

# An Online Voting System in Student Union Government Election (A Study of Delta State Polytechnic Ogwashi-uku)

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**Abstract:** The inefficiency of voting process in SUG elections has resulted in a lot of problems. These problems have continued to obstruct the peace and tranquility of elections as the choice of a capable candidate is not encouraged by the existing system. These problems include high rigging during electoral process, a single voters casting his vote multiple time, inefficient and inaccurate counting of voters by officers concerned, long queues observed at polling stations and illegible voters casting their vote. Violence, defacing and littering of institution's environment during student union election campaign have been the problem faced by manual system of voting in our institutions. This paper proposes an online voting system which is a paperless form of voting that will meet the electoral needs of the student union government. The system generated a more convenient voter and candidate registration interface, voter storage and count, campaign and manifest page as well as immediate result compilation. The proposed system harnesses and utilizes the immense power of ICT techniques to create a striking impact in the way electoral activities are being conducted in Nigerian institutions. The goal of the system is tailored at establishing an efficient and effective electronic voting system aimed at improving students 'government democracy, and reducing electoral irregularities and malpractices in students' union elections.

**Keyword:** online voting, transparency, electoral malpractice, Irregularities, SUG

## I. INTRODUCTION

### Background To the Study

Gathering of students to participate in Student Union Government (SUG) election has been a continual challenge for student's union government in Nigeria tertiary institutions (Bonaventure et al., 2014) and also to University management because of insecurity, violence in campaign and election. This is as a result of the fact that election in most Nigeria tertiary institutions manual secret ballot voting system, which holds on a single voting location where the electorates need to be physically available. This voting system is problematic as it triggers election crisis, it is inconvenient and susceptible to error and time consuming. Electoral result can easily be manipulated or altered, the electorates and electoral officers can easily be induced to act against their will. The system is not friendly to physically challenged electorates. It does not ensure security of voters and votes. It encourages multiple voting and very much error prone since vote's collation, votes counting and results compilations are done manually by humans. The Institution's environment will be littered with posters and fliers. Voting schemes have evolved from counting hands in early days to systems that include paper, punch card, mechanical lever and optical-scan machines. Electronic voting systems provide some characteristic different from the traditional voting technique, and also it provides improved features of voting system over traditional voting system such

as accuracy, convenience, flexibility, privacy, verifiability and mobility. But it suffers from various drawbacks such as time consuming, consumes large volume of paper work, no direct role for the higher officials, damage of machines due to lack of attention and election updates is done manually.

These drawbacks are overcome by Online Voting System. Online Voting System is a voting system by which any Voter can use his/her voting rights from anywhere in the country. We provide a detailed description of the functional and performance characteristics of online voting system. Voter can cast their votes from anywhere in the country without visiting voting booths in a highly secured way. This makes voting devoid of violence and increases the percentage of voting. Users are individuals who interact with the system and all user interaction is performed remotely through the user's web browser since the system will be web based.

### Aim and Objectives of the Study

The main aim of this research is to design online voting software which among others is able to achieve the following objectives;

- Each voter will be able to vote only once
- Nobody will have access to the votes before the official opening of the electronic ballot box.
- The votes cast cannot be intercepted, modified or diverted.
- The On-line site will resist any attack
- Only registered voters will have access to the application
- Voters will be protected against any attempt of identity theft.
- The secrecy of the vote will be guaranteed
- Rigging of the election will be controlled
- The system will not accept vote outside the voting period
- It shall put to an end the indiscriminate alteration of election result by officer of the electoral committees in SUG elections.

### Overview of Online Voting System in Sug Election

The concept of online voting has been around for decades, but it is only in recent years that it has become an increasingly widespread option for decision making. The history of online voting dates back to the emergence of the Internet, although at that time it was mainly used for research and communication purposes. And, as it began to be designed, and to grow in popularity and accessibility, the possibility of using it for voting became more realistic. Thus, in the late 1990s and early 2000s, the first online voting systems began to be tested, and despite the challenges faced by these incipient systems, the development of online voting tools continued.

Predecessors of online voting can be identified in the use of voting machines, which date back to the late 19th century in England and the US. The controversies surrounding online voting today are mirrored in the controversies surrounding this early use of voting machines. In the 1980s developments around the term teledemocracy made voting possible making use of TV sets via teletext. The discussion about electronic voting picked up momentum in the early 1990s through the increasingly popular access to the internet and the rapid development of the World Wide Web. The USA and Switzerland, relying on their experience in direct democracy, voting machines and postal voting, were among the forerunners of developing online voting. Somewhat surprisingly, Estonia was the first country to employ online voting in national parliamentary elections in 2007. It has been demonstrated that as voting systems become more complex and include software, different methods of election fraud become possible. Others also challenge the use of electronic voting from a theoretical point of view, arguing that humans are not equipped for verifying operations occurring within an electronic machine and that because people cannot verify these operations, the operations cannot be trusted. Furthermore, some computing experts have argued for the broader notion that people cannot trust any programming they did not author.

The use of electronic voting in elections remains a contentious issue. Some countries such as Netherlands and Germany have stopped using it after it was shown to be unreliable, while the Indian Election commission recommends it. The involvement of numerous stakeholders including companies that manufacture these machines as well as political parties that stand to gain from rigging complicates this further. Moreover, people without internet access and/or the skills to use it are excluded from the service. The so-called digital divide describes the gap between those who have access to the internet and those who do not. Depending on the country or even regions in a country the gap differs. This concern is expected to become less important in future since the number of internet users tends to increase. The main psychological issue is trust. Voters fear that their vote could be changed by a virus on their PC or during transmission to governmental servers.

Expenses for the installation of an electronic voting system are high. For some governments they may be too high so that they do not invest. This aspect is even more important if it is not sure whether electronic voting is a long-term solution.

Although there are many researches works on online voting systems, here we have critically analyzed and summarized twenty research works and projects which are more relevant, recent and pertinent. It is observed that most of the recent works addresses the issue of online voting and use of various information technologies. (Vivek S K, et.al., 2020) developed a secure, transparent and decentralized e-voting system is proposed using the Hyperledger Sawtooth blockchain framework. Restricted access of the system through election polling stations allows voters to cast their votes, which are recorded in the immutable blockchain state, Fairness and reliability of the election procedure due to nil possibility of vote manipulation. The issue of fairness and reliability of the election procedure due to nil possibility of vote manipulation was addressed. The technology/platform used were Angular 8, Node.js, Amazon RDS, and Sawtooth blockchain, Python with the APIs, Docker technology, Amazon Web Services. (Shubham Gupta et Al., 2021) developed a system where the voter is registered into the system database well before the time

of election. Now at the voting time, in the first step voter must verify his/her government identity such as Aadhar card or voting card with his/her proper picture, once it is verified, he/she moves to the second step. In second step voter has to go under the face reorganization process. Once the corresponding matching or verification is done, the voter will move to next step to cast his/her vote at the EVM. The cast vote is shown on display for the satisfaction of voters and then the voting data is continuously uploaded. The election department can monitor the data in more reliable way so that no discrepancy or modification can take place. The technology used were PyCharm, JetBrains IDE using Python, IoT, ThingSpeak, Open Source Computer Vision Library OpenCV, Arduino. (Naseer Abdulkarim Jaber Al-Habeeb et al., 2020) described an application for m-voting targeting the specific conditions of Iraq in the COVID situation. In the current society, the application of which we are talking about can also be seen as a significant help for a numerous amount of countries during the pandemic of COVID-19. The application is based on Mobile technology. Mobile technology chosen is motivated by the fact that although people do not have computers, almost everyone has a mobile phone in Iraq. The technology/platform used were Android Studio, PHP- Restful Services for the Back End Component and MySQL database. (Roopak T. M, & Sumathi R., 2020) developed a scheme which provides the secured EVS by using biometric details and virtual ID of voters which is obtained from the Aadhar database. These details are mandatory before casting the Vote. Apart from this, as an additional measure, this system also uses the digital signature as the key for the encryption of the votes inside the block. Aadhar integration to the EVS overcomes the duplication or tampering of votes. The technology used was Blockchain Technology.

(Ganesh Prabhu S, et.al., 2021) developed the face scanning system that is used to record the voters face prior to the election and is useful at the time of voting. The offline voting system is improvised with the help of RFID tags instead of voter id. This system also enables the user the citizens to see the results anytime which can avoid situations that pave way to vote tampering. This paper focus on a system where the user can vote remotely from anywhere using a computer or mobile phone and doesn't require the voter to go to the polling station through two step authentication of face recognition and OTP system. The technology/platform used were Arduino Uno, LCD Display, RFID, Push Button. (Robert Kofler et Al., 2003) developed a system which can assure the anonymity of the voter. This makes sure that there is little to no risk of tampering or manipulation of votes. The issue of security and application choices for security was also addressed in this paper. The technology/platform used was Electronic Voting, Electronic Democracy and Internet Applications. (Mohamed Ibrahim, et.al., 2021) discussed the design and development of Election Block a voting system that provides its own blockchain. Cernay Andre M. McGeorge School of Law on their Analysis of Internet voting proposal, said that several states have already attempted using Internet voting systems for their state or local elections, which is rig free. The trials were done in a small scale setting.

Iowa State University has even held an election on-line. In February of 2001 the University's government of the student body elections was held on-line. Students were required to use their university identification number as well as a pin number to gain access to vote. The election ran smoothly.

The MIT/Caltech researchers "see a promising future for electronic voting despite its problems today". They advocate

using the methods currently in use which results in the lowest average numbers of “uncounted unmarked and spoiled ballot” like in precinct optical scanning. Their report even proposed a frame work for a new voting system with a decentralized modular design.

Rebecca Mercum invented the “Mercuri method” for on-line voting, a critical Component of this method is very smaller to the Caltech/MIT proposal. A voting machine must produce human-readable hardcopy paper result which can be verified by the voter before the vote is cast.

John Naughton in his article “Election of the future” quoted Churchill as saying that democracy is in such a poor state that some suggest financial incentives for voting as he famously observed is the worst system of government except for all the others. For all the gratifying footage citizens queuing interminably to cast their hard won votes. There is the reality of abysmal turnouts and voters apathy throughout the more “mature” democracies of the west.

All these, he enumerated, the denial of voting right, the long queuing and time wasted while processing the result, the assault encountered during voting which has discouraged many from voting, can be completely eradicate by on-line voting system.

Betty Whitaker a principal research engineer at Geogicitech Research Institute (GTRI) reported in USA Today (Magazine) April 2002 that people wonder why they cannot vote over the Internet if they can buy thing over the Internet. She foresees the elections of the future to be more convenient, accurate and faster for voters and election electoral officials.

The web-based voting system allows voters to vote from their various homes located at different geographical areas. Not only can they vote at various locations, the electronic voting system is absolutely secured, because they are protected by passwords and tamper-proof audit logs.

Secondly, the technology also makes it much more difficult for those in power to keep secrets from their electorates. Given that the free flow of information is one of the pre-requisites for democracy.

Uncertainty over the 2000 US presidential election count has stimulated interest in better voting methods. These aim to increase participation, lower the costs of running elections and improve the accuracy of results. This briefing note looks at options for using new technologies in voting, focusing on the pros and cons of internet voting and the implications of such a radical change in the way that elections are conducted. The British system of casting votes in elections has been relatively unchanged since the Ballot Act of 1872. Elections are conducted by Returning Officers on a constituency-by-constituency basis and have a reputation for fairness, accuracy and integrity. Registration to vote is required by law (though not always enforced). Voter turnout is relatively high in national elections, although low and falling in local and European Parliament elections (see below). Public confidence in the integrity of the voting process is high and this confers legitimacy upon elected, representative bodies. Given the confidence in existing voting arrangements, why should there be a move to change the way that votes are cast in UK elections? There are three main factors: declining turnout, constitutional innovations and new technologies.

Also, on the 24<sup>th</sup> May, 2015, Student Union Election went awry at the college of Education, Kangere. The resulting violence spilled from the institution to neighboring

communities with several innocent people injured. Meddling of external authorities in university student election is not uncommon, this is usually geared at ensuring the victory of an “anointed” candidate, and such can easily trigger student revolt and violence; an example of this is the protect and violence held at June 2016, Akintola University of Technology in Nigeria

(Aderigbe et al., 2018) asserted that electronic voting system as a way to cob errors, manipulation, and fraud; also ensure integrity in the SUG election. However the problem with their work is that it did not solve the issues of election violence as the platform will enable electorates to gather at a place to cast their votes which can trigger violence.

(Divya et al., 2019) the software enabled a voter to cast his/her vote through internet without going to the voting booth after registering oneself for voting in advance which include storing data by himself in the database.

The study claimed to achieved elimination of proxy vote and double voting, fast access to the software, highly efficient and flexible which improves voting drastically. This system was developed using JavaScript and ASP.net

Similarly (Idongesit et al., 2018) used Html, CSS and JavaScript in front end and MySQL, PHP JavaScript and ASP.net in backend and obtain the same result. However their system does not have the feature for manifest and campaign page for online campaign which will eradicate the littering of paper and posters in the institution environment during physical campaign.

## II. REVIEW OF RELATED WORK

**AMBROSE ALI UNIVERSITY (AAU) Ekpoma, Edo State Nigeria:** Ekpoma (2023), as part of efforts to fully digitalize its operations, the Ambrose Ali University (AAU), Ekpoma-Edo State has conducted Students’ Union Government (SUG) elections, held on Monday May 29, 2023 using Electronic Voting system. With these voting system, students voted from the comfort of their homes, using smart phones, computers, ipads and other relevant electronic gadgets. The election produced Oribhabor Cletus as president and Okogbe Rich Oladele as secretary of the institution’s apex student union body. The Dean of Students Affairs, Prof. Olusegun Matthew Akanbi described the introduction of e-voting as another landmark achievement marking the transformation Ambrose Ali University. He said the idea was conceived by the administration of the past vice-chancellor, Prof. Ignatius Onimawo, to eliminate violence and rancour that usually characterize student elections in the institution. “All over the world, our students who are validly registered members of the union are voting right now. There is no place where students are congregating. So there is no pushing, fighting or quarreling; and transparency is also guaranteed”, he stated during the election. The Spokesperson of the institution, Mr. Edward Aihevba explained that the voting system was in line with avowed commitment of the vice-chancellor, Prof. Asomwam Sonnie Adagbonyin, to putting the university in global digital platform. According to him, the university was already conducting its senate meetings and examinations, electronically, just as students results were now been uploaded on the internet, hence transcript could now be transmitted electronically. President of the National Association of Nigeria Students (NANS), Comrade Usman Umar Barambu who was part of the observers, described the voting system as a laudable achievement, as it was free of hitches and manipulations. “I will want to recommend it for other universities and the nation

at large, because if we are able to achieve this in our campuses and in our country Nigeria, then I'll say democracy has taken a new dimension.

#### University of Ilorin (ui), Kwara State Nigeria:

Babatunde (2022), an E-Voting System in the University of Ilorin have elected new executives of the Student Union Government SUG for the 2022 Session. The election which was done via the e-voting system saw Egbewole, an expert in international Law and Jurisprudent, was announced on Thursday by the Pro-Chancellor and Chairman of the University Governing Council, Malam Abidu Rafindadi Yazid.

The Chairman of the electoral body, Malam Abidu Rafindadi Yazid, described the e-portal voting system as an innovation that affords students the opportunity to vote for their candidates of choice without necessarily having to leave the confines of their classrooms or hostel rooms. The system removed the cumbersome nature of students having to go and queue to be able to vote, thereby missing their lectures in the process. Before the Election Day, students were required to complete their voter's registration through the University portal. On Election Day, voting commenced at exactly 7.00am and ended around 6.00pm at the end of the election. The ISEC Chairman announced the results at Lecture Theatre 1 in the presence of all the agents of the various aspirants, security men and campus journalists. Also present during the announcement of the result were the Dean and Sub-Dean of Student Affairs were present.

E-voting system was introduced by the Student Union Government in Benue State University 2021. The University introduced e-voting system due to the COVID-19 pandemic protocols and also to check election manipulation. Student's Union election in the institution had always witnessed violence with cultists hijacking the poll. The Director of ICT in the school Mr. Terna Abuul, The new Vice Chancellor Professor Tor Iorapuu came up with the innovation as a way of digitalizing operations in the school, adding that it is meant to avoid overcrowding because of COVID-19 pandemic. Mr. Abuul said the technology was an off the shelf software which the University subscribed to. "It is not a Nigerian developed system. It is foreign technology. It is cloud based and nobody can penetrate. "Now, the system operates this way, only students who have paid their tuition fees and are registered on the school portal are eligible to vote. "We now harvested the names of such candidates and voters to constitute our voters' register. On the day of the election (Wednesday 2nd May, 2021, students received SMS and a link to their email addresses. We had instructed them to update their emails and phone numbers they intend to use to ensure that they are authentic. Now from their mobile phones especially those using smart phones, they were asked to click on the link that is the SMS which was sent to their phones and opens the platform which takes them to the environment where all the names of the contestants both for executive and parliamentary positions are listed. "So, after ticking the position and their candidates, they have an opportunity to review it and certify if it was their preferred choice. If they are satisfied, they submit and their vote counts. "One thing about the system is that you cannot duplicate it. The code generated is unique for each candidate and this worked very well".

He disclosed that there were 15172 accredited voters with 97 candidates. He added that 10 students contested for the Student Union Government (SUG) president. "The election lasted between 8 am and 2 pm after which the only lady who contested Miss Agatha Aker of Law Faculty emerged the SUG

President. She scored 1037 votes which represented 17 percent of the 6,092 votes cast. Many students hailed the innovation while describing it as a good move to stop the use of none students participating in the schools election. The election was transparent and went without hitches. The Student Union Government called the Nigerian Government to adopt the innovation for future elections in the country.

In conclusion, the context of this work defines e-voting system as encompassing several different types of voting embracing both electronic means of counting votes. It also includes the use of punched cards, optical scan voting systems and specialized voting kiosks (including self-contained direct-recording electronic voting systems or DRE). This system is an innovation that affords students the opportunity to vote for the candidates of their choice without necessarily having to leave the confines of their classrooms or hostel rooms. The system will remove totally the cumbersome nature of students having to go and queue to be able to vote, thereby missing their lectures or their various individual activities in the process.

This research implies that since there have been series of successes recorded, about e-voting, the system surely will if adopted by the student union government of Delta State Polytechnic Ogwashi-Uku, eradicate totally violence, High expenses and time wasted in carrying out elections manually.

### III. RESEARCH METHODOLOGY

#### Procedures of the Existing System

The existing voting system follows a series of well-defined procedures to conduct elections. The key steps in the process are as follows:

1. **Announcement and Nomination:** The Election Commission announces the upcoming elections and invites eligible students to nominate themselves as candidates for specific positions. Nominations are verified for eligibility, and a final list of candidates is prepared.
2. **Campaigning:** Candidates are given a designated period to campaign and communicate their visions, goals, and plans to the student body. During this time, candidates engage in debates, speeches, and other activities to garner support.
3. **Preparation of Ballots:** The Election Commission designs and prints physical ballots, ensuring that each candidate's name and position are accurately represented.
4. **Voting Period:** On the designated day and location, eligible voters visit the polling station set up by the Election Commission. Each voter marks their choices on the paper ballots in a private and confidential manner.
5. **Vote Counting and Results:** After the voting period ends, the Election Commission, along with authorized observers, manually counts the cast ballots. The votes are tallied for each candidate and position, and the results are announced to the student body.
6. **Dispute Resolution:** In case of any disputes or challenges regarding the electoral process or results, the Election Commission is responsible for resolving these issues impartially.

#### Issues and Limitations of the existing system

While the existing voting system has been used for conducting elections, it is essential to acknowledge its challenges and limitations, including:

1. **Time-Consuming Process:** The manual voting process can be time-consuming, especially during the vote counting phase, which may lead to delays in announcing the results.
2. **Human Errors:** The manual nature of the system makes it susceptible to human errors during vote counting, which could impact the accuracy of the results.
3. **Limited Accessibility:** Students who may not be physically present on the campus during the voting period, due to various reasons, may face challenges in participating in the manual voting process.
4. **Environmental Impact:** The use of paper ballots can result in a significant environmental footprint, contributing to paper waste and resource consumption.
5. **Scalability:** As the student body grows, the manual voting system may become more cumbersome to manage efficiently.
6. **Security Concerns:** Safeguarding the physical ballots from tampering or loss is crucial to ensuring the integrity of the voting process.

#### IV. SYSTEM DESIGN

System design is the process of designing a new system after sorting out the problems in the existing system. It includes the design of a proposed system after a documented study of the current manual operation and system requirement in the establishment. However the success of this phase depends on the actualization of the system study stage.

##### The System Architecture:

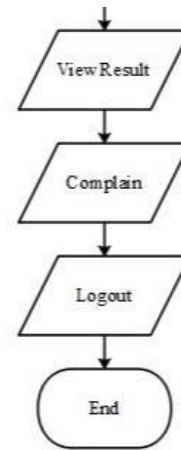
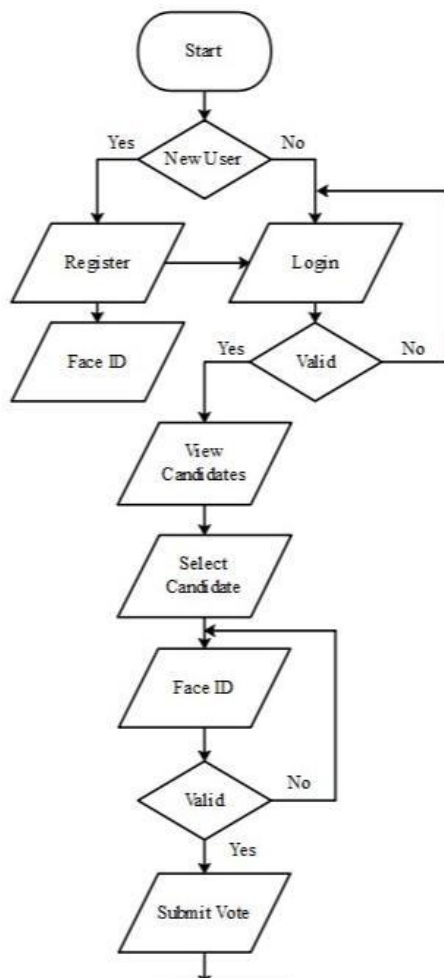


Figure 1: Architectural Design of the system

##### Input

This shows all the input into the system using the input devices. This includes the login forms, registration forms and every other form through which input is given.

##### Output

This refers to all the output/reports generated from the different input into the system after processing. This includes the following:

##### Database Specification

Database refers to an organized collection of information stored in a computer disk and accessed with a Database Management System. Thus Database management system refers to software which allows the user to manipulate database. Database is an integrated collection of logically related files or records. It contains information about a particular enterprise and provides environment that is both convenient and efficient to use. Examples of database are: Personal File, Card catalogue in a library, Telephone Directory, Dictionary, Students File. Examples of DBMS are: MySQL server, Oracle, MS Access, FoxPro, phpMyAdmin.

The database management system used in this project work is Microsoft SQL Server (MsSqlServer). The system makes extensive use of a database for data storage and retrieval. The database is made up of the following significant tables:

Table 1: Aspirant Table

Update   Script File: dbo.tblAspirants.sql		Name	Data Type	Allow Nulls
PK	Id	int		<input type="checkbox"/>
	DisplayPix	nvarchar(MAX)		<input checked="" type="checkbox"/>
	Name	nvarchar(MAX)		<input checked="" type="checkbox"/>
	MatNo	nvarchar(MAX)		<input checked="" type="checkbox"/>
	Position	int		<input checked="" type="checkbox"/>
	Bio	nvarchar(MAX)		<input checked="" type="checkbox"/>

1. This table stores information such as the name, Mat Number, Biography and position of the aspirants.

Table 2: Position Table

Update Script File: <code>dbo.tblPosition.sql</code>			
Name	Data Type	Allow Nulls	
Id	int	<input type="checkbox"/>	
Position	nvarchar(MAX)	<input checked="" type="checkbox"/>	

2. This table stores all the available positions in the system

Table 3: Voters Table

Update Script File: <code>dbo.tblVotes.sql</code>			
Name	Data Type	Allow Nulls	
Id	int	<input type="checkbox"/>	
Username	nvarchar(MAX)	<input checked="" type="checkbox"/>	
Aspirant	nvarchar(MAX)	<input checked="" type="checkbox"/>	
Position	nvarchar(MAX)	<input checked="" type="checkbox"/>	

iii. The table stores of and holds the number of votes casted

## V. SYSTEM IMPLEMENTATION

### Hardware Requirements

The web server in which this software is expected to be run is expected to have the following minimum hardware requirements:

- i. PC with at least 4Gb RAM
- ii. 500Gb hard disk
- iii. 3.5GHz, 64x processor

### Software Requirements

The web server in which this software is expected to be run should possess the following software requirements or later versions

- i. Operating system: Windows server 2008, windows 7,8,10
- ii. Server: Internet Information Server (IIS) 7, 8
- iii. Database Management System: Ms SQL Server 2012 or later
- iv. Dot Net (.Net) framework 4.5 and above

### System Interface

System interface refers to the set of rules, protocols, and methods that define how different software components or systems can communicate and interact with each other. It serves as a boundary that enables independent software modules to work together effectively, exchanging information and coordinating their actions.

## VI. EVALUATION OF RESULT

The result of the program has confirmed the process by registering Aspirant and having a portal for transparent voting.



Figure 2: Homepage

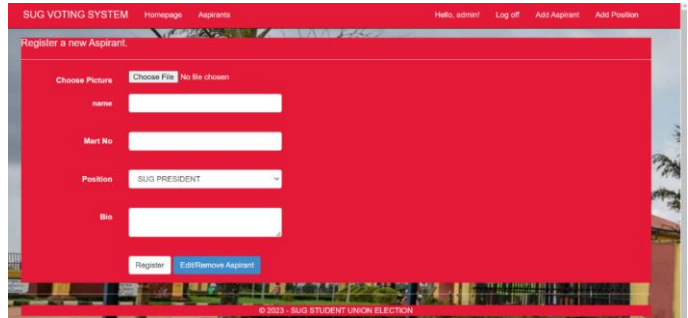


Figure 3: Aspirant Registration Form

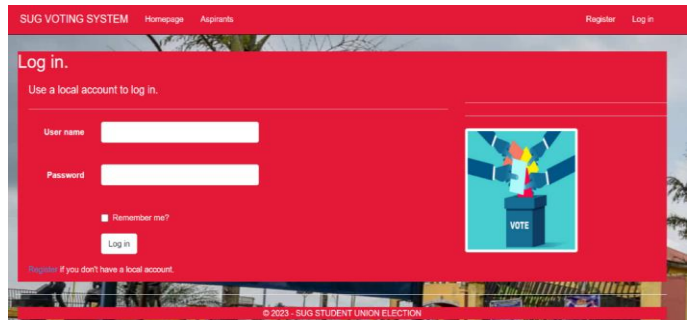


Figure 4: user login form

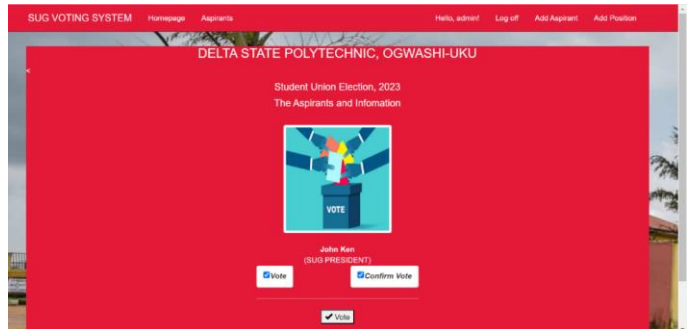


Figure 5: voting page

## CONCLUSION

Undoubtedly, implementing a comprehensive Electronic Voting System will significantly enhance the standard of elections at Delta State Polytechnic, Ogwashi-uku, for the student union government. While acknowledging the existing challenges in the current electoral process, it is equally important to recognize that these issues can be overcome with dedication and effort from all stakeholders involved.

The contribution to Knowledge of this research is that it clarifies the requirements and key elements of an E-voting system, and our implementation offers essential features such as accurate voter identity verification, mandatory registration, and authorization checks to ensure that only legitimate users can cast their votes. Additionally, voter authorities are limited to prevent any potential violations.

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