Design of a Secured Online Voting System for electoral process

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Abstract

Today many people are so much concerned about the integrity of election results and there is pressure on leaders to provide a transparent and authentic means of free and fair election, most have the opinion of the introduction of some form of Internet voting in public elections that would allow people to vote online, all electronically, from their personal computers or mobile devices suggesting that that Internet voting would offer greater speed and convenience, particularly for overseas and military voters and, in fact, any voters allowed to vote that way.

In today's world of technology online system enhance work speed and accuracy, this brings comfort and ease stress from the manual. A public election system constitutes the backbone of a democracy where the people has to elect their leader. Most countries like Nigeria uses a manual election system, which constitutes several problems. Due to this paper ballot based election system, voters are faced with numerous problems before or during elections and others are faced by the electorate before and after the voting. An online system, which involves procedures like registration of voters, vote casting, automatic vote count which increment as the voting process progress, and declaring results etc. would constitute a good solution to replace current system. This system will decrease the risk for corruption.

Keywords: PHP, SQL, ODB, Html,Vote, JQuery, DB Table

1.1   Introduction

Online Voting System is an online voting method. In this system all eligible voters can cast their vote remotely from different location and the result will be stored in one central server database without going to any polling booth. There is a database which is maintained by the Electoral Commission in which all the names of voter with complete information is stored. According to

George Oham George Olajide (2013), Online Voting System is an online voting technique. In this system people who have citizenship of a country and whose age is above 18 years of any sex can give his/her vote online without going to any polling booth. There is a database which is maintained by the Electoral Commission in which all the names of voter with complete information is stored.

The aim is to boost the turnout of votes by bringing it to their door step and at their convenient. First of all let us consider all other election constraint. Some people absent themselves from voting due to unfavorable weather Conditions in different areas during the election. People who are outside of their town/city don't want to come to their area for just casting the votes due to the expenses and trouble of transportation. Same also applies to electoral workers on duty during the election, they don't have any interest to cast their vote during job or sometimes they don't have facility to submit their vote.

Fig 1.1 Typical view of the system Home page

1.2   OVERVIEW OF THE TRADITIONAL METHOD

In traditional elections, a voter usually goes to the polling unit. After direct person-person screening exercise voters card, the voter is allowed to vote. The voter is then given a ballot which allows a single vote. Once the ballot is used, it cannot be used again. However, this ballot

must also be anonymous. The ballot must identify the voter as being permitted to vote, but not reveal their actual identity, and the voter must also be given assurances of this. Traditional polling methods trust a lot of parties during the election. The current methods require an attacker interact directly with the voting process to disrupt it. There is a greater chance of getting caught as there will be physical evidence in the traditional polling.

One issue with e-voting is educating the voters, making them understand the usage of the system and the need for it. We don't have to assume that all the users are experts in computer operation, we also have it in mind that it is not all that may use the system easily. We understand the fact that a majority of the voting public has a very little knowledge about the computers. According to some of the research done by the Public Policy Institute of California over 50% of 18-44 years of age voters prefers Internet voting.

1.3   Why preferred more than the manual Voting

Long voting process: The manual voting exercise involves a number of steps that result in long queues. This is because each voter takes a considerable amount of time to vote.

Delays in result publication: It has been gathered that it takes the MOUACO the full day announce the result of the High cost of election organizing: The procurement of materials that ensure the validity of the voters registration, as well as the complete success of the electoral process make election costs very high. Indelible ink, ballot boxes and papers as well as other logistics, despite being expensive, are indispensable in a manual voting system, sometimes you see people being in polling unit for almost four to six hours without electoral materials.

The case for online voting: Efforts should be geared towards the minimization, if not the total elimination, of the problems associated with manual elections. A number of techniques can be introduced to ensure that time and other resources are efficiently used.

Computerizing the voting system: Computerizing voting procedures imply the use of computer technology in undertaking such activities as Voter Registration Exercises, Voting and Vote Counting. Although the initial cost of developing computerized voting systems would be high, the long run effects would be that election costs would drastically reduce. Computerized voting systems would make obsolete the need for ballot boxes and papers, because the system would simulate these.

This would mean that printing costs would be reduced by a considerable amount. Computerizing the verification process by using the computerized voting systems would help to enforce relevant controls in order to verify whether or not a person has already cast a vote, leaving no need for indelible ink.

Computerized voting systems usually tally results as and when votes are cast. This also means that vote

Counting, which wastes time when done manually, would be eliminated. At the click of a button, results of an election would be known. In the event of a run-off, there would be no need to print a different batch of ballot papers or purchase indelible ink. The computerized system would be reset to reflect the candidates who would contest.

2.1   Literature Review

According to Verified Voting (2014) there is widespread pressure around the country today for the introduction of some form of Internet voting in public elections that would allow people to vote online, all electronically, from their own personal computers or mobile devices. Proponents argue that Internet voting would offer greater speed and convenience, particularly for overseas and military voters and, in fact, any voters allowed to vote that way. However, computer and network security experts are virtually unanimous in pointing out that online voting is an exceedingly dangerous threat to the

Integrity of U.S. elections. There is no way to guarantee that the security, privacy, and

Transparency requirements for elections can all be met with any practical technology in the foreseeable future.

3.1   System Design Methodology

There are four main approaches to efficient and fully secure elections:

For the sake of this project the V-model was adopted:

V- Model means Verification and Validation model. Just like the waterfall model, the V-Shaped life cycle is a sequential path of execution of processes. Each phase must be completed before the next phase begins. Testing of the product is planned in parallel with a corresponding phase of development.
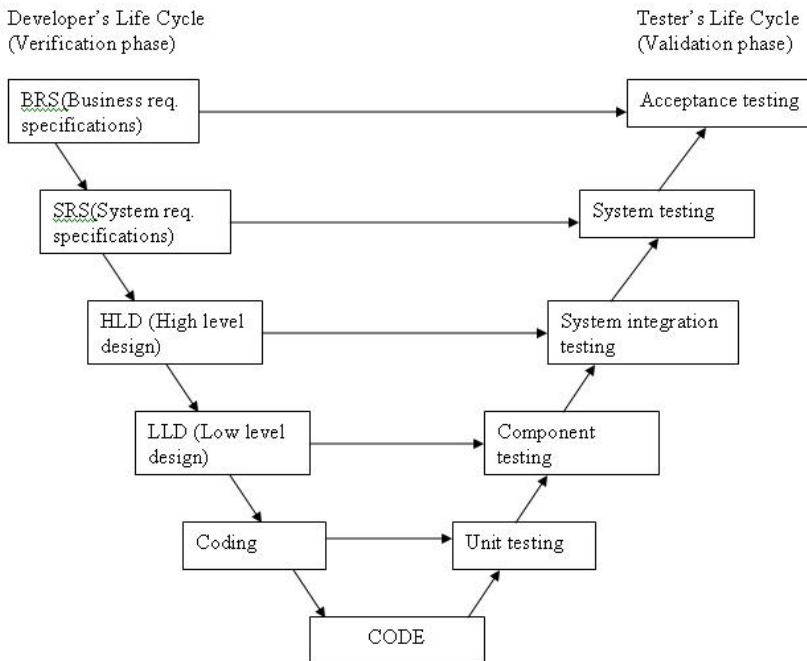
Fig 3.1 Diagram of V-model:

The various phases of the V-model are as follows:

- **Requirements** like BRS and SRS begin the life cycle model just like the waterfall model. But, in this model before development is started, a system test plan is created. The test plan focuses on meeting the functionality specified in the requirements gathering.

- **The high-level design (HLD)** phase focuses on system architecture and design. It provide overview of solution, platform, system, product and service/process. An integration test plan is created in this phase as well in order to test the pieces of the software systems ability to work together.

- **The low-level design (LLD)** phase is where the actual software components are designed. It defines the actual logic for each and every component of the system. Class diagram with all the methods and relation between classes comes under LLD. Component tests are created in this phase as well.

- **The implementation** phase is, again, where all coding takes place. Once coding is complete, the path of execution continues up the right side of the V where the test plans developed earlier are now put to use.

- **Coding:** This is at the bottom of the V-Shape model. Module design is converted into code by developers.

3.2   Technologies Used

Database

The system was interfaced with MySQL database at the background, the database holds the data's and interactions that is going on in the blog.
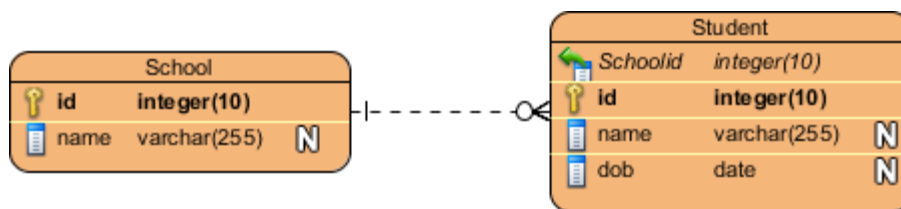

Fig 3.2 Database Entity Relationship diagram

Intricacies of the electronic voting system

- The count/bar Automatically increment
- User must login to vote
- Voters cannot vote twice
- All valid vote is counted correctly
- All votes are kept secret
- Only eligible voters can cast a vote
- Nothing can affect or manipulate the voting as it is automated
- Party can verify the result of the voting
- Voter cannot be coerced into casting a particular vote by a coercer.

3.3   Design specification

This system is a web base system so the following are met:

- A PC (desktop, laptop, Tablet or other portable devices)

- Good internet connection

- Database Design (MYSQL)

- For Coding (PHP)

- For Interface (HTML 4.0, JavaScript's

- Testing (WAMP Server, Live server- Windows server (2008 and above), Linux Server)

- -Reporting Tool (error Reporting/log file)

We have two Privilege Levels:

- **Administrators**: The administrators maintain the system and organize the poll

- **Users**: These are the eligible voters i.e. those who participate in the elections.

- **Top-down structure**: the system is made of four major Subsystems which interact with users by means of GUI screens, namely, Online Voter Registration System (OVRS), Online Voting System (OVS), Election Statistics System (ESS), user log and OVIS Database Manager (ODM).

Online Voter Registration System (OVRS): OVRS is the subsystem responsible for managing the voter.

Registration process. Online Voting System (OVS): OBS manages all online balloting activities. It provides interactive interfaces for registered voters to cast their votes. OVS works alongside ODM to deny people who have already cast their vote's re-entry into the system.

Election Statistics System (ESS): ESS is the subsystem responsible for automatically tallying votes and performing various statistical computations. Alongside OVS and ODM, ESS provides a user-friendly interface where election results are displayed. Also, it provides facilities for the printing of hard copies of results.

OVIS Database Manager (ODM): ODM has an important role to play in the operation of OVIS, in that, it is the part that stores information such as voter registration details, votes of candidates, voters who have already voted, etc

3.4   Data Management

The system is designed in such a way that the database is managed effectively.

This allows voters' data to be retrieved, added, updated, deleted, sorted and traversed easily and quickly.

Data is also stored with regard to the election results and other information relevant to the system.

3.5   Implementation of controls to avoid double voting:

User identification and access control functionalities are built into the system so as to guard against double voting and vote riggings. These functions helps the system to prevent unauthorized user to gain access. So a voter who try to vote twice will be denied access entering the voting page.

3.6   Security/Authenticity:

The system supports printing, the activities and result of the system can be printed. Such activities includes, Voter Registration details to Election Results and Provision of personalized portal to all registered voters.
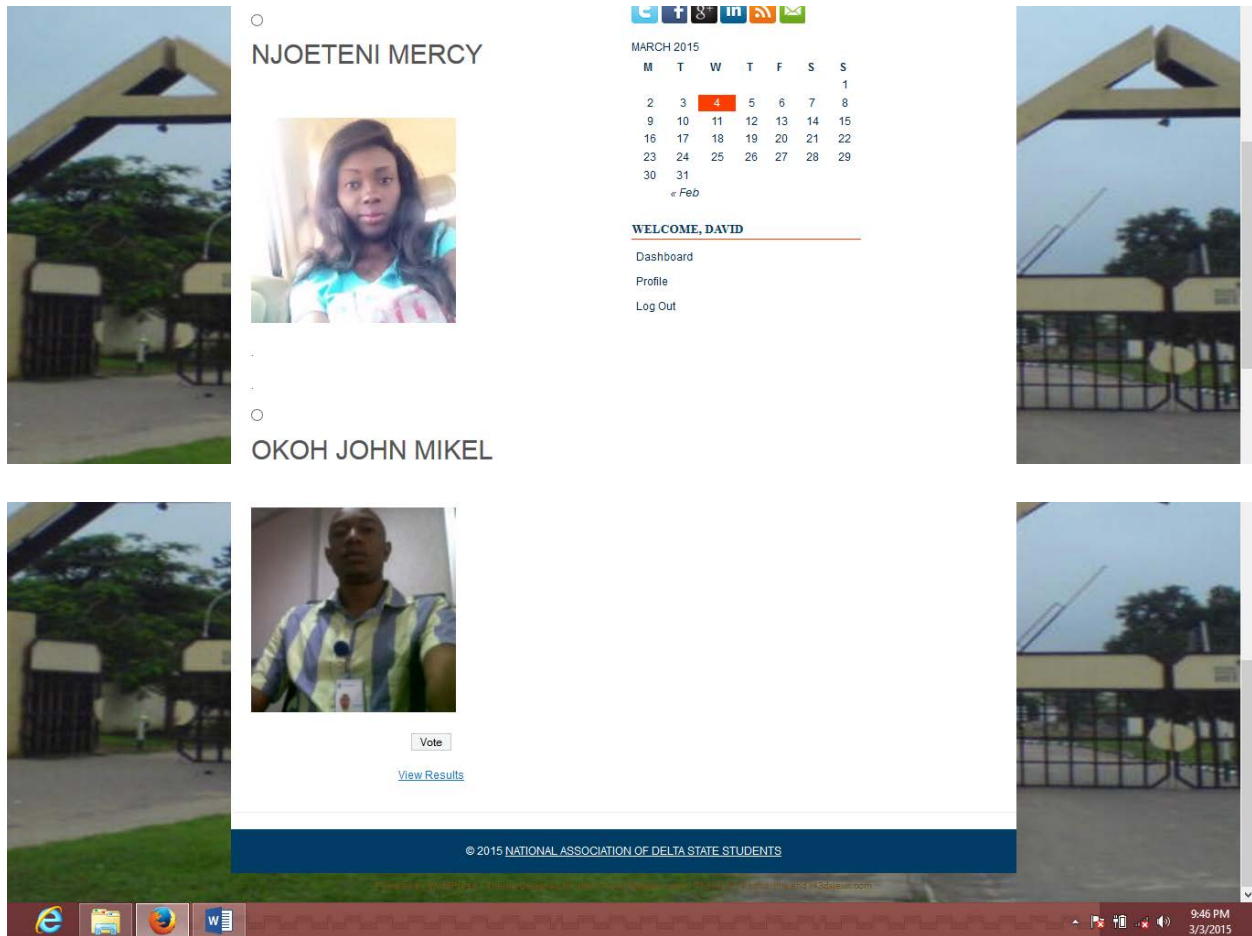
Fig 3.3 Typical view of the Voting page

4.1   System Testing and Result

The System was tested to prove its effectiveness with the Election of NATIONAL ASSOCIATION OF DELTA STATE STUDENTS (MOUAU), it was proved reliable accurate and fair, voters and candidates commended and encouraged the continuity and even its introduction into the countries electoral process. It also has some additional security features like Completely Automated Public Turing test to tell Computers and Humans Apart (CAPTCHA) added to decrease the security concerns.

The procedures that was followed in the voting are:

4.2   NADESTU electoral process:

- **voter Registration:**

Voters Registered at their convenient locations, at their own time within the voters registration period, Voters without means of registration have to come down to the registration center to get registered by the officials.
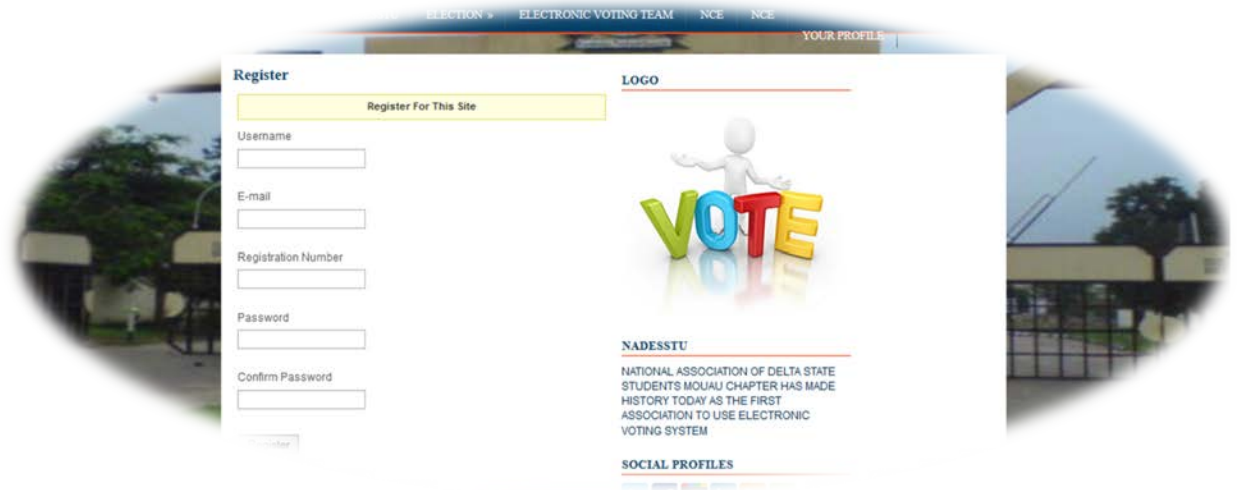

Fig 4.1 Typical view of the Registration page

- Voter Validation/Account Activation:

The users' eligibility was considered before the account was activated. The eligibility was done by comparing if that user is actually a student from the departmental list and other prerequisites such as departmental due.

- Voting:

The Voters have to Log in with their username and password to cast the vote. The person would then be Expected to provide a username and password known only to him during Registration, if the voter is eligible then the login will be successful but if the User is not eligible it will bounce back with an error message.

Fig 4.2 Typical view of the Login page

Voters without means of voting have to come down to any designated polling unit to cast his/her vote.

- Vote Counting:

No need to count at the end of the voting process because the progress bar is displaying automatically.

- Collation and Publication of Results:

With reference to the progress report Above the Electorate will announce the winner of the election.

4.3   Some codes to check if the user has voted already:

```
session_start();
if ((isset($_SESSION['hasVoted']))) {
//Already Voted
}
else {
//Process the Vote
}

user

<?php
require_once("includes/connection.php");
```
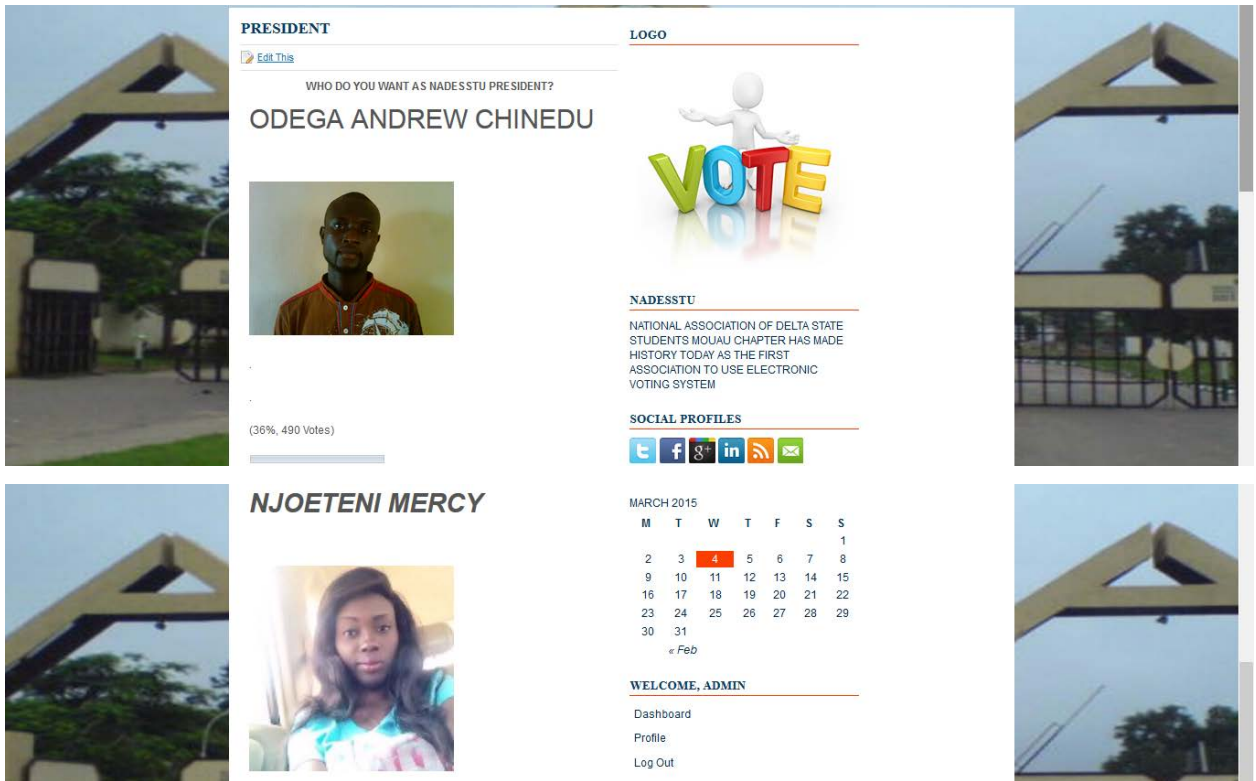
```php
?>
?>
<?php
include_once("includes/form_functions.php");
// START FORM PROCESSING
if (isset($_POST['submit'])) { // Form has been submitted.
$errors = array();
// perform validations on the form data
$required_fields = array('username', 'password');
$errors = array_merge($errors, check_required_fields($required_fields,
$_POST));
$fields_with_lengths = array('username' => 30, 'password' => 30);
$errors = array_merge($errors, check_max_field_lengths($fields_with_lengths,
$_POST));
$username = trim(mysql_prep($_POST['username']));
$password = trim(mysql_prep($_POST['password']));
$hashed_password = sha1($password);
if ( empty($errors) )
$query = "INSERT INTO users (
username, hashed_password
)
VALUES (
'{$username}', '{$hashed_password}'
)";
$result = mysql_query($query, $connection);
if ($result) {
$message = "The user was successfully created.";
} else {
$message = "The user could not be created.";
$message .= "<br />" . mysql_error();
}
```

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```php
} else {
if (count($errors) == 1) {
$message = "There was 1 error in the form.";
} else {
$message = "There were " . count($errors) . " errors in the form.";
}
}
$username = "";
$password = "";
?>
```

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Fig 4.3 Typical view of the Result page

4.4   Some of the codes used includes

<FORM NAME ="form1" METHOD ="GET" ACTION ="process.php">

<?PHP print $question; ?>

<P>

<INPUT TYPE = 'Radio' Name ='q' value= 'A' <?PHP print $answerA; ?>><?PHP print $<img src="images/odega.jpg" width="12 height="12">Odega Andrew Chinedu; ?>

<P>

<INPUT TYPE = 'Radio' Name ='q' value= 'B' <?PHP print $answerB; ?>><?PHP print $<img src="images/odega.jpg" width="12 height="12">Njoeteni Mercy; ?>

<P>

<INPUT TYPE = 'Radio' Name ='q' value= 'C' <?PHP print $answerC; ?>><?PHP print $<img src="images/odega.jpg" width="12 height="12">Okoh John Mikel; ?>

<P>

<INPUT TYPE = "Submit" Name = "Submit1" VALUE = "Click here to vote">

</FORM>

Each registered voter would be able to interact with the system as if it were made personally for him, upon log in. This function is designed to make the system interactive as well as user

friendly. For example, a registered voter, Njoeteni Nancy, as soon as she login would meet a welcome screen with the greeting message "Welcome Njoeteni Nancy" at the top right corner of the screen.

The system would grant access once only to a user to use his or her username and password.

If any of the data is wrong, the voter would be denied access. Registered voters who forget their username or passwords may contact the Voting Supervisor or Official at the voting center, who would use the "forgot password" function to retrieve the username or and password of the voter (after other personal identification checks) or call the numbers on the screen.

Once a voter has access to the system, the person may vote for his chosen candidate. After the voters' selection of the candidates the user will click on vote and the screen will change to result page, increments are made to the votes of candidates who were voted for, and other internal statistical computations made. Once a vote is submitted to the system, the voter would not be granted access into the voting page again. This is to guard against multiple voting.

Whenever votes are cast, necessary increments are made to the votes for whom the votes are cast, and the appropriate administrator can access the results of the elections so far. When voting finally ends, all relevant statistics and reports are generated which are seen by the administrators. For possible result verification/integrity.

5.1   CONCLUSION

There are lots of Benefits of this online voting system, it is Fast and easy service, It save time that could have been used to count polls as the result is auto-incrementing with the number of vote and it is displaying immediately on percentage base, It reduces paper work and makes the work easier for the electorate, The system allow voters to cast their vote at their convenient location instead of having to bring their PVC to a particular polling unit etc.

Online voting system provides opportunity for all votes to be counted and all eligible voters to exercise their franchise, it provides avenue for voters to vote from their convenient locations and also ease administrators as they can get election results out more quickly than conventional methods of manual voting. Though Online Voting have a numerous advantages over manual ones, there are some few challenges that must be addressed in order to benefit from it fully. The

Electorate needs to be educated adequately on the use of online voting. (In developing countries, not all voters may be able to enter their username and passwords!).

There is high cost of implementing it at the initial Secondly, there is the challenge of voter education.

Online voting system should be examined and analyzed and then be allowed to creep into our electoral system as this will bring more benefits now and to the coming generation to make the people wish tom work.

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