

Electronic Voting: Challenges and Prospects in Nigeria's Democracy

Alausa Dele Wasiu S.¹, Akingbade Luisa O.²

¹B.Sc, M.Sc, Mnse, Coren Regd, ²B.Sc, M.Sc

^{1,2}Department of Computer Engineering the Federal Polytechnic, Ilaro, Ogun-State, Nigeria.

ABSTRACT

One basic feature of democracy is that it cuts across all divides of people in the act of election. It also encourages individual freedom according to the rule of law; hence people may behave and express themselves as they choose. This paper examines the development and implementation of an Electronic Voting System (EVS) that enables voters to cast their votes online and also enables the officials to register voters and print out the results of the votes casted. It equally provides security such that voters can only vote once with their identification details. The system therefore eliminates common fraud, speed up the processing of results, increase accessibility and make voting more convenient for the citizenry.

Keywords: Voters, EVS, Speed, Accessibility, Identification Details.

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I. INTRODUCTION

Electronic voting procedure simply is the use of computer technology in undertaking such activities as Voter Registration Exercise, Voting and Vote Counting. If properly implemented, e-voting solutions can eliminate certain common avenues of fraud, speed up the processing of results, increase accessibility and make voting more convenient for citizens in some cases, when used over a series of electoral events, possibly even reducing the cost of elections or referendums in the long terms. With the passage of time, voting, which was mainly manual, has been influenced by information Technology, with debates arising about the relevance or not, of computerized/online voting. Thus, electronic voting (e-voting) system is a voting system in which the election data is recorded, stored and processed primarily as digital information (Dimitis Gritzalis, 2003). Electronic voting is often seen as a tool for advancing democracy, building trust in electoral management, adding credibility to election results and increasing the overall efficiency of the electoral process. The technology is evolving fast and election managers, observers, international organisations, vendors and standardisation bodies are continuously updating their methodologies and approaches.

Voting technology and ballot design can influence election outcomes, affect how voters felt about their ability to exercise their right to vote and influence voter's willingness to accept the results of an election as legitimate (Benjamin B. Bederson et al 2003).

According to McGaley, M. and Gibson, J.P 2003 "Internet voting system have gained popularity and have been used for government elections and referendums in the United Kingdom, Estonia and Switzerland as well as municipal elections in Canada and party primary elections in the United States and France". There are also hybrid systems that could include an electronic ballot making device (usually a touch screen system similar to a DRE) or other assistive technology to print a voter verified paper audit trail, and then use a separate machine for electronic tabulation. According to council of Europe, "After tests conducted on more than 50 municipalities, the Brazilian electoral justice launched their voting machine". Since 2000, all Brazilian voters are able to use the electronic ballot boxes to choose their candidates. The Presidential election, which had more than 135 million voters, the result was defined 75 minutes after the end of voting (Council of Europe, 2011).

Unlike just every other system in our society, this voting system must be usable by every citizen at least 18 years old. This includes the elderly, disable, uneducated and poor users. Validation is carried out using any government approved means of identification like Driver's Licence, National Identity Card, and International Passport or electronic means like biometric capture.

In Democracy the rules of law is paramount and ensure the protection of the rights of the citizens. In a society where there is the rule of law order is maintain and this help to limit the power of government. In countries that practice true democracy all citizens are equal under the law; no one is discriminated against on the basis of race, religion, ethnic group, or gender. All citizens are entitle to fair hearing and may not be denied their freedom. No one is above the law. There are many criticisms against the use of electronic and internet voting. These schools

of thought have argued that results of electronic elections are not verifiable nor are they able to guarantee fairness of elections. (Okonigene, R.E. and Ojjeabu, C.E. 2011).

It should be noted that transparency in this voting process fosters voter confidence and should be open to Inspection. Also voters are able to cast votes with equipment and skills and no one is able to determine how any individual voted. Only authorized voters are able to vote, while the voting systems records the votes correctly with reliable and demonstrable authentic election records.

II. METHODOLOGY

There are different methods of casting votes during an election, they are Manual voting system (Manual ballot system, Head counting, Voice vote) and Electronic voting (Online voting, Biometric recognition voting and Automated voting system). The method employed in this work is the Electronic Voting. The inefficiency of manual voting system, time and resources wasted during the voting has brought about the development of the Electronic Voting, which would provide accuracy, speed and security that would ensure a credible election at any level of government. The cost implication of online voting and biometric recognition voting system gives the E-Voting system an added advantage because it is less expensive and easy to acquire, maintain and service.

2.1 DESIGN ANALYSIS

This work was designed using Software Development Design (Programming Interface). This involves the design and implementation of an Online Voting Portal that could be used for e-voting. This portal was designed using ASP.NET MVC which is an open source [web application framework](#) that implements the [model-view-controller](#) (MVC) pattern.

The online portal had its design using the Microsoft Visual Basic Environment (MVBE) with the ASP.NET Model-View-Controller (MVC) which is an open source web application framework that implements based on the MVC pattern. A *model* represents the state of a particular aspect of the application while a *controller* handles interactions and updates the model to reflect a change in state of the application, and then passes information to the view. A *view* accepts necessary information from the controller and renders a user interface to display that information. The MVC pattern was adopted in the design of the Front End interface which is the designing of the Graphic User Interface (GUI) application and the programming coding. This front end design is been segmented into two levels of Voter and Administrator.

Figure 2.0 below explains the roles of the voter and administrator software. The voter software refers to the section of the portal that handles voters' information while the administrator software refers to the section of the portal that is open and assessable to the portal administrator in other to supply voter information.

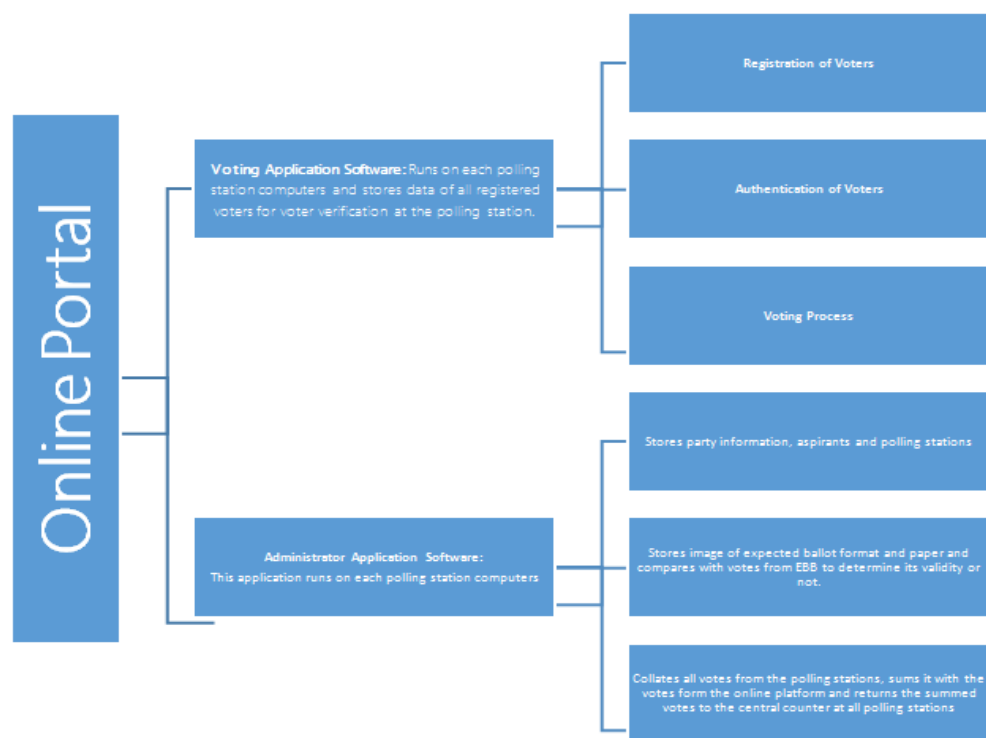


Fig 2.0: Online Voting Chart.

The chart in figure 2.0 depicts the application embedded in the voting portal developed. The embedded applications comprises of;

The Voting Application Software that incorporates the voter registration, voter authentication and the voting process as well as the Administrator Application Software that incorporates the party information, the expected format and ballot, the ballot comparator and the collation of the online votes and summation of same.

The Voting Application Software

- ❖ The Voter Registration Interface gathers information about the voter and to determine the eligibility of the voter through the use of 3rd party database platforms like the National Driver's License, National Immigration Service, etc. Upon successful age verification from any of these authorized database platforms the voter supplies the necessary information and proceeds to open an *Online Voting Account* that will be required to authenticate the voter in the voting platform of the portal. The login details into the voting platform will require an additional token which is generated once the voting account is created successfully. All voter information will be sent to the e-mail supplied by the voter during Bio-data input and the voter may print the voter card produced after supplying all information. If the voter's age could not be verified, the voter has the opportunity to make three attempts at getting the age verified.
- ❖ Voter Authentication: Authenticating all eligible voters on the portal is done when the voter logs into the platform, enters the username and password supplied during registration and also the token generated on the portal upon successful registration.

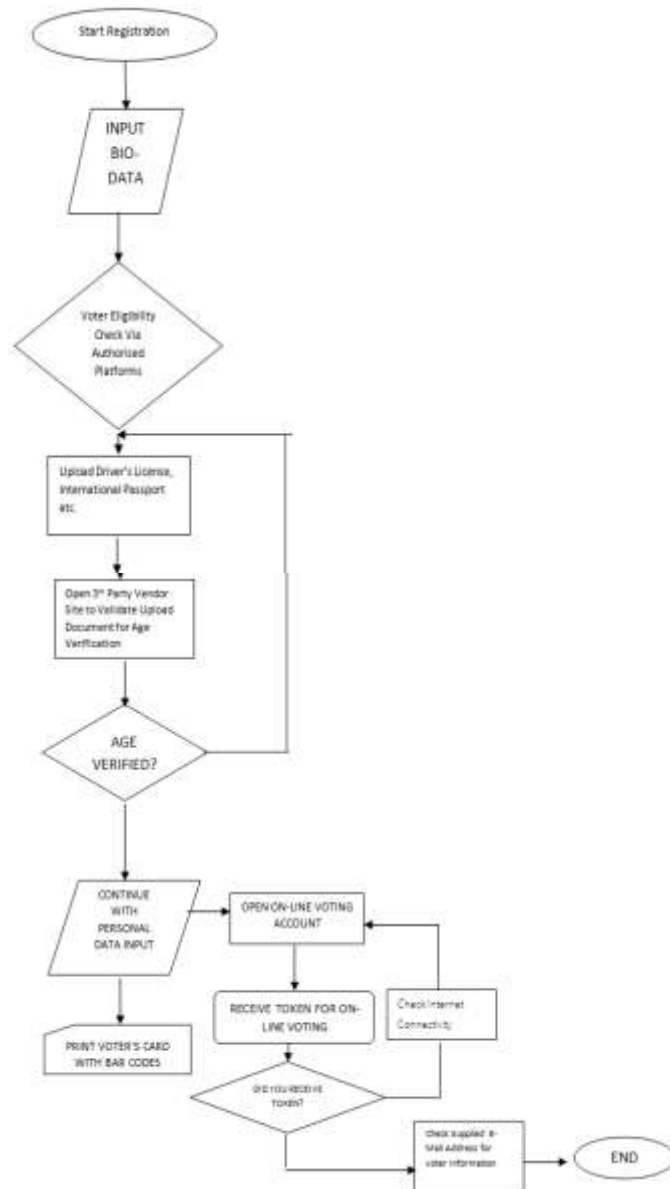


Fig 2.1: Voter Registration Flowchart

- ❖ **Voting Process:** The voting process is as depicted in fig 2.2. The flowchart represents voting process via the online portal. Voting commences on the online platform with a successful completion of voter authentication process. Upon login, an online ballot paper will be generated. The ballot paper carries the party logo and the position(s) vied for and the voter is expected to select the party to be voted for. The voter confirms the ballot paper and proceeds to vote by clicking the vote tab. This stage generates another token that will authenticate the vote. This token would be forwarded to the voter's mobile phone via a Short Message Service (SMS) and the token would be valid for 5 minutes after which the token becomes invalid. The token received is typed into the portal to validate the vote, however, if the token had expired the cast vote would be recorded as invalid. The online counter displays the number of valid and invalid votes.

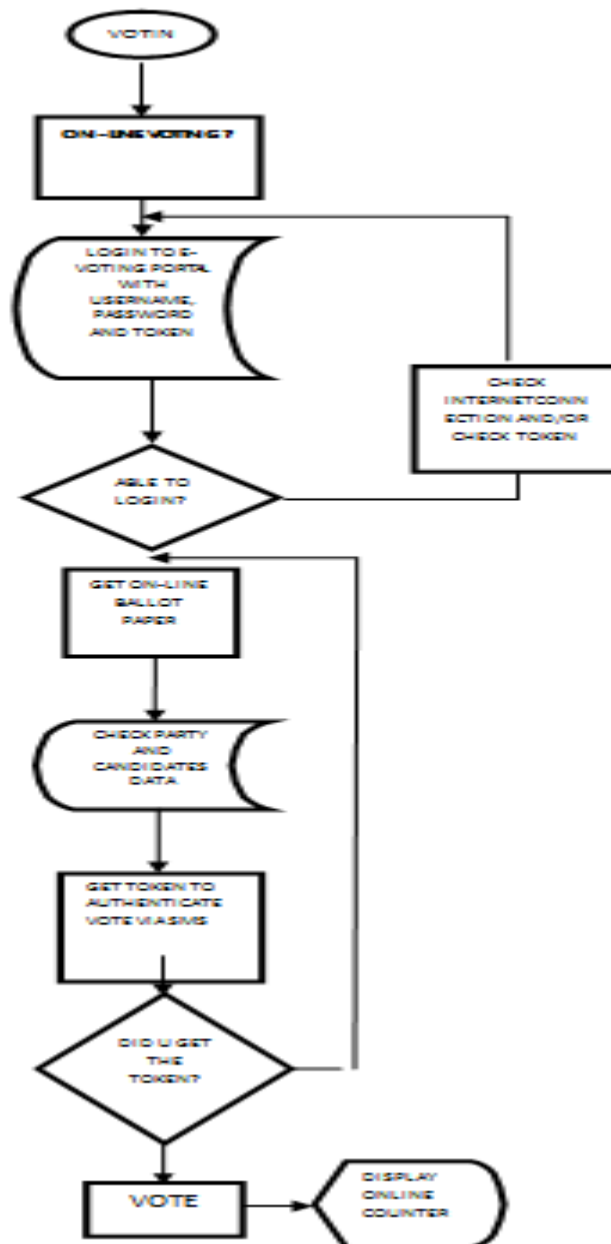


Fig 2.2: Voting Process

The Administrator Application Software

The Administrator manages and controls all the activities of the portal, and also setup the portal for use by the voters. Hence, the administrative software performs the following functions;

- ❖ All information about political parties is stored under the administrative software. The party information includes the logo and positions the party would be vying for. The ballot paper that carries all party logos and position vied for will be stored under the party information platform.

- ❖ Images of the ballot paper and the approved format to determine its validity will be stored under the administrative software. Hence, votes that meet the stored format would be returned as valid, otherwise it would be returned as invalid.

- ❖ All votes cast online are collated under the administrative software.

Database

Database management is an integral part of this project judging from the quantum of information that needs to be save, retrieved and transferred during and after the election process. To manage the database the Structured Query Language (SQL) was incorporate into the Visual Basic Environment to manage the data.

SQL (Structured Query Language) is a [special-purpose programming language](#) designed for managing data held in a [relational database management system](#) (RDBMS), or for stream processing in a [Relational Data Stream Management System](#) (RDSMS). The SQL language is subdivided into several language elements, including:

- ❖ *Clauses*, which are constituent components of statements and queries. (In some cases, these are optional.)
- ❖ *Expressions*, which can produce either scalar values, or tables consisting of columns and rows of data
- ❖ *Predicates*, which specify conditions that can be evaluated to SQL three-valued logic (3VL) (true/false/unknown) or Boolean truth values and are used to limit the effects of statements and queries, or to change program flow.
- ❖ *Queries*, which retrieve the data based on specific criteria. This is an important element of *SQL*.
- ❖ *Statements*, which may have a persistent effect on schemata and data, or may control transactions, program flow, connections, sessions, or diagnostics.
- ❖ *Insignificant whitespace* is generally ignored in SQL statements and queries, making it easier to format SQL code for readability.

The most common operation in SQL is the query, which is performed with the declarative SELECT statement. SELECT retrieves data from one or more tables, or expressions. Standard SELECT statements have no persistent effects on the database. Some non-standard implementations of SELECT can have persistent effects, such as the SELECT INTO syntax that exists in some databases.

III. CHALLENGES OF MANUAL VOTING

The following are some of the challenges facing the democratic system in Nigeria:

- ❖ The inefficiency of manual voting system, time and the resources wasted during the voting..
- ❖ The ineffectiveness of the electoral process and that of thousands of polling station officials.
- ❖ Also, an electoral environment where there is little or no trust in the officials' of the Independent Electoral Commission (INEC).
- ❖ Snatching of ballot boxes, the electoral materials and massive rigging by party officials in collaboration with INEC officials.

IV. PROSPECT OF E-VOTING IN NIGERIA

Highlighted below are some of the gains of E-Voting if adopted in Nigeria:

- ❖ The system also provides security such that voters can only vote ONCE with their identification details.
- ❖ If Property implemented, e-voting solutions can eliminate certain common avenues of fraud, speed up the processing of results, increase accessibility and make voting more convenient for citizens in some cases, when used over a series of electoral events, possibly even reducing the cost of elections or referendums in the long terms.
- ❖ It provides a complete computer system that would provide facility for voters and officials to cast, register and print out the result of the voting exercise respectively.
- ❖ Achieving an electronic voting system that would contain the details of aspirants and voters.
- ❖ It gives the voters access through personal identification number and username.
- ❖ Internet voting options satisfy voter's desire for convenience.
- ❖ More accurate results as human error is excluded.
- ❖ Internet voting can meet the voting needs of the physically disabled.
- ❖ Internet voting can reduce the incidence of vote-selling and family voting by allowing multiple voting where only the last vote counts and prevent manipulation with mail-in deadlines through direct control of voting times.
- ❖ The benefits of the chosen e-voting solution should outweigh the drawbacks, not only when compared to other electronic voting systems also when compared to paper voting
- ❖ Finally, the general public, as well as other key stakeholders in the electoral process, should trust the voting solution and be confident with it.

The trust in the e-voting system should be built on a well understood and reliable solution that is well-implemented rather than on the ignorance of key stakeholders.

V. TESTING AND RESULTS

5.1 ELECTRONIC VOTING SYSTEM

After completion of the portal design and coding, the portal codes were debugged and run on the Mozilla Firefox browser and the Home Screen is as shown below,



Fig 5.0: Electronic Voting System Home Screen

Voters Process

- ❖ **Voter Registration:** From the top right corner of the home page ever eligible voter that logs on the voting portal is expected to register at the commencement of the registration process. Once the register button is clicked the registration page is displayed as shown below.

Fig 5.1: Voter Registration Page.

Once registration is completed with age validation, a voter card is issued, the voter card is issued with a bar code which is necessary for verification.

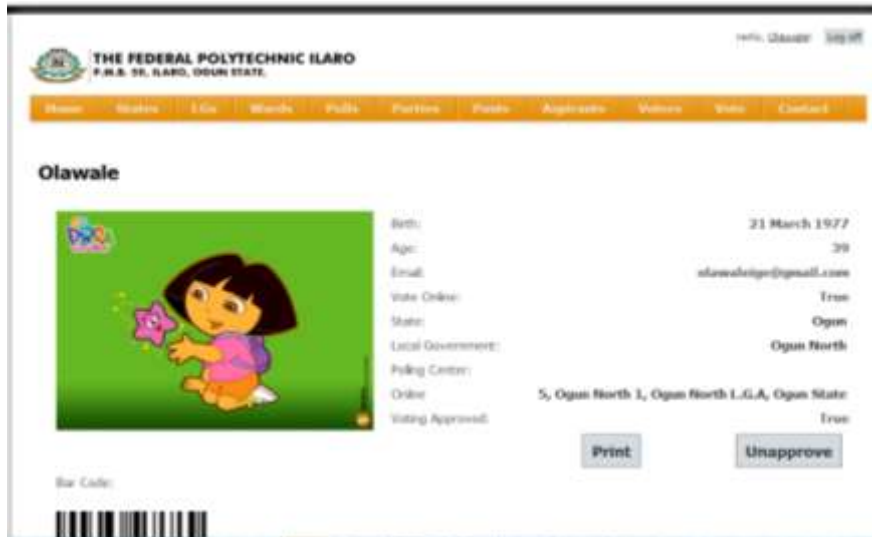


Fig 5.2: Voters' Card

- ❖ Voter Authentication: Once voting commences every registered voter is expected to log into the voting platform with the username, password and token issue during registration.

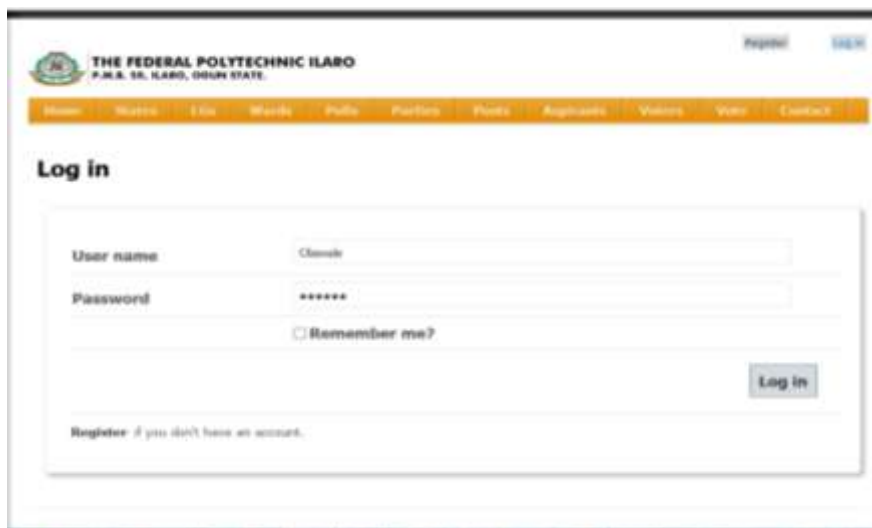


Fig 5.3: Voter Login Page

- ❖ Voting: For the voting to commence, all registered voters would login and click on the vote tab to see the position up for election with the stipulated time frame. A typical election is as shown below;



Fig 5.4: A typical elction page.

5.2 Administrator Application Software

The three functions performed by the administrator software were subjected to test and the results gotten are shown below;

- ❖ Party Information: Information about the party, aspirant, polling stations and positions vied for were captured by the administrator application software



Fig 5.5: Party, Aspirant and Polling Station Information captured by the Administrator.

- ❖ Ballot Information: The image of the ballot paper and the valid ballot format are captured by the administrator so that the Ballot Scan application can use it to compare with the ballot cast to determine its validity or not.

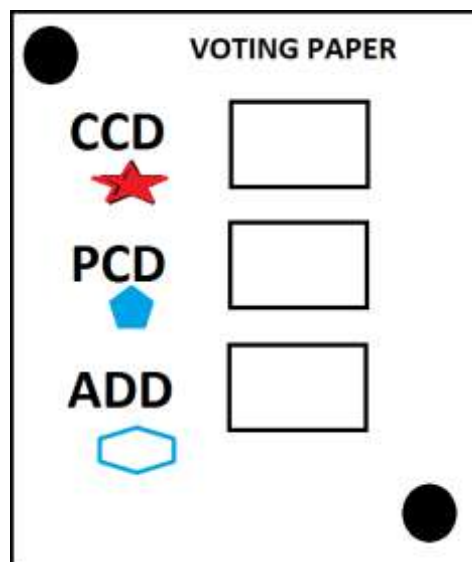


Fig 5.6: Sample of the Ballot Paper.

Also captured is the image of what is expected to be the valid vote. This image will be used to compare all the vote cast to determine its validity or not. Fig 5.7 shows the sample of a valid vote.

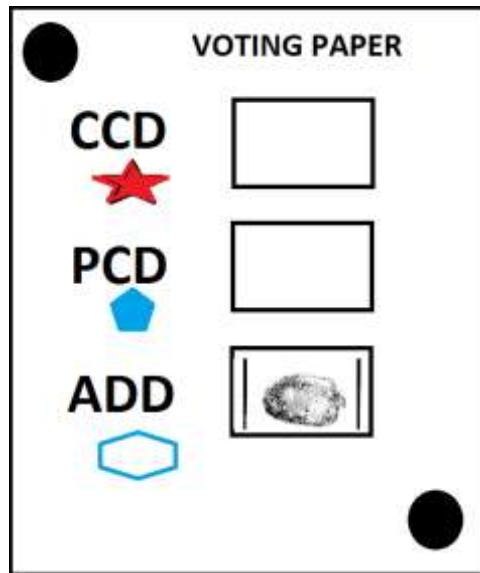


Fig 5.7: Captured Image of a Valid Vote

To compare the votes the application stores images of the ballot paper in the Ballot Scan platform of the application. From the Ballot Scan shown in figure 5.8 paper Template holds information about the approved ballot paper and valid vote and to determine this the application considers the shade thickness of the papers dropped into the ballot box. Server Directory refers to scanning unit of the ballot box and its link with the online platform. Finally the voting directory refers to the directory where all vote goes to when cast and from where the Ballot Scan application will look for the votes to compare and determine its validity or not. Fig 5.8 shows the Ballot Scan Platform of the application.

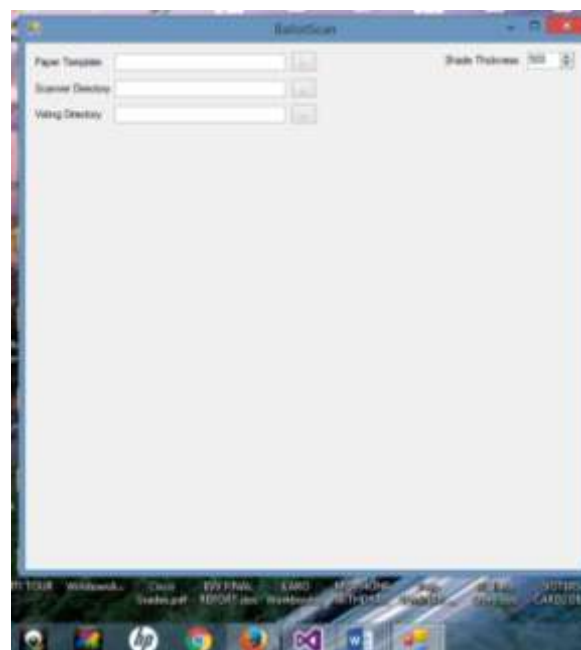


Fig 5.8: BallotScan Application on the Administrator Software

VI. CONCLUSION

The implementation of this electronic voting system would enable free and fair election in a developing country like Nigeria. This system will help to eliminate election irregularities, stealing of ballot boxes to mention but a few. E-Voting system offers convenience to the voter and considerable ease to election administrators as they can get election results out more quickly than conventional methods of manual voting. Thus, the E-Voting system has helped in the automation of the traditional voting system and hence its efficiency.

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