layout of the pilot study questionnaire as well as ease of completion, time it took, and level of question difficulty. The 30 participants who completed the pilot study survey also completed the assessment questionnaire designed to validate the pilot study questionnaire. The responses showed that the time range taken to complete the pilot study questionnaire was between 10 and 15 minutes, and 80% of the respondents used 10 minutes to complete the pilot study questionnaire. According to 90% of the respondents, the questionnaire length was acceptable with a clear layout and easy

to understand instructions, whereas 10% of the respondents adjudged the instructions were difficult to understand.

Content validity was assessed using professionals with a background in information technology. The invitation to participate in the pilot study contained a URL link to the pilot study assessment survey. Participants were to assess the pilot study questionnaire by scoring phrasing, importance, and appropriateness of the 12 questions for the dependent and independent variables on a 5-point Likert-type scale. Phrasing of research questions means that the significance and emphasis of research questions are communicated to the reader. Wordings used in a questionnaire that are phrased effectively are not haphazard, but they are dependent upon the characteristics of the target population (Allen, 2017). Developing comprehensive research questions for a new study is important because the activity of the research will be guided by the research questions. It is important for research questions to be sufficiently focused so as to drive the research to a valid inference. The importance of the research questions means that it provides a guide for the study (Patino & Ferreira, 2016). Appropriateness of the research questions means that the research questions were appropriate for the study (Ratan, Anand, & Ratan, 2019).

Each question to ascertain the effective phrasing, importance, and appropriateness of the questionnaire was scored on a 5-point Likert-type scale ranging from 1(*Strongly disagreed*) to 5 (*Strongly agreed*). All questions scored highly for phrasing, importance, and appropriateness with mean scores above 3.0 for each question. Overall means and

standard deviations for importance, appropriateness, and phrasing were 4.40 *SD* + 0.500, 3.88 *SD* + 0.833, and 4.32 *SD*.+ 0.557, respectively.

For the bivariate analysis, the Likert scale was used as an interval scale to enable me to conduct a parametric statistical test. Using the ordinal data values as interval data values will mean that the difference between any two ratings will be the same all through (Joshi et al., 2015). The main objective of the pilot study was to validate the instrument designed for the study and find out any defect in the measuring instrument In operationalizing the variables of the study, the results from the pilot study validated the adoption of the variables (Joshi et al., 2015).

Data Collection

Potential participants for the study were any of the remaining 4840 information technology professionals, because 300 have been initially randomly selected for the pilot study. Since I had the objective of sampling 95 respondents, which is the minimum participants needed for the main study, invitations were sent to 1000 of the information technology professionals to get above the minimum number. The invitation contained a URL link to the main study questionnaire. One hundred and thirty-eight participants, 95 male and 45 female, located at six geo-political zones in Nigeria, namely North Central, South West, South-South, North West, South East, and North East, who are working in both public and private organizations, completed the questionnaire.

The responses of participants were downloaded and imported into SPSS (Version 24). Variable fields were created, and a codebook generated for the annotations of the variables for the purpose of analysis.

Before data collection for the study, I obtained approval from Walden University IRB. The IRB approval number is 05-06-20-0658477. Data were collected over a period of 14 days, and 138 participants completed the survey out of the 1000 that received the email. This gave a response rate of 13.8%.

Study Results

Demographic Characteristics of the Respondents

The characteristic of participants regarding their job cadre is reported in Table 3.

Table 1

Demographics of Participants by Position

Position	*n*	%
MD/CEO	27	19.57
Directing staff	37	26.81
Management staff	42	30.43
Others	32	23.19
Total	138	100

The characteristic of participants regarding their geographical location is reported in Table 4.

Table 2

Demographics of Participants by Location

Location	*n*	%
North Central	63	45.45
North East	6	4.55
North West	6	4.55
South East	6	4.55
South West	44	31.82
South-South	13	9.09
Total	138	100

The characteristics of participants regarding their industry segmentation are reported in Table 5.

Table 3

Demographics of Participants by Industry

Industry	*n*	%
Public	80	57.97
Private	58	42.03
Total	138	100

The characteristics of participants regarding the size of the organizations where they are working are as stated in Table 6.

Table 4

Demographics of Participants by Size of Organization

Size of organization	*n*	%
1-50	31	22.73
51-100	13	9.09
101-500	25	18.18
501-1000	0	0.00
Over 1000	69	50.00
Total	138	100

The characteristic of participants regarding their gender is shown in Table 7.

Table 5

Demographics of Participants by Gender

Gender	*n*	%
Male	93	67.4
Female	45	32.6
Total	138	100

Descriptive statistics. The descriptive statistics for the dependent and independent variables were calculated. Examining and analyzing the test result showed that the minimum values of each variable range from 1 to 3, while the maximum values of each variable were 5. The mean values of each variable, ranged from 4.05 to 4.58 while the standard deviations of the variables ranged from 0.602 to 0.933. Table 8 shows the measured variables and the mean opinion scores (MOS).

Table 8

Measured Variables and Their Mean Opinion Scores

Variables	Mean opinion score	*SD*
EOU	4.58	.602
EOP	4.05	.813
DEPTB	4.41	.635
INCI	4.28	.694
POF	4.46	.674
ACT&TR	4.17	.912
GOVTR	4.36	.714
VTRST	4.49	.607
AOF	4.07	.933
MTBTY	4.31	.681
CDOTE	4.37	.716
SVAT	4.48	.619

Inferential statistics. Inferential statistics were used to examine the relationship between technological, environmental, economic factors, and the sustainability of voter accreditation technology. I used Pearson's coefficient and multiple linear regression analysis to test if relationships exist between the independent variables and the dependent variable. Table 9 shows the result of Pearson's correlation coefficient (r) test between

each independent variable and the dependent variable. Pearson's correlation coefficient (*r*) values were positive, and they ranged from .329 to .890. Examining the result showed that sustainability of voter accreditation technology (SVAT) and prevention of fraud (POF) had the highest correlation $r\ (138) = .890, p < .01$ while the lowest correlation was between sustainability of voter accreditation technology (SVAT) and incremental implementation (INCI) $r\ (138) = .329, p < .01$.

Table 9

Result of Pearson's Correlation Test Between Dependent and Independent Variables

Sustainability of voter accreditation technology (SVAT)	Pearson's correlation (*r*)	*p*
Ease of use (EOU)	.348**	.000
Ease of participation (EOP)	.416**	.000
Dependability (DEPTB)	.506**	.000
Incremental implementation (INCI)	.329**	.000
Prevention of fraud (POF)	.890**	.000
Accountability and transparency (ACT&TR)	.486**	.000
Government regulations (GOVTR)	.431**	.000
Voter trust (VTRST)	.806**	.000
Availability of funds (AOF)	.445**	.000
Maintainability (MTBTY)	.631**	.000
Continuous development of technical employees (CDOTE)	.538**	.000

** Correlation is significant at the 0.01 level

The regression model was a good fit of the data, because the multiple correlation coefficients *R* referred to as the degree of the value of the prediction of the dependent variable sustainability of voter accreditation technology (SVAT) was good enough. The

value of R was 0.905, which indicated a good level of prediction. The coefficient of determination (R^2) was 0.820. This shows that 82% of the variability of the dependent variable SVAT is accounted for by the independent variables. The result showed that the independent variables statistically significantly predict the dependent variable SVAT $F(11, 126) = 52.121$, $p < 0.001$.

Table 10 shows the model summary of the multiple regression analysis. The values of the multiple correlation coefficients R, the value of the coefficient of determination R^2, adjusted R^2, and the standard error of the assessment showed that the regression model fits the data. The value of R was 0.905, which indicated a good level of prediction. The value of coefficient of determination R^2 was 0.820, this accounted for 82% of the variability of the dependent variable SVAT.

Table 10

Model Summary of the Multiple Regression Analysis

Model	*R*	*R* Square	Adjusted *R* Square	Std. error of the estimate
1	.905[a]	.820	.804	.274

[a]Predictors: (Constant), CDOTE, EOU, POF, EOP, VTRST, MTBTY, DEPTB, AOF, INCI, GOVTR, ACT&TR

Table 11 shows the result of the F-ratio test. The result revealed that the regression model was a good fit for the data; this is because the independent variables were able to predict SVAT $F(11, 126) = 52.121$, $p < 0.001$.

Table 6

F-ratio Tests

	Sum of squares	*df*	Mean square	*F*	Sig.
Regression	42.988	11	3.908	52.121	.000[b]
Residual	9.447	126	.075		
Total	52.435	137			

[a]Dependent Variable: SVAT
[b]Predictions: Constant), CDOTE, EOU, POF, EOP, VTRST, MTBTY, DEPTB, AOF, INCI, GOVTR, ACT&TR

Table 7

Result of Multiple Regression Analysis

	Unstandardized coefficients		Standardized coefficients			Collinearity statistics
	B	Std. error	Beta	*t*	Sig.	VIF
(Constant)	.257	.263		.976	.331	1.701
EOU	.048	.051	.047	.957	.341	2.111
EOP	-.002	.042	-.002	-.040	.968	3.142
DEPTB	.013	.065	.013	.197	.845	1.359
INCI	-.023	.039	-.026	-.579	.564	4.001
POF	.583	.069	.636	8.403	.000	3.573
ACTTR	-.005	.049	-.008	-.109	.914	2.443
GOVTR	.001	.051	.001	.018	.986	3.928
VTRST	.204	.076	.200	2.669	.009	3.333
AOF	-.033	.046	-.049	-.717	.475	2.790
MTBTY	.086	.057	.095	1.505	.135	2.432
CDOTE	.071	.051	.082	1.394	.166	1.701

[a]Dependent variable: SVAT

The result of the multiple regression analysis is shown in Table 12. Prevention of fraud (POF), and voter trust (VTRST) had a statistically significant predictive effect on the sustainability of voter accreditation technology (SVAT). The prediction model for SVAT from the independent variables is

SVAT = .257 + (.048 x EOU) – (.002 x EOP) + (.013 x DEPTB) – (.023 x INCI) + (.583 x POF) – (.005 x ACT&TR) + (.001 x GOVTR) + (.204 x VTRST) – (.033 x AOF) + (.086 x MTBTY) + (.071 x CDOTE)

The result of variance inflation factors is also shown in Table 12. The value of each variance inflation factor, which ranged from 1.359 to 4.001, revealed that there was no sign of multicollinearity problem; this is because each value of variance inflation factors calculated for independent constructs was below 10 (Thompson et al., 2017).

Results of Research Questions

Findings of the Pearson's correlation coefficient analysis and multiple linear regression analysis are reported in this section. The main research question for the study was, "what is the relationship of technological, environmental, and economic factors on the sustainability of voter accreditation technology amongst information technology professionals in Nigeria?" Specific research questions were used to examine the relationship between each of the independent variables and the dependent variable. Testing of the null hypotheses of the study using the results of the inferential statistics tests are discussed below:

Research question 1 asked "What is the relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between ease of use and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests.

Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between ease of use (EOU) and sustainability of voter accreditation technology (SVAT), r (138) = .348, $p < .01$. Consequently, the null hypothesis of the research question 1 was rejected. The result of the multiple regression analysis $\beta = .047$, $t(126) = .957$, $p = .341$, showed that EOU did not statistically significantly add to the prediction. This implies that ease of use of the voter accreditation technology has little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 2 asked "What is the relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between ease of participation and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between ease of participation (EOP) and sustainability of voter accreditation technology (SVAT), r (138) = .416, $p < .01$. Consequently, the null hypothesis of the research question 2 was rejected. The result of the multiple regression analysis $\beta = -.002$, $t(126) = -.040$, $p = .968$, showed that EOP did not statistically significantly add to the prediction, which implies that ease of participation in the voter accreditation technology has little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 3 asked "What is the relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between dependability and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between dependability (DEPTB) and sustainability of voter accreditation technology (SVAT), r (138) = .506, p < .01. Consequently, the null hypothesis of the research question 3 was rejected. The result of the multiple regression analysis $\beta = .013$, $t(126) = .197$, $p = .845$, showed that DEPTB did not statistically significantly add to the prediction, which implies that dependability has little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 4 asked "What is the relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between incremental implementation and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between incremental implementation (INCI) and sustainability of voter accreditation technology (SVAT), r (138) = .329, p <

.01. Consequently, the null hypothesis of the research question 4 was rejected. The result of the multiple regression analysis $\beta = -.026$, $t(126) = -.579$, $p = .564$, showed that INCI did not statistically significantly add to the prediction, which implies that incremental implementation has little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 5 asked "What is the relationship between the prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between prevention of fraud and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between prevention of fraud (POF) and sustainability of voter accreditation technology (SVAT), $r\ (138) = .890$, $p < .01$. Consequently, the null hypothesis of the research question 5 was rejected. The result of the multiple regression analysis $\beta = .636$, $t(126) = 8.403$, $p < .01$, showed that POF statistically significantly added to the prediction of SVAT. This implies that prevention of fraud has a huge effect on the sustainability of voter accreditation technology in Nigeria.

Research question 6 asked "What is the relationship between accountability and transparency and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between accountability and transparency, and

sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between accountability and transparency (ACT&TR) and sustainability of voter accreditation technology (SVAT), r (138) = .486, $p < .01$. Consequently, the null hypothesis of the research question 3 was rejected. The result of the multiple regression analysis $\beta = -.008$, $t(126) = -.109$, $p = .914$, showed that ACT&TR did not statistically significantly add to the prediction, which implies that accountability and transparency have little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 7 asked "What is the relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between government regulations and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between government regulations (GOVTR) and sustainability of voter accreditation technology (SVAT), r (138) = .431, $p < .01$. Consequently, the null hypothesis of the research question 7 was rejected. The result of the multiple regression analysis $\beta = .001$, $t(126) = .018$, $p = .986$, showed that GOVTR did not statistically significantly add to the prediction, which implies that government

regulations have little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 8 asked "What is the relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between voter trust and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between voter trust (VTRST) and sustainability of voter accreditation technology (SVAT), r (138) = .806, $p < .01$. Consequently, the null hypothesis of the research question 8 was rejected. The result of the multiple regression analysis $\beta = .200$, $t(126) = 2.669$, $p = .009$, showed that VTRST added statistically significantly to the prediction, which implies that voter trust has little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 9 asked "What is the relationship between the availability of funds and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between availability of funds and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there

was a significant relationship between the availability of funds (AOF) and the sustainability of voter accreditation technology (SVAT), r (138) = .445, $p < .01$. Consequently, the null hypothesis of the research question 9 was rejected. The result of the multiple regression analysis $\beta = -.049$, $t(126) = -.717$, $p = .475$, showed that AOF did not statistically significantly add to the prediction, which implies that availability of funds has little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 10 asked "What is the relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis was "There is no statistically significant relationship between maintainability and sustainability of voter accreditation technology amongst information technology professionals." The null hypothesis was tested using Pearson's correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between maintainability (MTBTY) and sustainability of voter accreditation technology (SVAT), r (138) = .631, $p < .01$. Consequently, the null hypothesis of the research question 3 was rejected. The result of the multiple regression analysis $\beta = .095$, $t(126) = 1.505$, $p = .135$, showed that MTBTY did not statistically significantly add to the prediction, which implies that maintainability has little effect on the sustainability of voter accreditation technology in Nigeria.

Research question 11 asked "What is the relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals?" and the corresponding null hypothesis

was “There is no statistically significant relationship between continuous development of technical employees and sustainability of voter accreditation technology amongst information technology professionals.” The null hypothesis was tested using Pearson’s correlation coefficient and multiple linear regression tests. Analysis of the test results from Table 9 and Table 12 showed that there was a significant relationship between the continuous development of Technical Employees (CDOTE) and the sustainability of voter accreditation technology (SVAT), r (138) = .538, $p < .01$. Consequently, the null hypothesis of the research question 11 was rejected. The result of the multiple regression analysis $\beta = .082$, $t(126) = 1.394$, $p = .166$, showed that CDOTE did not statistically significantly add to the prediction, which implies that maintainability has little effect on the sustainability of voter accreditation technology in Nigeria.

Summary

This chapter gave a flow of how data was collected and the results of data analysis. In all, a total of 138 IT professionals responded to the questionnaire. 27 (19.56%) of these respondents were the chief executives (MD/CEOs) in their offices. The bulk of the responses (45.5%) were from the north central geo-political part of Nigeria and 57.9% from the public sector. Half (50%) of the respondents worked in organizations with staff strength of over 1,000. Most (67.4%) of the respondents were male. The results of the study showed that all the independent variables had significant correlations to the sustainability of voter accreditation technology. However, POF ($r = 0.890$) and VTRST ($r = 0.816$) had the highest correlation coefficient value. Similarly, both POF and VTRST were the only variables that were statistically significant predictors of SVAT though the

multiple regression model accounted for 82% of the variability of SVAT. The implications of these results are discussed in Chapter 5. Chapter 5 also discussed the limitations of this study, recommendations, and the study's implications for positive social change.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this quantitative correlational study was to examine the relationships between technological, organizational, economic factors, and the sustainability of voter accreditation technology. The independent variables were ease of use (EOU), ease of participation (EOP), dependability (DEPTB), incremental implementation (INCI), prevention of fraud (POF), accountability and transparency (ACT&TR), government regulations (GOVTR), voter trust (VTRST), availability of funds (AOF), maintainability (MTBTY), and continuous development of technical employees (CDOTE). The dependent variable is the sustainability of voter accreditation technology (SVAT). The targeted population for the study was a group of 5,140 Nigerian information technology professionals.

Interpretation of Findings

The findings of the study established that the dependent variable of sustainability of voter accreditation technology could be predicted based on the independent variables for the study with the value of the coefficient of determination being 0.820. This indicates that the independent variables can explain 82% of the variation of the sustainability of voter accreditation technology. The result of the multiple linear regression implied that only the prevention of fraud and voter trust, had significant contributions to the prediction of the model while the rest of the variables had little effect.

There were significant relationships between all factors and sustainability of voter accreditation technology; Pearson's correlation coefficient (*r*) values were positive, and they were ranged from .329 to .890. Examining the result showed that sustainability of

voter accreditation technology and prevention of fraud had the highest correlation r (138) = .890, $p < .01$. This is a very strong correlation implying that the more efforts can be put into prevention of fraud and voter trust, the more success will be achieved with the sustainability of voter accreditation technology.

Technological Factor

The DOI theory states that the technological context comprised three factors that could potentially have an impact on the sustainability of the voter accreditation technology. The three factors include relative advantage, compatibility, and complexity of innovation. The framework is a technology adoption theory also mentioned complexity and compatibility as the technological factors that influence the adoption of technological innovations. The electronic data interchange adoption model mentioned perceived benefits as one of the technological factors that influence the adaptation of technological innovation.

The research model categorized ease of use, ease of participation, dependability, incremental implementation, prevention of fraud, and accountability and transparency as the technological variables that influence the sustainability of voter accreditation technology. Note that the mentioned variables can be grouped under compatibility, complexity, and relative advantage. Prior research, as mentioned in Chapter 2, showed positive associations between the sustainability of the voter accreditation technology and the above factors (Ayinde & Idowu, 2016; Evrensel, 2010; Iwuoha, 2018; Olurode, 2017; Travares & Olveira, 2018; Zhang et al., 2015).

The findings of the study, in agreement with previous studies, showed a positive relationship between these independent variables and the dependent variable. Therefore, an improvement in the property of an e-voting system that makes operators or voters able to use it with little or no assistance, the dissemination of information or materials that enables voters and election administration to clearly understand and take part in the registration process, and ensuring that a voting system functions exactly as expected will all increase the sustainability of the voter accreditation technology. Also the gradual introduction of new technologies such as the gradual replacement of manual voter register with smart card readers in Nigeria, putting in place mechanisms to overcome electoral fraud and other malpractices, and ensuring transparency, which engenders trust and public confidence in the electoral process, will bring about the sustainability of the voter accreditation technology.

This positive relationship between the above six independent variables and the sustainability of voter accreditation technology was consistent with prior studies discussed in the literature review (Ayinde & Idowu, 2016; Evrensel, 2010; Iwuoha, 2018; Olurode, 2017; Travares & Olveira, 2018; Zhang et al., 2015). The study results also revealed that the prevention of fraud had the strongest correlation or higher impact on the sustainability of voter accreditation technology compared to the other variables. This implies that the adoption of new technologies requires information on compatibility and complexity of innovation and seeks validation of the relative advantage from the sustainability of voter accreditation technology before the consideration of its adoption.

Consequently, in the regression test, only prevention of fraud added statistically significantly to the prediction of the regression model. This implies that ease of use, ease of participation, dependability, incremental implementation, and accountability and transparency have little effect on the sustainability of voter accreditation technology in Nigeria compared to the prevention of fraud.

Organizational Factor

Organizational factors present limitations and restrictions or prospects for technological innovations in an organization (Awa et al., 2017). The organizational factor in this study, based on the DOI theory, is defined as the characteristics of an organization that influence adoption or rejection of an innovation. The TOE framework identified government regulations and technical support infrastructure as factors in the organizational context that influence the adoption of technological innovations. Constructs under organizational factors in the research model include government regulations and voter trust. As discussed in Chapter 2, several prior studies have suggested that these organizational factors are significant determinants in influencing the adoption of new technologies (Awa et al., 2017; Cheeseman et al., 2018; Kimbi et al., 2014; Osho et al., 2015; Tsou & Hsu 2015).

The correlation analysis of the data in this study showed that these factors were positively correlated to the sustainability of voter accreditation technology. This is consistent with the statements of Cheeseman et al. (2018) and Kimbi et al. (2014), who have suggested that these organizational factors positively influence the adoption of technology. Pearson's correlation coefficient values of the two organizational factors

indicated a significant correlation to the dependent variable. Therefore, the more favorable the rules or laws enacted by the government are to the people, the better the prospects for the sustainability of voter accreditation technology (Wolf et al., 2017). If governments put in place regulations that support the continuous adoption of election technologies, it will encourage the sustainability of voter accreditation technology. Also, any mechanism that can be put in place to achieve public trust in implementing an e-voting system may influence the level of trust in the voting technology and encourage the sustainability of voter accreditation technology. (Kimbi et al., 2014).

The analysis of the regression test values, nevertheless, indicated that voter trust, out of the two organizational factors, added statistically significantly to the prediction of the sustainability of voter accreditation technology. This means that government regulations have reasonable effect on the sustainability of voter accreditation technology in Nigeria.

Economical Factor

Based on the research model, economic factors consist of the availability of funds maintainability and continuous development of technical employees as factors that influence the sustainability of voter accreditation technology. As discussed in Chapter 2, several prior studies have suggested that these economic factors are significant determinants in influencing the adoption of new technologies. (Nwokeafor, 2017; Omilusi, 2018; Vlachokyriakos et al., 2014).

The findings of the study, in agreement with previous studies, showed a positive relationship between these independent variables and the dependent variable. This

indicates that an increase in the financial ability of an electoral body to adopt, operate, and maintain a voting system, procuring a voting device, which enables adopters to effectively manage and maintain the device in a cost-effective way, and improving skill, diligence, and attentiveness by ad hoc staff in the use of voter technology will positively contribute to the sustainability of voter accreditation technology.

The Pearson's correlation coefficient values of these three economic factors indicated a significant correlation to the dependent variable. However, none of the factors had a statistically significant predictive effect on sustainability of voter accreditation technology in Nigeria. The prediction of the regression model, which implies that the economic factors have little effect on the prediction of the sustainability of voter accreditation technology in Nigeria.

Limitations of the Study

The adoption of voter accreditation technology may vary from one country to the other (Evrensel, 2010). As stated in Chapter 1, the focus of my research was on the INEC and information technology professionals across Nigeria who are involved in decision making to adopt new technologies and innovations. Therefore, the results of the study can be applied to Nigeria and possibly other countries that may have similar challenges. It is not guaranteed that the result of the study can be applied across all other countries that have adopted or intend to adopt voter accreditation technology.

Also, the results of the study indicated a correlation between each independent variable and the dependent variable using Pearson's Correlation. Yet, through multiple regression, only two variables were statistically significant in their prediction of the

dependent variable. This relates to what was mentioned in chapter one that the variables in the study were only measured but not manipulated, and the study did not go beyond defining the correlation between research variables; because correlational designs do not classify reasons for behaviors (Burkholder et al., 2016).

Another limitation of the study is that it focused on IT professionals. This could be a bias as the research question was addressing the sustainability of a voter technology that is IT based. The major population of voters does not fall under this area. Variables such as ease of use, ease of participation, and voter satisfaction cannot be used as a representation of the voters who determine how these factors will influence the sustainability of voter accreditation technology.

Recommendations

The recommendations offered in this study were established using a rational response to the study findings' implications for the IT professionals. The empirical evidence of this study showed that technological, organizational, and economic factors will impact the adoption of the sustainability of voter accreditation technology. Nevertheless, though the above factors are essential, it is just as important as how organizational context comprising of top management support and organizational readiness can influence an IT professionals' attitude towards the adoption of innovation. Without the sustainability of voter accreditation technology for future elections, credibility, and integrity of the electoral process will be weakened, consequently impairing democracy (Shuaib et al., 2017).

Similarly, the findings of this study indicated that the prevention of fraud, and voter trust, had significant contributions to the prediction of the model, whereas prevention of fraud had the highest correlation to the sustainability of voter accreditation technology. To achieve sustainability of voter accreditation technology, winning the support of top stakeholders, for example, the politicians, ministers, and consequently, the people determine their readiness to support and integrate what is required to have a sustainable voter accreditation technology. There are several areas that researchers of future studies can examine to improve further our consideration of sustainable voter accreditation technology. These areas include

- extending the geographic boundary of the research to multiple regions outside Nigeria,
- researching and analyzing a more generalized population (i.e., the voters),
- addressing further the impact of top management support and classify any other roles or behaviors by top management (i.e., the government and those in charge of elections) that could impact the decision-making process of adopting sustainable electronic voter accreditation technology,
- conducting case studies on countries that have adopted sustainable electronic voter accreditation technology successfully,
- addressing the security concerns of electronic voter accreditation technology, and

- using a qualitative method to achieve a comprehensive knowledge of additional variables that impact the adoption of sustainable electronic voter accreditation technology.

Firstly, this study was limited to Nigeria based IT Professional working in private and public organizations in Nigeria; researchers of other studies in the future can further extend to other geographical boundaries of other regions outside Nigeria. Such a diverse population may help identify differences between cultures and how it would influence the sustainability of electronic voter accreditation technology.

Secondly, researching and analyzing a more generalized population i.e. the voter and addressing further the impact of top management support and classify any other roles or behaviors by top management, i.e., the government and those in charge of elections could provide a deeper understanding on how they impact the sustainability of this technology.

Thirdly, by conducting case studies on countries that have adopted sustainable electronic voter accreditation technology successfully and addressing the security concerns of electronic voter accreditation technology researchers will be able to evaluate the decision making and adoption process that enabled the success as well as find out the risk factors and how to mitigate them to ensure voter satisfaction.

Lastly, this study was conducted using a quantitative method with a correlational design and an online survey. Using a qualitative method may help to achieve a comprehensive knowledge of additional variables that impact the adoption of sustainable electronic voter accreditation technology.

Implications

This study provided a comprehensive investigation on the sustainability of electronic voter accreditation technology, evaluating technological, technological, and economic factors. The findings of this study can be used by the management of the INEC to understand how to ensure voter accreditation technology sustainability. It may provide the INEC with a scientific background for decisions that will ensure the sustenance of voter accreditation technology for better, transparent, efficient, and credible electoral processes in the future.

Sustaining the voter accreditation technology could contribute towards an improved, positive political culture in Nigeria, as well as increased public confidence in the electoral processes and electoral management body. As a result of the transparency and traceability feature the voter accreditation technology brings to the electoral process, issues of electoral fraud that promotes violence will be reduced, thereby fostering a positive social change.

Conclusions

The main objective of this quantitative correlational study was to examine the relationship between technological, organizational, economic factors, and the sustainability of voter accreditation technology. To understand the sustainability of electronic voter accreditation technology, it is essential to identify the determinants that impact the decision of adoption and conduct an insightful analysis that recognizes if these factors have the same implications in different areas.

The findings of this study offer several significant conclusions and implications about the influencing factors of the sustainability of voter accreditation technology. Firstly, to attain sustainable voter accreditation, technology is significantly dependent on its prevention of fraud, and voter trust. Secondly, of the eleven factors considered, all of them showed a statistically significant correlation to the dependent variable.

The findings of this study may help decision-makers to understand the influencing forces that determine the sustainability of voter accreditation technology. Besides, this study will contribute to the limited research on the sustainability of voter accreditation technology by providing a broad investigation of factors that influence it through an assessment of the technological, organizational, and economic factors.

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Appendix: Sustainability of Voter Accreditation Technology Survey

1. What is your gender?
Female
Male

2. What is your age bracket in years?
18 -20
21-30
31-40
41 -50
51 and above

3. What is the highest level of education you have completed?
PhD
Masters
Graduate HND/BSc

4. For the purpose of this survey, the participants are required to be Information Technology (IT) professionals.
Do you meet this profile? (tick one)
Yes
No

5. How many years of experience do you have as an IT professional?

6. Position level: Tick (√) where applicable
MD/CEO
Directing Staff
Management Staff
Others

7. Which region in Nigeria is your organization located?

8. Which industry does your organization belong to?
Private
Public

9. In what year was your organization founded?

10. Approximately how many employees are employed by your organization?
1-50
50-100
100-500
500-1000
Over 1000

11.Do you know of the voter accreditation technology?
Yes
No

12. Have you interacted with the voter accreditation technology?
Yes
No

13. If yes please explain

14. The Sustainability of the Voter Accreditation Technology is very important to the success of future elections in Nigeria
5- Strongly agree
4- Agree
3- Neither agree nor disagree
2- Disagree
1- Strongly disagree

Please indicate how much you agree or disagree with each of the following statements in Q15 - Q25 based
On a scale ranging from strongly disagree to strongly agree.

15. The Ease of use of voter accreditation technology will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

16. The Ease of participation when using voter accreditation technology will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

17. The dependability of the voter accreditation technology will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

18. The Presence of Incremental implementation in the voter accreditation technology increases its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

19. The ability of the voter accreditation technology to prevent fraud will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

20. Accountability and transparency of the voter accreditation technology will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

21. Government regulations will ensure the sustainability of voter accreditation technology
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

22. Voter trust of voter accreditation technology will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

23. Availability of funds will ensure the sustainability of voter accreditation technology
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

24. Maintainability of voter accreditation technology will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree
2-Disagree
1-Strongly disagree

25. Continuous development of Technical Employees to manage the voter accreditation technology will ensure its sustainability
5-Strongly agree
4-Agree
3-Neither agree nor disagree

2-Disagree
1-Strongly disagree