

Wolkite University

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WOLKITE UNIVERSITY

COLLEGE OF COMPUTING AND INFORMATICS

DEPARTMENT OF COMPUTER SCIENCE

PROJECT TITLE:-WEB BASED VOTING SYSTEM FOR ETHIOPIA

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PROJECT ADVISOR: Mr. ERMIAS NIGATU

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SUBMITED TO DEPARTMENT OF COMPUTER SCIENCE

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR

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DECLARATION

This is to declare that this project work which is done under the supervision of instructor Ermias Nigatu and having the title Web Based Voting System for Ethiopia is the sole contribution of: Shiferaw Amsalu, Digafeneh Mathewos, and Grumnesh Gulilat.

No part of the project work has been reproduced illegally (copy and paste) which can be Considered as Plagiarism. All referenced parts have been used to argue the idea and have been cited properly. We will be responsible and liable for any consequence if violation of this declaration is proven.

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APPROVAL FORM

This is to confirm that the project report entitled Ethiopia online voting system submitted to Wolkite University, College of Computing and Informatics, Department of Computer science by: Shiferaw Amsalu, Digafeneh Mathewos, Grumnesh Gulilat is approved for submission.

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Finally, we would like to express love, thanks, appreciation, and respect to our families and friends. Also we would like to thank the teaching staffs of Computer Science who have contributed wholly to the success of this project. We would like to say once again Thank You to you all!

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LIST OF ABBREVIATIONS

Administrator
Admin 13
Business Rule
BR 15
Use Case Identification
UI 4
House of Representatives
HOR 2
Hypertext Markup Language
HTML 8
Hypertext Preprocessor
PHP 8
Identification Number
IDN 19
Internally Displaced Persons
IDPs 13
National Electoral Board of Ethiopia
NEBE 2
Object Oriented Structured Analysis
OOSA 1
Secure Socket Layer
SSL 20
Structural Query Language
SQL 4
System Development Life Cycle
SDLC 7
Unified Modeling Language
UML 7

ABSTRACT

Electronic voting is the most known technology for voting from the existed alternatives.

The intension of this project is developing automated voting system for Ethiopia. The current mechanism for handling the vote management system of the country is limited on manual work. This has limitation on controlling the work securely, for declaring the result on time, and has high consumption on resources. Long voting process the manual voting exercise involves a number of steps that result in long queues. This is because each voter takes a considerable amount of time to vote. Many countries have used different technologies to support their voting activity and have got successful results.

The main objective of the project is developing an online voting system for Ethiopia.

This project proposes a web based electronic voting. The experience of other countries is used as an input for the system .we used questioners, interview and documentary as fact finding techniques. And also we used unit test, system test as system test methodology. We used object oriented analysis as system analysis methodology. The requirements for the system are collected from historical records and policies of the Ethiopian election. The system architecture, the security risks, and the implementation details of the system are also included in the document.

CHAPTER ONE

1. Introduction

1.1 Background

Voting is a formal process by which Voters make their political choice on public office or candidates for public office. It makes a fundamental contribution to democratic governance. The Constitution of the Federal Democratic Republic of Ethiopia, in its article 56, declares a Political Party or a Coalition of Political Parties that has the greatest number of seats in the House of People's Representatives shall form the executive and lead it. Also in the Amended Electoral Law of Ethiopia (DDD, 2014), Proclamation clearly puts that a Candidate who received more votes than other Candidates within a Constituency shall be declared the winner. And The Ethiopian electoral, political parties registration, and election's code of conduct proclamation declares:- For the House of Peoples' Representatives' election, a candidate who gets the highest number of votes among the contestants shall be declared the winner in accordance with the FDRE Constitution (Ethiopia, 2021), Where, in accordance with regional constitutions, more than one candidate is elected to regional councils, the candidates who get the highest number of votes shall, in the order of their votes, shall be declared winners. Therefore the Constitution and the amended Electoral law emphasize that the country follows the majority system, under which the candidate who receives more votes than any competitors within a constituency is declared the winner.

Elections allow the populace to choose their representatives and express their preferences for how they will be governed. Naturally, the integrity of the election process is fundamental to the integrity of democracy itself. The election system must be sufficiently robust to withstand a variety of fraudulent behaviors and must be sufficiently transparent and comprehensible that voters and candidates can accept the results of an election.

In the present the election system in Ethiopia is using paper ballot and there are 45 000 polling stations in the country which makes the voting process more time consuming and needs man power to execute the voting process. This existing election system in Ethiopia has many problems during the election process and the outcome of actual results and it is not a kind of election system they can trust. Whereas the government officials claimed it was fair and free election system. The integrity of the election process is fundamental to the integrity of democracy itself.

Therefore, the purpose of this study is to develop a web-based voting system in which is which votes can be casted electronically and also used for counting results instead of traditional manual schemes.

1.2. Statement of the Problem

In Ethiopia, elections take place every five years to elect members of HOR. The electoral procedure involves many processes. The processes are voter Registration, Voter Register Exhibition, Voting, Vote Counting, Collation and Publication of Results.

A number of problems associated with each phase of the electoral process are discussed below:-

Invalid votes: A vote shall be deemed invalid for one of the following reasons:

- If it contains marking for more candidates to the council than the voter is allowed to make.
- If it identifies the voter by name.
- If it is blank.
- It does not clearly indicate the voter's intent.
- Where, the ballot paper is not legal or issued by the polling station.
- A vote is considered to be invalid if the thumbprint or the mark has not been placed at the right spot.

Long voting process: The manual voting exercise involves a number of steps that result in long queues. This is because each voter takes a considerable amount of time to vote. By using such manual election system time are wasted. For example to record voters information and to give candidate cards the election board need to organize the committee that implement these mission, the committees who give these service until the elections are completed they loss their time.

Resource Consumption: the Election board pays out money to these committees in order to succeed the election successfully.

Delays in result publication: It has been gathered that it takes the NEBE about more than one month to eventually publish election result.

High cost of election organizing: The procurement of materials that ensure the validity of the voters' registration, as well as the complete success of the electoral process makes election costs very high. Indelible ink, ballot boxes and papers as well as other logistics, despite being expensive, are indispensable in a manual voting system.

Therefore, this project is an effort in solving the problems associated with each phase of the electoral process. The Efforts may be geared towards the minimization, if possible the total elimination of the problems associated with the manual election system.

1.3. Objective of the Project

1.3.1 General Objective

The main objective of the project is developing an online voting system for Ethiopia.

1.3.2 Specific Objective

- Identifying the problem
- Selecting the appropriate development tools for the system
- Designing friendly user interface
- Designing database to the system that can hold all the information
- Testing the system
- Integrating the whole system

1.4. Scope and Limitation of the Project

1.4.1 Scope of the Project

We use local language for our project. Such as Amharic.

The scope of this project is developing web based voting system for Ethiopia. There are different kinds of electronic voting system in the world, but this project targets to do web based voting system. The system contains modules that can handle voters' and candidates' registration system, including vote counting module.

It perform the following tasks:-

- Create account to the system users.
- Registering candidate.
- Registering voter.
- We use local language Amharic,Oromic
- Limit access level of the voter.
- View profile from the database.
- Manipulate (or edit) profile and change password.
- Cast vote online.
- Show vote result online.

- Generate report for
    - Total number of registered voters.
    - Total number of registered parties.
    - Percent of casted voter.
    - Winner party.

1.4.2 Limitation of the Project

Limitation of the project defines what the newly proposed system is not going to perform and not cover.

- Our system cannot help any **blind** voters and any **illiterate** voters who wants to vote their representatives.
- The polling station assign special polling station for blind voters and illiterate voters to vote their representatives.

1.5. Feasibility Study of the New System

Feasibility study is essential to evaluate the cost and benefits of the new system. On the basis of the feasibility study decision is taken on whether to proceed or to cancel the project.

Need of the feasibility study:

- It determines the potential of the existing system.
- It used to determine/finds out the problem of the existing system.
- To determine all goals of the new system.
- It finds all possible solutions of the problems of the existing system.

1.5.1 Operational Feasibility

The system to be developed will provide accurate, active, secured service and decreases labor of workers and also it is not limited to particular groups or body.

1.5.2 Technical Feasibility

The system to be developed by using technologically system development techniques such as: - Java script, css and MYSQL database server without any problems and the group members have enough capability to develop the project. So the system will be technically feasible.

1.5.3 Economic Feasibility

The system to be developed is economically feasible and the benefit is outweighing the cost. Since this project already computerizes the existing system, by now the reduction of cost for materials used in manual operation becomes beneficiary to the organization.
Generally the system that we developed, online voting system brought a number of tangible and intangible benefits.

1.5.3.1 Tangible Benefits

- Tangible benefits are those that are quantifiable and measurable.
- They are improvement project benefits that have some specific dollar value, number of labor hours, or other specific metric that can be determined to have been achieved through the project.
- Cost Reduction.
- Error Reduction.
- Increase Speed of activity.

1.5.3.2 Intangible Benefits

- **Intangible benefits:** - are benefits from your Lean Sigma program that are not explicitly measurable.
- **Intangible benefits:** - are benefits that cannot be directly or solely attributed to the results of the project or process improvement.
    1. Reduce Resource Consumption.
    2. Increase security.

1.5.4. Political Feasibility

The system to be developed is not conflict with any government directives, because it gives services for the people effectively and efficiently, all the stakeholders also agreed before the system developed. So the citizen is profitable and the system will be politically feasible.

1.6. Significance of the Project

The main purpose of online voting system includes:

- Improve voting service to the voters through fast, timely and convenient voting.

- Reduction of the cost incurred by the election board during voting process in paying the very many clerks employed for the sake of the success of the manual system.
- This system require less number of staff during the election
- The system is a lot easier to independently moderate the elections and subsequently reinforce its transparency and fairness.
- Online voting systems require being very precise or cost cutting to produce an effective election management system

1.7. Beneficiary of Project

For voter

- Improve voting service to the voters through fast, timely and convenient voting.
- Increase Speed of activity.
- The voter who can elect the candidate online
- **For candidate**
- He/she can see the result of vote online.

For NEBE (National Electoral Board of Ethiopia)

- This system require less number of staff during the election
- Reduction of the cost is incurred by the election board during voting process in paying
- Error Reduction
- Increase Speed of activity.

1.8. Methodology and Software Used

1.8.1. Fact Finding Techniques

The method used to achieve the development of the project based on the fact that must be applied to overcome the manual voting System.

Observation:-

We used observation to know how the existing system work, to know how different sub offices and how polling station member are handling the work in the polling station during 2013 general election.

Interview

The additional data would be gathered through the technique of interview, through this technique we get different information's from the current workers of the organization and from peoples who have been participating on voting before.

Document (literature review)

We will collect information from different references, projects and web sites.

Mainly we get more information from the Ethiopian Electoral, Political Parties Registration and Election's Code of Conduct Proclamation book.

By **discussing** and **analyzing** the problems with project team and some person.

1.8.2. System Analysis Techniques

In the project analysis and design phase we will use unified modeling language (UML).The data analysis model applied in this project will be an **object-oriented approach.** Because it is based upon the concept of objects.

Objects contain data in the form of attributes and code in the form of methods Object oriented programming languages are various but the most popular ones are class-based, meaning that objects are instances of classes, which also determine their types.

So, for designing purposes an object-oriented designing will be applied in this project. Since it is easy to maintain if any error is occurred.

1.8.3. System Development Model

Iterative: The **iterative model** is a particular implementation of a software development life cycle (SDLC) that focuses on an initial, simplified implementation, which then progressively gains more complexity and a broader feature set until the final system is complete.

- The progress is easy measurable.
- Generates working software quickly and early during the software life cycle.
- More flexible – less costly to change scope and requirements.
- Easier to test and debug during a smaller iteration.
- Easier to manage risk because risky pieces are identified and handled during its iteration

1.8.4. System Testing Methodology

Unit testing: first we will test each unit at each system, so if a problem is encountered it will immediately maintain at which the problem is occurred.

Unit test is a way of testing a unit - the smallest piece of code that can be logically isolated in a system. In most programming languages, that is a function, a subroutine, a method or property.
Modern versions of unit testing can be found in frameworks like JUnit, or testing tools like Test Complete.

System testing: system test is a level of software testing where a complete and integrated software is tested. The purpose of this test is to evaluate the system's compliance with the specified requirements. System testing: The process of testing an integrated system to verify that it meets specified requirements.

1.9. Tools to Be Used In This Project

1.9.1. Software Requirement

This project team will use the PHP and database tool to develop the new computer based system. In addition to these programming and database tools we will use additional software to different tasks. These are:

- Microsoft word 2013
- Sublime
- Edraw max
- Microsoft PowerPoint 2013
- Xampp Server
- mySql database server
- Notepad++

1.9.2. Deployment Environment

NEBE (National Electoral Board of Ethiopia)

1.9.3. Hardware Requirement

- Any Desktop Computer
- Flash disk 2GB - 8GB
- Compactable CD-ROM 700MB
- Laptop

1.9.4. Fronted Technologies

- HTML
- CSS
- JavaScript

1.9.5. Backend Technologies

- SQL Server
- Database to

CHAPTER TWO

2. DESCRIPTION OF THE EXISTING SYSTEM

2.1. Introduction of Existing System

The Current system is a manual system that needs intensive human labor, resource, consumes time, less security. First of all in these manual systems voters have requested to register. Voters Need to Know during Registration:-

1. An elector shall be registered in person.
2. Any person shall be registered once and at one polling station only.
3. Registration shall be held only at the polling station, registration out of polling station is forbidden.

Voters vote the candidates by going to voting station that is centralized. To vote, each voter gets the candidates' symbol and name that present on the vote paper and makes"X"marks on only one candidate. On the other hand illiterate electors shall vote by pressing one of their fingerprints in the square corresponding to the candidate for whom they want to vote. Counting the voice of each voter and reporting the winner also need much time, perhaps if the counting error is occurs that manual system cannot report. Resources are extravagances when papers are duplicated for the candidates to introduce themselves. Fraud (fake) occurring during election time was protected by law.

2.2. Users of Existing System

There are different users with their responsibility in the existing system:-

1. **Constituency:-**
   - Distribute election materials to polling stations.
   - Register candidates and issue identity card to candidates to those who fulfill the criteria.

1. **NEBE:-**
   - Registers National and Regional parties.
   - Announce winner party.

1. **Polling station:-**

- Register voters;
- Keep election materials dispatched from the constituency;
- Conduct elections that protects the secrecy of the ballot in accordance with this Proclamation;
- Entertain complaints submitted in accordance with the law;
- Count votes and announce provisional results to the public by posting on a notice board;

1. **Voters: -**

- They should vote their candidates.
- views candidate profile
- View the result.

4 .**Candidates:**- Candidates registered by **Constituency**.

5. **Spectators:** - They should see what is going on in the election.

2.3. Major Functions of the Existing System

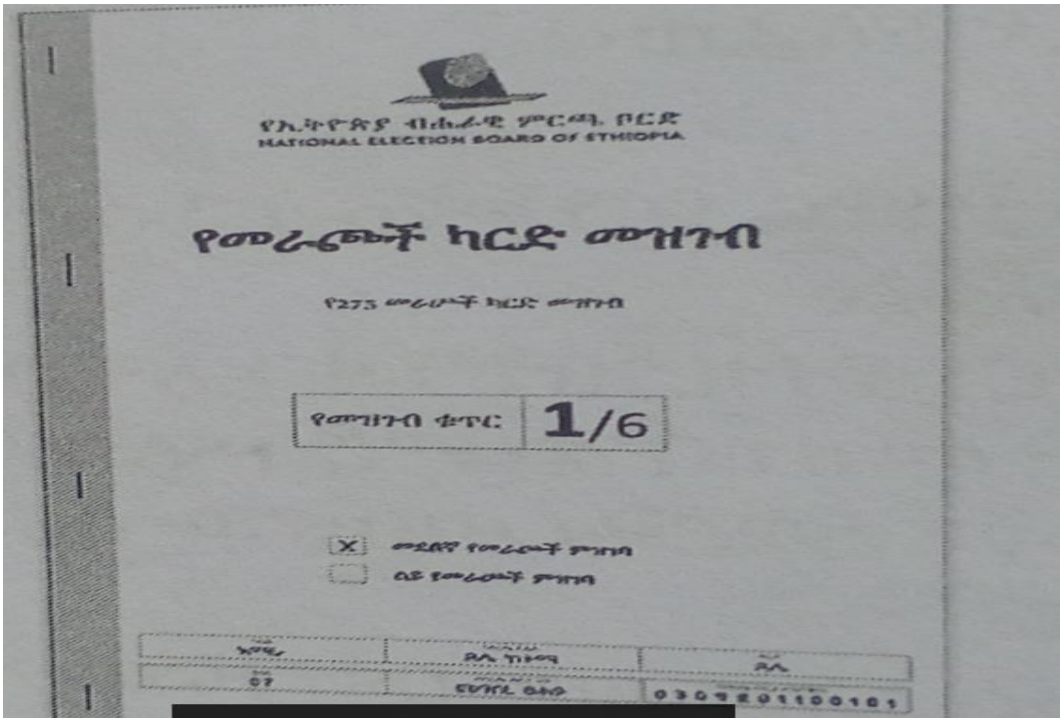
The major function of existing or manual system are:

- Voter Registration.
- Candidate Registration.
- Voter Register Exhibition.
- Voting,
- Vote Counting.
- Collation and Publication of Result.

2.4. Forms and Other Documents of the Existing Systems (If Any)

Voter card record

- Each polling station will receive 6 voter card records.
- Voters' ID cards are being deducted from this voter card record.
- Each voter card record contains 275 voter cards.

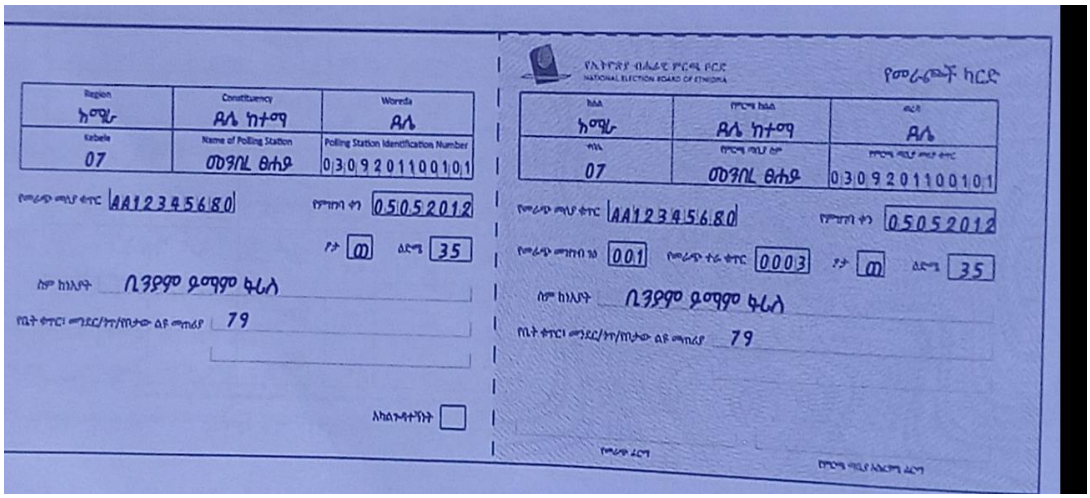


Voter Record

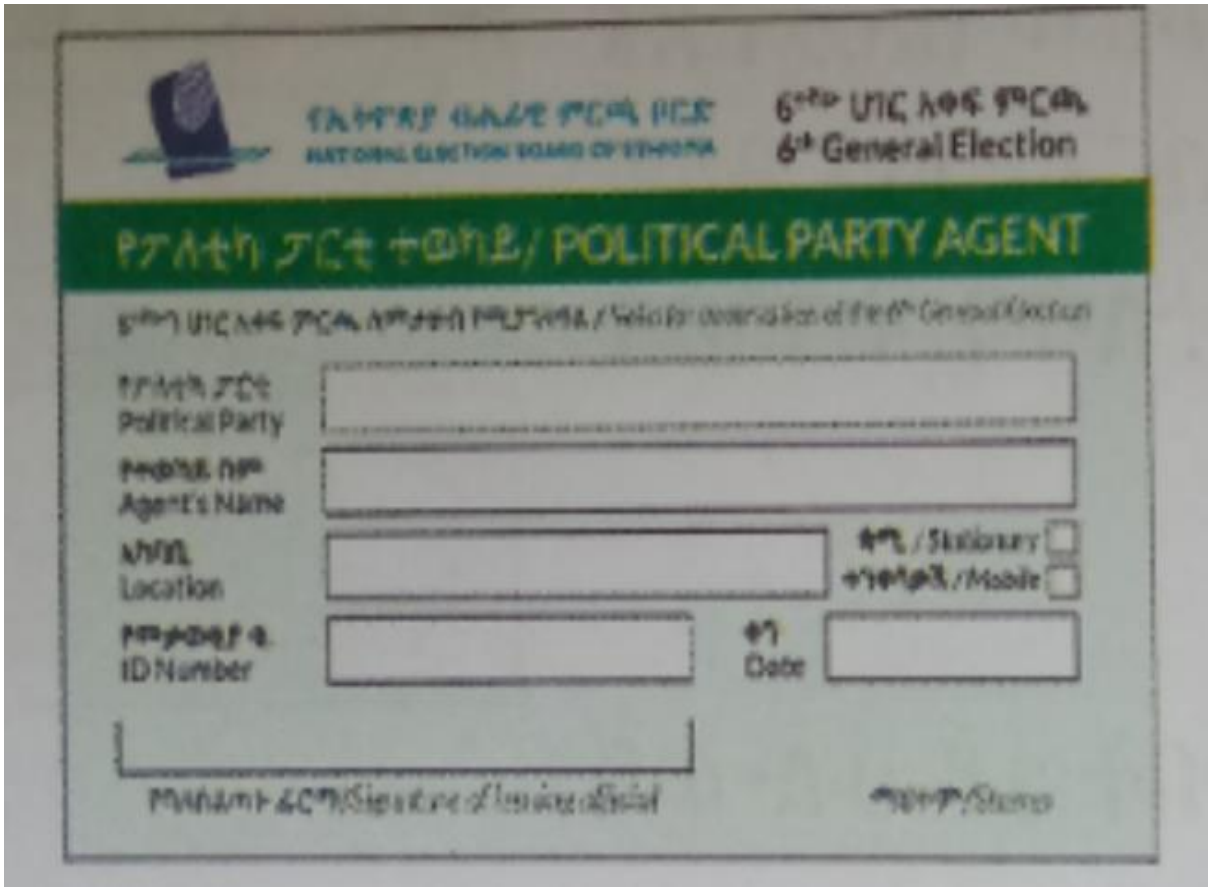
- Each polling station has one voter record.
- Each voter record has 1650 rows, which are used to record voter data.
- Each row has a pre-printed identification number:
- This number will serve as the voter identification number.

Voter card form

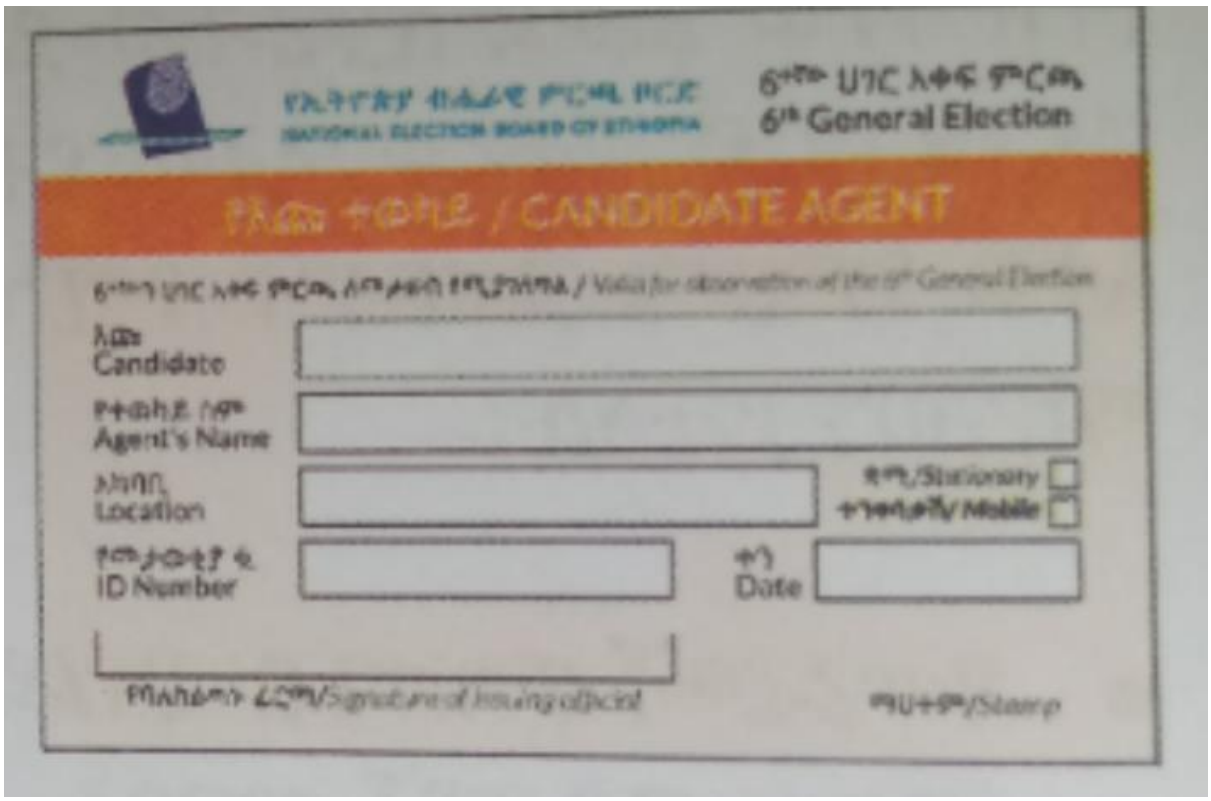
Used to record voter's information on voter card.



Political party Agent Form



Candidate Agent Form



Ethiopian_Electoral_Administration_body NEBE

It is administered by 5 full-time board members nominated by the House of Peoples' Representatives for a six-year.

It is an independent institution that coordinates national, regional and local elections.

Regional branch office

- They are permanent offices in the capital city of the nine regions and two city administrations.
- Lead, coordinate and oversee regional elections.
- They report regional election results to NEBE.
- Perform tasks provided by NEBE.

Zonal Coordination Offices

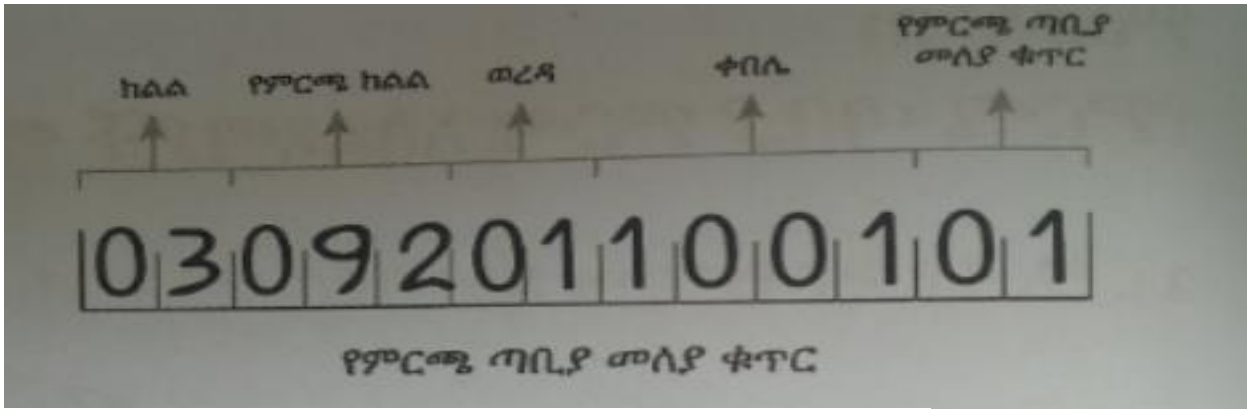
- They are established to create relations between the regional branches and the bodies below.

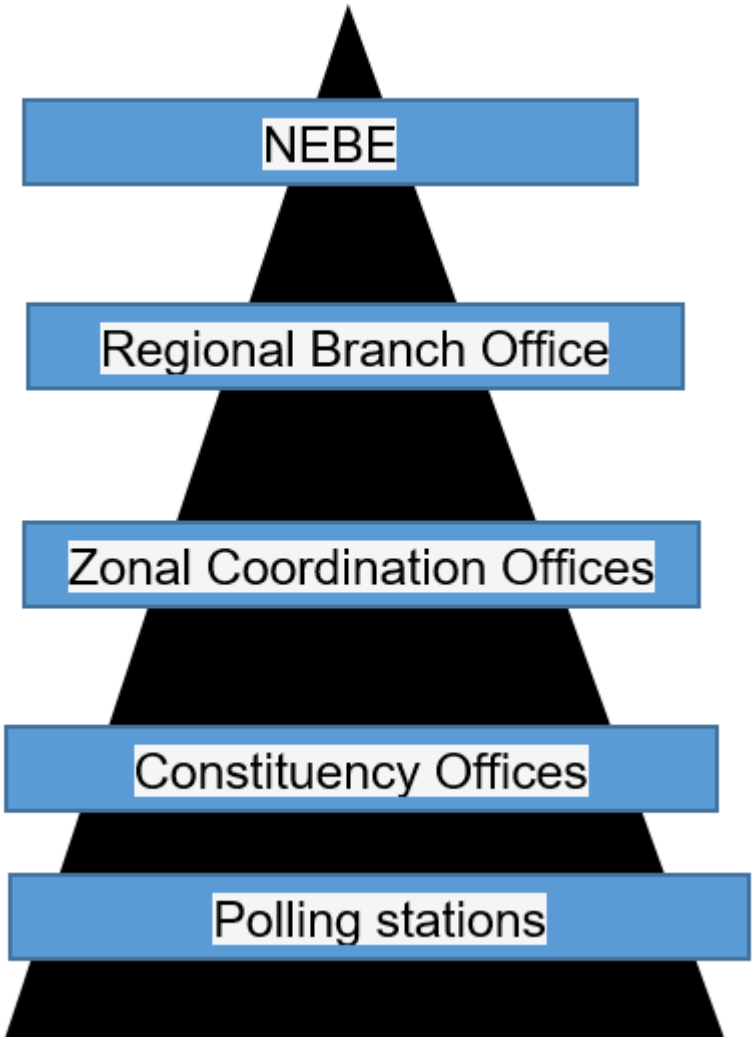
Constituency Offices

- They ensures that all polling stations have a voter record and voter card record.

Polling stations

- They are set up to serve all the people in the constituency.
- Voting registration and counting is done in these areas.
- A special and mobile polling station is set up for voters such as soldiers, students, IDPs (Internally displaced persons) and pastoralists.
- Each polling station has identification number





- The National Electoral Board of Ethiopia (NEBE) shall establish a time table for the transfer of completed voter registration cards from the polling station to the Constituency Office.

2.4.1. Practices to Be Preserved From the Existing System

Even if the existing system has a lot of problems, there are a number of activities that need to be preserved. Those are:

- Existing **data storage** system is partially automated for use, Since the NEBE used manually and partially automated data storage system. This stored data has a vital role in the case power lose and when the automated system got the affected by the virus.
- **Registration: -** shall be made up on presentation of an identity card or passport.
- **Distribution of tasks**:-Here everyone has its duty to do and come over the problem of overloading the work to some part of the workgroup.

2.5. Drawbacks of the Existing System

In the present the election system in Ethiopia is using paper ballot and there are 45 000 polling stations in the country for this reason.

There is some drawbacks in existing system:

- The voting process is consuming more time and needs man power to execute the voting process.
- This existing election system in Ethiopia has many problems during the election process.
- It is not a kind of election system they can trust.
- High cost of election organizing.

2.6. Business Rules of the Existing System

BR1: To vote at Federal level:-

- You must be above 18 years old.
- You must be an Ethiopian.
- Has not served a term of imprisonment is eligible to vote.
- You must reside within the constituencies for at least 6 months.

BR2: The voter must be come to the office on the registration day.

BR3: The Constituency can register the candidates and tell when the Election date is begin.

BR4: The Constituency can register the voters and tell, when the Election date is begin.

BR5: The voter must came in the given schedule.

BR6: The voter can select one candidates and putting an "X" mark across the symbol of the candidate on a voting paper box.

BR7: The Election Officer can coordinate the workers and the co-workers in the time of Election.

BR8: The NEBE can announce the result in mass media such as: - TV, Radio, Magazines, Internet.

CHAPTER THREE

3. PROPOSED SYSTEM

The main aim of this project is to automate the current manual system and it will solve the problems that are in the manual system. This system saves resources by doing all things used in election system; and counts the result for each candidate correctly and report with exact value electronically. The new system does not pass over without reporting the occurred errors during the counting result. Also in security side our system is secured because, it needs User name and Password. Before the Election Day the system will be used for viewing candidates' profiles. Our system will be in election mode, for the purpose of vote casting only on the Election Day. When aiming this system we consider the following significance aspects:

- Reduce the time and task required to perform the operation within the election area.
- It will change the manual processing to computerize system.
- It will provide speed, efficient, Flexibility, reliability, and security for the system users.
- For voters, better satisfaction of the speed provided by the system casting their vote.
- And it improved the moral (motivation) of the users to use the new technology.

3.1. Functional Requirements

Functional requirements describe the interactions between the system and its environment independent of its implementation. The environment includes the user and any other external system with which the system interacts.

The following points list down the functional requirements of our system:-

Login:

- The system should allow all users to login to perform their task.
- Used to authenticate the user.

Register Parties:

- All National and regional parties should be registered first.

Register Election Officer (Regional branch office):

- The System Admin needs to register Election Officer for 11 regions and 2 city administrations.

- Election Officer means a person assigned by the Board to administer elections at each regions and city administrations.

Register Constituency

- The Election Officer needs to register Constituency for all Worde's in his region.

Register Candidates:

- Before the vote casting process begins, the Constituency needs to register the candidates.

Register voter:

- Before the vote casting process begins, the Constituency needs to register the voter.

Cast Vote:

- When the voter keys the correct Username and Password to the system, the system will extract the eligible candidates on that polling station, then, the voters casts the vote by keeping the rules.

View result

- After caste vote all actors see the result online using password and username.

Manage profile

- We can update, delete the user profile.

Manage constituency

- Election officer can maintain all operation of constituency.

Change password

- All actors can be change their password.

Manage candidate

- Constituency can maintain all operation of candidate.

Register party

- System admin can register the party.

User validation and authentication

- Before login all actors can be insert valid password and username.

Assign privilege

- When the system admin assign the privilege to election office.

Block account

- Election officer and system admin block account for constituency, election officer respectively.
- Constituency block account for polling station.
- System admin block account for candidate.

Manage registration

- It perform Update registration day, Update Election Day, Set Election Day and Set registration day.

Block voter

- Polling station can be block voter if any problem is occur.

Manage election officer

- System admin can be manage the election officer.

Update registration day

- System admin can be update the registration day.

Update Election Day

- System admin can be update the Election day.

Set Election Day

- System admin can be Set Election Day.

Set registration day

- System admin can be Set registration day.

Manage polling station

- Constituency can be block polling station if any problem is occur.

Give comment

Voters and candidates can be give comments.

View comment

System admin, election officer, constituency, polling station can be view comments.

Generate report for

- Total number of registered voters.
- Total number of registered parties.
- Percent of casted voter.
- Winner party.

Logout:

- All user logout from the system after accomplish their task.

3.2. Non-functional Requirements

Non-functional requirements (also known as **quality requirements**), which impose constraints on the design or implementation (such as performance requirements, security, or reliability).

3.2.1. User Interface and Human Factors

The system can easily be accessed by an authorized person. This accessibility can be achieved through using user name and password. The dialogue with the system will be easy to follow due to user friendly button which is very easy to communicate and users can to navigate their way through various screens. The system will have graphical user interface which suitable for any kind of user by using easily used buttons and safe web colors with more attractive to stay on the website. Generally it will include the necessary features for each user with a user friendly and attractive interface. The system should have to provide interactive and easily manageable user interface for the users.

- **The user interface of online voting system is:**
    - Simple to use or interact with system.
    - No need the expertise level of the users but give training at once to users.

3.2.2. Hardware Consideration

- The hardware that is consumed by the new system is basically a computer machine that is used for all the operation of the system. The Software product to be developed should run on existing standard computers. The system is portable that can run on any type of computer and it supports any type of browsers.
- This Website opens in any personal computer supporting windows 7, Windows8, Windows 10 and other smart phone.

3.2.3. Security Issues

When a voter wants to register, kebele ID required, username and password is given to the voter for authentication.

The registered voter can login to the system with the help of the IDN code. Then, the system shows the check box, names and party symbol of the candidates. The voter checked the check box corresponding to each candidate and submits his/her vote to the system. And we use encryption method in order to secure the user data when registering and accessing the data from the database. The suspected problem is man-in-the-middle attack. Before the data reaching at the destination, it can be trapped and modified. For the

case of the channel between the web browser and the web server, SSL technology is viable solution. So we will try to use SSL technology to secure the data.

3.2.4. Performance Consideration

- There might be many users accessing to the web server simultaneously. As an online voting tool performance shouldn't be affected much and response time for submitted page should be less than a minute.

- **Response Time**

Upon request for user inquiry the system under normal condition should display results as quickly as possible.

- **Processing Time**

Since the system is developing with efficient programming language and database upon request for user's activities the system under normal condition should process the request as quickly as possible.

- **Workability**

The system should be suitable for all users. It should be accurate in performing its functions and secured enough from attacks by external users.

- **Correctness:** The system provides correct response to the correct request.
- **Concurrent Processing:** Because the proposed system is web based can execute multiple users.
- **Concurrency:** The system should support multiple accesses of users. It should give service to multiple users concurrently.

3.2.5. Error Handling and Validation

- Errors could rise from users and from the system. Errors that occurred from the wrong doing of users will be handled by appropriate exception handling mechanisms. Generally, if an error occurs, the system will identify the error and notify the user so that he/she can take the appropriate corrections rather than terminating the system and the system must handle the error and should display an error message if the user inputted the characters that are mismatched to corresponding data types.
    - **Incorrect input**: the system handles many exceptions like inserting empty string to the database and inserting a duplicated customer id, inserting incorrect customer name and display an appropriate message for each error.

- **Login error**: the system shall handle an attempt to login with incorrect username and password and display error message or block for 3 minutes if attempt limit is reached.

3.2.6. Quality Issues

- **Availability:** The system should have to be functional at any given time. There is no delay in the availability of any information, whatever needed, can be captured very quickly and easily by using more than one server. The server should be always on to be available. The system shall support the use of multiple users at a time and understandable by all users.
- **Maintainability**: The System should be easily maintainable in case of problems and gives consistent service at all times without fluctuation until there is internet connection and should be testable.
- **Reliability**: The proposed system will minimize crash during its runtime, since more than one user could use the system simultaneously. The system should be reliable and matured enough in giving its service. It should have a fault tolerance mechanism in which it can recover fast from problems that may occur.

3.2.7. Backup and Recovery

- In order to prevent data loss in case of system failure, the result of votes that were polled till then have to be saved in the database, for the system to resume the counting process on reboot.
- The System admin should set up his system time appropriately for the election process to start at the correct time.
- The system should be capable of gracefully recovering from earlier crashes and continuing the voting process.

3.2.8. Physical Environment

- Our system to be deployed in NEBE and the weather conditions are not affect our system.
- The proposed system we are going to develop can be affected by the physical environment when a natural disaster occurs. On the other hand external conditions such as weather condition will not have any effect on the performance of the system. The new system will be affected by internal physical environment like attack by

viruses, worms and the like. To overcome this problems the team member develop the backup (recovery) system to protect the data when the system damage.

3.2.9. Documentation

- This online voting systems will provide two types of system documentation. These are internal and external documentation. System documentation addresses programmers, system developers, owners, and users. Programmers include those who are currently working on the project as well as those who give support and maintain the system including the system administrator.
    - Internal Documentation: This contains program source code.
    - External Documentation: This also contains, use case models, the class and interaction diagrams (activity, sequence, and state diagrams)

CHAPTER FOUR

4. SYSTEM ANALYSIS

4.1. System Model

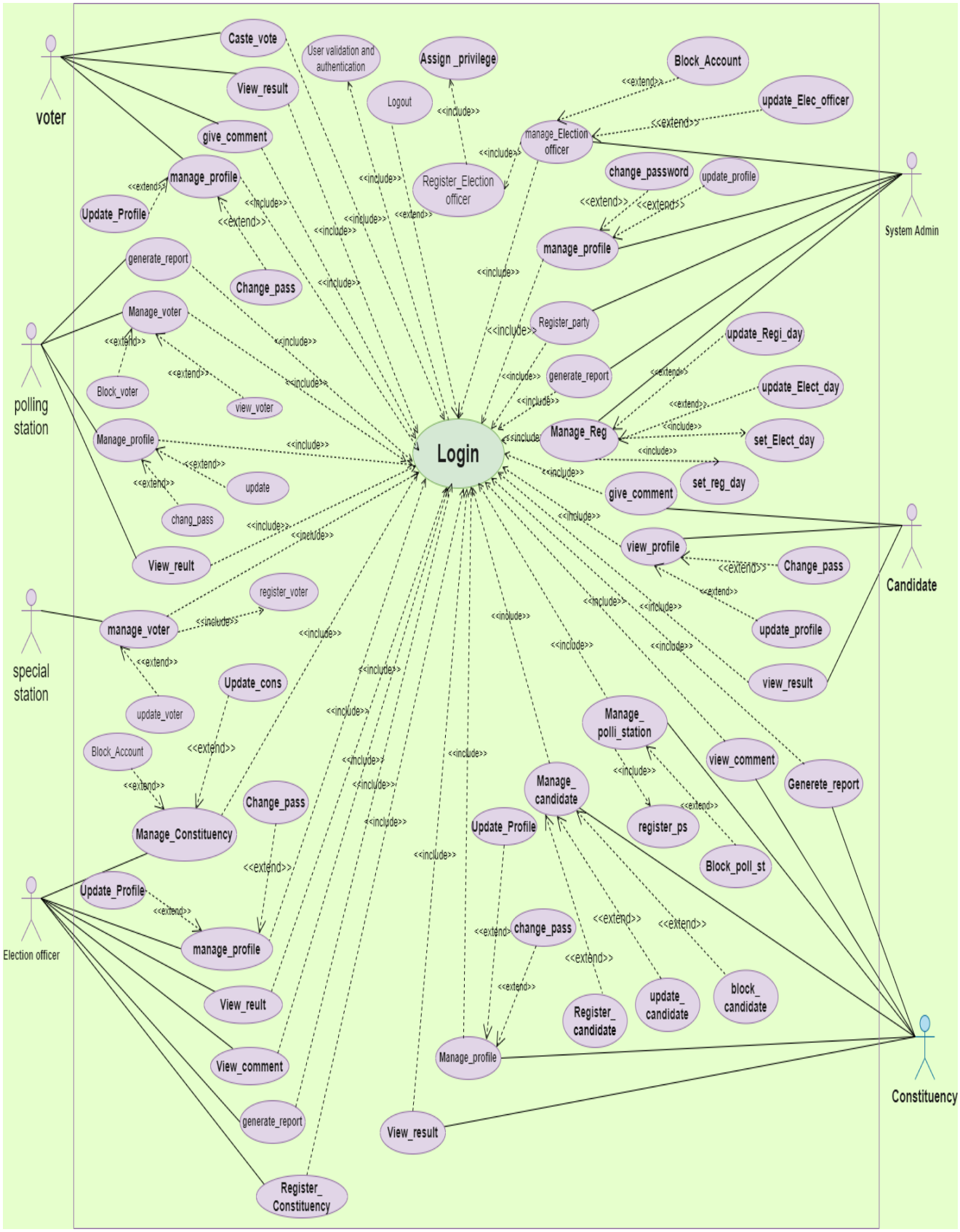
Object-Oriented System Analysis (OOSA) looks at the problem domain, with the aim of developing a conceptual model of the information that exists in the area being analyzed. The result of object-oriented analysis is a description of what the system is functionally required to do, int he form of a conceptual model. That will typically be presented as a set of use cases, activity diagrams, and Class responsibility collaborator. The purpose of object oriented analysis is to develop a model that describes computer software as it works to satisfy a set of customer defined requirements.

4.1.1. Use Case Model

- Modeling the Functions of the system (Use Case Modeling)
- The main activities that are performed in this part will be:
  - Identifying if there is any additional actors and use cases,
  - Constructing a use case model, and
  - Documenting the use case course of events.

- Use Case represents interaction between a user (human or machine) and the system

4.1.2. Use Case Diagram



➢ Figure 4. 1 Main use case diagram

- **System Admin:**
  - Perform login.
  - Manage parties.
  - Manage Candidate
  - Mange Election officer
  - Generate report.
  - Mange Election and registration day.

Election officer:

- Perform login.
- Register Constituency.
- Manage Constituency.
- View result.
- Generate report
- View comment.
- Change profile

Constituency:

- Perform login.
- Register Candidate.
- Manage voter.
- Change profile.
- Generate report.
- View comment

Voter:

- Perform login.
- Cast vote.
- Change profile.
- View result.
- Give comment.

Candidate:

- Perform login.
- Change profile.
- View Result.
- Give comment.

Polling station

- Manage profile
- Manage voter
- View result
- Generate report.

Special station

- Manage profile
- Register voter
- View result
- Generate report

Use Case Description

Table 4. 1 use case description for login use case

Use Case Name	**Login**
Use case id	UI-1
Description	Used to authenticate the user.
Actors	Administrator, voter, candidate, Election Officer. Constituency
Precondition	The actors should activate the system.
Basic course of action	➢ The actor instantiate login page ➢ Login page will be activate ➢ Actor enter user name and password and clicks login button ➢ System checks the validity of the provided information ➢ If the user id and password are valid, the actors will be logged on to the system ➢ Confirmation message will be displayed. ➢ Workers home form displayed.
Post condition	The actor should log on successfully.
Alternative course of action	➢ Actor enter user name and password and clicks login button ➢ System checks the validity of the provided information ➢ If the user ID and password are invalid. ➢ The system displays “error message”. ➢ The system asked to re-enter user name and password.

Table 4. 2 use case description for Register Election officer

Use case name	**Register Election officer**
Use case id	UI-2
Actor	System Admin
Description	➢ This use case is initiated by the System Admin.
Pre-condition	The System Admin must log on the system.
Basic course of Action	➢ The System Admin must activate the system. ➢ The System Admin fills user name and password on the login page.

	➢ The system shall check the user name and password with the existing user name and password. ➢ The system will open the Election officer Registrar page. ➢ The System Admin will be registering the Election officer. ➢ The System Admin click the save button.
Post-condition	➢ The System Admin register the Election officer.

Table 4. 3 **Use case description for assign privilege**

Use case name	**assign privilege**	
Use case id	UI-3	
Actor	Administrator	
Description	Administrator gives permission for appropriate users in order to perform specific task.	
Precondition:	The user must be a members of administrator	
Basic course of action	User action	System response
	1. Administrator wants to access valid users. 2.Specify valid users to give privilege 3.Give appropriate privilege for users 5.End use case	4. Check if the necessary information of user is recorded on the database.
Alternative course of action	The system returns the admin to specify valid users.	
Post condition	Administrator create privilege successfully	

Table 4. 4 use case description for Register Constituency use case

Use case name	**Register Constituency**
Use case id	UI-4
Actor	Election officer
Description	➢ This use case is initiated by the election officer
Pre-condition	➢ The Election officer must log on the system.
Basic course of Action	➢ The Election officer must activate the system. ➢ The Election officer fills user name and password on the login page. ➢ The system shall check the user name and password with the existing user name and password. ➢ The system will open the Election officer page or the Constituency Registrar page. ➢ The Election officer click the save button.
Post-condition	The Election officer register the Constituency.

Table 4. 5 use case description for Register Polling Station

Use case name	**Register Polling Station**
Use case id	UI-5

Actor	Constituency
Description	➢ This use case is initiated by the Constituency
Pre-condition	➢ The Constituency must log on the system.
Basic course of Action	➢ The Constituency must activate the system. ➢ The Constituency fills user name and password on the login page. ➢ The system shall check the user name and password with the existing user name and password. ➢ The system will open the Constituency page or the Polling Station Register page ➢ The Constituency click the save button.
Post-condition	The Constituency register the Polling Station.

Table 4. 6 use case description for Register Candidate use case

Use case Name	Candidate registration	
Use case id	UI-6	
Actor	Constituency	
Description	In order to participate in the election as candidate the Constituency must register to the system.	
Precondition	Candidates are valid agent to register in to the database.	
Basic course of action	User action	System response
	1. Open website if you want to register. 2. Enter password and username to go registration form. 4. Password and username is valid fill the form correctly. 5. Click on register button. 7. us case ends	3. Check password and username and return message and page. 6. Display successfully registered message.
Alternative course of action	If the candidate is not valid agent or have note correct profile the Constituency try to check candidate's profile whether the candidate is valid or not.	
Post condition	Register candidate correctly.	

Table 4. 7 use case description for Register Voter use case

Use case name	**Register Voter**
Use case id	UI-7
Actor	Constituency

Description	➢ This use case is initiated by the Constituency. ➢ It provides to register itself.
Pre-condition	The voter must click register button on the home page.
Basic course of Action	➢ The Voter must activate the system. ➢ The voter fills the form including his kebele ID on the register page click the Register button. ➢ The system shall check the voter kebele ID with the existing kebele ID ➢ From kebele database.
Post-condition	The Constituency register the voter.

Table 4. 8 use case description for Cast Vote use case

Use case name	**Cast Vote**
Use case id	UI-8
Actor	Voter
Description	➢ This use case is initiated by the voter. This use case will enable the voter to cast one vote at a time. ➢ It provides the capability to the system to process the voter's ballot.
Pre-condition	The voter must have valid user id.
Basic course of Action	➢ Actor enter user name and password and clicks login button ➢ Display the home page or the main page of the system. ➢ The actor begins when the voters select cast vote from main page. ➢ The system shall display the well come page. ➢ The voter will insert his/her id number and encrypted code. ➢ The system shall check the id number and encrypted code with the existing id number and encrypted code. ➢ The system will open.
Post-condition	The voter can vote one candidate.

Table 4. 9 use case description for View Result use case

Use case name	**View Result**
Use case id	UI-9
Actor	Voter, Election Officer**,** Constituency, candidate, system Admin.
Description	➢ This use case is initiated by the voters, candidate, Election Officer, system Admin. ➢ It provides the capability to the system to perform the counting of ballots polled for each candidate and announces the election results.
Pre-condition	Ballot information should be secured before the counting.
Basic course of Action	➢ Actor enter user name and password and clicks login button. ➢ Display the home page or the main page of the system. ➢ The actor begins when the voters select result view from main page. ➢ The Use Case begins when the voter, Election Officer sends request to view the result.
Post-condition	Must report the result to the voters, Election Officer.

Table 4. 10 use case description for View Profile use case

Use case name	View Profile
Use case id	UI-10
Actor	Voter, candidate, Constituency, Election Officer, System Admin
Description	➢ This use case is initiated by the voters, candidate, Constituency, Election Officer. ➢ It provides the capability to the system to View each candidates.
Pre-condition	The Actors must activate the system.
Basic course of Action	➢ Actor enter user name and password and clicks login button. ➢ Display the home page or the main page of the system. ➢ The actor begins when the voters select view profile from main page. ➢ The use case begins when the voter, election officer sends request to view the profile.
Post-condition	Must report the Profile to the voters, candidate, Constituency, Election Officer.

Table 4. 11 use case description for Profile Manipulation use case

Use case name	Profile Manipulation
Use case id	UI-11
Actor	Constituency, Election Officer, System Admin
Description	➢ This use case is initiated by Constituency, election officer, and system admin. ➢ It provides the capability to the system to process the profiles of the voters and the candidates. ➢ The processing here includes creation, modification and deletion process.
Pre-condition	The Constituency, election officer, and system admin must log on to the system. And the election database must be the updated one, before this use case is started.
Basic course of action	➢ First the Constituency, Election Officer and System Admin must initiate the system by login to the system. ➢ And then those actors select the update form from the profile menu. ➢ Then update page displayed. ➢ The Election Officer and System Admin can update the profile that has to be updated.

Table 4. 12 use case description for General Manipulation use case

Use case name	General Manipulation
Use case id	UI-12
Actor	System Admin
Description	➢ This use case is initiated by System Admin; update and add new feature to the system.

Pre-condition	The system admin must login to the system first.
Basic course of action	➢ The system admin must activate the system first ➢ The Admin then go to main database system and manipulate the database.

Table 4. 13 use case description for Generate Report use case

Use case name	**Generate Report**
Use case id	UI-13
Actor	System Admin, polling station, election officer, constituency.
Description	➢ It provides to generate report.
Pre-condition	System Admin, polling station, election officer, constituency must login first.
Basic course of Action	➢ The System admin must activate the system. ➢ The System Admin select report form from Report menu. ➢ Report from menu interface displayed. ➢ The System can generate the report from the page.
Post-condition	The System Admin generate result that the system can count the casting vote.

4.2. Object Model

An object model uses various diagrams to show how objects behave and perform real-world tasks. The diagrams used include class diagram and data dictionary.

The object model describes objects in object-oriented programming, object-oriented analysis, and object-oriented design.

4.2.1. Class Diagram

Provide a conceptual model of the system in terms of entities and their relationships.

Class diagrams show the static structure of the model, in particular, the things that exist (such as classes and types), their internal structure, and their relationships to other things. It is an abstraction of the real environment class of candidate, voters, Election officer, and System Administrator. **Have the following classes**

- System Admin
- Constituency
- Election Officer
- Candidate
- Voter
- Polling Station
- Special Polling Station
- Party

- Election day
- Registration day

Table 4. 14 Classes and their Responsibilities

No.	Class Name	Responsibilities
1.	System Admin	Manipulate database and create account for the system users.
2.	Voter	Castes his/her vote and views candidate profile, register his/her self.
3.	Election officer	Generate result, view profile of the selected user, register candidate
4.	Constituency	perform login, register voter and manipulate the profile of The voter when there is a change.
5.	party	System Admin register the party
6.	Election day	Set date for Election.
7.	Register day	The start and end day for registration of voters.
8.	View result	Displays the election result

Class representation each class is represented by a rectangle subdivided into three

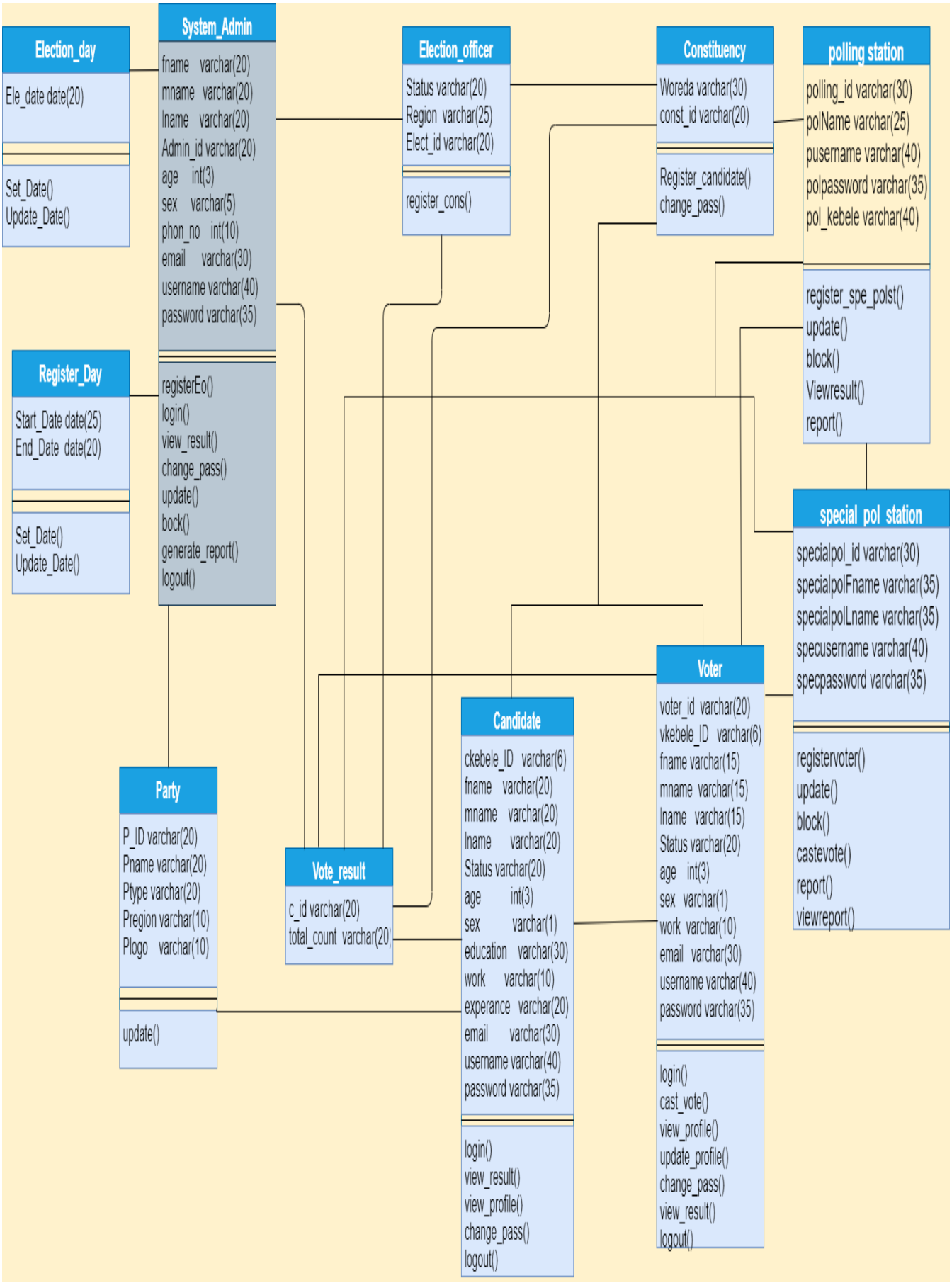


Figure 4. 2 Main class diagram

4.2.2. Data Dictionary

System Admin

Table 4. 15 System Admin

Name	Data type	Length	Privilege constraint
Admin_id	varchar	20	Primary key
Fname	varchar	20	
Mname	varchar	20	
Lname	varchar	20	
Sex	varchar	10	
Age	Integer	10	
Phone No	Integer	10	
Email	varchar	30	

Election_officer

Table 4. 16 Election_officer

Name	Data type	Length	Privilege constraint
status	varchar	20	
Region	varchar	20	
Elect_id	varchar	20	

Constituency

Table 4. 17 Constituency

Name	Data type	Length	Privilege constraint
Woreda	varchar	30	
Const_id	varchar	20	

Table 4. 18 Polling Station

Name	Data type	Length	Privilege constraint
Pol_id	int	10	
Kebele	varchar	20	

Table 4. 19 Special Polling Station

Name	Data type	Length	Privilege constraint
Sp_id	int	10	

Candidate

Table 4. 20 Candidate

Name	Data type	Length	Privilege constraint
Candidate ID	varchar	10	Primary key
Kebele_id	varchar	10	
Fname	varchar	20	
Mname	varchar	20	
Lname	varchar	20	
Sex	varchar	10	
Age	Integer	10	
work	varchar	10	
Education	varchar	30	
Email	varchar	30	
Experience	varchar	20	

Voter

Table 4. 21 Voter

Name	Data type	Length	Privilege constraint
Voter ID	varchar	20	Primary key
Fname	varchar	15	
Mname	varchar	15	
Lname	varchar	15	
Age	Integer	10	
Sex	varchar	10	
Work	varchar	10	
vkebele_id	varchar	20	
Email	varchar	30	
status	varchar	20	

Party Table

Table 4. 22 Party

Attributes	Data type	length	Privilege constraint
Party_id	varchar	20	Primary key
Name	varchar	20	
Region	varchar	10	
Type	varchar	20	
Logo	varchar	10	

Voter Result

Table 4. 23 Voter Result

Name	Data type	Length	Privilege constraint
Voter_Id	varchar	20	Primary key
Total vote	varchar	20	

Date	Date	20	
Time	Time	20	

4.3. Dynamic Model

4.3.1 Sequence Diagram

A sequence diagram shows, as parallel vertical lines (lifelines), different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner.

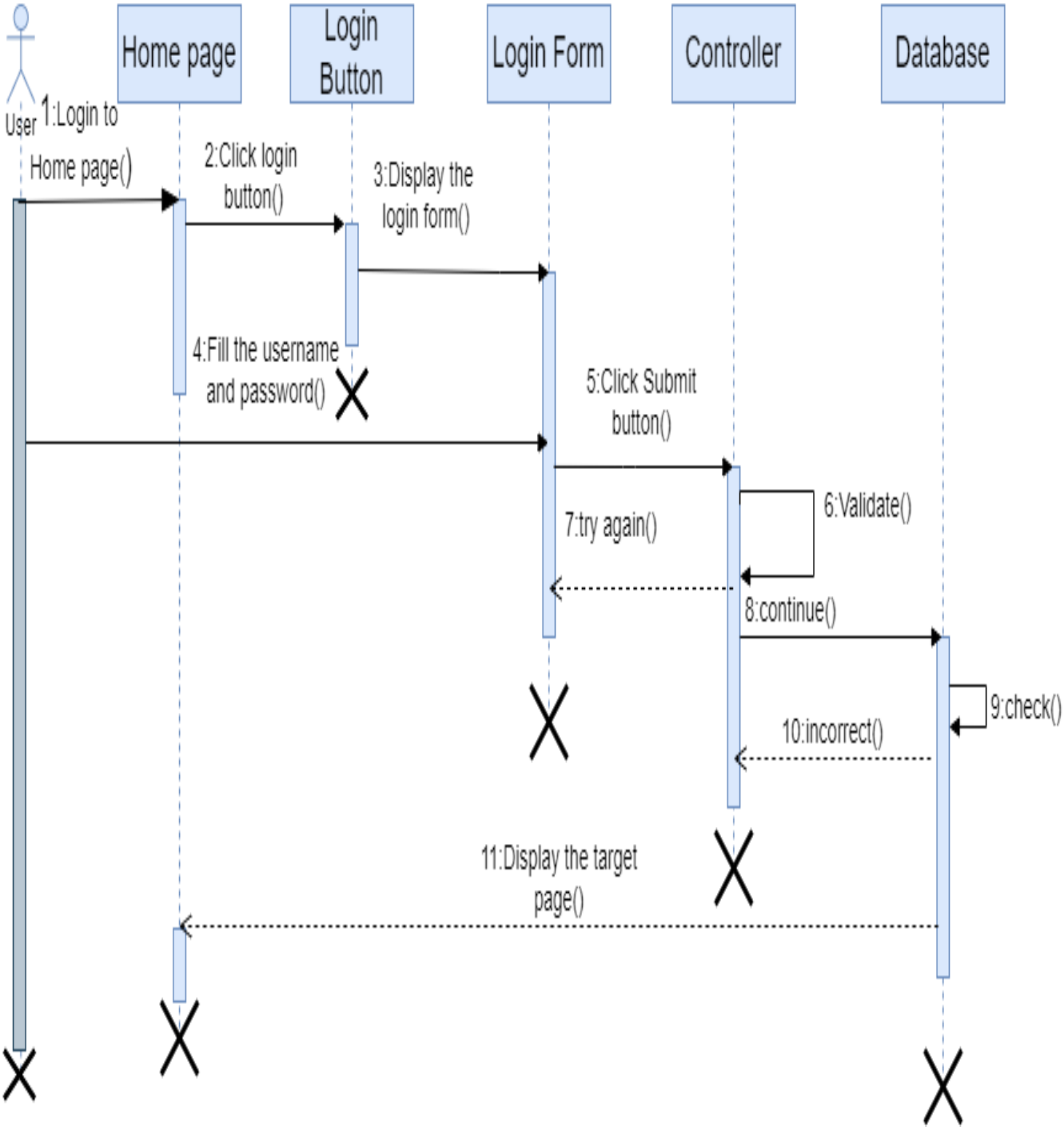


Figure 4. 3 Sequence diagram for login

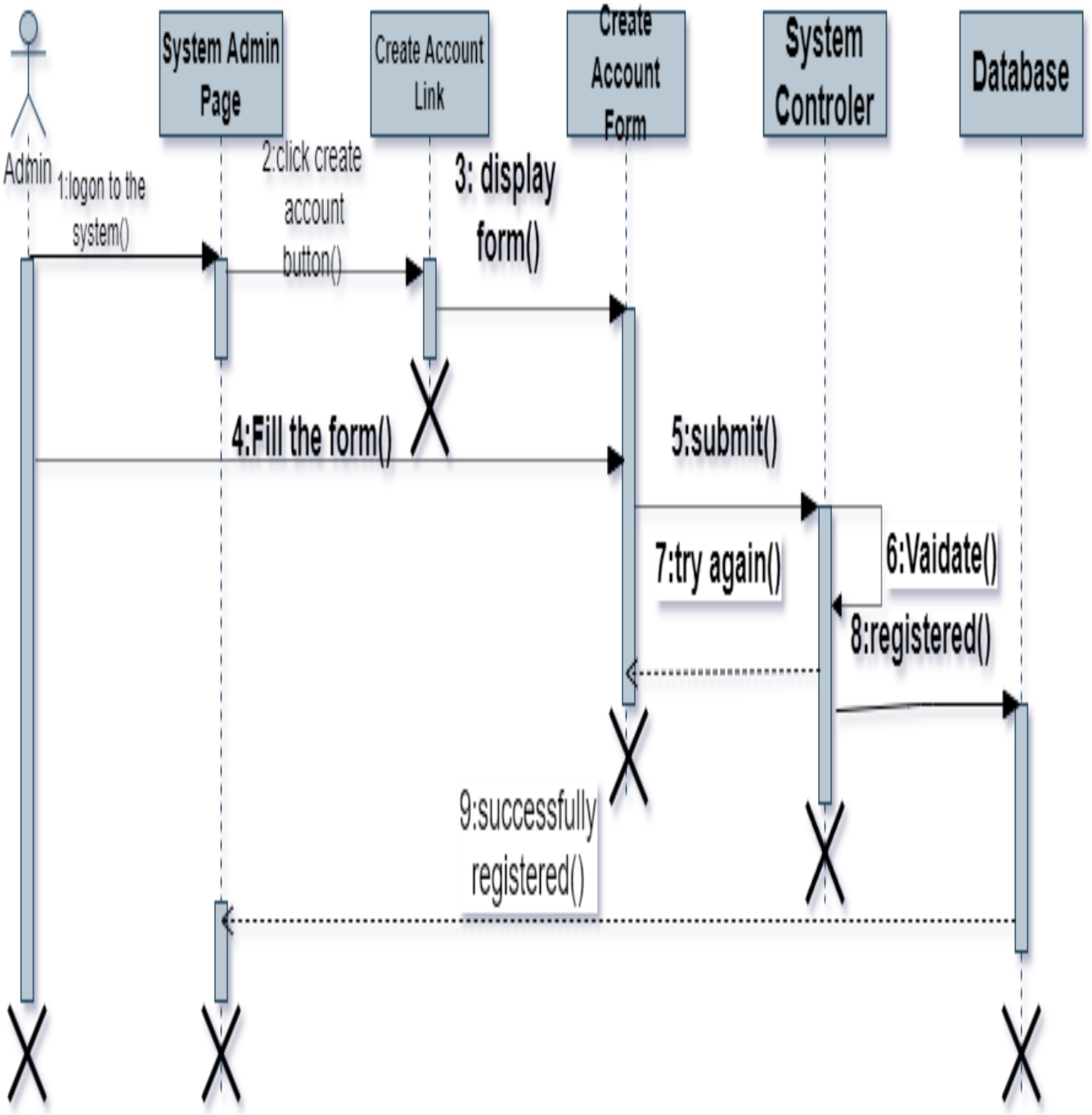


Figure 4. 4 Sequence diagram for Create Account

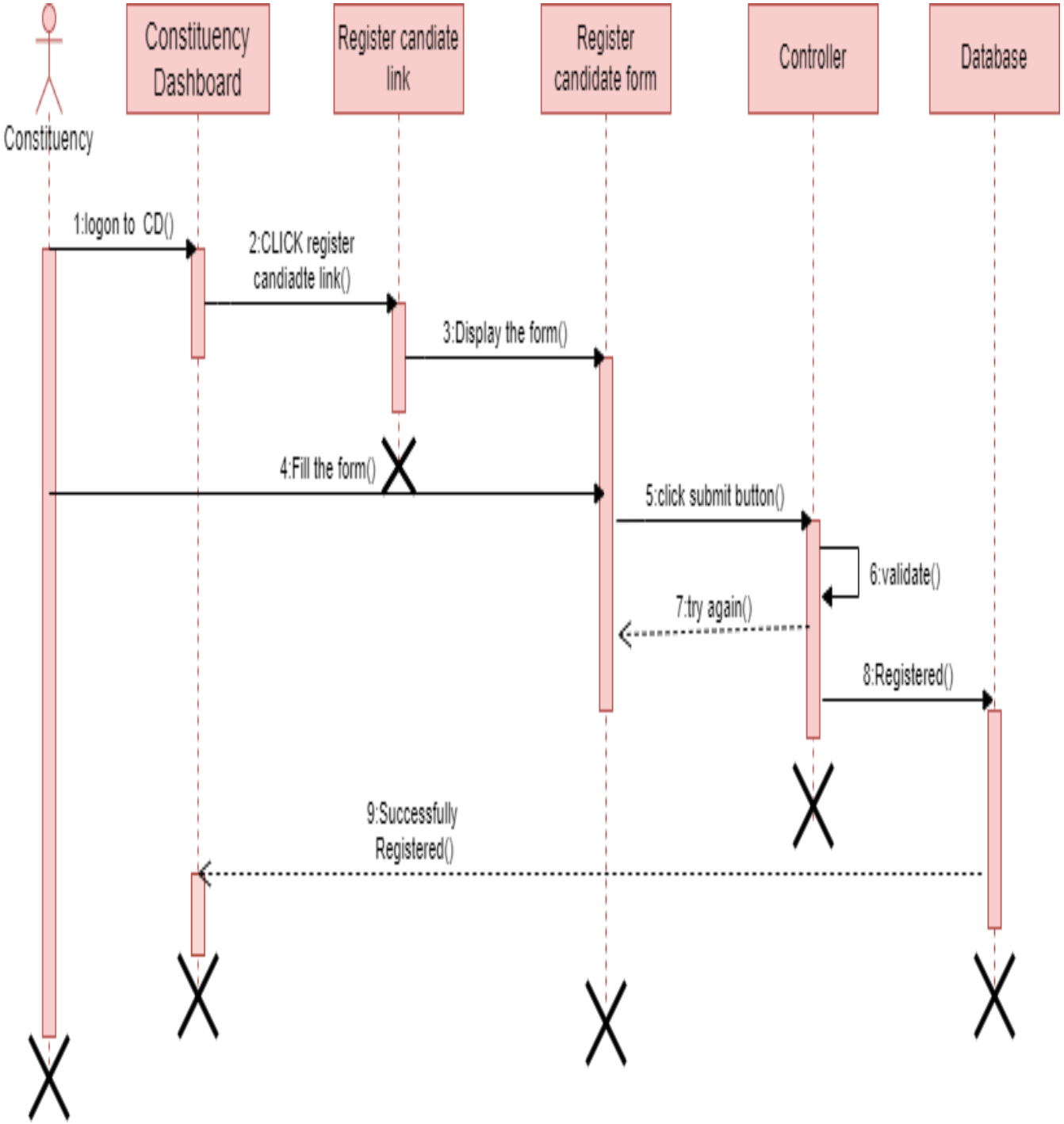


Figure 4. 5 Sequence diagram for Register candidates.

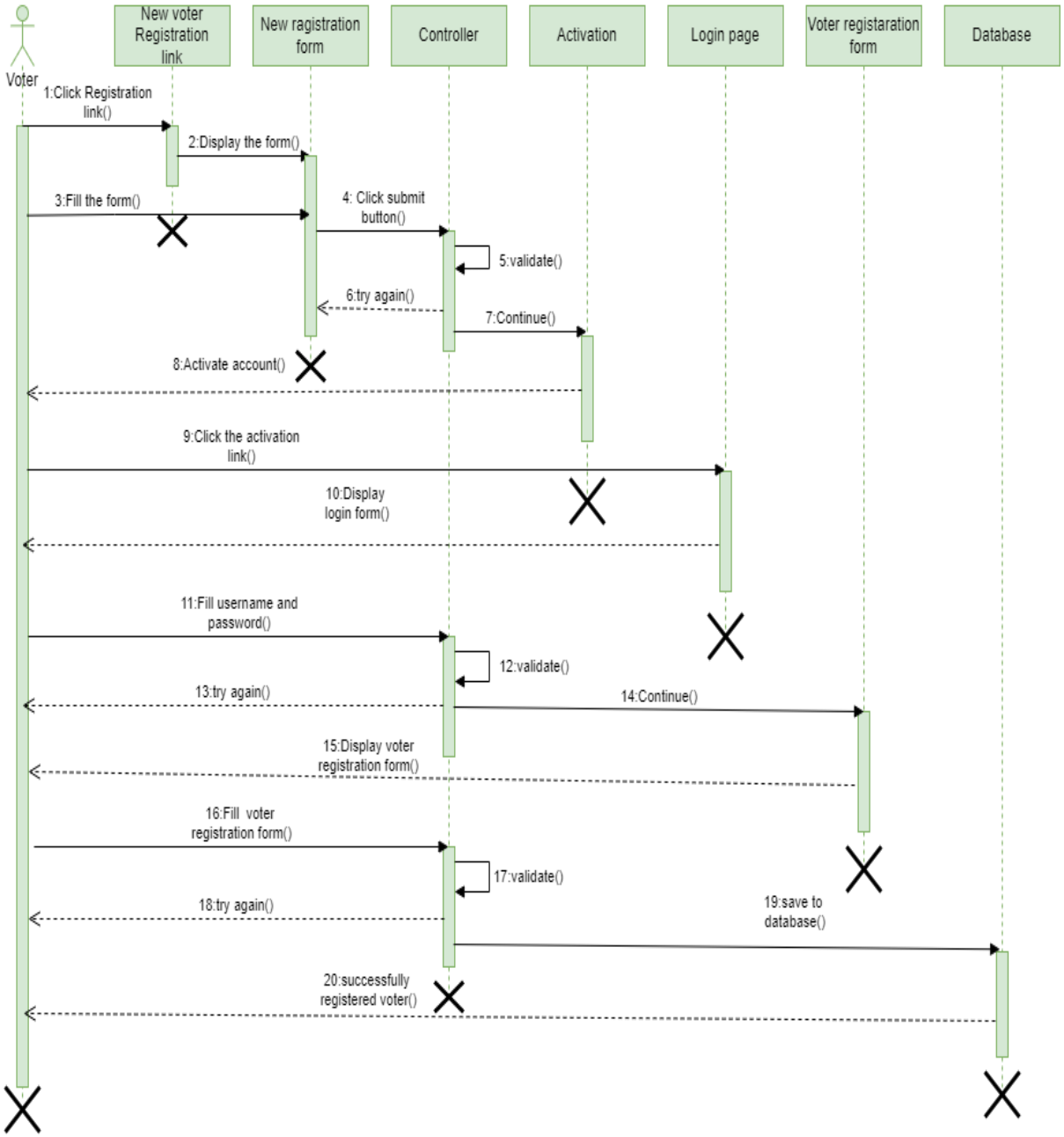


Figure 4. 6 Sequence diagram for voter register.

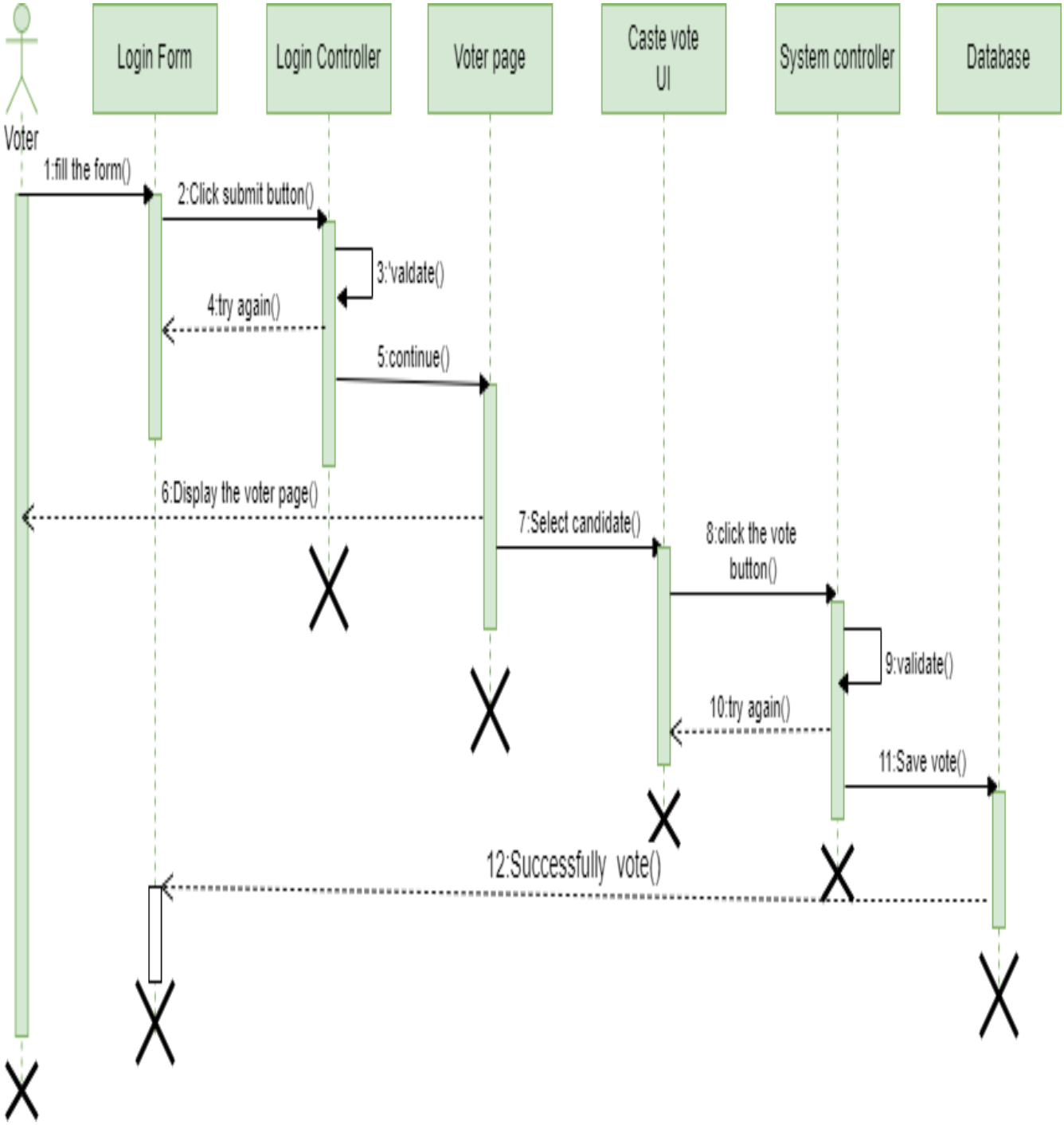


Figure 4. 7 Sequence Diagram for cast vote

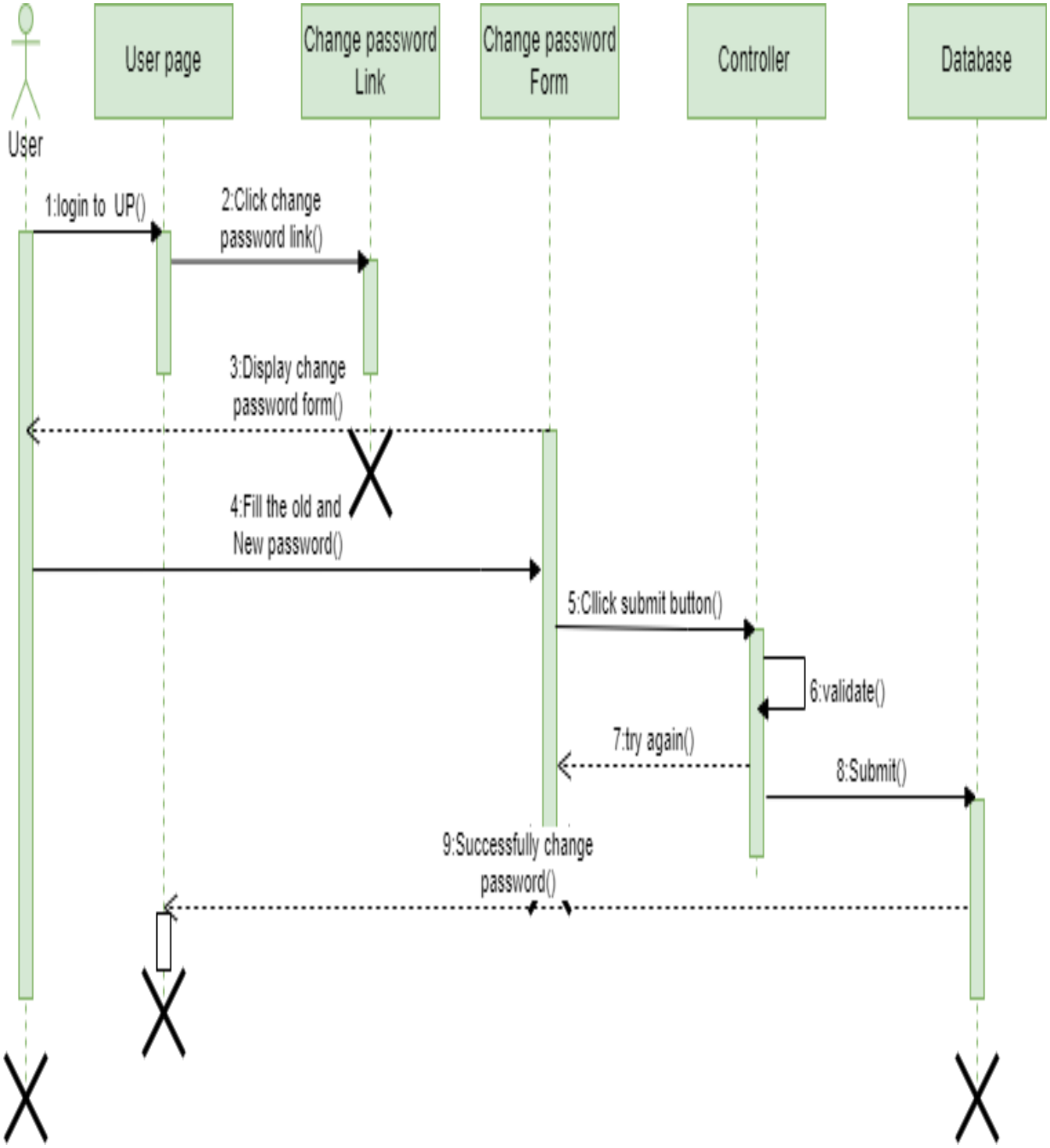


Figure 4. 8 Sequence Diagram for Change password

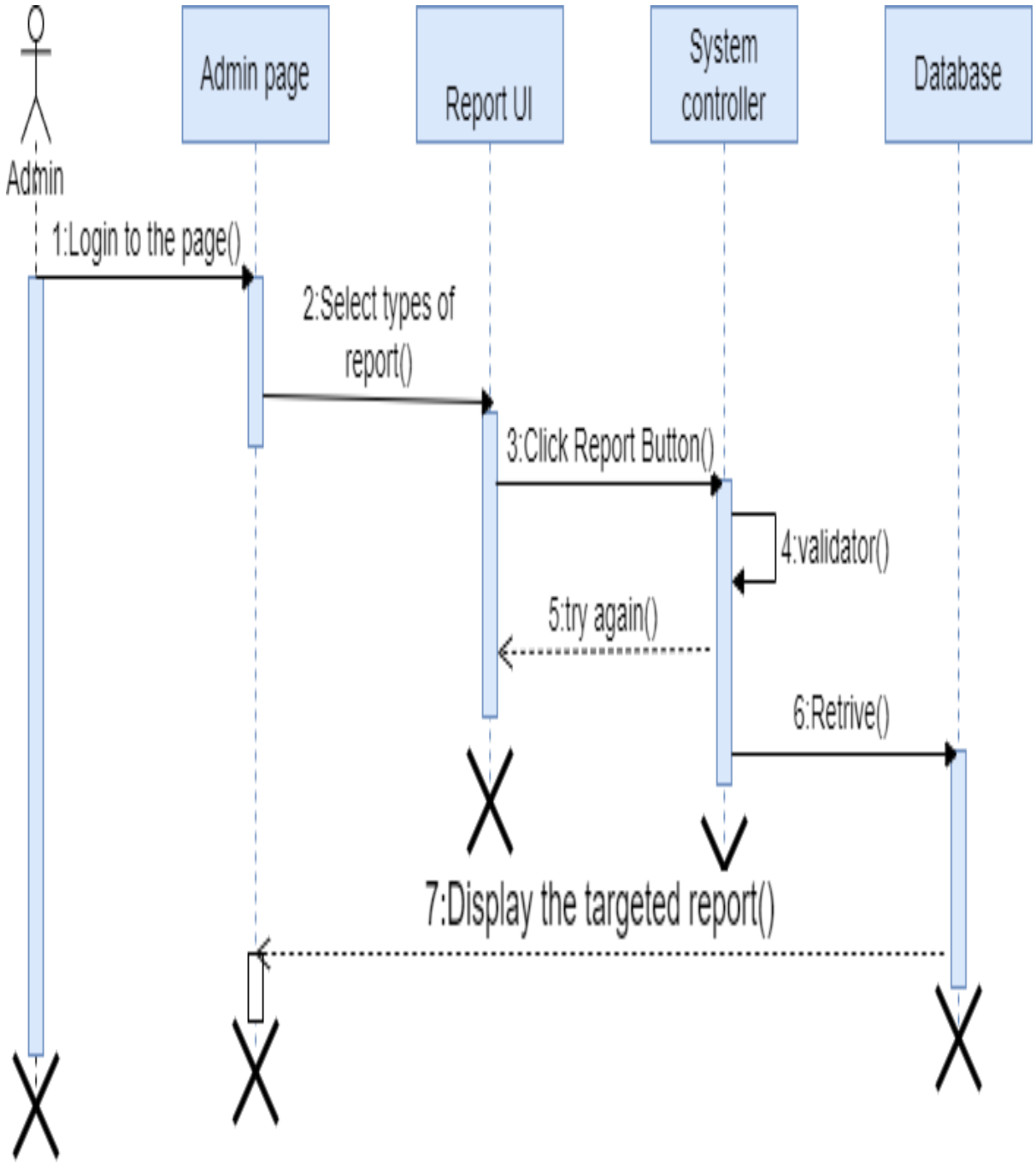


Figure 4. 9 Sequence diagram for generate report

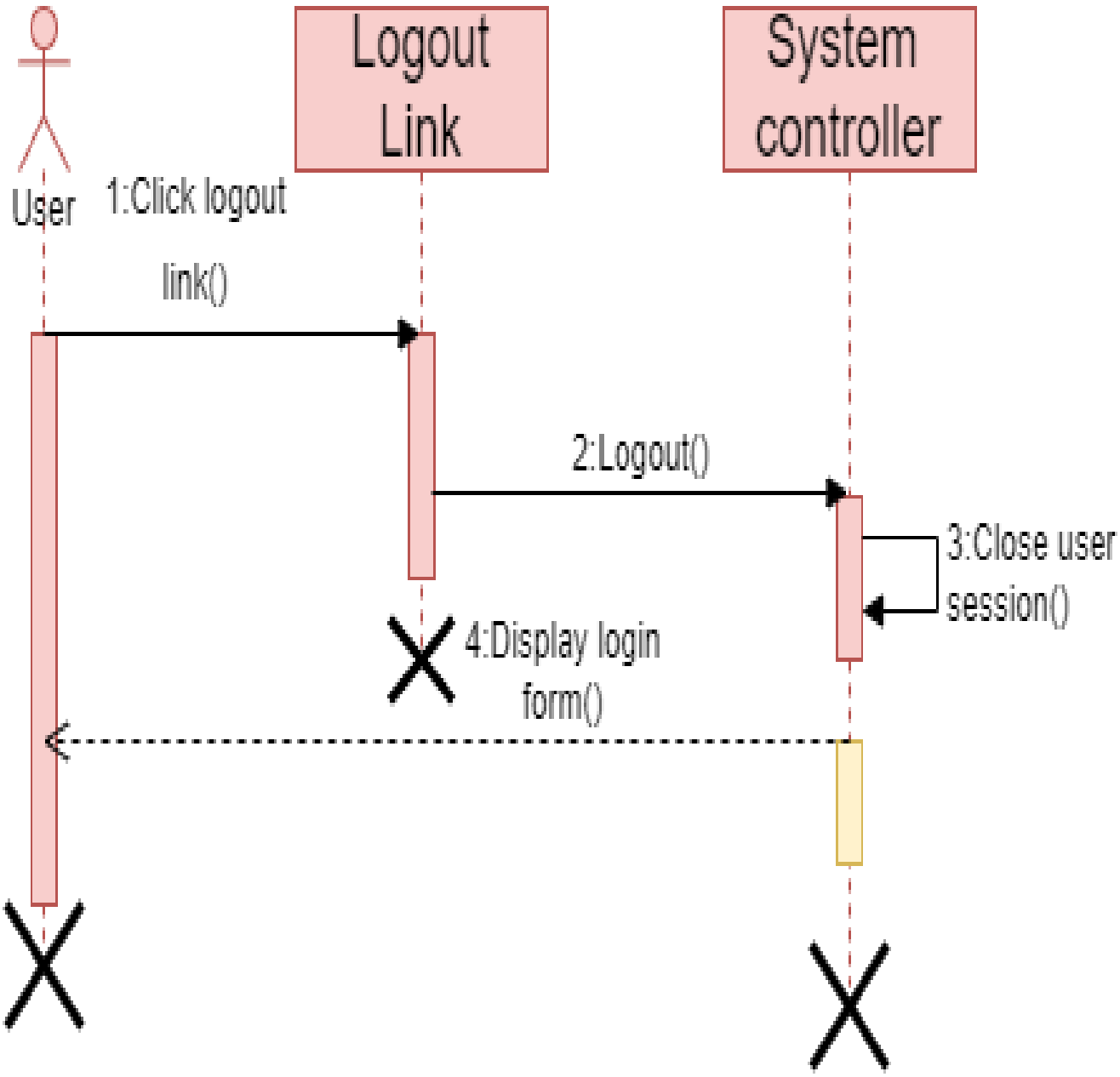


Figure 4. 10 Sequence diagram for logout.

4.3.2 Activity Diagram

Activity diagrams deals with all type of flow control by using different elements like fork, join etc. The purposes of activity diagram can be described as:

- Draw the activity flow of a system.
- Describe the sequence from one activity to another.
- Describe the parallel, branched and concurrent flow of the system.

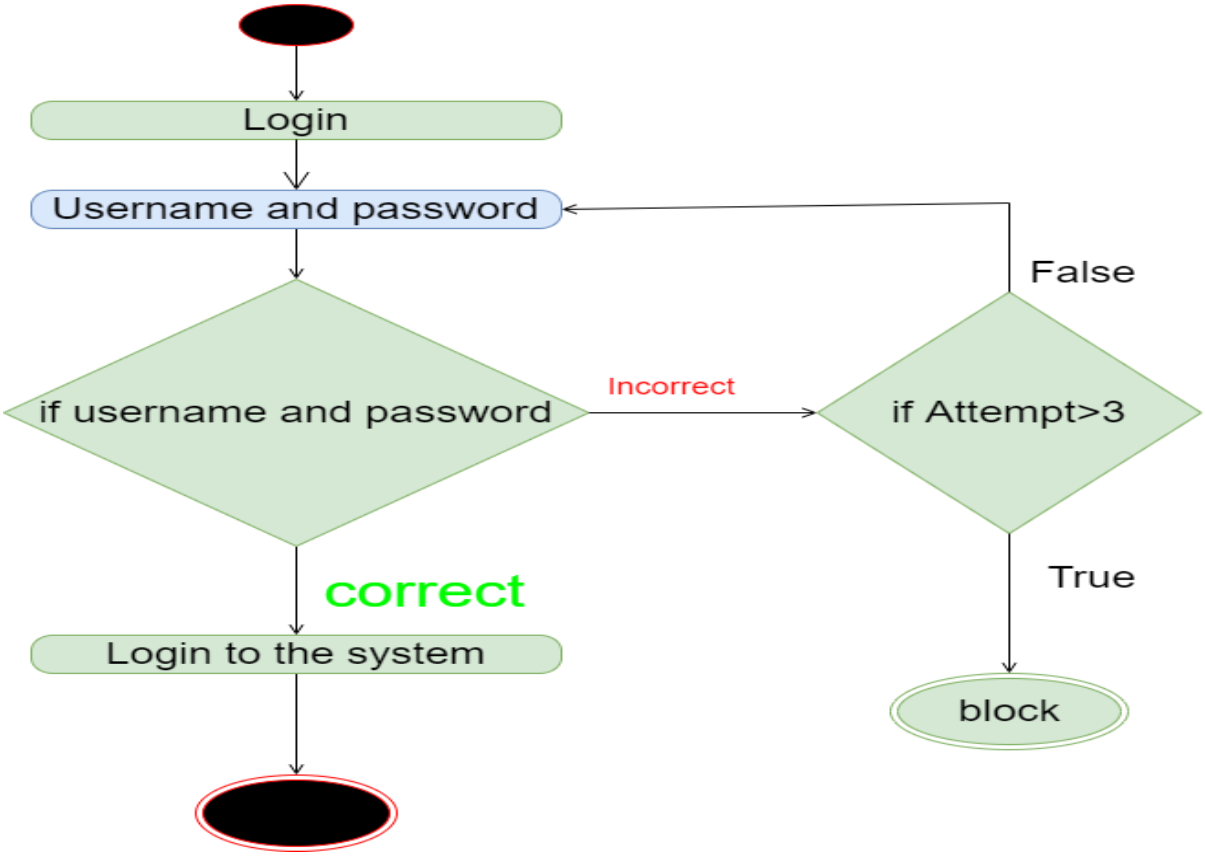


Figure 4. 11 Activity diagram for Login

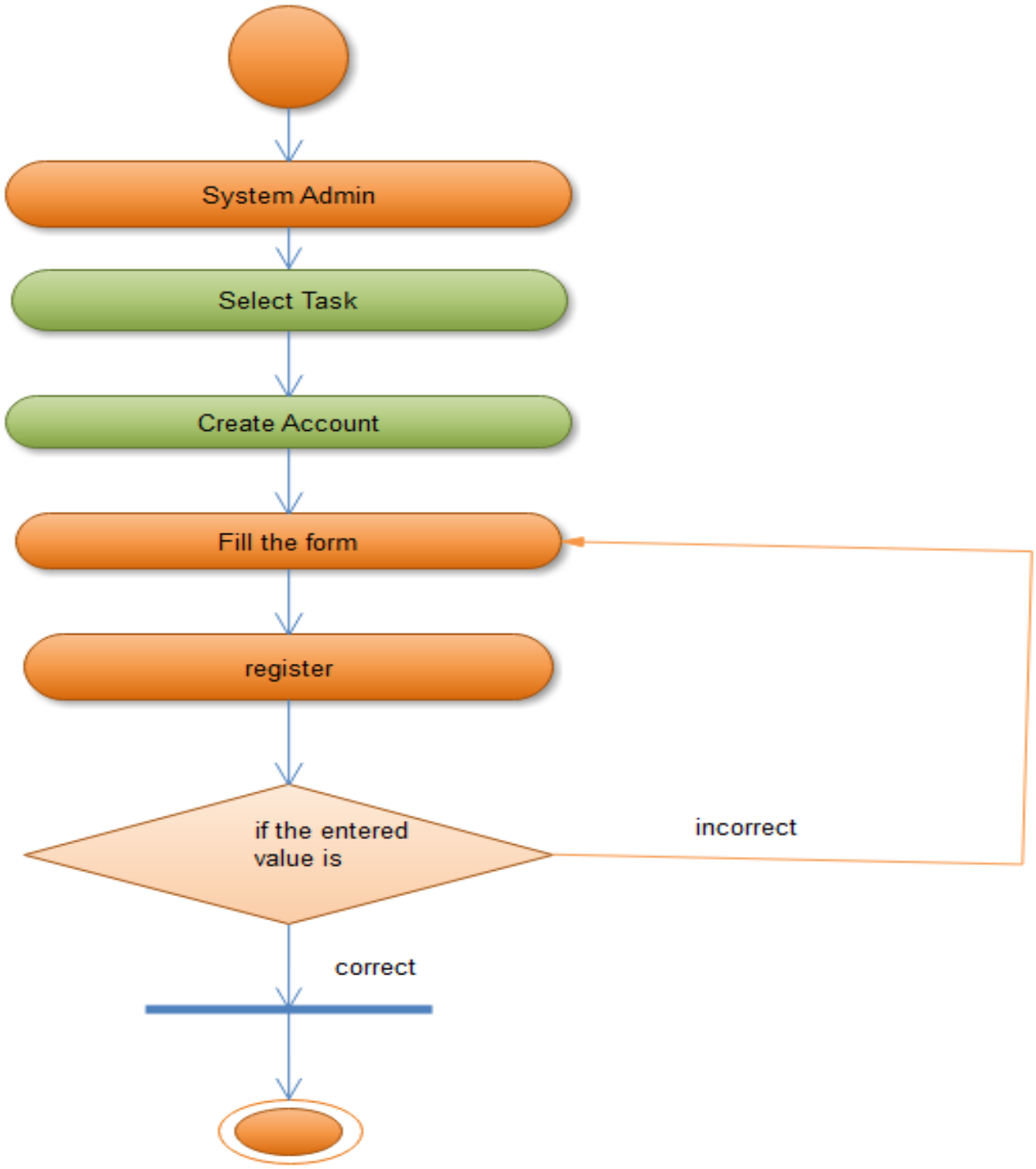


Figure 4. 12 Activity diagram for tasks of System Administrator

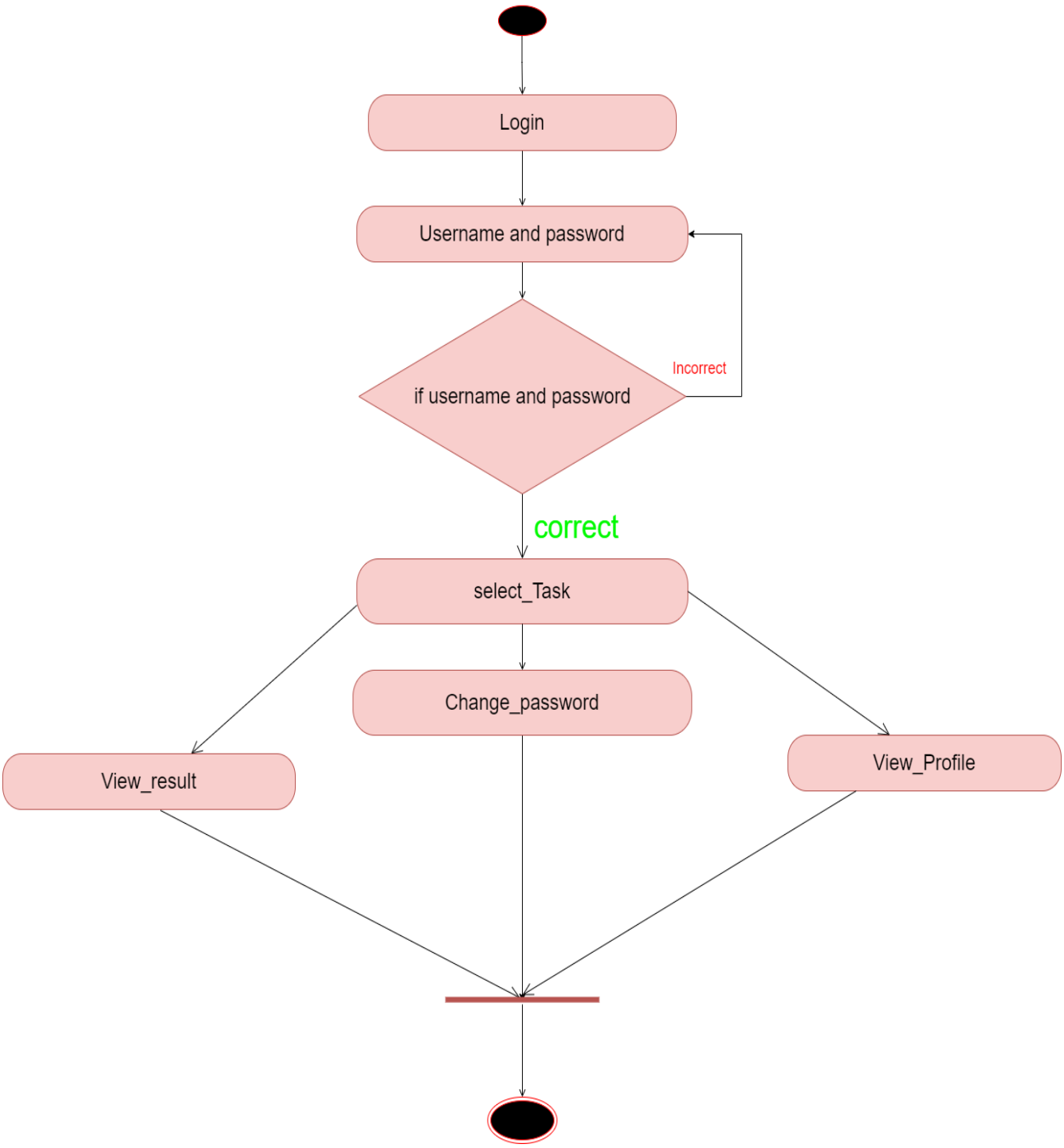


Figure 4. 13 Activity diagram for Candidate

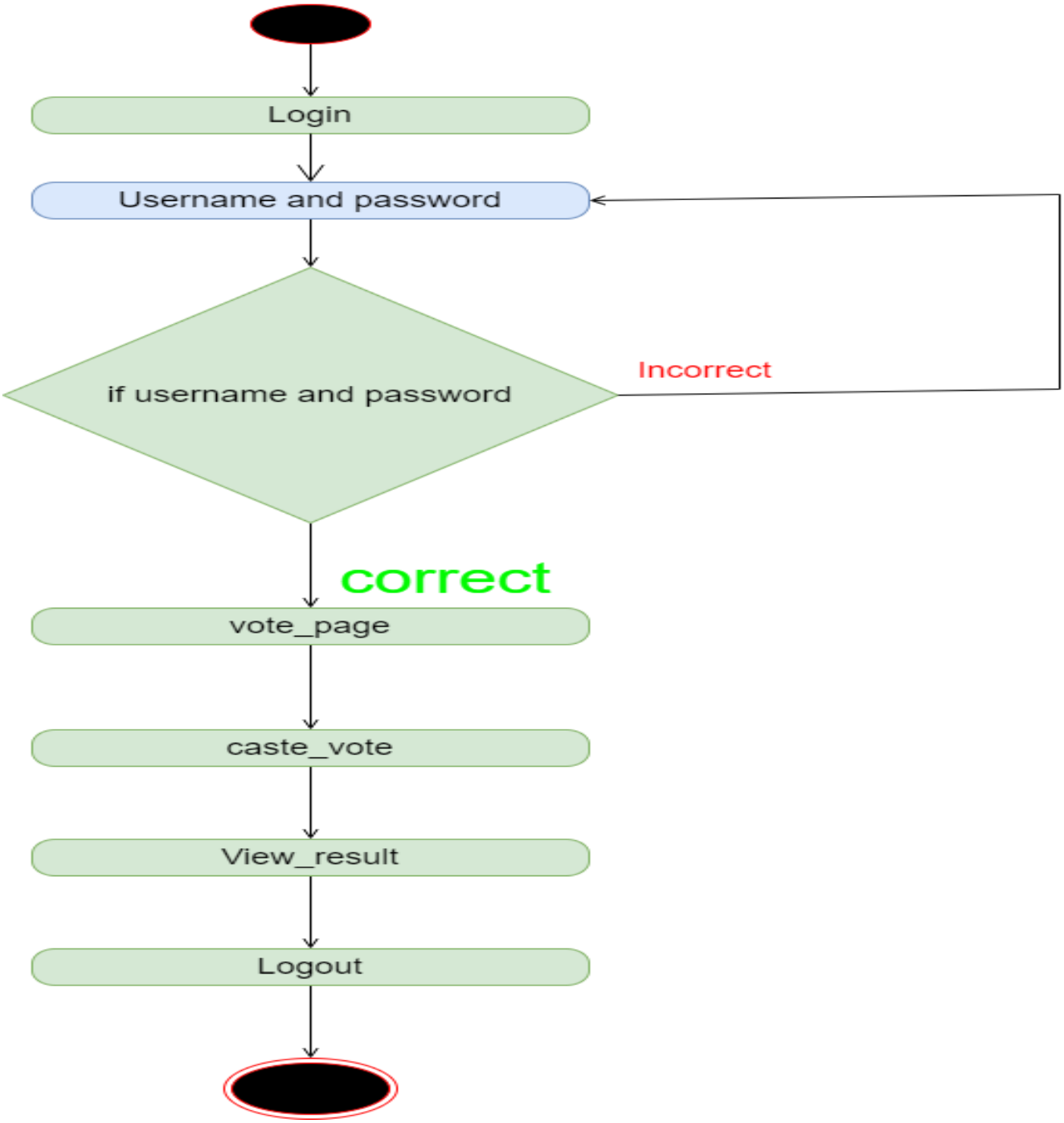


Figure 4. 14 Activity diagram for Vote caste

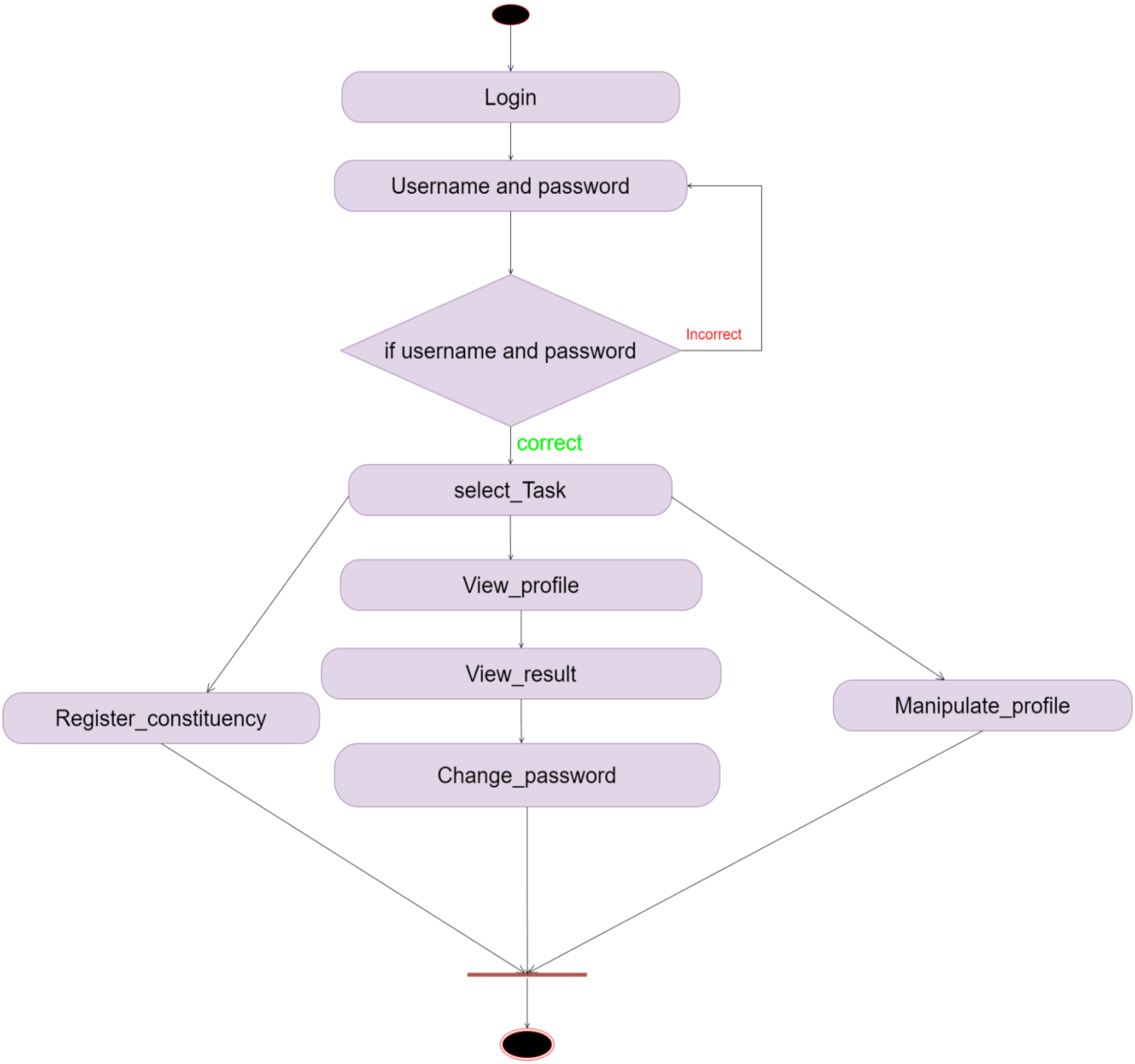


Figure 4. 15 Activity diagram tasks for Elections officer.

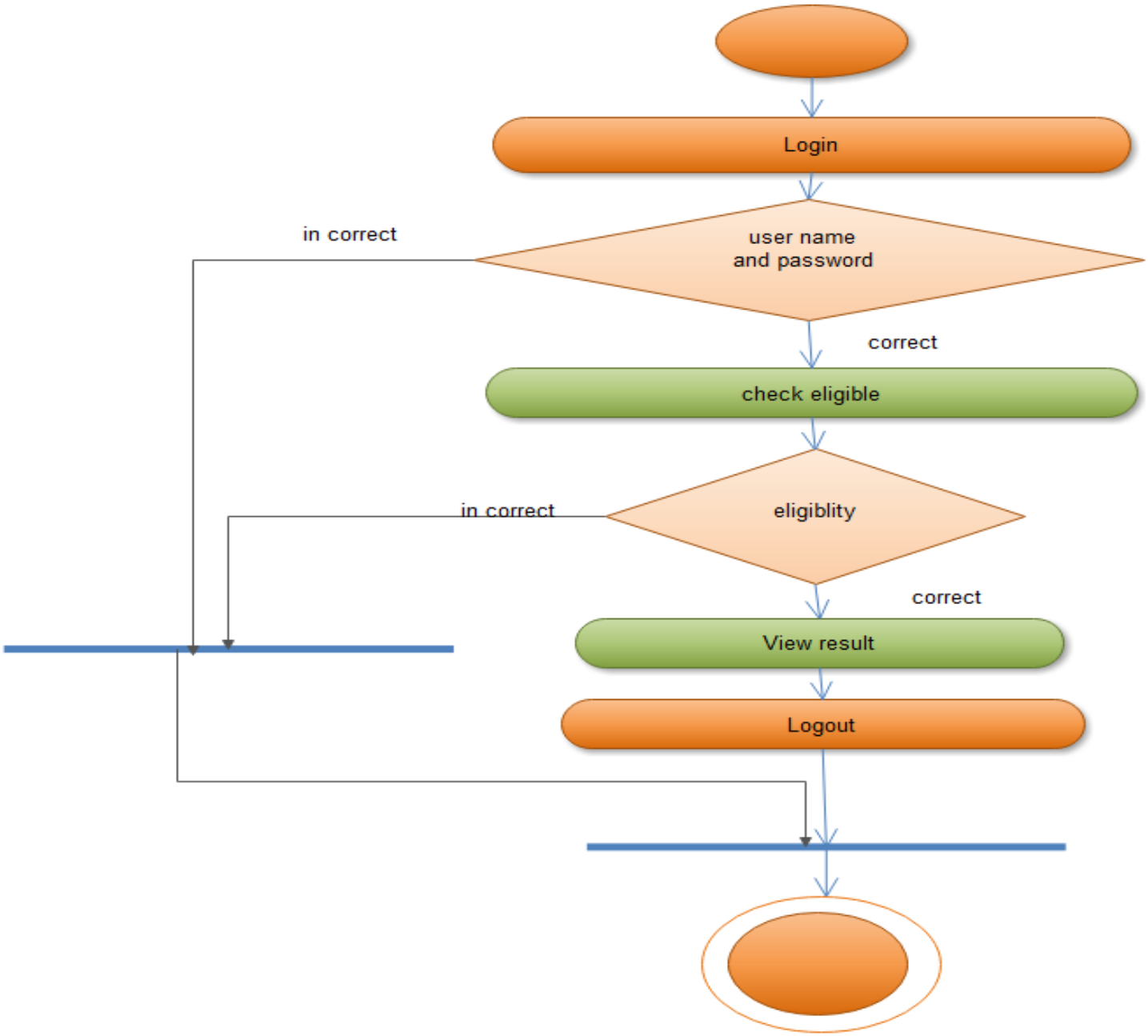


Figure 4. 16 Activity diagram for View Result

4.3.3. State Chart Diagram

A state chart diagram is a view of a state machine that models the changing behavior of a state. State chart diagrams show the various states that an object goes through, as well as the events that cause a transition from one state to another.

The common model elements that state chart diagrams contain are:

- States
- Start and end states
- Transitions

Start and end states represent the beginning or ending of a process.

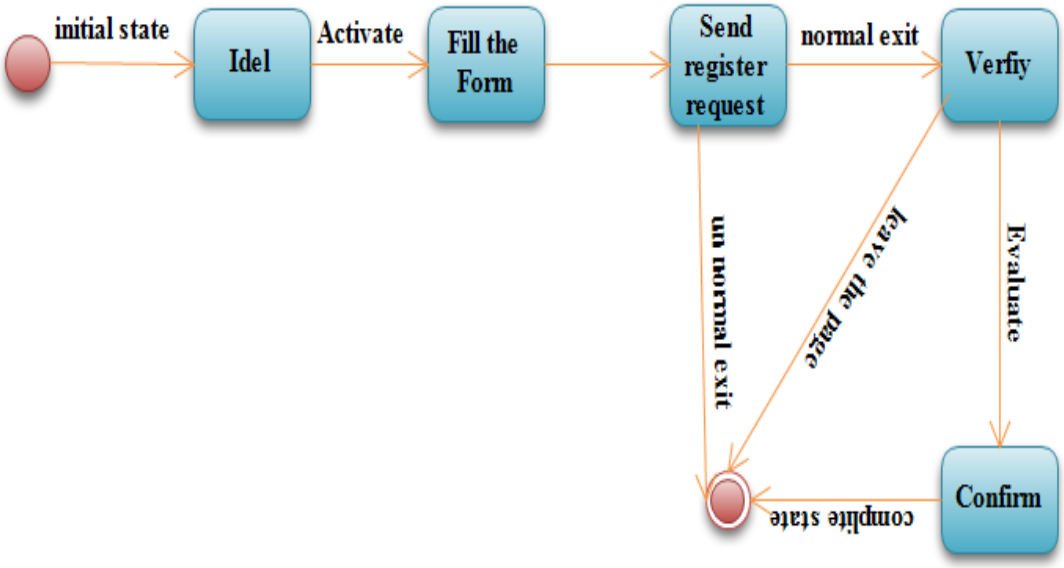


Figure 4. 17 State chart diagram for Register Voter

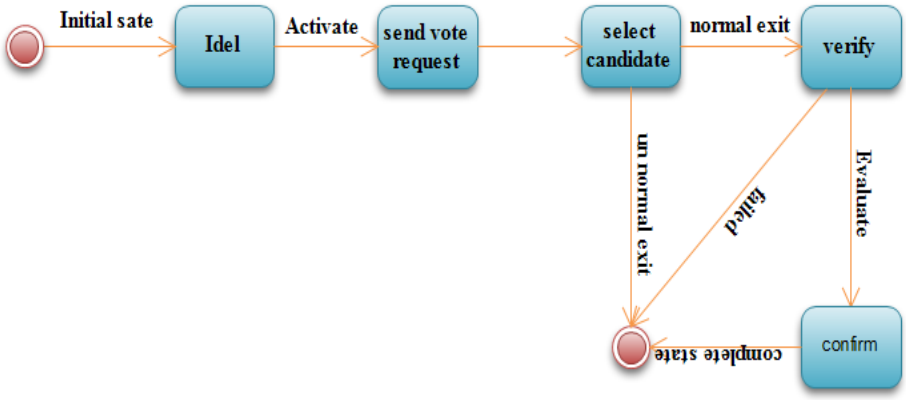


Figure 4. 18 State chart diagram for Cast vote

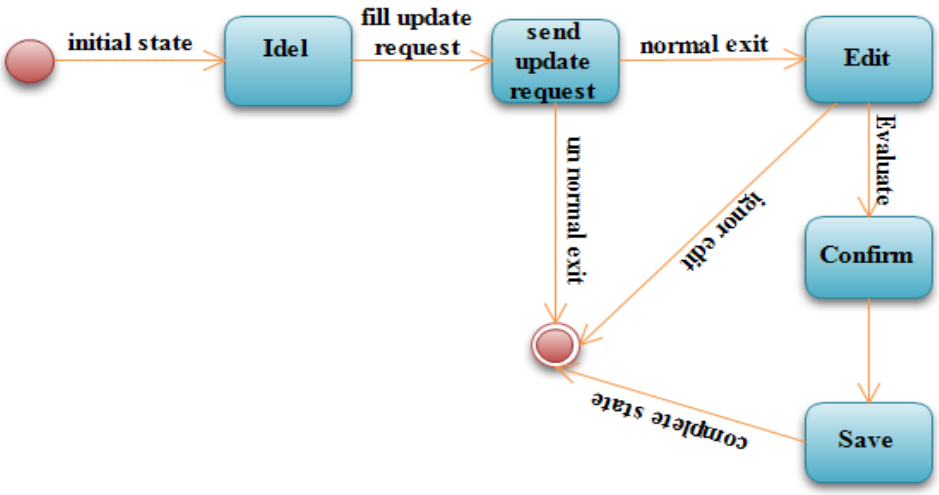


Figure 4. 19 State chart diagram for profile manipulation.

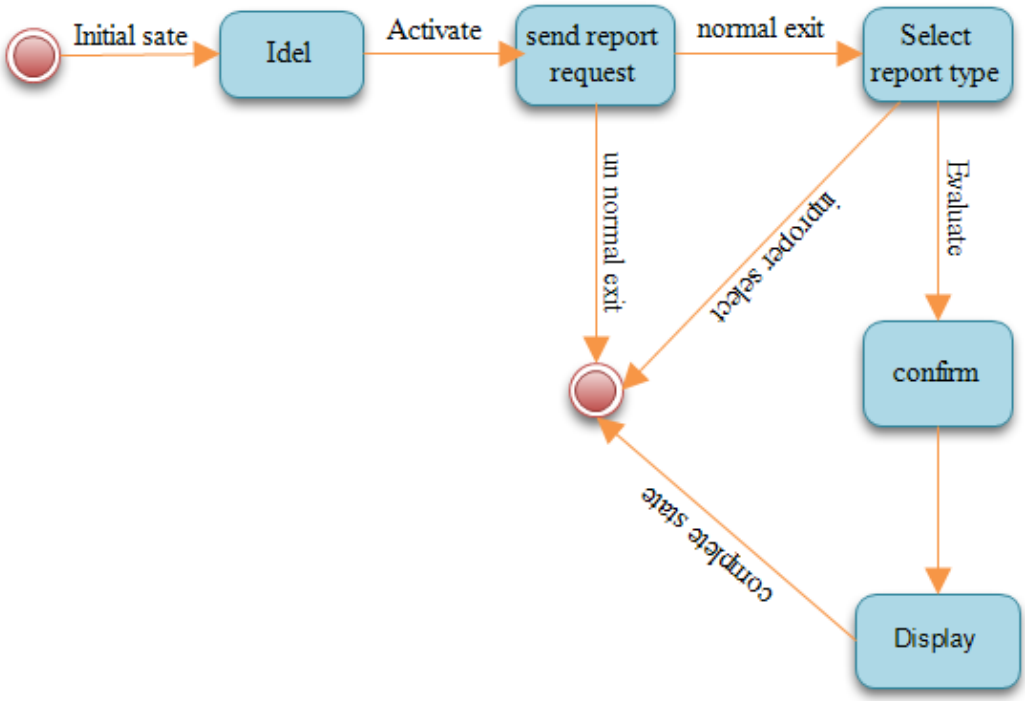


Figure 4. 20 State chart diagram for Generate report.

CHAPTER FIVE

5. SYSTEM DESIGN

5.1 INTRODUCTION

This chapter of the project document provides a system design of this project. This chapter contains and describes about Component modelling, Deployment diagram, Database design and Class mapping.

The purpose of designing is to show the direction of how the Application is built and to obtain clear and enough information needed to drive the actual implementation of application. It is based on understanding of the model the Application built on system design also focuses on decomposing the system into manageable parts.

5.2 Design Goals

The objectives of designing are to model a system with high quality. Implementing of high quality system depends on the nature of the design created by the designer .If one wants to make changes to the system after it has been put into operation depends on the quality of the system design. So if the system is designed perfectly, it will be easy to make changes to it.

The goal of the system design is to manage complexity by dividing the system in to manageable pieces. Some of the goals are listed below.

- **Modifiability**: if in the system, some functionality requires to be modified, this modification must be done specifically to that function or page without affecting the overall system organization.
- Our system should be capable of being readily changed to improve different services depending on the need of the user.
- **Flexibility:** our system should be able to bend easily or without breaking.
- **Efficiency:** our system should be able to avoid wasting materials, energy, efforts, money and time by producing desired output.
- **Accessibility:** One of best feature of proposed system is its accessibility. Users can access the current information being everywhere in the country as well as outside the country through internet. To trace some of its best features related with accessibility like:
  - It is accessible without geographical location limitation

- It is accessible without time limitation – user can share their idea every time.
- Information or the same information accessed by multiple users at the same time.

5.3. Proposed System Architecture

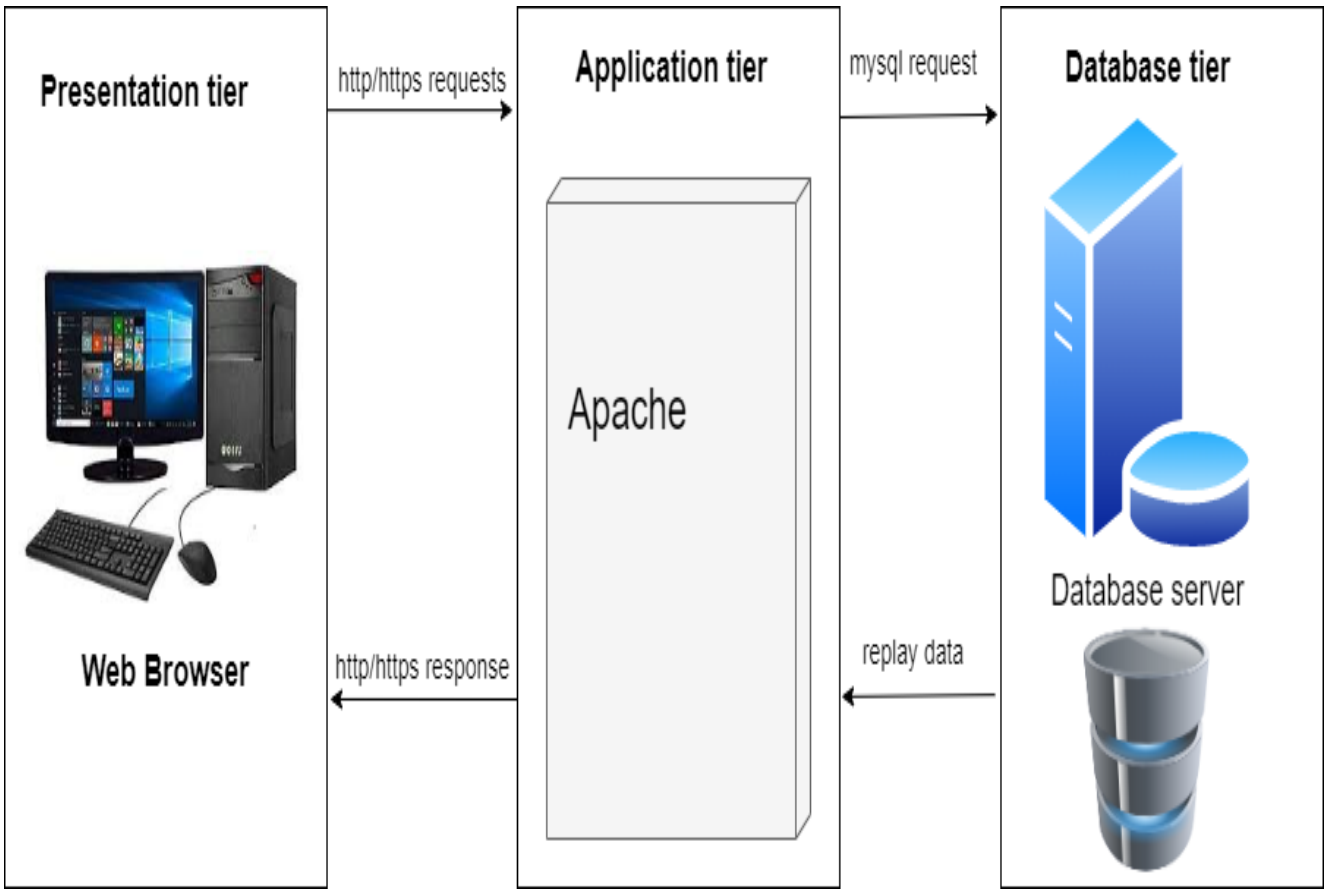


Figure 5. 1 Proposed System Architecture.

The architecture chosen for the system is three tier. The first layer runs on the client side, the second layer at the middle layer and the third layer will be the database system. The system will run using web technology. This architecture provides greater application scalability, high flexibility, high efficiency, lower maintenance, and reusability of components. Since each tier runs on a separate machine, it improves systems performance.

The system uses dynamic web technology, i.e., adding and retrieving data to and from the data store whenever requested is possible. It requires a client side program which is accessed by the Election officer, by the voter and also an interface that communicate with the external system. It needs server side functions that implement the functional requirements and the database system that stores data.

- **Client Tier/ Presentation tier**

The first user is the **System Admin**. This person is responsible for adding critical data to the system, control and activate the system. The type of data is like Election Officer' Authorization,' username and password, control and activate the system. The final report is also generated by this person.

The second user is the **Election officer**. This person is responsible for approves Constituency, and manipulation the profile of the registrar and the Constituency.

The third user is the **voter**; the role of this voter is casting votes. The interface used by the voter is web form. As vote casting is processed at the polling stations, which are distant from the database server.

The fourth user is **candidate**; the role of this candidate is advertising information.

The fifth user is **Constituency**; the role of this **Constituency is** perform login, register voter, **candidate** and manipulate the profile of the voter when there is a change.

- **Middle Tier/Application tier**

The middle tier will contain the core parts of the vote application, i.e., the web server and business logic. The web server will handle all requests coming from the client machines. The requests are different with its type, for example; request for data insertion, request for report generation and others. It is also the web server which the responses that is forwarded to the client machines.

The business logic part will hold the process and core functions that will be implemented in the system. When the data is submitted from the client machines, first it will be handled by the functions of the web server and then transferred to the business logic for processing. Again, the business logic processes the data and sends it either to the database or back to the web server, this is determined by the type of service required.

- **Data Tier/Database tier**

The system uses one database; this database is the repository consisting of the application data. It is here that all the database tables will be stored.

5.3.1. Subsystem Decomposition and Description

System decomposition refers to the process by which a complex problem or system is broken down into parts that are easier to conceive, understand, program, and maintain. To reduce the complexity of the solution domain, we decompose our system into simpler parts, called subsystems, which are made of a number of solution domain classes. In the case of complex subsystems, we recursively apply this principle and decompose a sub-

system into simpler subsystems. We decompose our system in to six subsystems. These are:

- Registration system
    - Account creation
    - Candidate registration
    - Constituency registration
    - Voter registration
- Profile manipulation system
    - Update account
    - Delete Account/user
    - Change password
    - Update profile
- View system
    - View profile
    - View comment
    - View result
- Report system
- Vote system
- General manipulation
    - Control System
    - Activate system

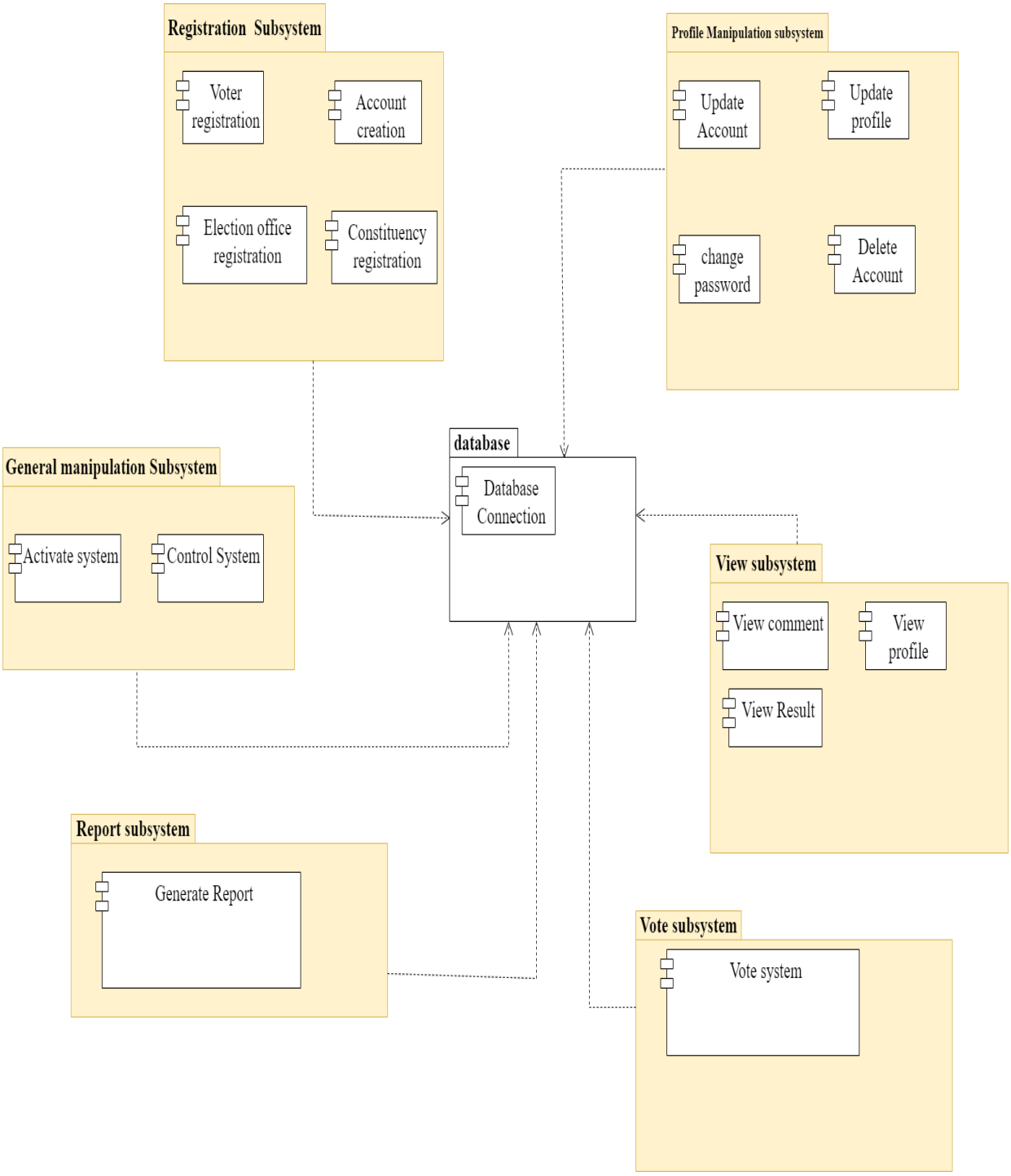


Figure 5. 2 Component Diagram.

5.3.2. Hardware/Software Mapping

- **Deployment Diagram**

Deployment modeling is used to show the hardware of the system, the software that is installed in the hardware and also the middleware that is used to connect the dissimilar machines to one and other. It also shows how the software and the hardware components work together in order perform the task.

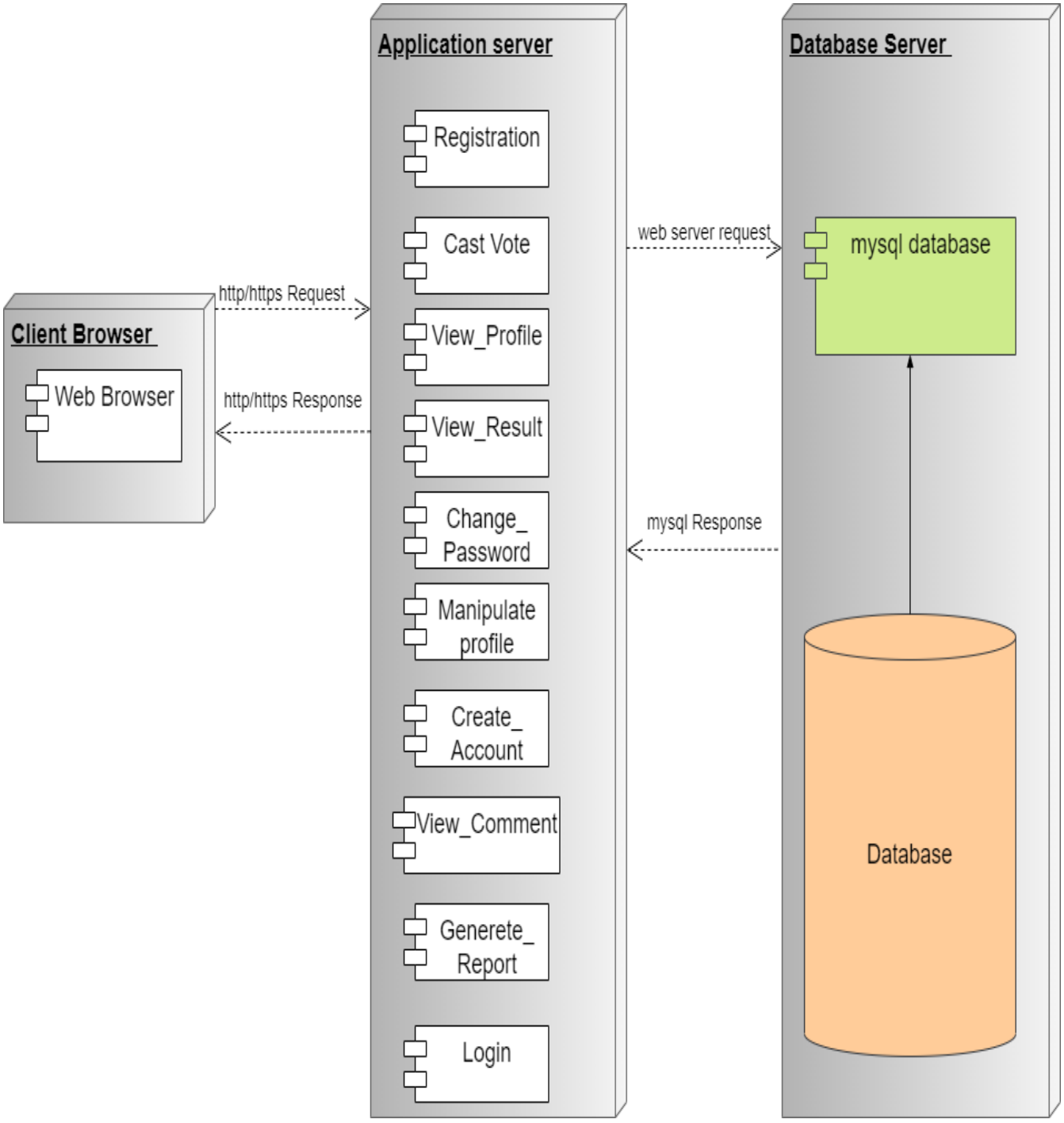


Figure 5. 3 Deployment Diagram.

5.3.3. Detailed Class Diagram

Diagrams are used to represent the structure of the system in terms of objects, their notes and nature of relationship between classes. It shows the static features of the actors and do not represent any particular processing. It is an abstraction of the real environment class of, user and Administrator.

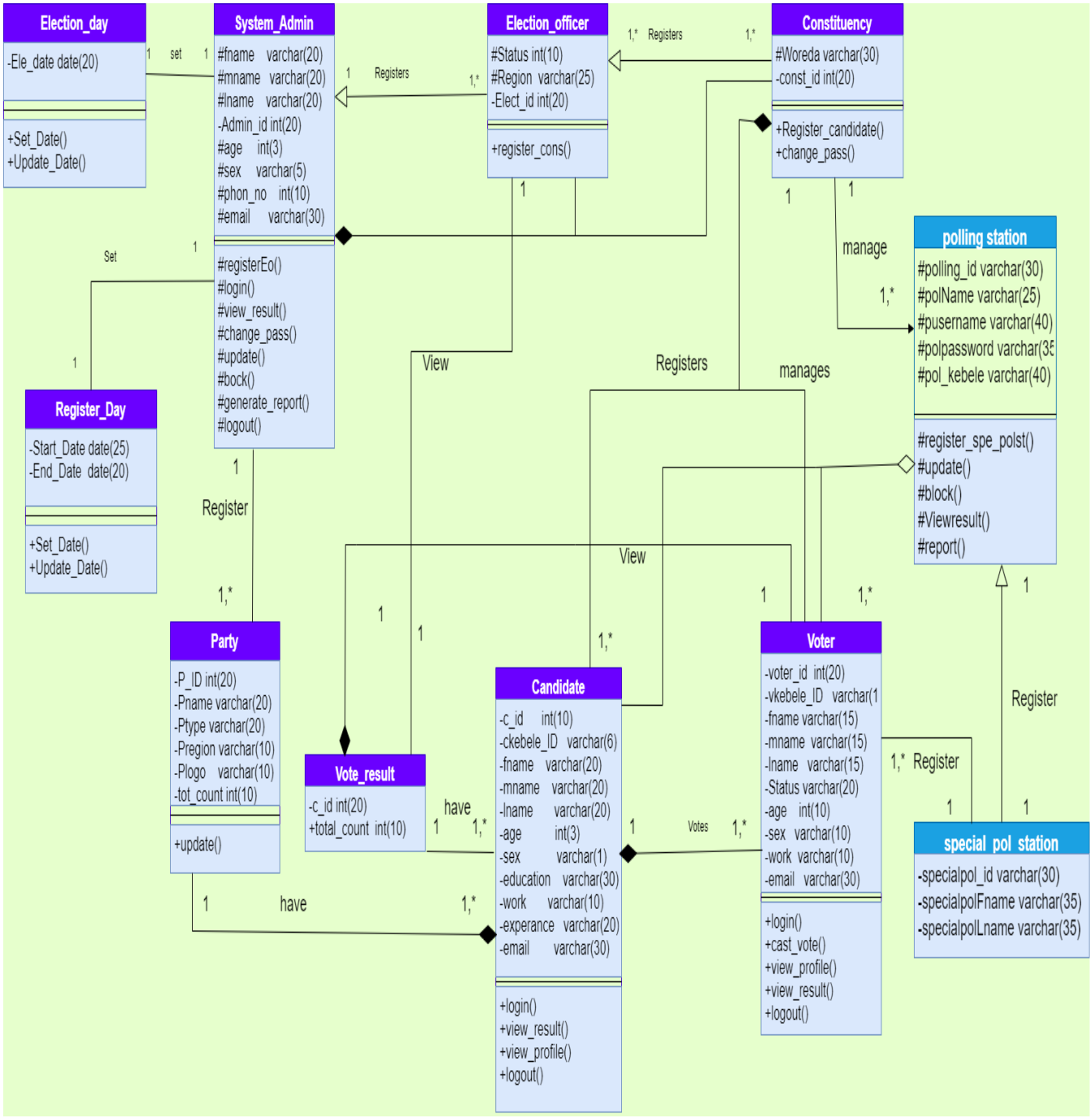


Figure 5. 4 Detailed Class Diagram

5.3.4 **Persistence data**

Persistence data encapsulate the capability to store, retrieve, and delete objects/data permanently.

In the current database system we have used different tables as object and each object is related to each other. This schema enables as data manipulation activity such as select, search, delete, update on the database. The following tables indicate the persistence data management of the system.

Database design is the process of producing a detailed data model of a database
This logical data model contains all the needed logical and physical design choices and physical storage parameters needed to generate a design in a Data Definition Language, which can then be used to create a database. A fully attributed data model contains detailed attributes for each entity. The term database design can be used to describe many different parts of the design of an overall database system. Principally, and most correctly, it can be thought of as the logical design of the base data structures used to store the data.

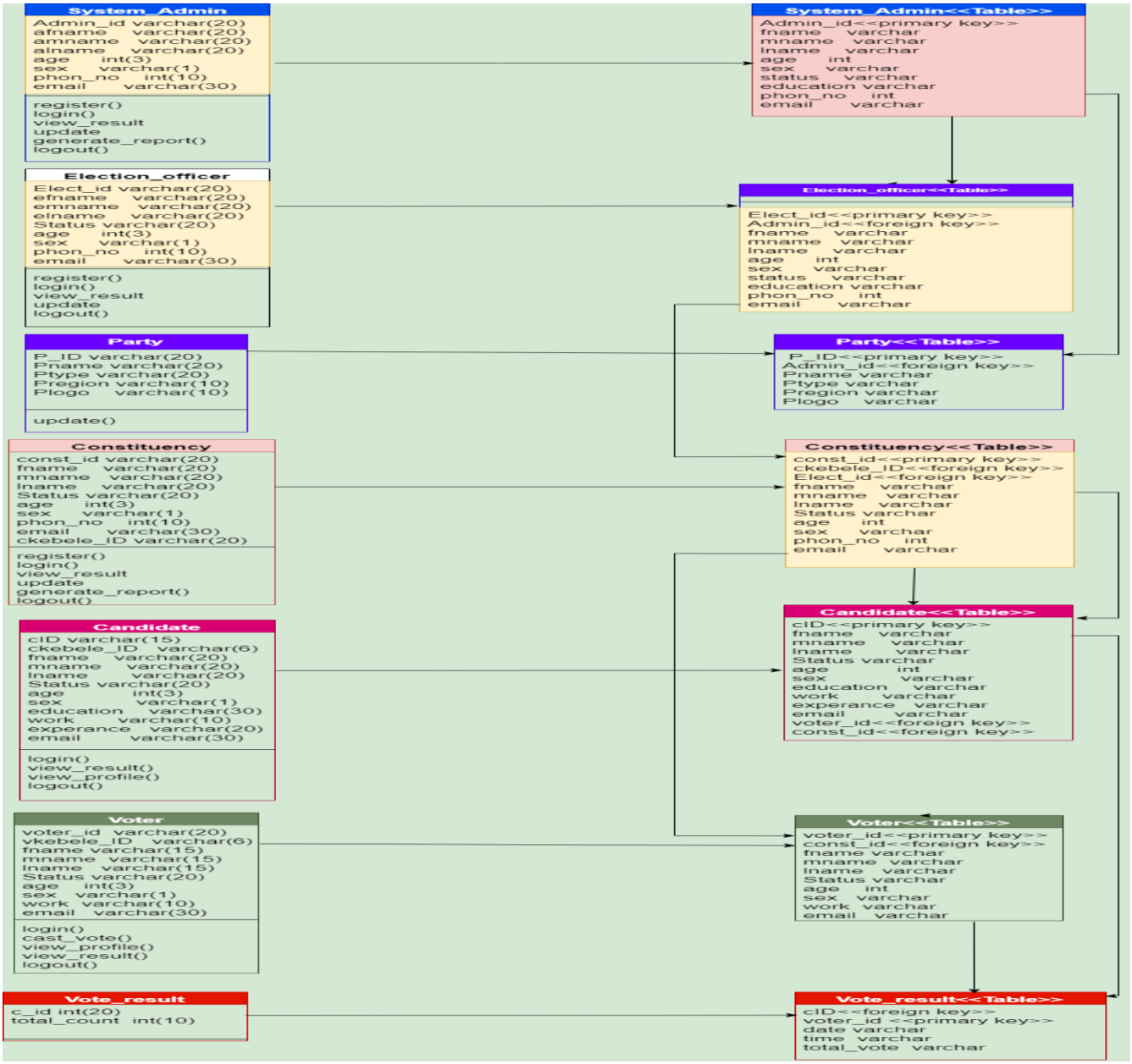


Figure 5. Persistent Diagram

5.3.5. Access Control and Security

When a voter registered to cast his/her vote, IDN is given to the voter for authentication. The registered voter can login to the system with the help of the IDN code. Then, the system shows the check box, names and party symbol of the candidates. The voter checked the check box corresponding to each candidate and submits his/her vote to the system. And we will use encryption method in order to secure the use data when registering and accessing the data from the database. The suspected problem is man-in-the-middle attack. Before the data reaching at the destination, it can be trapped and modified. For the case of the channel between the web browser and the web server, SSL technology is viable solution. So we will try to use SSL technology to secure the data.

Table 5. 1 Access Control and Security table

Operations	Actors						
	System Admin	Election_office	Constituency	Voter	Candidate	Polling Station	Special Polling Station
Manage account	yes	yes	no	no	no	no	no
Manage Election_office	yes	no	no	no	no	no	no
Register Election_office	yes	no	no	no	no	no	no
Manage Constituency	no	yes	no	no	no	no	no
Control System	yes	no	no	no	no	no	no
Voter Registration	no	no	no	yes	no	no	yes
View comment	no	yes	yes	yes	yes	yes	yes
Register Constituency	no	yes	no	no	no	no	no
Register Polling Station	no	no	yes	no	no	no	no
Register Special Polling Station	no	no	no	no	no	yes	no
Caste vote	no	no	no	yes	no	no	no
View Result	yes	yes	yes	yes	yes	yes	yes

View profile	yes	yes	yes	yes	yes	yes	yes
Change password	yes	yes	yes	yes	yes	yes	yes
Login	yes	yes	yes	yes	yes	yes	yes
Generate Report	yes	no	no	no	no	yes	yes
logout	yes	yes	yes	yes	yes	yes	yes

5.4. Packages

Package diagram, a kind of structural diagram, shows the arrangement and organization of model elements in Middle to large scale project. Package diagram can show both structure and dependencies between subsystems or modules, showing different views of a system, for example, as multi-layered (aka multi-tiered) Application - multi-layered application model.

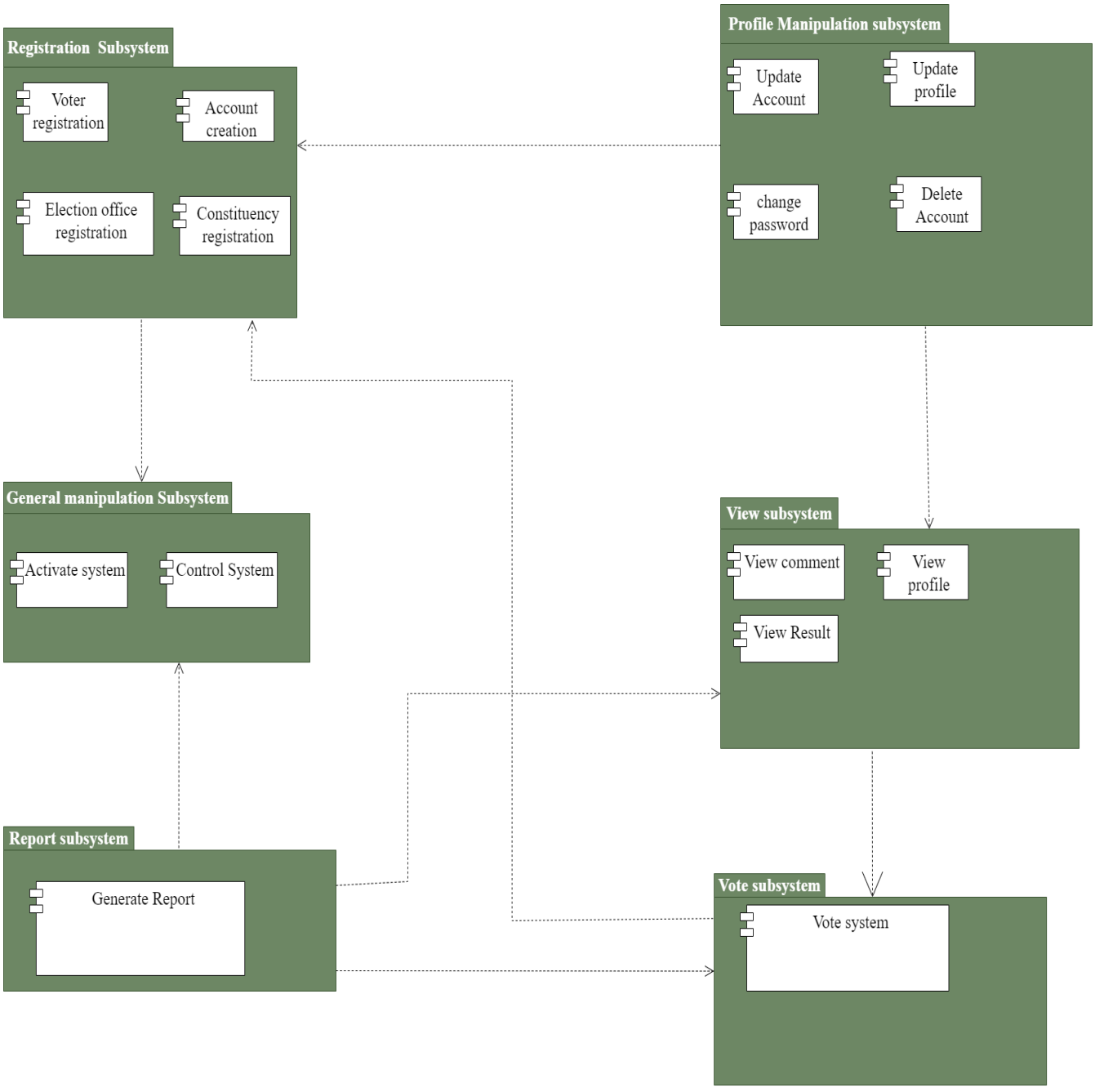


Figure 5. 5 Package Diagram

5.5. Algorithm Design

Some algorithm of our project are the following.

Method1: Login ()

Description

This method enables voter to log in into the system

Login (username, password)

Begin

If (inputs are valid)

Then

GET username and password from database

If (username = =entered username and password = =entered password)

Display “Login success”;

Else

Display “login error!”

End if

Else

Display “inputs are invalid try again!”

End if

End

Method 2: Register Voter ()

Description

This method enables criminals to be registered into the system.

Register Voter (voterl_ID, First Name, Last Name, Age, Sex, Phone no, Address)

Begin

If (input is valid)

Then

Insert (voter_ID, First Name, Last Name, Age, Sex, Phone_no, Address) in to the database

Display “successfully registered message!”

Else

Display “please try again”!

End if

End

Method 3: Create Account ()

Description

This method enables administrator create account for voter.

Create Account (Account_ID, Username, Password, User_Role)

Begin

If (input is valid)

Then

Insert (Account_ID, Username, Password, and User_Role) in to the database

Display “successfully created message!”

Else

Display “please try again”!

End if

End

Method1: Logout ()

Description

This method enables user to logout from the system

Begin

If the user login to the system then and click logout link

Then

Delete cookies and display the home page

End if

5.6. User Interface Design

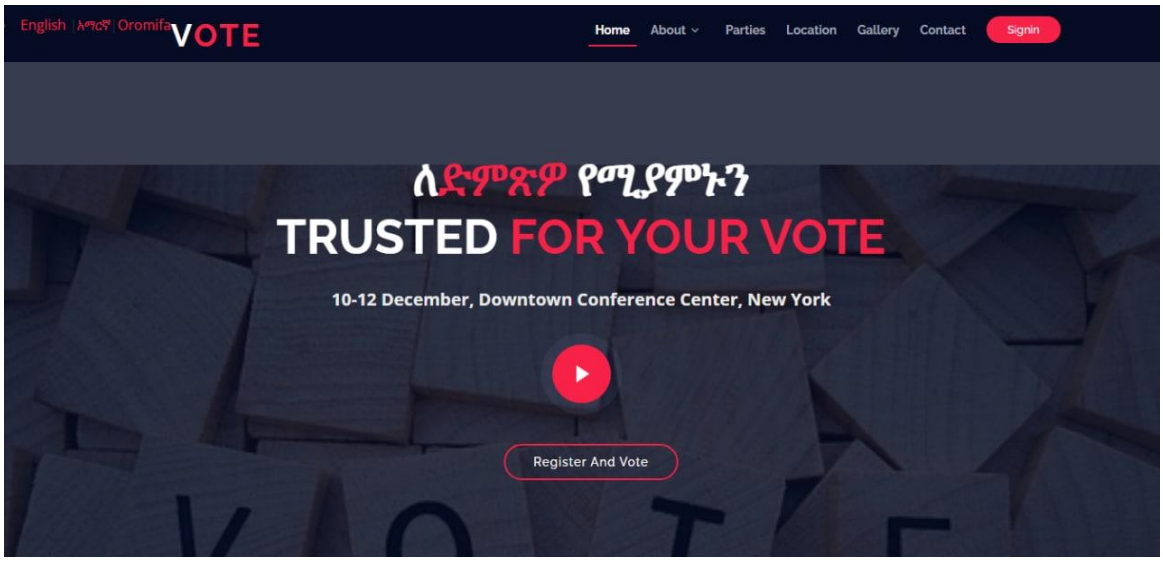


Figure 5. 6 Home page

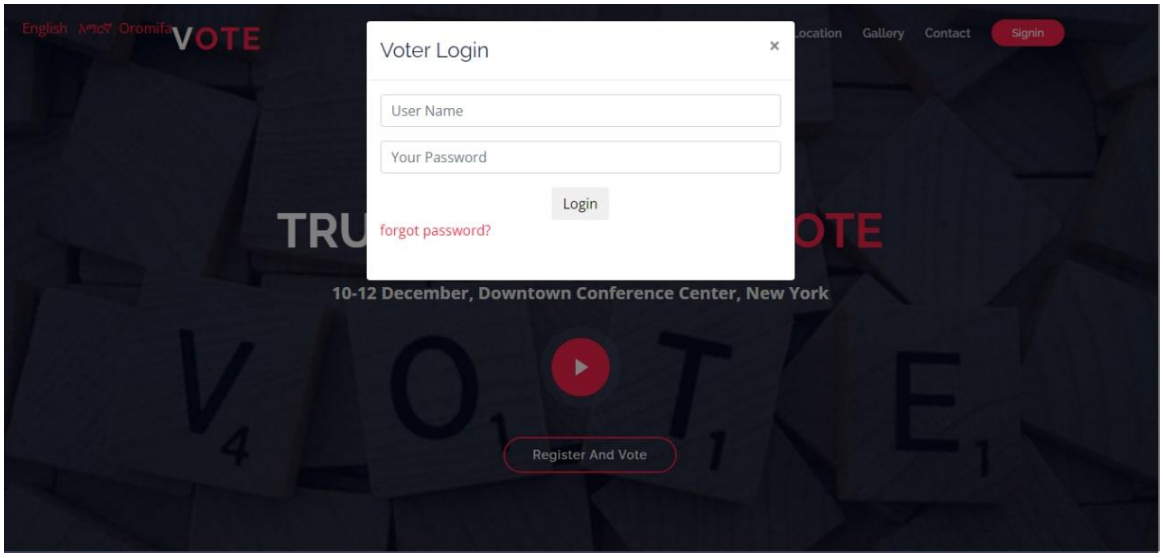


Figure 5. 7 Login page

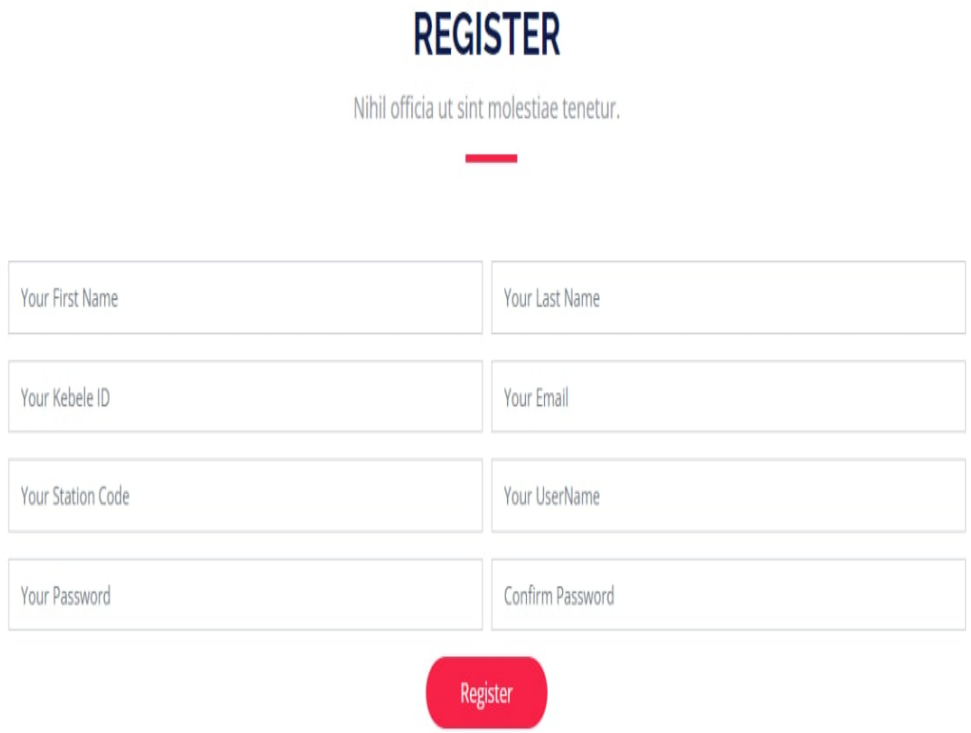


Figure 5. 8 Voter Registration page

CHAPTER SIX

6.1 IMPLEMENTATION AND TESTING

6.2 Implementation of the Database

In this project mySql database server management system used for the implementation of the database.

Because mySql database server is an advanced open-source object-relational system which applies SQL language.

It allows to store large and sophisticated data safely and help developers to build the most complex applications.

Using MySQL database management system helped us to perform the following activities:

- We created all tables which were identified and shown as persistent model in the design document with their primary keys, foreign keys, check constraints and unique constraints.
- We configured a schedule of database backup aromatically in every week.
- We take appropriate level of security to our data base

6.2. Implementation of the class diagram

The implementation of the system is based on the design of the class diagram and the business logic with the targeted programing language. The attributes are properly defined with their data types and access visibilities (modifiers). Methods are also defined appropriately with their return types, parameters, and data types including access visibility. The document of this project is well organized and documented based on the document design.

6.3. Configuration of the application server

In this project, PHP is used as an application server because it is a free, open-source framework and for the purpose of developmental speed and performance as well as for security purposes. It offers interactive shortcuts for full integration with the system databases.

- Folders and files are properly organized.
- The application server properly starts and shutdowns.
- Its configuration enables the remote access of the system.

6.4. Configuration of application security

- The configuration of application security server is well handled for the security purposes. Security issues are handled properly
- All input validations are implemented properly.
- Encryption and decryption algorithms are implemented properly for sensitive data.
- User's roles are handled properly for accessing the system.
- User's accounts are assigned with necessary access privileges.
- Session and cookies are also implemented in this system properly.

6.5. Implementation of user interface

The user interface of this system is implemented based on the design. t is clear and interactive; as much as possible complexity is handled in this user interface.

It reduces memory loads of the users.

It is consistent and interactive.

It is easy and clear to use.

6.6. Testing the system

The functionality of the developed system must be tested because it has to provide its intended goal or functions. The following features are tested:-

- Input and output function
- Subsystem communication
- Database and application server communication
- Databases and user interface interactions
- Graphical user interface.
- Validations and authentication
- Security mechanisms also tested in this system.

6.6.1. Test Case

Sample Test Cases

Registration Form having following fields:-

First name, last name, username, station code, Email, password etc.

6.6.2. Testing tools and Environments

In this project different testing tools are used for testing the system development process progress and for debugging purposes.

Software testing tools

Web browsers (Chrome, Microsoft edge).

Hardware testing tools

Computer (Dell desktop, HP laptop)

6.6.3. Unit testing

We unit testing at the coding level to test the methods' functional correctness of the independent modules, the unit testing technique was used. We used it to isolate a section of codes, verify the correctness of the code, the functions and procedures of the system, to fix debug in development cycle and helped us to understand the code base, reuse code, and enable us to make quick changes. Generally, we used a unit test to correct code errors at the right time.

6.6.4. System testing

We applied System testing at high-level design to ensure the functional and non-functional requirements' correctness, performance, accuracy, functionality validations, and security have been met correctly. We tested the complete and fully integrated software product. Examined how the whole subsystems work together to achieve the desired goal of the user's requirements from the system.

6.6.5. Integration testing

At low-level design, we used integration testing to examine how the different procedures work together to achieve the goal of the system. Check the interaction between individual functionality which performs the specific task. All the screens functions, stores data tables, and other modules were connected with seamless interfacing. All the required outputs were produced successfully as expected from the systems and inputs were validated and stored in the correct formats. In this second level testing technique, we tested the interfacing issues between the modules and we make sure that this project has no interfacing issues between the related modules.

6.6.6. Acceptance testing

We used acceptance testing to determine whether or not the software system has met the required specifications. We used it to evaluate the system's compliance with the business required and verify if it has met the required criteria for delivery to end-users. This system is ready for end-users because we tested it based on the following acceptance testing criteria.

It's functionally correct and complete. It is usable.

Data integrity and confidentiality are ensured. Scalable and available.

Has high performance and security. It is well documented.

CHAPTER SEVEN

7 .CONCLUSION AND RECOMMENDATION

7.1 Conclusion

As a system come up to the stage of completion, it's time to literate the work has been done and check against the developed system success indicator which was set at the beginning of the system. It's the moment to determine whether the attempt is successful as per the predetermined objectives. The project begins with Identifying, defining the problem and adopting an appropriate system development methodology, identifying resource requirements, and setting project schedule. In analysis, we tried to model the new and proposed system using UML diagrams: use case diagrams, sequence diagrams, class diagrams. The new system might look and feel with greater comfort and desired objectivity. In design phase, we extended work analysis with more models. The class type architecture, class diagrams in analysis were extended in design to step closer to the implementation. In general; during the various phases of the project, we have learnt a lot in multidisciplinary technologies required to be embed with this system and these technologies would be useful in our future techno-economic career. We have applied the best efforts towards the achievement of our desired objectives of the proposed system. We tried our best to design a better architecture of the proposed web based voting system for Ethiopia. We conclude that we have almost achieved objectives for the promising solutions for problems to voting for Ethiopia.

Generally: - This web based voting system for Ethiopia performs or cover some limitation of manual based system like resource consuption,long voting process, delay publication result report, are previously performs by manually but, Our system Performs this task based on computerized with effective and fast way.

7.2 Recommendation

According to scope of our project the team develops web based application. Because of the time constraint we may have limitation which should be consideration in, but in the feature the team believes that this system should be fully operationally by adding some functionality that are not included in the system. We also want to recommend this project can be expanded and more automated with additional functionalities by integrating with many new technologies. If any organization, group or individual is interested in re-making and improving this web based lounge service system project we as a group recommend them to include the following features need to be incorporated in any further revision and extension.

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