Government Information Quarterly 37 (2020) 101257

Contents lists available at ScienceDirect

Government Information Quarterly

journal homepage: www.elsevier.com/locate/govinf

Factors for e-voting adoption - analysis of general elections in Nigeria

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ARTICLE INFO

Keywords:
E-voting adoption
Innovation theory
IS adoption
Ethnography
E-voting
Nigerian elections

ABSTRACT

The adoption and use of e-voting technologies in major elections remain largely problematic regardless of where they are implemented. This has motivated a number of survey-based empirical studies on determining important factors for e-voting adoption based on existing technology adoption models. However, there is a paucity of studies, which provide deep insights and understanding of core issues involved in e-voting adoption success or failures in different contexts. This article describes an ethnography carried out with the goal to understand factors that support or inhibit e-voting adoption based on detailed data collected during the 2011 Nigerian General Elections. By consolidating existing e-voting adoption models and a multi-level innovation adoption model into an analytical framework, we analysed the observations made by one of the authors as a participant in the adoption and implementation of the e-voting initiative as well as the post-election reports. Our findings are synthesized into a multi-level e-voting adoption model. In addition, we catalog a number of factors that could negatively affect e-voting adoption in a similar environment. Our results contribute to advancing theory building in e-voting adoption while it provides practitioners with a concrete checklist of success factors and barriers for adopting e-voting technologies.

1. Introduction

E-Voting constitutes a very important aspect of ICT-enabled democratic governance (Achieng & Ruhode, 2013). It generally aims at increasing participation of citizens in the electoral process and improving the outcomes of elections by addressing challenges associated with traditional voting practices (Adeshina & Ojo, 2014). Thus, e-voting technologies support one or more of the major phases of the electoral process–from registration stage in the pre-voting phase to voting/balloting and verification to counting or tallying after voting (Ojo, Adeshina, & Ayo, 2005; Sampigethaya & Poovendran, 2006).

In practice, there are mixed sentiments regarding the adoption and use of e-voting technologies in different parts of the world. For example, a number of countries such as the Netherlands, Germany and Ireland have moved away from the use of e-voting for balloting after initial adoption (Achieng & Ruhode, 2013). The use e-voting machines (EVM) have also remained controversial in the United States. Overall, while e-voting is perceived as generally risky, benefits derivable from e-voting are not outweighed by the actual risks (Bannister, 2005).

As a research domain, e-voting has attracted researchers from different disciplines from Computer Science (system design and security protocols), Public Administration and Political Science (voter behavior, participation, representative democracy) and Information Systems (technology adoption and efficiency) (Choi & Kim, 2012). Exploration of bibliographic data on e-voting from Google Scholar and Elsevier's Scopus show sustained interest in e-voting particularly in the last decade (2004) but with most of the contributions in one of the technical aspects of e-voting including the design of e-voting machines and Internet Voting systems, as well as security, authentication and verifiability problems. There are relatively few studies investigating challenges related to the adoption of e-voting technologies in real elections. Existing studies on e-voting Adoption have examined factors for adoption of Internet Voting by individuals (Bakon & Ward, 2015; Jacobs & Pieters, 2009; Schaupp & Carter, 2005); opportunities and challenges in implementing e-voting in developing countries (Thakur, 2015; Ojo et al., 2005; Ahmad, Abdullah, & Arshad, 2015; Jegede, Aimufua, & Akosu, 2012) and understanding the effect of cultural differences on the trust in e-voting technologies (Gefen, Rose, Warkentin, & Pavlou, 2005). Another observation is that research in the e-voting adoption sub-domain has largely investigated adoption of e-voting technologies by individuals. Thus, discussion on the adoption of these technologies at the organizational level is rare. One of such rare efforts aimed at investigating factors that could determine the intention of Electoral Authorities or Management Bodies to adopt e-voting

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http://dx.doi.org/10.1016/j.giq.2017.09.006
Received 19 November 2015; Received in revised form 31 August 2017; Accepted 25 September 2017
Available online 12 October 2017

technologies in the South African context is presented in Achieng and Ruhode (2013). In addition, we are not aware of any efforts to simultaneously study e-voting adoption at both individual and organizational levels.

The work presented here complements existing empirical research on e-voting by providing an Ethnography of e-voting in the Nigerian context. Ethnographic research is one of the most in-depth research methods possible; offers right insight into the human, social and organizational aspects of information systems (Myers, 1999). Using a multi-level innovation adoption framework described extensively in Wisdom, Chor, Hoagwood, & Horwitz (2013) as a theoretical lens, the study draws from the direct involvement of one of the authors as a key participant in the pre-adoption and adoption phase of e-voting to support voter registration in the 2011 Nigerian General Elections. It also relied on the careful analysis of the post-election review report. In particular, our study investigates factors that are important for the successful implementation of e-voting technologies across five levels of innovation contexts – external environment, organization, innovation, individual (internal users of the innovation – electoral officers) and clients (external users of the innovation – citizens or voters). Our findings are consolidated into a theoretical model we call the "e-voting Adoption Model".

The rest of the paper is organized as follows: Section 2 presents a background in e-voting and its adoption, followed by a description of our research approach in Section 3. Narratives about the use of e-voting in the Nigerian General Elections and findings from the post-election reports are analysed based on the adoption framework in Section 4. The core factors associated with each category of adoption constructs are identified in Section 5. Discussions are presented in Sections 6 while recommendations and concluding remarks are provided in Section 7.

2. E-voting adoption

2.1. Concepts

E-voting is usually associated with the use of electronic devices such as Electronic Voting Machines (EVM) and channels (like the Internet) for casting votes or balloting (Receipts & Elections, 2004; Sampigethaya & Poovendran, 2006). E-voting is considered in Chung & Wu (2009) as digitization efforts related to e-government and e-democracy. In this line of thinking, e-voting will aim at digitizing the different stages of the electoral process including registration, balloting, verification and counting.

According to Chung & Wu (2009), the possibility to vote remotely is one of the greatest benefits of e-voting since it potentially raises participation in the voting exercise. Qadah and Taha (2007) supports this assertion claiming that e-voting permits voters to cast their votes at any time from any location and using a variety of electronic devices (Qadah & Taha, 2007). In addition, they believe that e-voting generally automates and simplifies the election process, increases participation rates, reduces counting mistakes and minimizes the time it takes to announce voting results.

Different e-voting systems have been proposed and adopted to support voting process. This includes computer counting, Direct Recording Electronic voting machine (DRE), Online Voting, Poll-site e-voting, Kiosk e-voting and remote e-voting (Qadah & Taha, 2007; Ojo et al., 2005).

There are a number of key entities involved in any form of voting including e-voting. These entities include: Voter, Authority, Candidate and Adversary (Sampigethaya & Poovendran, 2006). These entities could be very useful in developing a voting model that may underpin an e-voting system. Voters are those eligible to vote by choosing among the Candidates. Candidates are usually pre-specified and often chosen by Voters in a private manner. In addition, final count has to be reliable and verifiable. Authorities are government agencies and offices responsible for conducting the election. An adversary is any malicious entity that attempts to manipulate the voting and tally. Sampigethaya and Poovendran (2006) further explains that External Adversary may coerce a voter or buy votes or passively breach privacy of voters. Internal Adversary on the other may try to breach privacy, modify or reveal the partial tally or corrupt the Authority. Designs of e-voting systems must preserve important rights of voters and concomitantly prevent malicious activities.

There are strict requirements for any e-voting system (Chung & Wu, 2009; Qadah & Taha, 2007; Sampigethaya & Poovendran, 2006), including: Eligibility - ensure that only valid voters meeting pre-determined criteria are eligible to vote or take part in the election; Privacy and Anonymity - Ensure that no one can connect a ballot to its voter; Fairness - Ensure that votes obtained by each candidate cannot be known before the announcement of the election result; Verifiability - A voter should be able to verify if its vote was correctly recorded and accounted for in the final vote tally; Uniqueness - must ensure that eligible voter can cast a vote only once in each election; and Dispute-freeness - must provide a mechanism to resolve all disputes at any stage.

In the context of this work, e-voting focuses on the use of ICT to support voter registration or enrollment and the verification process. According to Ojo et al. (2005), in the e-enabled registration process, a voter may register online or visit a polling booth with an attendant Electoral Authority's agent present to guide the voter through the e-registration process. Whichever channel is selected, the voter will complete a registration form that can be captured directly into the Electronic Voters Database. Voter's verification can be done either online or at designated locations with the help of an attendant, for instance, using Voter fingerprint signatures. Thus, the support for voter eligibility is the key requirement for the e-voting system under consideration in this paper.

2.2. E-voting adoption factors

This section reviews the extant literature on factors for e-voting technology adoption. After extensive literature search on the subject matter, only eleven articles were found to discuss factors influencing individuals and organizations in their intention to adopt, implement and accept e-voting technologies. These articles largely discussed factors determining intention to adopt e-voting (Pre-adoption) and those that affect the effective adoption and implementation (adoption). We could not find articles discussing factors for acceptance and continued use of e-voting.

2.2.1. Pre-adoption factors

Bakon and Ward (2015) investigated and identified the main determinants of e-voting adoption by eligible voters living abroad across three countries including Malaysia, Singapore and in the USA. They showed that Socio-demographic, Political and Information Technology Factors were significant in explaining overseas citizens' adoption of E-Voting (Bakon & Ward, 2015). The study by Gefen et al. (2005) identified the diversity in culture and trust as important factors in e-voting Adoption, by comparing potential e-voters in the USA and South Africa (Gefen et al., 2005). They concluded that when there is cultural diversity, trust level becomes less significant in e-voting adoption. Adeshina and Ojo (2014) expounded on the importance of situating the adoption of e-voting within appropriate human and environmental context (Adeshina & Ojo, 2014). They conceptualized e-voting as a socio-technical system, identified factors including availability of e-voting regulatory framework, political environment, and ease of use as critical for adopting e-voting. The main factors influencing citizens' intention to engage with e-voting in the Middle East, using Jordan as a case study, was presented in Alomari (2014) and included perceived usefulness and perceived ease of use. At the organizational level, factors such as organizational structure, site readiness, system readiness, staff training readiness and communication were identified as critical factors for organizational adoption of e-voting in Al Khouri (2012). At the

Table 1
Factors for adoption of e-voting in literature.

SN	Title	Factors		Adoption Phase		Ref.
		Positive	Negative	Pre	In	
1	Web 2.0 and elections: a study of factors influencing diaspora voters adoption of e-voting system	Socio-demography, political and ICT factors	Lack of trust in politicians and government	Yes		Bakon & Ward (2015)
2	Electronic voting in the Netherlands: from early adoption to early abolishment	Trust and confidence in system	Lack of trust, Lack of Voter Register, Lack of Authentication, Lack of Recount and Verifiability, Poor Attention to security		Yes	Jacobs & Pieters (2009)
3	E-voting India and the Philippines – A Comparative Analysis for Possible Adaptation in Africa	Availability of voter registration, Support for rural, elderly and illiterate voters; Access to e-voting System; Voters acceptance and trust, Availability of regional support, security of e-voting system,	High cost of e-voting, Use in concurrent elections		Yes	Surendra Thakur (2015)
4	Cultural Diversity and Trust in IT Adoption: A Comparison of Potential e-Voters in the USA and South Africa	Trust, cultural diversity		Yes		Gefen et al. (2005)
5	Design Imperatives for E-Voting as a Sociotechnical System	Regulatory framework, Participation of stakeholders, localization of e-voting solutions, consideration of contextual factors, simplicity and ease of use, political consideration		Yes		Adeshina & Ojo (2014)
6	Towards E-democracy in the Middle East: E-voting Adoption	Perceived usefulness perceived ease of use		Yes		Alomari (2014)
7	E-Voting in UAE FNC Electronic: A Case Study	Organizational structure, Site readiness, System readiness, Staff training readiness and communication			Yes	Al Khouri (2012)
8	E-Voting: From apathy to adoption, involved youth from 18 to 24 and their intention to use internet voting services	Perceived usefulness, Perceived compatibility or prior experience in similar services (e.g. government) Trust in the Internet; Trust in government			Yes	Schaupp & Carter (2005)
9	Factors affecting the intentions of voters to participate in Internet Voting Systems	User perception about government - Trust - Experience with government Perception about web technology - Usefulness - Ease of use - Security - Privacy User Characteristics - Level of trust - Level of risk		Yes		Kitlan (2010)
10	Issues and Challenges of Transition to e-voting Technology in Nigeria		Lack of Legal framework, Lack of funding, Gender imbalance, Cybersecurity threats, Lack of adequate local expertise, Tension in political environment, insecurity, low level of trust in electoral officials, inadequate trials	Yes		Ahmad et al. (2015)

(*continued on next page*)

individual level, Kitlan (2010) in his dissertation identified factors that affect the intentions of potential voters to participate in Internet voting systems in the U. S. to include user perception about government and web technologies (Kitlan, 2010). Lastly, constructs based on the diffusion of innovation, technology acceptance, technology quality of service, and web trust were used in a conceptual model to analyze the potential use of future internet voting systems in Choi & Kim (2012). They identified user perception about government, perception about web technology, and user characteristics as the core factors. They established that confidentiality, accuracy, ease of use directly and indirectly (through usefulness) determine intentions to use e-voting technologies.

2.2.2. Adoption and Implementation factors

A number of factors were found important for the adoption and sustained implementation of e-voting technologies in Jacobs & Pieters (2009) which discussed the adoption of e-voting in the Netherlands. The authors identified trust and confidence in e-voting system as key adoption factors. They also further identified the factors responsible for subsequent abandonment of e-voting, including lack of trust and inability of e-voting systems to provide verifiable results as in traditional paper voting (Jacobs & Pieters, 2009). Thakur (2015) discusses the experiences of two adopting countries, India and the Philippines with the intention of learning from the experiences of the two countries to guide possible adoption in African countries with similar socio, political, environmental and infrastructural challenges (Thakur, 2015). The context was identified as the key differentiating success factor in both cases. Several success factors were listed for consideration by adopting countries. However, their data was skewed towards students and researchers living in Malaysia, Singapore and the USA. Schaupp and Carter (2005b) identified factors influencing the adoption of online voting systems by young persons aged between 18 and 24 years. In identifying these factors, they used constructs from technology acceptance, diffusion of innovation and web trust. The critical factors identified are perceived usefulness, perceived compatibility, trust in the Internet; and trust in government among others (Schaupp & Carter, 2005). A summary of both pre-adoption and adoption factors established in the extant literature are summarized in Table 1.

2.2.3. Inhibiting factors for successful e-voting adoption

Apart from positive factors, several factors that could negatively impact e-voting adoption were also identified by some of the authors whose works are summarized above. For instance in Ahmad et al. (2015), factors such as Lack of Legal framework, Lack of funding, Gender imbalance, Cybersecurity threats, Lack of adequate local expertise, Tension in political environment, insecurity, low level of trust in electoral officials and inadequate trials were identified as factors that could impact transition into e-voting. Negative factors identified in Bakon & Ward (2015) include lack of trust in politicians and government. In addition, Lack of trust, Lack of Voter Register, Lack of Authentication, Lack of Recount and Verifiability, Poor attention to security (Jacobs & Pieters, 2009), high cost of e-voting, and use of e-voting in concurrent elections (Thakur, 2015) were also identified as factors that could adversely impact e-voting adoption.

3. Method

To advance our understanding of the factors that contribute to the successful adoption of e-voting technologies, this section develops an analytical framework for documentation and analysis of the ethnography carried by the authors. It also provides details on our research strategy, data collection and analysis techniques adopted in the study.

3.1. Research objectives

A major objective of our research is not only to determine adoption

Table 1 (*continued*)

SN	Title	Factors		Adoption Phase		Ref.
		Positive	Negative	Pre	In	
11	Voter Intention to Use E-Voting Technologies: Security, Technology Acceptance, Election Type, and Political Ideology	User Intention to use e-voting - Confidentiality - Accuracy - Ease of Use - Usefulness Usefulness - Confidentiality - Accuracy - Ease of use		Yes		Choi & Kim (2012)

factors for e-voting technologies but to also provide a deeper understanding of these factors. Our first objective is to establish a more holistic and robust perspective about e-voting adoption by building on and responding to the challenge in Wisdom et al. (2013). This in our opinion will enable us to better structure and account for a complete set of adoption factors. Our second objective which informed the use of the ethnographic approach is to provide a deeper understanding of some of the adoption factors relevant to our case study. Our case provided the opportunity to closely observe and directly participate in the adoption process and in implementing an Electronic Voters Register system in a complex environment typically presented by a densely populated developing country.

Thus, the research seeks answers to the following two research questions:

1. What are the major factors that contribute to the effective adoption of e-voting technologies at different levels such as External Environment, Organizational, Innovation and Individual levels?
2. Which of these factors must be addressed to enable effective adoption of e-voting in the Nigerian context?

3.2. Analytical framework

The analytical framework adopted in this work is rooted in 20 theoretical models including the well-known Rogers Diffusion of Innovation Theory (Rogers, 1983), and Technology Acceptance models (Venkatesh, Morris, Davis, & Davis, 2003) consolidated into integrated Innovation model described in Wisdom et al. (2013). The analytical framework enables a multi-level analysis of e-voting adoption constructs and structuring of the different adoption factors identified in the literature and specified in Table 1. One of the core features of the Wisdom et al. (2013) model is that it identifies different contexts in which innovation could take place. The model identifies four different contexts including External System, Organization, Innovation and Individual, and high-level factors that are associated with these contexts. Another interesting feature of the integrated model developed in Wisdom et al. (2013) is the use of middle-range theory and causal mechanisms (Hedström & Ylikoski, 2010) in its synthesis. The middle-range theory is an approach to theory building which stresses that an underlying mechanism helps explain an outcome across different contexts. The notion of the mechanism is associated with a structure composed of parts that are responsible for one or more phenomena. Thus in the case of e-voting adoption, mechanisms comprise those structures and entities that are associated with External Environment, Electoral Authority, E-Voting Technology and Electoral Actors that contribute to the successful adoption of e-voting. Mechanisms could also have negative effects like inhibiting desired positive outcomes. This type of framework enables us to capture both enabling and inhibiting factors identified in Section 2 as mechanisms for e-voting. Therefore, the analytical framework is a multi-level adoption framework comprising Contexts (or Level), Mechanisms (or Factors) and Outcome (Successful adoption) for e-voting. Table 2 below shows how the generic mechanisms identified in Wisdom et al. (2013) are mapped to e-voting specific factors identified from e-voting literature and presented in Table 1.

The Socio-political and External Influence factors examine all extraneous factors that could influence the adoption of the technology, such as the external environment, electoral policies and regulations and incentives. The Electoral Authority characteristics cover different factors including the ability of the organization to absorb new technologies, leadership.

3.3. Research strategy

This work adopts an ethnographic research approach in investigating e-voting adoption factors in the Nigerian context. Ethnographic research is suited to providing Information Systems researchers with rich insights into the human, social and organizational aspects of information system (Myers, 1999; Rudkin, 2002). This approach is able to describe situations rarely observed and for which better understanding may have important consequences (Rowe, 2012). Our decision to adopt this approach is hinged on: 1) the unique positioning of one of the authors as an important actor, and direct participant in the e-voting initiative in Nigeria with direct access to events and detailed information on the initiative by other stakeholders, 2) the opportunity to carry out an in-depth qualitative analysis of the available information based on an extensive set of multi-level innovation adoption constructs that are yet to be investigated at this breadth; and 3) the research is aimed at in-depth analysis of a single case, to better understand the nature of the mechanisms or factors associated with e-voting adoption. One of the authors had full access to all relevant information leading to the decision to implement the e-voting technology and participated in the implementation and roll out of the technology throughout the country. Detailed discussions on the Ethnography research approach are presented in Myers (1999), Rowe (2012), Rudkin (2002) and Whitehead (2005). The limitations of Ethnographic research will be highlighted later in Section 6 as part of the discussion of our results.

3.4. Data collection

Ethnographies are similar to case studies in terms of sources of data. In addition to the use of interview, documentary evidence, report and record inspection, direct participant observation is an important source of ethnographic data. In our case, we considered the direct experience of one of the authors, field notes created, and archives of documents related to the implementation of the e-voting technology during the 2011 General Elections. A major source of information for the research is two major reports on the review of the 2011 Nigerian General Elections (National Democratic Institute for International Affairs, 2011) and (Independent National Electoral Commission, 2011).

3.5. Data analysis

The written accounts and reports (in Section 4 and Independent National Electoral Commission, 2011) were analysed using the contents analysis approach (Hsieh & Shannon, 2005; Elo & Kyngäs, 2008; White & Marsh, 2006). Specifically, we adopted a mixed strategy involving two different approaches to content analysis described in Hsieh & Shannon (2005): the directed and summative approach. In the directed approach, the analysis starts with a theory or relevant research findings as guidance for initial codes. For this, we adopt codes corresponding to constructs under the four e-voting adoption levels in Table 1. We employed the summative approach involving counting and comparisons, usually of keywords or content, followed by the interpretation of the underlying context. We used the summative approach to determine the strength of the identified factors from the analysed reports and participants notes. For instance, the more a factor is mentioned across different reports, the more such factor is considered important. Due to the volume of the reports, we analysed three randomly selected reports from each of the 6 geo-political zones in Nigeria. Results of the analysis are presented in Table 3.

4. Case study - E-voting adoption in the Nigerian 2011 general elections

This section presents a summary of the ethnographic notes made about the observations, interactions, analysis and reflection by the participant observer during the 2011 General Elections in Nigeria. The structure of the narrative is based on the levels, constructs and factors defined in Table 2.

Table 2
E-Voting Adoption Constructs and Factors.

Level	Constructs	Factors from EV Adoption Literature
External environment	Environment	o Socio-demographic Factors o Political Factors o ICT Diffusion o Cultural Diversity
	Policies and regulations Incentives	o Regulatory Framework for e-voting
Electoral authority characteristics	Absorptive capacity Leadership capacity	o Organizational readiness
	External relationships and networks	o Availability of Regional Support
	Operations size and structure	o Organization Structure
	Norms, values and culture	o Communication culture
	Training readiness Readiness for change	o Staff readiness for training
E-Voting technology innovation	Complexity, relative advantage and observability Cost-efficacy and feasibility	o Perceived usefulness
	Evidence and compatibility	o Perceived Security of e-voting o Perceived compatibility with prior experience o Perceived Privacy and Confidentiality of e-voting
	Facilitators and barriers	o Availability of Voter's Register; Support for illiterate population;
	Innovation fit with user's norms and culture	o Localisation of e-voting Solution
	Trialability, relevance and ease of use	o Ease of use of e-voting Solution
Individuals - electoral officers (EO), Voters & stakeholders	Attitude of EO towards change	o Trust and Confidence in System o Trust in the Internet o Perception about Government (Trust in Government and Experience with Government) o Perceived level of risks
	Motivation of EO to use innovation	
	Participation and acceptance rate	o Participation of Election Stakeholder
	Voter's attitude to Change	o Voter's Acceptance and Trust

4.1. Context for e-voting

We describe observed changes that were designed to make the socio-political environment more amenable to the implementation of e-voting technologies. The narrative in this section also includes regulations and incentives to guide the operation and behavior of the Electoral Authority, political actors and voters, that will use the innovation and be affected by the adoption of the technology.

4.1.1. Socio-political environment

Nigeria with a population of over 150 million and about 250 ethnic groups has a voting population of 73.5million as at the time of 2011 elections. Nigeria inhabits a landmass of about 1000 square km. About 15% of the voting points are located in very difficult to reach terrains. Elections took place in Nigeria in 1999, 2003 and 2007. All of these elections were adjudged not to be free and fair. Given the backdrop of the 2007 elections acknowledged by all major stakeholders as fraught with irregularities, there were understandably major fears about the 2011 elections. The need for a paradigm shift for the electorates to regain the confidence in the elections was clear. The Government of the day appointed a credible individual as the Chairman of the Electoral Authority called the Independent National Electoral Commission (INEC) with other men of integrity to serve as Commissioners under him. The old Voters roll was discarded. The electricity power infrastructure was problematic with a frequent power outage.

4.1.2. Changes in policies and regulations

A number of policies were introduced to enable the use of technology in general elections. The Electoral law was modified to allow for electronic capture of data and the use of same as evidence in court. The Law was also modified to allow for results of elections to be declared on the spot and a copy of election result posted at every polling unit (the smallest voting point in Nigeria). Local and International observers were accredited to observe the elections. Stakeholders' consultative engagements were set up to allow the Electoral Authority; the political parties; civil society organizations and the development partners to help in the preparation and the monitoring and the conduct of elections.

4.1.3. Government incentives

While the Federal government did not provide any specific incentives towards the adoption of technology to the populace, the State government offered all kind of incentives (including subtle threats) to enable the populace to register. Incentives included work free days to make time for voter registration while threats included the denial of admission to wards of those who failed to register in Public schools. Beyond this, there were reports that politicians offered cash incentives to potential registrants to enable them to register for the elections. Other changes were introduced by way of voter education through other governmental agencies and civil society organizations. It is important to note that the Voters Card is acceptable in Nigeria as a means of identification. This constituted a huge incentive to people who otherwise would not have been registered.

4.2. Electoral authority

This section describes organizational factors that shaped the capacity of Electoral Authority – The Independent National Electoral Commission (INEC) in the implementation of the e-voting technology (specifically the Electronic Voters Register). It describes factors related to the absorptive capacity, innovation leadership, support relationships, operations, and training readiness of the national Electoral Authority.

4.2.1. Absorptive capacity

The Independent National Electoral Commission (INEC) before the 2011 elections was perceived as a biased umpire. However, the electorates believed that that INEC had the capacity to adapt under the right leadership. INEC had in the past kept the largest single instance of

Table 3
Summary of Participant's Narratives for each Adoption Constructs.

Level	Constructs	Observed Mechanisms
Socio-political and external influence	Sociopolitical environment	m1. Over 150 million and 250 ethnic groups m2. 15% of voting points located in difficult terrains and not easily accessible m3. Entrenched cultural of electoral malpractices and rigging
	Policies and regulations	m4. Electoral law to allow for result declarations at the point of voting m5. Legal reform to allow for e-voting technology adoption m6. Local and International observers were invited m7. Stakeholders engagement
	Incentives	m8. Work free days, educational support for parents m9. Voters card accepted as ID card
Electoral authorities	Absorptive capacity	m10. Previous technology capacity in OMR based Electronic Register m11. Several communication equipment deployment to more than 800 locations m12. Acceptable leadership to jumpstart innovation
	Innovative leadership capacity	m13. The Electoral Management Body (EMB) chairman is a political scientist with daring flare for ICT m14. Consultant – a former employee of Google m15. An ICT Director with a Ph.D in Computer vision
	External relationships and networks	m16. Multilateral organization helped with funds and project management m17. Software developers hired as support staff m18. 2 software experts per state (37 states); 2 tech support per LGA (774) m19. 10,000 Registration Area support supervisors
	Operations size and structure	m20. Chairman supported by 2 technology experts m21. 500 Permanent technical staff with degrees in Engineering and Computer Science m22. 774 Electoral officers; 10,000 Registration Area Supervisors m23. 240,000 e-voting equipment operator for 120,000 locations
	Norms, values and culture	m24. Culture towards technology adoption is above average
	Training readiness	m25. Cascade training adopted; 40 Master trainer – 800 Electoral officers trained 12,000 RAO trained 250,000 Operators m26. Too large classes made training less effective m27. Lack of adequate hands-on practice on equipment m28. Physical communications means available to the lowest level
	Readiness for change	m29. Above 80% readiness to adopt e-voting technology for electoral operations
E-Voting Technology Enactment	Complexity, relative advantage and observability	m30. Background technology complex but front end very simple m31. Stakeholders aware of e-voting relative advantage in forestalling elections fraud m32. Electoral law to allow for result declarations at the point of voting m33. All staff both permanent and temporary observe the use of the technology
	Cost-efficacy and feasibility	m34. No explicit feasibility study carried out m35. Implicit feasibility based on the cost of bad governance and a failed state. m36. Qualitatively cost effective based on the conduct of free and fair elections
	Evidence and compatibility	m37. No pilot to ascertain compatibility, but several tests conducted m38. Concerns about the use of open-source software m39. Efforts made to consider peculiar factors like lack of electricity; Lithium Ion batteries to power DDC for 24 h and generators m40. Stakeholders engagement and use of women operators helped respect cultural norms concerning women identification.
	Facilitators and barriers	m41. Facilitators include political parties, religious leaders, community leaders, traditional rulers, educational institutions m42. Unscrupulous operators and politicians
	Innovation fit with user's norms and culture	m43. E-voting innovation revolutionized the traditional practices of manually written names m44. Concerns about eventual use of data and loss of data
	Trialability, relevance and ease of use	m45. No pilot program, but several stress tests of e-voting technology m46. Innovation solved the intended problem, and huge attention paid to user friendliness m47. A big-bang approach due to time constraints
	Attitude towards change	m48. Very positive attitude towards change by voters, political parties and agents, candidates and other actors.
Electoral Actors	Motivation to use innovation	m49. All actors were motivated to use the technology because of the ultimate objective of free and fair elections m50. Motivation was also based on previous fraudulent elections
	Participation and acceptance rate	m51. Participation and acceptance by all actors was above 80%

the electoral database in the world in her Data Centre. INEC deployed several communications equipment to the 37 states of the Nigerian federation and had also deployed VSAT (Very Small Aperture Terminals) infrastructure to all 774 Local Government Areas (LGAs). It had also conducted an election in 2003 with almost real-time declaration of results. To this extent, the INEC capacity to absorb technology was not in doubt. However, what was in doubt was the political will to do the right thing. This was achieved through the selection of a Chairman who was reputed to be forthright. This was largely responsible for the success of the highly technical Electronic voters' roll. About 132,000 units of equipment were rolled out for a registration exercise that lasted for 3 weeks with the capture of the facial image and 10 fingerprints. The successful enrollment of voters provided a strong premise for INEC's capability to absorb new innovation such as e-voting.

4.2.2. Innovation leadership and champion

The INEC had a number of Innovation leaders. The Chairman of the Commission was a nationally respected academic with a daring personality. He was supported by a technically-sound consultant and Director of ICT with ample technology leadership experience and with a doctorate degree in Computer Vision. The technology champions also comprised young software developer volunteers whose motivation was professional recognition and prestige. The Chairman of the Electoral

Authority extended a high degree of trust to this technology team.

4.2.3. Relationship with external support entities

The Electoral Authority with the help of the United Nations Development Programme hired a former Google employee as a consultant for activities leading to the 2011 elections. The main technology deployed during the 2011 elections was to deal with the Voters' registration exercise. The new software was developed for the Ubuntu Linux platform, using C + +, Qt, FBI AFIS, MySQL, PostgreSQL; a collection of open source tools. There was no time for piloting, so the implementation team anticipated that the first week of rollout would experience a number of issues. Volunteer developers were hired and with two software experts stationed in each of the 37 states of the Nigerian Federation. In addition, two Hardware and Software experts were also sent to each of the 774 local government Areas (LGA's). Recharging and repair camps were set up for every 10 polling units. A huge number of temporary workers were employed and offered rigorous training. This level of preparation was considered critical for such large deployment and operation towards the 2011 elections.

4.2.4. Operations size and structure

The command structure of the deployment had the Chairman at the top advised by two technology experts – the external Consultant and the ICT Director. Below this were about 500 permanent technical officers of the Electoral Authority that held at least a college degrees or a diploma. These staff members were deployed for support services during the exercise. Other technology experts involved were discussed in the previous section. Besides these individuals, the INEC engaged additional 240,000 individuals and trained them to operate the Direct Data Capture (DDC) equipment at 120,000 locations across the country. A Central Situation Control Room was set up at the headquarters and smaller centers were set up at the 37 states of the federation. Technical and Software help was also available at the Local Government Areas and about 12,000 repair camps were set up at the Registration Areas.

4.2.5. Training readiness

There was a need to train more than 250,000 individuals to operate the equipment. INEC adopted the Train-the-Trainers method. About 40 super trainers were trained at the headquarter and dispersed to the states to train a total of about 800 individuals who went further to train another set of 12,000 individuals. These trained individuals finally trained the rest of the 250,000 operators. Training was conducted quite ahead of time. However, when the implementation exercise started, some untrained individuals were erroneously included in the group – this was very unfortunate and had a negative impact on the exercise.

4.3. E-voting technology innovation

A number of innovation characteristics have been found to be important in the adoption stage of any innovation. This adoptable innovation should: be clear in purpose, simple to use, unambiguously more advantageous than current practices, require minimal expertise to implement them, observable and transferable (Wisdom et al., 2013).

4.3.1. Complexity, relative advantage and observability

Despite the fact that the underlying technology deployed was relatively complex, the objectives of the e-voting initiative were clear to individuals involved. The essence of the e-voting initiative was to have individual's bio data collected with fingerprints and facial image, and in the end obtain a temporary photo ID. Given the country's notoriety for rigged elections, no one was in doubt as to the benefit of the e-voting project. All major stakeholders were aware that the exercise should lead to freer and fairer elections. Every category of staff of INEC and indeed the temporary staff often called the ADHOC staff observed the demonstration of the use of technology before adoption. Software testing was carried using the staffers as officials and registrants.

4.3.2. Cost-efficacy and feasibility

There was no explicit feasibility study of the cost benefits analysis of the technology adoption. This should be considered against the background that Nigeria had 120,000 voting points and had to deploy required infrastructure and equipment to these 120,000 points simultaneously. While sharing equipment would have been more cost-effective, the prevailing circumstances in Nigeria and the constraints of time as a result of the constitutional regime would not allow for such luxury. In terms of implicit cost-benefit analysis, the project was very beneficial to Nigerians. If the subsequent elections were not free and fair, violence that could threaten the corporate existence of the Nigerian entity would be considered imminent.

4.3.3. Evidence and compatibility

There was no evidence that the adopted technology would work in Nigeria. Indeed there was huge agitation about the use of Linux which was considered unfamiliar to typical Nigerian users. This coupled with the propaganda by big software firms brought a lot of doubts about the compatibility of the adopted technology in the Nigerian environment. However, it must be noted that the Software and the Hardware systems were purpose-built. The Software was built to cope with peculiarities such as people not knowing their date of birth and some individuals not having the complete 10 fingers for data capture. In the case of Hardware, every unit of equipment was supported by 2 Lithium-Ion batteries that were capable of lasting for 12 h. In addition, a generating set was made available for charging equipment for every 10 polling units. As there had been similar exercise, internal stakeholders believed that this technology met the needs of the people. Albeit some part of the country due to cultural beliefs were not very comfortable to have their women being photographed and being attended to by male operators. Voters' education and deployment of female operators helped in dousing tension that would have arisen as a result of this cultural sentiment.

4.3.4. Facilitators and barriers

Facilitators and barriers were determined from lessons learned from the earlier unsuccessful deployment of similar technology. Political parties, religious leaders, community leaders, traditional rulers, educational institutions were identified as facilitators. The barriers identified include unscrupulous operators who may be registering after hours – this barrier was dealt with by the use of time stamp. There were other operators who in order to discredit the system used images of strange objects. However, this was dealt with by assigning supervisors to look through the daily takings while backing up the data. Other barriers include the politicians that aimed at any cost to inflate the voter roll by encouraging their supporters to register many times. Consistent voters' education and demonstration of the technology which immediately identified unintended double registrant was employed. In addition to this, there was the use of threats to prosecute offenders. Many training and empowerment programs were in place that helped in reducing the tension especially when the exercise was not going smoothly.

4.3.5. Innovation fit with User's norms and culture

The use of e-voting essentially revolutionized the traditional practices of writing names on tabulated papers. It was obvious to the populace that this was a better option. However, they were afraid that data collected could be lost or used against them. The first fear was dispelled by writing names in the traditional way and secondly issuing a temporary voters card with barcode. These actions reassured them that even if the data is lost electronically it could still be obtained from other sources.

4.3.6. Trialability, relevance and ease

There was no pilot program involved in the implementation of the technology due to severe time constraints. However, different types of testing (including stress) were conducted on the e-voting system. The

tests did not bring up all the issues as expected, but the anticipation of regarding the first few days as a kind of trial period helped to deal with the negative impact that lack of a pilot would have brought up. The innovation to a very large extent solved the problem it was intended to solve. The voters appeared to have a level of confidence in the Voters roll. The international organizations elections observers commended the accuracy of the roll. While there were initial concerns about the use of the adopted technology, the attention paid to user-friendliness helped in changing initially perceived difficulty in the use of the system within a few days. Interestingly, the "big bang" approach with the use of pseudo-trial period employed in the deployment of e-voting technology in Nigeria appeared to work.

4.4. Electoral actors

A number of individual and entities characteristics were found important for successful adoption of e-voting technology. Observed characteristics from the different categories of individuals (including voters, candidates and their agents, electoral officers, political parties, civil society and observers) concerned with use of the e-voting technology are described below.

4.4.1. Voters

There was a very positive attitude by the voters towards the technology change. The voters were very motivated to use the technology. This was to the extent that some voters provided their generating sets as power backup while others provided their vehicles for the transfer of defective equipment. The participation rate was about 90% while acceptance was about 80%. It has been noted that in Nigeria the Voters register attract more respondents than any other registration effort. Voters do know that without a voters' card they cannot vote. The knowledge and skill of Voters as actors increased as the exercise proceeded and indeed they started discovering solutions to some technical problems e.g. washing of hands before fingerprinting.

4.4.2. Candidates and agents

Candidates and aspirants were skeptical at first, but later gained confidence in the system after a series of testing for double registrants. The candidates later educated their supporters about the system. The candidates also intensified their campaign strategy, since they knew rigging was unlikely to work. This had a positive impact on the polity.

4.4.3. Electoral officers

Electoral officers are personnel of the Commission. The general attitude of the electoral officers was firstly that of fear. Their experience of similar technology had not been very successful. With this doubt of the workability of the system they were very concerned about backup and the need to provide an alternative list, in case the electronic one fails. Having seen the ease with which the technology worked and the ease that it will bring to their responsibility they embraced the technology wholly. The INEC also tried to carry them along as the development was ongoing and this helped to own the innovation. The Electoral officers were motivated to use the system after their initial concerns were dispelled. The participation and acceptance rate was more than 95%. The level of knowledge of the group was close to 98%. Some of them had to train the operators under them.

4.4.4. Political parties

The political parties' initial attitude was to act against the introduction of the innovation, as they hitherto benefitted from the inaccurate roll. Realizing that there were no alternatives, they had to adopt the innovation. However, attempts to carry out malicious actions to compromise the innovation or the users persisted. Compromised ICT personnel of INEC were identified and subsequently dismissed. After these initial challenges, acceptance rate ultimately reached about 89%. Party representatives demanded CD copies of the Electronic list. The political parties were motivated to use the innovation. In fact, after the elections, some of them used the innovation as a basis for litigations.

4.4.5. Civil societies

The civil society organizations (CSO) in Nigeria had been very active on electoral issues, with strong support from international organizations and development partners. This group of organizations was trained on the use of equipment. The initial reluctance and scepticism were overcome by active engagement, accepting the innovation as "sine qua non" for free and fair elections. Subsequently, the CSOs assisted in education about the innovation. After conducting their own tests their acceptance rate was over 90%.

4.4.6. Observers

Most international observers were not users of the innovation. For local observers the write-up for CSO's above holds. Often, the local observers are drawn from the CSOs. As indirect users or rather a non-users, their acceptance of the innovation can only be derived from their reports, which is often not quantitative. The e-voting innovation was rated very highly by these international and local observers (National Democratic Institute for International Affairs, 2011). The innovation was accepted as a basis for a credible election.

A summary of mechanisms in the above narratives is presented in Table 3 below.

5. Analysis

This section provides an analysis of the narratives above for the different constructs and the post-election review reports (Independent National Electoral Commission, 2011) which provide detailed account about the issues and learnt critical success factors for the elections. An interesting aspect of the report is that each of the 37 states of the federation provided separate reports on the issues, challenges and critical factors for future successful elections. As indicated in Section 3, due to the volume of the report, we randomly selected reports across the 37 states ensuring representation from each of the 6 geo-political zones in the country. Analysis revealed a number of patterns across these narratives and reports. Since we were interested in major factors for adoption as well as major challenges, only themes that featured at least twice across the reports were selected as significant. The identified adoption factors are described here across the four adoption contexts – Socio-political and external influence, Electoral Authorities, e-Voting Technology and Electoral Actors.

- Socio–political & External Influence - The most important factor identified at this level is the role of the Inter-Agency Consultative Committee set up to coordinate electoral matters and ensure security across various states of the federation. The second related factor is the availability of adequate security for all polling units.

- Electoral Authorities–At the organizational level, structural factors like timely receipt and distribution of e-voting materials and men at the polling units, adequate publicity, and sensitization of stakeholders, inter-agency collaboration among the Electoral Authority and other offices and consultation with stakeholders are important.
- E-Voting Technology- Regarding the e-voting technology itself, the belief that the technology will enable better election outcomes was a key factor. The "cultural acceptance" of technology is another important factor. For instance, the use of technology that does not require taking photographs of female voters/registrants is important for electorates in the Northern part of the country. Another important factor is user friendliness and use of the highly customized (built for purpose) solution to address concrete realities or requirements of the environment.
- Electoral Actors–overcoming past fears and experience (e.g. through campaigns and engagement) in addition to clearly communicating

Table 4
Identified factors for adoption constructs from the case study.

Level	Constructs	Factors from case study analysis
Socio-political and external influence	Environment	o Cultural Diversity (m1, −) o Physical terrain (m2, −) o Adequacy of physical security (review) ** o Availability of inter-agency consultative committee on election security (review) *****
	Policies and regulations	o Regulatory Framework for e-voting (m4, m5, +)
	Incentives	o Work free days, education support for parents (m8, +) o Acceptance of voter's card for identification (m9, +)
Electoral authority characteristics	Absorptive capacity	o Organizational readiness (m10, +)
	Leadership capacity	o Strong technocratic and acceptable leadership (m12, m13, m14 +)
	External relationships and networks	o Availability of support to rural regions (m16, m17, +)**
	Operations size and structure	o Well-defined organization Structure (m22, m23, +) o Effective operational context for e-voting innovation (review) ****
	Norms, values and culture	o Sound communication culture (m24, +) o Publicity and sensitization of stakeholders (review) ***
	Training readiness	o Staff readiness for training (m25, +) * o Use of well-trained personnel to operate e-voting technology (review) ***
	Readiness for change	o Willingness of staff to adopt e-voting technology (m29, +)
E-Voting technology innovation	Complexity, relative advantage and observability	o Perceived usefulness (m31, +)
	Cost-efficacy and feasibility Evidence and compatibility	o Enabler of free and fair election and general election outcomes (m36, +)
	Facilitators	o Support of key stakeholders like community leaders, religious leaders, political parties, etc. (m41, +)
	Barriers	o Entrenched culture of electoral malpractice (m3,m42 -) o Ineffective training (m26, m27, −)
	Innovation fit with user's norms and culture	o Localisation of e-voting Solution (m39, +) o Cultural acceptance of technology (review) o Concerns on use of collected data beyond election (m44, −)
	Trialability, relevance and ease of use	o Ease of use of e-Voting Solution (m30, m46 +)
Individuals - electoral officers (EO), Voters & stakeholders	Attitude of EO towards change	o Trust and confidence in system (m48, +)
	Motivation of EO to use innovation	Believe about the efficacy of the e-voting (m49, m50, +)
	Participation and acceptance rate	o Participation of election stakeholder (m51, +)
	Voter's attitude to change	o Voter's acceptance and trust (m48, +)

the benefits for each category of actors are considered to be major factors for adoption.

As shown in Table 4, the strength of each of these critical factors is indicated by the number of references supporting them (represented as *).

6. Discussion

Various studies on the diffusion of innovation in organizations and technology acceptance by individuals and groups have been carried out. This has also led to the development of many related theoretical frameworks and models across different domains including e-voting. However, only a few existing research like (Venkatesh et al., 2003; Wisdom et al., 2013) and to a large extent (Kamal, 2006) have attempted to integrate this fragmented landscape. Unlike (Venkatesh et al., 2003), which only examines technology (or innovation) adoption at individuals or groups level, Wisdom et al. (2013) and Kamal (2006) provide multi-level or multi-faceted perspective to innovation adoption by organizations and individuals/groups taking into consideration the external environment in which the innovation is embedded. In fact, Kamal's IT adoption model in the government sector could be easily mapped to Wisdom's Context-Mechanism-Outcome model (Wisdom et al., 2013).

We have leveraged the work by Wisdom et al. (2013) to consolidate the extant literature on e-voting adoption into a multi-level or robust multi-context adoption model, used subsequently as an analytical framework for structuring the ethnography of the 2011 Nigerian General Elections. Results from our analysis of the adoption of e-voting experience in Nigeria strongly underscore the importance of context and environment in organizational innovation diffusion and innovation adoption by individuals or groups. For instance, the overall outcome of the election was by far more important to stakeholders in their election review report than the efficacy of the e-voting technology. It was interesting to note that the review report only examined structural issues around the e-voting technology but not the technology itself. In addition, the Inter-Agency Consultative Committee for coordination and security of elections was considered as one of the most important critical factors for successful election outcomes. This factor enables the availability of e-voting equipment at the different polling units. Fig. 1 above shows a consolidated model for e-voting adoption success based on the analysis of the case study.

By producing a list of critical factors for the different adoption constructs across the 4 levels, we are also in a position to validate some of the adoption constructs presented in Wisdom et al. (2013) and Kamal

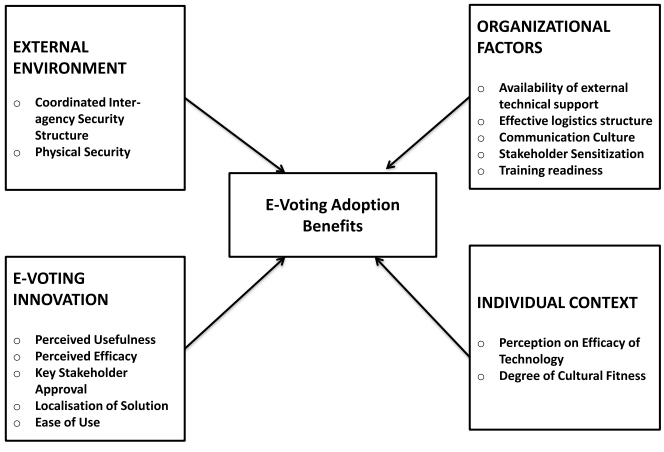

Fig. 1. E-Voting Adoption Model.

2006. In addition, we provide some measure of the importance of these constructs for the e-voting domain. For example, explicit identification of coordination through inter-agency committees directly support the claim in Wisdom et al. (2013) that lack of coordination negatively impacts adoption. Actually, our results enable us to produce a more specific multi-level adoption model for e-voting as shown in Fig. 1. As with any other ethnographic studies, one of our biggest contributions in our mind is in the depth of information revealed about the different factors in our framework. Some of the negative factors that could inhibit successful adoption of e-voting captured in literature were also found our case study. For instance, the use of "big-bang" approach (inadequate trials) raised many problems in the rollout of the technology in the case under study. Also, high level of distrust of politicians and poor credibility of the Electoral Authority were major obstacles that had to be directly addressed, e.g. intense publicity, effective communication strategies and stakeholders engagement.

It is plausible to question the generality of results produced from ethnographic-style research like ours. First, like any case-based studies, theory testing and building are generally possible in ethnographies. Arguments similar to those by Eisenhardt in Eisenhardt (1989), Eisenhardt & Graebner (2007) are equally valid for ethnography. Therefore, we can claim that ethnography is appropriate for new topic areas and often result in theories that are novel, testable, and empirically valid. Thus, the process for theory generation described in Eisenhardt (1989) for case studies could be equally employed for ethnographic studies.

In evaluating an ethnography, Myers (1999) offers criteria for evaluating this kind of study, which includes: 1) Is this a contribution to the field?, 2) Does the author offer rich insights?, 3) Has a significant amount of materials been collected? and 4) Is there sufficient information about the research method?

Considering our arguments above, we claim that our work makes concrete contributions to the e-voting theory development. None of the existing e-voting adoption models reviewed in the literature (see Table 1) provides constructs at the four levels presented in Fig. 1. The work also contributes to innovation adoption theory by operationalizing the multi-level adoption framework in Wisdom et al. (2013) as well as the IT innovation adoption in government model presented in Kamal (2006). In addition, as indicated above, our analysis offers in-depth insights into the critical factors and challenges in e-voting adoption in a developing country context similar to Nigeria, i.e. a country with a large population similar to Indonesia or to some extent India. As shown in Sections 4 and 5, significant materials were collected and available to the researchers. Furthermore, we have argued earlier about the validity of our results based on the agreement with factors associated with constructs in Wisdom et al. (2013) in particular.

One of the major drawbacks of the ethnography research, in general, is the amount of time it takes to analyze materials. For example, we had to carefully sample (stratify) about 50% of the reports from different states of the federation to determine the critical factors and related challenges, in addition to extensive records available to the participating author.

7. Conclusions

This work partly responds to the call for more ethnographic studies in IS research (Rowe, 2012). We consolidated the fragmented e-voting adoption landscape as part of the process of constructing our analytical model. Our results also provide a more holistic empirical study of e-voting when compared with past studies on e-voting adoption. In fact, we are unaware of any existing work that has carried out a detailed multi-level analysis of e-voting adoption in general and specifically in the African or developing world context. We believe that this work contributes to theory building in the adoption of e-voting technology and demonstrates the application of the multi-level innovation adoption framework. The identified critical success factors and some of the challenges reported in the post-election report provide a good basis for practical recommendations. Specifically, this article offers five recommendations for policymakers and researchers and other key stakeholders working with Electoral Authority involved in the adoption of the e-voting technology:

- First and fundamentally, any e-voting solution should be considered as a part of the ensemble of important elements for organising successful elections – A major implication of our findings is that ultimately, stakeholders are more interested in the overall outcome of the elections in terms of its fairness, freedom from third-party influences, satisfaction of all stakeholders and adequacy of security at all levels. This means adoption of e-voting solutions must be situated within a broader socio-technical and organizational context as elaborated with our multi-level innovation model. The success of the entire system is what really matters to stakeholders.
- Second, the Electoral Authority responsible for driving the use of the e-voting technology must have the capacity to efficiently support the use of e-voting solution not only at major election centers but also at remote and rural locations – This requirement on size and structural capacity of the Electoral Authority is key to avoiding crisis from the use of the e-voting solution during the elections. For instance, in our case study, the oversensitivity of the fingerprints recognition module for rural voters (with rougher handprints) led to high false negatives which required immediate reconfiguration of the systems at those locations. This unforeseen problem threatened the integrity of the elections. Consequently, adequate logistical arrangement and rapid response processes must be in place organizationally to support the use of the solution in remote locations.
- Third, communication with stakeholders and among the various institutions (both government and non-governmental) involved in the adoption and use of the e-voting solution must be carefully planned and executed – Most of the initial problems and barriers to adoption of the e-voting solution in our case study was around trust issues from the political parties and their agents. While the general logic behind the adoption of the e-voting solution made sense to the public, convincing the political stakeholders and their supporters about the efficacy of the innovation and the ability of the Electoral Authority to deploy the solution without the risk of disenfranchisement of electorates was difficult. Consequently, the Electoral Authority must maintain ongoing communication on issues identified, solutions sought and backup plans throughout the adoption process with all major stakeholders.
- Fourth, while it is clear that training will be required for all personnel involved in the adoption and use of the new e-voting solution, emphasis must be put on the efficacy of the training programmes – Albeit, most e-voting solution implementations will be accompanied by training programmes, experience from the case study shows that often the Electoral Authority and associated agencies fail to carefully select appropriate personnel for training to equip them with the required competencies. This factor had major consequences in the case presented in this article. Specifically, according to the National Democratic Institute for International Affairs (2011), there were major differences in the duration and contents of training programmes across the country. This lack of standard and inadequate coverage of trainees resulted in untrained and ill-trained personnel handling the e-voting equipment and consequently disruptions in the registration and validation processes.
- Fifth, given that most e-voting innovation involve relationship with technology vendors, adequate time must be given for localisation and customisation to fit the reality of the adopting environment – There is a general tendency to underestimate the time required for successful deployment of the associated technology supplied by a vendor. Regardless of the contract terms with technology supplier, appropriate slack time must be provided as a safeguard in the deployment of generic e-voting technologies that needs to be probably

adapted to local conditions related to infrastructure such as power in remote places or unanticipated physical conditions of voters, e.g. inability of machines to read the fingerprints due to physical injuries or scars on fingers. Where possible, additional timing and contingencies must be factored into contract terms for voters for agile adaptation of the associated e-voting technology and solution.

As with ethnographic and case study research, care must be taken in generalising our findings to contexts that are very different from ours.

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