

Proposal for Efficient and Reliable Electronic Voting System in Nigeria

O. I. Shittu¹; S. O. Oyamakin; A. U. Chukwu

Statistical Modeling Group (SMG)
Department of Statistics,
University of Ibadan, Ibadan, Nigeria.
E-mail: oi.shittu@hotmail.com¹

Abstract — The third republic in the Nigeria's democracy is twenty years old. The 2019 general elections in Nigeria has come and gone with all its anomalies at the expense of the tax payers money. The election umpire has demonstrated high level of incompetence in view of the increasing number of political parties and number of candidates contesting, voting age population and other factors have led to huge increase in the wastage of tax payers money on election process. This paper therefore, highlight the imperative of biometric electronic voting system in Nigerian democracy in view of the enormous problems associated with the traditional paper-based voting system. An electronic voting system is proposed with a view to ameliorating the problems and wastages associated with paper-based voting system. The proposed voting system is expected to enhance election participation by reducing election apathy among the elites in the society.

Keywords: Democracy, Political party, Election participation, Electronic voting, voting age population.

I. INTRODUCTION

Electronic voting systems are used in countries all over the world, but adoption of this technology has been somewhat haphazard. A few countries have tested electronic voting and adopted it, others have tried it out and abandoned it, and some continue to test it or have plans for further testing in the future.

Only a small handful of countries use electronic voting technology on an ongoing basis, and even fewer use it nationwide as the sole voting method.

Types of Electronic Voting in World Elections

There are three main types of electronic voting systems that have been used in elections around the world. Some countries use one type of voting nationwide, and others use

different types in different areas. Optical scanning, Direct recording Internet voting Khasawneh et. al.(2008).

Optical Scan Voting Machines in World Elections

Optical scan voting system is the oldest and most common. With this system voting machines use paper ballots that are marked by the voter and then scanned for electronic tabulation. This process is very similar to traditional paper-based voting, but it allows ballots to be counted and results made available in a much shorter time frame.

Since optical scan technology has been around for so long, it has been used in many countries throughout the world. Some countries have adopted optical scan technology across the board, some have abandoned it, and others use it primarily for absentee votes. Countries where optical scan voting is used in at least some municipalities include Canada, United States, Philippines, South Korea. The system was however discontinued in the United Kingdom and Germany

Direct Recording Electronic Voting Machines

Direct recording electronic (DRE) voting system is newer and less common. It records votes electronically, and store them electronically, without the voter interacting with any physical ballot. These machines can use touchscreen interfaces, dial controls, and push-buttons. Brazil and India are countries that have implemented DRE voting machines nationwide.

Some DRE machines use a single master ballot that is inserted into the machine in some way to show voters which buttons to push to vote for which party and candidates. Other machines use the same types of screens found in computers, tablets, and smartphones to display the ballots.

While there are no physical ballots used with DRE voting machines, some are designed to create a paper trail. These

machines typically print a ballot receipt for each voter to confirm. The receipts are then retained for verification and recount purposes.

Brazil has used DRE voting machines on a limited basis in 1996, expanded its use throughout the country in 2000 but were eliminated entirely in 2018. Brazil have now adopted electronic voting at all levels nationwide

Internet voting system

Internet voting is the rarest form of electronic voting, and it allows voters to register their votes over the internet. These systems can use physical polling places or allow voters to use their own devices in their own homes. Estonia has implemented this type of voting nationwide, while other countries allow it in more limited circumstances. The following countries: Bhutan, United Kingdom, Italy, Norway, Kazakhstan, Australia, Nepal, Philippines, Australia, Guatemala, Costa Rica, Ecuador, Russia, Mongolia, Nepal, Bangladesh, Indonesia, Finland, Somalia (Somaliland) and Switzerland have tested the electronic voting system. Canada, United States, Peru, Argentina have used electronic voting in some parts of their country

while Brazil, Estonia, India and Venezuela have used it nationwide in their countries.

In Argentina, electronic voting was first implemented on a limited basis in 2004. Additional election reform legislation was passed in 2016. Argentina purchased DRE voting machines from South Korea for its 2017 national election, but they were not used due to security concerns.

Nigerian Bar Association (NBA) used internet voting system in 2017 to elect their council members but the result of the exercise is still being contested in various courts all over the country.

Source: <https://www.lifewire.com/which-countries-use-electronic-voting-4174877>.

II. NIGERIAN EXPERIENCE

Nigeria has been practicing manual voting system as an independent nation since 1960 with 360 federal district 176,996 voting points. However, since the advent of the third democratic dispensation in 1979 and with the increase the population, voting age population, manual voting has been very cumbersome with the outcome of the elections contested every voting year at all levels from the presidential election to the local government levels.

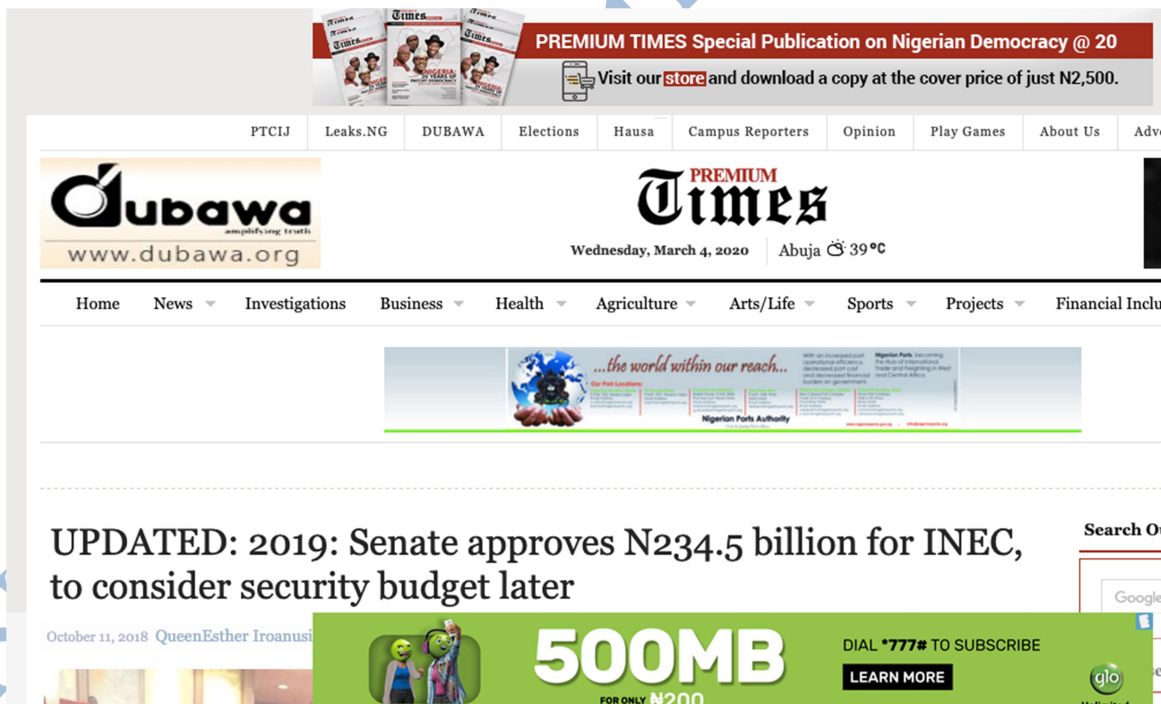


Figure 1: Newspaper headlines of INEC request for more funds

In a manual paper-based election voting system, the electorates cast their votes to select their candidates using a designed ballot papers by the Independent National Electoral Commission (INEC), where electorate simply cast their ballots and deposit in sealed boxes distributed across the polling units in the local government around the country. At the end of the election, all these boxes are officially opened and votes counted manually in the presence of certified party agents for the few political parties. This is done for all the candidates until the total number of votes are compiled for all parties and results declared at the ward level, Local Government (LG), state and at the national level for the presidential elections. The manual voting process warrants transparency at the voting/polling units during vote counting before the compilation at the ward levels before compilation at the LG and State levels.

Many times, however, counting errors take place, and in some cases, voters find ways to vote more than once, introducing irregularities in the final results, which could, in some cases lead to inconclusive elections, and hence require a repeat of the election process altogether in the constituency or the state (Figure 1). Moreover, in some cases, some political parties purposely manipulate the electoral process with the objective of distorting the results of an election in their favor of a political party and/or

certain candidates. Here, all such mishaps can be avoided with a properly scrutinized election process; but when the electoral votes are too large, errors can still occur Khasawneh et. al.(2008).

With the increasing number of political parties (91 in the 2019 elections), there is huge increase in the number of contestants for post of (president, Governors, Senate and house of representative member, State legislatures and local government chairmen and councilors). This leads to huge volume of paper to produce election materials including ballot papers. Nigeria's experience in 2019 elections is a good example where the election umpires have displayed gross incompetence blamed the reasons on logistic problems and whether conditions. The cost of transporting election materials in the states and senatorial districts, cost of honorarium (permanent and ad-hoc staff) and high cost of maintaining and mobilizing local and international election observers throughout the 774 local governments in the country constitute a large chunk of the total cost of the election fund. All the above has led to increasing high cost of conducting general elections. Another disturbing issue is payment of money for votes (vote buying) particularly at the primary and general elections.

The figure comprises the N189 billion requested by INEC to conduct the 2019 general elections, and N45 billion provided for the commission under statutory transfer.

The Senate on Thursday passed the sum of N234 billion for the Independent National Electoral Commission (INEC) in the 2018 budget.

The lawmakers approved that the N189 billion be vired from both recurrent and capital components of the Special Intervention Programme captured in the Service Wide Vote of the 2018 Appropriation Act.



TRENDING

Figure 2: Presidents' request for more funds for INEC through the Senate

Considering Figures 1 and 2 above, It is clear that Nigeria naturally calls for a change in paper-based elections to a fully automated electronic or online computerized election process. In addition to overcoming commonly encountered election pitfalls of the traditional voting system, electoral vote counts are done in real time that by the end of elections day, the results are automatically out [1, 2]. The election process can be easily enhanced with various

features based on the demand and requirements of different countries around the world.

III. BIOMETRIC E-VOTING SYSTEM

Biometrics is best defined as measurable physiological and / or biological characteristics that can be utilized to verify the identity of an individual. They include fingerprints, retinal and iris scanning, hand geometry, voice patterns,

facial recognition, Gait recognition, DNA and other techniques Khasawneh et. al. (2008) They are of interest in any area where it is important to verify the true identity of an individual. Initially, these techniques were employed primarily in specialist high security applications; however, we are now seeing their uses and proposed uses in a much broader range of public facing situations.

Essentially, a biometric system follows two characteristic traits: identification and verification. The former involves identifying a person from all biometric measurements collected in a database. The question that this process seeks to answer is: “who is this?” It, therefore, involves a one-compared-to-many match. Verification involves authenticating a person’s claimed identity from his/her previously enrolled pattern. “Is this who he claims to be?” is the question that this process seeks to answer. This involves a one-to-one match [6, 7].

IV. PROPOSED ELECTRONIC VOTING SYSTEMS

According to Khasawneh et. al.(2008) voters arrive at a voting station according to a Poisson arrival process, and the temporal distance separating the various arrivals is

modeled as an exponential random variable. The hypothetical maximum number of voters arriving at a voting center is set by the system admin *a priori*; this is explained by the fact that the number of voters in a given voting district is known beforehand.

Each voter would swipe his/her official identification card through a magnetic card reader, at which point he/she would be prompted for his/her finger print upon completion of which a candidate screen would pop up showing pictures of candidates in the electoral circuit of the voter. If the voter’s record indicates other needed forms of display/presentation (as embedded in the information on the voter’s ID card), such as sound, then those forms will be used instead of the candidate image display/s.

The voter would select his/her candidate of choice at the touch of an image displaying the picture of his/her candidate of choice. The system also allows the voter to cast the vote via audio means for those voters with special needs. At this point the voting process for a given voter is complete and the voter count is tallied in favor of the chosen candidate.

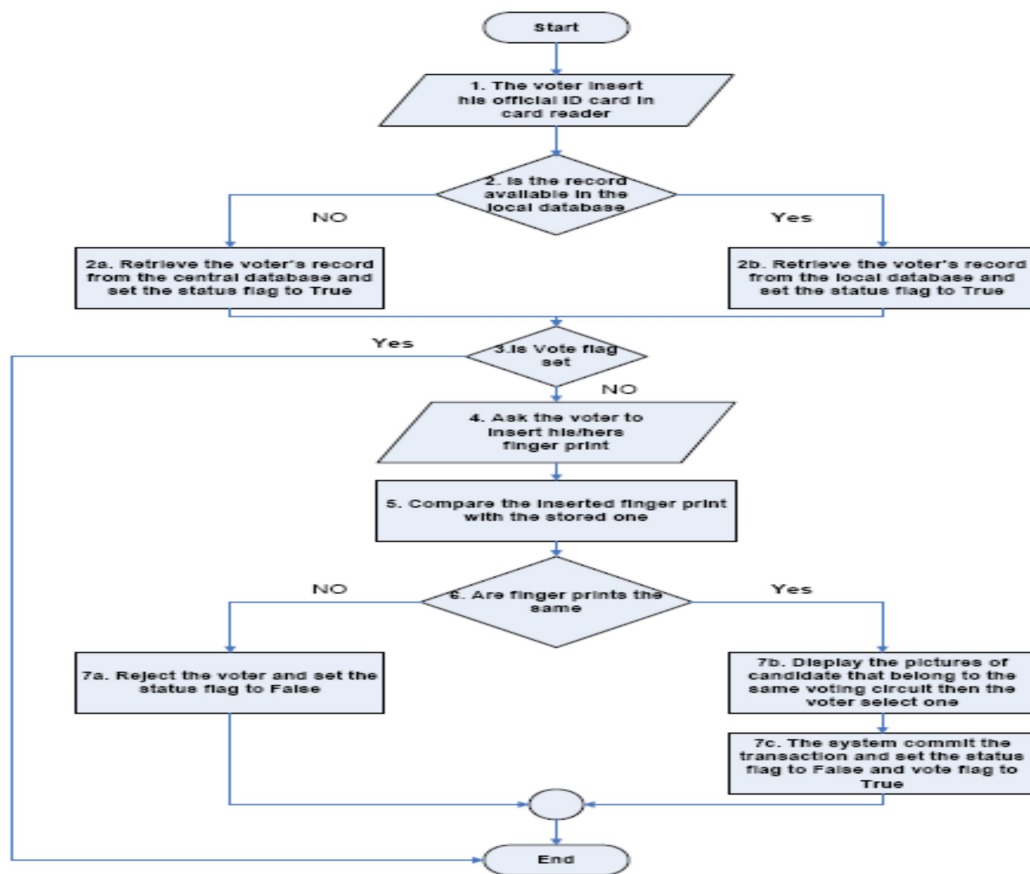


Figure 3: Proposed flow chart of the e-voting systems Algorithms

In Figure 3, it is assumed that the speed of the voting process is governed by a number of limiting factors: First, a growing queue length was seen to adversely impact the rate at which voters were able to cast their votes. Second, the response time of the system, right from the minute a voter would step into a voting center until the cast vote is tallied in favor of one candidate or another, is adversely impacted by the database response at the server end. Third, the network response time, viz., available network bandwidth, plays out big at determining the transaction time per voter.

V. CONCLUSION

For the particular purpose of this paper, we have assumed that the network bandwidth is infinite. We plan to investigate the network impact on the voting process in an ongoing study. However, using the client/server model with the embedded local DB infrastructure, we anticipate minimal impact of network. Also, there is a plan to validate the effectiveness of this algorithm through the following channels for acceptability while we continue to train the model for effective deliveries at elections; Upper and Lower Houses of Assembly, University Senate elections across the six geopolitical zones and state house of assemblies.

REFERENCES

- [1] R. Mercuri. Electronic Vote Tabulation Checks and Balances. PhD thesis, University of Pennsylvania, Philadelphia, PA, October 2000.
- [2] A. D. Rubin. Security considerations for remote electronic voting. *Communications of the ACM*, 45(12):39–44, December 2002. <http://avirubin.com/evoting.security.html>
- [3] McGaley Margaret, McCarthy Joe, “Transparency and eVoting: Democratic vs. commercial interests”, www.cs.nuim.ie/~mmcgailey/Download/Transparency.pdf
- [4] Online Voting. Parliamentary Office of Science and Technology. May 2001. www.parliament.uk/post/pn155.pdf
- [5] McGaley, Margaret. “Irish Citizens for Trustworthy Voting.” 6 July 2004. <http://evoting.cs.may.ie/>
- [6] Joshua Smith with Advisor Dr. S.Schuckers, Improving Usability and Testing Resilience to Spoofing of Liveness Testing Software for Fingerprint Authentication, 2005
- [7] S. Nanavati, M. Thieme, R. Nanavati. *Biometrics: Identity Verification in a Networked World*. John Wiley and Sons, Inc. 2002.
- [8] Trupti Umakant P and More S.V (2016): A Survey on Secure E-Voting System Using Biometrics, *IJARSET*, vol. 3, Issue 3, ISSN: 2350-0323
- [9] Abirami P, Anandha R.J and Palamisamy V (2018): A Survey on Biometric E-Voting System Using Retina, *Intl. Joul. Of Pure and Applied Maths.*, vol. 118, No. 8, 517-521. ISSN: 1314-3395
- [10] Khasawneh M, Malkawi M, Al-Jarah O and Hayajneh T.S (2008): A Biometric-Secure e-Voting System for Election Processes, *Proc. Of the 5th Intl. symp. On Mechatronics and its applications*, Amman, Jordan.