Vote Hub: An Online Election System

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Project Detail

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*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others

Plagiarism Free Certificate

This is to certify that, I am ___Muhammad Rabbi___ S//o __Muhammad Arif Butt___, group leader of FYP under registration no CIIT/_FA16-BCS-314_/LHR at Computer Science Department, COMSATS Institute of Information Technology, Lahore. I declare that my FYP proposal is checked by my supervisor and the similarity index is _6_% that is less than 20%, an acceptable limit by HEC. Report is attached herewith as Appendix A.

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Abstract:

We are designing a prototype Vote Hub to conduct online elections for any organization according to their need. Vote Hub is a web-based ONLINE ELECTION SYSTEM in which we will give a platform to organizations and users to manage the election system according to their own requirements. We will be providing the easiest way of conducting election to elect a suitable candidate. Voter can cast vote by only one click after logging into the system by inserting their valid credentials. Vote Hub is being designed in such a way that high security techniques are implemented in it to ensure security. Two factors authentication is one of the security features. Paper polling is a waste of valuable resources like time, paper, and money. Traditional election system takes a lot of effort of the organizer to manage the election and counting vote. So we implement the paper free idea to speed up the things in the era of technology by avoiding the conventional paper polling elections. The people/employees who are out of the station due to any reason can cast votes manually availing this online voting system by using any Internet connected device's web browser like chrome, Firefox etc. ensuring that no chance of rigging will occur during elections. Our designed prototype will be tested in COMSATS. This project will be designed by using several programming languages (React, JavaScript, Node, and Mongo DB). If the application/software is not installed on the candidate's device he/she will not be able to use the facility.

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CHAPTER 1

INTRODUCTION

1 Introduction

Some develop countries have already come through the paper polling elections and now working with the technology using online systems for elections. Our goal is to make this trend also applicable in Organizations of Pakistan so that people can ease them self with technology, and an organization can ease them self with the savage of valuable resources like time, money, efforts of managing the elections and counting the votes.

So we came up with Vote Hub which gives a platform for any organization to conduct an election and manage it according to their particular desire which means this system has given the user the freedom to decide the topic of election, limit the number of voters, symbols of candidates, date and time of election, how many candidates are participating and updating the list of candidates and eligible voters in a short span of time. We are testing our designed prototype in COMSATS, where all the eligible voters can cast their vote by just one click after going through the two factor authentication process.

Security is one of our main components in this project. High security features are being implemented in it. In which we are using latest techniques to secure the system like two factor authentication for the voter so there should be no double casting vote and there will be no chance of rigging the election. First part of authentication includes **Email verification**. A link of the voting site/ voting ballot is being sent by the system to the voter on their email, from which they can access the voting site. **Code Generator** is second part in our **two factor authentication** process. The Code Generator: in security context is a category of authenticating user by sending a random 6 digit system generated code via Email or Number. User need to answer that security question in order to pass that authentication process. These security features verifies the user from all aspects.

Organizations overseas voters can also cast their vote by this online voting system by logging in our system. A suggestion and issue box is provided to the users where people can give suggestions and express their views on different problems anonymously.

2 Objective

- Our main objective is to provide paper free Election platform to the Organizations of Pakistan with powerful security features to avoid chances of rigging.
- This platform will help them to save their valuable resources like time, money and cost of management
- To allow people to cast votes according to their own will without any third party pressure.
- Ensuring the security with two factors authentication.
- Code Generator used to send the verification code
- User has the liberty to organize the election according to their needs.
- Updating the list of candidates and eligible voters in a short span of time.
- Not allowing the double casting of vote.
- Encrypting the voter's identity and its casted vote.
- Even Admin or Organization organizing the elections has not the access to see the voter's identity and vote.
- To provide ease for the people so that they will not need to go too far places to cast votes.
- Admin cannot access the result before time.
- Automatic counting of votes.
- Notification system for sending reminders alerts and news about election to the voters
- To reduce the risk of mistakes while counting of votes.
- To reduce the effort & cost of counting and creating ballots.
- Saving of the valuable resources.

3 Problem Statement

As we are living in a computerized world, electronic voting system provides potential for voting and improves the election management techniques over what has been available till now with manual voting systems. Paper polling system is totally waste of time and valuable resources. Chances of rigging are high in paper polling system and voter's identity can be compromised at any stage. Cost of managing single election is too high. Most important people who are out of station are unable to cast their vote because they are not physically present at the time of election. Keeping all these restrictions and cons in mind we came up with a prototype of Online Election System that is far much better, faster, economical, and reliable in terms of security and voters identity to ensure a democratic culture in Pakistan Organizations.

4 Assumption and Constraints

- An online connection is mandatory to use the system.
- Candidate can vote only once irrespective of any mistake done.
- As it is an online voting system, in case of non-availability of internet the voter will not be able to submit the vote.
- Voter must have a verified email on which he/she will receive an election link without that, voter cannot get access to the election site.
- To ensure security code generator is added so if a person has no mobile phone he/she will not be able to access the ballot.
- In case of week internet connection the information might not get submitted within the given time frame and the vote will be wasted.
- This software system cannot be used offline
- Vote must be submitted with in the given time span otherwise vote will be wasted.
- Only voters updated in the voter list are allowed to cast the vote. No third person can access the ballot in any case.

5 Project Scope

- We are providing a platform where organizations can manage their own elections with minimal efforts.
- Increasing number of voters as individuals will find it easier and more convenient to vote.
- Less effort and less labor intensive, as the primary cost and focus primary on creating, managing, and running a secure web voting portal.
- To make easy and reliable election system with advance security features encouraging the democratic culture in Pakistan's organization
- Using this online system if you are out of station due to any reason you will not need to go back to the relevant place for just casting vote rather you can cast vote from your personal mobile phone as well.
- Candidates can submit their point of views on different needs and issues on the system.
- You can view the total count of votes which each elected leader got through each area.
- Improves voting with friendly Interface

CHAPTER 2

Requirement Analysis

1 Literature Review

There are various application development tools which provide little functionality similar to our project. The functionalities of such applications are similar to our project but each of them has certain limitations in some areas. The major web-based applications are:

1. VoxVote

VoxVote is a simple and user-friendly online voting system with many interactive features. This online application is used to make quizzes, questionnaires and surveys etc. Logos and colors for the organizations can also be managed by using this application. Results and conclusions can also be shown with its results graphics. For using this application you first have to login to the system. Prepare your presentations or quizzes into new VoxVote project and send it to the audience using a pin code. If you want to make any changes, editing should be done before achieving and will be sent through “send email" buttons on the event.

- **Critical Analysis:**

While using this application results can be sent to different members of an organization. VoxVote helps you reduce paper work and manual processes. As this application tallies the results by its own hence helps in interactive exchanges very well. Its integrated presentation tools help to highlight facts and figures while giving presentations so you don’t need to switch between the solution and researched presentation solutions.

2. Election Runner

Election runner is a mobile application for an organization to conduct elections and is available on iTunes and Google play for free download. This iOS and android mobile application is developed to provide voters a very convenient platform to vote. To use this mobile based application voter must login to the election runner. Account settings can be done by clicking on the settings button which is at the top of the dashboard. App can be enabled or disabled when required by clicking the toggle. This mobile application is very efficient in managing ballots over emails, nominations and phone voting.

- **Critical Analysis:**

Election runner is a mobile based application but as it is a web-based application voter don't need to necessarily use mobile device for voting. Instead voters can access elections using any of the internet connected device by any device's web browser of their choice like chrome, Firefox, safari etc. If some organization's administrator is providing email address for voting, the voters don't need to download the app but can simply vote over there as the link in their email will directly open their device's browser.

3. Pool Gateway:

Poll gateway is a well featured android, web and windows-based application designed to serve businessmen, entrepreneurs and SMEs. Ranked choice voting, phone voting, ballots over emails, Nominations, SMS voting, candidate profiles can be managed at one place using this application. Poll gateway wizard can be used to make new policies, create users and secure access. Interaction with stakeholders can be performed using an email or SMS engine.

- **Critical Analysis:**

Poll gateway provides a very secure platform for the users and they can cast vote only once. Social Security code, unique citizen code or biometric authentications can be used to enhance user's privacy. Another important feature of this application is poll gateway AI which is used to detect errors, illegal practices and exceptions. End to End encryption is applied so that the voting data cannot be decrypted.

2 Stakeholders List

- User (voters, nominated candidates, organizers)
- Admin
- Development Team
- Market competitors

3 Requirement Elicitation

3.1 Functional Requirements

FR01: Login

Req. No.	Functional Requirements
FR01-01	The system shall allow the user to enter username and password.
FR01-02	The system shall lead the user to dashboard if login was successful.
FR01-03	The system shall prompt the user to enter username and password again if login was unsuccessful.
FR01-04	The system shall allow the user to recover their password by clicking the forgot password button.
FR01-05	The system shall allow the user to save their login details by clicking the remember me check box

FR02: Sign Up

Req. No.	Functional Requirements
FR02-01	The system shall allow the user to sign up.
FR02-02	The system shall allow the user to sign up to the system by clicking the “sign up” button..
FR02-03	The system shall prompt the user if username or email id is already taken.
FR02-04	The system shall lead the user to the app if sign up is successful.

FR03: Create New Elections

Req. No.	Functional Requirements
FR03-01	The system shall allow the user to create elections if the login was successful by clicking create new elections button.
FR03-02	The system shall allow the user to enter the relevant details to create the elections.
FR03-03	The system shall notify the user after the election is created.

FR04: Elections Details

Req. No.	Functional Requirements
FR04-01	The system shall allow the user to enter the elections details, such as election starting & ending time and date.
FR04-02	The system shall allow the user to save the entered details by clicking the save button.
FR04-03	The system shall allow the user to move to next step by clicking the next button.
FR04-04	The system shall not allow the user to move to next step if any input field is missing there.

FR05: Create Ballot

Req. No.	Functional Requirements
FR05-01	The system shall allow the user to create Ballot if the login was successful by clicking the add position or question button.
FR05-02	The system shall allow the user to enter the relevant details to create the Ballot.
FR05-03	The system shall allow the user to save the entered details by clicking the save button
FR05-04	The system shall allow the user to move to next step by clicking the next button.
FR05-05	The system shall not allow the user to move to next step if any input field is missing there.

FR06: Notifications

Req. No.	Functional Requirements
FR06-01	The system shall allow the user to select a notification method through which elections announcements and verification's held.
FR06-02	The system shall allow the user to move to next step by clicking the next button.
FR06-03	The system shall not allow the user to move to next step if any input field is missing there.

FR07: Update Voters List

Req. No.	Functional Requirements
FR07-01	The system shall allow the user to update the voter list into the system.
FR07-02	The system shall allow the user to add voter id, voter email and voter phone number in proper format to continue
FR07-03	The system shall allow the user to add any voter with same email, same id and same phone number.
FR07-04	The system shall allow the user to move next after the voter are updated successfully

FR08: Review

Req. No.	Functional Requirements
FR08-01	The system shall allow the user to review all the elections details which he/she has submitted before running the elections.
FR08-02	The system shall allow the user to go back to previous step if any change is required by clicking back button.
FR08-03	The system shall allow the user to move to next step by clicking the save & next button.

FR09: Change Account Settings

Req. No.	Functional Requirements
FR09-01	The system shall allow the user to change his/her account details.
FR09-02	The system shall notify the user after the account settings are successfully updated.
FR09-03	The system shall enable the user to cancel the process by clicking the cancel button.
FR09-04	The system shall notify the user if the changes made cannot be updated.

FR10: Count Votes

Req. No.	Functional Requirements
FR10-01	The system shall counts the votes automatically by verification from the database.
FR10-02	The system shall display the total count of votes for each nominated candidate by clicking the "votes count" button.

FR11: Submit Vote

Req. No.	Functional Requirements
FR11-01	The system shall allow the voter to access the ballot by entering the verified credentials.
FR11-02	The system shall allow the voter to select a candidate and submit vote by clicking the "submit vote" button.
FR11-03	The system shall notify the voter after the vote gets successfully submitted.

FR12: View Profile

Req. No.	Functional Requirements
FR12-01	The system shall allow the user to view profile after login by clicking the Profile button.
FR12-02	The system shall allow the user to display and access all the options in profile menu.

FR13: Logout

Req. No.	Functional Requirements
FR13-01	The system shall allow the user to logout their account.
FR13-02	The system shall lead the user to login panel when logout successful.

3.2 Non-functional requirements

NFR01: Performance

NFR01-01	Average load time of the starting page of the system must be less than 2 second.
NFR01-02	Average processing time taken by the system to complete a request should be less than 10 seconds.
NFR01-03	System Mean Time to Failure should not be more than 60seconds within 24 hours of use.
NFR01-04	Average system response time should not be greater than 5 seconds.

NFR02: Security

NFR02-01	System must provide access to authorized users only that enter through the login module.
NFR02-02	System must not provide access to any user except the designated user to update the database.
NFR02-03	No user can view data of any other user through any report or views provided by the system.

NFR03: Usability

NFR03-01	The system will provide detailed help documentation about each and every module and functionality provided by the system.
NFR03-02	Easy to use interface for non-technical users or for users using application for the first time.

NFR04: Defects-Maintenance

NFR04-01	Post Release defects of the system must not exceed 1 critical bug per month.
NFR04-02	Post Release bug fixing should not take more than 5 hours.

NFR05: Reliability

NFR05-01	In case of client /server crash all information/data should be recoverable within 30 minutes of the incidence.
NFR05-02	The system will ensure no data is lost in case the application crashes.

NFR06: Supportability

NFR06-01	The web application will successfully run on Chrome, Firefox or any related internet browser.

4. Requirements Traceability Matric

Table 1: Requirement Traceability Matrix

Requirements	Actor	Team member	Priority	Use case ID	Use case Diagram
FR-01	User / admin	Rabbi	High	001	Figure 1
FR-02	User/ admin	Rabbi , M.Ali	High	002	Figure 1
FR-03	User/ admin	M.Ali	Medium	003	Figure 1
FR-04	User / admin	Rabbi, M.Ali	High	004	Figure 1
FR-05	User / admin	Rabbi, M.ali	High	005	Figure 1
FR-06	User / admin / system	Rabbi, M.ali	High	006	Figure 1
FR-07	User / admin	Rabbi, M.Ali	High	007	Figure 1
FR-08	User / admin	Rabbi, M.Ali	Medium	008	Figure 1
FR-09	System	Rabbi, M.Ali	High	009	Figure 1
FR-10	Voter	Rabbi, M.Ali	High	010	Figure 1
FR-11	User / admin	Rabbi	Low	011	Figure 1
FR-12	User / Admin	M.ali	Low	012	Figure 1

5. Use case descriptions

Table 2: Use case description of Login

Use case ID 001	**Use case Name: Login**	
Priority	**high**	
Actors:	User, Administrator	
Use Case Summary	Login allows to user to login into the system and access dashboard.	
Pre-condition:	The user must sign up to the system if he/she wants to log into the system.	
Normal Flow of Events		**Alternative Path**
1. The use case starts when the user wants to use the system's functionality by logging in.		
2. The user must enter his/her Email ID and password to login to the system.		
3. The system will get opened by displaying "welcome to Vote Hub".		
4. This use case ends.		
Exceptions / Alerts		
1. The system will not allow to login without accurate Email ID and password.		
Post Conditions		
Step#		**Description**
User is now login into the system.		
Use Case Cross References		
Includes	Cancel Action	
Extends	None	

Table 3: Use case description of Sign Up

Use case ID 002	**Use case Name: Sign Up**
Priority	**high**
Actors:	User, Administrator
Use Case Summary	Sign up allows user to permanently register into the online Vote Hub.
Pre-condition:	First of all the user must open the Vote Hub system so that he/she can register to the system.

Normal Flow of Events	**Alternative Path**
1. The use case starts when the user wants to add his/her account to the system.	**1a:** If the user does not confirm the registration the account will not get registered.
2. The user must enter the following information I.e. first name, last name, email to get registered to the system.	
3. The system responds by asking the user to confirm registering the information.	
4. User confirms registration.	**4a:** The user press "cancel" button.
5. A system responds by registering the information and notifying the user that the profile has registered.	
6. This use case ends.	

Exceptions / Alerts
1. The system will not allow the user to use the system without registration. .
2. The system will not allow to get registered without filling all the text boxes.
3. The system does not allow the user to access dashboard without Email authentication.

Post Conditions	
Step#	**Description**
The user has registered into the Voting Hub system.	

Use Case Cross References	
Includes	Cancel Action
Extends	None

Table 4: Use case description Create New Elections

Use case ID 003	**Use case Name: Create New Election's**
Priority	**medium**
Actors:	User
Use Case Summary	Create New Elections allows the user to create elections into the system.
Pre-condition:	The user must login into the system if he/she wants to create new election into the system.

Normal Flow of Events	**Alternative Path**
1. This use case starts when the user login to the system.	
2. The user must click onto the "new election" button to start the election process.	**2a**. User cancel the action by clicking the cancel button.
3. The user submits the details by clicking the "confirm" button.	
4. This use case ends.	

Exceptions / Alerts
1. The system will not allow the user to create new elections without logging into the system.

Post Conditions	
Step#	**Description**
The user will have created the election page into the system.	

Use Case Cross References	
Includes	Cancel Action
Extends	None

Table 5: Use case description of Election Details

Use case ID 004	**Use case Name: Elections Details**	
Priority : high		
Actors: User		
Use Case Summary	The system shall allow the user to enter the election details such as election title, start time, end time, star date and end date of election.	
Pre-condition:	The user must login first into the system to view details.	
Normal Flow of Events		**Alternative Path**
1. The use case starts when the user wants to generate new elections after clicking the new election button.		
2. The user must fill all the required fields to continue further.		
3. The system responds by moving to next step when all details are entered and user clicks the save button.		**3a.** The user clicks "cancel" button.
4. This use case ends.		
Post Conditions		
Step#		**Description**
The details of election have been updated in database.		
Use Case Cross References		
Includes	Cancel Action	
Extends	None	

Table 6: Use case description Create ballot

Use case ID 005	**Use case Name: Create Ballot**	
Priority:	**High**	
Actors:	User	
Use Case Summary	Create ballot allows the user to create ballot page into the system.	
Pre-condition:	The user must login into the system if he/she wants to create ballot into the system.	
Normal Flow of Events		**Alternative Path**
1. This use case starts when the user wants to create new elections into the system.		
2. The user must click onto the "new election" button to start new elections first.		
3. The user must enter the candidates name position or question and description in order to create ballot.		**3a.** The user clicks the "cancel" button.
4. The user submits the details by clicking the "confirm" button.		
5. This use case ends.		
Exceptions / Alerts		
1. The system will not allow the user to create ballot without logging into the system. **2.** System will not allow user to crate ballot before creating new elections details.		
Post Conditions		
Step#		**Description**
The user will have created the ballot page into the system.		
Use Case Cross References		
Includes	Cancel Action	
Extends	None	

Table 7: Use case description Send Notification

Use case ID 006	**Use case Name: Send Notifications**	
Priority: High		
Actors: System		
Use Case Summary	The use case shall allow the system to send notifications such as election reminders, email verifications link and access key to the voter.	
Pre-condition:	The user must login and create new elections first in order to send notifications.	
Normal Flow of Events		**Alternative Path**
1. This use case starts when user or admin creates new elections.		
2. After filling the election details and creating ballot user or admin selects the notifications methods.		
3. User must select at least one of the notifications methods to send notification by marking the options.		**3a.** User may select Email notification system. **3b.** User may select Number notification system. **3c.** User may select both.
4. This use case end.		
Exceptions / Alerts		
1. System will only send notification if new election is created. **2.** System will not send any notification if user does not select any of the sending method.		
Post Conditions		
Step#		**Description**
System will send the notifications to the voters after the elections are created through mail or number.		
Use Case Cross References		
Includes	None	
Extends	None	

Table 8: Use case description Review Details

Use case ID 007	**Use case Name: Review Details**	
Priority : medium		
Actors: User		
Use Case Summary	System shall allow the user to review all the election details before finally running the elections.	
Pre-condition:	Use must log in and create new elections first and enter election details in order to review them.	
Normal Flow of Events		**Alternative Path**
1. This use case starts when user wants to review all elections details entered.		
2. User first creates new elections by clicking the new election button and enters all the elections details step by step.		**2b.** User CANCELS the action.
3. Before running the election user must click review button in order to review all the election details he/she entered.		**3a.** User confirms the details and click submit button to run the elections. **3b.** User wants to go back to edit the details further more.
4. This use case ends.		
Exceptions / Alerts		
1. The system shall not allow the user to review the details if elections are not created step by step.		
Post Conditions		
Step#	**Description**	
System will allow the user to review all the election details and submit them to start running the election.		
Use Case Cross References		
Includes	Skip	
Extends	None	

Table 9: Use case description Change Account settings

Use case ID 008	**Use case Name: Change Account Settings**
Priority	**medium**
Actors:	User, Administrator
Use Case Summary	Account settings allow the user to change/update account details into the system.
Pre-condition:	The user first login into the system to change account settings in the system.

Normal Flow of Events	**Alternative Path**
1. The use case starts when the user wants to change account settings.	
2. The user must click the "Profile" button and then on "settings" button to update changes.	
3. The user edits the details like password, email etc.	**3a.** The user clicks cancel button.
4. The user clicks "confirm" button to update the changes.	
5. The system responds to the user that the changes have been updated.	**5a.** Changes don't get updated.
6. The use case ends.	

Post Condition	
Step#	**Description**
The user has updated the account settings.	

Use Case Cross References	
Includes	Cancel Action
Extends	None

Table 10: Use case description submit vote

Use case ID 010	**Use case Name: Submit Vote**	
Priority **High**		
Actors: Voter		
Use Case Summary	Submit vote allows the user to cast vote by selecting the candidate.	
Pre-condition:	The user must pass the authentication process such as Email verification & access key to reach the ballot to cast vote.	
Normal Flow of Events		**Alternative Path**
1. The use case starts when the voter wants to cast vote.		
2. The voter must provide verified credentials to see the ballot.		
3. The voter selects the concerned candidate.		
4. Voter clicks on the "submit vote" button to cast vote.		**4a.** The user press "cancel" button.
5. The voter clicks the "Confirm" button.		
6. The use case ends.		
Exceptions / Alerts		
1. Once the user submits the vote, the action cannot be reversed to choose any other option.		
Post Conditions		
Step#		**Description**
The User will have submitted the vote.		
Use Case Cross References		
Includes	Cancel Action	
Extends	None	

Table 11: Use case description Logout

Use case ID 012	**Use case Name: Logout**	
Priority **Low**		
Actors: Voter		
Use Case Summary	Log out will allow the user to go back to the login panel from dash board.	
Pre-condition:	The user must click logout button in profile menu in order to logout from the system	
Normal Flow of Events		**Alternative Path**
1. The use case starts when user wants to close all the activities and go back to the login panel.		
2. The user must click the logout button in the profile menu.		
3. The use case ends.		
Exceptions / Alerts		
1. Once the user clicks the logout button, he/ she will be directed to the login panel.		
Post Conditions		
Step#		**Description**
The User will have submitted the vote.		
Use Case Cross References		
Includes	Cancel Action	
Extends	None	

6. Use case design

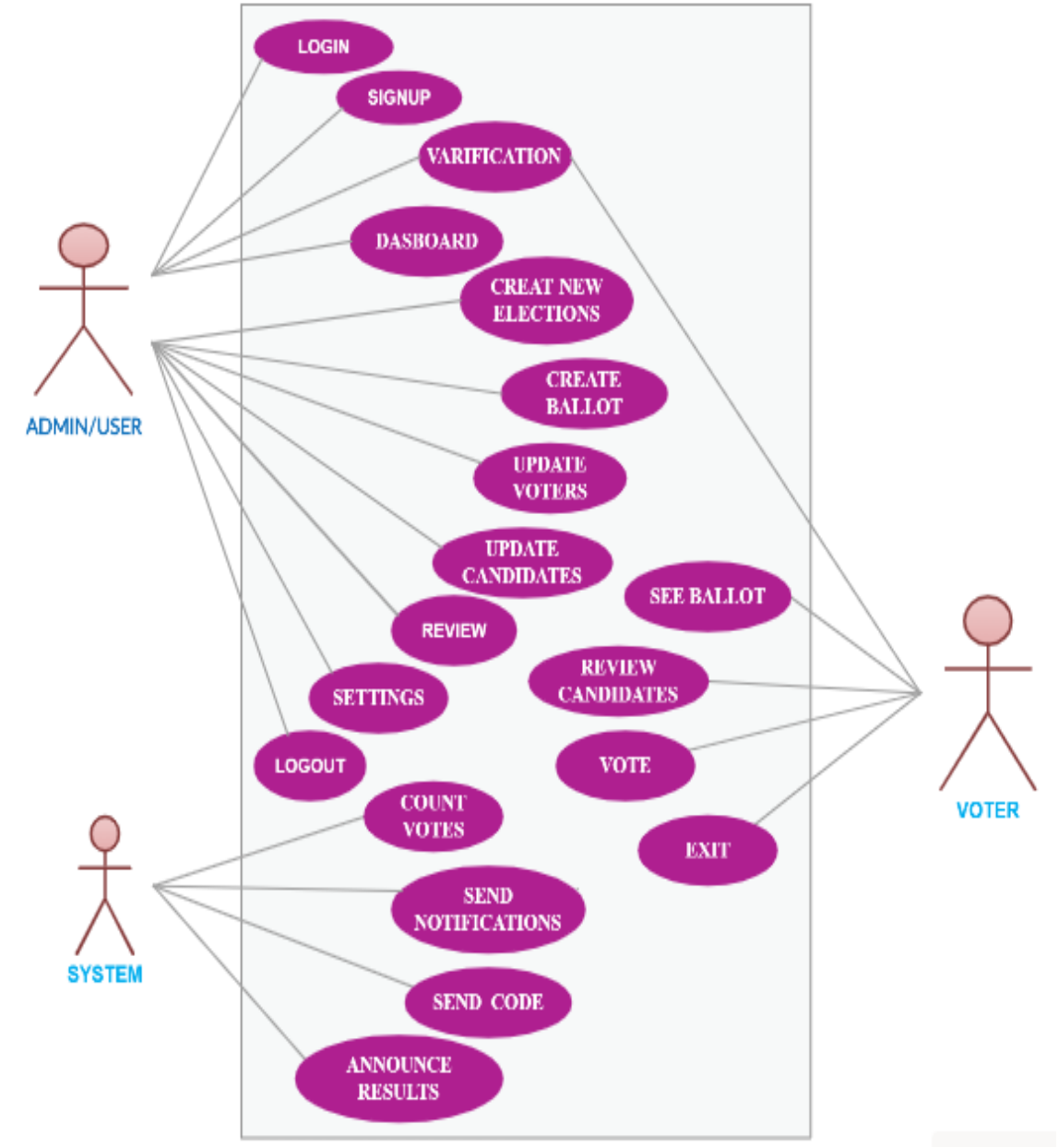

Figure 1: Use case model of system

6.1 Use Case Design of Voter

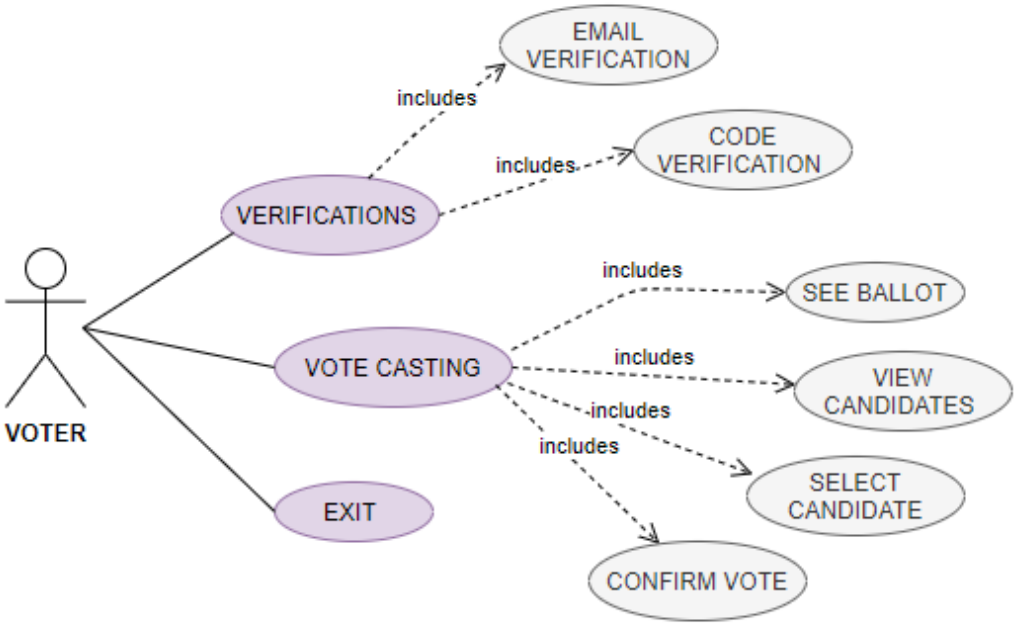

Figure 2 Use case design of voter

6.2 Use Case Design of Admin

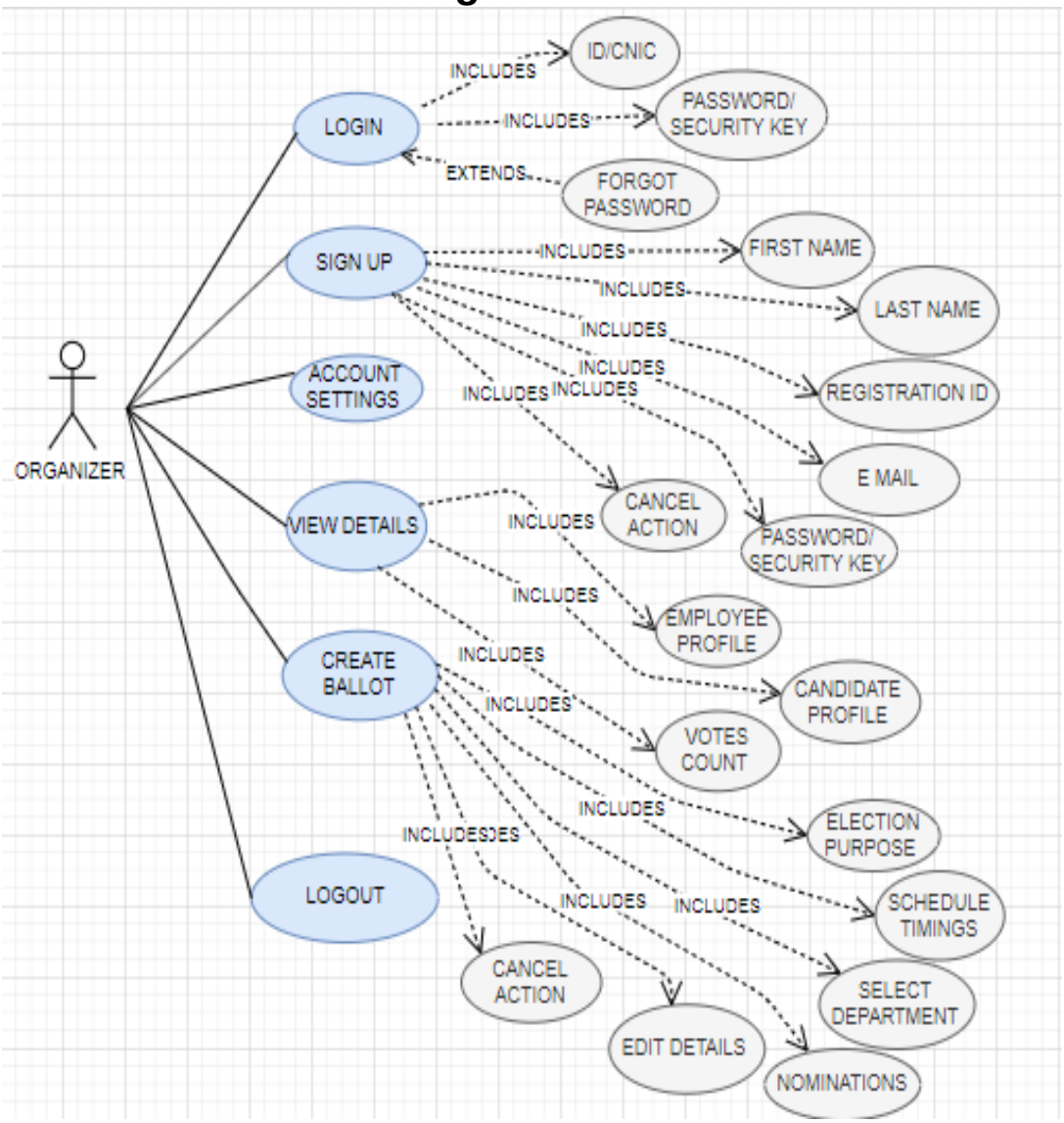

Figure 3: Use case model of Admin / organizer

6.3 Use Case Design of System

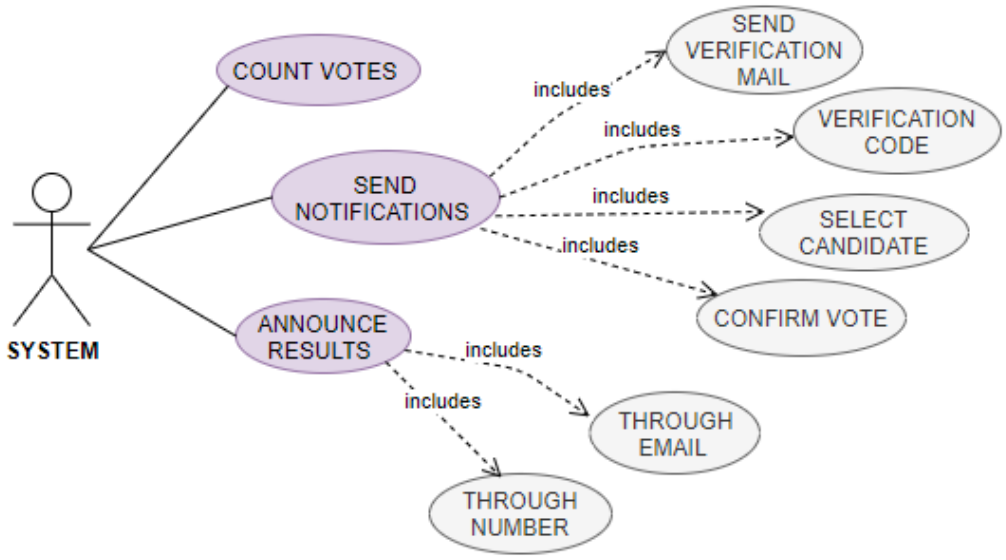

Figure 4 Use case model of System

7 Software development lifecycle model

Hybrid Model

We are using hybrid model which is the combination of prototype model and Incremental model. Hybrid model because in this way the requirements are broken down into multiple smaller standalone modules and the replications of these modules are implemented so that we can see the product results at early life cycle stage. This is done before or during the analysis phase.

Why Hybrid Model?

- It will generate working system in much less time during the software development life cycle.
- Requirements will be divided into independent standalone modules.
- It will be easier to test and debug in smaller iterations.
- Those smaller modules will be implemented so that there will be less risk of errors.
- Errors can be easily detected and removed with smaller sections.
- Better increased user involvements.
- Improved quality of requirements specifications hence save time and cost.

CHAPTER 3

SYSTEM DESIGN

1 Work breakdown structure

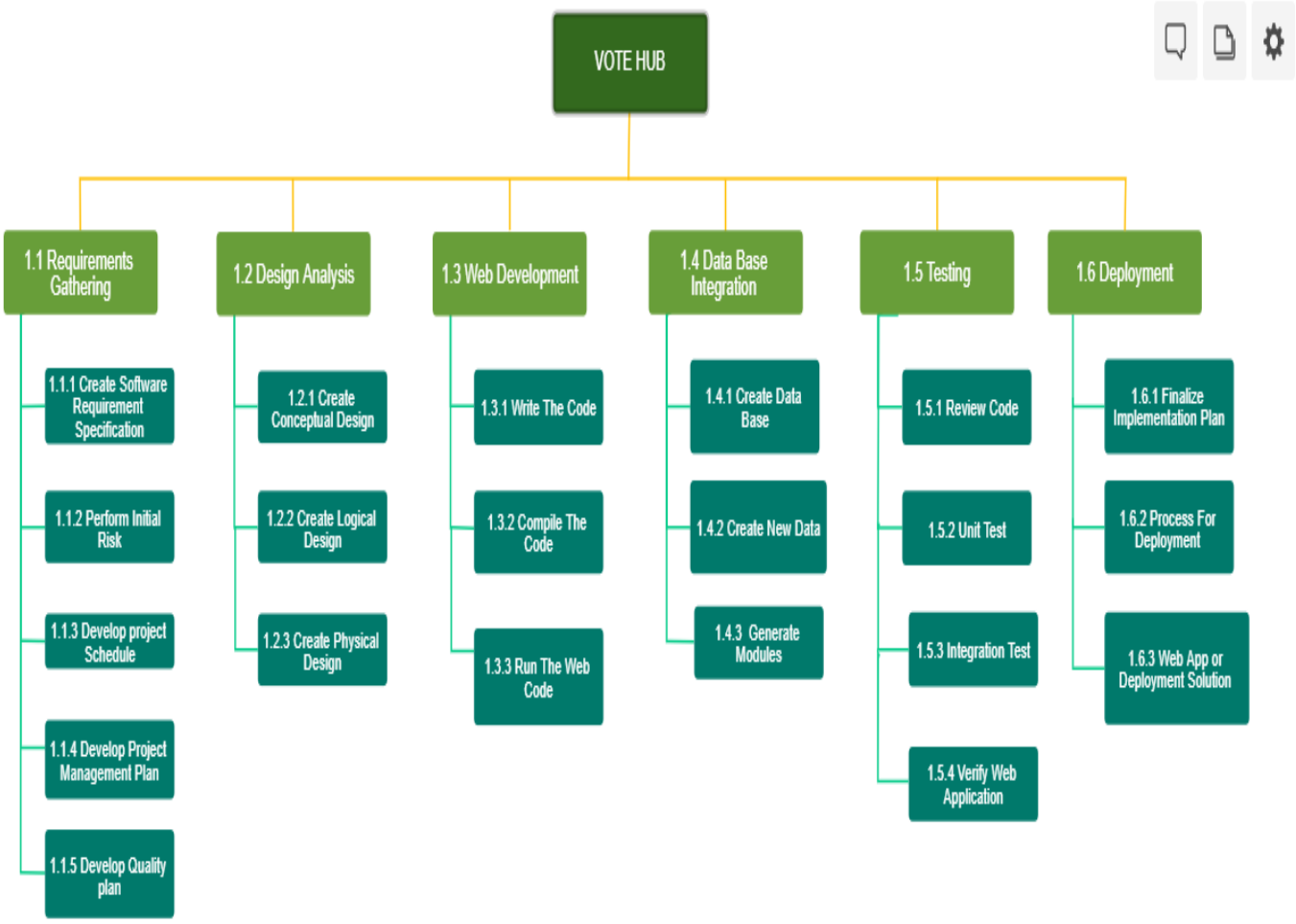

Figure 5 WBS

2 Activity diagram

Activity diagram of login

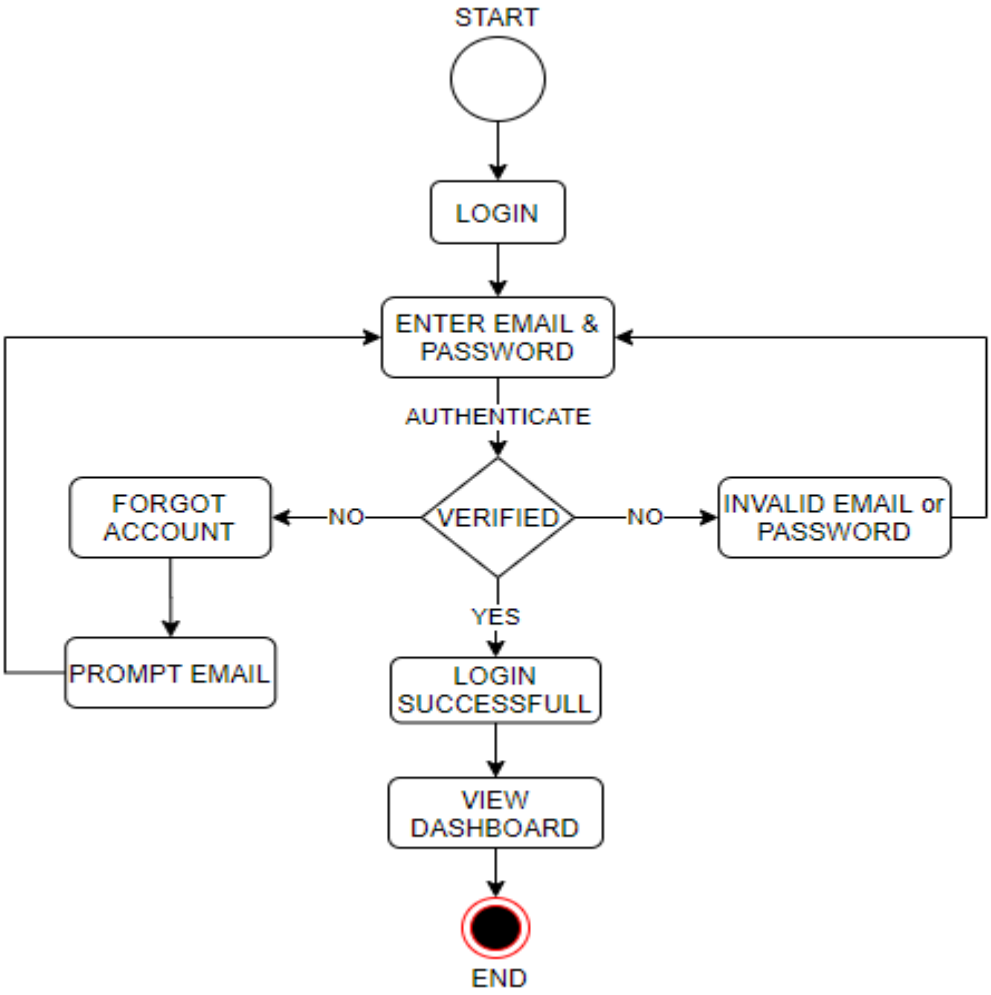

Figure 6 Activity diagram of login

Activity diagram of signup

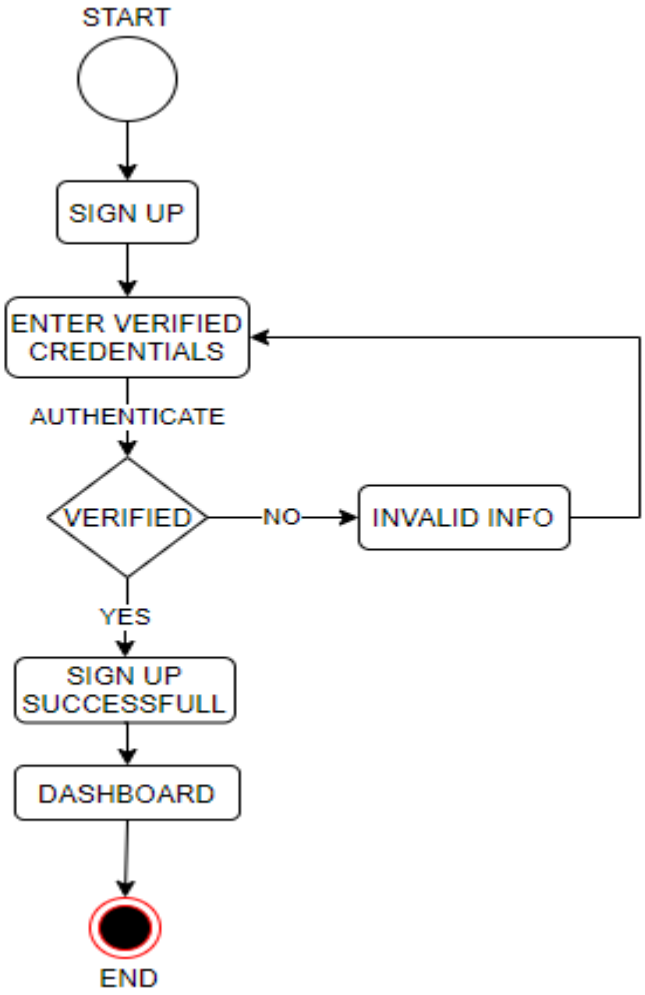

Figure 7 Activity diagram of signup

Activity diagram of Create Ballot

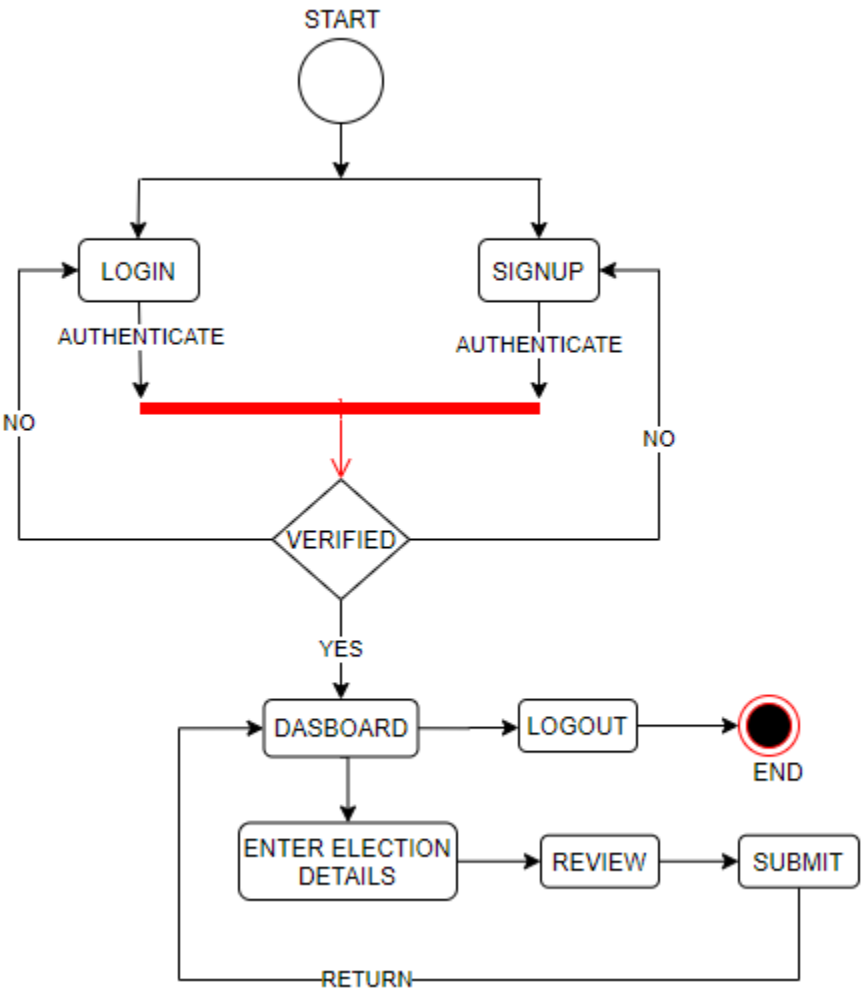

Figure 8 Activity diagram of Create new elections

Activity diagram of Submit vote

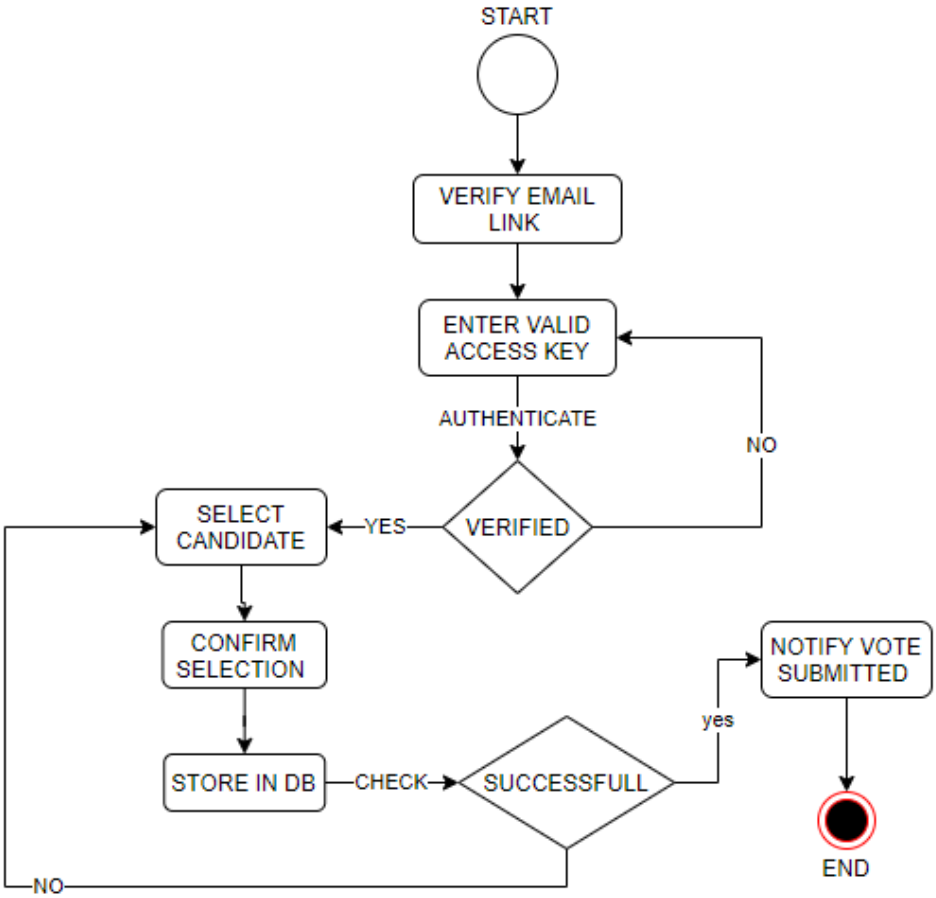

Figure 9 Activity diagram of Submit vote

Activity Diagram of Account Settings

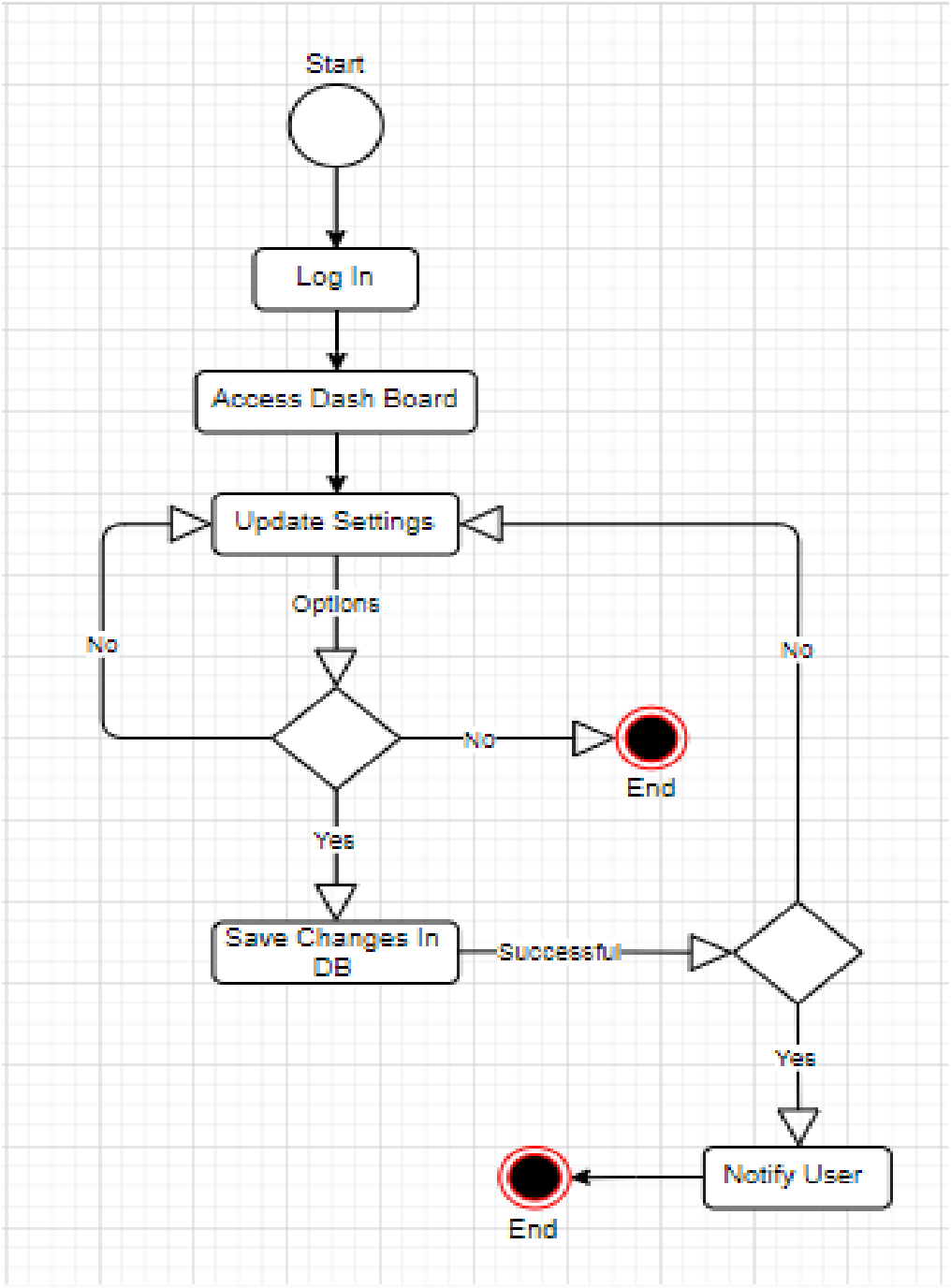

Figure 10: Activity Diagram of Account Setting

3 Sequence diagram

Sequence diagram of login

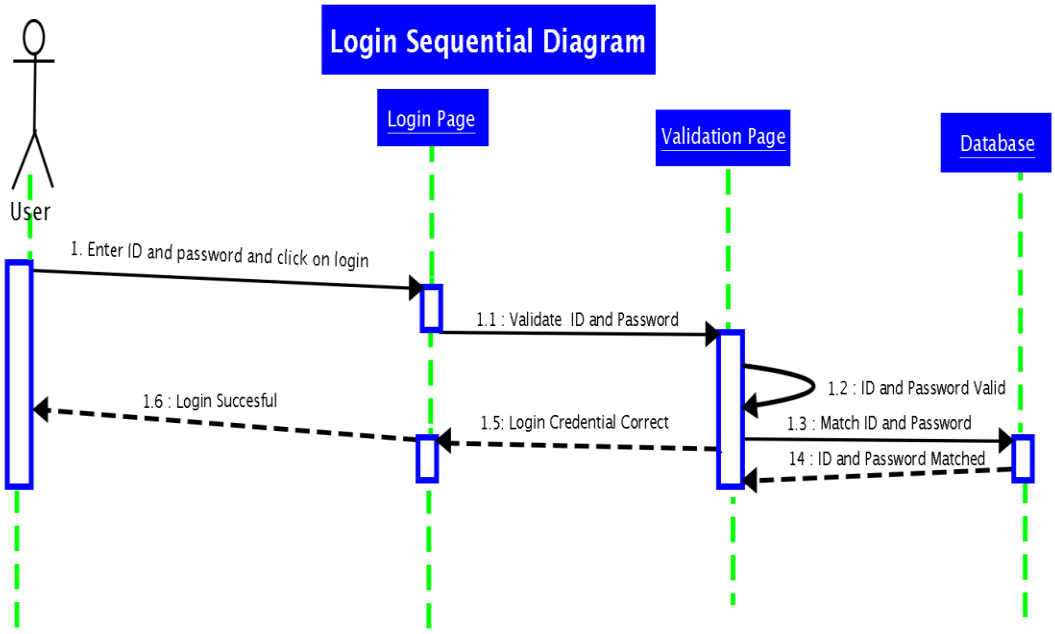

Figure 11 Sequence diagram of login

Sequence diagram of sign up

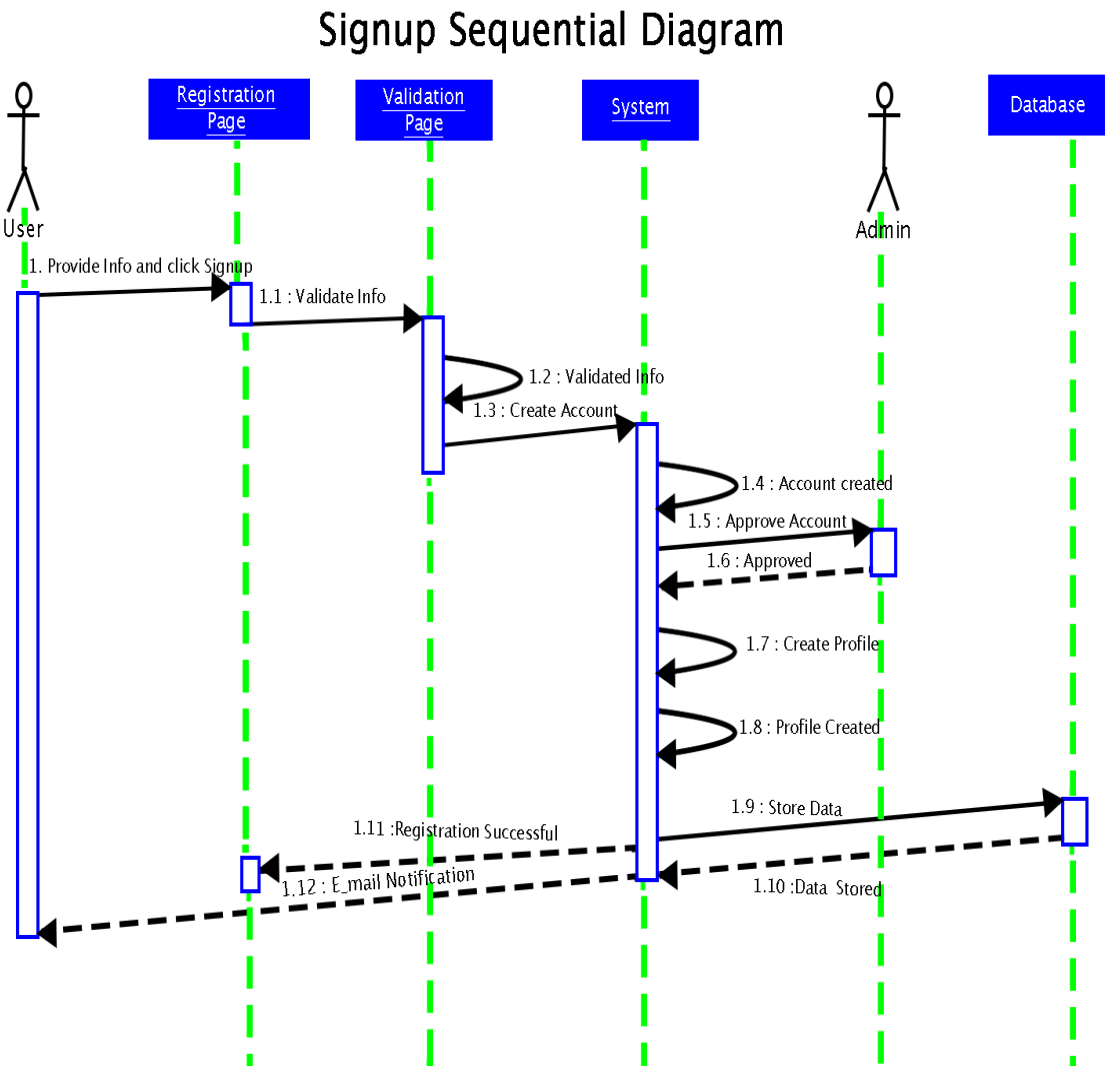

Figure 12: Sequence diagram of sign up

Sequence diagram of Access Dashboard

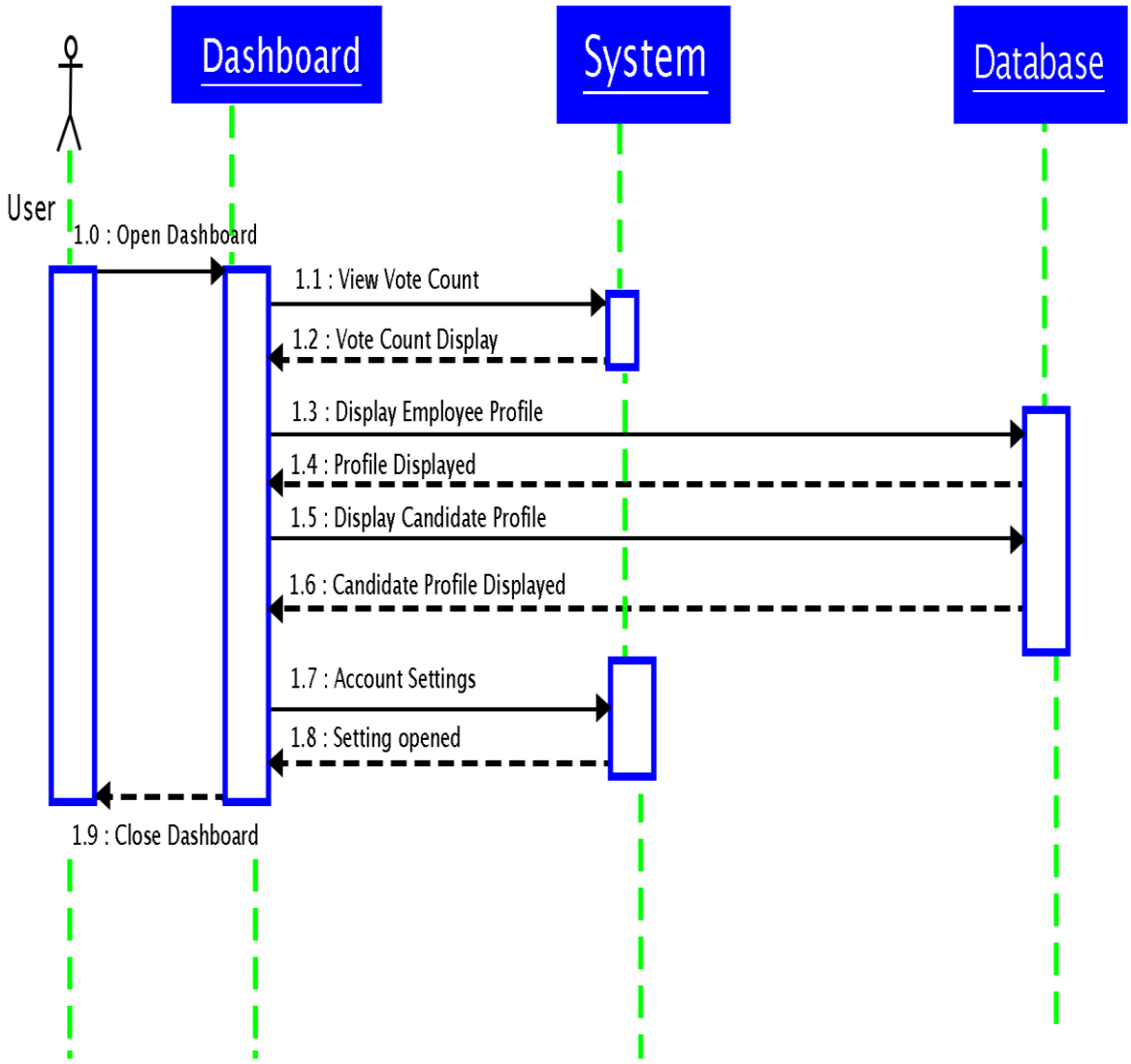

Figure 13 Sequence diagram of Access Dashboard

Sequence diagram of Submit Vote

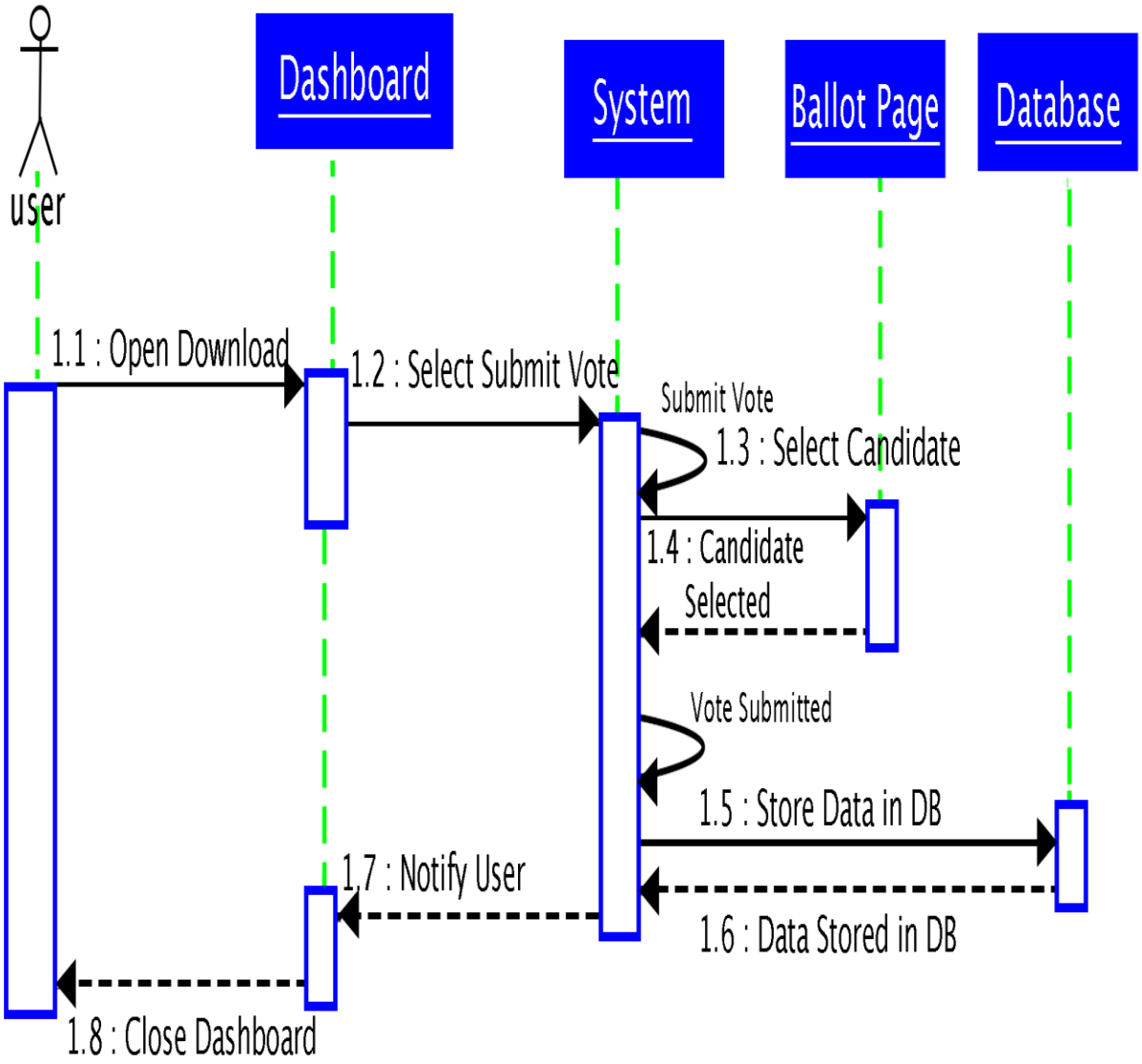

Figure 14 Sequence diagram of Submit Vote

Sequence diagram of Logout

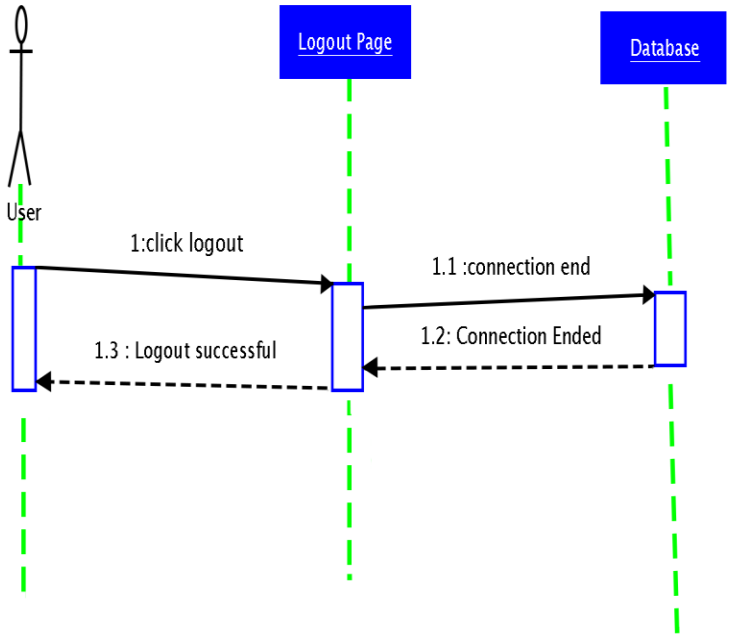

Figure 15 Sequence diagram of Logout

4 System Architecture

Architecture of Web Application (React js + Node)

The architectural design of the system shows how the architecture of Voting Hub system. The architecture of the system was based on the Node architecture model, where application is split into different Application Programming Interface APIs. Voting Hub system is composed of different small APIs which when combined all together form the whole architecture of the system. Data storage occurs in the database which runs MONGO DB as the database engine. End-systems that want to use our web application will invoke functions of this API - such as a voting function or a data update request from members of the hierarchy.

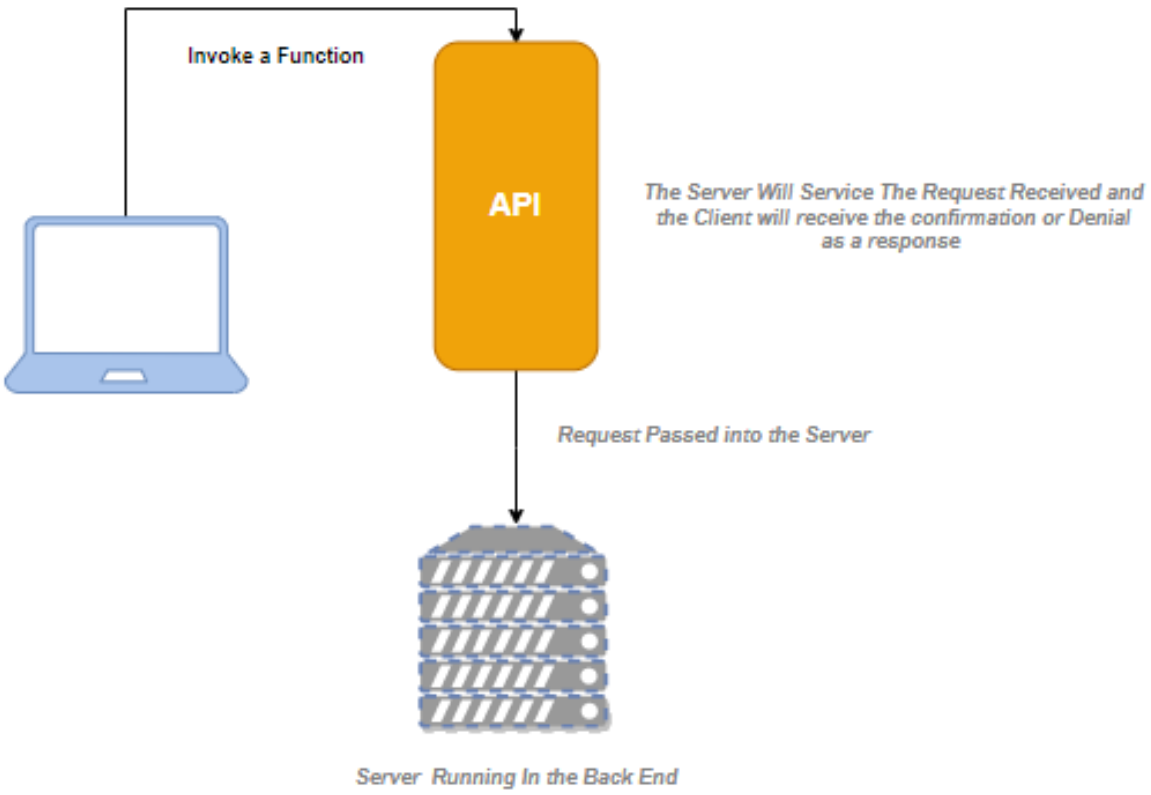

Figure 16 Architecture of System

5 Network Diagram

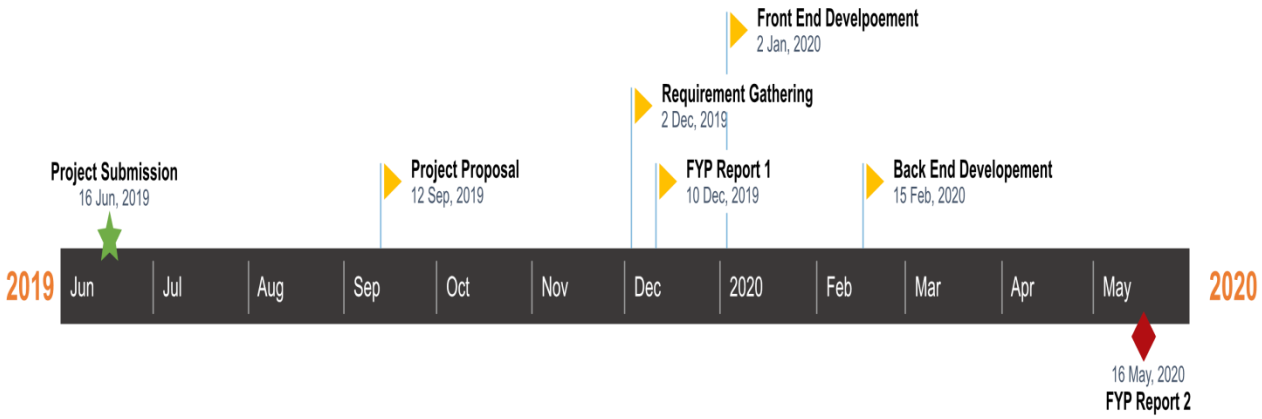

Figure 17 Network diagram

6 Class Diagram

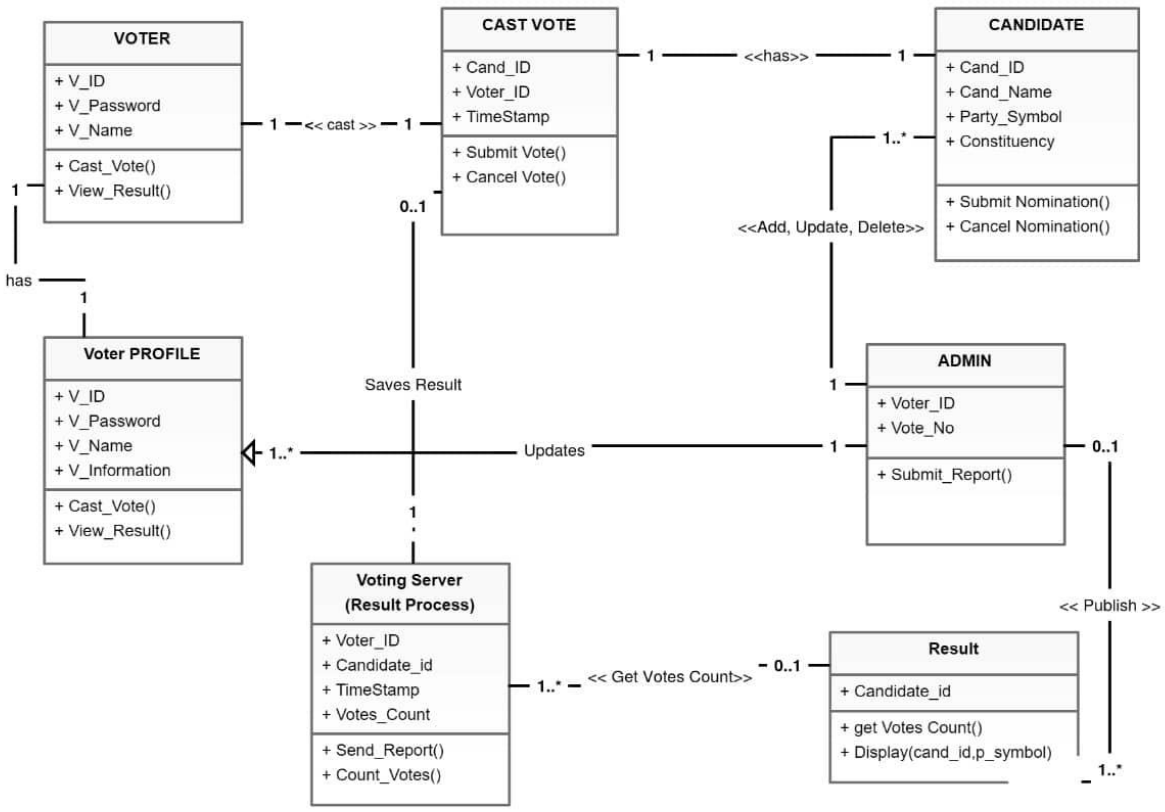

Figure 18 Class diagram

7 Database Diagram

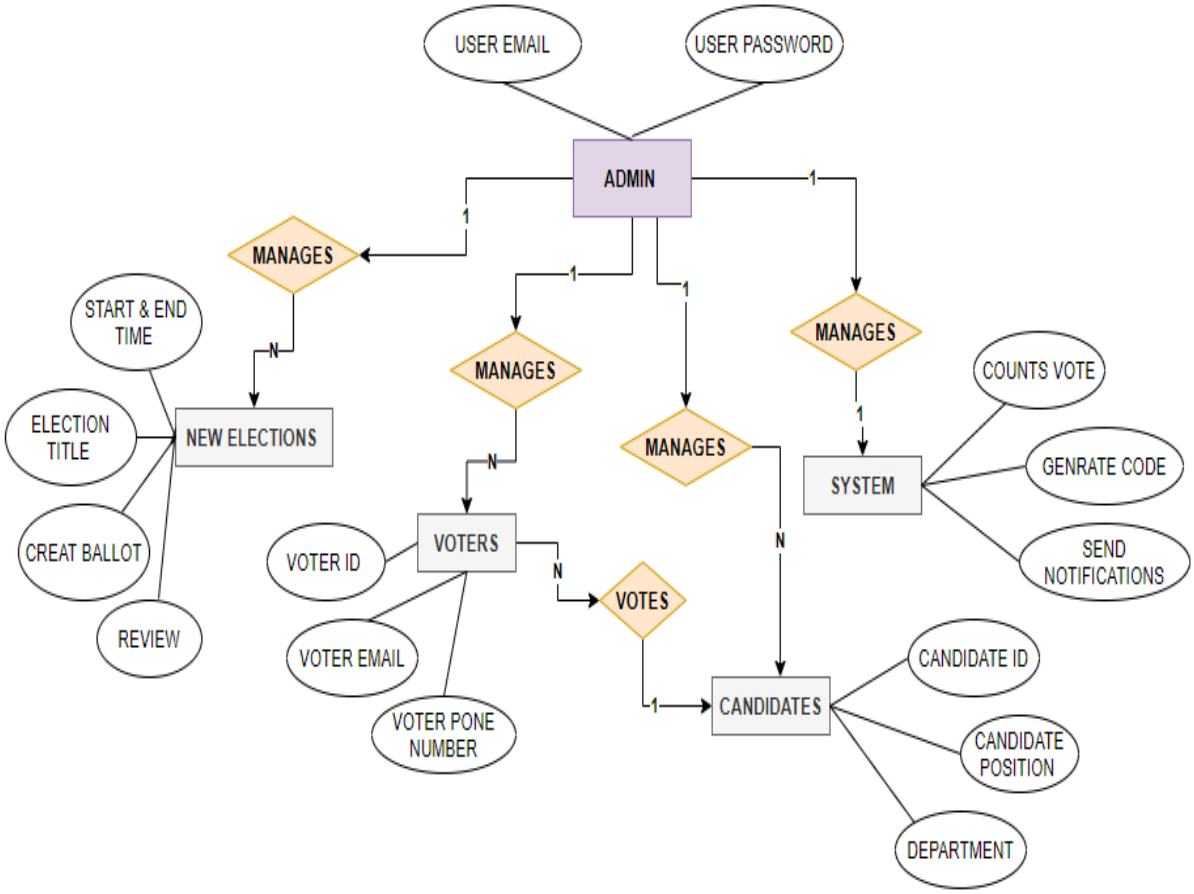

Figure 19 Database diagram

8 Collaboration diagram

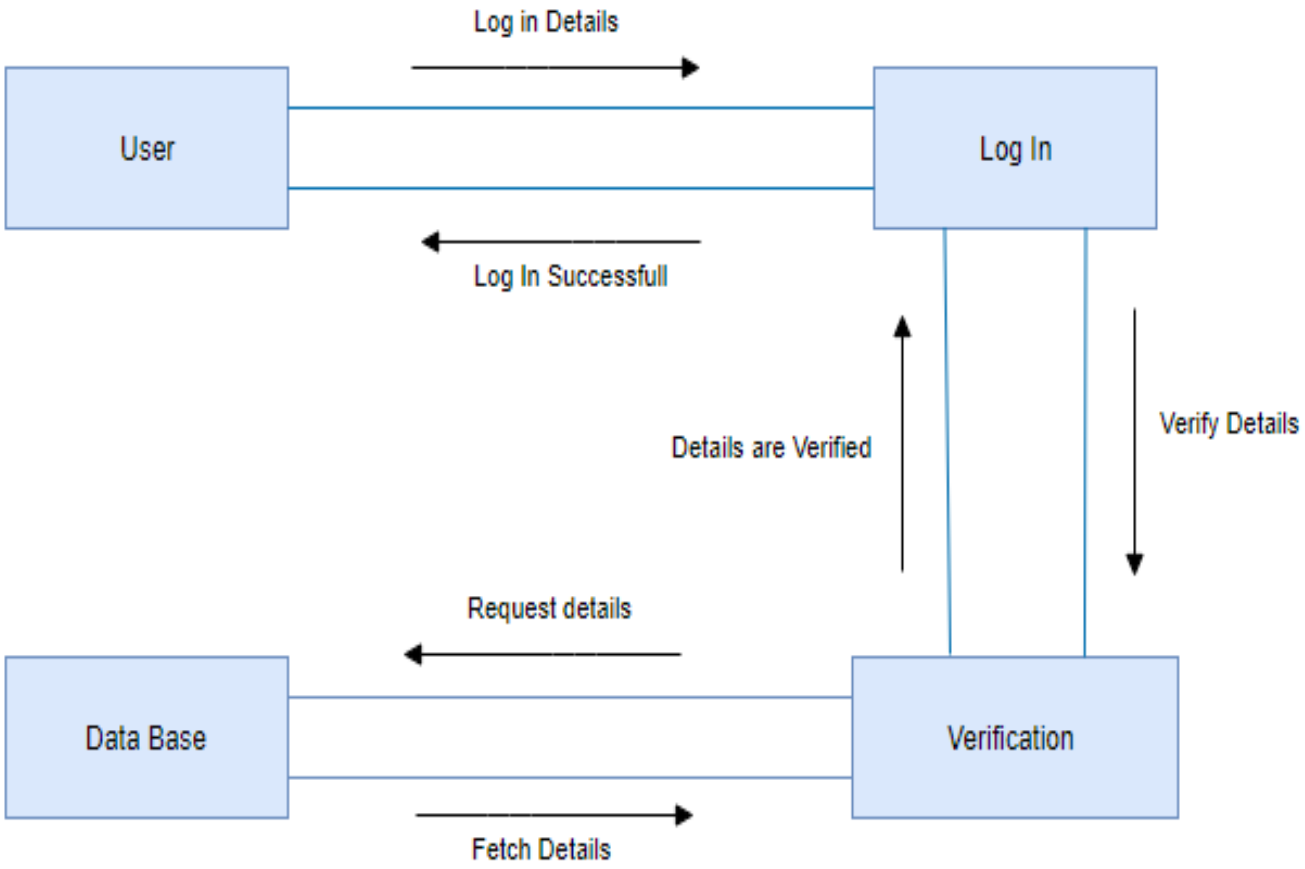

Figure 20 collaboration diagram of login

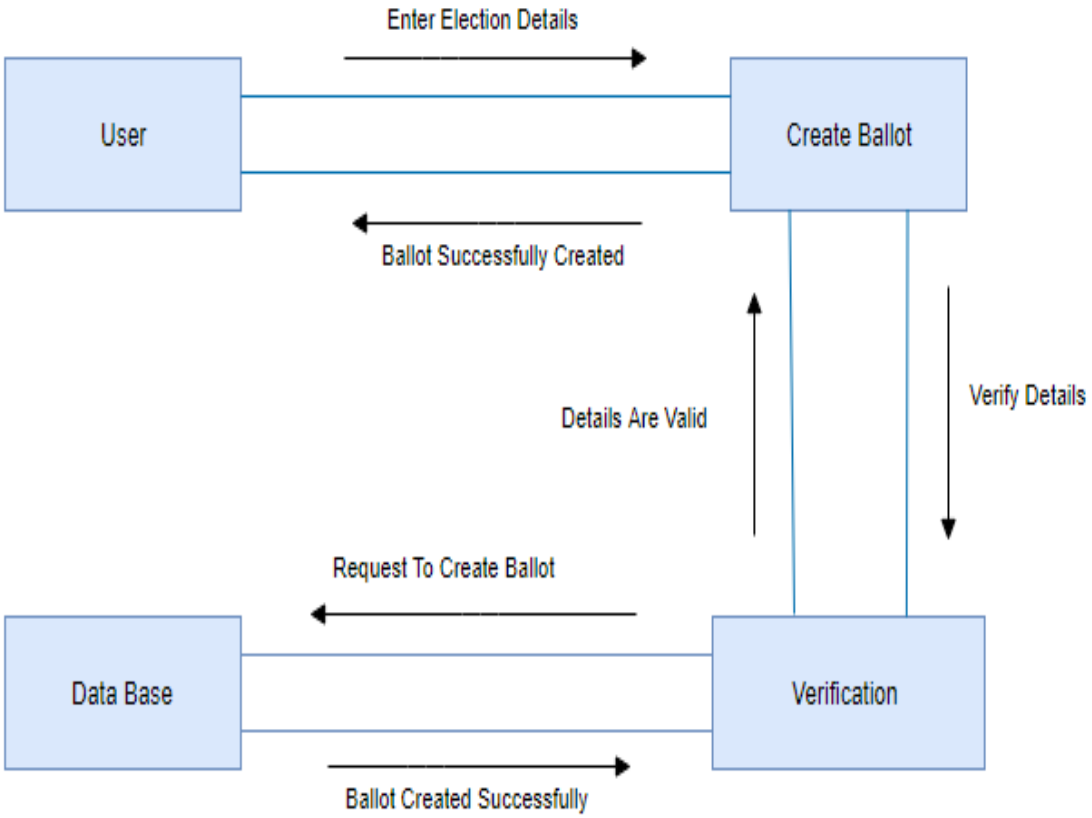

Figure 21 Collaboration diagram of Create Ballot

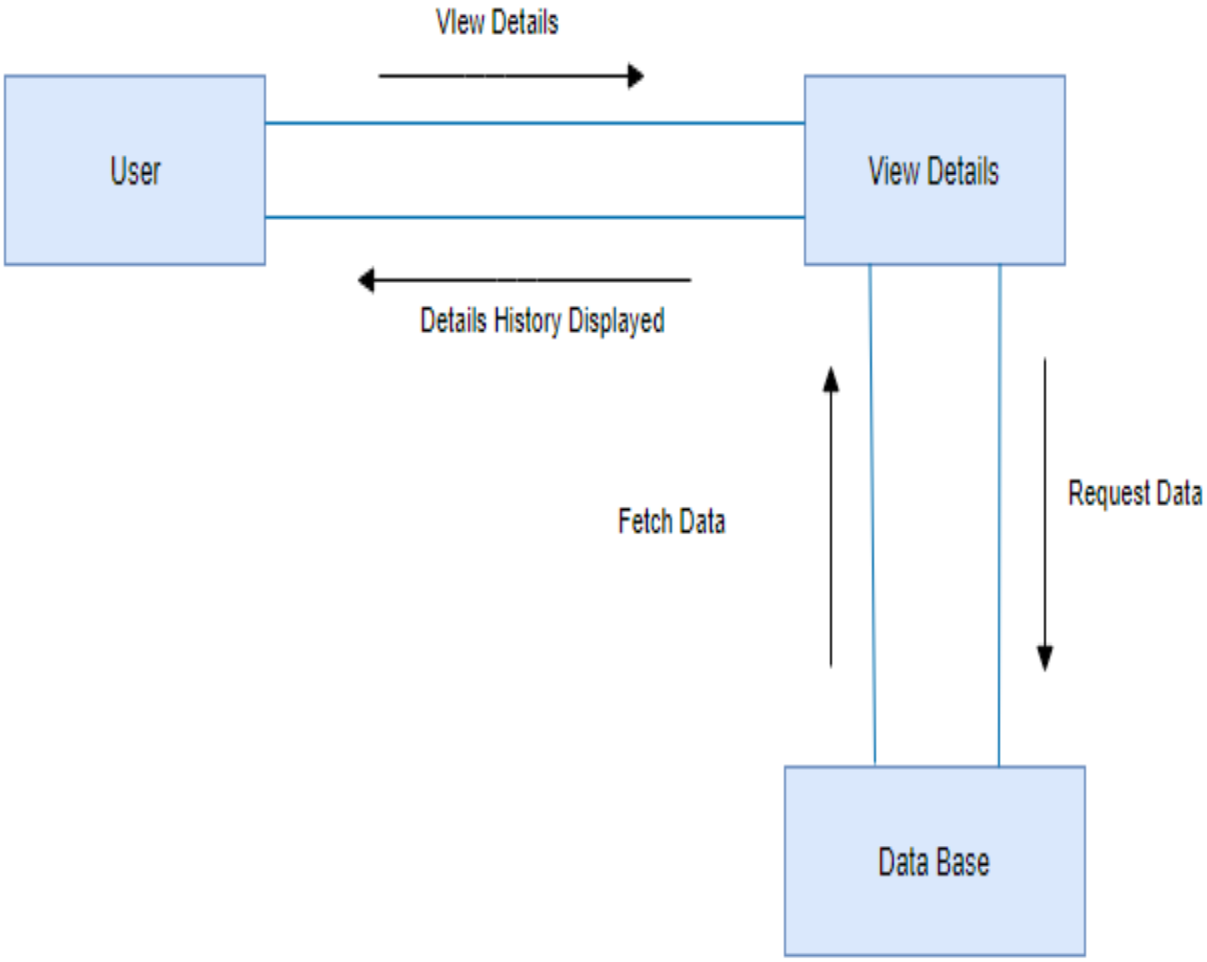

Figure 22: collaboration diagram of View details

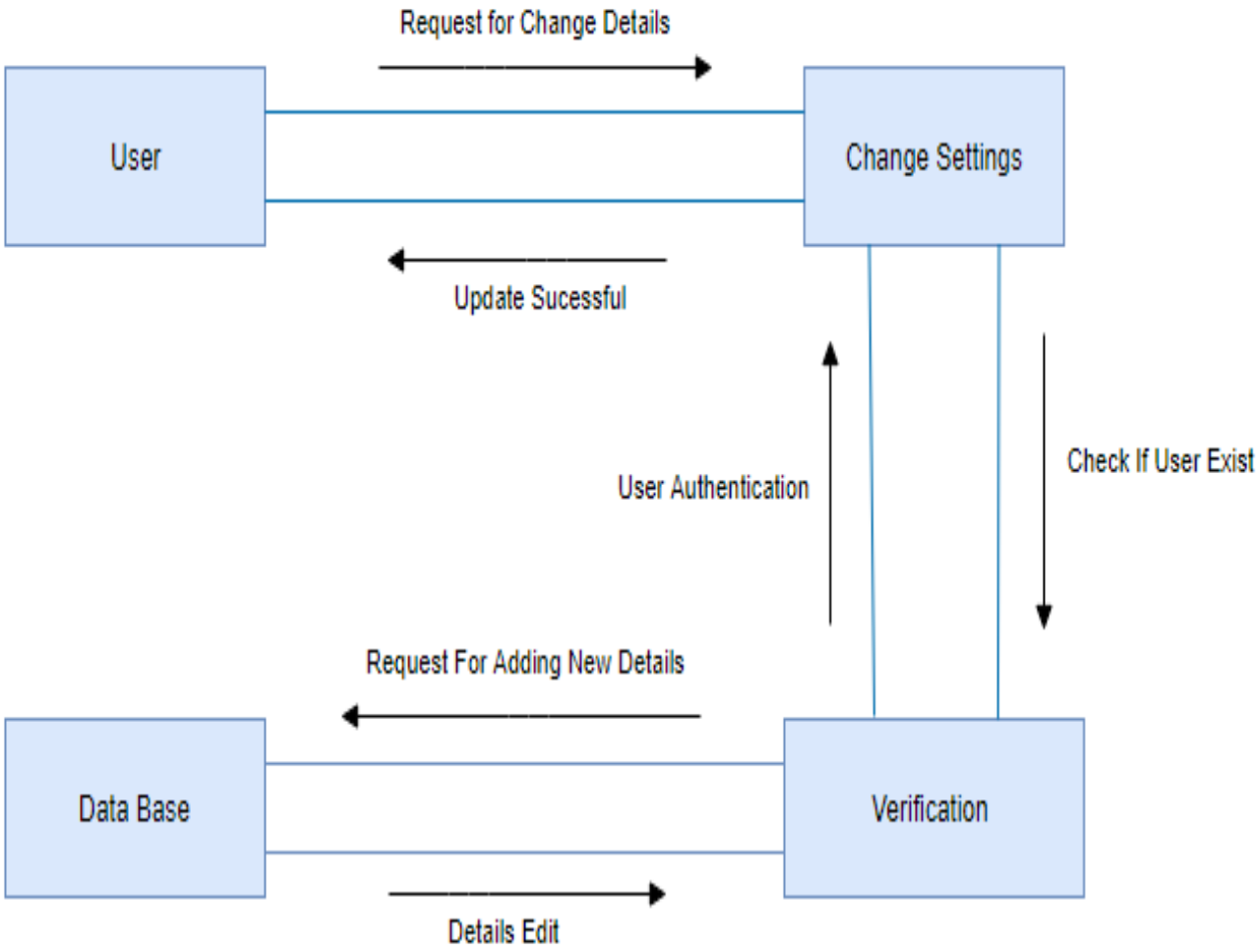

Figure 23: collaboration diagram for Account Setting

CHAPTER 4

SYSTEN TESTING

4.1 Test cases

Table12: Test Case for Sign Up

Test Case #: 01	**Test Case Name:** Sign Up
System: Vote Hub	
Designed By: Muhammad Rabbi	
Executed By: Muhammad Ali	
Short Description: Sign Up allows the user to get registered into the system.	

Step	Action	Expected System Response	PASS / FAIL	COMMENTS
1	The user choses signup to sign up into the system.	The system in response displays fields to enter. 1. email address, 2. first name, 3. last name 4. Password. 5. Organization name	Pass	User enters data in the required fields.
2	The user enters first name, last name, email address and organization name.	The system in response validates whether the details are entered according to the defined format and authenticate the user.	Pass	All the detail which is entered by the user is verified by the system.
3.	User clicks the “signup” button.	The system sends the verification link to authenticate the user via email to complete the signup process.	pass	An email verification link is received by the user at his / her provided MAIL.

Post Condition: system will lead the user to the dashboard after successful signup

Table 13: Test Case for Login

Test Case #: 02	**Test Case Name:** Login
System: Vote Hub **Designed By:** Muhammad Rabbi **Executed By**: Muhammad Ali **Short Description:** Login allows the user to access the functionality of the system	
Pre-Conditions: User must signup first to get logged in to the system.	

Step	Action	Expected System Response	PASS / FAIL	COMMENTS
1	The user selects the login option from the navigational bar.	The system displays the login page and allows the user to enter email id and password.	Pass	System displays the input fields to the user to enter data.
2.	The user enters email ID and password.	The system validates whether the email ID and password are entered according to the defined format.	Pass	System verifies all the fields and format of data.
3	The user clicks the "Login" button.	The system leads the user to the dashboard if he / she is already registered after verification from the database.	Pass	System allows the user to reach dashboard after successful login.

Post Condition: system will lead the user to the dashboard after successful login.

Table 14: Test Case for Create New Elections

Test Case #: 03	**Test Case Name:** Create New election
System: Vote Hub **Designed By:** Muhammad Rabbi **Executed By**: Muhammad Ali **Short Description:** Create new elections allows the user to generate a general election for the voters to cast the votes.	
Pre-Conditions User must have a registered account.	

Step	Action	Expected System Response	PASS / FAIL	COMMENTS
1.	The user selects to create new elections in the system.	The system in response displays the fields to enter election title election purpose, start date, time duration, nominated candidates, notification process, add voters list and review the entered details.	Pass	All fields are shown to the user step by step and user enters all the required details to go to the next step.
2.	The user enters Elec tion purpose, time duration, nominated candidates, notification process, updated voters list and review the entered details.	The system validates whether the details are entered according to the defined format. And all fields are field.	Pass	All fields are tested by the system to proceed further
3.	The user clicks “confirm” button.	The system displays the information on the screen that your election is running.	Pass	Message is shown on the screen and user return to dashboard
Post-Conditions The user has created the new elections successfully				

Table 15: Test case for Submit vote

Test Case #: 04 **System:** Vote Hub **Designed By:** Muhammad Rabbi **Executed By**: Muhammad Ali **Short Description:** Submit vote allow the voter to select he candidate and cast his / her vote.	**Test Case Name:** Submit Vote
Pre-Conditions The voter must pass all the authentication processes	

Step	Action	Expected System Response	PASS / FAIL	COMMENTS
1	The voter click on the link sent on his / her verified mail to access election site	The system in response displays second step authentication page in which voter enter his her access key sent on his number	Pass	Emil link is verified and user reach the election site successfully
2.	Voter enters the valid access key in order to reach ballot to select candidate.	The system in response displays the ballot where all the nominated candidates are present.	Pass	Voter gets access to the ballot after passing all authentication processes.
3.	Voter selects his / her favorite candidate and confirms the vote.	After selecting candidate system asked the voter to confirm selection and then submit vote.	Pass	A confirmation pops up on screen to confirm the voter selection.
4.	The vote gets submitted	The system in response displays a message your vote is submitted.	Pass	Voter gets notified that vote has been submitted and voter exits the panel.

Post-Conditions The voter gets out of the ballot screen

Table 16: Test Case for Access dashboard

Test Case #: 05	**Test Case Name: Access Dashboard**
System: Vote Hub **Designed By:** Muhammad Rabbi **Executed By**: Muhammad Ali **Short Description:** Dashboard allows user to access the functionality of the system.	
Pre-Conditions The user must first login to the system.	

Step	Action	Expected System Response	PASS / FAIL	COMMETS

1	The user choses to access the dashboard.	The system in response displays the following option on the dashboard.
		• Profile
		  • Settings
		  • Info
		  • Log out
		• New Election
		• Home
			Pass	All the necessary working tabs are shown on the display screen.

2.	The user choses to change account settings by clicking on "Profile" button and then on “settings”.	The user in response displays the setting options • Change name • Change email • Change password • Current password • New password • Change organization name	Pass	All the changes user wants are updated in data base
3.	The user clicks "log out" button.	The system logout the account and displays the login page.	Pass	System logouts the panel successfully.
POST CONDITION: User do nothing and simply logout of the system.				

4.2 Unit/ Integration/ Acceptance testing

Researchers have carried out unit testing and also have carried out integration testing And full end to end system testing to ensure that few or no bugs found a place in the deployed application.

4.2.1 Unit testing

Unit testing is the procedure of testing the system's unit individually. This is done at The module level where basic components of the software were tested to verify its functionality. It is often done by testing tools.

In this testing we will test modules and sensors that are involved.

- Time calculation
- Vote submission
- Result generation.
- Vote calculation.
- Ballot creation
- Setting

4.2.2 Integration testing

Modules are known as the units that were tested in the earlier testing phase. Integration testing is a kind of testing in which all the modules are combined for the testing purpose. In this testing phase, we will be testing the actions or logics that the user and admin are able to perform. Following are some actions

4.2.3 System testing

System testing is a type of testing of black box testing in which the entire system is tested as a whole in search of any error. The complete interrelated system is tested to verify whether all components work efficiently and effectively as a whole.

4.2.4 Acceptance testing

Acceptance testing is performed as to compare the system and analyze whether it meet the objective and requirements or not.

CHAPTER 5

CONCLUSION

5.1 Problems Faced & Lesson learned

Our main target is to implement a secure and rigging free election site to provide a positive and friendly environment for our voters and a user friendly interface for the user to manage elections in a short span of time. While implementing security regarding functionalities we came along lot of possibilities that could engage chance of rigging but with time and research we came up with the solution of every possible chance that could harm our voter's integrity and election site security.

5.2 Conclusion

As we are living in a computerized world, electronic voting system provides potential for voting and improves the election management techniques over what has been available till now with manual voting systems. This online system will definitely save time, cost and effort spent over paper and labor to count the votes manually. Electronic voting system has raised the levels of security and has prevented the integrity of votes from having duplicate votes. This electronic system has made the elections much more convenient than before. Automated functionalities have reduced the risk of errors hence making the results accurate.

5.3 Future work

As a result of successful implementation of this project, the risk of errors and corruption will get reduced to the minimum. As minimal manpower is required by the Vote Hub system. The security levels are increased with a swift and user friendly voting experience for voters. One of the many benefits of electronic voting it will allow people to share their point of views and solutions for issues which will help organizations to improve their strategies and workings. Furthermore, it would reduce the waiting time as the results are generated automatically into the system. So, in future the implantation of electronic/ online voting systems will greatly increase the efficiency of election systems.

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