



BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

**MWALIMU SACCO ELECTRONIC VOTING SYSTEM FOR
MATUNGULU CONSTITUENCY**

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**Research Project Submitted in Partial Fulfillment for the Degree in Bachelor of
Science in Information Technology of the Technical University of Mombasa.**

July 2023

DECLARATION

I hereby declare that this project is my own work and has never been done or submitted elsewhere by somebody else.

Students Name: _____

Sign: _____ Date: _____

I confirm that the work reported in this project was carried out by the candidate under my supervision.

Supervisors Name: _____

Sign: _____ Date: _____

DEDICATION

The project is entirely dedicated to all those that were part of the process, the parties concerned in making it all a big success. It was a journey worth taking that enabled me to learn a lot in my study and the corporate world. I appreciate my parents and my friends. This project is dedicated to my Family for their support and encouragement.

ACKNOWLEDGEMENT

Praise the Almighty God for His endless blessings to participate in this educational journey. I thank the Technical University of Mombasa for giving me the offer to pursue a Bachelor of Science in Information Technology. I would like to express my special thanks of gratitude to my project supervisor Dr. Kennedy Hadullo for the guidance in this project, I thank my family and friends who stood with me and helped in the completion of my project. Finally, I would like to thank the institution for providing all the necessary resources I needed to make this project a success.

Thank you.

ABSTRACT

The purpose of the study was to design an automated voting system for Matungulu Constituency, located in Machakos County. The system is to be used by the citizens of the constituency including students of the various learning institutions during the election of the management staff and leaders. The problem currently faced at the institutions in the constituency is a lack of democracy in electing leadership teams and most elections are manually done hence time is wasted abundantly. The model used in this study is the agile development model for coding and implementing the system. The front end used HTML and CSS websites while the back end used PHP and MYSQL. After the development and testing of the system, deployment commenced with some of the users for the effectiveness of the project.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Countries worldwide are carrying growing interest in e-voting (Buchsbaum, 2004). Saccos are democratic and are formed by members with the same objectives. The members are the owners of the Sacco as well. Saccos entail giving a monthly contribution by its members which instills a saving culture in the members. The stated Sacco that is used in this case study is the management of Board members of a given institution. An overview in this chapter is to give detail on the case study, the objectives of the study, and justify the case study.

1.2 Background of the study

This study focused on how the voting of Board members in the management of various institutions took place in Matungulu Constituency. Saccos face different challenges that cause its downfall. A major challenge faced is poor governance resulting from electing irresponsible leaders brought about by election fraud. Another challenge is the lack of time to participate in the elections on the stated day of the elections. With a voting system, convenience would have increased thus all members can be able to vote on the stipulated day of the elections. The recent developments in IT have been phenomenal. Given that institutions such as schools have embraced the use of computers, it will also be easier for students to participate in the election of their school leaders and practice democracy at large while in school. IT has revolutionized the way we live our lives by eliminating the digital divide.

1.3 Problem Statement

In Mwalimu Sacco, elections are done by the Sacco members who in turn vote for the best-fitted people vying for respective seats. Tampering with election papers, random voting of leaders, and lack of democracy is the major problem faced in the Constituency. This has led to poor leadership that causes citizens not to fully rely on their leaders hence development is highly affected. An introduction to a better system of voting will ease the electoral processes.

1.4 Objectives of the Study

1.4.1 Specific Objectives

- (i) The main aim of this project was to develop an automated voting system since there is barely an implemented online voting system for institutions in Matungulu Constituency.
- (i) Design an automated voting system using the agile methodology.
- (ii) Develop and implement the e-voting system using HTML, CSS, PHP, and MYSQL.
- (iii) Test the system using members of an institution in Matungulu Constituency.

1.5 Justification of the Study

The proposed system saves time since the members are able to vote independently. This enhances the privacy of electing their leader. Also, the members are able to participate in the elections despite their current location to conduct the elections. Integrity is upheld since the election of a leader is done once and not multiple times. Votes are automatically counted, which makes it easier and faster. Less cost is incurred since most work done by the staff of the election board has been automated. These are the reasons for the implementation of the system.

1.6 Limitations of the Study

- (a) The study is limited to users with digital gadgets such as smartphones and computers.
- (b) The study is limited to users with internet connectivity to access the voting site.
- (c) The study is limited to literate users.

1.7 Scope of the Study

The system research was done at Mwalimu Sacco in one of the institutions in Matungulu Constituency. Given a period of two semesters, which was the stated time, the implementation of this system can be achieved. The availability of support material such as internet connectivity fastened the development of this system.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

A final-year project should be designed to build and test the skills and knowledge acquired during education to prepare and train the students toward becoming a professional (Imed, Martin & Safa, 2011).

This chapter mainly focuses on the discussion of the literature found relevant to this study, a review of the available case studies, theoretical literature, an analysis of the critical literature, a summary of the topic, and the gaps to be filled. Every case study is unique in its way. That means that they all have their strengths and weaknesses that contribute to their fast or slow growth. The case studies are directly related to the research question, and they prove the strengths and incompleteness of every system. All gaps are identified as per the case study, and a comprehensive comparison is made against the proposed solution. Every case study is explained here in detail on how it works and how it complements or differs from every other voting system of the case study. The use of Information and Communication Technology (ICT) in the electoral process is on the rise around the world.

2.2 Theoretical Literature

While most of the applications emerge back office, ICT is finally reaching the arena of the voters (Krimmer and Schuster, 2008). E-voting is one of the most basic uses of technology in e-democracy. It offers considerable scope for faster, more efficient, and more accurate elections and referenda, not to mention the possibility of more frequent public consultation. However, it is also deeply controversial and has been subject to criticism on several fronts, not at least from people in the computer industry and citizens concerned about the potential for widespread electoral error or fraud (Barrister and Connolly, 2007).

Plurality Systems

Plurality voting is a system in which the candidate(s) with the highest number of votes wins with no requirements to get a majority of votes. In cases where there is a single position to be filled, it's known as first-past-the-post; this is the second most common electoral system for national legislatures, with 58 countries using it to elect their legislatures.

Majoritarian Systems

Majoritarian voting is a system in which candidates have to receive a majority of the votes to be elected, although in some cases only a plurality is required in the last round of counting if no candidate can achieve a majority. There are two main forms of majoritarian systems, one using a single round of ranked voting and the other using two or more rounds. Both are primarily used for single-member constituencies.

Proportional Systems

Proportional representation is the most widely used electoral system for national legislatures, with the parliaments of over eighty countries elected by various forms of the system.

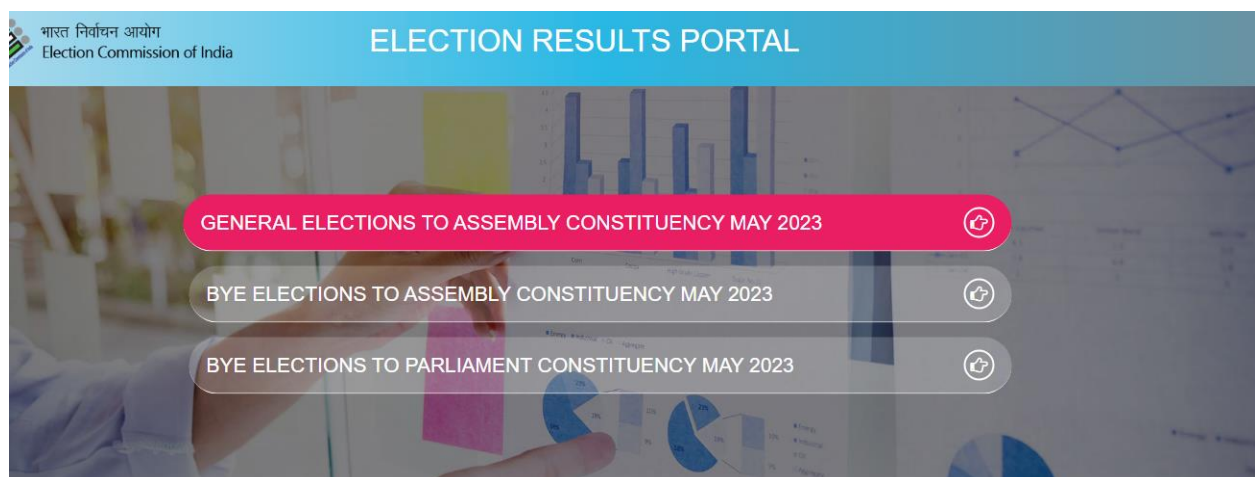
Party-list proportional representation is the most common electoral system used by 80 countries and involves voting for a list of candidates proposed by a party.

2.3 Case Study of Similar Systems

2.3.2 Case Study 1: India Voting System

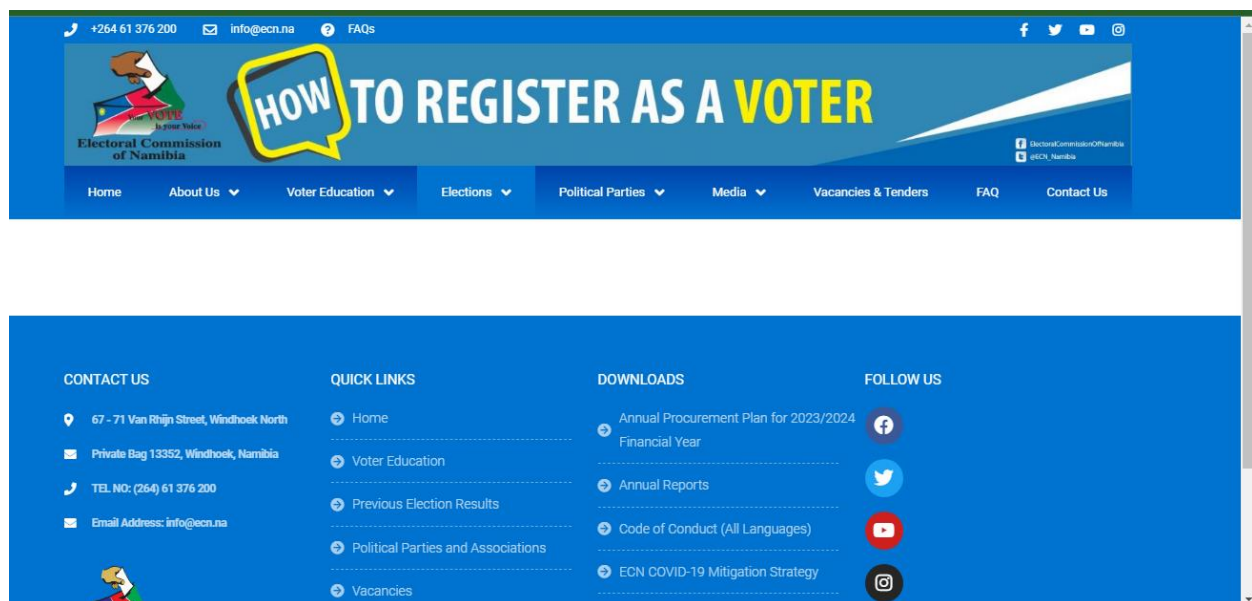
The use of Electronic Voting Machines (EVMs) was developed and tested in India in 1990. Before that, India used to use paper ballots and manual counting which were faulted a lot due to people faking the ballot papers, some voting more than once, expensive cost of printing the paper ballots. The EVMs benefitted the people voting but as well had some weaknesses. Some people claimed the EVMs to be faulty thus wrong results.

The screenshot shows the 'Voter Portal' login interface. On the left, a dark blue sidebar contains the text 'Voter Portal Election Commission Of India' and a list of links: 'Enroll To Vote', 'Check My Enrollment', 'Update My Details', 'Find My Polling Station', and 'Know My BLO'. The main area is white and titled 'Login'. It includes a link 'Don't have an account? Create an account', input fields for 'Mobile Number / Email ID / Voter ID Number' and 'Password', a 'Remember Password' checkbox, a 'Forgot password?' link, a captcha challenge '22+97' with the instruction 'Solve the maths and enter', and a green 'Login' button.



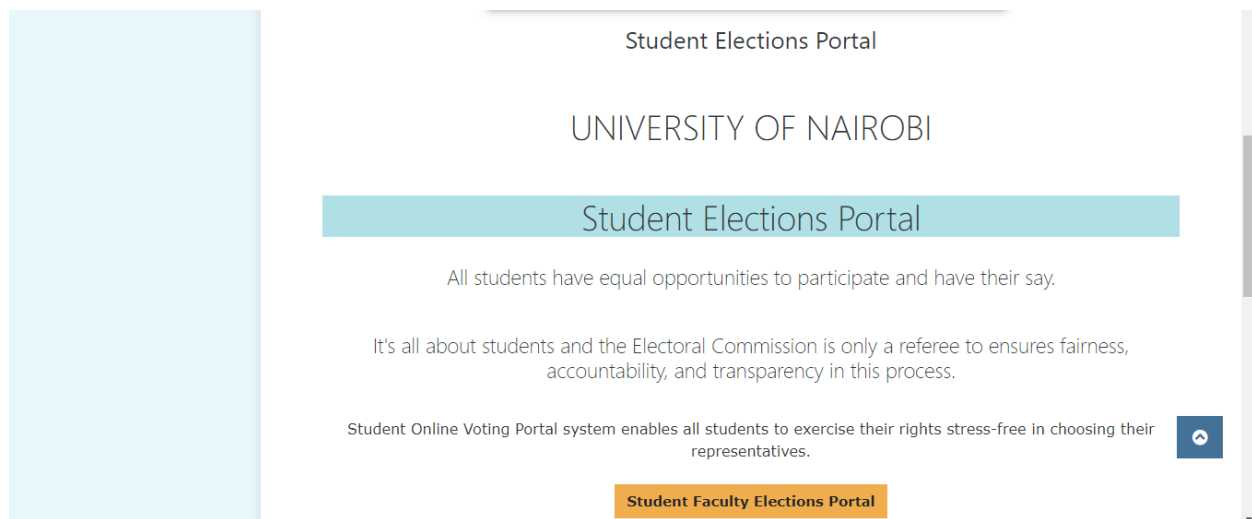
2.3.1 Case Study 2: Namibia Voting System

Namibia is the first African country to automate its national elections in 2014. Electronic Voting Machines (EVMs) were introduced. The machines can be powered by batteries which made it possible for them to be used even in the most remote areas during the voting and counting process. EVMs are standalone machines that are not connected to any computer network. In as much as the EVMs were used, any vote cast had to be verified by a count of the paper trail. This system, therefore, addressed the issue of both spoilt and rejected ballots, making this the strength of the voting system. The results were tabulated earlier that year. Despite using the EVMs, the losing party felt the members had not familiarized themselves with the system. This being its weakness, paper ballots were used again in the voting process.



2.3.3 Case Study 3: UoN Voting System

Electronic voting was first done at the University of Nairobi the first university in Kenya in 2018 and the first to hold automated voting of university delegates. It was found to have some issues which were corrected and later developed and used in the 2019 election of student leaders. The development of the system was spearheaded by the large population in the university which at times made some students not appear during the election periods. It has helped students as they can now vote from the comfort of their rooms. The system has been seen economical as the ballot papers are now not being printed out. Even though some students complain of rigging elections. The system has been used in many universities in Kenya the likes of Meru, Pwani, Chuka, and others are still adopting the same.



You are not logged in. ([Log in](#))

AMELSTUN OFFICIAL POLLS WILL OPEN IN:

TO VOTE; CLICK ON MY BALLOTS OR THREE BARS ON THE TOP LEFT

For assistance please send an email to:

ictsupportchs@uonbi.ac.ke

[Login Now](#)

Independent Electoral
Commission

[✉econhelp@uonbi.ac.ke](mailto:meconhelp@uonbi.ac.ke)



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2.4 Critical Review and Research Gap

The systems currently in the market do not address the needs of the Sacco members who want to use it to vote. Many Sacco members, me being one of them, don't use it since it has not been developed for that purpose and space. No one is to blame for this gap since every developer has its intentions and market. The identified gap helped in developing a system that can be used by an average Sacco member to vote, especially a high school student who is rarely exposed to automatic voting processes and is used to their culture of paper ballots in electing their student leaders. The system used the most familiar features that users have experience in using to make things straightforward.

2.5 Chapter Summary

The above case studies have shown that electronic voting machines have been used previously. However, they had weaknesses and therefore needed to develop a system online that could be used at someone's convenience, even from one's mobile gadget, the smartphone. An online web system for Mwalimu Sacco is therefore used by members to vote. The testing period enabled me to teach the members how to use the system.

This, therefore, solved issues of familiarity with an unknown system.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The main focus of this chapter was to discuss the fact-finding techniques that were used in the preparation process to deliver the system. All the facts that concerned this project were gathered using the techniques discussed in this section. The facts were classified either as user requirements or functional requirements for the application as they show what users should expect when the project is delivered. The system development model used was the agile development model as discussed later in this chapter. This chapter covers the design of the system. Research designs are also discussed in detail.

3.2 Research Design

3.2.1 Requirements Gathering

The purpose of requirements gathering is to ensure a deep understanding of the connection between the service providers and their clients. That made it possible to establish all the existing challenges and possible solutions from all the models that were developed. The information gathered about the current situation was analyzed and helped assemble the required material for developing the proposed system. All user requirements were put into consideration and implemented. The requirements that evolved were put into consideration and made the system user experience better every day.

3.2.2 Target population

The proposed system targeted members aged between 13 and 70 years, who constituted the majority population of people who were active members of the Sacco. As young as 13 years old constitute the students in the various high schools, considering the youngest among the groups to be 13 years old. The method used to choose the population was based on their accessibility and the detailed knowledge they had.

3.2.3 Sample size

The size for data collection for this system was 40. These constitute at least 10 members from four different Saccos that manage their Saccos using paperwork. The sample size was intended to give comprehensive data about the solutions available in the market, their strengths, and their limitations.

3.2.4 Data collection procedure and instruments

Fact-finding techniques were used in gathering facts that concerned the development of this project. Fact-finding techniques are all processes of collecting data and information based on the given technique. All the techniques proposed were used to come up with the data facts for the project and ensured that useful information was created. The fact-finding techniques were observations and questionnaires:

Questionnaires

Questionnaires are special documents that facilitate fact-gathering from a large number of people. These questions are similar to a written interview; the respondent can give their views through various channels. Questionnaires were prepared and distributed in the form of Google

Forms. Both open-ended and close-ended questionnaires were used, for the Sacco members who use the existing ballot method when researching the proposed system. The open-ended questionnaires allowed respondents to give their views without limitations. The close-ended questionnaires helped respondents choose from the available solutions already listed on the questionnaire.

3.3 System Development Methodology

3.3.1 Methodology justification

The software design model used is the agile development model for coding and implementing the system. The reason for choosing this development model is that it allows the developer to use continuous iterations for development and testing throughout the entire development life cycle of the project. The model uses the incremental and iterative approach in development and testing, hence allowing quick error identification and fixing.

All the requirements of the system to be developed are captured in the planning phase. These requirements include software and hardware requirements. The fact-finding techniques discussed were used to collect data from all stakeholders and members. The fact-finding techniques ensured the validity and reliability of the data collected about the system.

3.4 System Requirement Analysis

The requirements of a software system are grouped into functional and non-functional requirements. The section below gives an in-depth view of the functional and non-functional requirements of the system.

3.4.1 Functional Requirements

The system provides the following functional requirements

- (a) To educate the electorate on the voting process.
- (b) To enable members to vote
- (c) To allow the administrator to register candidates and voters.
- (d) To compute votes automatically.

3.4.2 Non-functional Requirements

- (a) Scalability – the system serves many users at a go without jamming.
- (b) Convenience – the system accepts user requests and gives solutions instantly.
- (c) Ease of use – the interface design is straight to the point.
- (d) Security – user personal data is secure from exposure. Transparency is guaranteed using the system compared to paperwork.

3.4.3 Unified Modeling Language

These UML diagrams represented the Mwalimu Sacco System visually along with all main actors, their roles, actions, and classes. That helped to understand and maintain the similarity between the document and the system itself. It shows what users do and what the system does for the users.

3.4.3.1 Use case modeling

Use case diagrams represented different roles played by different actors (users) in a system, and the Mwalimu Sacco system for this case. Here, we had two main actors: the admin and the users. This use case diagram illustrated the roles of all users and the interdependence of roles for a single actor and also the dependencies among actors.

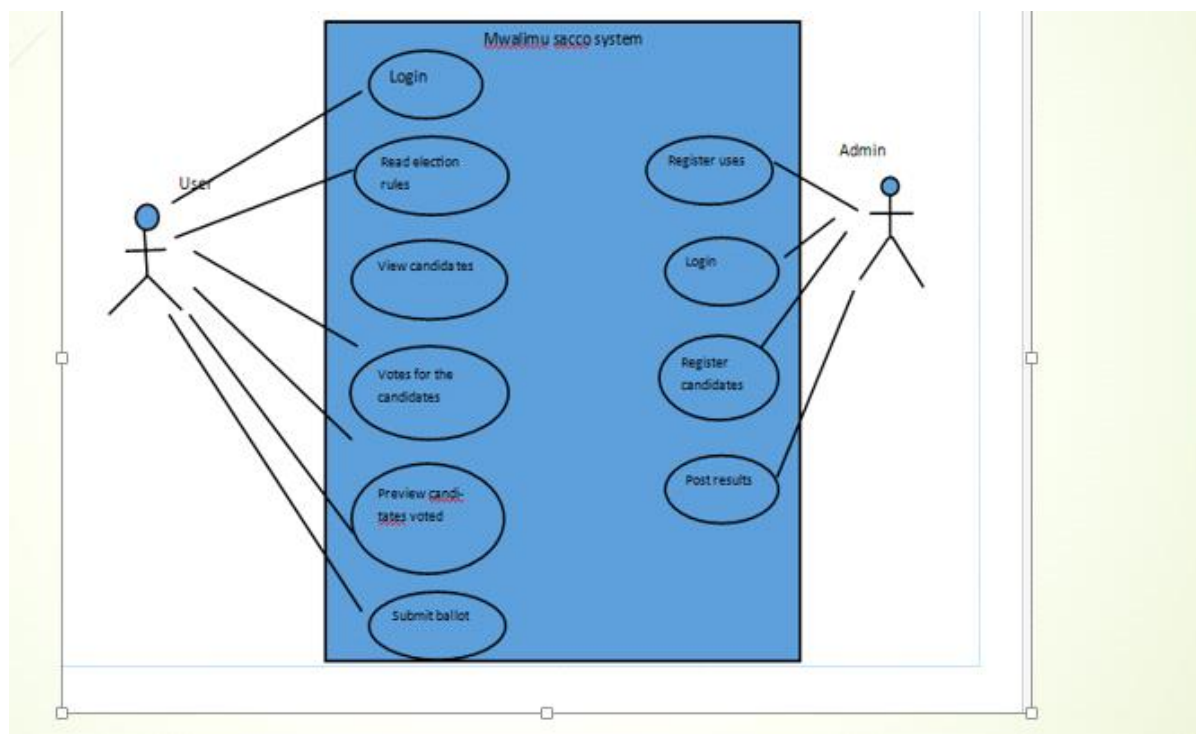


Figure 1: Use case diagram for Mwalimu Sacco System

3.4.3.2 Activity Diagram

Flowchart Diagram for Service Provider Registration and Service Delivery

The flowchart diagram is very useful because it represents the dynamic aspects of the system. It's a flow chart that represents how one activity leads to the start of another activity. A single activity is described as an operation of the system. The following diagram shows the activities that are carried out in a system systematically.

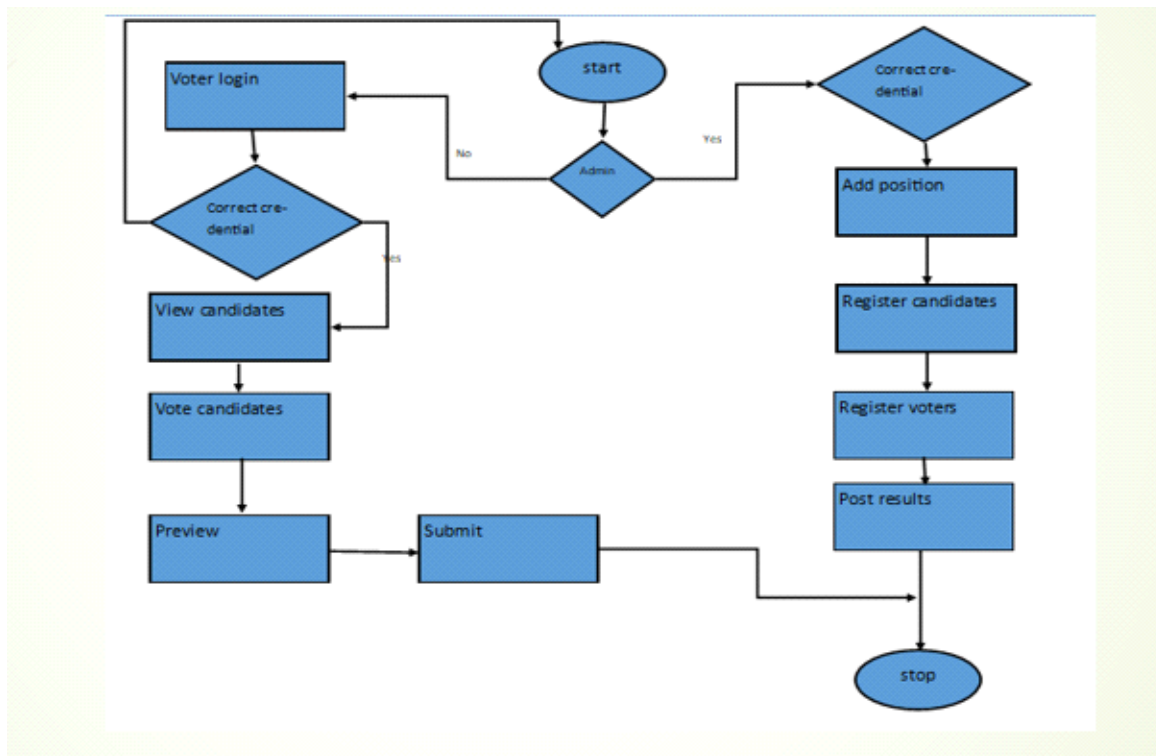
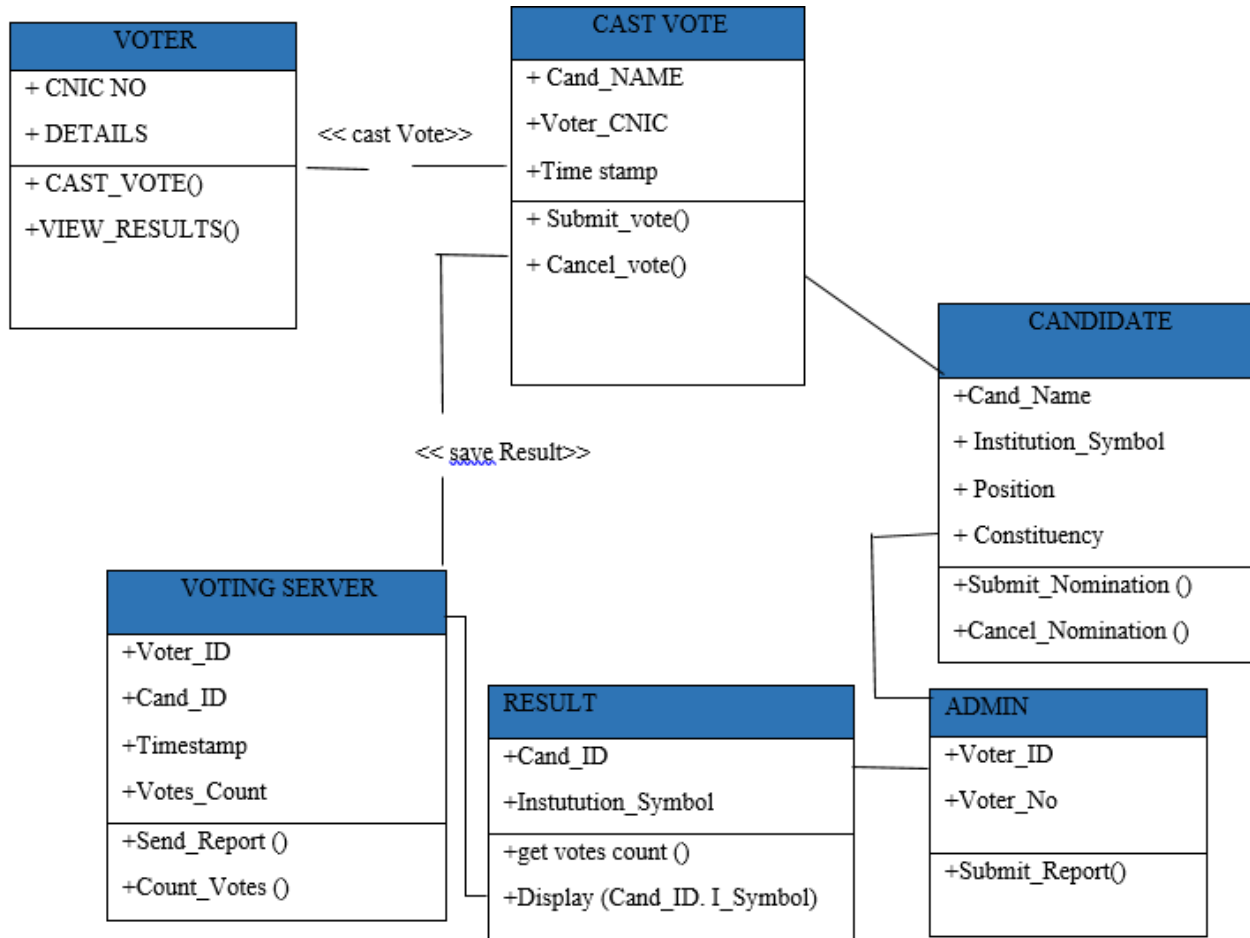


Figure 2: Flowchart diagram for Mwelimu Sacco System

3.4.3.3 Class Diagram



3.5 Coding

After all the system requirements were gathered, the process of implementing and coding the actual system began. Front-end web development uses CSS for the effective designing of the web application, and Javascript is used to create user interactivity like button clicks. PHP is used for the back-end development to handle database interactions whereas MYSQL is used for data storage due to its convenience in retrieval and storage of data enhancing the scalability of the system. A MySQL database is used for this system to help synchronize data needed by the system. This helps when refreshing data because all updates in the records of registered individuals update automatically. The main goal was to come up with a working system that meets the objectives and defined functionality.

3.6 Testing Design

The black-box test technique is used since system internal knowledge is not required by the user. The environment for testing the system was interactive hence making it easy to use. All modules of the system are tested by users virtually due to distance barriers to verify that each one of them achieves the intended objective. The results of the test matches the expected results, otherwise, any error in the system is fixed and tested again until the objective is successfully met. The testing is intended to check data validation and correctness in the process. The system only works when the user has an active internet connection to help access the online database. User opinion and feedback are highly valued and included when making changes to make the system work better.

3.6.1 Test Cases

Table 3.1 shows a test case for unsuccessful login

Steps for testing	Expected results	Actual results
i. Run the system ii. Enter the wrong username or password in the login form. iii. Click the login button	Login should be unsuccessful	An error message pops up indicating wrong credentials have been entered.

Table 3.2 shows a test case of successful login

Steps for testing	Expected results	Actual results
i. Run the system ii. Enter the correct username or password in the login form. iii. Click the login button	The login should be successful	A message of successful login is displayed and the user is displayed a new page layout

Table 3.3 shows a test case on Admin Registration Form

Steps for testing	Expected results	Actual results
i. Login successfully	Display of positions being vied for.	Display of positions vied for.
ii. Add different positions being vied for.	Display of candidates registered.	Display of candidates registered.
iii. Add the different candidates vying for different positions.	Display of registered voters.	Display of registered voters.
iv. Add the voters who are members of the Sacco.		

Table 3.4 shows a test case on voter login and voting

Steps for testing	Expected results	Actual results
i. Click the link to see the voting process.	Direct to a page.	Directed to a page with the voting process steps.
ii. Enter the correct login credentials.	Check if the user exists.	Login successfully.
iii. See different candidates for the positions they are vying for.	The names and positions vied for.	Show the selected leader.
iv. Click leader of choice.	Show the selected leader.	

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction - Overview of Chapter Contents:

Chapter Four presents the research findings and subsequent discussion related to developing and implementing the automated voting system for the Matungulu Constituency. This chapter is organized as follows:

4.2 Presentation of Findings:

This section presents the findings corresponding to each specific objective outlined in Chapter One. The research objectives and their corresponding findings are discussed as follows:

4.2.1 Objective 1: Development of an Automated Voting System

Objective 1 aimed to develop an automated voting system for the Matungulu Constituency.

Admin Login

The admin uses this page to log in to the system

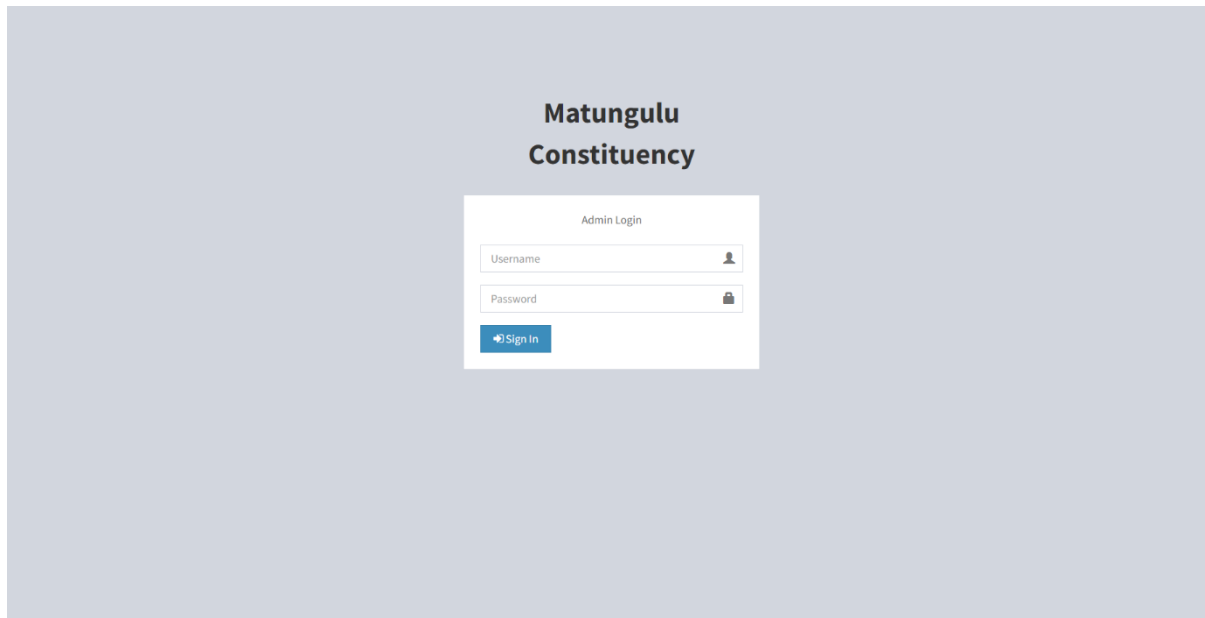


Figure 1 admin login screenshot

Admin Dashboard

This page is available when the Admin logs in to the system. Here the Admin can interact with all their Roles.

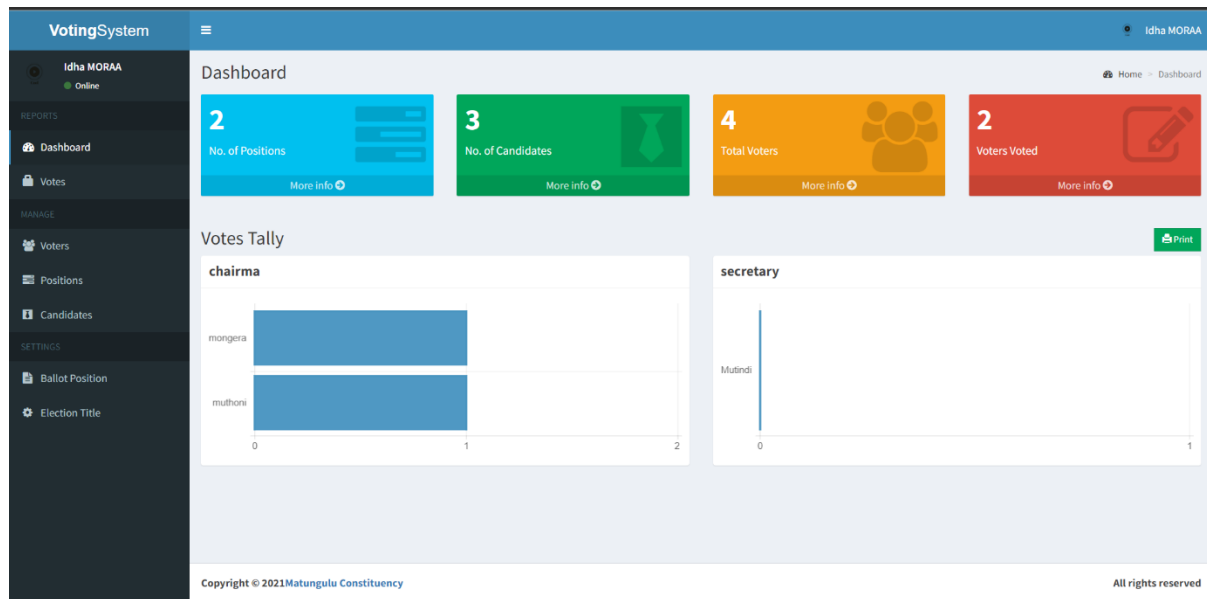


Figure 2 Admin dashboard screenshot

4.2.2 Objective 2: Methodology Implementation

Objective 2 focused on implementing the agile methodology for the development of the e-voting system.

Add New Position

In this page the admin can add new positions.

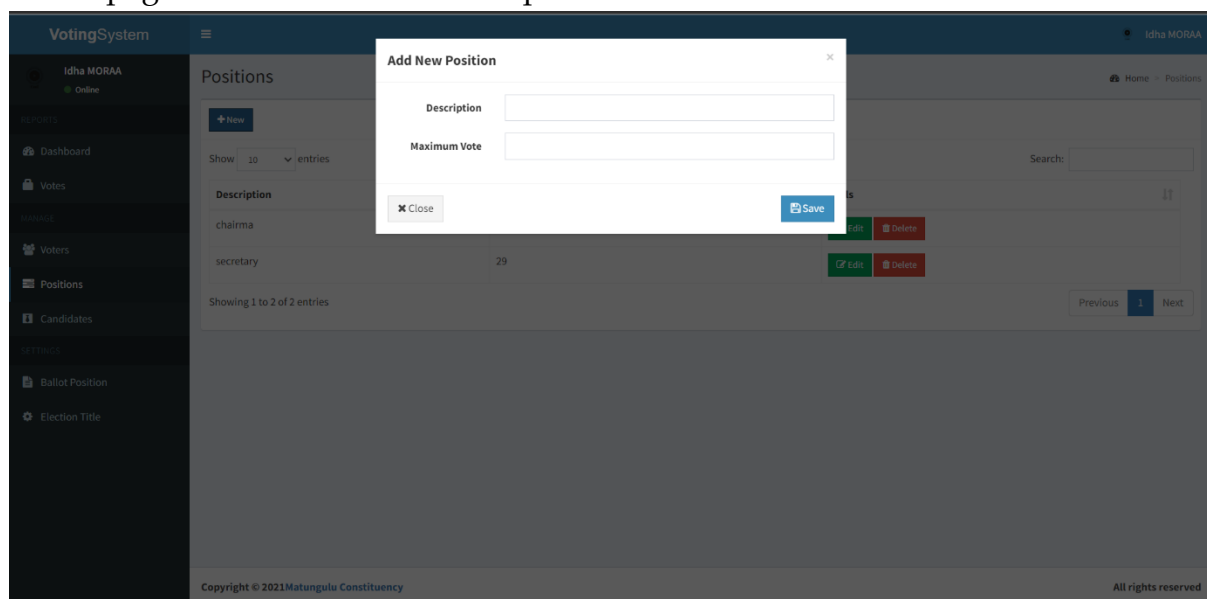


Figure 6 adds a new position form screenshot

Register Candidate

In this page the admin can register Candidates

The screenshot shows the 'Add New Candidate' form overlaid on the 'Candidates List' page. The form contains the following fields:

- Firstname: Daniel
- Lastname: Musunza
- Position: secretary (selected from a dropdown)
- Photo: Choose File (No file chosen)
- Platform: (empty text area)

Buttons at the bottom of the form include 'Close' and 'Save'. The background shows a sidebar with navigation links like Dashboard, Votes, Voters, Positions, Candidates, Ballot Position, and Election Title. The main content area displays a table of candidates with columns for Name, Position, and Photo.

Figure 7 Register candidate form screenshot

Register Voters Page

In this page, the admin can register new Voters

The screenshot shows the 'Add New Voter' form overlaid on the 'Voters List' page. The form contains the following fields:

- Firstname: christine
- Lastname: Mutindi
- Password: (empty text field)
- Photo: Choose File (No file chosen)

Buttons at the bottom of the form include 'Close' and 'Save'. The background shows a sidebar with navigation links like Dashboard, Votes, Voters, Positions, Candidates, Ballot Position, and Election Title. The main content area displays a table of voters with columns for Name, Lastname, and Photo.

Figure 8 Register a voter form screenshot

Voters Login Page

This is where the voters log in to the system using the user ID and password given by the Admin.

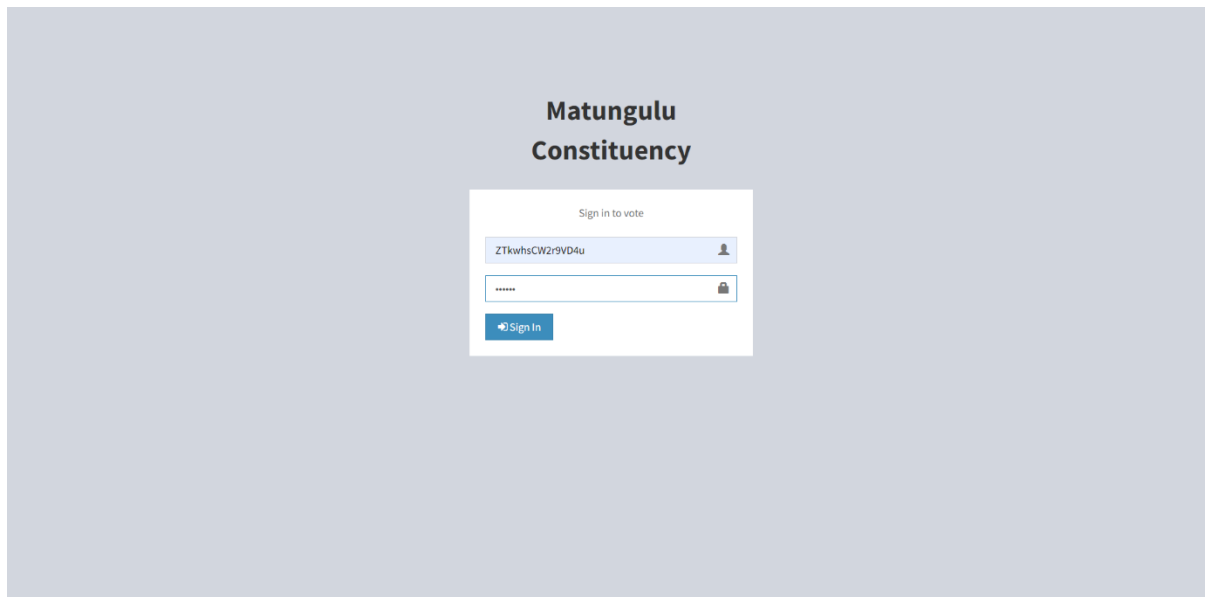


Figure 9 Voter's login screenshot

4.2.3 Objective Three: Testing and Validation

Voter's Dashboard

Once Voter logs in, they see this page where they can be able to vote.

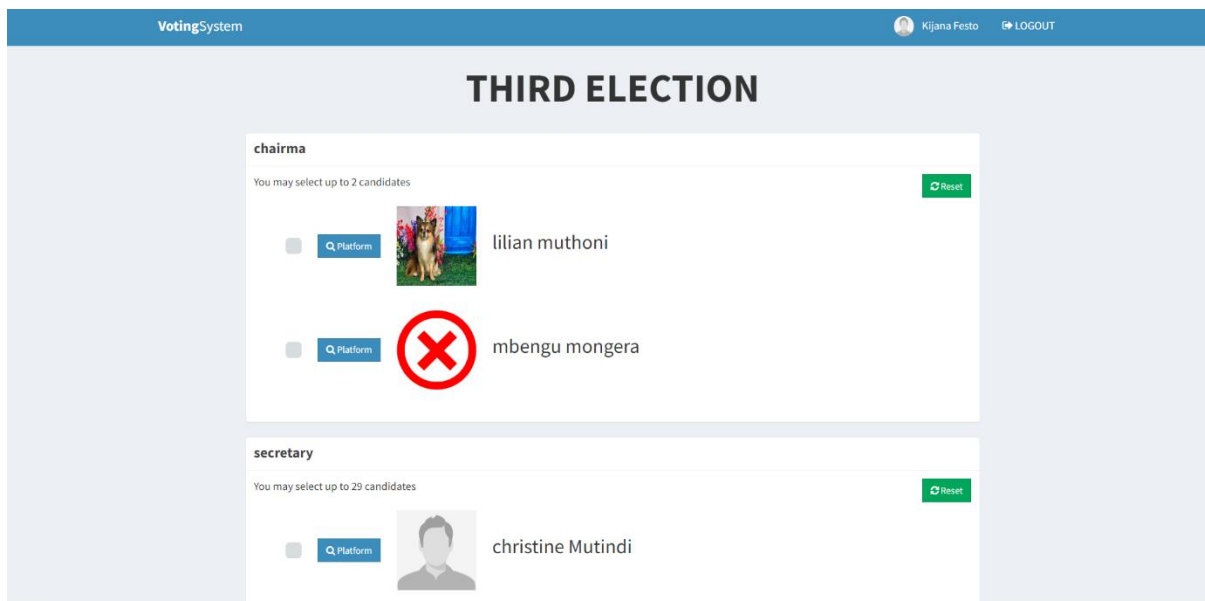


Figure 10 Voter's dashboard screenshot

All Votes

Here the Admin can see all votes Cast

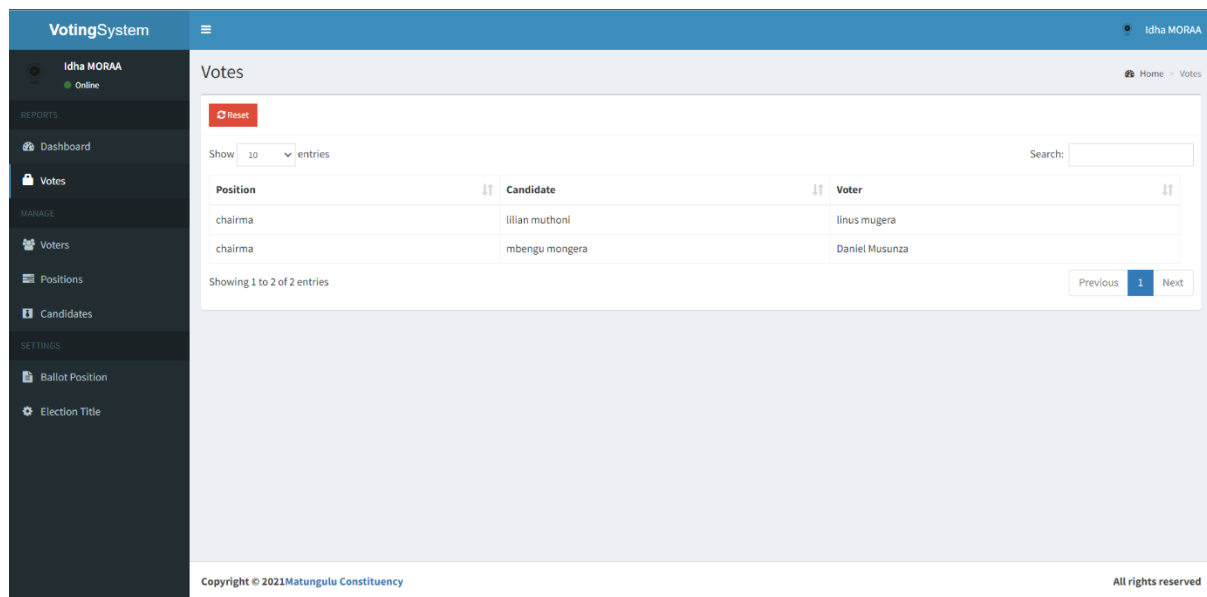


Figure 11 All votes screenshot

Tables Query from PhpMyAdmin

This shows all Tables used in this system

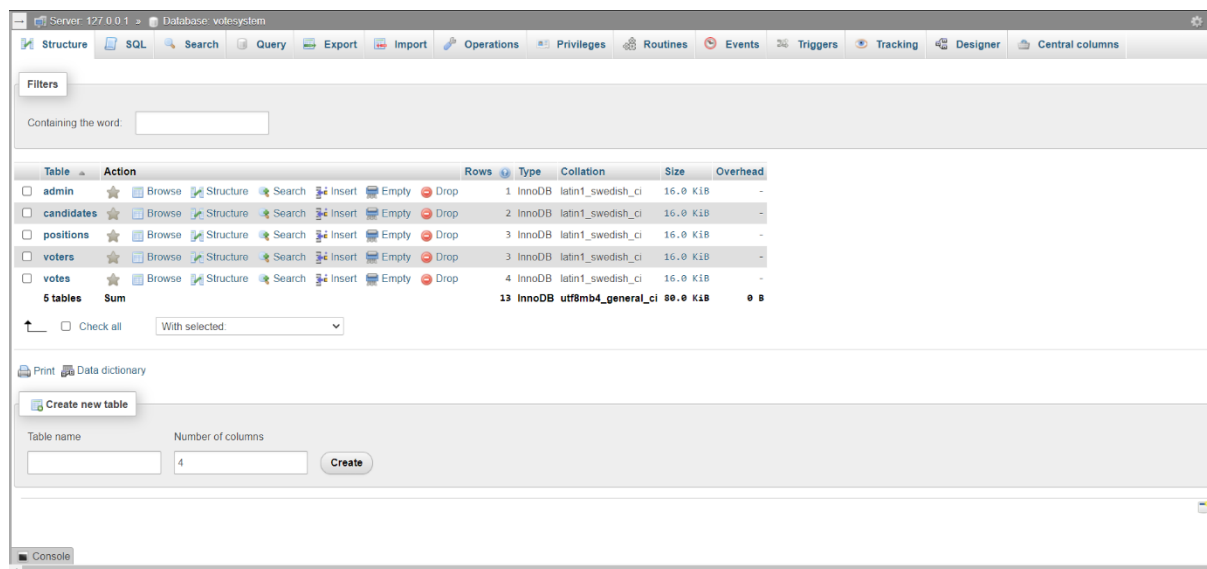
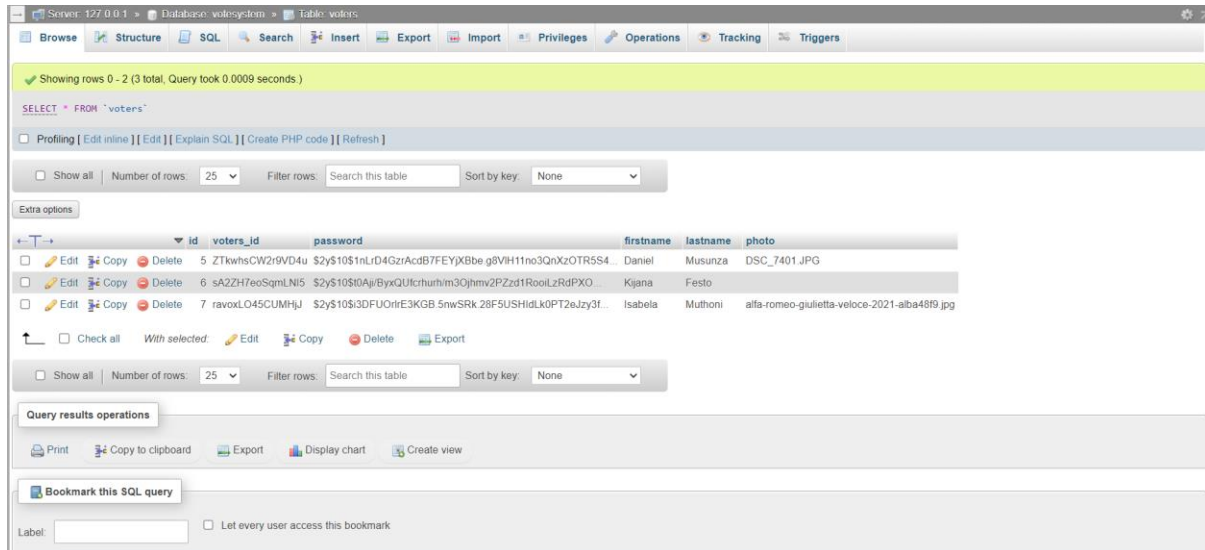


Figure 12 Tables Query 1

Voters Query

This shows a query of all voters.



Showing rows 0 - 2 (3 total, Query took 0.0009 seconds)

```
SELECT * FROM `voters`
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

Extra options

	id	voters_id	password	firstname	lastname	photo			
<input type="checkbox"/>	Edit	Copy	Delete	5	ZTkwhsCW2r9VD4u	\$2y\$10\$1nLrD4GzrAcB7FEYjXBbe g8VH11no3QnXzOTR5S4...	Daniel	Musunza	DSC_7401.JPG
<input type="checkbox"/>	Edit	Copy	Delete	6	sA2ZH7eoSqmlNI5	\$2y\$10\$0AjrByxQUlcrhurh/m3Ojhm2PZzd1RooilzRdPXO...	Kijana	Festo	
<input type="checkbox"/>	Edit	Copy	Delete	7	ravoxLO45CUMHjJ	\$2y\$10\$3DFUOrE3KGB 5nwSRk 28F5USHIdLk0PT2eJzy3f...	Isabela	Muthoni	alfa-romeo-giulietta-veloce-2021-alfa489.jpg

Check all | With selected | Edit | Copy | Delete | Export

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

Query results operations

Print | Copy to clipboard | Export | Display chart | Create view

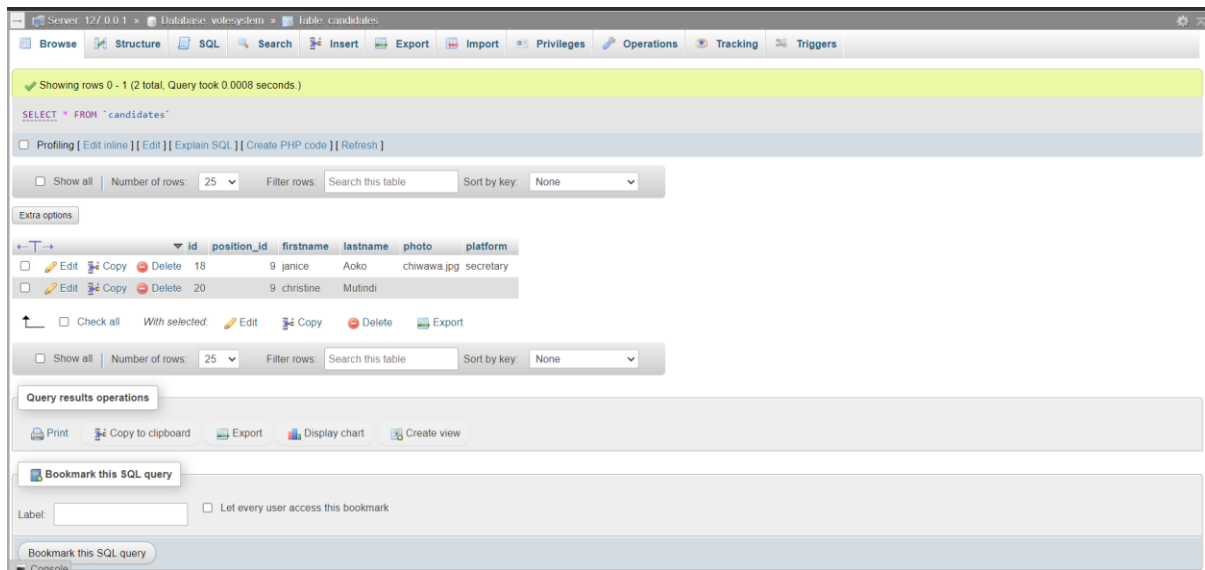
Bookmark this SQL query

Label: ☐ Let every user access this bookmark

Figure 13 Voters Query 1

Candidates Query

This shows a Query of all Candidates registered.



Showing rows 0 - 1 (2 total, Query took 0.0008 seconds)

```
SELECT * FROM `candidates`
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

Extra options

	id	position_id	firstname	lastname	photo	platform		
<input type="checkbox"/>	Edit	Copy	Delete	18	9 janice	Aoko	chiwawa.jpg	secretary
<input type="checkbox"/>	Edit	Copy	Delete	20	9 christine	Mutindi		

Check all | With selected | Edit | Copy | Delete | Export

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

Query results operations

Print | Copy to clipboard | Export | Display chart | Create view

Bookmark this SQL query

Label: ☐ Let every user access this bookmark

Bookmark this SQL query

Console

Figure 14 Candidates Query 1

4.3 Chapter Summary:

Chapter Four presents the research findings related to the development and implementation of the automated voting system. The findings align with the objectives set forth in Chapter One, confirming the successful completion of each objective. The chapter discussed the key features of the automated voting system, providing visual representations through screenshots for transparency and clarity. Additionally, the application of agile methodology during system development was elaborated upon, emphasizing the benefits of this approach. Overall, Chapter Four lays the foundation for the subsequent chapter, which will involve a comprehensive discussion of the research findings, their implications, and recommendations for improving the electoral process in Matungulu Constituency.

CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction - Overview of Chapter Contents:

Chapter Five serves as the culmination of this research, providing a comprehensive summary, conclusions drawn from the findings, and valuable recommendations for future actions. The chapter is structured as follows:

5.2 Summary of Findings:

In this section, is a general overview of the key findings from the research conducted on the automated voting system for the Matungulu Constituency. The summary will address each research objective individually, offering a concise synopsis of the outcomes.

5.2.1 Objective One: Development of an Automated Voting System

The research successfully achieved Objective One by creating an automated voting system tailored to the specific needs of the Matungulu Constituency. This system encompasses features such as secure login processes, user-friendly data entry forms, robust query functionalities, comprehensive report generation, and stringent validation mechanisms. These findings confirm the system's effectiveness in modernizing the electoral process.

5.2.2 Objective Two: Methodology Implementation

Objective Two involved the application of the agile methodology during system development. This agile approach facilitated a flexible and iterative development process, ensuring that the system met the evolving requirements of the Matungulu Constituency. The findings underscore the suitability of agile methodology for similar projects in the future.

5.2.3 Objective Three: Testing and Validation

Objective Three focused on testing the automated voting system with members of an institution in Matungulu Constituency. The findings reveal that the system successfully passed the validation process, demonstrating its reliability and accuracy. The positive outcomes of user testing indicate that the system is ready for wider adoption.

5.2.4 Objective Four: User Acceptance

Objective Four assessed the user acceptance of the automated voting system among Sacco members. Findings show a high level of satisfaction and enthusiasm among users, with a significant majority expressing confidence in the system's security and usability. This user acceptance bodes well for the system's long-term success.

5.3 Conclusions:

The research answers key research questions by drawing specific conclusions from the findings. These conclusions shed light on the effectiveness of the automated voting system and the benefits of the agile development methodology. The system's ability to address the shortcomings in the existing electoral process is a significant takeaway, ensuring improved transparency, efficiency, and trust in future elections within the Matungulu Constituency.

5.4 Recommendations and Suggestions for Further Study:

While this research successfully addressed the development and implementation of the automated voting system, future studies in this area could explore the following:

The impact of the automated voting system on voter participation and engagement within Matungulu Constituency.

Comparative studies assessing the effectiveness of different agile methodologies in software development for electoral systems.

An evaluation of the scalability and adaptability of the automated voting system for use in other similar institutions or constituencies.

These suggestions for further study can contribute to ongoing efforts to enhance electoral systems and technology-driven democratic processes.

5.5 Chapter Summary

Chapter Five, the culmination of this research, succinctly encapsulates the study's vital components. It concisely outlines the research's successful findings, highlighting the development and application of the automated voting system using an agile methodology, with each research objective yielding positive results. The conclusions underscore the system's favorable impact on electoral processes, user satisfaction, and its potential for advancing democracy and development within Matungulu Constituency. Additionally, the agile methodology's effectiveness is affirmed. Practical recommendations emphasize the importance of training, maintenance, and continuous improvement for the system's long-term viability, offering a clear path for the future. This chapter, therefore, serves as a strategic guide towards enhancing democratic processes and socio-economic development in Matungulu Constituency and beyond.

Program code

Admin Login

```
<?php
    session_start();
    include 'includes/conn.php';

    if(isset($_POST['login'])){
        $username = $_POST['username'];
        $password = $_POST['password'];

        $sql = "SELECT * FROM admin WHERE username = '$username'";
        $query = $conn->query($sql);

        if($query->num_rows < 1){
            $_SESSION['error'] = 'Cannot find account with the username';
        }
        else{
            $row = $query->fetch_assoc();
            if(password_verify($password, $row['password'])){
                $_SESSION['admin'] = $row['id'];
            }
            else{
                $_SESSION['error'] = 'Incorrect password';
            }
        }
    }
    else{
        $_SESSION['error'] = 'Input admin credentials first';
    }

    header('location: index.php');

?>
```

Add voting positions Method

```
<?php
    include 'includes/session.php';

    if(isset($_POST['add'])){
        $description = $_POST['description'];
        $max_vote = $_POST['max_vote'];

        $sql = "SELECT * FROM positions ORDER BY priority DESC LIMIT 1";
        $query = $conn->query($sql);
        $row = $query->fetch_assoc();

        $priority = $row['priority'] + 1;

        $sql = "INSERT INTO positions (description, max_vote, priority) VALUES
('$description', '$max_vote', '$priority')";
        if($conn->query($sql)){
            $_SESSION['success'] = 'Position added successfully';
        }
        else{
            $_SESSION['error'] = $conn->error;
        }

    }
    else{
        $_SESSION['error'] = 'Fill up add form first';
    }

    header('location: positions.php');
?>
```

Register a Candidate Method

```
<?php
    include 'includes/session.php';

    if(isset($_POST['add'])){
        $firstname = $_POST['firstname'];
        $lastname = $_POST['lastname'];
        $position = $_POST['position'];
        $platform = $_POST['platform'];
        $filename = $_FILES['photo']['name'];
        if(!empty($filename)){
            move_uploaded_file($_FILES['photo']['tmp_name'],
'../images/'.$filename);
        }

        $sql = "INSERT INTO candidates (position_id, firstname, lastname, photo,
platform) VALUES ('$position', '$firstname', '$lastname', '$filename',
'$platform')";
        if($conn->query($sql)){
            $_SESSION['success'] = 'Candidate added successfully';
        }
        else{
            $_SESSION['error'] = $conn->error;
        }

    }
    else{
        $_SESSION['error'] = 'Fill up add form first';
    }

    header('location: candidates.php');
?>
```


Register a Voter Method

```
<?php
    include 'includes/session.php';

    if(isset($_POST['add'])){
        $firstname = $_POST['firstname'];
        $lastname = $_POST['lastname'];
        $password = password_hash($_POST['password'], PASSWORD_DEFAULT);
        $filename = $_FILES['photo']['name'];
        if(!empty($filename)){
            move_uploaded_file($_FILES['photo']['tmp_name'],
'../images/'.$filename);
        }
        //generate voters id
        $set = '123456789abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ';
        $voter = substr(str_shuffle($set), 0, 15);

        $sql = "INSERT INTO voters (voters_id, password, firstname, lastname,
photo) VALUES ('$voter', '$password', '$firstname', '$lastname', '$filename')";
        if($conn->query($sql)){
            $_SESSION['success'] = 'Voter added successfully';
        }
        else{
            $_SESSION['error'] = $conn->error;
        }

    }
    else{
        $_SESSION['error'] = 'Fill up add form first';
    }

    header('location: voters.php');
?>
```

Voters Login

```
<?php
    session_start();
    include 'includes/conn.php';

    if(isset($_POST['login'])){
        $voter = $_POST['voter'];
        $password = $_POST['password'];

        $sql = "SELECT * FROM voters WHERE voters_id = '$voter'";
        $query = $conn->query($sql);

        if($query->num_rows < 1){
            $_SESSION['error'] = 'Cannot find voter with the ID';
        }
        else{
            $row = $query->fetch_assoc();
            if(password_verify($password, $row['password'])){
                $_SESSION['voter'] = $row['id'];
            }
            else{
                $_SESSION['error'] = 'Incorrect password';
            }
        }
    }
    else{
        $_SESSION['error'] = 'Input voter credentials first';
    }

    header('location: index.php');

?>
```

Voting Method

```
<?php
include 'includes/session.php';
include 'includes/slugify.php';

if(isset($_POST['vote'])){
    if(count($_POST) == 1){
        $_SESSION['error'][] = 'Please vote atleast one candidate';
    }
    else{
        $_SESSION['post'] = $_POST;
        $sql = "SELECT * FROM positions";
        $query = $conn->query($sql);
        $error = false;
        $sql_array = array();
        while($row = $query->fetch_assoc()){
            $position = slugify($row['description']);
            $pos_id = $row['id'];
            if(isset($_POST[$position])){
                if($row['max_vote'] > 1){
                    if(count($_POST[$position]) > $row['max_vote']){
                        $error = true;
                        $_SESSION['error'][] = 'You can only choose
'. $row['max_vote']. ' candidates for '. $row['description'];
                    }
                    else{
                        foreach($_POST[$position] as $key => $values){
                            $sql_array[] = "INSERT INTO votes (voters_id,
candidate_id, position_id) VALUES ('".$_voter['id']."', '$values', '$pos_id')";
                        }
                    }
                }
            }
            else{
                $candidate = $_POST[$position];
                $sql_array[] = "INSERT INTO votes (voters_id,
candidate_id, position_id) VALUES ('".$_voter['id']."', '$candidate', '$pos_id')";
            }
        }
    }
}
```

```
        if(!$error){
            foreach($sql_array as $sql_row){
                $conn->query($sql_row);
            }

            unset($_SESSION['post']);
            $_SESSION['success'] = 'Ballot Submitted';

        }

    }

}
else{
    $_SESSION['error'][] = 'Select candidates to vote first';
}

header('location: home.php');

?>
```

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Table 3.4 shows the project timeline

	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Planning							
Design							
Coding							
Testing							
Delivery							

Budget

ITEM	COST
Flash Drive	KES 1,000
Modem	KES 3,000
Printing cost of all documents	KES 1,000
Traveling cost	KES 3,000
TOTAL COST	KES 8,000