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STUDENT ONLINE VOTING SYSTEM

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Abstract

The SOV system provides online voters registration forms for students where students registers and are allowed to log in as either students or delegates or candidates. Each registered user has a password to log in. The system provides an interactive platform where voters and candidates interacts and thus candidates perform their campaigns. The system allows preliminary voting and the results are graphically represented in percentage. This system also allows the candidates to be liked by users and the most liked candidate is the most popular. The system compute and gives the election results for all the posts and provides reports for the whole election process. The main objective of this system is to design, develop and implement an efficient, user friendly, interactive web based student voting system. The methodology used is waterfall.

Keywords: *Students' Online Voting, Students, Delegates, Candidates, Student Online Voting System (SOV)*

1.1 Background

University student leaders are the core link between the university students and the university administration. These leaders are therefore elected democratically to represent the interests of the students as per the university act. It is always an expectation of every student that elections be held fairly and results computed accurately.

In the previous elections, there have been challenges in the turnout of voters due to some challenges they face on the voting day. Initially the students were expected to queue and cast their votes in the ballots as per their various schools. The current system does not verify and account for the persons to vote since no voting registration is done prior. This has been bringing some loopholes in that even a student who is not in session can queue and vote as long as he/she has a student identification Card. The current system does not also tell the number of expected voters since they rely on the population of the student of which not all students are interested in these elections. This is the main challenge to the voters and officials of election commission.

Candidates are expected to reach voters through campaigns of door to door, rallies and debates which has been a challenge for a while due to the busy environment in the school. Many students do not attend rallies because of their busy schedules and also it's hard for candidates to find students in their houses since availability is an issue. This mode of campaigning has been yielding less fruits and thus voters would cast votes with either no or less knowledge about the candidates and their manifestos. When it gets to counting, a lot of time man powers

are consumed following the large population of voters. With the nature of human being not being so diligent, a lot of flaws are found which brings a lot of chaos from the stakeholders.

Following these challenges, I saw it good to come up with a system that could curb these problems and speed up the election system to ensure free and fair elections. When a system that is based on pens and ballot papers is used at a large population, the results can be ambiguous and that questions the intelligibility of the system used. Hand counting votes is time consuming especially at a turnout of many voters and many positions being voted for. In a case of disabled or duty bound people, they struggle to cast their votes the system makes it easy for them since they can vote at their comfort of their places. This system also curbs the chances of the manipulation of results from influencing authorities and thus generate transparency to the highest levels.

1.2 Current System

The current system is a manual system where everything is done minus computers. The aspiring candidates apply through their various schools departments for the various posts of interests. They are therefore vetted by the senior authorities and nominated for the posts. Afterwards they are given a duration of campaign where they have to sell their policies and agendas to the voters and win their votes. These campaigns are done through door to door campaigns where they literally have to walk from house to house asking for votes and also some one to two rallies that are expected to tell their manifestos and defend themselves for the posts. The rallies are always a challenge since the supporters of the opponents may interfere with the speech of a candidate or just cause chaos or crannies to prevent others from listening to the candidate. The debates organized in conjunction to the election are always ineffective since they provoke conflicts and chaos from the opposite possible teams.

Voting is done manually using pen and ballot papers where a student is suppose to tick or put a mark alongside the candidate of choice. This many times leads to so many spoilt votes due to ignorance or violation of rules of the students who are hungry to vote. The students make long queues to cast their votes as voting is done one student at a time. Counting of votes is done handily with the candidate's agents witnessing the process. The candidate with the majority of votes is declared winner and sometimes once the candidate with major votes is noticed, the counting process is stopped. How then will the other candidates know they lost by how many votes? This is the reason for my proposed system. The system is so slow, tiresome and with a lot of loopholes as there maybe some essence of manipulation of results from the higher authorities in favor of their preferred candidates who may not be the choice of the people.

1.3 Problem Statement

The current system of election does not take record of voters hence gives chance to any person to vote as long as they have the school identification cards. Some students may not be eligible for the process since they may not be in the school system on different reasons. Interaction between voters and candidates has been minimal since they only interact in rallies which are done once and may not be enough for all students to know who the candidates are and what the candidates have for them. Senior authorities may exploit and manipulate the votes in favor of their preferred candidates which tempers with the expected free and fair elections. The current system consumes a lot of time since users have to queue in order to vote and also counting is hand counting which takes a lot of time and man power.

The proposed system will provide online voters registration forms for students where students will register and be allowed now to log in as either students or delegates or candidates. Each registered user will have a password to log in. The proposed system will provide an interactive platform where voters and candidates will interact and thus candidates perform their campaigns. The system will also perform some sort of tallying where results

and statistics on the expected election will be shown and updated properly. The system will allow preliminary voting and the results will be graphically represented in percentage. This system will also allow the candidates to be liked by users and the most liked candidate is the most popular. The system will compute and give the election results for all the posts and provide reports for the whole election process.

1.4 Proposed system

The proposed system will provide online voters registration forms for students which they will fill and upon registration of their details, they will be allowed to log in and interact with the sytem. The student details will be saved in the student details database. The user will be allowed to create their various passwords which they will use along their school admission number to log into the system. The users will be able to log in as either normal student or delegate or candidate. Delegates details are saved in the delegate database while candidates details are saved in the candidates database.

The proposed system will also provide interaction platforms for both the voters and the candidates where they will interact and discuss matters elections. The candidates shall therefore perform their campaigns and answer the possible questions from the voters on the chat platforms. The candidates will be allowed to pose their various agendas and manifestos and defend them on interrogation of the delegates. Candidates will interact with delegates and respond to their queries accordingly. Students will interact and send messages to delegates for representation of opinions.

The system will be able to perform some sort of tallying before and after voting. The results and statistics on the election will be shown and be updated properly and instantly. The system shall also allow preliminary voting where the delegates are able to vote and results are displayed openly to everyone. The students and delegates will be able to like the various candidates and the most liked candidate will be the most popular. The system will display the results of likes and votes and even percentage of victory. The proposed system will therefore compute the election results for all the posts voted and also compute the most popular candidate and the least popular candidate. The system will also compute reports for the whole election process.

The following are the goals of the proposed system;

- Only eligible voters are allowed to vote.
- Every voter shall cast only one vote
- It must be impossible to change anybody’s vote
- The complete voting procedure must be so transparent
- User friendly
- Robustness; it functions no matter any failure
- Hacker secure
- Transparency; users can check the system integrity without any trouble.

1.5 Objectives

1.5.1 Main Objective

To design, develop and implement an efficient, user friendly, interactive web based student voting system.

1.5.2 Specific Objectives

- To develop a system that will capture candidates and voters details
- To develop a system that will facilitate online voting.
- To develop a system that will facilitate voters and candidates interactions.
- To develop a system that will generate reports for the election process.

1.6 Research Questions

The proposed system is based on the following research questions.

1. How will the proposed system capture candidates and voters details?
2. How will the proposed system facilitate online voting?
3. How will the proposed system ensure voters and candidates interact?
4. How will the proposed system generate reports for the election process?

1.7 Justification

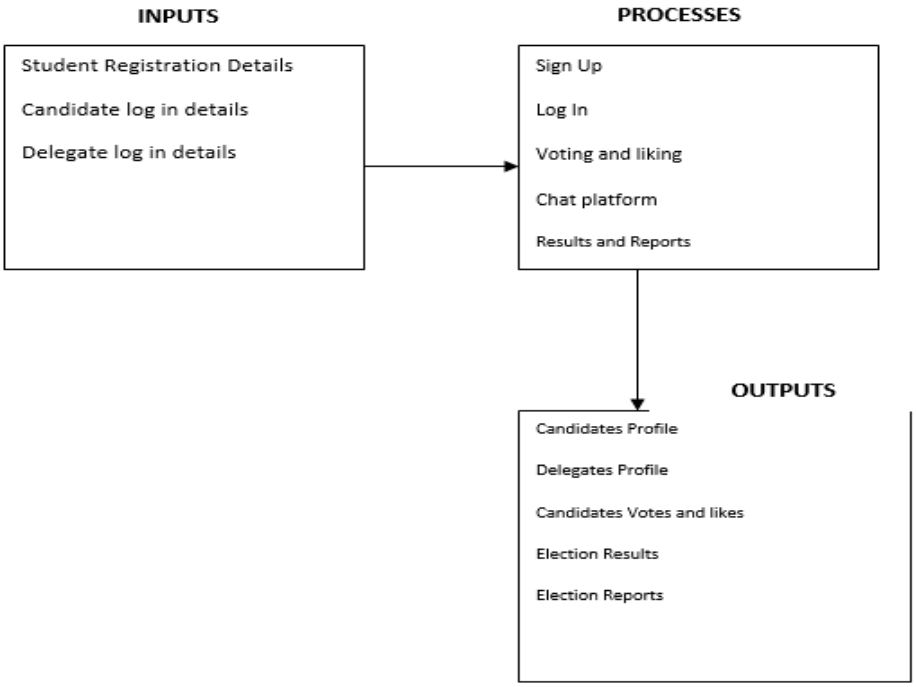
The success of this research will ensure the scalability of SOVS to be used in other institutions of higher levels and even the secondary schools since the benefits upon successful implementation of the proposed system justifies its system development and deployment. The proposed system will ensure transparency and high integrity in the election process. The system will be user friendly and provide great efficiency in the election process. Its success can also be replicated in other universities.

1.8 Scope

For the purpose of coming up with a student online voting system, a case study of Kirinyaga University (Kenya) Student Organization Student council was used. The study assumes that voter registration can be completed successfully and the students can have login credentials to log in, interact on the forum, listen to manifestos of the candidates, give election opinions and finally cast a vote. The proposed system will only work on the web platform.

1.10 Conceptual Framework

Figure 1 Conceptual Framework



2.1 Literature Review

This chapter documents the available relevant literature concerning the problem domain. The implication was that the researcher devoted sufficient time to reviewing research already undertaken on related problems. This was done to find out what data and other materials are already available from earlier research, and identify gaps that the present research may fill.

2.2 Election

Election is the process that gives the citizens the rights to select candidates to represent them in a democratic pattern. Election deals with the democracy and freewill of citizens, for this reason voting process is considered to be very critical and sensitive process, therefore election implementation must serve many requirements in order to deliver a trustworthy election. These requirements can be defined as user conventions requirements and delivery of secure voting process requirements. [6]

Due to the fast development of network technology the world is going toward the use and implementation of the e-technology in every aspect of our life including e-governments. Online voting becomes one of these technologies. Online voting refers to the use of hardware and software to establish an electronic system, useful in voting process, by generating an electronic ballot that replaces the paper ballot. E-voting was introduced by e-governments especially in Europe in order to serve voting convention by providing remote system so the voter can cast his/her vote whenever and wherever he/she can. These systems will increase voter's participation and will speed up the votes counting. Introducing remote voting technique over the internet (e-voting) will serve voter's convention. The main idea of this technology is to speed up the ballot counting and increase voters' participation by providing remote voting process and social interaction platforms.

2.3 Types of Voting

Voting is a process at the heart of a democratic society. There is a wide variety of different voting systems that are based on traditional paper ballots, mechanical devices, or electronic ballots. [2]

2.3.1 Paper Ballots

Hand written paper ballots were first used in Rome in 139 BCE, and their first use in America was in 1629, to select a pastor for the Salem church. These early paper ballots offered only modest voter privacy and they were fairly easy targets for various forms of election fraud. The modern system of election using paper ballots was first used in 1858 in Australia. The great Australian innovation was to print standardized ballots at government expense, distribute them to the voters at the polling places, and require that the voters vote and return the ballots immediately. Today, the security against election fraud this provides seems obvious, but in the 19th century, it was not obvious to most observers, and it was not until 1888 that this ballot was used in the United States. A properly administered Australian paper ballot sets a very high standard, assuring voter privacy, preventing voters from revealing how they voted, and assuring an accurate and impartial count.

2.3.2 Lever Voting Machines

Lever voting machines were first used in 1892 in New York, and were slowly adopted across the country. They completely eliminate most of the approaches to manipulating the vote count that were endemic a century ago, and they can easily be configured to handle a complex general election ballot. Lever voting machines offer excellent voter privacy, and the feel of a lever voting machine is immensely reassuring to voters! Unfortunately, they are immense machines, expensive to move and store, difficult to test, complex to maintain, and far from secure against vote fraud. Furthermore, a lever voting machine maintains no audit trail. With paper ballots, it is possible to recount the votes if there is an allegation of fraud. With lever voting machines, there is nothing to recount! In effect, lever voting machines were the "quick technological fix" for the problems of a century ago; they eliminated the problems people understood while they introduced new problems. Because they are expensive to test, complete tests are extremely rare. The mechanism is secure against tampering by the public, but a technician can easily fix a machine so that one voting position will never register more than some set number of votes, and this may not be detected for years.

2.3.3 Punched Cards

The first new technology to effectively challenge lever voting machines was the now infamous Votomatic voting machine. Punched card data processing dates back to the 1890's, but IBM did not introduce the Votomatic punched card voting system until 1964. The Votomatic ballot and the more recent mark-sense ballot both represent a return to the Australian secret ballot, but with the added benefit of automated and impartial vote count produced using tabulating machinery. With this return to paper ballots, we gained the ability to recount the vote in the event there is a challenge, but we also introduce the question of how to interpret marginal votes. From a legal perspective, a ballot is an instrument, just like a deed or a check. When the ballot is deposited in the ballot box, it becomes anonymous, but just prior to the moment when the ballot is deposited, it ought to be possible to hand the ballot to the voter and ask "does this ballot properly represent your intent?". Votomatic punched card ballots fail this simple test! While the ballot is in the Votomatic machine, the voter can punch holes in it but is unable to see the ballot itself. Once removed from the machine, the voter can see the holes, but without the ballot labels printed on the machine, the voter is unable to tell what those holes mean.

2.3.4 Optical Mark Sense Ballots

Optical mark-sense voting systems were developed in the early 1970's by American Information Systems of Omaha, alternately in competition with and in cooperation with Westinghouse Learning Systems of Iowa City. The latter was the licensee of the University of Iowa's patents on the optical mark-sense scanning machine. Essentially the only advantage of mark-sense technology over punched card technology is that it uses marks on a printed paper ballot. This is an important advantage! This means that no special machines are required to vote on the ballot, it means that, with proper ballot design, a voter can easily verify that the markings on the ballot exactly convey his or her intent, and it means that, during a hand recount, no special expertise is required to interpret the intent of the voters. Unfortunately, the first generation of optical mark-sense voting machines was extremely sensitive to the particular type of pen or pencil used to mark the ballot, and to the exact details of the mark itself. As a result, early machines, including many still in use today, had real difficulty distinguishing faint deliberate marks from smudged erasures, and they tended to have mark sensing thresholds that required a fairly dark mark. The newest generation of optical mark-sense readers uses visible wavelength image processing technology instead of simple infrared sensors to read the marks. Many of the more recent offerings use either FAX machine scanning mechanisms or computer page-scanning devices to obtain the image of the ballot, and they operate by finding each marking target before they search the target for acceptable marks. Such machines can easily ignore relatively dark smudged erasures while catching relatively faint deliberate marks.

2.3.5 Direct Recording Electronic Voting Systems

The newest voting technology uses direct-recording electronic voting machines. These were developed after microcomputers became sufficiently inexpensive that they could be incorporated into a voting machine. The first of these was developed by Shoup in 1978; The Shoup Voting Machine Company was one of the two companies that had been making lever voting machines for much of the century. Their new electronic voting machine was built to have the "look and feel" of a lever voting machine, thereby minimizing the voter education problems that always accompany changes in voting technology. Much of the rhetoric today about voting system reform asks why we can't have voting machines that are as ubiquitous and convenient as automatic teller machines. This turn of phrase is a reference to the newest generation of direct-recording voting machines; these make no attempt to emulate earlier technology; physically, they are little more than repackaged personal computers with touch screen input and special software to make them function as voting systems. All of today's direct-recording voting machines attempt to offer far stronger audit and security tools than the old lever machines they functionally replace. Instead of simply storing vote totals on odometer wheels inside the machine, they store an electronic record called a ballot image recording each voter's choices, and they store an audit trail of all actions involving the machine, from pre-election testing to the printing of vote totals after the polls close. These records are stored in duplicate form, for example, in a hard drive in the machine as well as in a removable memory pack of some kind or on an adding machine tape inside the machine. Should any disaster strike or should a recount be requested, it should be possible to recover all votes that have been cast on such a machine. Unlike any system resting on paper ballots, none of the information stored inside a direct recording electronic voting machine can be said to have the status of a legal instrument. Instead, the record is created by the software within the voting machine in response to the voter's actions, and the record is only as trustworthy as the software itself. It is far from easy to test and inspect software to assure that it functions as advertised, and it is far from easy to assure that the software resident in a machine today is the same software that was authorized for use in that machine months or years ago.

2.4 Electronic Voting

This is a voting system where the recording, casting and counting of votes involves information and communication technology. [5] The main principle of e-voting system is the replica of the regular voting system as much as possible it is compliant with the election legislation and principles and be at least secure as the regular voting. In a nutshell, e-voting strives to be uniform and secret, only eligible persons are to be allowed to e-vote and a voter should only cast one vote and the collections are to be secure, reliable and accountable. [1] This system gives loopholes to election theft and manipulation of votes especially during the collection of votes. The proposed research works on filling this gap. The process of this system is ambiguous in a manner that a voter has to register and keep confirming whether his/her details are in the system and on the voting day, voters have to cast their votes in the ballot. It is proved to be challenging for the system to accommodate the disabled and multilingual voters hence it is also time consuming. for the evoting system to function properly, it should ensure error-free and robust electronic voting over the internet which has been a difficult for this system hence it could not be implemented in most of the institutions worldwide including Strathmore University in Kenya. [3]

2.5 Online Voting

This is just like electronic voting but only that it is web based system. In this paper a new easy to use, secure and transparent online voting system is proposed. The new scheme can be easily used by colleges and universities worldwide. The new scheme most notable allows voters to interact, participate in campaigns and political rallies virtually by use of a web based system.

2.6 Identified Gaps

1. lack of transparency in the election systems
2. lack of robust and error-free systems for election process

3.1 Research Methodology

According to Industrial Institute, methodology' is the way of searching or solving the research problem. The research methodology aims at answering the following questions;

1. How will the proposed system ensure only the eligible voters vote?
2. How will the proposed system ensure that votes are not manipulated by any factors?
3. How will the proposed system ensure voters and candidates interact?

3.2 Target Population

Students from different faculties and schools in Kirinyaga University formed the population of the research. Kirinyaga University has six schools and faculties.

3.3 Data Collection

The project utilized both primary and secondary data in generating additional facts on the subject. Other sources of data included books, published papers, journals and the internet among other relevant publications.

3.2.1 Interviews

Interviews allowed verbal responses and also gave the respondent room to give out any suggestions and expectations.

3.2.2 Direct Observation

Direct observation helped me to get real time scenario of what was happening on the ground based on the experimental outcomes. I used this approach in the primary data collection where I observed the case on the ground keenly during the past elections.

3.3 Development Methodology

The development methodology used is the waterfall. This included the analysis, design, implementation and the testing steps.

3.3.1 Analysis

In this case the researcher analyzed the requirements, and fully understood the problems. Analysis was conducted on the current systems failures and strengths. This allowed a better understanding of the expected improvements. Further analysis was also conducted on the problem definitions to clearly understand what to tackle. This phase is usually accompanied by documentation for each requirement, which enables other members of the team to review it for validation.

3.3.1.1 Logical Design

Logical design characteristically looked at the intended system from a logical perspective without considering physical requirement. The project needed a logical design that modelled the flow of data and information through the system from input to output. Logical design also modelled the security checks that the system will be using as well as the formats for all data items in the system.

3.3.1.2 Physical Design

The physical design is concerned with how the physical architecture of the entire system interacted to achieve its objectives. It modelled the user interfaces, the server architecture and the database models.

3.3.2 Implementation

Once the designs are deemed to be viable, technical implementation begins. Implementing the project was the toughest part as all the coding was done in this phase. Being that the project serves only the web platforms, coding took place in two phases.

3.3.2.1 Database coding phase

The backend relied on a robust implementation of MySQL database. The database is relational in architecture and host tables which can be abstracted into views for the front end as needed and by access level specifications. All the system's data is stored and processed here

3.3.2.1.1 Web Coding

The project is coded in HTML + JavaScript +PHP for the web platform.

3.3.3 Testing

Upon completion of full implementation, testing occurred before it got into public consumption. I use the design documents, personas and user case scenarios to run comprehensive tests including the Components testing and on the finished applications.

SYSTEM DESIGN

4.1 Data flow Diagram

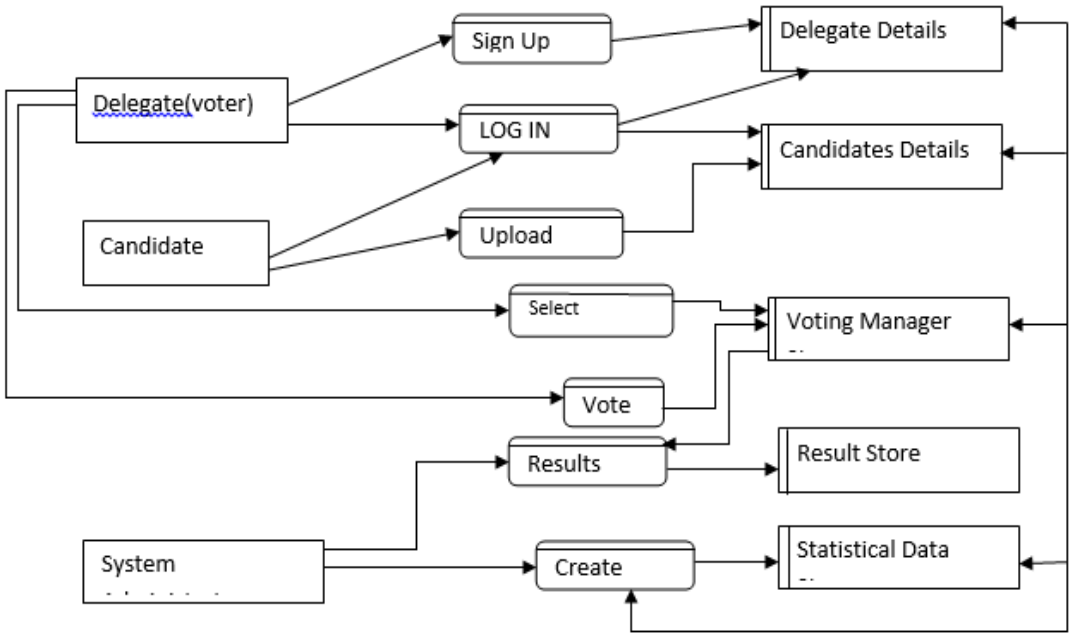


Figure 2 Data flow diagram

4.2 System Requirement

The following are the requirements needed for the system. The system runs only on the web platform and therefore the requirements were met to enable the expected performance.

CATEGORY	REQUIRED	DESCRIPTION
OS	Apple iOS, Android, MS Windows, Linux, Mac	Web browser host Platform OS
Web Browser	Above Chrome 12, Firefox 14, IE 7, Safari 2	Displaying Webpages
JavaScript	Supported and Enabled	Front end Logic execution
Processing	Single/Multi Core + 1GHz and Above	Microprocessor
RAM	512MB and Above	Host Operating System Memory
Internet Access	1MBps Downlink, 512KBps Uplink	WAN Online Functionality

4.3 User Requirement

The user should be literate in English and eligible to use the system. The user should also access internet in order to interact and use the system since it's a web based.

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SYSTEM DOCUMENTATION AND DESIGN

DATABASE DESIGN

TABLES

Figure 3 Candidates and Delegates Table(MySQL)

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	counter	int(11)			No	None		AUTO_INCREMENT
2	reg_number	varchar(20)	latin1_swedish_ci		No	None		
3	designation	varchar(10)	latin1_swedish_ci		No	None		

Figure 4 Candidates Details (MySQL)

Server: MySQL:3306 » Database: ovscoredatabase » Table: candidate_details

Browse | Structure | SQL | Search | Insert | Export

#	Name	Type	Collation	Attributes	Null	Default	Comments
1	counter	int(10)			No	None	
2	reg_number	varchar(20)	latin1_swedish_ci		No	None	
3	email	varchar(30)	latin1_swedish_ci		No	None	
4	user_name	varchar(50)	latin1_swedish_ci		No	None	
5	firebase_id	varchar(50)	latin1_swedish_ci		No	None	
6	firebase_pass	varchar(100)	latin1_swedish_ci		No	None	
7	profile_status	varchar(12)	latin1_swedish_ci		No	None	
8	school	varchar(100)	latin1_swedish_ci		No	None	

Figure 5 Delegates Details (MySQL)

Server: MySQL:3306 » Database: ovscoredatabase » Table: delegate_details

Browse | Structure | SQL | Search | Insert | Export

#	Name	Type	Collation	Attributes	Null	Default	Comm
1	counter	int(11)			No	None	
2	reg_number	varchar(20)	latin1_swedish_ci		No	None	
3	email	varchar(30)	latin1_swedish_ci		No	None	
4	user_name	varchar(50)	latin1_swedish_ci		No	None	
5	firebase_id	varchar(100)	latin1_swedish_ci		No	None	
6	firebase_pass	varchar(50)	latin1_swedish_ci		No	None	
7	profile_status	varchar(12)	latin1_swedish_ci		No	None	
8	school	varchar(100)	latin1_swedish_ci		No	None	

Figure 6 Student Details (MySQL)

Server: MySQL:3306 » Database: ovscoredatabase » Table: student_details

Browse | Structure | SQL | Search | Insert | Export

#	Name	Type	Collation	Attributes	Null	Default	Com
1	counter	int(5)			No	None	
2	reg_number	varchar(20)	latin1_swedish_ci		No	None	
3	email	varchar(50)	latin1_swedish_ci		No	None	
4	user_name	varchar(50)	latin1_swedish_ci		No	None	
5	firebase_id	varchar(100)	latin1_swedish_ci		No	None	
6	firebase_pass	varchar(50)	latin1_swedish_ci		No	None	
7	school	varchar(100)	latin1_swedish_ci		No	None	

Figure 7 Voting Manager Table (MySQL)

Server: MySQL:3306 » Database: ovscoredatabase » Table: voting_manager

Browse | Structure | SQL | Search | Insert | Export

#	Name	Type	Collation	Attributes	Null	Default	Comments
1	counter	int(11)			No	None	
2	vote_type	varchar(50)	latin1_swedish_ci		No	None	
3	status	varchar(10)	latin1_swedish_ci		No	None	

INPUT DESIGN

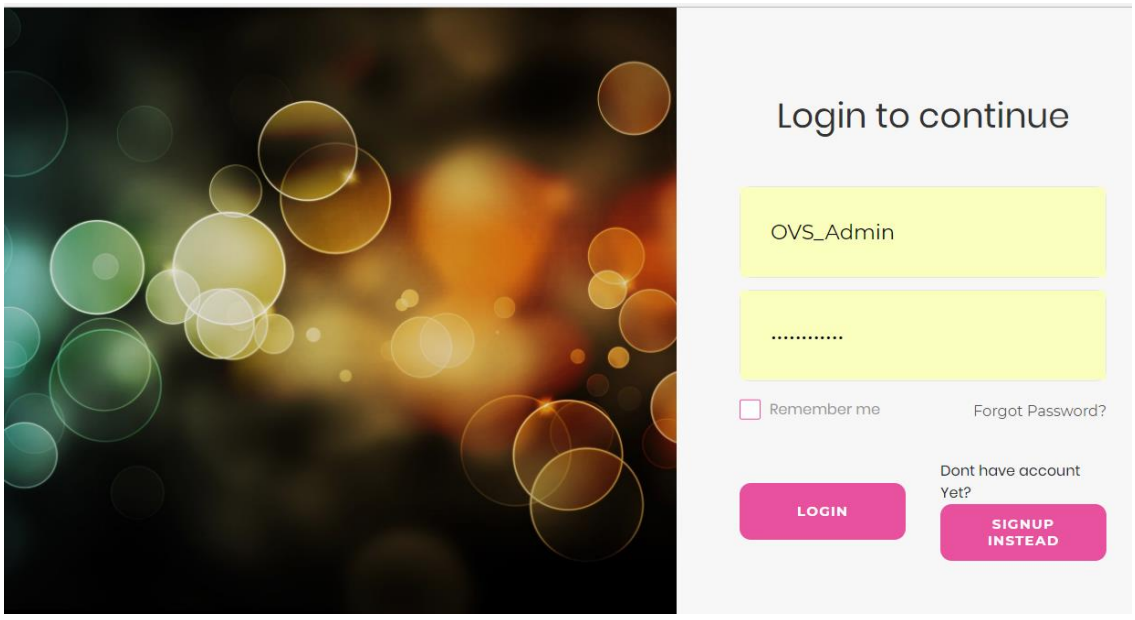

Figure 8 Log In form

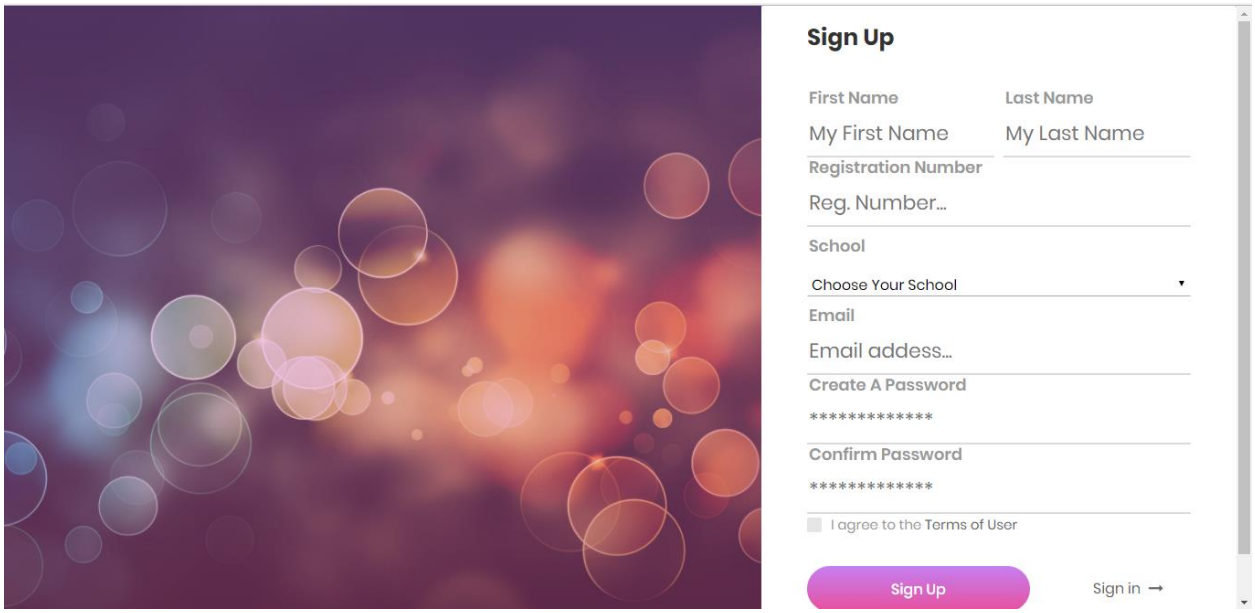

Figure 9 Sign Up Form

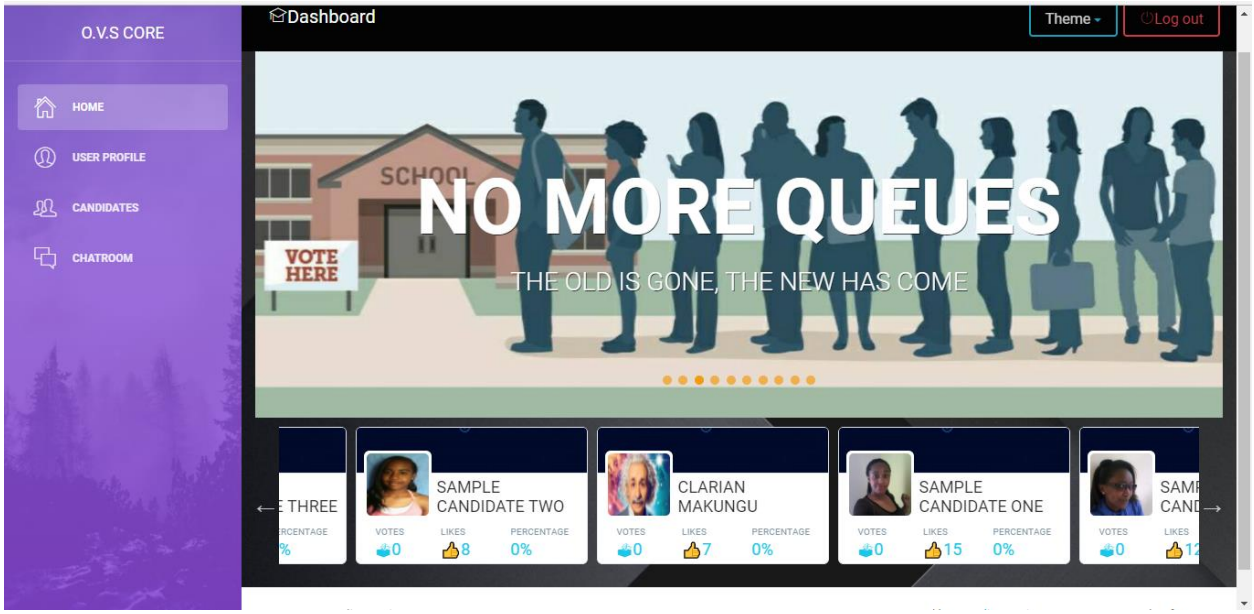

Figure 10 Candidates Home Page

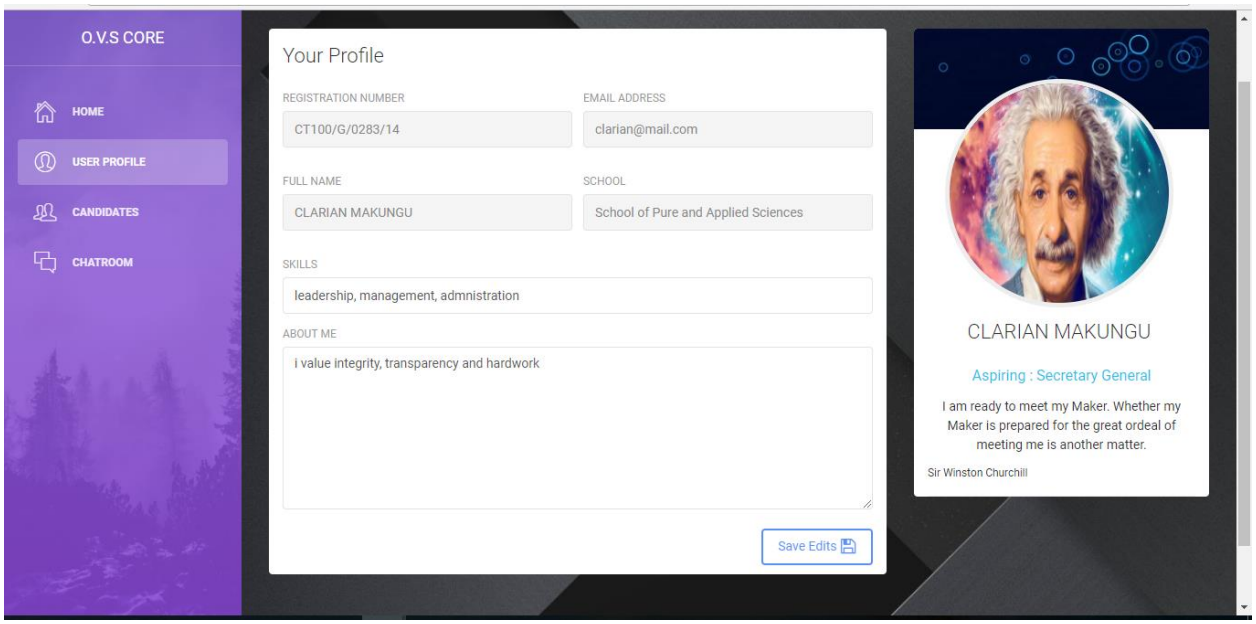

Figure 11 Candidates Profile

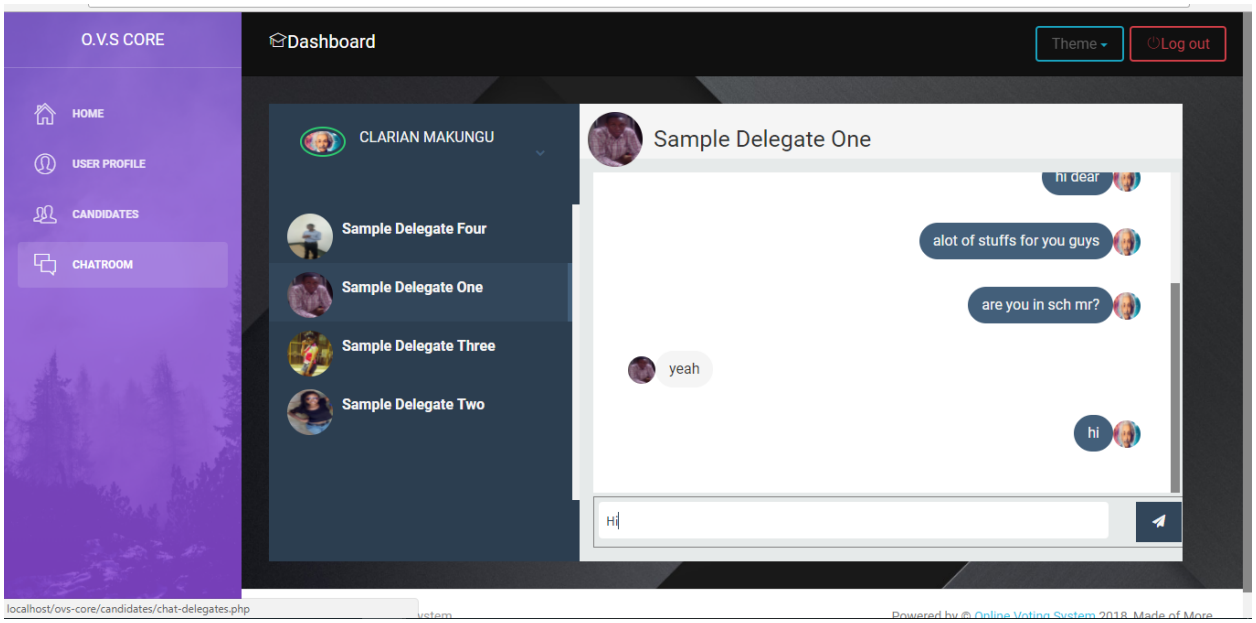

Figure 12 Candidates Chat Interface

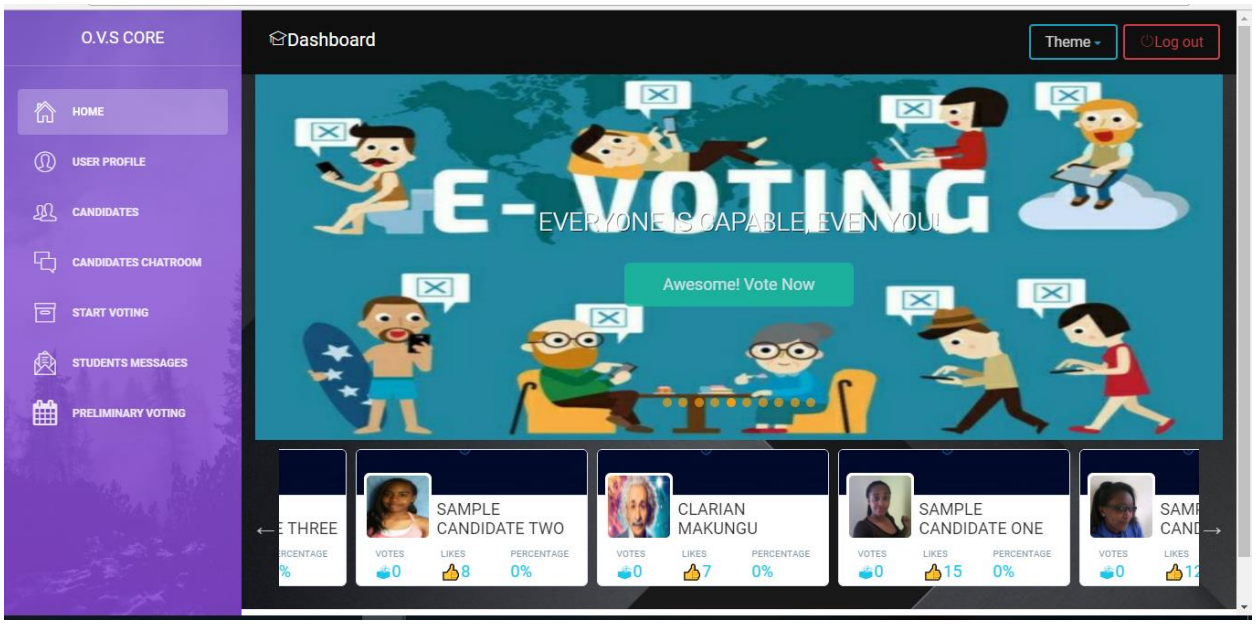

Figure 13 Delegates Home Page

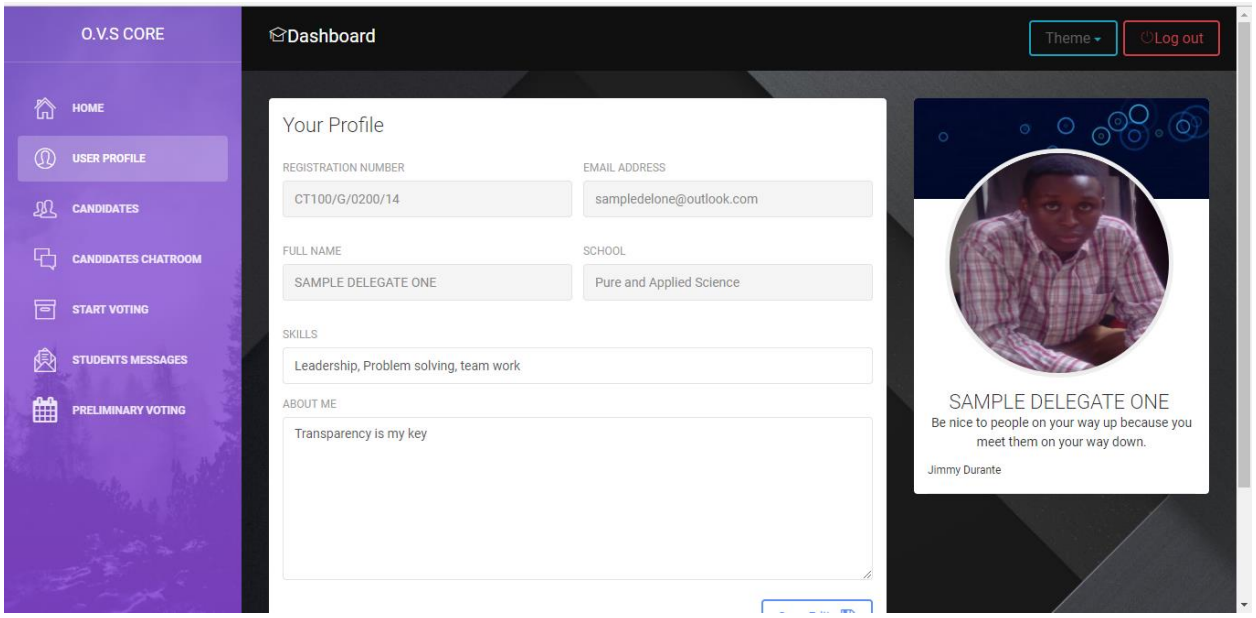

Figure 14 Delegates Profile

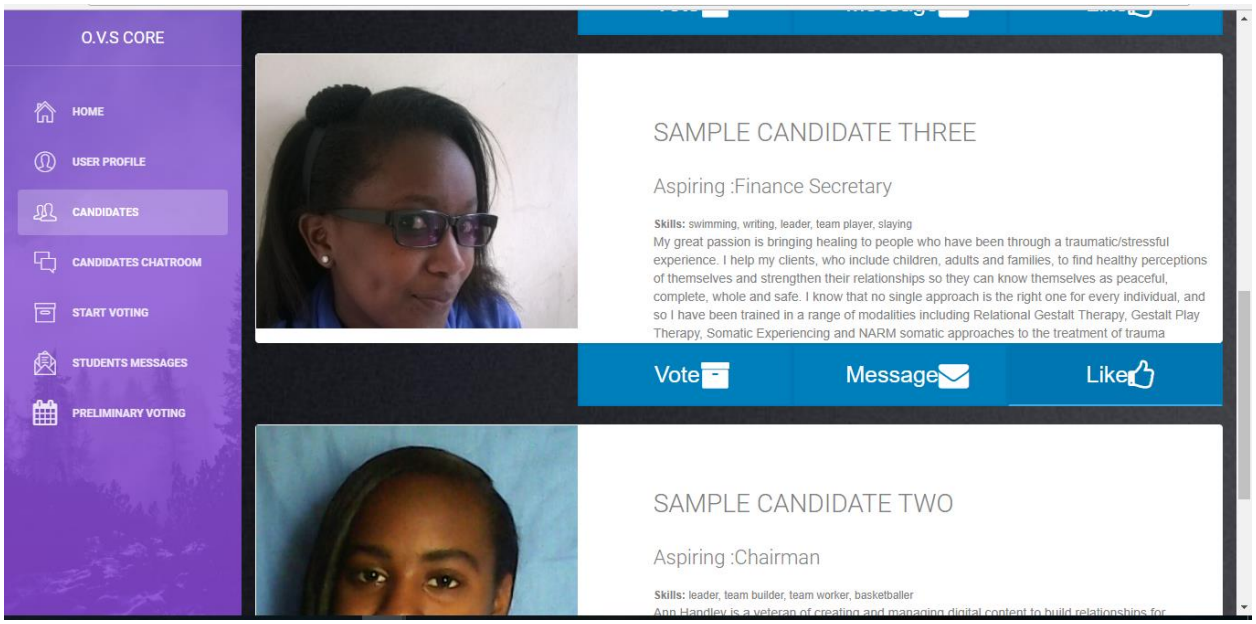

Figure 15 Delegate & Candidate Interaction Interface

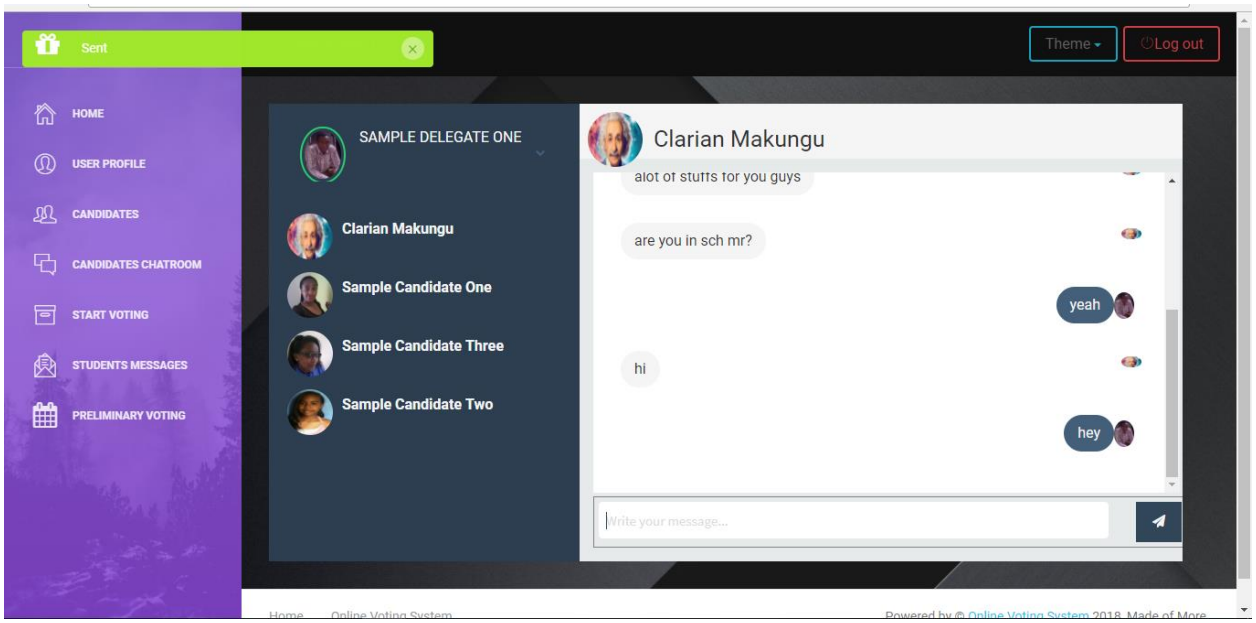

Figure 16 Delegate Chat Interface

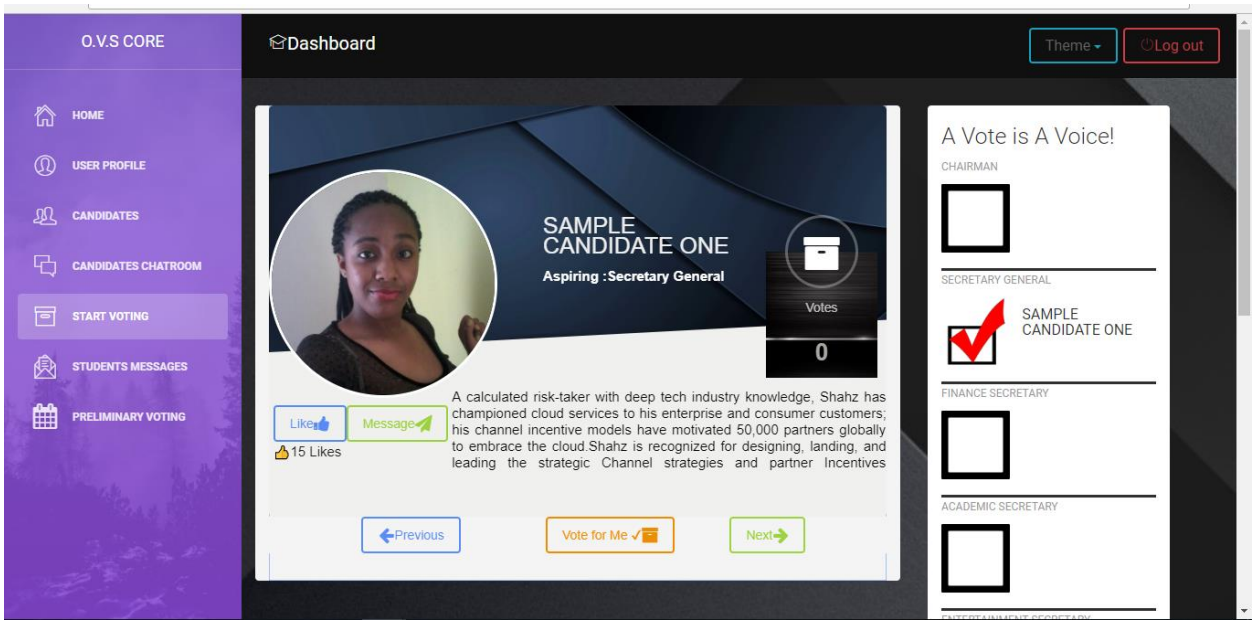

Figure 17 Delegate Voting Page

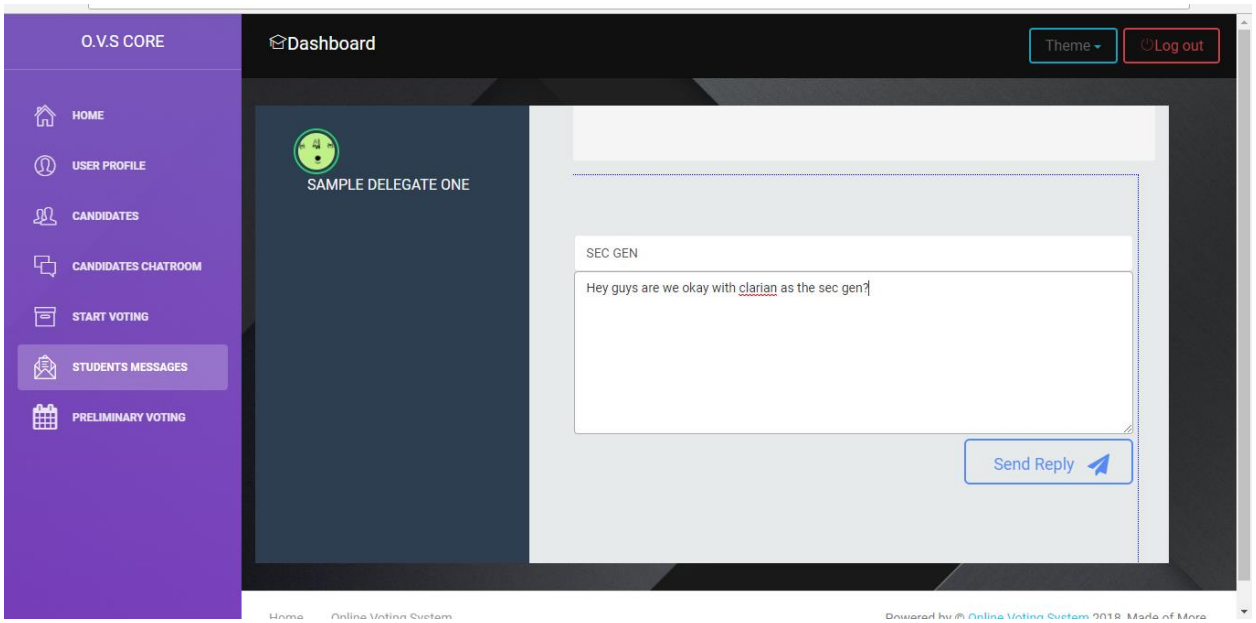

Figure 18 Delegate & Student Interaction Page

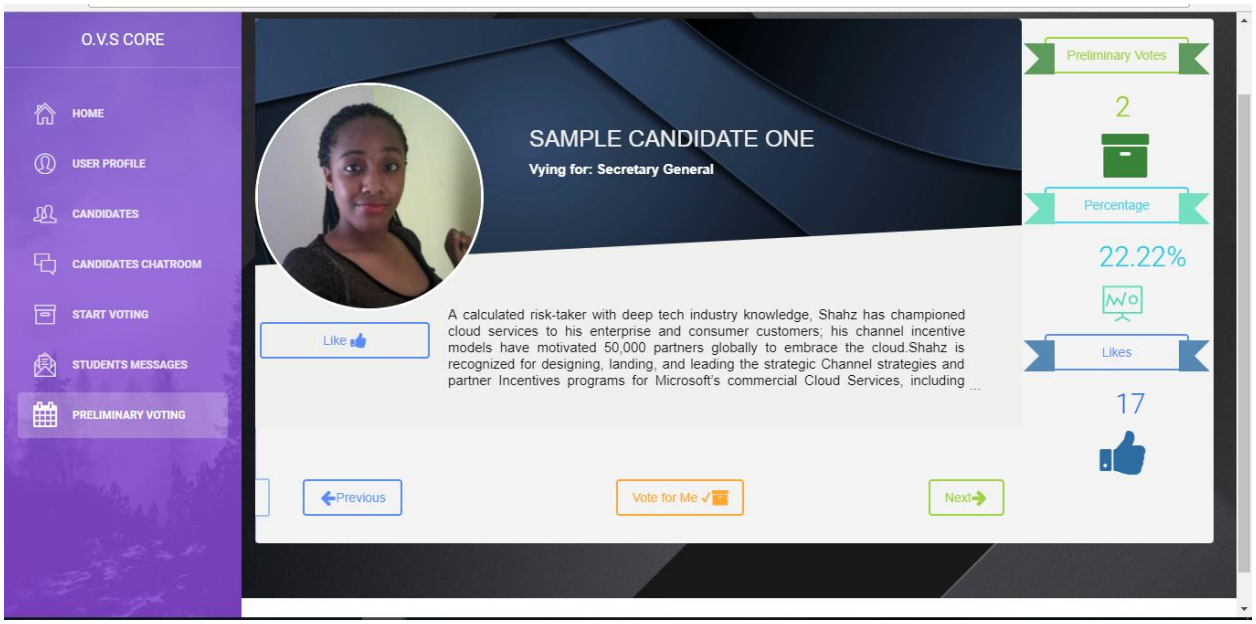

Figure 19 Preliminary Voting Page

5.0 SYSTEM TESTING

5.1 UNIT TESTING

Unit involves testing software with a small piece of source code (unit, component, and/or function) of the same software. During performing tests, some hypotheses were made, and the testing was then determined if true or false. This way, the developer was able to check whether a unit behaves as intended or whether a unit corresponds to the design specifications.

All the sources used in unit testing were created by the developer as a part of software development. The following unit tests were performed to ascertain functionality.

Table 1 Test Cases for Unit Testing

TEST CASES (TC#)	TEST NAME	TEST DESCRIPTION	S/W	TEST ENVIRONMENT
TC1	Navigation Tests	This test verifies if the user is able to navigate the site and access all URLs. Testing a login scenario	ovs-core	Windows 10 Pro, 1TB HDD, 8GB RAM, Wamp(Apache) Server, MySQL Server
TC2	Authentication Tests	This test verifies the username and password to access ovs- core	ovs-core	Windows 10 Pro, 1TB HDD, 8GB RAM, Wamp(Apache) Server, MySQL Server

INTERFACE TESTING

Interface Testing was performed to evaluate whether systems or components pass data and control correctly to one another. It was also used to verify if all the interactions between these modules are working properly and errors are handled properly. To perform the interface tests, the developer created a checklist that outlined all the functional requirements of the system and the various test cases to assess them.

Table 2 Functional requirements descriptions

Functional requirement	**Description**
FR01	Registering and Authentication for users of the application
FR02	Updating profiles in the system
FR03	Interacting and chatting
FR04	Voting, results and reports

TEST CASES

The table below shows how each of the functional requirements were assessed using Test Cases.

Table 3 Test Case One Details and Results

TEST CASE (TC#)	**FUNCTIONAL REQUIREMENT**	**TEST NAME**	**TEST DESCRIPTION**	**S/W**	**TEST ENVIRONMENT**
TC1	FR1	Authentication	Verify and authenticate user using registration number and password	ovs-core	Windows 10 Pro, 1TB HDD, 8GB RAM, Wamp (Apache) Server, MySQL Server Android 6.0 Marshmallow, 3GB RAM

Action Performed	**Action's output**	**Valid Input**
Enter Reg Number and password	Navigate to user's home page	Well formatted Reg Number and password

Table 4 Test Case Two Details and Results

TEST CASE (TC#)	FUNCTIONAL REQUIREMENT	TEST NAME	TEST DESCRIPTION	SOFTWARE	TEST ENVIRONMENT
TC2	FR2	Updation	Update Profiles for delegates and candidates	ovs-core	Android 6.0 Marshmallow, 3GB RAM

Action Performed	Action's output	Valid Input	Invalid Input
Edited Candidate's profile	Navigate to candidates profile page and display edited details	All candidate's details including name, about, photo, skills, post	None

Table 5 Test Case Three Details and Results

TEST CASE (TC#)	FUNCTIONAL REQUIREMENT	TEST NAME	TEST DESCRIPTION	SOFTWARE	TEST ENVIRONMENT
TC3	FR3	Chat	Chat with delegate, candidate or student	ovs- core	Windows 10 Pro, 1TB HDD, 8GB RAM, Wamp(Apache) Server, MySQL Server Android 6.0 Marshmallow, 3GB RAM

Action Performed	Action's output	Valid Input	Invalid Input
Chat amongst users i.e delegate and candidate, delegate and student	Navigate to Chat platform screen		A non recovR QR code or an inexistent unique ID

Table 6 Test Case Four Details and Results

TEST CASE (TC#)	FUNCTIONAL REQUIREMENT	TEST NAME	TEST DESCRIPTION	SOFTWARE	TEST ENVIRONMENT
TC4	FR4	Voting	Voting of Candidates	ovs-core	Windows 10 Pro, 1TB HDD, 8GB RAM, Wamp(Apache) Server, MySQL Server Android 6.0 Marshmallow, 3GB RAM

Action Performed	Action's output	Valid Input	Invalid Input
Voted the various candidates	Pop up alert displaying success in voting/liking		Illegible bogus text

USABILITY TESTING

The table below summarized tests that were performed to ascertain the usability and experience of users while interacting with the system.

Table 7 Usability Testing Results

Element	Output
Flow from start to finish	Yes
Feedback from Actions performed	Instant Feedback
Seamless Navigation	Yes
Performance	Optimal
Failure or crashes	None
Runtime error messages	None
Slow or delayed loading	Acceptable

INTEGRATION TESTING

This checks whether the various components of the system are integrated and working in sync. All the screens, functions, stores, data tables and other modules were connected with seamless interfacing. All the required outputs were produced successfully as expected from the systems and all inputs were validated and stored in the correct formats.

6.1 LIMITATION

Hosting services are very expensive, and also buying bundles for research incurred a lot.

6.2 CONCLUSION

The system allows users to sign up and therefore log in to interact with the system. The system allows the students, delegates and candidates to interact virtually with each other. The system also enables delegates to do the preliminary voting and even voting online and the results are displayed for all users to view. The system allows every user to like the candidates of their preferences and the most liked candidate is the most popular. The system is able to compute reports for the whole election process.

6.3 RECOMMENDATIONS

I wish to recommend that students be provided with hosting facilities that will enable them to carry out proper testing for the projects.

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