MAASAI MARA UNIVERSITY

SCHOOL OF SCIENCE

DEPARTMENT OF COMPUTING AND INFORMATION SCIENCES

BSC.COMPUTER SCIENCE

COM 423 COMPUTER SCIENCE PROJECT

UNI-COL WEB ERP (HIGHER LEARNING INSTITUTIONS WEB ERP)

FINAL REPORT

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REG NO: BS02/035/2012

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DATE: ……/……. /……

Final report in partial fulfilment of the requirements for the degree of Bachelor of Science In Computer Science

DECLARATION

I hereby declare that this project proposal is my original work and that it has not been presented to any other university.

NAME: WEKESA COLLINS

SIGNATURE: DATE ……/……/…….

This project report has been submitted with my approval as the university supervisor.

NAME: ABRAHAM MATHEKA

SIGNATURE: ……..DATE……../……../……

DEDICATION

I dedicate this project to my parents for being supportive to me.

ACKNOWLEDGEMENT

For this opportunity,
I thank my parents and family at large who have made my four-year course study in Maasai Mara University come true. They made sure required fee is paid so that I attend lectures. They also ensured I have the required equipment for my study majorly laptop that I used heavily in learning programming and more so in building my project.

I thank my lecturers for being supportive, mostly Mr. Abraham Matheka for his tireless advice and guidance during the project period.

Above all I thank the **Almighty God** for giving me good health throughout the entire period of project development and for giving me wisdom.

ABSTRACT

I present a web ERP system for higher learning institutions. It is called UNI-COL WEB ERP.This system is developed as a web application and also a mobile application for students' portal that runs on android, windows and IOS operating systems. The system targets higher learning institutions, i.e universities and colleges.

I have implemented the following modules/sub-systems: student portal, finance system, library system, i-voting system and m-voting system, HR system, employee portal and admissions. Other modules include exam system, accommodation system and procurement system.

This project documentation has seven chapters:

Chapter One: Introduction. Here I have given a brief information about the project. The chapter includes rationalize, background information, problem statement, justification, scope of study, objectives, ethical and professional issues, schedule, resources and projected budget.

Chapter Two: This chapter involves literature review where I have tried to compare my project with other done work in higher learning web ERPs in Kenya and outside Kenya.

Chapter Three: This chapter encompasses the research methodology. I have described the SDLC process and the model I have used which is waterfall model. I have used waterfall method because it has the following advantages; easy to understand, easy to manage milestone and deliverables, it is widely used and known and it reinforces good programming habits i.e. design before code.

Chapter Four: This chapter involves system analysis and requirement modelling.
The chapter addresses following areas:-

- Description on how the current system works using flow charts, DFDs.
- How the facts and the data gathered including the methods used.

- Requirement definitions and modeling of the Current system in terms of physical DFDs and Logical DFDs
- Requirement definitions and specifications of the proposed.
- Requirement definitions and Modeling of the proposed System in terms of physical DFDs and Logical DFDs. It include processes and data modeling.
- Disadvantages of the existing ERP systems
- Advantages of the proposed system.
- Conclusion.

Chapter Five: This chapter involves with general system design. It has data flow diagrams, flow charts,UML.logical database design,physical database design,conceptual database design,the UI,input and output design and mobile application interface.

Chapter Six: This chapter talks about system implementation.

The chapter addresses the following areas:-

- Tools used for coding and testing
- Testing: which is explained in terms of the data used to test and the approach.
- Proposed Change-over techniques
- Training of users.

Chapter Seven: This chapter encompasses limitations,conclusions and recommendations.

The chapter has the following details:

- Limitations: In this section I have stated some of the problems I encountered in the process of doing my research e.g. time factor, finances, anti- cooperative responses.
- Conclusion: ties the results of the study to theory, practice and policy by pulling together the theoretical background, literature review, potential significance for application and results of the study.
- Recommendations: the section highlights suggestions and recommendations for further improvements in the system developed.

At the end there is the references which gives sources I got most of the information.It is done in APA format.

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CHAPTER ONE: INTRODUCTION
RATIONALE

1.1 Introduction

We live in a world where computers are omnipresent; technology has entirely changed the way we live, towards the better. And education is one such name where technology and the use of computers have changed the way it is delivered, completely different from what it used to be in the last decade. Other than various new learning techniques like online courses, smart classrooms; technology has equally simplified the management of educational institutions. ERP implementation have been revolutionizing institutional management for some time now, helping institutions to improve their operations, thus making them manageable and more transparent.

ERP in education is not a new concept; ERPs were in full-fledged use in major corporations in some of the biggest industries, to ease the management process. With the development of technology and widespread demand for computing concepts has led to the increasing popularity for ERP solutions in other industries like educational institutes.

1.1.1 ERPs over traditional system of management

The time and efficiency are factors that places the ERP software ahead of the traditional methods. Managing funds in an institution and tracking them into a report almost sounds like rocket science if done manually. A lot of productive time goes into meeting this kind of specific requirements. Moreover, management of a lot of basic operations like inventory, HR, finance and other services at times appear a complex task. Educational ERP implementation can ensure an institution function at its maximum potential. (Fedena, 2015).

1.1.2 The benefits of an education ERP system

An education ERP definitely has a lot to offer, like-

- **Cost effective:** Perhaps the most prominent advantage of using ERP in education is the costing factor. Saving on the amount of man hours let you save so much on finance. Basic campus management requires a lot of manpower to manage things like fee collection, the grueling admission process, etc. When this management is done online, a lot is saved on the finance sector which can be used in other useful purposes.

- **Better organization of data:** Organize your data the way you want. Education ERP gives you a lot of ways to organize data of an institution that would help in proper management of it. Data is managed well and available with a single click of a mouse.

- **Data is secured:** Data or information stored in web servers are far more secured than those stored physically in shelves. Storing information and data stored by ERP software in servers have backup systems and thus, information is preserved.

- **More automated administration:** The entire administration which was otherwise managed using huge manpower, involving all possible flaws that are not tracked easily and managed. With education ERP, the point of flaws in managing important administration processes like fee collection, library books, admission list, etc is nearly minimal, unless there are some human errors in filling up information or technical glitches.

- **A quicker management process:** Education ERP software quickens the entire process of institutional management to great extent. All you need to wait for is the implementation of the ERP software and you are set for a faster management of your institution like never before. Be it the admission process of an entire new batch of students or generating customized reports on a particular batch is a task done in minutes.

- **More focus on education:** When most of the time is saved from taking one-to-one attendance in class or filling up the mark sheet after every exam, a lot of time is saved to be invested in what is more important- teaching.

Enterprise resource planning (ERP) is a category of business-management software—typically a suite of integrated applications—that an organization can use to collect, store, manage and interpret data from many business activities.

The ERP system is considered a vital organizational tool because it integrates varied organizational systems and facilitates error-free transactions and production. However, developing an ERP system differs from traditional system development. ERP systems run on a variety of computer hardware and network configurations, typically using a database as an information repository.

1.1.3 A Brief History of ERP

The term ERP was coined in 1990 by Gartner, but its roots date to the 1960s. Back then, the concept applied to inventory management and control in the manufacturing sector. Software engineers created programs to monitor inventory, reconcile balances, and report on status. By the 1970s, this had evolved into Material Requirements Planning (MRP) systems for scheduling production processes.

In the 1980s, MRP grew to encompass more manufacturing processes, prompting many to call it MRP-II or Manufacturing Resource Planning. By 1990, these systems had expanded beyond inventory control and other operational processes to other back-office functions like accounting and human resources, setting the stage for ERP as we've come to know it.

Today, ERP has expanded to encompass business intelligence (BI) while also handling "front-office" functions such as sales force automation (SFA), marketing automation and ecommerce. With these product advancements and the success stories coming out of these systems, companies in a broad range of industries—from wholesale distribution to ecommerce—use ERP solutions.

Moreover, even though the "e" in ERP stands for "enterprise," high-growth and mid-size companies are now rapidly adopting ERP systems. Software-as-a-Service (SaaS) solutions—also referred to as "cloud computing"—have helped fuel this growth. Cloud-based solutions not only make ERP software more affordable, they also make these systems easier to implement and manage. Perhaps even more importantly, cloud ERP enables *real-time* reporting and BI, making them even valuable to executives and staff seeking visibility into the business.

As a result, companies including educational institutions of all sizes and a wide range of industries are transitioning to cloud ERP systems.

1.2 BACKGROUND

ERP(Enterprise Resource Planning) systems are the largest software applications adopted by businesses along with quite investments in their implementations .They attempts to integrate all the departments and functions within an organisation into a single computer system that can server the other departments. However ,unlike other applications, little research has been conducted about these systems in a university environment.
A university is run by different departments, which in most cases relies on information from another department. For, example examination department will strongly rely on admission department for the information about students. Having independent information systems to run each department in a university is considerably expensive, inconvenience, unreliable and time consuming to get the required information. To solve this, an integrated ERP system is required. (M.R.V.Chaudron, 2004)

1.3 PROBLEM STATEMENT

In recent years, higher education has been has been strongly influenced by global trends, especially as a result of the call by governments for universities to improve their performance and efficiency.

University management deals with the super complex process of managing colleges, distance learning centres, deciding curriculums and formulating college/students/learning centre related policies. Universities are under more pressure than ever. They must be as efficient and effective as any business, yet they are also accountable to students, industry partners, faculty, staff, and the community at large.

At the same time, Universities must keep pace with the increasing demands of a market in constant motion. Today's students are sophisticated and tech-savvy, and expect services that usually go beyond the scope of a regular IT infrastructure. Universities also need to manage the elaborate system of circulating journals, books, databases and other reading material that establish a continuous information flow to various stakeholders.

Rising stakeholders' expectations (especially students and governments), quality and performance requirements and competitive education environments, along with decreasing governmental support, have pressured universities to adopt new strategies in order to improve their performance.

Currently most stakeholders in an institution of higher education face the difficult of accessing accurate and timely information (in case of students: results,fee statements, units and courses),managing their information, travelling (both students and staff).

Consequently, the higher education sector has to turn to Enterprise Resource Planning (ERP) to help them cope with the changing environment. As a result, existing management and administration computer systems is replaced by ERP in these institutions, so as to achieve more efficiency and accessibility for all members and improve their performance by providing better managerial tools. (Nevin, 1990)

UNI-COL – is a university ERP software that empowers administrators spend more time doing work that creates real value for a university as opposed to fighting limitations of legacy systems and questionable data.

Problems with the normal special purpose management systems include:

i. **Scalability:** They are not easily scalable.This means adding new functionality to the system as needs change is difficult.This could mean hard management of new processes,departments and more.

ii. **Unreliable reporting:** Much of the inefficiency in operational work stems from improper reporting. This is common in the non-ERP systems, which don't allow various departments to access information seamlessly.

iii. **Data quality:** As compared with manual record-keeping or other traditional approaches, an ERP system improves data quality by improving the underlying processes. As a result, better business decisions can be reached.

iv. **Supply chain:** It is difficult to have an improved supply chain with a single special purpose system, hence inefficient procurement, inventory and demand forecasting.

v. **Data Access:** Single special purpose systems have unreliable and inefficient data access. It will be difficult to control data if each reside in different databases.

vi. **Time consuming:** General purpose systems consumes a lot of time especially if it doesn't incorporate all the required data. Borrowing data from other available systems wastes time.

vii. **Cost:** It is considerably costly dealing with many special purpose systems. This may be in terms of database and overall system maintenance,acquisition,trainings.

viii. **Security:** It is so challenging maintaining the security of different special purpose systems differently. This is because each system has its own database .

ix. **Complexity**: These systems brings about complexity in terms of their structure setting, database and operations.

1.3 JUSTIFICATION

UNI-COL ERP has made activities in learning institutions to be run smoothly.Departments are managed with ease.Staff and students will find it easy to access reliable information.

1.4 SCOPE OF THE STUDY

This project is focused on studying the existing systems used in higher learning institutions to manage all the activities in the institution, from students to lecturers, examinations to fee payment, accommodation to internal elections, health to procurement, transport to employees(HR) and much more. The UNI-COL ERP incorporate all these into one integrated system, with common/central database, to realise savings on time and cost. (Oesterich, 1999)

1.5 AIMS AND OBJECTIVES

1.5.1 AIMS

To come up with safe, reliable, scalable, integrated, transparent, web based **Enterprise Resource Planning System(ERP)** system for institution of higher learning(College or University),for smooth running of the institution from students, staff to administration, and the general management at large.

1.5.2 PROJECT OBJECTIVES

i. To review current information management in higher learning institutions.
ii. To develop a college/university ERP,called UNI-COL ERP.

iii. To examine how ERP systems used affect implementation experiences for public universities.

iv. To establish how ERP based communication affects implementation experiences for various public universities in Kenya.

v. To determine how ERP systems in service delivery influence implementation experiences in public universities in Kenya .

1.6 SCHEDULE

Project Gannt Chart (November 2015 to April 2016)

Project		Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4
System Planning and Selection																	
Proposal Writing																	
System Analysis and Design																	
System Implementation																	
Documentation																	
Delivery																	

Key: WK-Week

Table 1: Project Gannt Chart

1.7 RESOURCES

Minimum Requirements

Developer Software to Used

i. Windows XP and above/Linux Mint/Ubuntu.
ii. XAMPP server
iii. Mozilla,Chrome and IE
iv. Sublime Text 2.0

Hardware

i. Intel Pentium Processor and above
ii. At least 512MB RAM
iii. 500 MHZ processor.
iv. Monitor supporting 1028 ×768 pixels
v. 4 GB hard disk free space
vi. Mobile phone(preferably smartphone)
vii. GSM Modem or phone enabled hotspot/USB tethering capability.

Development Technologies

i. PHP
ii. Javascript
iii. HTML 5
iv. Jquery
v. Jquery UI
vi. Jquery Mobile
vii. Ajax
viii. Twitter Bootstrap
ix. MYSQL

User Requirements

i. PC running on windows XP and above/Linux/Ubuntu or A mobile phone device.
ii. Internet Connection.
iii. A browser.
iv. A smart phone to run the mobile app.

Supported Platform

i. Windows OS/Linux/Ubuntu

ii. Android,Windows and IOS

1.8 . BUDGET

Item	**Cost**
HP laptop:Intel duo core,2GB RAM,500 HDD,I.64GHZ	Ksh.40000.00
Tecno Y3S Mobile Phone	Ksh. 5000.00
TOTAL	**Ksh. 45000.00**

Table 2: Budget

CHAPTER TWO : LITERATURE REVIEW

2.1. CONTENT

The history of Information systems indicate that many business organizations or learning institutions incrementally developed in-house system solutions in such a way that each system had its own files and database with loose and awkward integration. According to Jeffrey (2002)[as per research done by Prof. William Okelo-Odongo], business organizations tried to integrate the legacy information systems, usually with poor results, to form a single integrated information system. As the momentum for shifting to integrated software solutions picked up, observed that ERP vanquished the old stand-alone computer systems in 1990s (A, 2016)and replaced them with a single unified system, which has since become flexible enough that users can install some modules that are relevant to their business without buying the whole package.Most large organizations in the developed world have adopted ERP software, whereas the smaller (G.Faverio, 2005) organizations have started to follow their lead (Research by Everdingen, Hiilegersberg & Waarts, 2000). The dynamism of business needs coupled, advancement in technology and the ever-evolving global business environment have led to innovative development of suitable corporate information systems.

2.2. CONCLUSION

From the above works,it is clear that a web ERP is of high important to any learning institution.This is more of concern with even the advancement of cloud computing.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

It is made of phases that are executed in a linear fashion.According to Kendall et al (2007) SDLC is concerned with the development process of information systems.It is a phased approach to information systems development,the major phases being project identification and planning,requirement gathering,systems analysis,systems design,testing and implementation.

Project identification and planning: This involves identification and selection of the project, project scope and feasibility study. The researcher identifies the problem that need a solution, assesses whether it can get a solution and the limits of the research. For the management to approve the project they must be convinced that it is bringing a solution that is pragmatic and the solution will address real issues in the company.

Requirement Gathering : At this stage all the requirements of the system are gathered. This can be done through interviews, questionnaires, observations, sampling data from the organization and analyzing it .The analyst tries to find out what the users need to perform their tasks. The people involved in this phase are operation managers, users, operation workers and analysts. All the possible requirements of the system are captured in this phase and documented in a requirement specification document.

System Analysis: At this phase the system requirements are analyzed. Data flow diagram is the tool used to show the input, processes and output of the business. A data dictionary is then developed that gives a list of the items used and their specification .It is also at this stage that structured decision are analyzed.This is done using decision trees, structured english or decision tables which are the three major tools of analyzing structured decisions.

System Design: The physical and logical design are carried out at this phase. The physical design involves programming languages, database design, etc used for implementation and the logical design involves devising the user interface, data models and specification of process. The analyst

at this phase must design back up and controls to protect the data and the system. System design assists in defining overall system architecture.

Coding: After the design phase the system is coded using the programmers preferred programming language.The language should also be appropriate for the project. The code should correspond to the blueprint available from the design phase. Documentation of the software is also done at this phase which should include a user manual and a help facility.

Testing and Implementation: Testing is done to remove any bugs that could be in the system and to verify that it meets user expectations.The small units that make up the system are tested individually, then integrated together and tested again. At this stage the users are trained on how to handle the system. There should be smooth transition from the old system to the new system.It is the work of the system analyst to make sure that happens at this stage. This can be done using strategies like parallel conversion, direct conversion, phased conversion or pilot conversion. All the system documentation should be completed at this phase and evaluation done. From this stage the system becomes operational.

The following is a brief description of this waterfall model :

3.2 Waterfall Model

This model is run in stages.Each stage ends with verification and validation activity to minimize problems in that stage.It is the classic lifecycle model.

The diagram below how stages flows in this model:

Figure 1: Waterfall Model

3.3 STRUCTURED SYSTEMS ANALYSIS AND DESIGN METHODOLOGY (SSADM)

SSADM is a method of analyzing and designing information systems using systems approach. (Weaver et al,1998). It strictly follows the waterfall method. The following are its phases:

Figure 2: phases structured systems analysis and design methodology (SSADM)

Project initiation and planning: The project is commenced at this stage and a strategic plan on how to undertake it drawn.

Requirement Gathering: Users give the analyst their expectations. The analyst gathers what is required to achieve the goal.

System Analysis: The current system is analyzed using dataflow diagrams.

System Design: Tables and their relationships are drawn. Normalization is done. It is advisable to normalize up to the third normal form.

Coding: The programmers code the system using a suitable programming language.

Testing and Implementation: The system is checked for errors.This can be user testing, stress resting, performance testing, etc**.**

Delivery and evaluation: The system is shipped to the respective company and evaluated to find out whether it meets the expectations.

According to Kendall et al. (2007) this methodology has the following advantages and disadvantages

3.4 EVALUATION METHODOLOGY

I evaluated the system using function points. Function points involves using complexity factors with different inputs, outputs and files. They are used to measure functionality. Functionality is used to show how much and what the product can do or perform.

According to Mathew (2009), Function points are used to determine the size of computer applications and the projects used to develop them. The size is determined either from a user point of view or a functional.

Function points were developed by Albrecht. Function Point Analysis (FPA), is the method used to determine the size of a software considering its function and is expressed in function points (Mathew 2009) .FPA didn't come because there was need of a new measure but because there was need to measure productivity which was becoming increasingly important.

CHAPTER FOUR: SYSTEM ANALYSIS AND REQUIREMENTS MODELLING

4.1 INTRODUCTION

At this stage the client and the developer agree on exactly what the problems are and what the new system is to do. If the developer has the wrong idea then all the subsequent work will be wrong and a waste of time.

4.2 CURRENT PHYSICAL MODEL

Facts rarely come up in an ordered fashion. Most system developers will find a mass of detailed, incomprehensible and sometimes conflicting information which has to be sorted out, organized and documented .The system developer must then discuss with the client to confirm that the developer has understood the problems and the requirements, resolve any conflicts and in case of any gaps fill them.

Sometimes a system administrator will not document the physical details, this depends on the circumstances: If the project is complicated with many interrelated procedures, or if the system developer feels it is important to get the right detailed workings of the system, or if there are different users with many different and conflicting versions of how the system works. Normally users will respond well to this type of model because it shows the system as it currently operates, displaying the physical details that the users can recognize and relate to.

4.3 CURRENT LOGICAL MODEL

From the detail of how the existing system works, the developer needs to extract what the existing system does because the new system must incorporate most of the features, solve current known problems and meet any other client requirements. This model is known as current logical model.

4.4 DESCRIPTION OF THE EXISTING HIGHER LEARNING INSTITUTIONS ERP

The present ERPs used in universities and colleges are mainly desktop apps.Meaning they are not online/web apps.The interaction with the system always need the entity to be in place.For example if a lecturer wants to post marks it is hard for him/her to post the marks if he/she is not within the university vicinity.He/she has to travel all the way to the institution.
More so, the current systems are not fully integrated in terms of modules.Most of them have limited modules just in area of administration and exams.They don't have modules like the voting system to carry out university internal elections.Also a module like the library are always independent and it needs also registration of library users which is a wastage of time.This may result to problems for example when a student X changes his/her name in the admission office.This change may not be reflected immediately in other departments because the database is not central.

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4.5 DATA FLOW DIAGRAMS (DFDs)

A data flow diagram is a graphical representation of how information flows and is transformed as data moves from input to output. A DFD can be used to represent a software or system at any degree of abstraction. Data flow diagrams identify the system boundary, the external identities, the data stores, and the data or information flows into and out of the system. The data flow diagrams are process based.

4.5.1 CONTEXT DIAGRAM FOR THE CURRENT SYSTEM

This diagram is a general one and its main purpose is to assist the system analyst to understand the basic data flow.

Figure 3: context diagram for the current system(module:Electoral system),reference to Maasai Mara University

4.5.2 LEVEL 1 DATA FLOW DIAGRAM (DFD) FOR THE CURRENT SYSTEM

The level one DFD comes from the context diagram. The context diagram is expanded to get the processes inside, data stores and new lower level data flows.

Figure 4: level 1 data flow diagram for the current system(voting module),case Maasai Mara University

4.6 A FLOWCHART FOR THE CURRENT SYSTEM(VOTING MODULE)

A flow chart is a diagram that shows the flow of data through the information processing systems. It represents an algorithm, process or workflow. The representation is in a diagrammatic form which is an illustration of the solution to the problem. A flowchart is used to provide people with common language or point of reference when working on a project. They use basic geometric symbols and arrows to show relationships.

Figure 5: Flowchart for the current system.

4.7 UML DIAGRAMS

UML is a diagramming notation that is used to represent and discuss program designs. It is a language used to construct, visualize, specify and document the software system objects. It deals with particular set of objects and attributes. Object diagrams are used to visualize one instance at a time and the data that is in the system at that time. Below are some of the Unified Modeling Language diagrams that have been used.

4.7.1 ACTIVITY DIAGRAMS FOR THE CURRENT SYSTEM

An activity diagram is a graphical representation of workflow in a system. It can be used to show the workflow of any component in the system. In our case, we will use the Voter component and the election officer components

Figure 6: Voter activity diagram for the current system(Voting Module)

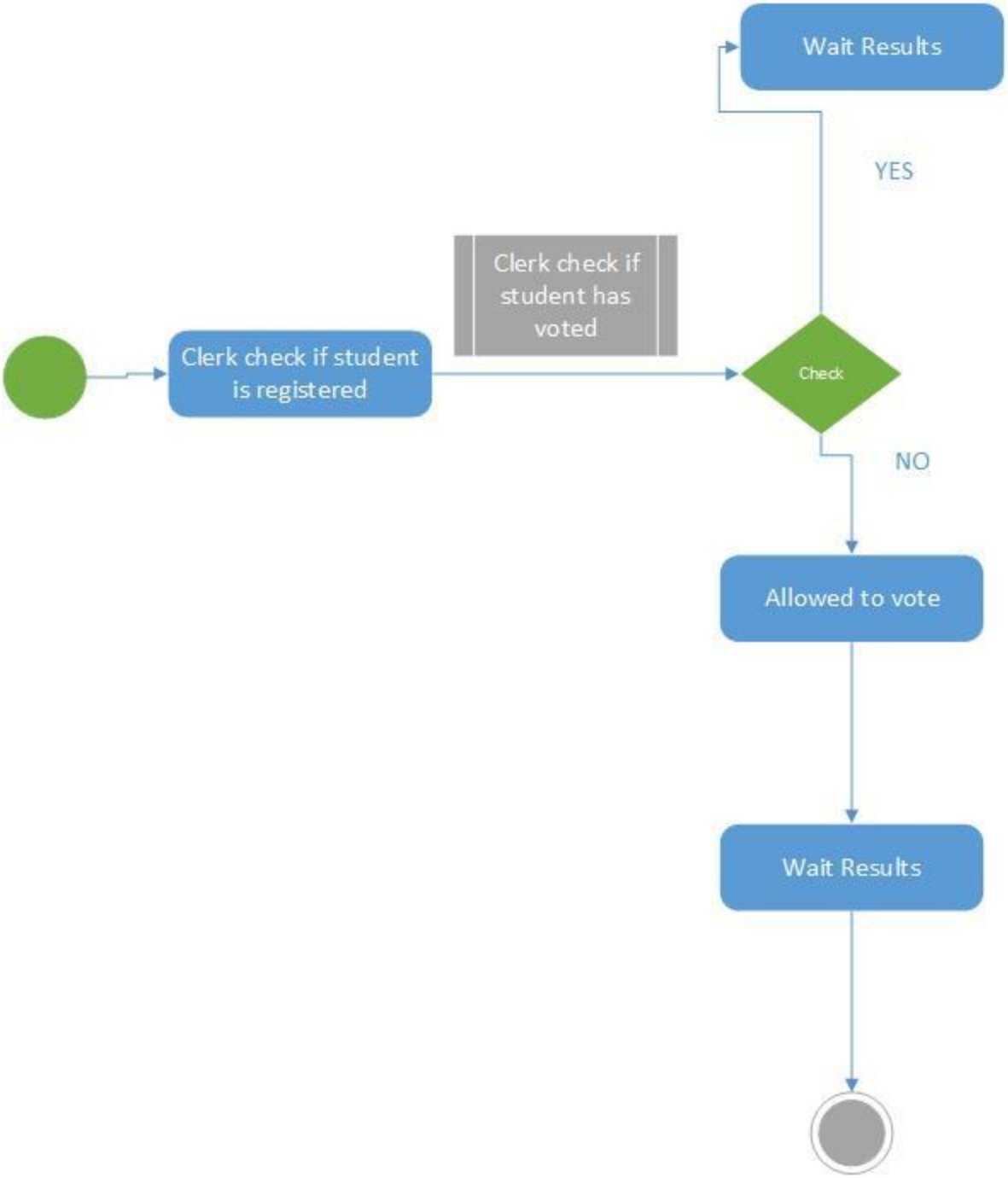
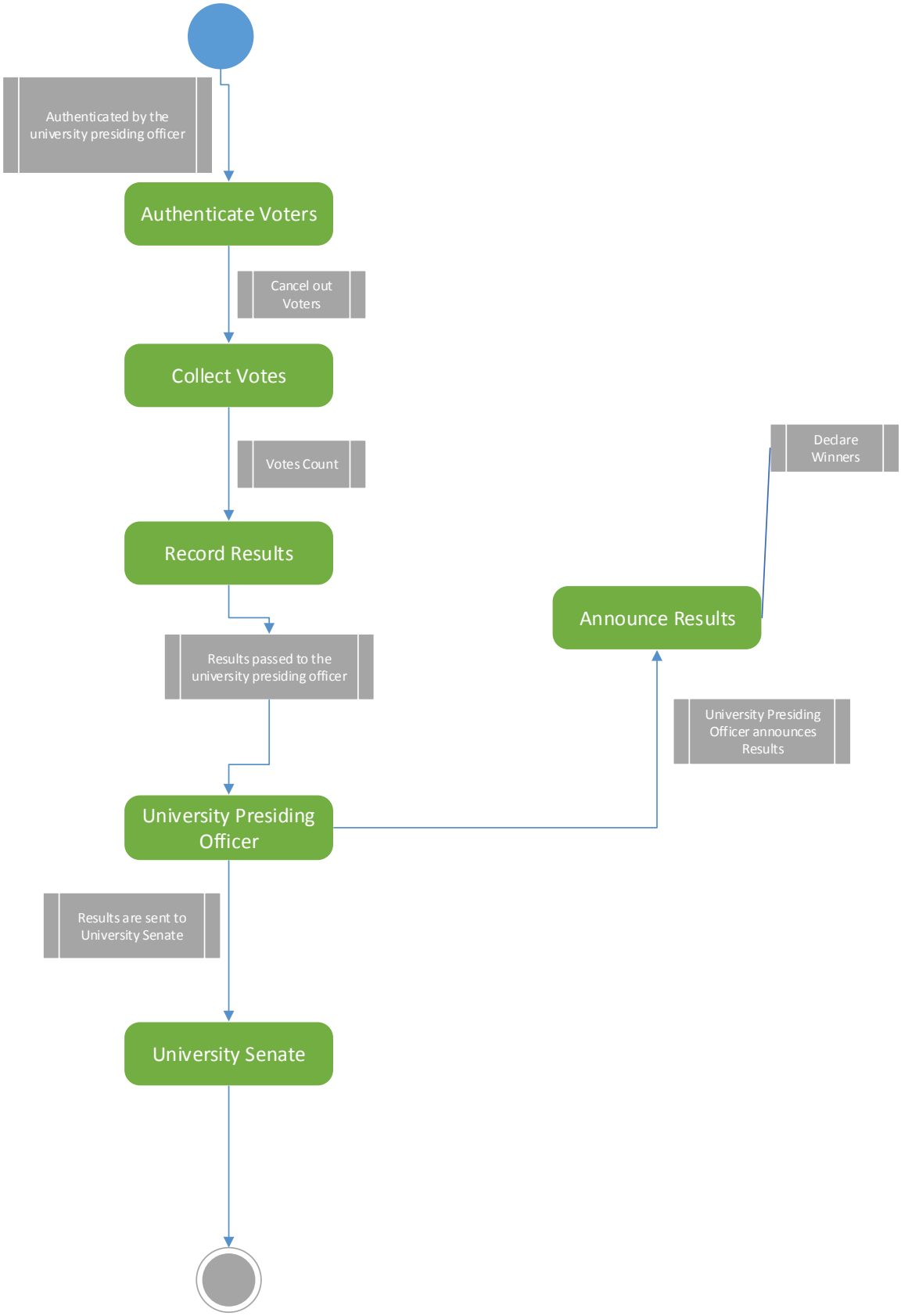


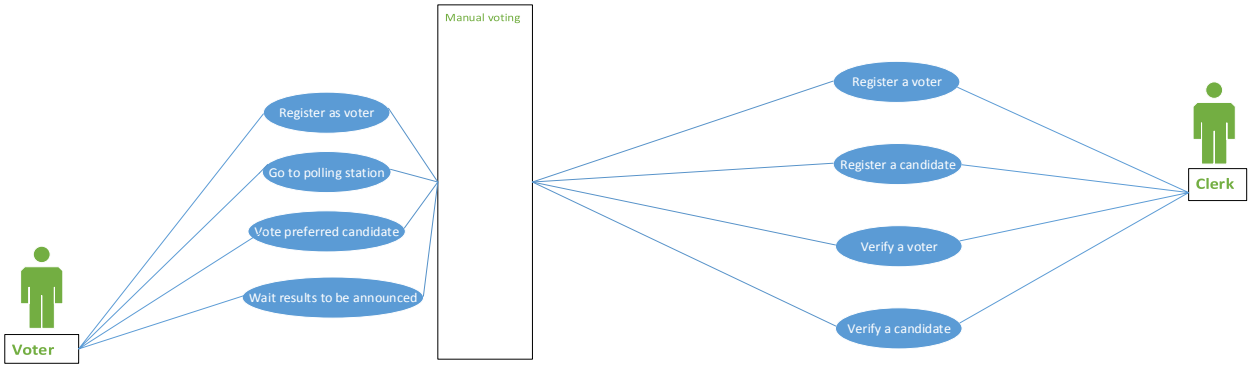
Figure 7: Maasai Mara University election clerk activity diagram for the current system


Authenticated by the university presiding officer
Authenticate Voters
Cancel out Voters
Collect Votes
Votes Count
Record Results
Results passed to the university presiding officer
University Presiding Officer
Results are sent to University Senate
University Senate
Announce Results
Declare Winners
University Presiding Officer announces Results

4.7.2 USE CASE DIAGRAM FOR THE CURRENT SYSTEM

A Use case diagram shows the interaction between the user and the system.

Figure 8: use case diagram for the current system

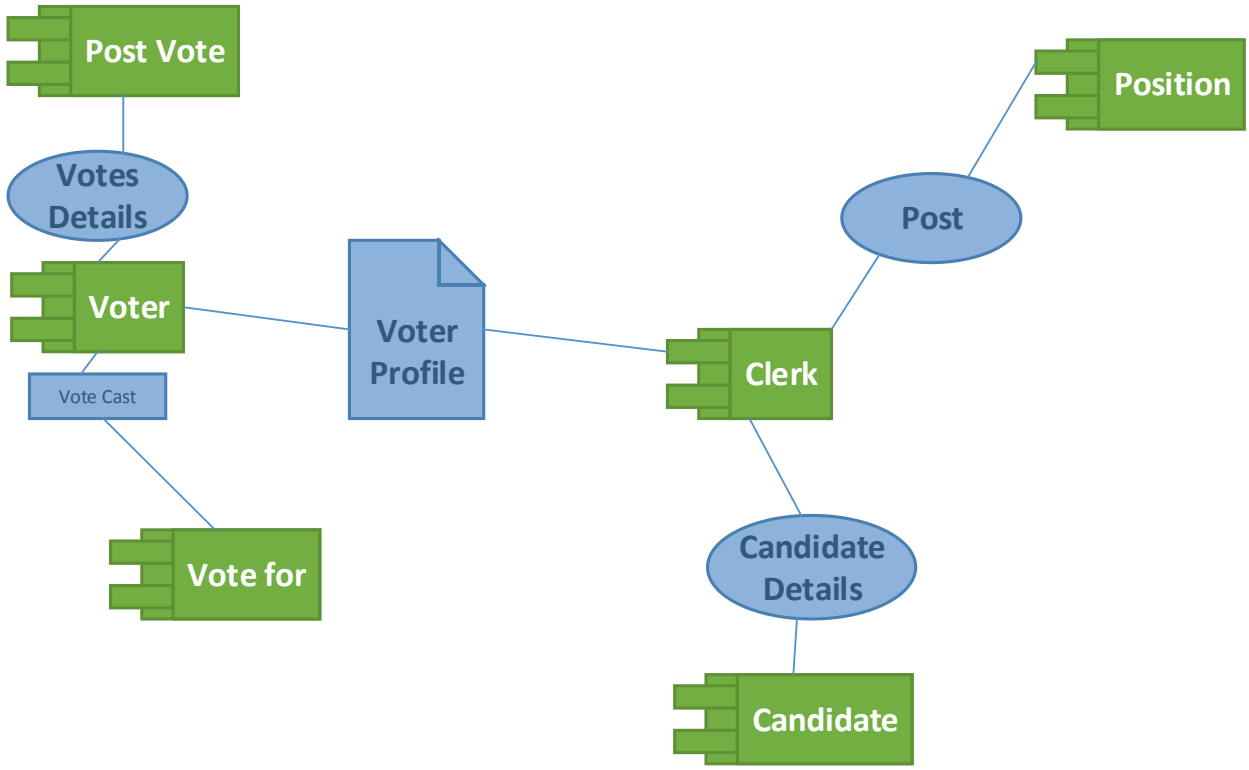


4.7.3 COMPONENT DIAGRAM FOR CURRENT SYSTEM(VOTING MODULE)

A component diagram shows how small components interconnect to form large components which are more complex. The components communicate with one another through interfaces. The components in university voting manual system include:

a) The voter
b) The election clerk
c) Candidate
d) School
e) Post
f) President vote
g) Voter for

Figure 9: component diagram for current system



4.8 FACTS AND DATA GATHERING

To complete this study, information was gathered primarily from university entities (students and staff) and the internet. Primary data was collected from students, library staff , finance staff and some lecturers. Other data was gotten from books, government reports, civil society reports and the internet.

4.8.1 INTERVIEWS

An interview is a talk between people where the interviewer asks the interviewee questions in order to extract certain information. In order to collect valuable information it is important to identify an expert in the domain of interest and prepare him/her before the time of interview. An interview should be conducted in a relaxed environment to get good results. When an interview is conducted correctly, it is the best method of collecting valuable data. In order to accomplish many objectives of a study it is important to interview people who are well conversed with the subject of the study. Interviews can be conducted face to face or electronically (online/telephonic) Three interviews were conducted in this study which were:

(i) Students

(ii) Head of Maasai Mara University Elections

(iii) Librarian

(iv) Accounts Clerk

(v) Non-teaching staff

4.8.2 PURPOSE OF INTERVIEWS

The purpose of the interviews was to know the challenges that the university society faces.For students it may involve accessing fee fee information,accessing library,voting and so on.For employees it involves accessing payslips and other information.The interview gives upper hand information because the requirements and also the available gap can be identified from the analysis of views from respondents.

4.8.3 SELECTION OF INTERVIEW SUBJECTS

In order to conduct the interview effectively it was necessary to select interviewee who could provide the best information. I got a list of students across the year of study,i.e from first years to fourth year,a non-teaching staff,a lecturer,ICT chairman and an ICT helpdesk attendant.

4.8.4 INTERVIEWING

I first approached the target.I briefed them about my study and explained comprensively to make them understand.I started interviewing them after one day,separately.Each of them gave their responds,of which I went to sit down and analyse keenly using SPSS.

Table 3: Sample Interview Questions

4.9 DISADVANTAGES OF THE EXISTING SYSTEM

The following are the disadvantages of the standalone management system and manual voting system:

i. **Scalability:** They are not easily scalable.This means adding new functionality to the system as needs change is difficult.This could mean hard management of new processes,departments and more.

ii. **Unreliable reporting:** Much of the inefficiency in operational work stems from improper reporting. This is common in the non-ERP systems, which don't allow various departments to access information seamlessly.

iii. **Data quality:** As compared with manual record-keeping or other traditional approaches, an ERP system improves data quality by improving the underlying processes. As a result, better business decisions can be reached.

iv. **Supply chain:** It is difficult to have an improved supply chain with a single special purpose system, hence inefficient procurement, inventory and demand forecasting.

v. **Data Access:** Single special purpose systems have unreliable and inefficient data access. It will be difficult to control data if each reside in different databases.

vi. **Time consuming:** General purpose systems consumes a lot of time especially if it doesn't incorporate all the required data. Borrowing data from other available systems wastes time.

vii. **Cost:** It is considerably costly dealing with many special purpose systems. This may be in terms of database and overall system maintenance,acquisition,trainings.

viii. **Security:** It is so challenging maintaining the security of different special purpose systems differently. This is because each system has its own database.

ix. **Complexity**: These systems brings about complexity in terms of their structure setting, database and operations.

x. Time consuming queuing while voting.

xi. The votes can be easily manipulated.

xii. Students chaos.Elections results can trigger students chaos due to unsatisfaction.But with the new system the students are able to get satisfied because they see how figures change.

4.10 ADVANTAGES OF THE PROPOSED SYSTEM

i. ERP improves quality and efficiency of running an academic institution.

ii. Eliminates bureaucracy by providing branch campuses direct access

iii. Offers greater range of student services with more flexibility

iv. Enables its major stakeholders to collaborate, access and exchange information from anywhere, anytime and any device

v. Automates the workflow of administrative and academic processes, reducing manpower cost and involvement

vi. Centralizes a mountain of data and analyzes it for enhanced learning, knowledge sharing

vii. ERP supports upper level management by providing information for decision making.

viii. ERP creates a more agile institution that adapts better to change.

ix. ERP can improve data security. A common control system, such as the kind offered by ERP systems, allows organizations the ability to more easily ensure key data is not compromised.

x. ERP provides increased opportunities for collaboration.

4.11 REQUIRED LOGICAL MODEL

The requirement modelling stage moves from the logic of the current system to required system. The objective is to spell-out what needs to be done to meet the requirements in the problem definition and how to solve them. The end product of this stage is a model of the required system and the specification of requirements outlining what the system is supposed to do but not how it will be implemented.

4.12 CONCLUSION

The proposed Web ERP system is very efficient ,scalable, robust and secure to be used in any higher learning institution .It will greatly make the workflow and management very efficient. This will greatly improve the activities in those institutions ,making learning even better.

CHAPTER 5: SYSTEM DESIGN

5.1 INTRODUCTION

Design is the process of applying various principles and techniques in order to define a process or a system in adequate detail for it to be physically realized. There are certain items such as modules, relationship among modules, data structures, relationship between the data structures and algorithms for implementation that must be designed in this phase. During system development, design is the first step into the development phase.

The design stage is expected to deliver outlines of different technical answers that meet the expectations of system analysis and requirement modelling stage.

These solutions include:

1. A minimum-cost solution. This just does the job and nothing more.
2. A medium –cost solution. This is convenient to users and does the job well. It may have additional features which the client did not ask for but the developer thinks they will be needed from experience.
3. A high- cost solution. This includes anything that the client needs.

In my design phase I did the following:

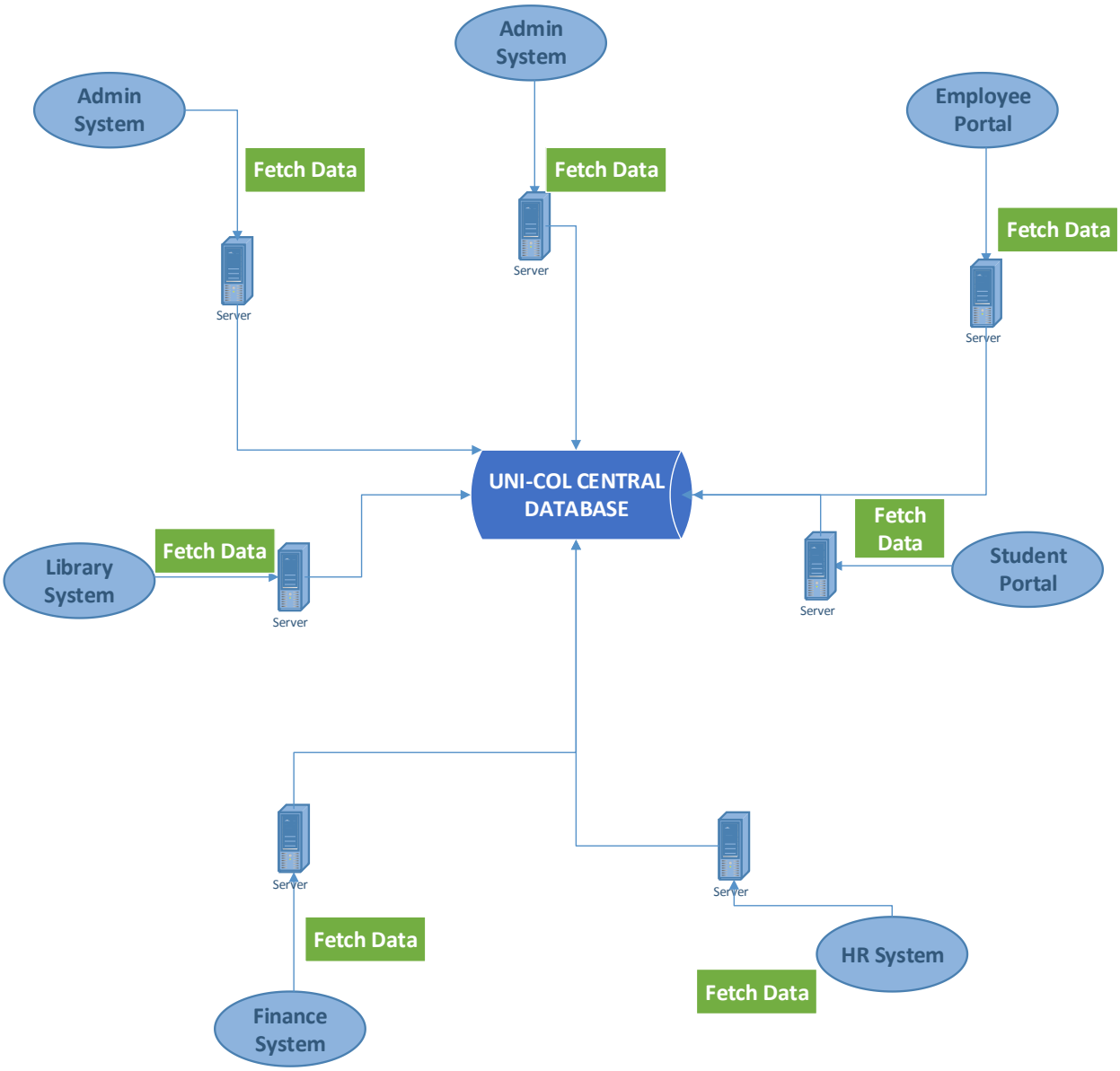
- ✓ Organized the system into modules
- ✓ Organized sub-modules for each module
- ✓ Allocated tasks to processors
- ✓ Choose an approach to manage data store
- ✓ Handled access to global resources
- ✓ Choose implemented logic

5.2 DATA FLOW DIAGRAM

5.2.1 CONTEXT DIAGRAM FOR THE PROPOSED SYSTEM

A context diagram is a data flow diagram that subsumes everything inside the scope of the system. It should just be an overview basically showing how the system will receive and send information to the entities external to the system. It includes inputs, the system in general and outputs. It is a bird's eye view of the data movement and widest conceptualization possible of the system. It answers the question, 'who needs to use this system?'

Figure 10: context diagram for the proposed system


Admin System
Admin System
Employee Portal
Fetch Data
Fetch Data
Fetch Data
Server
Server
Server
UNI-COL CENTRAL DATABASE
Library System
Fetch Data
Server
Fetch Data
Student Portal
Server
Server
Server
Fetch Data
HR System
Fetch Data
Finance System

5.2.2 LEVEL 1 DATA FLOW DIAGRAM FOR THE PROPOSED SYSTEM

Level 1 data flow diagrams for the proposed system

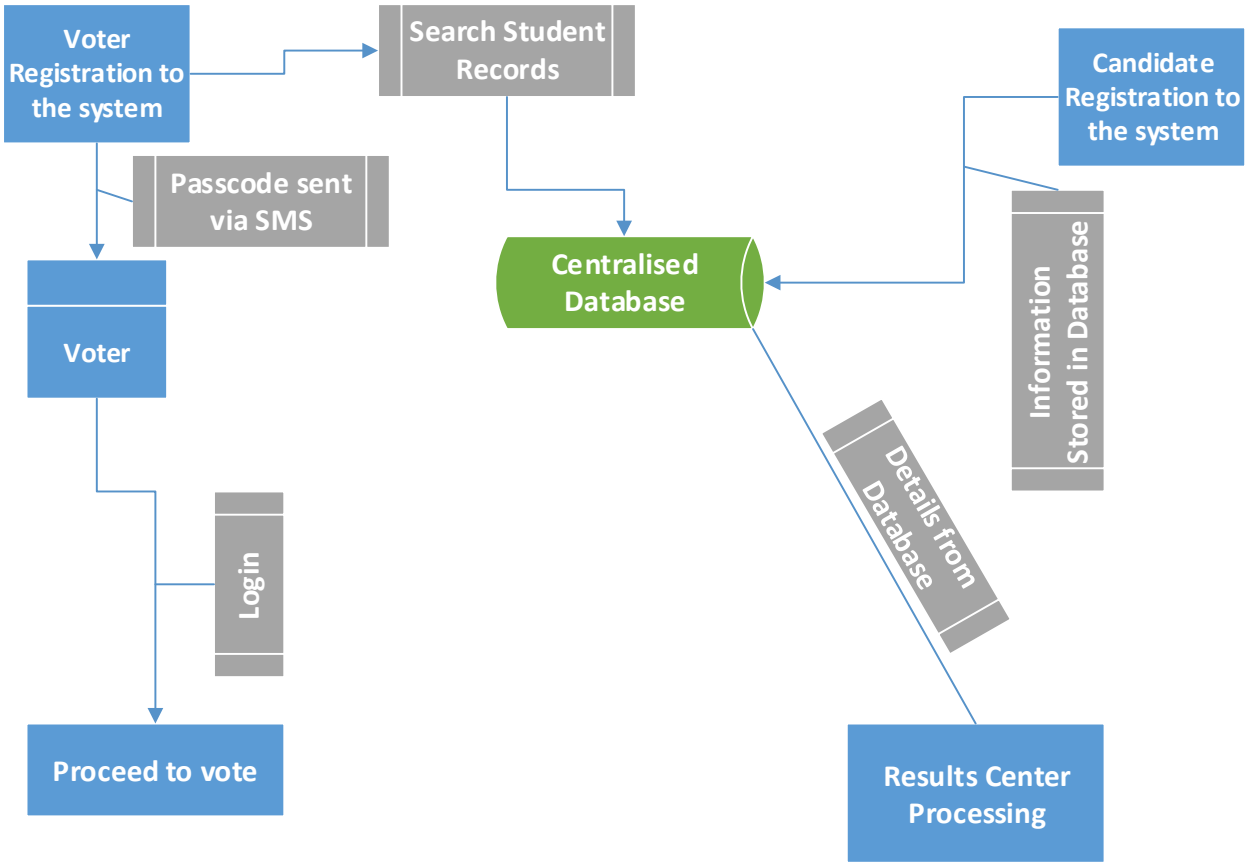


Figure 11: i-voting and m-Voting System

.

Figure 12:Library system

Figure 13:Finance System

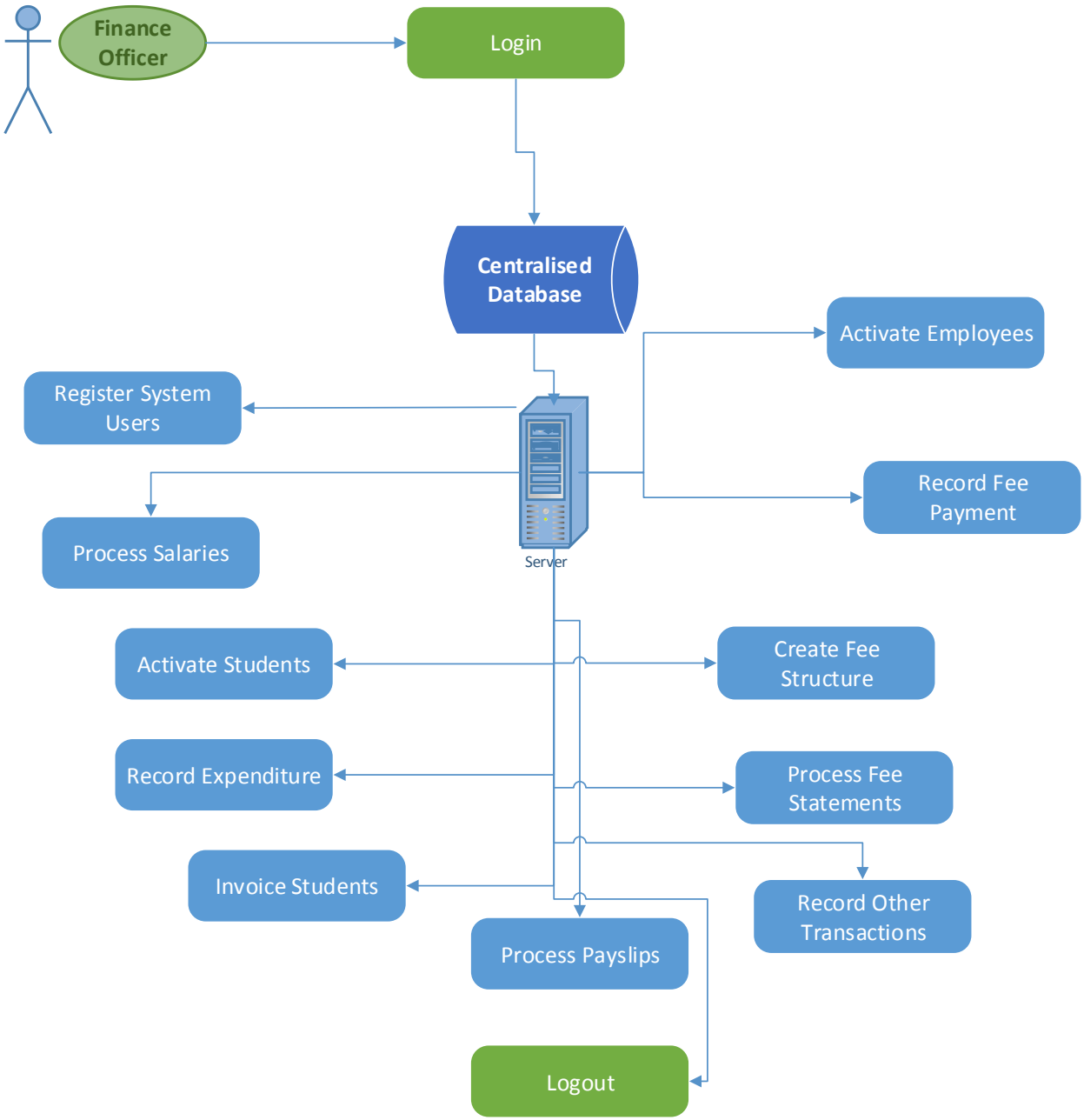

Finance Officer
Login
Centralised Database
Activate Employees
Register System Users
Server
Record Fee Payment
Process Salaries
Activate Students
Create Fee Structure
Record Expenditure
Process Fee Statements
Invoice Students
Record Other Transactions
Process Payslips
Logout

Figure 14:Student Portal

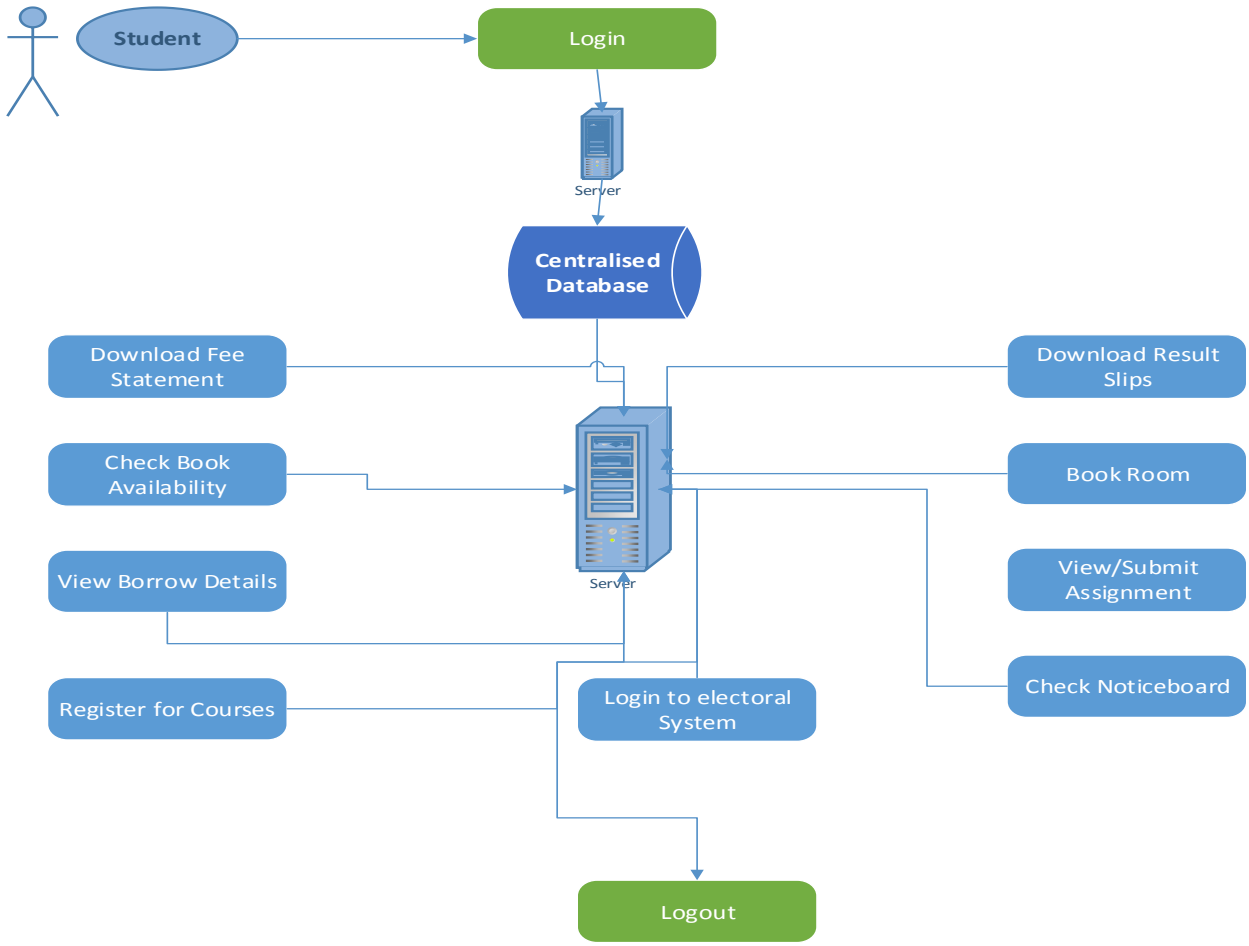
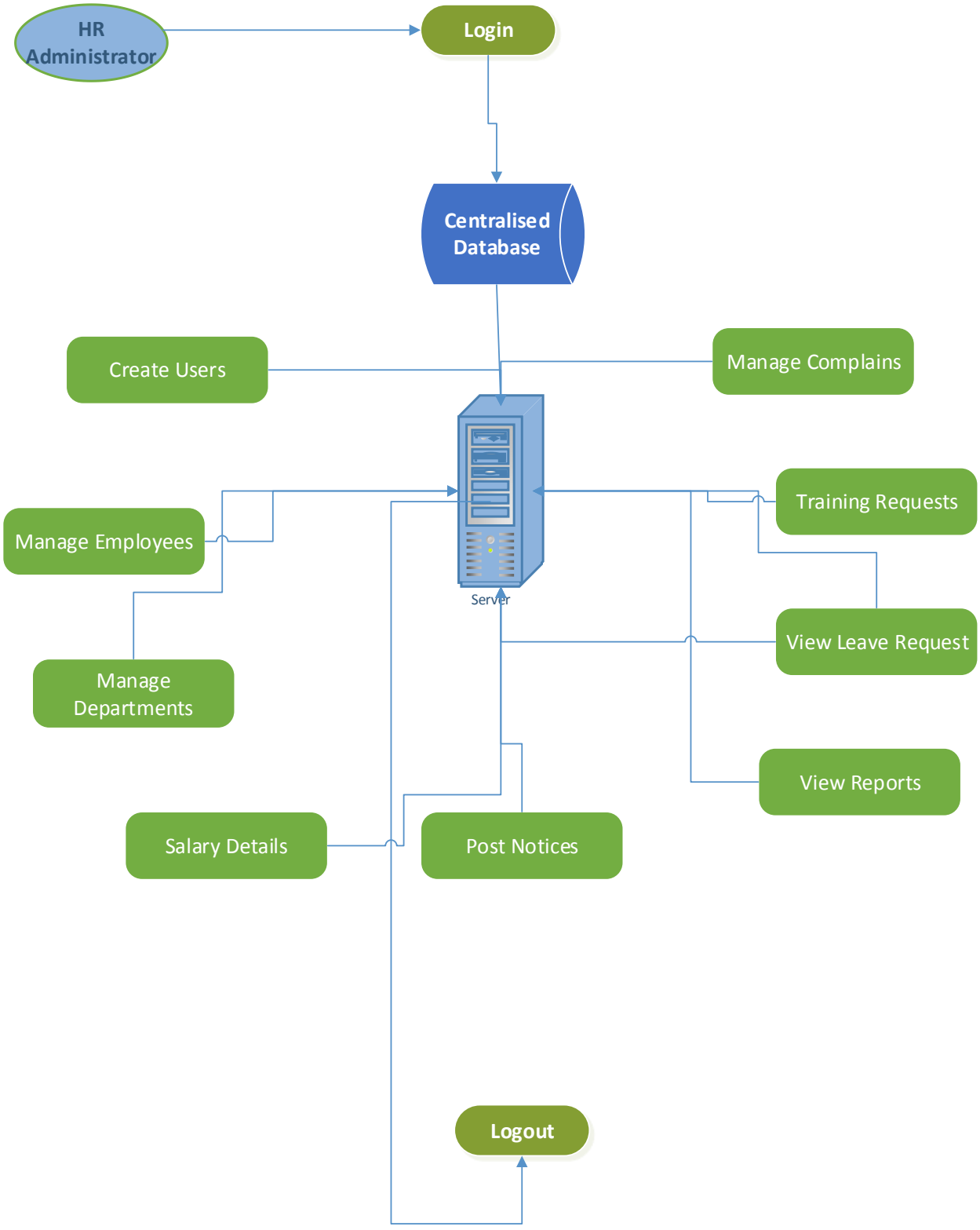


Figure 15: Employee Portal

Figure 16:HR System (Admin)


HR Administrator
Login
Centralised Database
Create Users
Manage Complains
Server
Training Requests
Manage Employees
View Leave Request
Manage Departments
View Reports
Salary Details
Post Notices
Logout

5.3 FLOW CHART FOR THE PROPOSED SYSTEM

A flow chart is a diagram that represents a process or an algorithm. The steps are represented by boxes connected using arrows.

Flow charts for the proposed system

Figure 17:Voting system (voter/student)

Figure 18:Voting system (Admin)

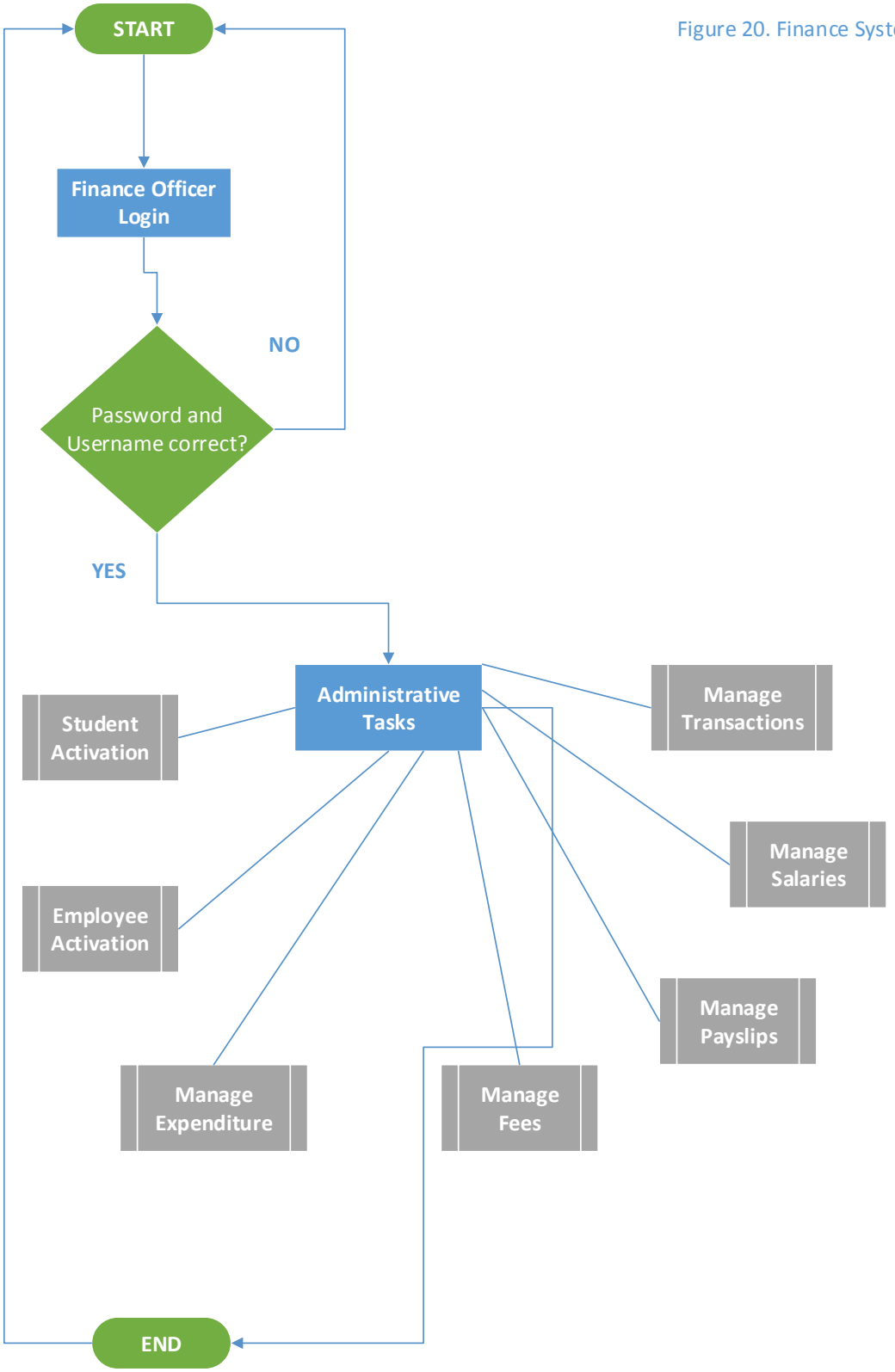


Figure 20. Finance System

Figure 19: Finance System

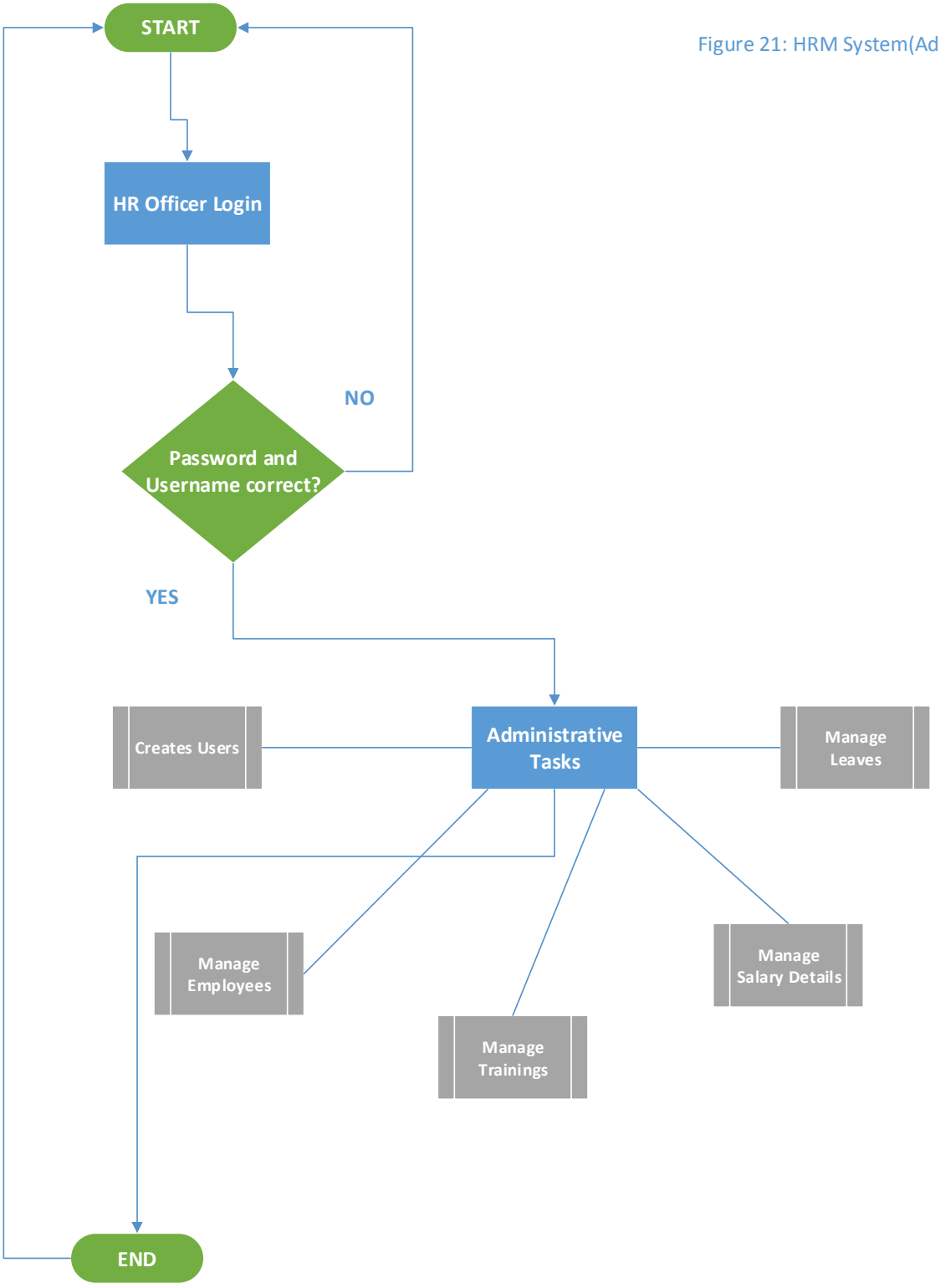


Figure 21: HRM System(Admin)

Figure 20: HRM System(admin)

Figure 21: Library System

5.4 UNIFIED MODELING LANGUAGE (UML) DIAGRAMS FOR THE PROPOSED SYSTEM.

5.4.1 CLASS DIAGRAM FOR THE PROPOSED SYSTEM

This is the major building block of object oriented modeling. It is a description of different types of objects exiting in the system and the types of static relationships among them. It summarizes the target system.

Figure 22: Class Diagram

5.4.2 USE CASE DIAGRAM FOR THE PROPOSED SYSTEM

Figure 23: Use Case Diagram for the proposed system(voting module)

Figure 24: Use Case Diagram for Finance System

Figure 25: Use Case Diagram(Library System)

5.4.3 OBJECT DIAGRAM FOR THE PROPOSED SYSTEM

The object diagram shows there relationship between objects. It is close to a class diagram. It shows how an object looks like at a particular time.

Figure 27: Object diagram for the proposed system(Voting Module)

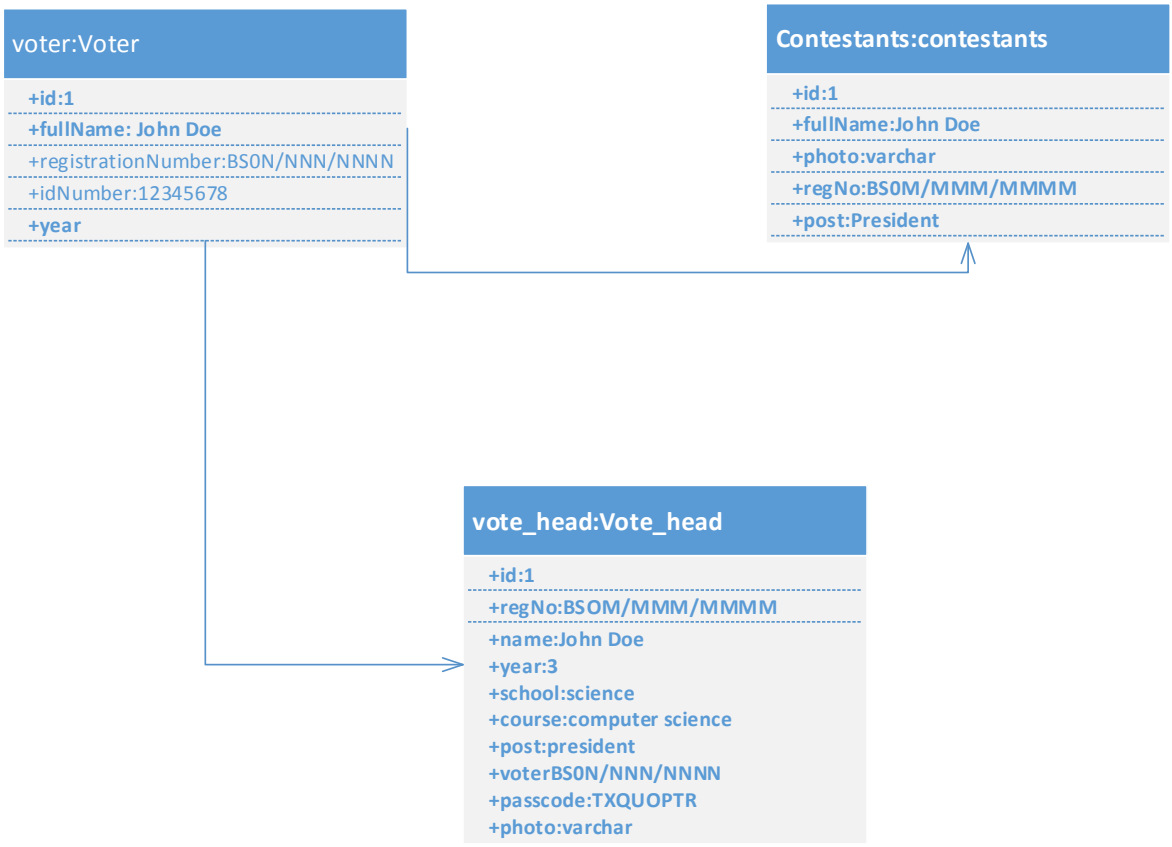


Figure 26:Component Diagram (Voting Module)

5.4.4 COMPONENT DIAGRAM FOR THE PROPOSED SYSTEM

The component diagram shows how small components interconnect to form large components which are more complex. The components communicate with one another through interfaces. The system components in my system include:-

a) Admin Panel

b) Voting System
c) Finance System
d) Students' Portal
e) Library System
f) Employee Portal
g) Recruitment System
h) HR System
i) Mobile App

Figure 28: Component diagram for the proposed system (Voting system)

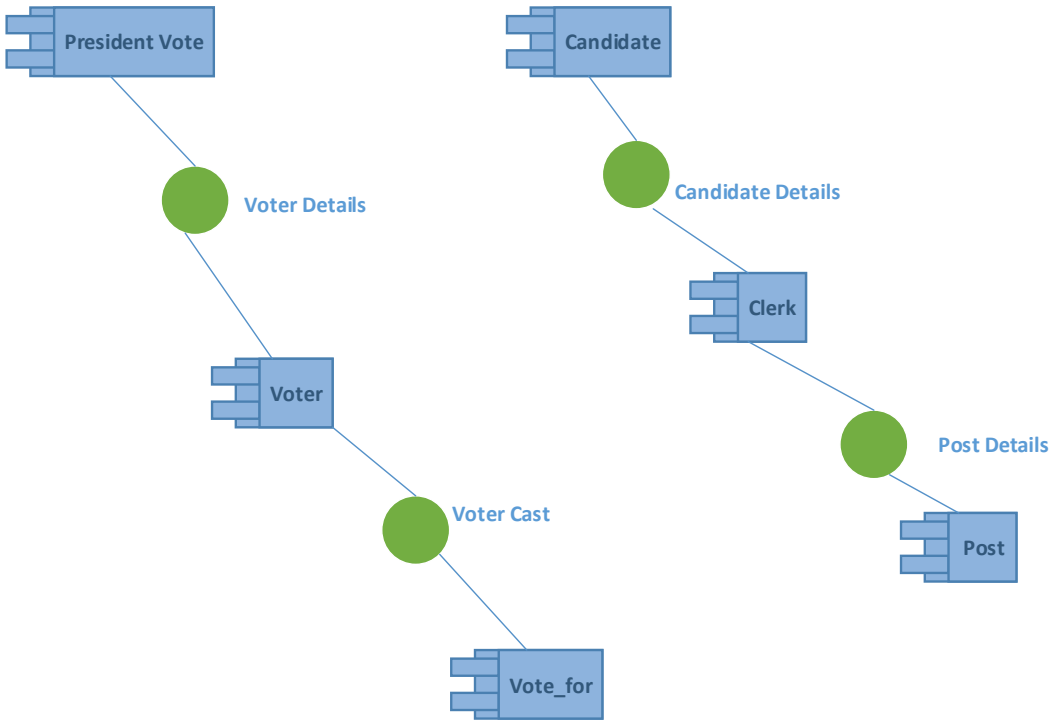


Figure 27: Object diagram(voting module)

5.4.5 ACTIVITY DIAGRAMS FOR THE PROPOSED SYSTEM

Figure 29: Activity diagram for the Election officer in the proposed system(voting module)

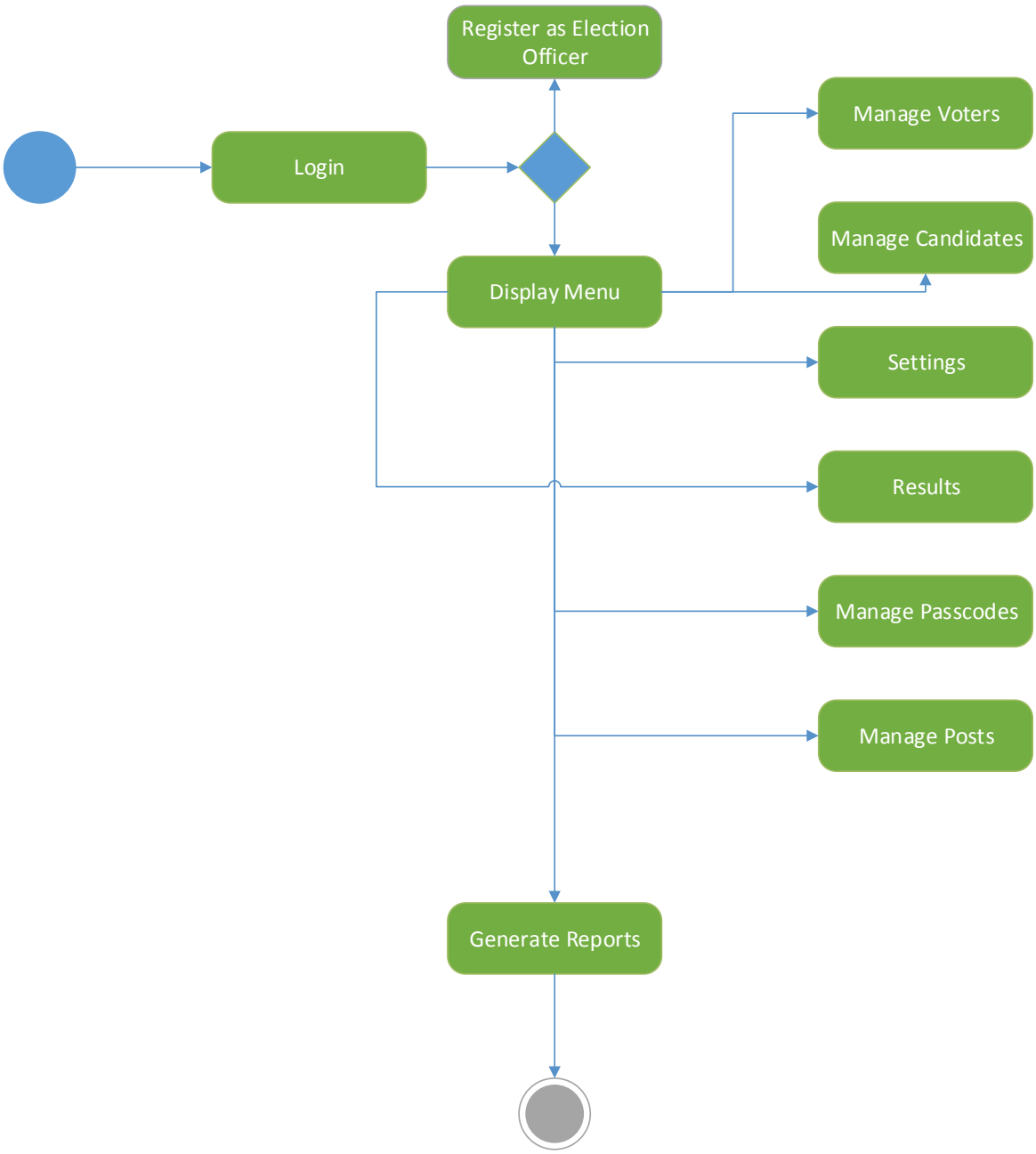


Figure 28:Activity diagram for election officer (Electoral System)

Figure 30: Activity diagram for the voter in the proposed system(Voting module)

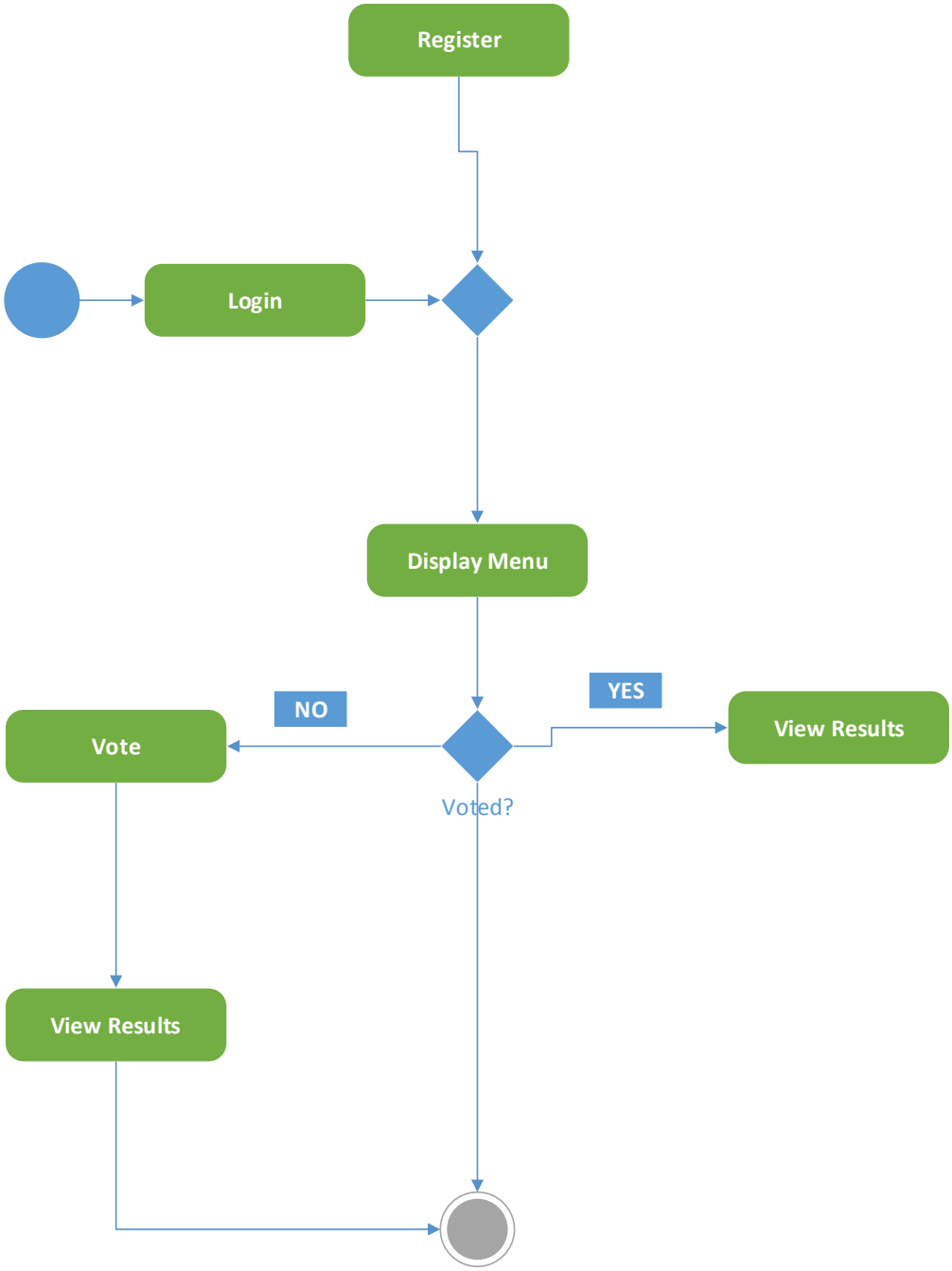


Figure 29:Activity Diagram for voter

5.5 LOGICAL DATABASE DESIGN

This is a set of table schemas. A table schema is also known as a relation schema. A logical database design shows all entities and relationships among them.

Database Name: erp

Figure 30:Logical Database Design(voting module)

5.6 PHYSICAL DATABASE DESIGN

The physical database design is done using SQL clauses. It is a representation of the model in the database. It shows all the table structures and specifies all the tables and columns.

Database Name: erp

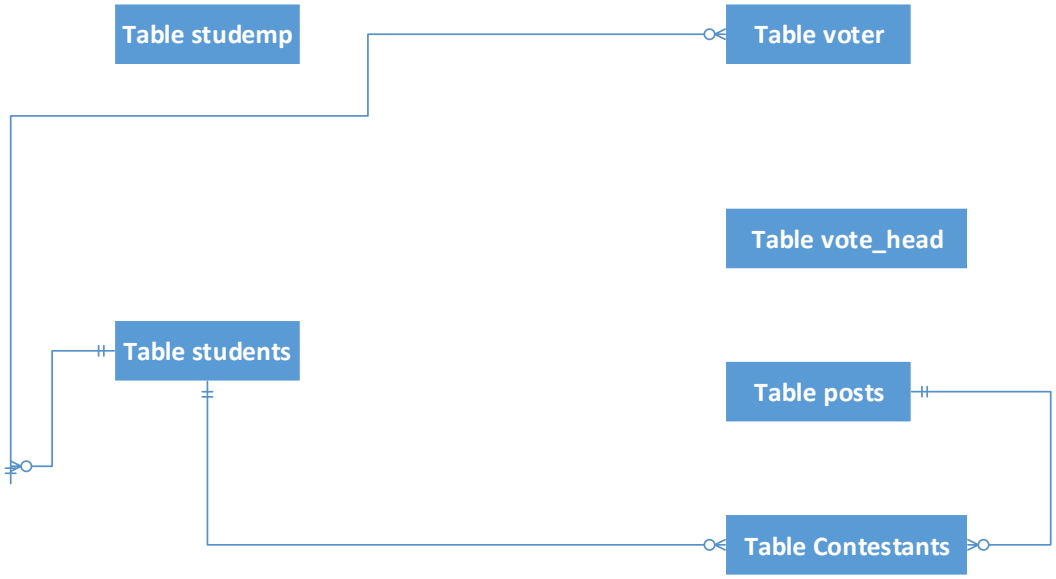
Figure 31:Physical Database design (voting module)

5.7 CONCEPTUAL DATABASE DESIGN

The conceptual database design is the highest level data model .It shows the main entities and how they relate with one another. No attribute or primary key is specified. It is commonly represented using entity relationship diagrams.

Database Name: erp

Figure 32:Conceptual database design(voting)



5.8 ENTITY RELATIONSHIP DIAGRAMS

Figure 33:Entity Relationship Diagram (Voter Registration)

5.9 DATABASE TABLES

This project uses the following tables:

i.tblusers

Table 4: User Table

Table 5: Contestants

Table 6: Class Reps

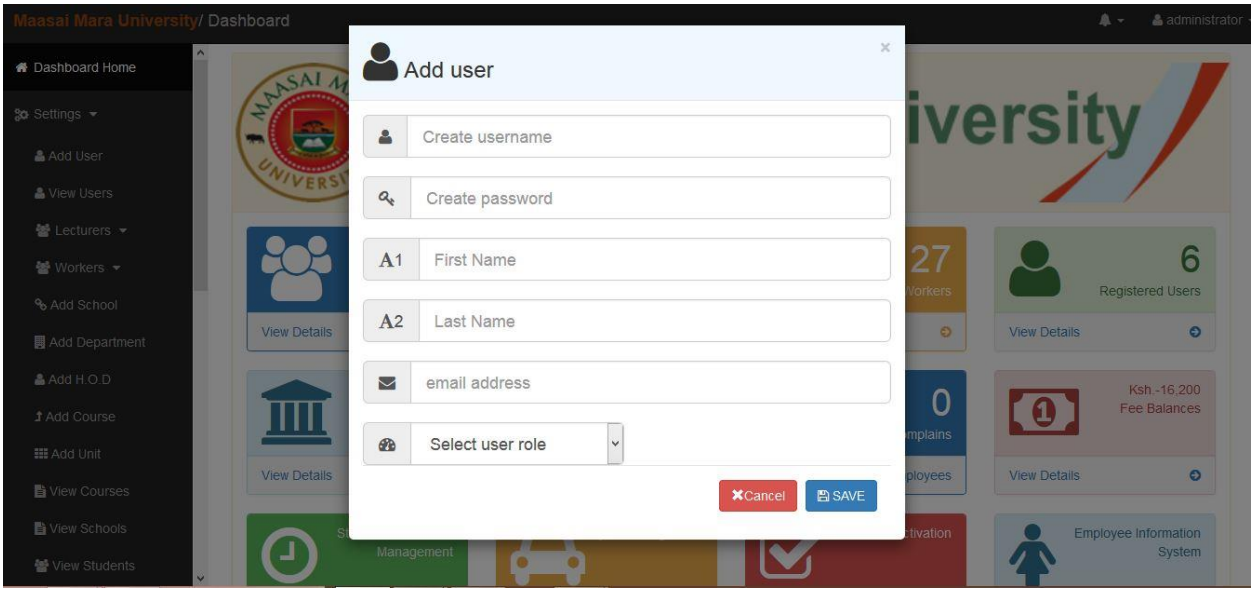
5.10 INTERFACE DESIGN

Figure 34: System user interface :System Administrator

5.11 INPUT DESIGN

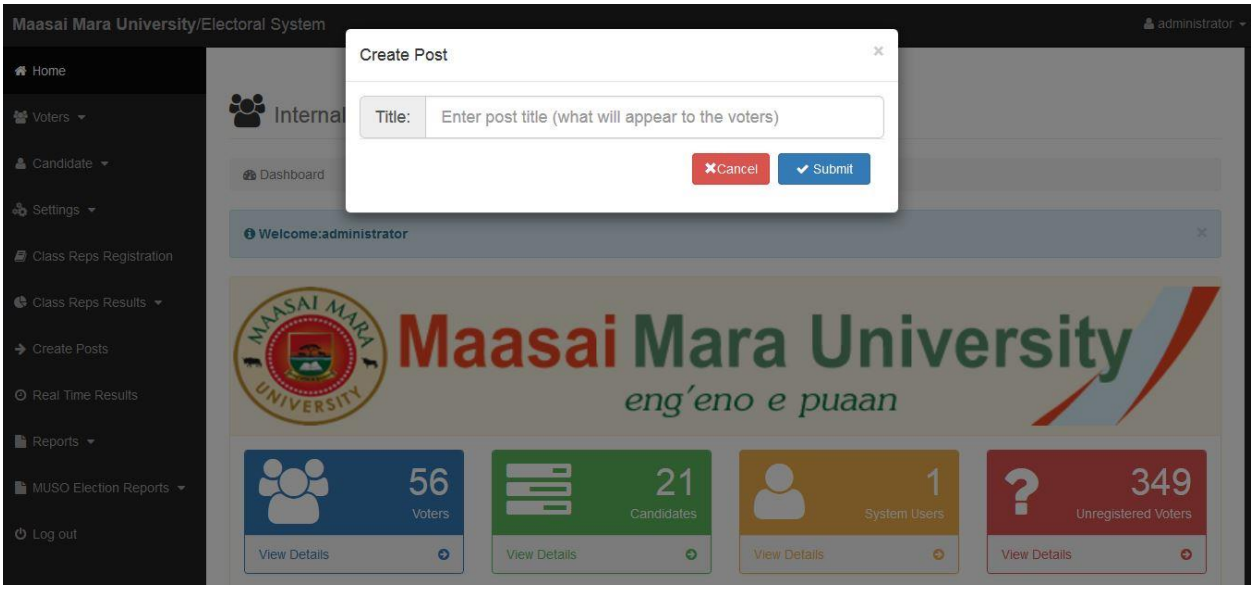
This shows how the forms have been designed for entry of data by the users of the system.

Figure 35: System user interface : Administrator registering system users



Here a user's details is registered into the system.A default password is created of which once registered,a user can change the password.

Figure 36: System user interface : Creation of Election Posts



Various electoral posts are created and stored in a centralised database.

Figure 37: System user interface : Casting votes

The voter select his/her favourite candidate and casts a vote.

Figure 38: System user interface : Candidate Registration

Figure 39: System user interface : Candidate Assigning of Posts

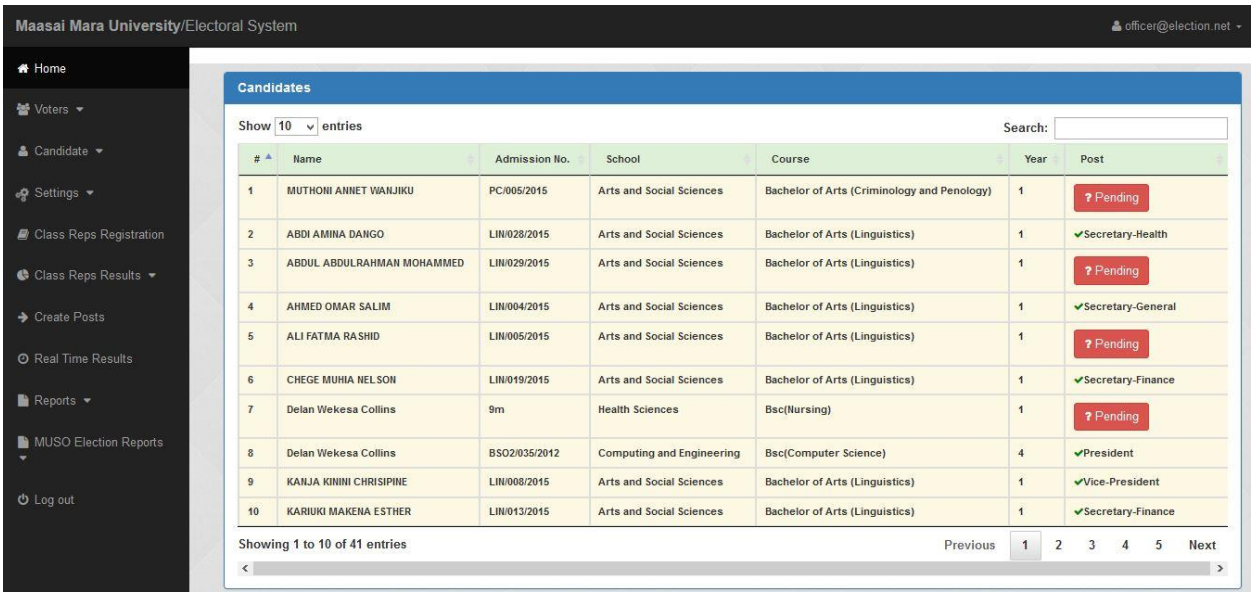
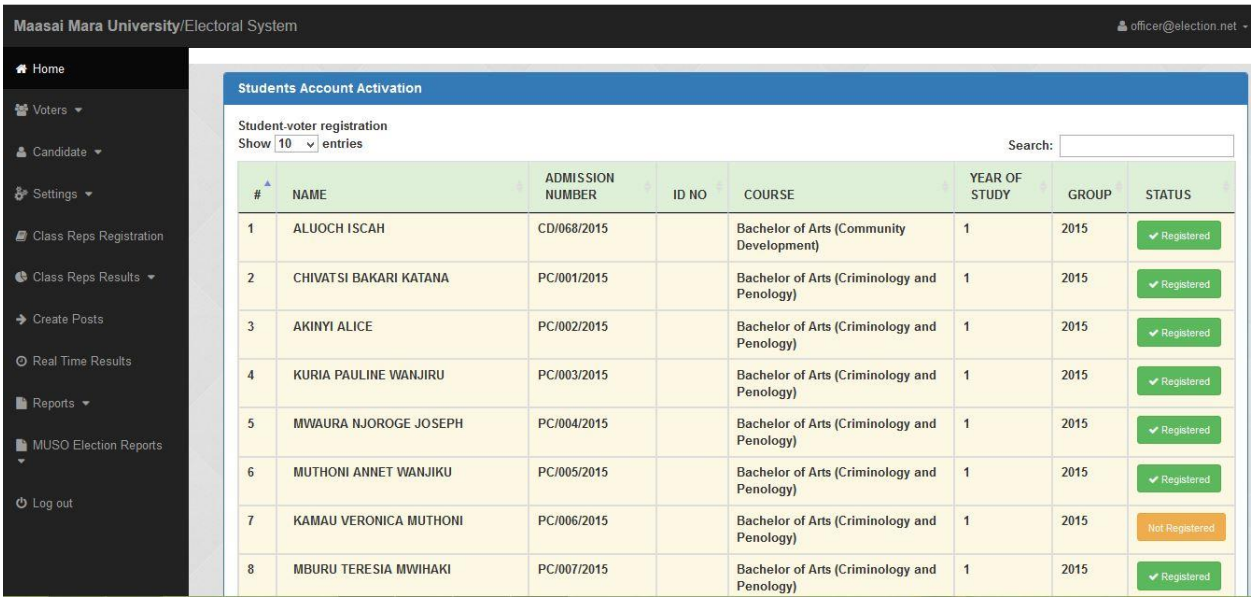


Figure 40: System user interface : Voter Registration/Activation



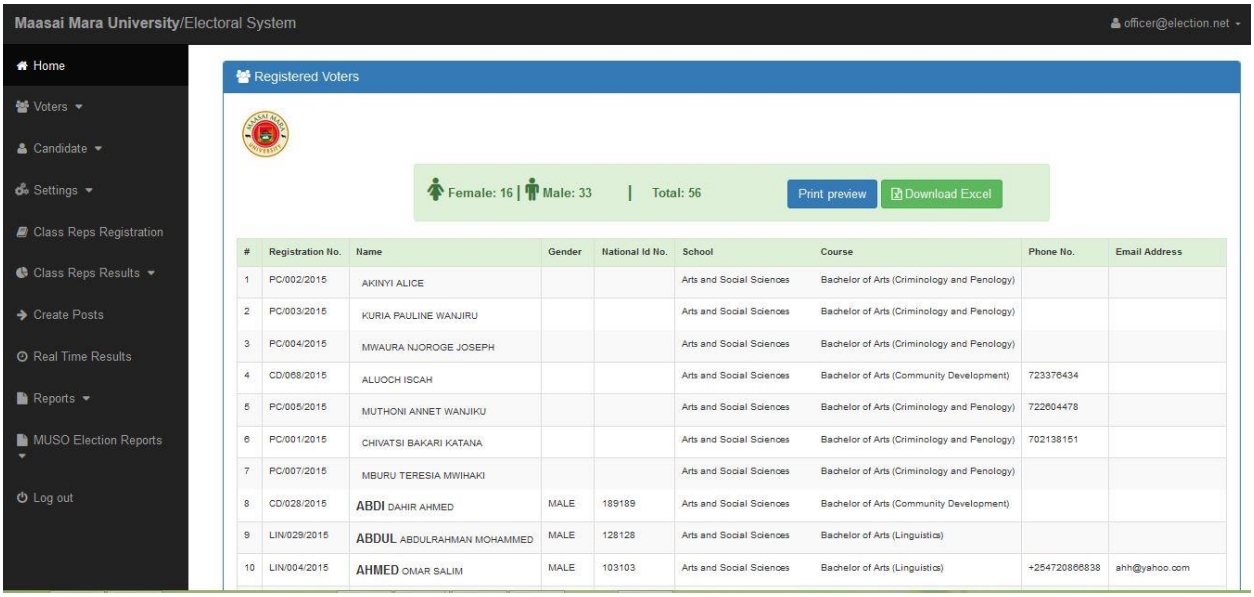
5.12 OUTPUT DESIGN

There are several objectives that the system analyst tries to attain when designing an output(kendall et al., 2007).These objectives are as follows:

i. Designing output to serve a specific purpose.
ii. Making output meaningful to the user.
iii. Producing the required output.
iv. Providing appropriate output distribution.
v. Delivering the outline before deadlines.
vi. Selecting the most effective way of delivering the ouput.

In designing the output interface I worked towards achieving the above objectives. The output is in form of reports. The system has the following reports:

Figure 41: Registered Voters Report



The report shows details of registered voters.It can be printed or downloadable.

Figure 42: Registered Candidates Report

It gives details of candidates.It can be printed and downloaded

Figure 43: Presidential Result Report

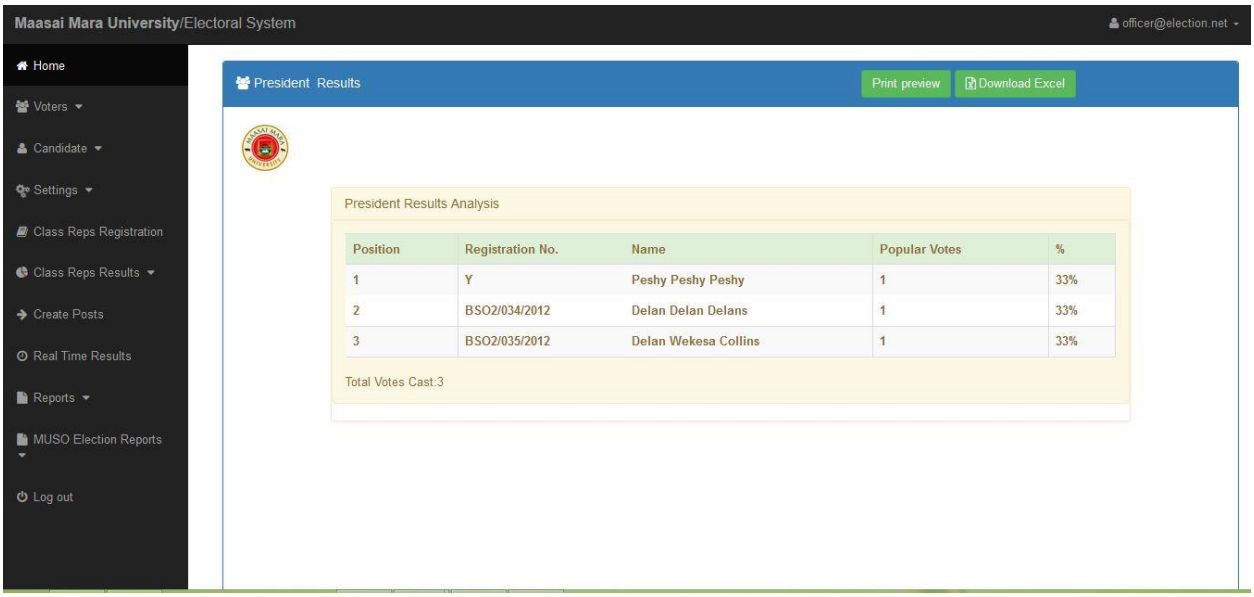


Figure 44: Real time Result Report

Figure 45: Mobile phone interface

5.13 MOBILE APPLICATION INTERFACE

Figure 46: The home interface of the app

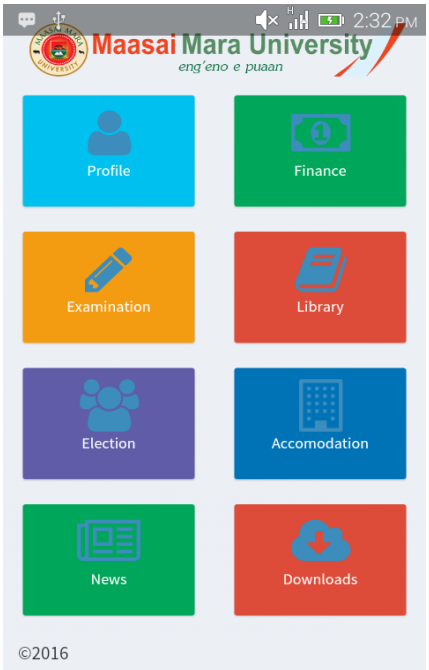
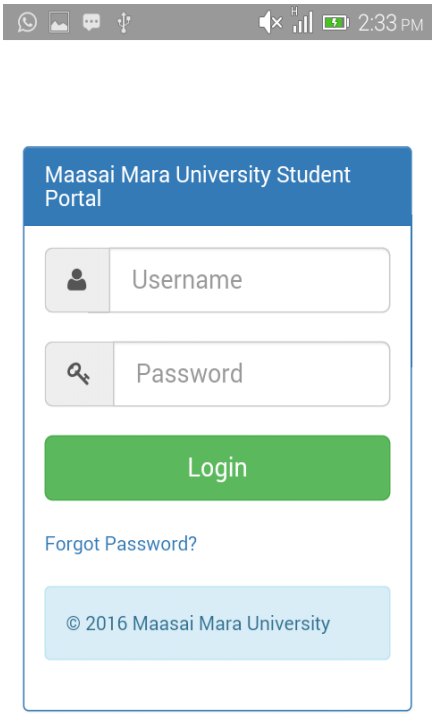


Figure 47: Login interface



CHAPTER SIX: IMPLEMENTATION OF THE SYSTEM

This is the stage where different modules of the software are coded and integrated together.In this chapter, testing of the system and the changeover are discussed. The different methods of testing that were carried are discussed in depth and how the system is expected to be implemented. Reasons are also given for the method of changeover adopted.

The chapter explains how users navigate through the system in order to use it easily and effectively.

6.1 FORM INPUT DESIGN

The users interact with this system through a web browser. Users accessing the system through a mobile phone interact with the system through a mobile application. The tools used to create the interface were HTML 5 and Twitter Bootstrap (CSS3) .PHP was used as a server side language. On the mobile phone C#(Xamarin) was used to built the application. The mobile application interacts with the database through web server. The user interacts with the system through a web browser to access the server. The system can be accessed using mozilla firefox, internet explorer, opera, google chrome, torch and other current browsers.

I will describe the voting system.After a voter has been registered,he/she undergoes through the following steps:

Step 1: The student login into his/her portal

Figure 48: Login interface

Figure 49: The student login into the electoral system

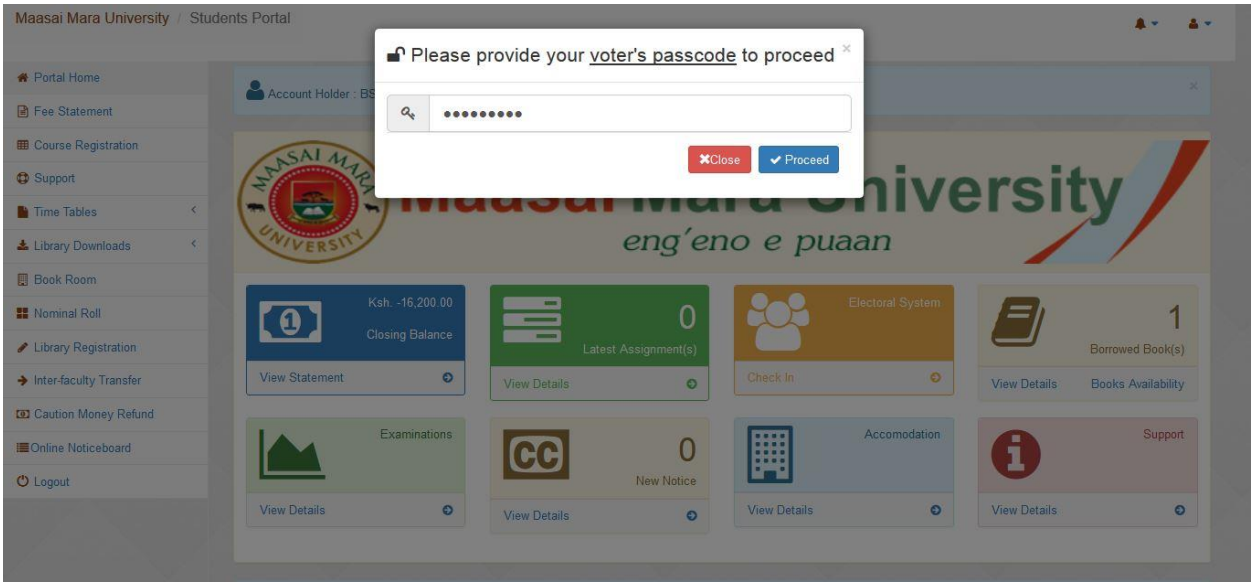


Figure 50: The student cast vote

6.2 TOOLS USED FOR CODING

The system has two parts: the main system running on the computer and the mobile phone application(student portal)

Main system

i. The interface was coded using HTML 5, Twitter Bootstrap (CSS3).
ii. Javascript including its libraries (JQuery and Ajax).
iii. Database: MYSQL.
iv. Apache Server.
v. PHP for server side coding.

Mobile phone application

Xamarin.

6.3 TESTING PLAN

Testing is done to evaluate the capability of software and to determine whether it produces the correct results. Software testing is done for the following purposes.

1. For reliability estimation
2. To improve quality
3. For verification and validation

A software is tested to check for correctness, reliability, usability, integrity, efficiency, flexibility, reusability, maintainability among others.

I used black box testing to test our system. The method was chosen because it focuses on all the system functionalities. In order to carry out this testing it is important to understand the relationships between different modules.

Under the black box testing I carried out the following :

1. **Function Testing**: In this I requested a Maasai Mara University lecturer to give me a view of the system to know what the user's view of the system was.

2. System Testing: Here I focused on the whole system and its environment. The main objective was to find any discrepancies the product has from the requirements and its documentation. I carried out the testing with students and it performed as it was expected.

3. **Performance Testing**: This is to check whether the system can perform its task within the required time.The observation was that the system performed its operation within the specified time.

4**. Stress Testing:** This is done to know whether the system can handle large amounts of data. I did this test by inputting large volumes of data of voters into the system and the system performed as expected.

5. **User Testing:** The user is given the system and documentation .The user is not a programmer and therefore he/she doesn't check for any programming errors. I found out what the user says about the system. This was done using fellow students and they really accepted the system.

6.3.1 TESTING STRATEGY ADOPTED

The testing strategy adopted in my system is the Top-Down strategy. This is because having the skeleton I can start testing the main functions in the early stages of the development process. This is an incremental approach where one module is tested after the other. This can be done either in breadth or depth. I used breadth approach where I tested the modules from top going to the next level. I also tested the interfaces for any errors. I used the breadth approach because our system

is huge and it would have taken longer time if I used the depth approach. The errors that were in the system were identified and removed.

6.3.2 TOOLS USED FOR TESTING

i. Astra Quickest for website testing
ii. Astra LoadTest for testing web-based system
iii. Aardvark for tracking web based bugs.
iv. Firebug.

6.4 TRAINING USERS

After building the system it is important to train the users of the system. The first step involves identifying whom to train. The training will be conducted to the university fraternity.I will train the entities intended to use the system.These include : students, lecturers,library attendants,finance officers,election officers,HR staff and employees.This is to make it smooth during the usage of the system.

6.5 PROPOSED CHANGEOVER

I intend to use parallel conversion for a changeover. In this strategy I will run the old system together with the new system at the same time. This is to make sure that the system is more reliable thereafter a permanent changeover will be implemented.

CHAPTER SEVEN: LIMITATIONS, CONCLUSIONS AND RECOMMENDATIONS

7.1 LIMITATIONS OF THE SYSTEM

The UNI-COL Web ERP has the following limitations:

i. It is dependent on network. When network is down, there will be difficulties in using the system.
ii. The system is run over a network. Networks are always prone to hackers.
iii. The mobile app requires a smartphone. Not all students have smartphones.

7.2 CONCLUSION AND FUTURE WORK

The aim of this research was to come up with a web ERP and mobile app student portal. This is supposed to eliminate use of paper, cutting the cost of running operations in a learning institution. Since the system is web based it can be accessed from anywhere provided network is available. To achieve, I built the system using the waterfall method because it was the most appropriate for my case.

Developing the web and mobile phone based system was a big task for me bearing in mind the short time I had and the fact that I had also lectures to attend, cats and also exam. I took the challenge positively and put my time into it. I have learned how to develop mobile applications and ERPs and how to do academic documents writing with citation and referencing.

7.3 RECOMMENDATIONS

i. Higher learning institutions should implement web ERPs.

ii. The university voting process should be carried out online and/or using mobile phones.

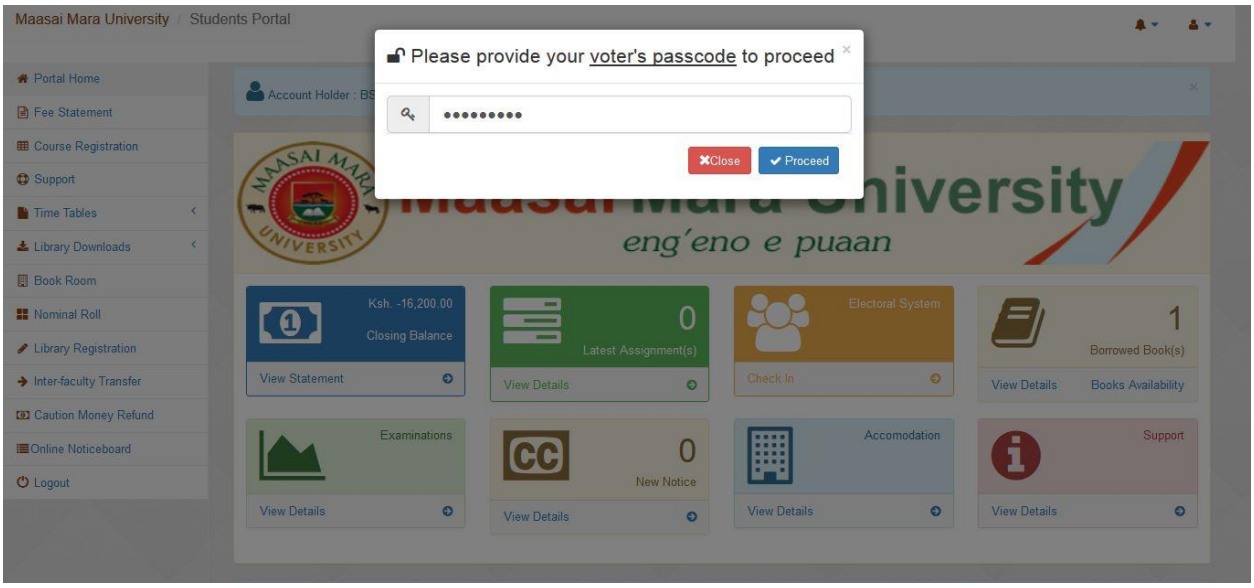
iii. Higher learning institutions should implement SMS systems that will be used to communicate with students and staff.This is because it is quick,efficiency and reliable.

iv. I also recommend the voting system to be advanced to e-electoral system so as to use gadgets e.g biometric electoral system.

APPENDIX 1: USER MANUAL

Electoral System

Voter Login



User Interface

This is the main page of the voter electoral system. It has the following components navigation:

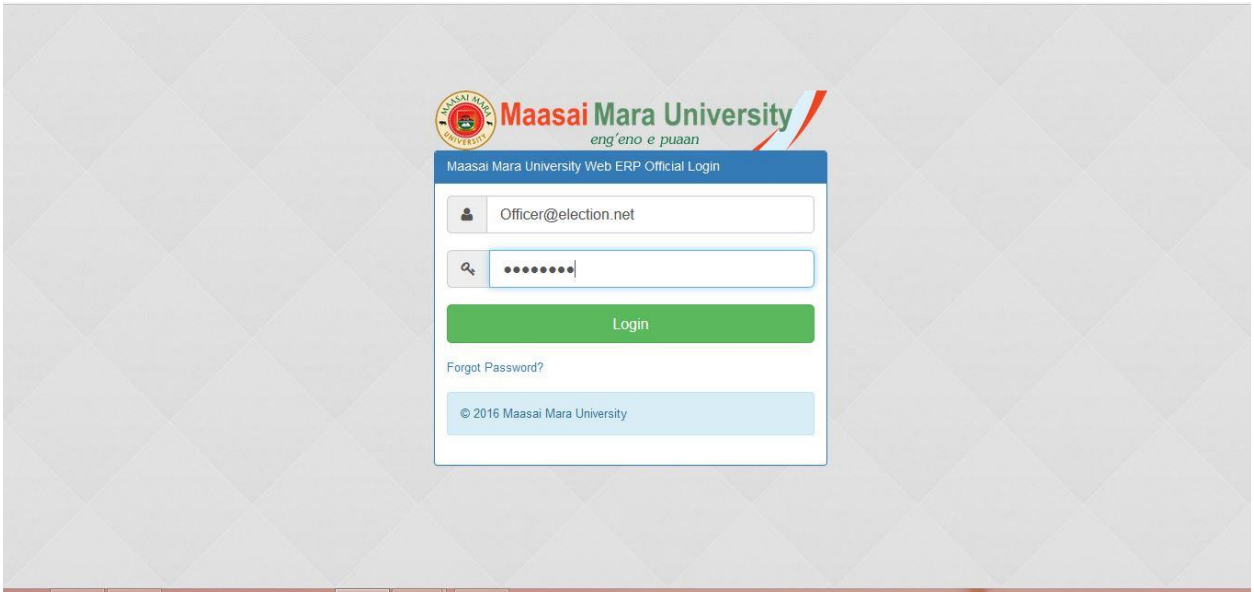
- **Home**-Is the above interface.
- **MUSO Candidates**-Displays contestants.
- **Class Reps Results**-Displays class reps contestants.
- **MUSO Real Time Results**- It displays the real time results.
- **MUSO Results Analysis**-It displays the analysis of results.
- **Help Desk**-Voter's help on how to use the electoral system.
- **Logout**-Where a voter logout of the system.

Voting Process

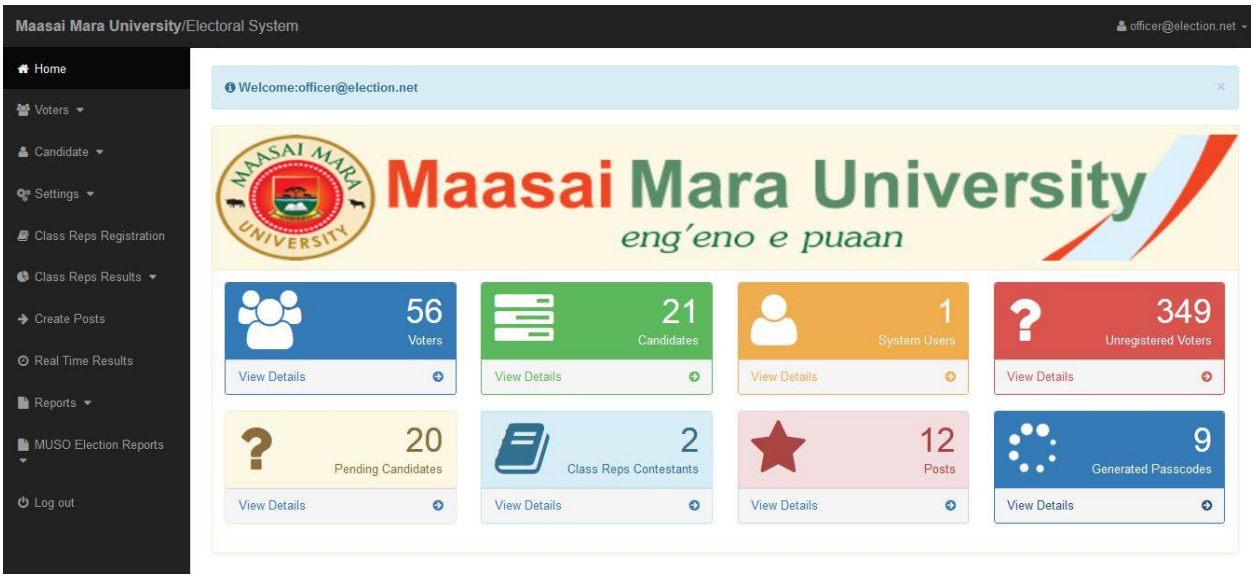
Here the voter selects a candidate of his/her choice.

The Voter View Real Time Results

Election Officer Login



The Home page for the election officer

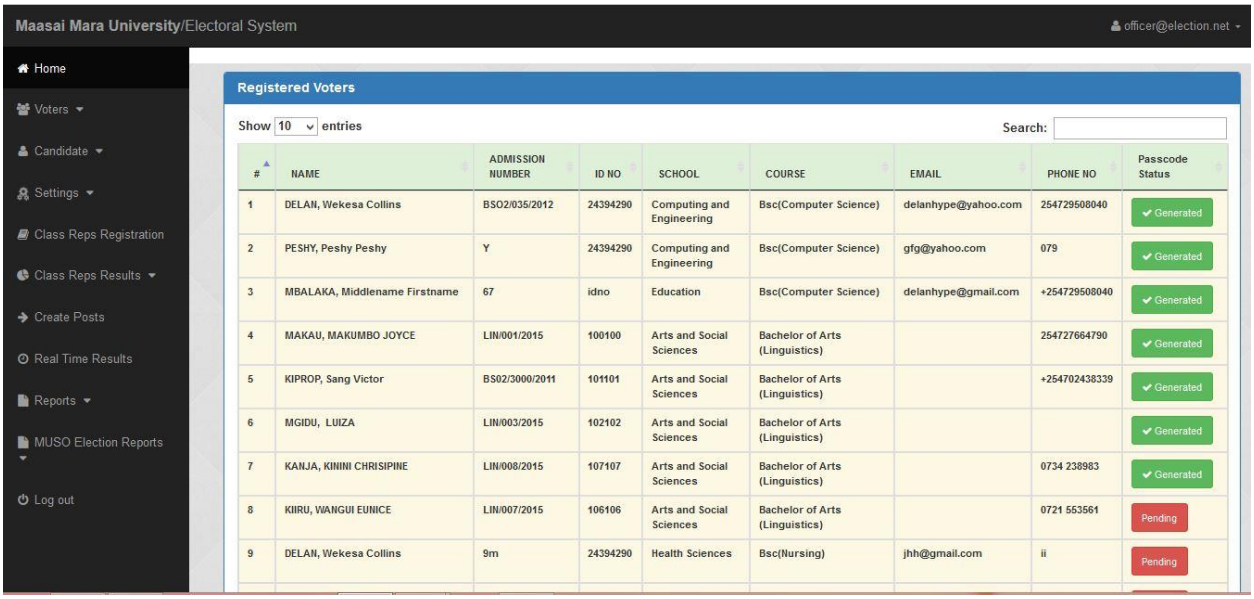


It has the following menus:

- **Home**-the homepage
- **Voters**-This is where voters are managed.
- **Candidates**-This is where candidates are managed
- **Settings**-here is where an election officer do other operations e.g passcode generation
- **Class Reps Registration**-This is where class reps are registered

- **Class Reps Results**-displays class reps results.
- **Create Posts**-here an election officer creates posts.
- **Real time results**-displays real time results.
- **MUSO Election Reports**-displays MUSO election results

Passcode Generation. This is where election officer generates passcode for voters.



APPENDIX 2: SAMPLE CODE

Sample Code for Index Page of voter page

Sample code for displaying results

```
    <script type="text/javascript" src="loader.js"></script>
  </head>

  <body style="font-family: Arial;border: 0 none;">
    <?php


    $query="SELECT DISTINCT `regNo`,name,photo,COUNT(*) as total FROM president GROUP BY `regNo` ORDER BY `total` DESC";
    $result = mysqli_query($conn,$query) or die(mysqli_error($conn));
    $num_results = mysqli_num_rows($result);

    if( $num_results > 0){

    ?>

      <script type="text/javascript">
        google.charts.load('current', {'packages':['corechart']});
        google.charts.setOnLoadCallback(drawChart);

        function drawChart() {
            var data = google.visualization.arrayToDataTable([
            ['Candidate', 'Votes'],
            <?php
            while( $row = $result->fetch_assoc() ){
              extract($row);
              echo "['{$regNo}', {$total}],";
            }
            ?>
          ]);

          var options = {
            title: 'Presidential Votes',
            curveType: 'function',
            legend: { position: 'bottom' }
          };

          var chart = new google.visualization.LineChart(document.getElementById('curve_chart'));

          chart.draw(data, options);
        }
      </script>

    <?php

    }else{
```

Javascript Sample Code for form controls

```
        },

        file: function( elem ) {
            return elem.nodeName.toLowerCase() === "input" && "file" === elem.type;
        },

        password: function( elem ) {
            return elem.nodeName.toLowerCase() === "input" && "password" === elem.type;
        },

        submit: function( elem ) {
            var name = elem.nodeName.toLowerCase();
            return (name === "input" || name === "button") && "submit" === elem.type;
        },

        image: function( elem ) {
            return elem.nodeName.toLowerCase() === "input" && "image" === elem.type;
        },

        reset: function( elem ) {
            var name = elem.nodeName.toLowerCase();
            return (name === "input" || name === "button") && "reset" === elem.type;
        },

        button: function( elem ) {
            var name = elem.nodeName.toLowerCase();
            return name === "input" && "button" === elem.type || name === "button";
        },

        input: function( elem ) {
            return (/input|select|textarea|button/i).test( elem.nodeName );
        },

        focus: function( elem ) {
            return elem === elem.ownerDocument.activeElement;
        }
    },
    setFilters: {
        first: function( elem, i ) {
            return i === 0;
        },

        last: function( elem, i, match, array ) {
            return i === array.length - 1;
```

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