

**FEDERAL UNIVERSITY OF TECHNOLOGY  
P.M.B. 1526, OWERRI**

**A**

**PROJECT REPORT**

**ON:**

**GSM MOBILE APP: A SOLUTION TO THE  
CHALLENGES OF THE CURRENT VOTING  
SYSTEM IN TERTIARY INSTITUTIONS IN  
NIGERIA**

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## CERTIFICATION PAGE

This is to certify that the project titled "**GSM Mobile App: A solution to the challenges of the current voting system in tertiary institutions in Nigeria**" was done by **Otugeme Ekene Teslim and Osuagwu Okechi Ucheoma**, submitted to the department of Electrical and Electronics Engineering, School of Engineering and Engineering Technology, Owerri in partial fulfilment for the award of Bachelor degree (B.Eng) in Electrical and Electronics Engineering.

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## **DEDICATION**

We sincerely dedicate this work to the Almighty God, our creator and helper who has brought us thus far, our parents and siblings for their unflinching support and to all who directly and/or indirectly inspire us to delve more academically.

## **ACKNOWLEDGEMENT**

We appreciate the department of Electrical/Electronic Engineering for their enthusiasm towards advancement of knowledge in the field of Engineering. We have understood the power of teamwork and togetherness all through the process of this project. Our special appreciation goes to our amiable supervisor, Engr. Reginald C. Okpara for his ingenious support and indefatigable guidance in the preparation of this work. Our hearty thanks goes to our parents and families for their financial and moral support

Also to our Head of Department Engr. Dr. D.O. Dike, who plays a fatherly role to us.

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Finally, we wish to appreciate all our lecturers in the department who have in one way or the other, impacted in us.

## **ABSTRACT**

The word “vote” means to choose from a list, to elect or to determine. The main goal of voting (in a scenario involving the students of a given tertiary institution), is to come up with student-leaders of the students’ choice. Most tertiary institutions, FUTO not an exception have problems when it comes to voting. Some of the problems involved include rigging votes during election, insecure or inaccessible polling arena, inexperienced personnel and so on because voting in these institutions have been found to be limited to methods like: Ballot paper, on the spot counting, electronic voting and others not specified. This android voting app seeks to address the above issues. It should be noted that with this app in place, the users, University/College of Education/Polytechnic students in this case shall be given ample time during the voting period. They shall also be trained on how to vote using the app before the election time, although little training is required because the app is user-friendly.

## **TABLE OF CONTENTS**

Title page	i
Dedication	ii
Acknowledgement	iii
Table of content	iv
<b>CHAPTER ONE</b>	<b>1</b>
1.0 : Introduction	1
1.1 : Background Information	1
1.2 : Problem definition	4
1.3 : Objectives	6
1.4 : Justification	6
1.5 : Scope of study	7
1.6 : Limitations of study	7
1.7 : Organization of work	8
<b>CHAPTER TWO</b>	<b>9</b>
2.0: Literature Review	9
2.1: Voting in Tertiary Institutions in South-East, Nigeria	11
2.1.1: Abia State University, Uturu	11
2.1.2: Ebonyi State University, Abakaliki	12
2.1.3: Federal University of Technology, Owerri	12
2.1.4: Imo State University, Owerri	13
2.1.5: Nnamdi Azikiwe University, Awka	13

2.1.6: The Federal Polytechnic, Nekede	14
2.1.7: University of Nigeria, Nsukka	14
2.2: Challenges faced with the current voting methods	15
2.3: Solutions Proffered so far to curb the voting challenges	17
2.4: The Android Voting App.	18
2.4.1: Advantages	19
2.4.2: Disadvantages	19
<b>CHAPTER 3</b>	<b>20</b>
3.0 Materials and Methodology	20
3.1: Methodology	
3.1.1: Brief summary of methodology	20
3.1.2: System Implementation Technologies	23
3.2: System Analysis	26
3.3: Front-End and Back-end	27
3.4: Database design	29
<b>CHAPTER 4</b>	<b>31</b>
4.0: Results and Discussion	31
4.1: Mobile App Specification and Design	31
4.1.1: User Requirement	31
4.1.2: Requirement Specification	32
4.1.2.1: Environments	32
4.1.3: Functional Requirements	32
4.2: System Login	32

4.3: Implementation of the mobile App for voting	33
4.3.1: Form Input and reports design	33
4.3.2: The Login form	36
4.3.3: The Voting Home page	36
4.3.4: The main voting page	36
4.4: System Modules and Components	37
4.4.1: Shortcomings with the system	37
4.5: Testing and Validation	38
<b>CHAPTER 5</b>	<b>40</b>
5.0: Drawbacks, Conclusion and Recommendation	40
5.1: The Drawbacks	40
5.2: Conclusion	40
5.3: Recommendations	41

## **REFERENCES**



# **CHAPTER ONE**

## **1.0 INTRODUCTION**

### **1.1 BACKGROUND INFORMATION**

The Federal Republic of Nigeria comprises six geopolitical zones organized into 36 states and the Federal Capital Territory (FCT) in Abuja. The country is located in West Africa and is bounded in the East by Cameroun, in the West by Benin Republic, in the South by the Atlantic Ocean and in the North by Niger Republic and Chad. There are about 151 tertiary institutions in this country.

In Nigerian tertiary institutions, student elections are carried out every session. There are basically three arms of government in Federal University of Technology, Owerri (FUTO) in which student representatives or executives are usually elected; the Students Union Government (SUG), Departmental and Hostel levels. They are elected by students only. Lecturers are believed to have no influence as to who emerges successful in such elections.

In FUTO, at the SUG level we have the executive, legislative and judiciary arms. The executive arm is headed by the President with the Vice President, Secretary General, Assistant Secretary General, Financial Secretary, Treasurer, Public Relations Officer, Welfare, Director of Transport, Director of Socials and Director of Sports. The legislative arm is headed by the speaker assisted by the deputy speaker and the chief whip with each department having a representative in the legislative council. These representatives are called the Member Student Representative Council (MSRC). The judiciary arm is headed by the chief judge.

At the departmental level, we have the President, Vice President, Secretary General, Assistant Secretary, Financial Secretary, Treasurer, Director of Research, Director of Sports, Director of Socials, and Director of Protocol.

At the Hostel level, we have the Governor, Secretary General, Treasurer, Director of Sports, Director of Socials and Director of Welfare.

That is to say for any students election, students of any given tertiary institution vote their fellow students who have shown interest into the above listed posts.

Elections have been utilized to decide various questions for at least 2000 years. An election enables certain formal decisions to be made through participation of a given population [2]. Research indicates that voting systems started from the oral voting system, the famous raising of the hand, to the *Kudavolai* system which was used in ancient India. In ancient Greece, people would vote by putting a white or a black stone/ball in a bucket. The first paper ballot substituted the oral voting in Rome in 139BC that is according to Douglas Jones [3]. Nigeria still makes use of this paper-based voting system.

Literature suggests that improvements in voting systems started as early as in 1892 with the introduction of the lever arch machine, then the introduction of optical-scan machines and punch card systems for voting [4]. The next evolution saw the introduction of Direct Recording Electronics (DREs), Telephone, Kiosk, Internet voting systems and lastly the mobile phone voting systems [5].

Most student electoral bodies ISEC not an exception, right from their inception to date, even with recent advancement in technology, still use primitive paper-based methods during voting; this system is characterized by manual form filling to choose leaders. This has led to excessive number of mistakes making their way to the final vote counts. The disadvantage of paper-based system outweighs the advantages for instance the need to print ballot papers is slow, expensive, inflexible, an environmentally hostile process. There are also visual impairments and literacy limitations among others.

In democratic societies, voting is an important tool to collect and reflect people's opinions. Traditionally, voting is conducted in centralized or distributed places

called voting booths. Voters go to voting booths and cast their votes under the supervision of authorized parties. The votes are then counted manually once the election has finished. With the rapid development of computer technology and cryptographic methods, electronic voting systems can be employed to replace the inefficient and most importantly error-prone human component. To increase the efficiency and accuracy of voting procedures, computerized voting systems were developed to help collecting and counting the votes. These include Lever Voting Machines, Punched Cards for Voting, Optical Mark-Sense Scanners and Direct Recording Electronic (DRE) voting systems.

Electronic voting (e-voting) has been attracting a lot of attention and research for the past few years all over the world, for it has some remarkable advantages over traditional paper based voting.

Over the last few years, students have suggested the introduction of electronic voting into the system. A general observation is that as more business is done using electronic medium, it shouldn't be difficult to carry out voting using electronic equipment rather than turning up at the polling arena on voting date to use paper and pen. Just a few of the Nigerian tertiary institutions have actually implemented the electronic voting using the online voting system. Electronic voting using the android voting app should be cheaper than the present paper based arrangement.

This application provides a new technique for casting votes using mobile phones. Android voting system is an application developed for android devices to deploy an easy and flexible way of casting votes during the election time and from anywhere. The application is especially developed for tertiary institutions to get students votes for any new administration in the students arm. The names of aspirants are fed into the system by the admin. (Otugeme Ekene T. and Osuagwu Okechi U.). Students can then cast their votes by ticking against their choice aspirant's name. One voter can only tick one name for each post and before a student's vote counts, he must have ticked one name for each post. Each and every

vote cast is stored in the database for the respective post. The system is such that the eligible students for the voting process (that is, bonafide students of that tertiary institution), get to see the progress of the election candidates because as each student casts his/her vote, it reflects against the aspirants' names and there is an immediate increment. As such, the system at the end of the voting process doesn't need to count the total votes since the winners emerge and are known once the poll closes.

Thus the app helps the institution offer transparent student election process and provide/deliver student-choice comrades.



*Figure 1.1: Ballot box for casting vote [1]*

## **1.2 Problem definition**

The voting/polling process by students of a given tertiary institution seems to be cumbersome since there are decades of thousands of students. So many cases of authentic students not participating in the voting process due to unfavorable voting time, conditions, environment, unbearable queue or mammoth crowd at the voting place which is not accommodated in the period scheduled for voting. There are

also scenarios where non-academic students flock the polling centres to participate in the voting process adding to the unbearable queue. Before anyone can vote, he must be accredited. Taking a look at the accreditation process below:

STEP 1: Go to the polling centre with your students' identification card and join the queue.

STEP 2: Present your card to the ISEC official for verification.

STEP 3: Your finger will be marked with ink to show that you have been accredited.

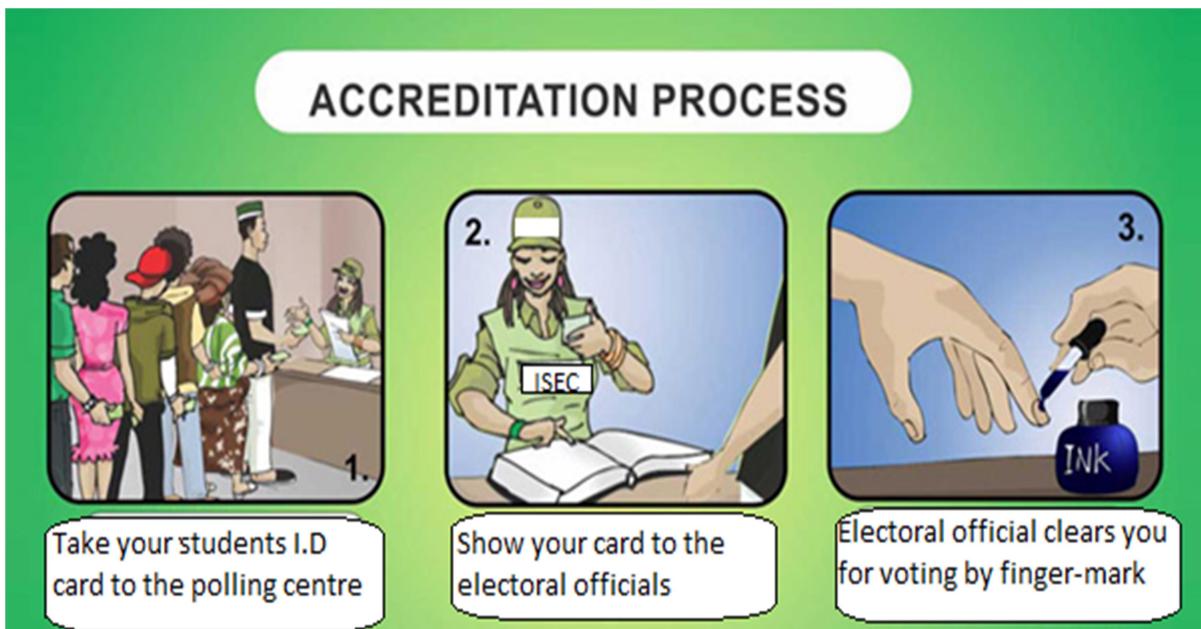


Figure 1.2: Voters accreditation process

And to think that this must be done for individual voters before they can actually vote could be really discouraging. Even after voting, malicious officers in charge end up playing with the result figures. This results in the release of wrong results leading to cases of post-election violence.

Such cases can be solved or drastically minimized by insisting on student voters exercising that task online using the kenekech voting app. The voters can also vote

from anywhere around the globe, they don't need to travel back to their institutions during election time in case they are elsewhere.

### **1.3 Objectives**

The main objective is to develop a mobile android app that can solve the challenges of the current voting system in tertiary institutions in Nigeria.

The specific objectives of the project include:

- Reviewing the current/existing student voting process or approach in Nigerian tertiary institutions.
- Coming up with an automated voting system for Nigerian tertiary institutions, using android phones.
- Implementing an automated/Android-app voting system.
- Validating the system to ensure that only legible voters are allowed to vote.

### **1.4 Justification**

The android voting app enables the voters to vote from any part of the globe as explained since it is an online application available on the internet. It excludes the use of manual voting process and soles cases of vote miscounts since at the backend of this system resides a well-developed database using SQL that can provide the correct data. Students can keep themselves updated with the progress of the report. No one can cast votes on behalf of others and multiple times. Saves time and reduces human intervention. It makes many more students become involved in the voting process. It makes students happy as their opinions/choices are paramount in producing student executives at all arms of the institution (Students Union

Government (SUG), departmental and hostel levels). The system is flexible and secured to be used.

### **1.5 Scope of study**

It is focused on studying the existing system of voting in Nigerian tertiary institutions to make sure that the students' votes count, for transparency and fairness in the elective positions.

Due to the large number of universities in Nigeria, we will be limiting the scope of this work to seven tertiary institutions in the South East only. They are:

- Abia State University, Uturu
- Ebonyi State University, Abakaliki
- Federal University Of Technology, Owerri
- Imo State University, Owerri
- Nnamdi Azikiwe University, Awka
- The Federal Polytechnic, Nekede
- University of Nigeria, Nsukka

A brief description of the institutions and their voting methods are given in the preceding subsections.

### **1.6 Limitations of study**

Major limitations in carrying out the work include:

- Time
- Financial constraints

Time factor was a barrier to the successful completion of this exercise since it had to be done within the semester. Also, we had financial constraints since all the activities involved were self-sponsored, we hadn't enough funds to go to all Nigerian tertiary institutions to carry out the survey.

## **1.7 Organization of work**

This report is based on proffering a solution to the challenges of the existing voting systems of higher institutions in Nigeria using an Android voting app. Chapter one gives a brief introduction and background study of the work, objectives, scope and limitation of the work. Chapter two reviews different literatures on previous and related works done in line with this project, the various voting methods within the scope and discusses challenges of current voting methods as well as solutions proffered so far to curb these challenges. The third chapter goes further to expatiate the methodology used and this involves the steps taken to arrive at the result. Chapter four talks of the results and discussions. The various results obtained from chapter three are shown with discussions on the significance and implications of the results. The concluding chapter which is chapter five talks on some drawbacks of the work, gives a highlight of the previous chapters and mentions achievements of the project and recommendations.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

All electronic or computer engineers who have done work in or are interested in electronic voting seem to agree that electronic voting does not meet the requirements for student elections and that the current widely-deployed voting system needs improvement. Other researchers have done work in electronic voting; while they may not explicitly mention voting from remote poll sites, their work is nonetheless relevant to any effort at designing or implementing a remote poll site voting system. Lorrie Cranor acknowledges the problems inherent in each kind of voting apparatus, but doesn't make an overt recommendation on her site for one technology over the rest. Some other academicians like Peter Neumann focus on the immensity of the problem one faces when trying to design and implement a truly secure voting system. They often remind us of Ken Thompson's Turning acceptance speech and the fact that we really can't trust any code which we did not create ourselves. Therefore, they tend to be extremely suspicious of proprietary voting machines and their makers who insist that we should "just try [them]." [6]

Neuman gives a list of suggestions for "generic voting criteria" which suggests that a voting system should be so hard to tamper with and so resistant to failure that no commercial system would be extremely difficult and prohibitively expensive.

A voting machine must produce human readable hardcopy paper results, which can be verified by the voter before the vote is cast, and manually later if necessary.

David Chaum presents a very interesting scheme, whereby voters could get receipts for their votes. This receipt would allow them to know if their votes were included in the final tally or not, and to prove that they voted without revealing any

information about how they voted. The security of this scheme depends on visual cryptography developed by Noar and Shamir, and on voters randomly choosing one of two pieces of paper. Mercuri and Neumann advocate the use of the technique in electronic voting systems.

In the recent years, voting equipment which were widely adopted in many countries may be divided into 5 types.

1. **Paper-based voting:** The voter gets a blank ballot and use a pen or a marker to indicate he wants to vote for which candidate. Hand counted ballots is a time and labor consuming process, but it is easy to manufacture ballots and the ballots can be retained for verifying, this type is still the most common way to vote.
2. **Lever voting machine:** Lever machine is a peculiar equipment, and each lever is assigned for a corresponding candidate. The voter pulls the lever to poll for his favorite candidate. This kind of voting machine can count up the ballots automatically. Because its interface is not user-friendly enough, giving some training to voters is necessary.
3. **Direct recording electronic voting machine:** This type, which is abbreviated to DRE, integrates with keyboard; touch screen, or buttons for the voter press to poll. Some of them lay in voting records and counting the votes is very quick. But the other DRE without keeping voting records are doubted about its accuracy.
4. **Punch card:** The voter uses metallic hole-punch to punch a hole on the blank ballot. It can count votes automatically, but if the voters perforation is incomplete, the result is probably determined wrongfully.
5. **Optical voting machine:** After each voter fills a circle corresponding to their favorite candidate on the blank ballot, this machine selects the darkest

mark on each ballot for the vote then computes the total result. This kind of machine counts up ballots rapidly. However, if the voter fills over the circle, it will lead to the error result of optical-scan.

In recent years, a considerable number of countries has adopted E-voting for their official elections. These countries include; America, Belgium, Japan and Brazil.

## **2.1 VOTING IN TERTIARY INSTITUTIONS IN SOUTH-EAST, NIGERIA**

A brief description of some of the tertiary institutions in the South-East and their voting methods are outlined below.

### **2.1.1 ABIA STATE UNIVERSITY, UTURU**

The inception of the university was in 1981 in the former Imo State under the name of Imo State University, UturuOkigwe. The university was established by Sam Mbakwe when he was Governor of old Imo State. Following the creation of Abia State in 1991, the Uturu campus of the University was ceded to Abia State; and is now known as Abia State University Uturu, Isuikwuato Local Government Area, Abia State, Nigeria. The university is organized in colleges and schools having been founded on the same collegiate system operated by University of Nebraska. Abia State University offers undergraduate, graduate and doctorate degree;and has two campuses with its main campus located in Uturu while its College of Agriculture and Veterinary Medicine is housed by the campus in Umuahia, Abia State capital.

**VOTING METHOD:** Manual Voting (Ballot Boxes)

### **2.1.2 EBONYI STATE UNIVERSITY, ABAKALIKI**

In the serene atmosphere of the eastern part of Nigeria, West Africa; stands a young citadel, driven by the quest for teaching, learning, research, development and excellence. That is Ebonyi State University.

Since 1999 when Ebonyi State University was upgraded to a full-fledged multidisciplinary University, the school became one of the few Universities fully committed to development of academic programmes in the areas of Law, Humanities, Sciences and Technology.

**VOTING METHOD:** Manual Voting (Ballot Boxes)

### **2.1.3 FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI**

The Federal University of Technology Owerri (FUTO) is a federal government university in a town known as Ihiagwa about 12-minute drive from Owerri, the capital of Imo State. The University is bounded by four communities of Eziobodo, Umuchima, Ihiagwa and Obinze, Imo State,Nigeria. It is the premier federal university of technology in South East and S/South parts of Nigeria. FUTO started with 225 students and 60 staff (28 academic and 32 non-academic). The university was founded in 1980. It later merged with Alvan Ikoku College of Education Owerri, absorbing the latter's students. The university is one of the premier technological universities in western Africa. Its student body comprises people from all over West Africa and beyond. It is the only federal university of technology in the South-East of Nigeria and one of the oldest in West Africa. The University is known for its technologically strong graduates, evidenced by the large number its alumni currently in oil and gas companies in Nigeria. The largest percentage of engineers in most oil companies in Nigeria are FUTO alumni.

## **VOTING METHOD:** Electronic voting

### **2.1.4 IMO STATE UNIVERSITY, OWERRI**

Imo State University (IMSU) in Owerri, Imo State, Nigeria was established in 1981 through law No. 4 passed by the Imo State House of Assembly. The university admitted the first intake of 392 pioneer students on October 23, 1981. After the creation of Abia State in 1991, the Uturu campus of the university became the Abia State University. Imo State University is a fully functional University. Most of the programmes of the University have obtained full accreditation from National Universities Commission of Nigeria. The decision to establish a State University arose when the absence of a Federal University was greatly felt by the people of Imo State whose major industry is education. The State had so many qualified candidates who could not be admitted by the existing Universities.

## **VOTING METHOD:** Manual Voting (Ballot Boxes)

### **2.1.5 NNAMDI AZIKIWE UNIVERSITY, AWKA**

Nnamdi Azikiwe University came into being as an offshoot of the defunct Anambra State University of Technology (ASUTECH). ASUTECH which was established through Law No. 7 of 30 July 1980 by the Government of the old Anambra operated as a multi-campus university, with campuses in Abakiliki, Enugu, Awka and Nnewi. In 1991, following the split of the old Anambra State into Anambra and Enugu States, the Awka and Nnewi campuses of the former ASUTECH were constituted into Nnamdi Azikiwe University by the Anambra State Edict No.5 of November 26,

1991. Nnamdi Azikiwe University was taken over by the Federal Government by Decree No. 34 of July 15, 1992. In 1991, after the former Anambra State was split

into Anambra and Enugu States, the Awka and Nnewi campuses of the former Anambra State University of Technology (ASUTECH) were combined into Nnamdi Azikiwe University, which was later taken over by Federal government. The university is named after Nnamdi Azikiwe, the first president of Nigeria. The Awka Campus became Nnamdi Azikiwe University. In 1992, the Federal Government of Nigeria took over the University from Anambra State. Nnamdi Azikiwe University, thus, became a Federal University.

**VOTING METHOD:** Manual Voting (Ticking your choice candidate on a sheet given).

### **2.1.6 THE FEDERAL POLYTECHNIC, NEKEDE**

The Federal Polytechnic, Nekede is a federal government-owned higher institution located in Nekede, a town in Imo State, South-Eastern Nigeria. It was established on a temporary site at the premise of Government Technical College by the Imo State government in 1978 as College of Technology, Owerri before it was moved to its present location in Nekede. On 7 April 1993, the polytechnic was changed to a federal government institution and was renamed "The Federal Polytechnic, Nekede". The Federal Polytechnic, Nekede offers National Diploma and Higher National Diploma courses at undergraduate levels.

**VOTING METHOD:** Manual Voting (Ballot Boxes)

### **2.1.7 UNIVERSITY OF NIGERIA, NSUKKA**

The University of Nigeria (UNN), commonly referred to as UNN, is a federal university located in Nsukka, Enugu State, Nigeria. Founded by Nnamdi Azikiwe in 1955 and formally opened on 7 October 1960, the University of Nigeria has four

campuses – Nsukka, Enugu and Ituku-Ozalla – located in Enugu State and one in Aba, Abia State, Nigeria.

The University of Nigeria (UNN) was the first full-fledged indigenous and first autonomous university in Nigeria, modelled upon the American educational system. It is the first land-grant university in Africa and one of the five elite universities in the country. The university has 15 Faculties and 102 academic departments. The University offers 82 undergraduate programs and 211 postgraduate programmes.

### **VOTING METHOD: Manual Voting**

## **2.2 CHALLENGES FACED WITH THE CURRENT VOTING METHODS**

Voting in the various institutions as explained above has been found out to be limited to the following methods:

- Ballot paper
- On the spot counting
- Electronic voting
- Other methods not specified

But these methods have their disadvantages. They are:

- For a variety of reasons, voters may be unable to attend voting booths physically, but need to vote remotely, for example, from home or while travelling abroad.
- This system is time consuming and can result in a number of problems[7] including:

- a) Voters leaving without voting because of long queues.
- b) A very high intolerable percentage of lost, stolen or miscounted ballots.
- c) High number of unclear or invalid ballot.
- d) Limited or no accommodation for people with disabilities.
- e) Bad weather might also cause people not to walk long distances to voting stations to cast their votes.
- f) Intimidation of voters by agents.

This is why the GSM Mobile App is being proposed to help solve these challenges.



*Figure 2.1: Scenes of election violence during election [8]*



*Fig 2.2: Scene of long queue during election [9]*

## **2.3 SOLUTIONS PROFFERED SO FAR TO CURB THE VOTING CHALLENGES**

With the rapid development of computer technology and cryptographic methods, electronic voting systems have been employed to replace the inefficient and most importantly error-prone human component.

To increase the efficiency and accuracy of voting procedures, computerized voting systems were developed to help collecting and counting the votes. For a variety of reasons, voters may be unable to attend voting booths physically, but need to vote remotely, for example, from home or while travelling abroad. Hence, there is great demand for remote voting procedures that are easy, transparent, and, most importantly, secure. Today, the most common way for remote voting is postal voting, where voters cast their votes by post. However, it lacks proper authentication and involves a time-consuming procedure. Internet voting was introduced to provide more flexibility. Because of the inherited security

vulnerabilities of the Internet and computerized systems in general, Internet voting incurred a wide range of criticism.

## **2.4 THE ANDROID VOTING APPLICATION (APP)**

This application provides a new technique for casting votes using mobile phones. Android voting system is an application developed for android devices to deploy an easy and flexible way of casting votes during the election time and from anywhere. The application is especially developed for tertiary institutions to get students votes for any new administration in the students arm. The names of aspirants are fed into the system by the admin. (Otugeme Ekene T and Osuagwu Okechi U). Students can then cast their votes by ticking against their choice aspirant's name. One voter can only tick one name for each post and before a student's vote counts, he must have ticked one name for each post. Each and every vote cast is stored in the database for the respective post. The system is such that the eligible students for the voting process (that is, bonafide students of that tertiary institution), get to see the progress of the election candidates because as each student casts his/her vote, it reflects against the aspirants' names and there is an immediate increment. As such, the system at the end of the voting process doesn't need to count the total votes since the winners emerge and are known once the poll closes.

Thus the app helps the institution offer transparent student election process and provide/deliver student-choice comrades.

#### **2.4.1 ADVANTAGES**

- The system can be used from anywhere by the students.
- It excludes the use of manual voting process.
- Students can keep themselves updated with the progress of the report.
- No one can cast votes on behalf of others and multiple times.
- Saves time and reduces human intervention.
- It makes many more students become involved in the voting process.
- It makes students happy as their opinions/choices are paramount in producing student executives at all arms of the institution (Students Union Government (SUG), departmental and hostel levels).
- The system is flexible and secured to be used.
- Admin can get instant result.

#### **2.4.2. DISADVANTAGES**

- Every student must have an android device for casting the vote.
- Every student must have access to internet data connection to participate in the election.
- Android service is used to asynchronously invoke the application on the voting day. There is a risk if the user has re-started the phone post registration, this service may not be running.
- The solution relies on the availability of android phones with OS version

## **CHAPTER THREE**

### **3.0 MATERIALS AND METHODOLOGY**

#### **3.1 METHODOLOGY**

It includes a brief summary, specific methods which were used in order to achieve the objectives of the project, particular requirements for implementation of the project and a brief explanation of why such methods were used for implementing the proposed system.

##### **3.1.1 BRIEF SUMMARY OF METHODOLOGY**

Kenekech voting app is a complex system that deals with the interconnection of various layouts and applications with the sole aim of parsing data through JSON (JavaScript Object Notation). The name “Kenekech” is a combination of Ekene and Okechi; names of the students who executed this project.

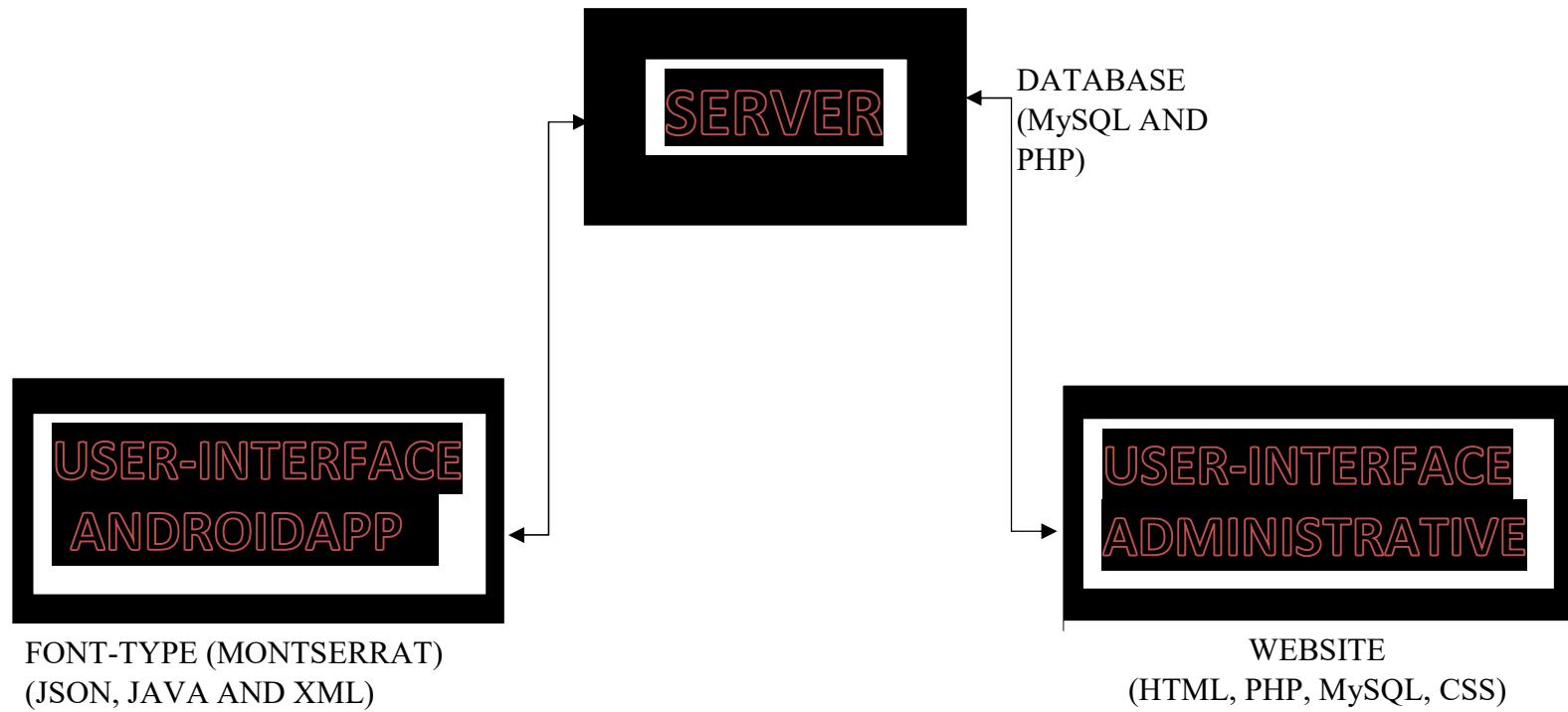
The first step in the development was the creation of a website. The website provides a domain that contains an effective database to be used to store the data of the voters and to organize how the voting is to be carried out. The domain name is <http://www.kenekech.com> and is hosted under <http://www.globalhosting247.com>.

The second step after the website with a domain has been created, was to write programs or codes in web technologies using Notepad++ and WampServer such as PHP, CSS AND MySQL which would allow the administrator to enter the students’ data, student aspirants for different posts at SUG, Departmental and hostel levels. We ensured that the server had the right variables (67 characters) at their appropriate positions, which ensures that everything is in place with the server site. After the data has been entered successfully by the administrators (Ekene and Okechi), we moved to the concluding yet very vital part of the construction.

The next step was the building of the android app. The android app is written basically in Java and XML (Extensible Markup Language). The XML takes care of the fragmenting and layout of the app. That is, it shows and directs to where a textview, edittext, button, spinner etc. are to be placed. In other words, the user interactions were configured. On the other hand, java provides the data manipulation. In the java file, there are important objects and classes that are used in the communication between the android app and the server database housing the data and these classes include:

- Http
- UrlConnection
- Buffer
- InputStream
- OutputStream
- NameValuePair etc.

The android studio was the integrated development environment used to write these programs and they were tested by the use of applications such as Genymotion and its VirtualBox.



*Figure 3.1: Design Framework of the Working of the Android Voting App*

The screenshot shows a Notepad++ window with the following details:

- Title Bar:** C:\wamp\www\kenekech\display\_HOSTEL.php - Notepad++
- Menu Bar:** File, Edit, Search, View, Encoding, Language, Settings, Macro, Run, Plugins, Window, ?
- Toolbar:** Standard file operations like Open, Save, Print, Find, Replace, etc.
- Code Editor:** The main area contains PHP code for a database query. The code is color-coded for syntax highlighting, with keywords in blue, strings in red, and variables in orange.
- Status Bar:** length : 1926 lines : 76 Ln : 1 Col : 1 Sel : 0 Dos\Windows ANSI INK

```
1 <?php
2     $response = array();
3     $regN = $_POST["RegNum"];
4     if (!$database = mysqli_connect("localhost",
5         "kenekech_OkeOtUU", "OkechiOtugeme1")) {
6         die();
7     }
8     if (!mysqli_select_db($database, "kenekech_kenekech")) {
9         die();
10    $resultCOne = mysqli_query($database, "SELECT RegNumber,
11        ReceiptNo, HostelCode FROM dhostelstu WHERE RegNumber =
12        '$regN'" or die(mysqli_error()));
13    $box = array();
14    while ($row = mysqli_fetch_row($resultCOne)) {
15        foreach ($row as $key => $value) {
```

*Figure 3.2: NOTEPAD++ Environment*

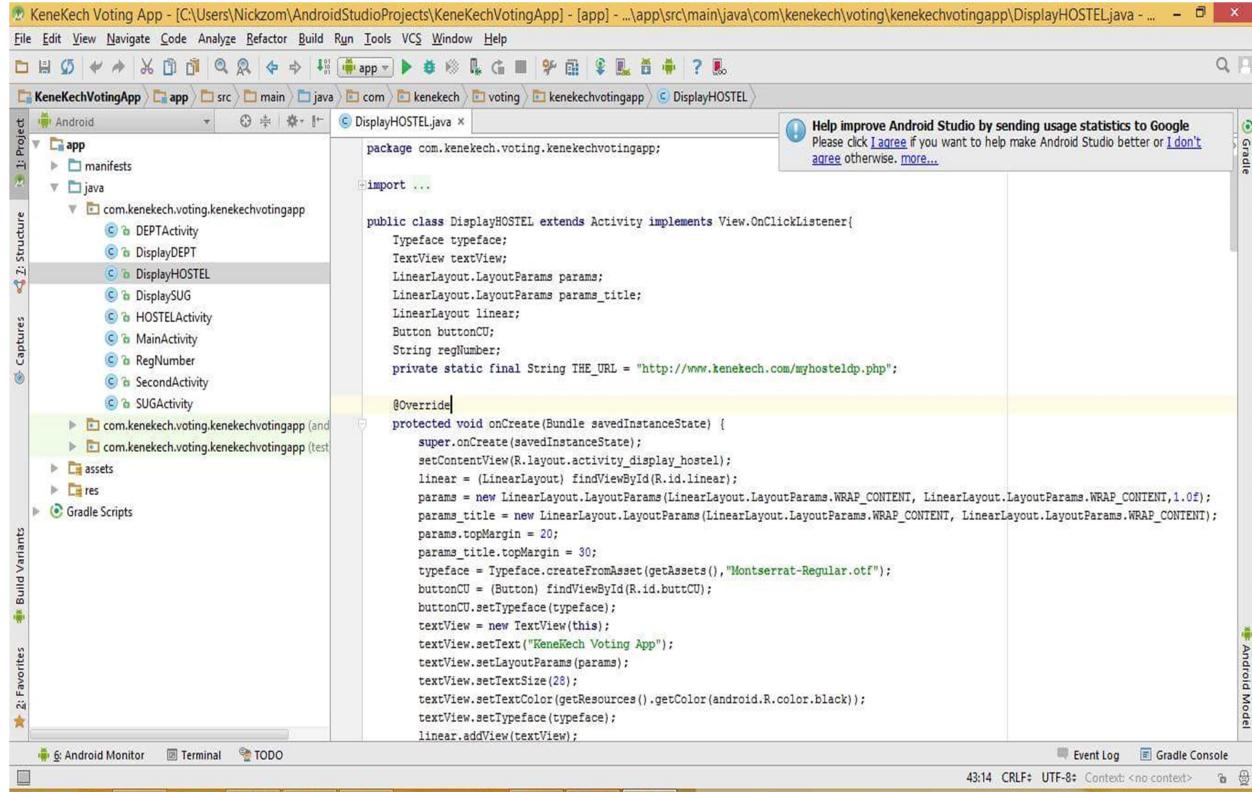


Figure 3.3: Android Studio Environment

### 3.1.2 System Implementation Technologies

The android voting app is web-based and several softwares/tools were used during the implementation. They include:

- **HTML (HyperText Markup Language):** It basically provides the framework for the web application user interface. It is the *lingua franca* for publishing hypertext on the World Wide Web. It is the core of the web world. Macromedia fireworks or dreamweaver is a preferred tool for designing HTML pages. The main HTML tags include HTML tag, HEAD tag, TITLE tag, META tag, LINK, TABLE (TR, TH, TD).
- **CSS ( Cascading Style Sheets):** It describes how HTML elements are to be displayed on screen, paper or in other media. It saves a lot of work because it can control the layout of multiple webpages all at once. It is basically used to

define styles for the webpages including the design, layout and variations in display for different devices and screen sizes.

- **SQL (Structured Query Language):** Relational Database Management System (RDBMS) is the basis for SQL. The SQL is involved with anything that has to do with the database sending and receiving data. For example, it executes queries against, retrieves data from, inserts records in, updates records in, delete records, creates new, creates new tables in, create stored procedures in and creates views in a database. It also sets permissions on tables, procedures and views.
- **PHP (HyperText Preprocessor):** it is an open-source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. It is a platform used to convert the web application platform to the server. It used for manipulation of data and configuration of cookies.
- **JAVA:** It's the main programming language for android app development. It takes care of manipulation of strings and variables, configuration of activities, calling of layout, for access to and fro the server database, user verification, URL connections, HTTP syntax connections, dialogue viewing, intent building, fonts, typefacing etc.
- **XML(Extensible Markup Language):** It is a simple, very flexible text format used for laying out, fragmenting and positioning. It plays an important role in the exchange of a wide variety of data on the web and elsewhere. It carries data with focus on what data is and not how data looks in the case of HTML.
- **WAMPSEVER:** Testing is done via the WAMPserver.

The app also employs hardware. It includes:

- **ANDROID PHONE:** An android phone containing the downloaded voting app, together with internet access/connection of atleast 2G, 3G OR 4G, is needed. The mobile app can be downloaded from various android application download platforms, which include:
  - a) Amazon Appstore
  - b) Apple Store
  - c) BlackBerry
  - d) Google Play
  - e) Firefox Marketplace
  - f) Ubuntu App Store



Figure 3.4: Examples of android applications downloading platforms [10]

### **3.2 SYSTEM ANALYSIS**

The analysis of the android app is deduced:

- STEP 1: The user enters his registration number. In the process, the app checks for internet connection and whether the registration number entered is accurate. If positive, the next activity comes up which displays the voter's data and the various elections to be partaken in.
- STEP 2: The user decides on the election he or she wants to participate in, either the SUG, departmental or hostel elections. For instance, if he/she clicks on 'SUG', a list of all the aspirants arranged against the posts they vie for comes up and the user is then at liberty to select preferred candidates. After the selection, he/she clicks on 'Submit' which sends the data to the server database for storage. This also applies for the departmental and hostel elections.

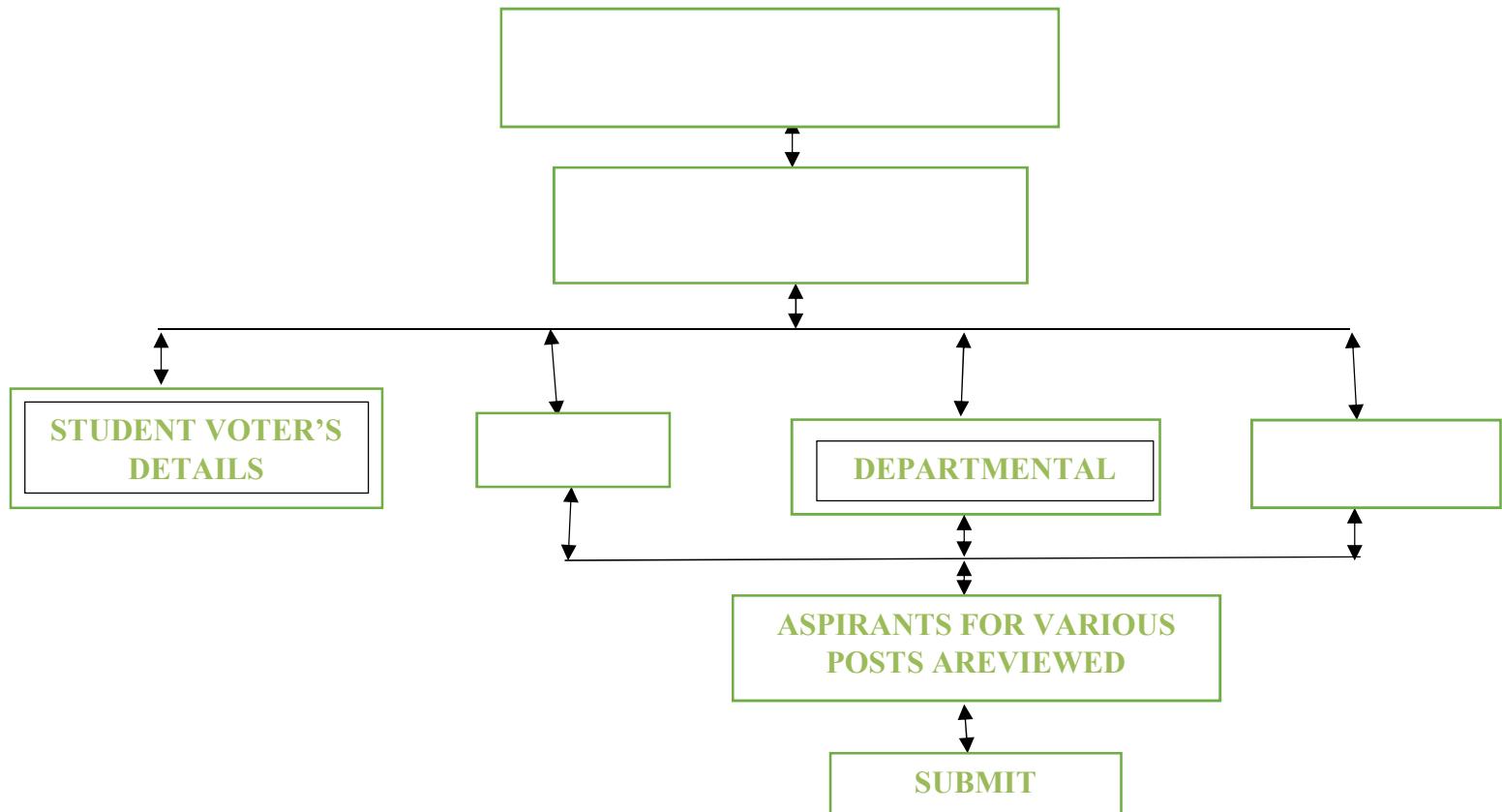
It is important to note that for a student's vote to count, he must have ticked one name for every post.

- STEP 3: After the submission, a notification pops up telling the user that his/her vote was cast.

Inorder to view the results of the election, the user is to enter his/her registration number again for security purposes. He then clicks on the particular election of interest and clicks on election results.

This ensures that before one can see the results, he/she must have cast his/her votes.

The login block diagram is as follows:



*Figure 3.5: Login Flowchart*

The only people capable of logging into the website are the administrators. The website (administrative user interface) is such that it has no direct communication with the android app user interface. The website and the android-app user interface only have communications with the server respectively (as shown in figure3.1).

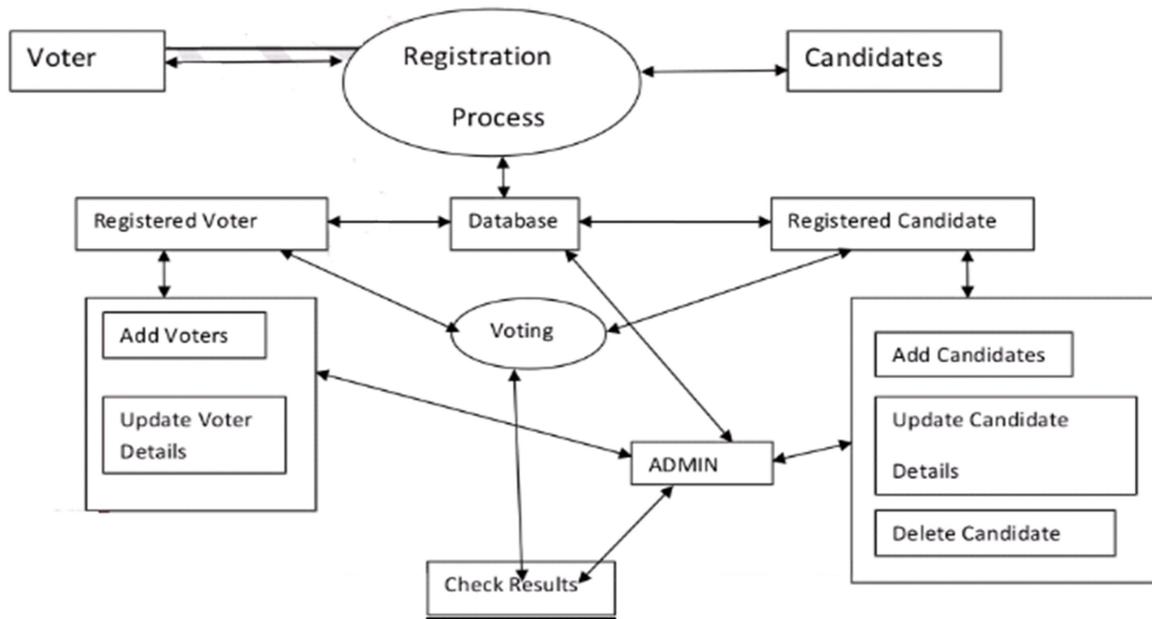
### 3.3 FRONT-END AND BACK-END

In their most general meanings, the terms front-end and back-end refer to the initial and end stages of a process flow. In software design, the **front-end** is the part of a software system that deals with the user and the **back-end** is the part that processes

the input from the front-end. The separation of software systems into “front-ends” and “back-ends” is a kind of abstraction that helps to keep different parts of the system separated. The general idea is that the front-end is responsible for collecting input from the user, which can be in a variety of forms and processing it in such a way that conforms to a specification that the back-end can use. The connection to the front-end and the back-end is a kind of interface (the server).

Front-end and back-end are terms used to characterize program interfaces and services relative to the initial user of these interfaces and services. The “user” may be a human being or program. These terms acquire more special meanings in particular areas:

- For software applications, front-end is the same as **user-interface**
- In client/server applications, the client part of the program is called the **administrator** and the server part is called the **voter**
- In compilers, the programs that translate source code into object code are often composed of two parts: a front-end and a back-end. The front-end is responsible for checking syntax and detecting errors, whereas the back-end performs the actual translation into object code.



*Figure 3.6: Data flow Diagram*

### 3.4 DATABASE DESIGN

The kenekech voting app uses many tables, viz.:

- Admin
- Voter
- Candidate

**Admin Table:** Holds records of the admin(s) with their respective preferred usernames and passwords. An illustration of the admin's table is shown below.

Table 3.1: Table structure for Admin login details

Field Name	Data Type	Size	Description
Username	Varchar	67	Login id for Admin. (Primary key)
Password	Varchar	67	Password for login

**Voter's Table:** This table holds records of registered students/voters. The table below illustrates the voter's table.

Table 3.2: Table Structure for voter's registration details

Field Name	Data Type	Size	Description
Voterid (Registration Number)	Integer		Login id for voter (Primary key)
Name	Varchar	67	Name of the valid student
Registration Number	Integer		Registration number of valid student
Department	Varchar	67	Department of student
Level	Varchar	67	Level of student

**Candidate's Table:** It holds records of the candidates and the posts they vie for. Its primary key is the id field which is also necessary during vote counting. The database is queried to find out how many voters cast their votes for given candidate. The candidate's table is shown as follows:

Table 3.3: Table structure for candidate details

Field Name	Data Type	Size	Description
Candidateid	Varchar	67	Posts id for candidates
Names	Varchar	67	Names of candidates

## **CHAPTER FOUR**

### **4.0 RESULTS AND DISCUSSION**

This chapter describes the practical implementation of the mobile android app from voting during student's election in FUTO. It is a practical walkthrough of our project from the mobile login to the administrator login to the voting proper and display of results, this section describes them.

### **4.1 MOBILE APP SPECIFICATION AND DESIGN**

#### **4.1.1 USER REQUIREMENT**

The Mobile App for voting should:

- Be able to display all registered voters in the database to the system admins as part of their access rights and privileges ([kenekech.com/cpanel](http://kenekech.com/cpanel)).
- Be able to display all candidates contesting and their positions to the voters (student) upon login into the mobile app.
- Have a user-friendly interface and user guides understandable by people of average computer skills.
- Names of candidates contesting should be able to be deleted, changed or updated as required year after year.

- Matric Numbers of all students who are the eligible voters should have been imputed by the system admins to enable the app recognize a student when he/she wants to log in to cast their vote.
- Be robust enough so that users do not corrupt it in the event of voting.
- Be able to handle multiple users at the same time and with the same efficiency, this will cater for the large and ever growing population of voters.
- Must not allow a user to vote more than once.

#### **4.1.2 REQUIREMENT SPECIFICATION**

This has to do with the environment and web terminologies and languages used in building this application. Much of this has already been discussed in chapter three.

##### **4.1.2.1 ENVIRONMENTS**

- Note Pad ++
- WAMP Server
- Android Studio
- Genymotion
- Macromedia fireworks 8
- Oracle -Virtual box

##### **4.1.3 FUNCTIONAL REQUIREMENTS**

- Secure storage and retrieval of voters' details from the database.
- Enable secure login of voters i.e., non-legitimate voters should never be allowed to login to the app, this includes non-students or lecturers.
- Maintaining and manipulating records in database through functions like edit, delete and view.
- Validate and verify input and output data.

## 4.2 SYSTEM LOGIN

To login into the app, one must have downloaded and installed the app from mobile stores e.g. Google play store on his/her smartphone. One must also have a valid Matric Number which is recognized by the school. It is possible for more than one voter to use a particular smartphone, but once any student votes with his/her Matric Number, that student won't be allowed to vote again.

At the opening of the app, the voter interacts with the login page where he/she is required to provide their Matric Number. Once logged in, then the voter is allowed to perform activities such as voting and viewing results.

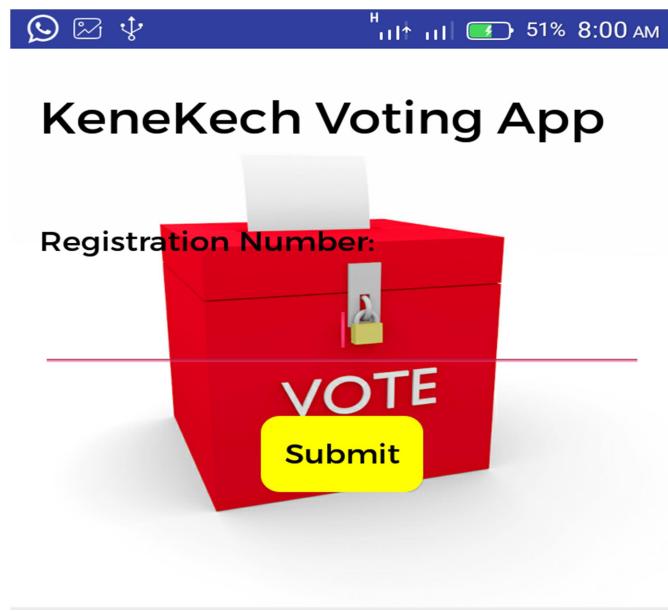


Figure 4.1: Picture of Mobile app login page

## 4.3 IMPLEMENTATION OF THE MOBILE APP FOR VOTING

This subsection gives an overview of the implementation and explains how users can navigate through the newly developed app in order to use it easily.

### 4.3.1 FORM INPUT AND REPORTS DESIGN

We created a user interface for the administrators in the form of a website to input student's data, the candidates' data aspiring for different offices at different levels.

We did this using all the web technologies mentioned in 4.

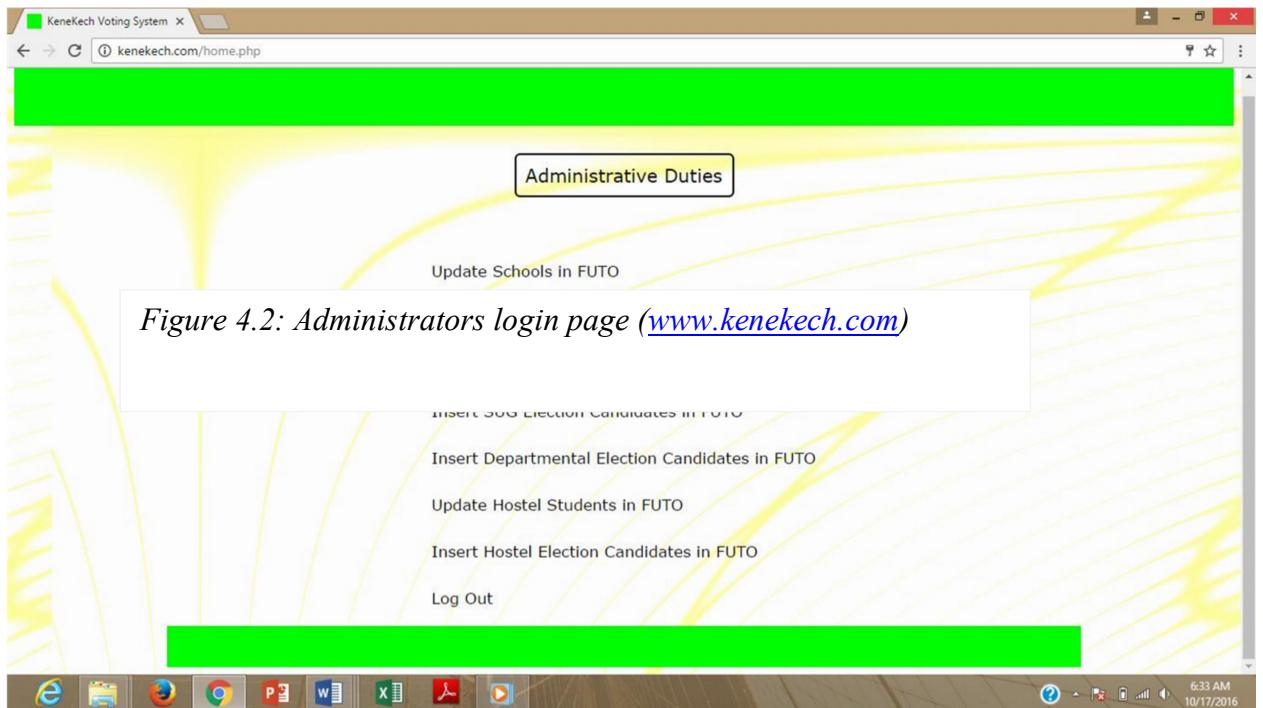


Figure 4.2: Administrators login page ([www.kenekech.com](http://www.kenekech.com))

Figure 4.3a : Administrator duties page

Update FUTO Students

Name:

Registration Number:

Level:

Department:

Figures 4.3b: Students update form

### 4.3.2 THE LOGIN FORM

Update

Go Back Log Out

FUTO Students

Serial	Name	Reg. No.	Level	Department
1	Osuagwu Okechi Ucheoma	20111793183	500	EEE
3	Eze Nnamdi Ugochukwu	20111771493	500	EEE
4	Nwogbunyama Emeka Ani	20111771903	500	EEE
5	Arukwe Jeffrey C	20111771253	500	EEE
6	Engr Reginald	20111793184	500	EEE

This is where a new user or voter starts. The individual is required to provide his/her Matriculation Number. When this is provided, the system validates the user if the entered Matric Number tallies with what is in the database. He/she is then logged in otherwise the voter is not logged in.

#### 4.3.3 THE VOTING HOME PAGE

This is the page where the three different voting types are displayed, whether SUG, Departmental or Hostel.



Figure 4.5: Voting Type Page

#### 4.3.4 THE MAIN VOTING PAGE

Once the voter clicks on the option of voting type, then a list of the different candidates and the posts they are aspiring for is displayed. The voter simply need to click on the circle at the side of his/her choice candidate.



## KeneKech Voting App

**President**

Idigo Emmanuel  
 Eze Paul  
 Emeka Spartacus  
 Agron Crixus

**Vice President**

Osuagwu Okechi Ucheoma  
 Uzoechi Juliet

**Secretary General**

Amusuo Paschal  
 Ebenebe Uchenna

**Assistant Secretary General**

Walter Ebere

**Financial Secretary**

Okonkwo Gerald

Figure 4.6: SUG Election page

## 4.4 SYSTEM MODULES AND COMPONENTS

The system was implemented as a mobile app-based voting system, using Web UI, Server and Android User Interface.

### 4.4.1 SHORTCOMINGS WITH THE SYSTEM

The app is limited by the following factors:

- Schools complain of limited finance to fully implement this system
- ISEC representatives and other ad hoc staff complain that their work is been done by this tool.

- Some students don't believe this is a more secure and legitimate method of voting.
- Power supply to various institutions is a hindrance. For instance FUTO has a record of poor power supply in the hostels and around campus. This may make it impossible for some candidates to vote as they may complain that their phone batteries are down.
- If wrong information is entered by the administrators the whole process may be faulty as computer based systems are garbage in garbage out.
- There is a significant loss of human touch in the voting process.

## 4.5 TESTING AND VALIDATION

Display of how it computes the votes, the results etc.



Figure 4.7: Display of voting progress result

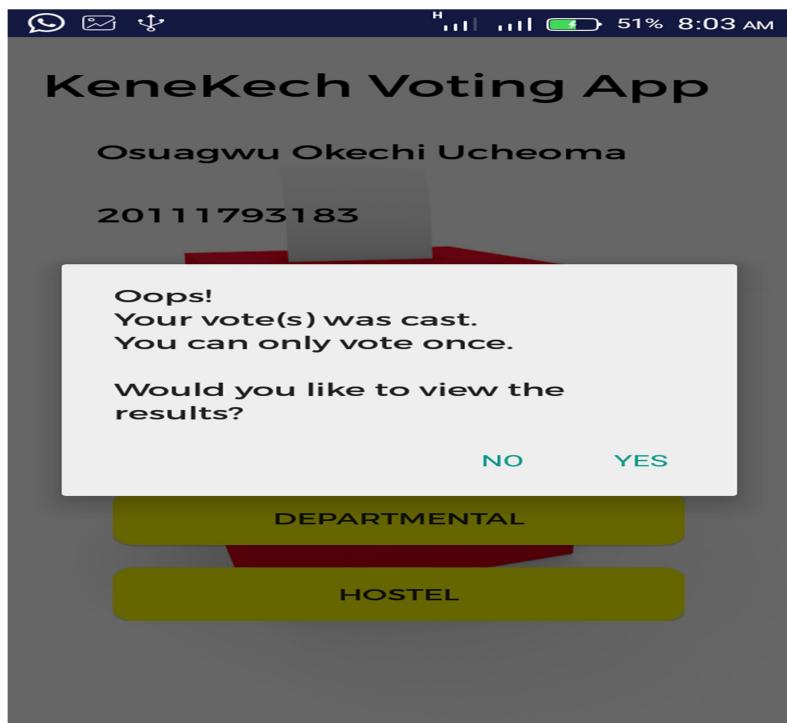


Figure 4.8: Display when you attempt to vote twice

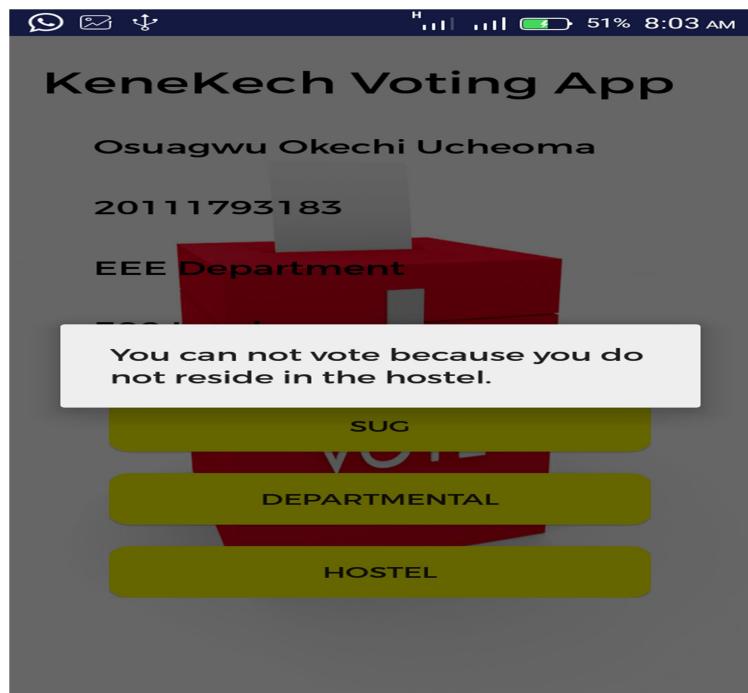


Figure 4.9: Display when you are not a hostel occupant

## CHAPTER FIVE

### 5.0 DRAWBACKS, CONCLUSION AND RECOMMENDATION

#### 5.1 THE DRAWBACKS

- Every student must have an android device for casting the vote.
- Every student must have access to internet data connection to participate in the election
- Android Service is used to asynchronously invoke the application on the Voting day. There is a risk if the user has re-started the phone post registration, this service may not be running
- The solution relies on the delivery of ONE TIME PASSWORD to the enrolled voters.
- The solution relies on the availability of Android phones with OS version

#### 5.2 CONCLUSION

Managing student elections and making sure to provide equal right to vote for all strata of institutions has inherently been an arduous task.

However, with the growth of telecom, Mobile Voting solution provides a strong alternative to traditional paperbased balloting or even the mere electronic voting.

As a burgeoning technology, mobile voting app is like any youngster, full of potential rather than accomplishments.

The foremost consideration about mobile voting app seems to be trust issues, not about the technology itself but rather the democratic culture of the country. This is where it is an absolute must to have a “secure and trustworthy” mobile voting app and polling platform.

Mobile voting app addresses issues confronting student elections at all levels of voting as a new mobile option delivering significant benefits to current processes, including –

- Increasing voter participation in any election by offering the convenience of a secure and "virtual polling location"
- Enhancing accessibility for disabled, handicapped voters
- Reducing costs of printing, distributing and handling paper or absentee ballots
- Eliminating the fraud associated with absentee ballots
- Increasing transparency in the voting process
- Transitioning the investment in traditional voting machines to technology-based solutions employing readily available mobile smartphones and tablet devices.

### **5.3 RECOMMENDATION**

The following additional enhancement have been added during the course of design and implementation of the project:

- Support for multiple people to use the same mobile for voting
- Implementation of additional One time password and delivery mechanism (postal delivery of security key) to ensure individual data integrity and privacy of the vote
- Encryption of SMS interaction (starting from the first SMS sent) to ensure secrecy of the data transmitted (complex encryption key combinations used to prevent hacking)
- Other institutions can adopt this voting system

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