CHAPTER IV

RESULTS ANALYSIS AND DISCUSSION

4.1. Designing System

System designing is basically the laying out the structural design of a system clearly step by step in a procedural manner. The design of system requires many aspects for effective design. In addition Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. The design of this system involves the estimation of physical needs, man power and hardware needed to support the development of the system as well as to support its operations after applied. The design of the system can be interpreted as, after the analysis phase of the system development cycle, defining on functional requirements, preparation for the design implementation, describing the system which will be established in the form of depiction of planning, sketching, the setting of several separate elements into a unified whole and function, and the software and hardware components of the system. The National Capital District Electronic voting System considers the main phase of system development life cycle, it focus on Planning, analysis, design, coding and testing, if the Electoral Commission of National Capital District and Papua New Guinea agree with the system, it can be implemented and maintenance sequence can also be considered.

4.1.1. Objective of Designing the System

The main objectives of designing the system are;

1. The system design aims at, developing an electronic census for all citizens of National Capital District where all data will be managed and kept safe electronically.
2. The system aims at doing away with paper ballot papers, instead register candidates electronically and ballot paper can be e-ballots papers.
3. Developing a database that will equally store the census data for citizens of national capital District, the candidates of NCD and store up votes casted by the citizens of National Capital District according to their preferences.
4. Developing a system which can be effective where the government can rely on without more spending on running manually run elections.

4.1.2. Proposed System overview

The proposed E-Voting system of National Capital District in Papua New Guinea is to use the concept of client-server, to the client using the browser and the server using PHP and MySql for communication and connection and it is done offline for safety purposes. The system can be accessed using offline Metropolitan area network (MAN) because it will be safe and secured rather than using online. Any browser can be used to access the system as illustrated below.

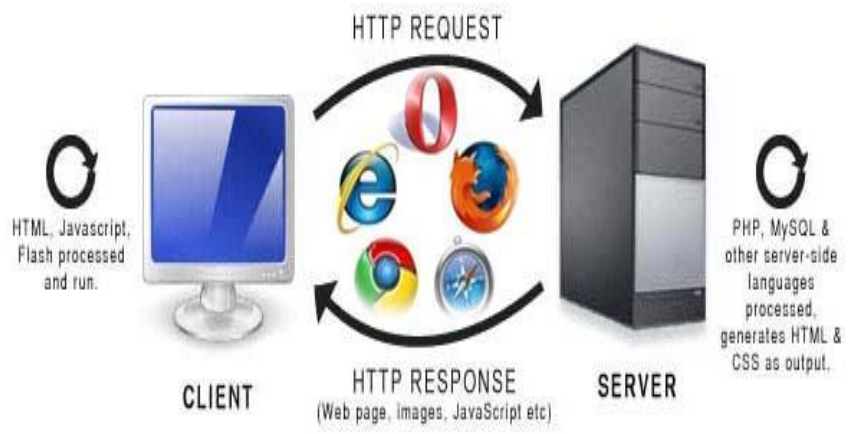


Figure 4.1: Scheme of Client- Server interaction relationship.

(Source: Joaquim, R., 2005. A fault tolerant voting system for the internet. M.S. Thesis, IST/UTL, Lisboa)

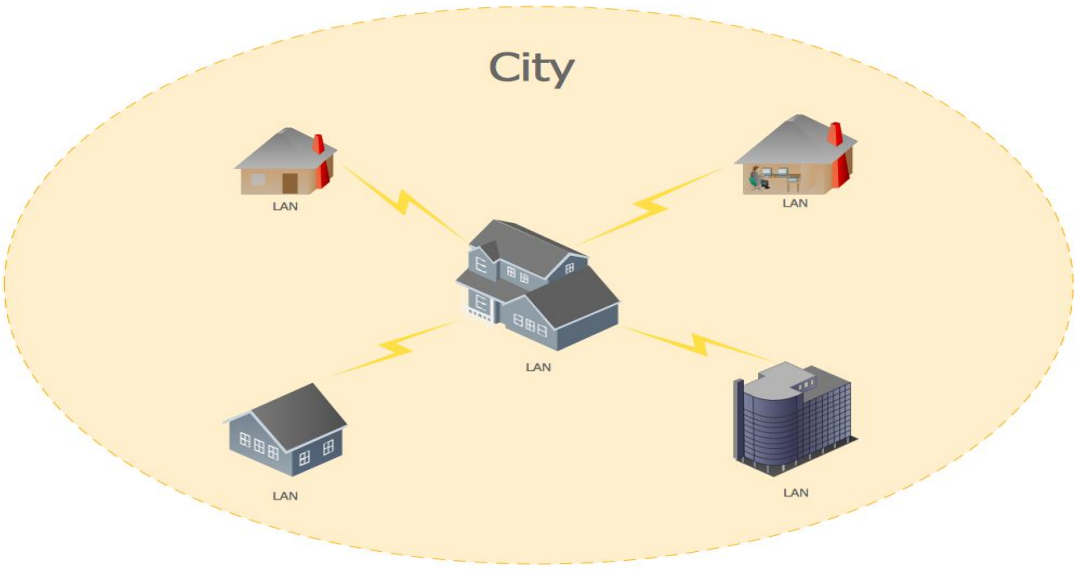


Figure 4.2: Metropolitan area network that will be used by the E-Voting system for NCD.

(Source: Joaquim, R., 2005. A fault tolerant voting system for the internet. M.S. Thesis, IST/UTL, Lisboa)

4.1.3. Proposed Designed Procedure

To have an effective proposed design for the system, the following necessities are include in the proposed system design; case diagram, activity diagram, sequence diagram, class diagram, collaboration diagram, component diagram and deployment diagram.

4.1.3.1. Use Case Diagram

Use case diagram basically describes the interactions between one or more actors or users of the e-voting system to be developed. In addition a **use case diagram** at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use case in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well. The following is the use case diagram of National Capital District Electronic Voting System.



Figure 4.3: Use Case Diagram of National Capital District Electronic voting system

4.1.3.2. Scenario Use Case

In software and system engineering, a **use case Scenario** is a list of action or event steps, typically defining the interactions between a role known as an "actor" and a system, to achieve a goal. The actor can be a human, an external system, or time. In systems engineering, use cases are used at a higher level than within software engineering, often representing missions or stakeholder goals. The detailed requirements may then be captured in the System Modeling Language (SysML) or as contractual statements.

Use Case analysis is an important and valuable requirement technique that has been widely used in modern software engineering since their formal introduction by

Jvar Jacobson in 1992. Use case driven development is a key characteristic of many process models and frameworks such as ICONIX, the Unified Process (UP), the Rational Unified Process (RUP), and the Oracle Unified Method (OUM). With its inherent iterative, incremental and evolutionary nature, use case also fits well for agile development.

In NCD e-voting System, the actors are the 'Admin', 'Electoral Official' and 'Citizen/voters'. The following use cases Scenario are evolved from the use case diagram.

1. **Use Case Scenario Login**

The Use Case Scenario Login evolved are as follows;

1.Name of use case: Login

2.The main actors: Admin and Electoral Official

3.Purpose: Login to the system and view that every systems and data registered are correct.

4.

Table 4.1: Use case Scenario Login

Admin	**System**
Main Success Scenario	
1. The Admin enters verification data into the system like user name and password to access the system	
	2. The system validates the data entered into the system to login to the system.
3. The welcome window is opened for the Admin to interact with the system.	
	4. The Admin is logged into the system to observe, evaluate and edit the system.
5. The Admin clicks on the tab which needs review from the number of tabs given.	
	6. The clicked tab opens that window for the Admin to view and evaluate the system
7. Admin evaluate the area which needs evaluation and edits if need arises,	
	8. System displays option for Admin to log out of the system.
9. After evaluating and editing the system,	

the Admin log's out of the system.	
	10. Admin is logged out of the system.
Alternate Scenario	
	11. If Edited and evaluated Data is not complete, the system will display error message saying the edited data is not complete.
12. Re-enter the data again and make sure they are correct by the admin.	

2. Use Case Scenario Update Candidate

1. Name of Use case: Update Candidate
2. Main Actors: Admin and Electoral Official
3. Purpose: The purpose of this Use case is to make sure all Candidates registered into the system are correct.

Table 4.2 The Use Case Scenario Update Candidate.

Admin	**System**
Main Success Scenario	
1. Admin Enters valued User name and password into the system to login to the system.	
	2. If Password is correct with the user

	name, the system log's in the Admin into the main windows environment of the System.
3. The Admin chooses Choose Edit and alter Candidates to update candidate details.	
	4. The system displays the Candidate edition and alter window environment for the Admin to either edit the data or add new Candidate into the system.
5. The Admin Updates the Candidates data.	
	6. The system reflects on the update and responds by displaying message as update is complete.
7. The Admin is satisfied with the update of Candidates so Admin log's out of the system.	
	8. The system log's out the Admin
Alternate Scenario	
	9. If the validation of login password and user name is not correct, the system will redirect the Admin to login again.
10. The Admin re-enters Password and	

User name to be verified by the system to login.	
	11. If the Updated Candidate data are incomplete, the system will display an error message saying the data updated are incomplete.
12. The Admin updates the Candidates data again and makes them complete and correct.	

3. Use Case Scenario Add New Candidate

1. Name of Use Case Scenario: Use Case Scenario Add New Candidate.
2. Main Actors: Electoral Official and Admin
3. Purpose: The purpose of this use case Scenario is simply adding new candidates into the system to add value and number to the E-Ballot Papers for voters to choose from those candidates.

Table 4.3: The Use Case Scenario Add New Candidate.

Electoral Official	**System**
Main Success Scenario	
1. Electoral Official Enters Valued Password and User name to enter the system.	
	2. System Validates Password and user name of the Electoral

	official and display the user interface for the electoral official.
3. Electoral Official is given is given menus to choose to interact with the system so the electoral official Chooses Register Candidates to add new Candidate.	
	4. The Candidate registration form is opened for the Electoral official to Register New Candidate.
5. The Electoral Official Fills in all necessary details on the New Candidate Registration form with a Photo of the new Candidate and clicks on Register.	
	6. The system saves all the New Candidate Data into the Voting Database system.
7. The Electoral Official Log's out of the system	
	8. The system log's out the Electoral Official
Alternate Scenario	

	9.If the password and User name to enter the system entered by Electoral Official is Incorrect the system will re-direct the Electoral Official to login again.
10. The Electoral Official Re-enters password and user name for the system to verify for entry into the system.	
	11. If the detail of the new candidate to be registered into the system is incorrect or incomplete the system will signal the Electoral Official that there has been an error so the Electoral Official must enter the Details again.
12. The Electoral Official Re-enters the new candidate detail correctly and completely as outlined on the new candidate Registration form.	

4. The Use Case Scenario Delete Candidate

1. Name of Use Case: Delete Candidate
2. Main Actors: Admin and Electoral Official
3. Purpose: The main purpose of this Case Scenario is to delete a candidate when he/she withdraws from the election or if details of the candidate are completely changed it must be deleted and updated again.

Table 4.4. The Use Case Scenario Delete Candidate

Admin	System
Main Success Scenario	
1. The Admin enters user name and password to enter into the system.	
	2. The System Validates the username and password and login the Admin into the system
3. The Admin enters the main user interface window of the system; from there He selects view Candidates.	
	4. The System Display all candidates registered into the system including the one to be deleted.
5. Admin Deletes the Candidate that are to be deleted and saves the others back into the system	
	6. The System Saves the remaining

	candidates back into the system.
7. The Admin Log's out of the system.	
	8. The Admin is logged out of the system
Alternate Scenario	
	9. If the validation of the password and user name of the Admin was not correct, the system will re-direct the Admin to login again.
10. The Admin logs in again with the correct password and username.	
	11. If the procedures of deleting a candidate were not complete, the system will display an error message saying there is an error in deleting the candidate so the Admin must delete again.
12. The Admin will delete the candidate again.	

5. The Use Case Scenario Register Citizen

1. Name of Use Case: Citizen Registration
2. Main Actors: Electoral Official and Admin
3. Purpose: The purpose of this Case Scenario is to register new citizens into the system using the citizen registration form provided by the system.

Table 4.5: The Use Case Scenario Register Citizen

Electoral Official	System
Main Success Scenario	
1. Electoral Official Login to the system by entering user name and password.	
	2. The main Windows user interface environment for the Electoral Official is displayed.
3. The Electoral Official clicks on the Citizen Registration menu.	
	4. The system displays the Citizen Registration user interface environment which contains the Citizen Registration form.
5. The Electoral Official fills in all the necessary detail on the Citizen Registration form and clicks on register to safe the citizen into the system.	
	6. The completed registration from for

	the citizen is saved into the database system of the system.
7. The Electoral Official Log's out of the system	
	8. The system log's out the Electoral Official
Alternate Scenario	
	9. If the validation of the password and user name of the Electoral Official are not correct, the System will re-direct the Electoral Official to login to the system again
10. The Electoral Official Log's into the System again entering the correct password and username.	
	11. If the details filled to register citizen into the system on the citizen registration from, the system will display error message saying there is an error in registration of citizen.
12. The Electoral Official filled the citizen's registration from again with the correct details and click register	

again to save the correct citizen registration.	

6. The Use Case Scenario Filter Result

1. Name of Use Case: Filter Result
2. Main Actors: Admin and Electoral Official
3. Purpose: This Case Scenario manly deals with filtering the results of voting and seeing that every citizens are being saved correctly so as the candidates registered into the system.

Table 4.6: The Use Case Scenario Filter Results

Admin	System
Main Success Scenario	
1. The Admin Enters User name and password to enter the system	
	2. The System validates the password and username and logs the Admin into the system and displays the main login mane of the system.
3. Admin Enters the system and view the main login page of the system. Admin choose the menu with will take admin to filter result of data entered into the system, Admin basically enter the database of the system.	

	4. The system display all data entered into the system, basically the Database of the system is displayed for the Admin to filter.
5. Admin closes the database save's the filtered data and logs out of the system.	
	6. The system logs out Admin.
Alternate Scenario	
	7. If the Admin enters a wrong password and user name for the system to validate and login, the system re-directs the Admin to login again.
8. Admin logs into the system again with the correct username and password.	
	9. If an edition is done to the data during filtering of data in the system and there is an error in the data filtered, the system will display error message so the Admin has to do filtering again and save the data correctly.
10. The error data during filtering are re-entered and saved into the system.	

7. The Use Case Scenario Generate Report

1. Name of Use Case: Generate Report
2. Main Actors: Admin and Electoral official
3. Purpose: This use Case Scenario basically deals with generating a progressive report of the tally of votes in the secured database of casted votes.

Table 4.7: The Use Case Scenario Generate Report

Admin	System
Main Success Scenario	
1. Admin Enters Password and Username to enter the system.	
	2. The system validates the password and username and logs in the admin into the system.
3. Admin enters the main menu for admin and clicks on view candidates details and the progressive details of votes will be shown there.	
	4. The system displays each specific candidate with the number of votes received according to the preference from one to three.
5. Admin prints out progressive report of votes collected by each candidate every time the number of votes varies. After	

printing the votes, admin logs out of the system.	
8. T	6. The system logs out admin.
Alternate Scenario	
e **U**	7. If the password and user name validation failed, the system will redirect the Admin to login again.
s **e** 8. Admin enter the password and username correctly again to enter into the system.	

Case Scenario Update Voter

1. Name of Use Case: Update Voter
2. Main Actors: Electoral Official and Voter.
3. Purpose: This use case dealt with detail update of voters that are registered into the system.

Table 4.8: The Use Case Scenario Update Voter

Admin	System
Main Success Scenario	
1. The Admin enters password and username to enter into the system.	
	2. The system validates the password and username and logs in the Admin into the system. The system displays the

	main welcome screen for the system with all the menus of the system.
3. The Admin clicks on the view menu and continues on to clicking on citizen menu and the citizen's details are displayed.	
	4. The system displays all the details of the citizens registered into the system.
5. The Admin clicks on the particular citizen/voter that needs update.	
	6. The system displayed the detail of the voter to be edited by the Admin.
7. The Admin updates the voter's details and saves the data correctly into the system to be saved.	
	8. The system saves the edited data safely into the system database.
9. The Admin logs out of the system.	
	10. The system logs out the Admin from the system.
Alternate Scenario	
	11. If the validation of password and username entered by the Admin to enter the system are incorrect, the

	system will redirect the Admin to log into the system again.
12. The admin enters the correct password and username again and enters into the system.	
	13. If the voters details updated are not correct, the system displays an error message.
14. The Admin checks the details again and make corrections and saves the details again.	

9. The Use Case Scenario Display Candidate

1. Name of Use Case: Display Candidate
2. Main Actors: Voters and Electoral Official
3. Purpose: this use case deal with displaying the candidates so the voters can view them clearly and choose for voting.

Table 4.9: The Use Case Scenario Display Candidate

Voters/Citizens	System
Main Success Scenario	
1.The Voter enters password and username to enter into the system.	
	2.The system validates the username and

	password and logs in the voter into the system.
3. The Voter clicks on District Candidate to vote for district candidates.	
	4. The system displays all the district candidates for NCD, especially those that are present in the voter's district.
5. The voters choose the candidate depending on his/her choice starting from the first preference to the last third preference and clicks votes.	
	6. The system saves all those votes accordingly, starting form preference one to preference three. And logs out the voter from the system.
	7. The system verifies that that the citizen who has voted cannot vote again.
Alternate Scenario	
	8. If the validation of the password and username of the voter were incorrect, the will redirect the voter to login again.
9. The voter will now have to enter the correct password and username into the system.	

	10. If the enter password and username already voted, the system will reject logging in for the second time and display a warning message saying you have already voted.

10. The Use Case Scenario Cast Vote

1. Name of Use Case: Cast Vote
2. Main Actors: Voter and Electoral Official
3. Purpose: This case scenario deals with casting of votes depending on the choice of each voters and saving the votes into the database of the system.

Table 4.10: The Use Case Scenario Cast Vote

Voter/Citizen	System
Main Success Scenario	
1. Voter login to the system by entering password and user name.	
	2. The system validates the password and username and logs in the voter into the system. And directly displays the district candidates for the voter to choose.
3. The voter views the different candidates and chooses the candidate's	

depending on his/her vote of choice starting from the first preference till the third preference. After choosing the voter clicks vote.	
	4. The system verifies the votes and stored them into the secured database of the system and continues opening a new window which displays all Regional candidates for the voter to choose.
5. The voter views the Regional candidates closely and votes according to his/her own preference starting from preference one all the way to preference three and click vote to send to vote to be saved.	
	6. The system validates the votes and stores the votes safely into the database system of the system and logs out the voter and make the system prepared for the next voter to login to vote.
Alternate Scenario	
	7. If the password entered with the username to are validated to be wrong the voter is redirected to login screen to

	login again.
8. The voter enters password and username correctly again to enter the system.	
	9. If the password and username entered is validated to have already used to vote, the system will displays an error message saying you have already voted.
10. The voter does not try again, only the new voter enters the system, every voters enters the system for the first time.	
	11. If the details filled on the preference are incorrect or incomplete the system displays error message so the voter has to vote again.
12. The voter votes again with the correct procedures to vote and the details filled on the e-ballot paper are corrected.	

11. The Use Case Scenario Voter's Profile

1. Name of Use Case: Voter's Profile
2. Main Actors: Admin and Electoral Official

3. Purpose: This use case deals with displaying the voters profile to the admin and electoral official for edition and correction.

Table 4.11: The Use Case Scenario Voter's Profile

Admin	System
Main Success Scenario	
1. The Admin enter password and username to enter the system.	
	2. The system validates the password and user name and login the Admin to the admin welcome page.
3. The Admin clicks on view Citizens menu in on the Admin welcome page and it take the Admin to the voter's profiles.	
	4. The voters profile are displayed for the admin to view and edit and do correction where needed. After viewing and addition, the Admin logs out of the system.
Alternate Scenario	
	1. If the password and username entered to the system by the Admin to enter the system is validated to be wrong, the system redirects the Admin to the

	admin login page to login again with the correct password and username.
2. The Admin enters the correct password and username again to login to the system.	
	3. If edition of the voters profile is not correct, the system displays error message to the admin for the admin to check the details again and do edition again.
4. The Admin check voter profile details again and makes correction.	

12. The Use Case Scenario Edit System

1. Name of Use Case: Edit System
2. Main Actors: Admin and Electoral Official
3. Purpose: This use case deal with the whole edition of the system, the Admin login to the system and edits the system where ever it needs edition.

Table 4.12: The Use Case Scenario Edit System

Admin	**System**
Main Success Scenario	
1. The Admin enters password and username in the admin login screen to enter the system.	
	2. The system validates the password and

	username and log's in the Admin into the system and displays the Admin welcome home page.
3. The Admin clicks on areas that need correction or edition to view the errors.	
	4. The system displays the page which has error for the admin to do edition or correction.
5. The Admin observes the error and does correction or edition and logs out of the system.	
	6. The system log's out the Admin from the system and saves all the edited data.
Alternate Scenario	
	7. If the password and username entered by the Admin are validated to be wrong the system redirects the Admin to the Admin login screen to login again.
8. The Admin log's in again by entering the correct username and password into the system for validation.	
	9. If the data corrected by the Admin are not yet correct for saving, the system

	still displays error message for the Admin to do edition again and save the data.
10. The Admin does correction again with the correct details.	
	11. If there is another error in another part of the system, the admin clicks the direction menu to direct him/her to that particular are for edition or correction of the system.
12. The Admin does edition to a different part of the system after completing editing the previous section.	

1. **Activity Diagram**

The following diagram show the activity diagram National Capital District Electronic voting system in full details of how the data flows logically without considering the physical environment.

1. Ac**tivity Diagram Login**

This activity diagram shows the workflow of how the login system interacts with the users who want to enter into the system.

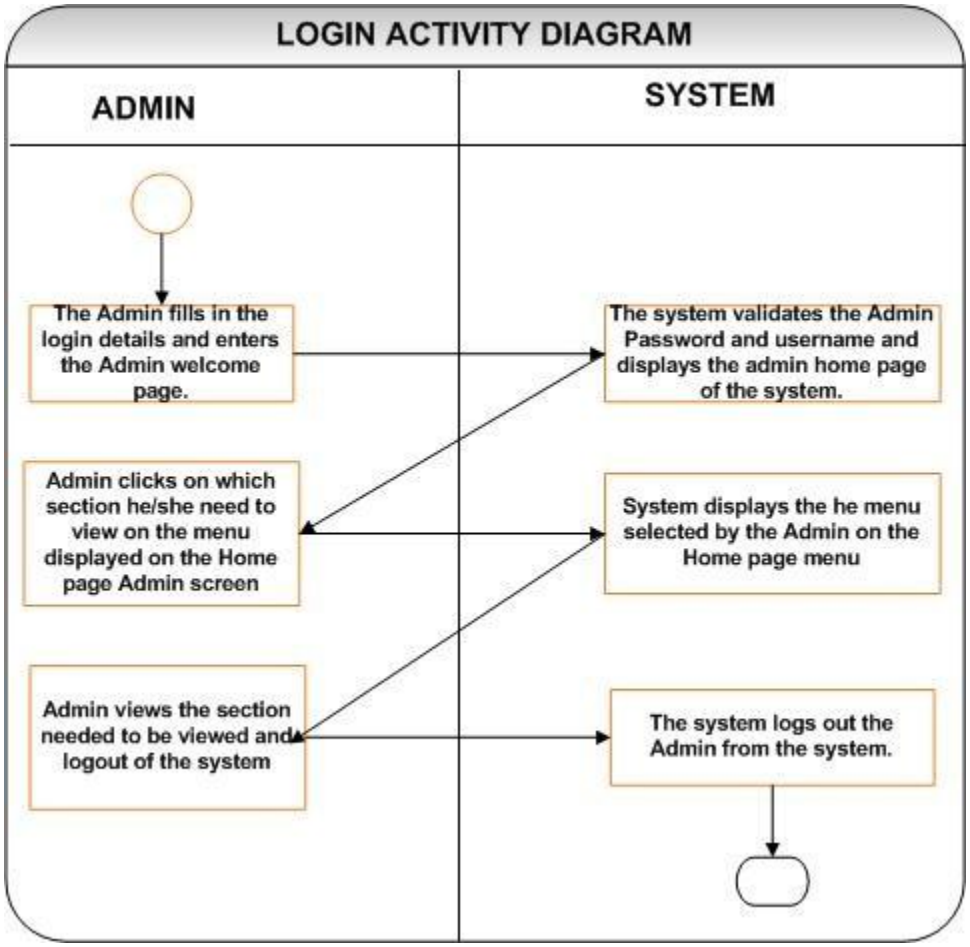


Figure 4.4 Activity Diagram of Admin login and interaction with the system.

2. Activity Diagram Update Candidate

This Activity diagram shows how the Admin enters the system and updates candidate, the candidate update refers to candidate details update, whether a name edition, box number edition , party edition or a candidate decides to withdraw from the election and he/she must be deleted from the database and the e-ballot paper.

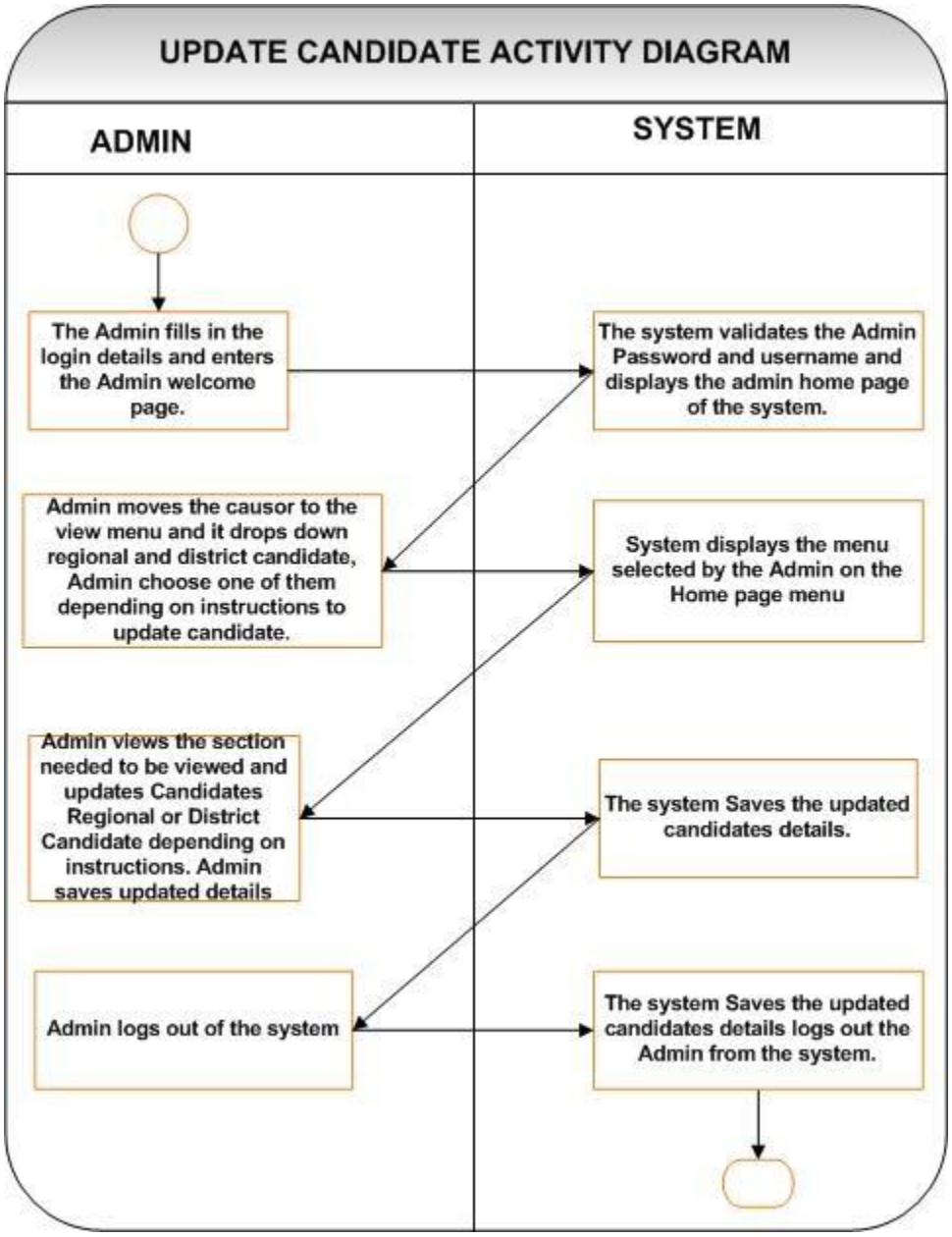


Figure 4.5: Activity diagram showing how admin enters the system and updates candidate.

3. Activity Diagram Add new Candidate

This activity diagram logically states how the Electoral official registers new candidate into the system for them to be included on the e-ballot paper for all voters to see and vote for him or her.

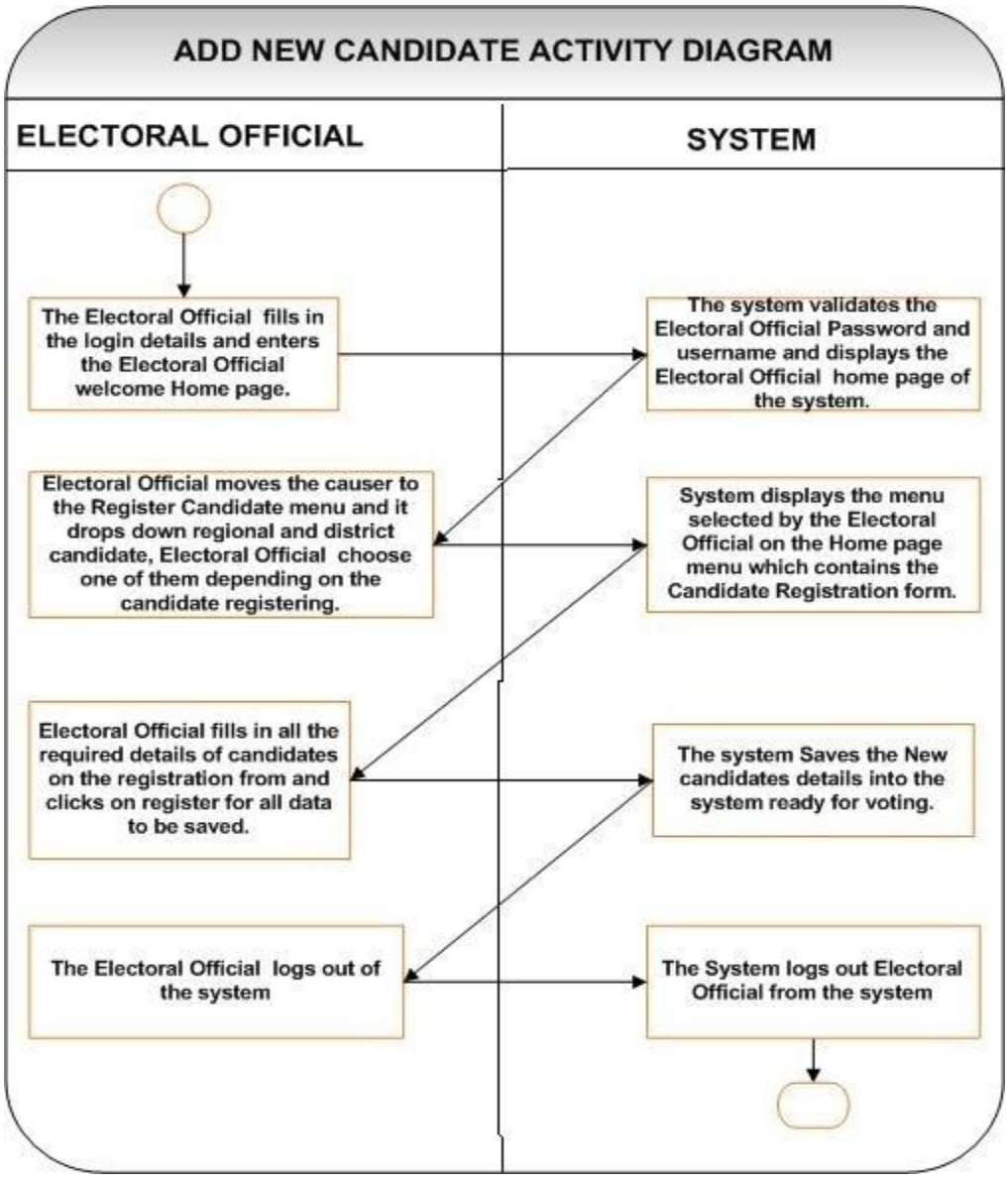


Figure 4.6: Activity Diagram show logical flow of the system when an Electoral Official Logs into the system to register a new Candidate into the system.

4. Activity Diagram Delete Candidate

This activity diagram show logically how a candidate is deleted from the database of the system if he/she withdraws from election or the logical deleting of candidates after election.

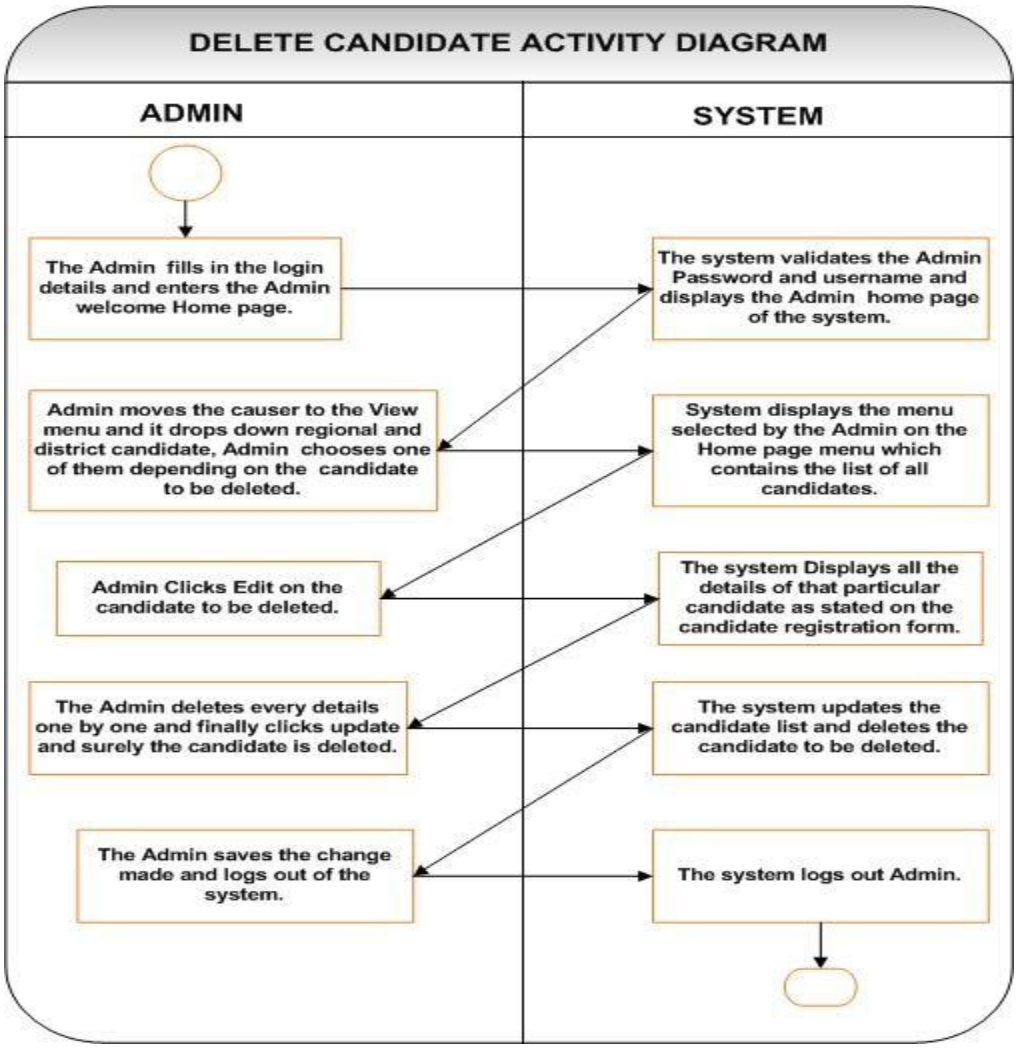


Figure 4.7: Activity Diagram showing logical flow of deleting a candidate from the Electronic Voting system.

5. Activity Diagram Register citizens of NCD.

This Activity diagram deals with displaying all activities executed through by the system to register a citizen of NCD into the e-voting system preparing him/her for voting.

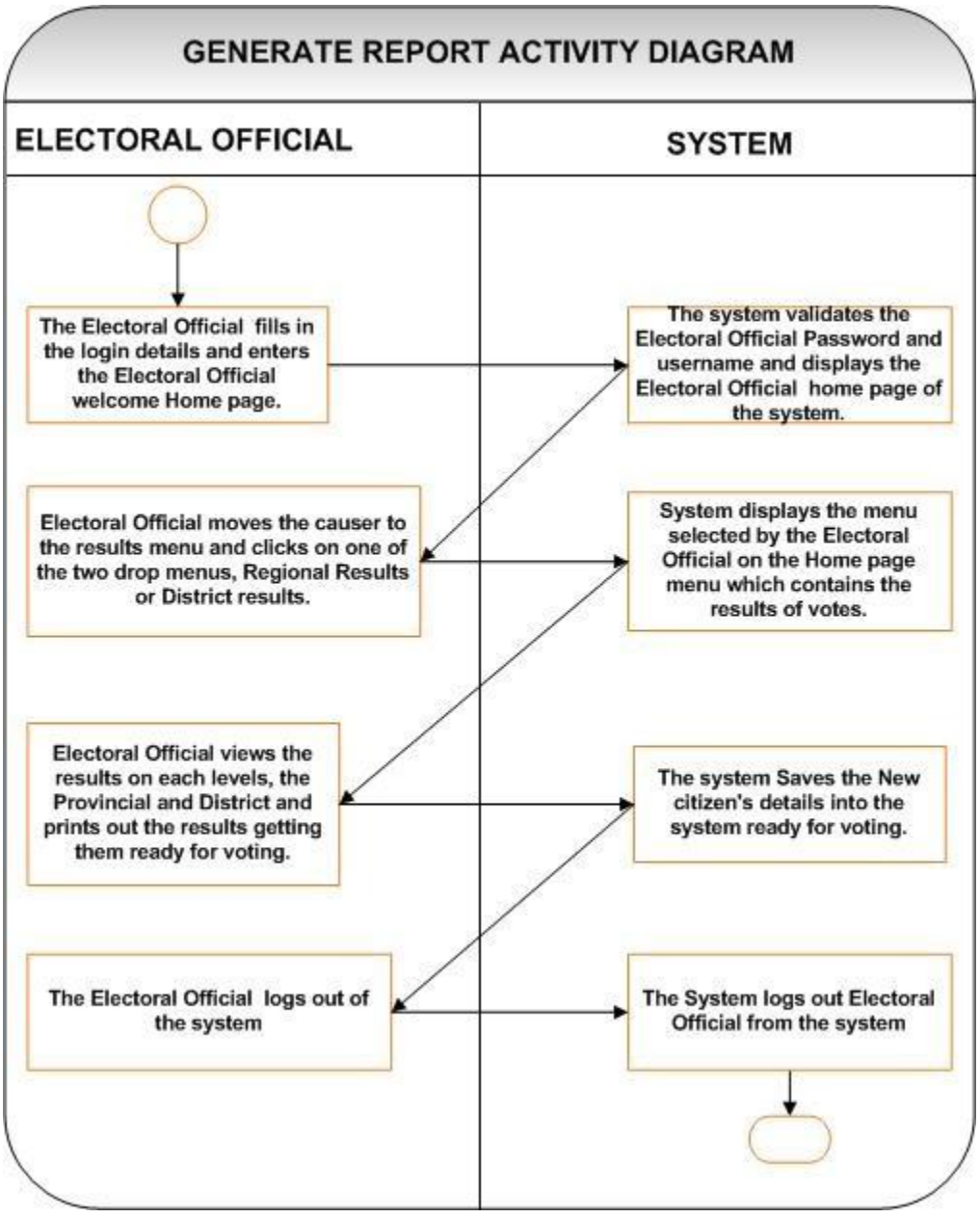


Figure 4.8: Activity Diagram of registering a citizen of NCD into the system.

6. Activity Diagram Filter Results

This activity diagram shows the step by step activities that are carried out by the system when the admin filters results of all activities carried out in the system.

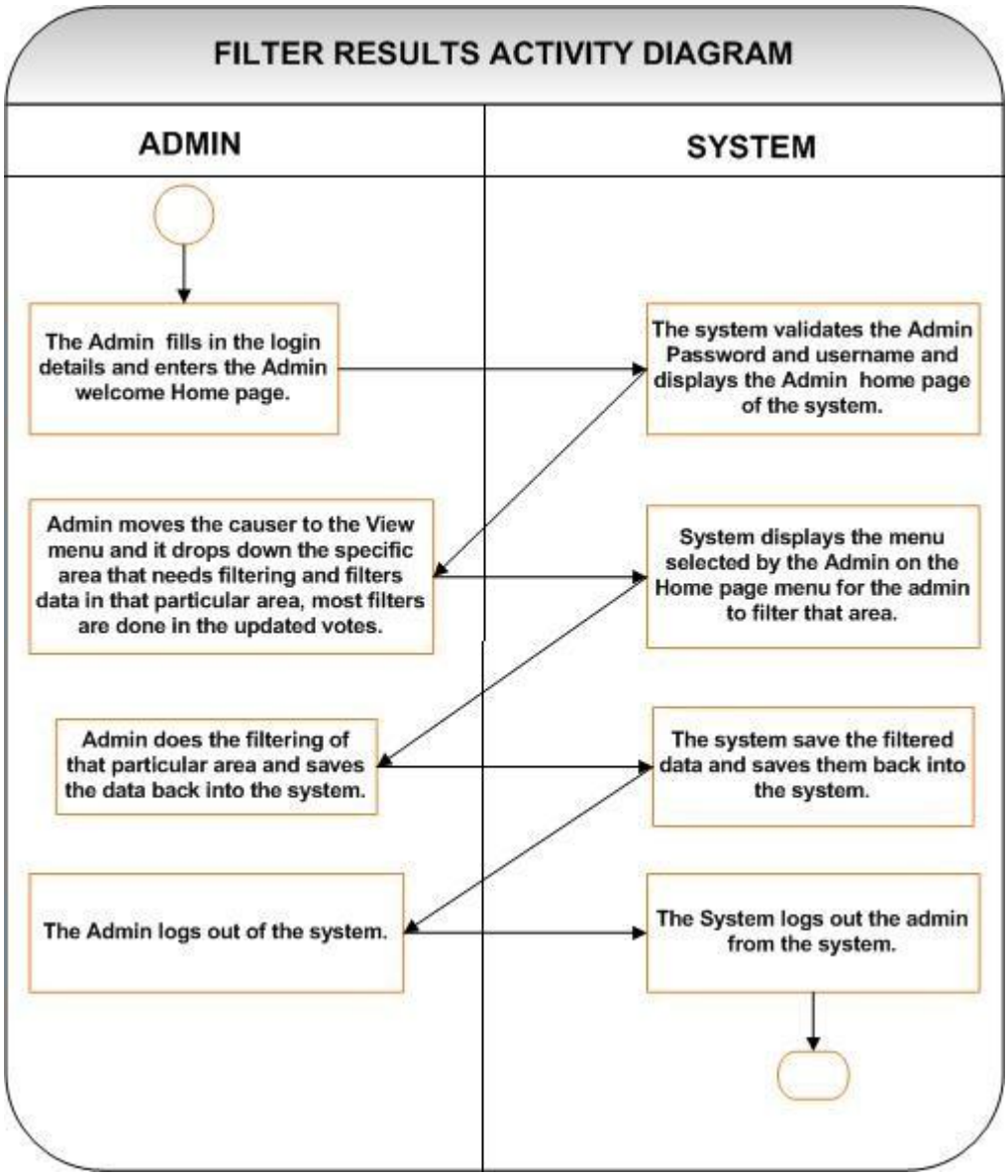


Figure 4.9: Diagram show flow of activities that take place during filtering of data in the system by the admin of the system.

7. Activity Diagram Generate Report

This Activity diagram shows the procedures step by step on how the Electoral Official generates report on the output obtained from the system, it prints out results of votes received by each candidates.

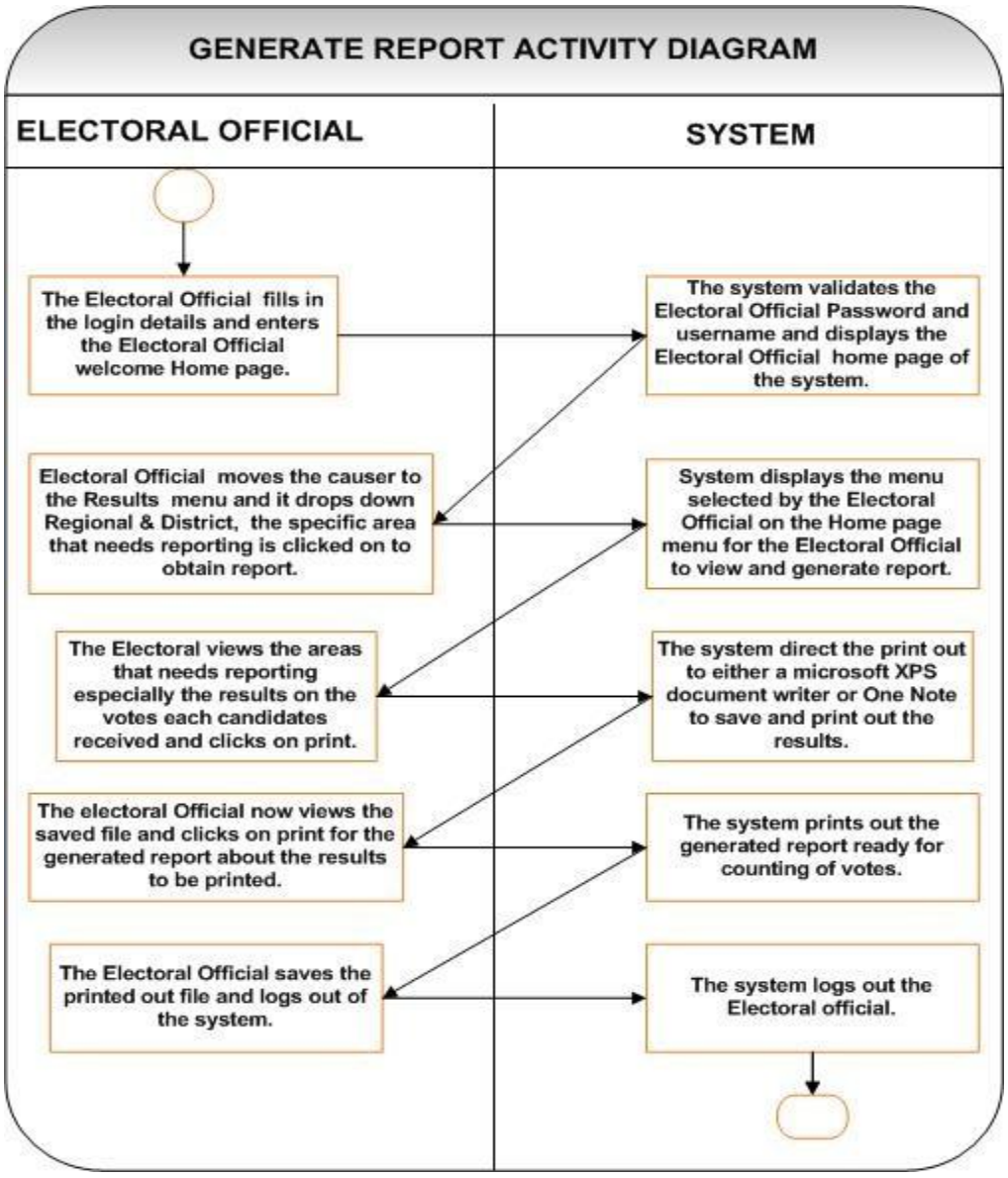


Figure 4.10: Activity diagram of Electoral official interacting with the system to view and print out the voting results output by the system.

8. Activity Diagram Update Vote

Activity diagram showing procedures on how a voter's detail is updated during the time of registration and status after voting.

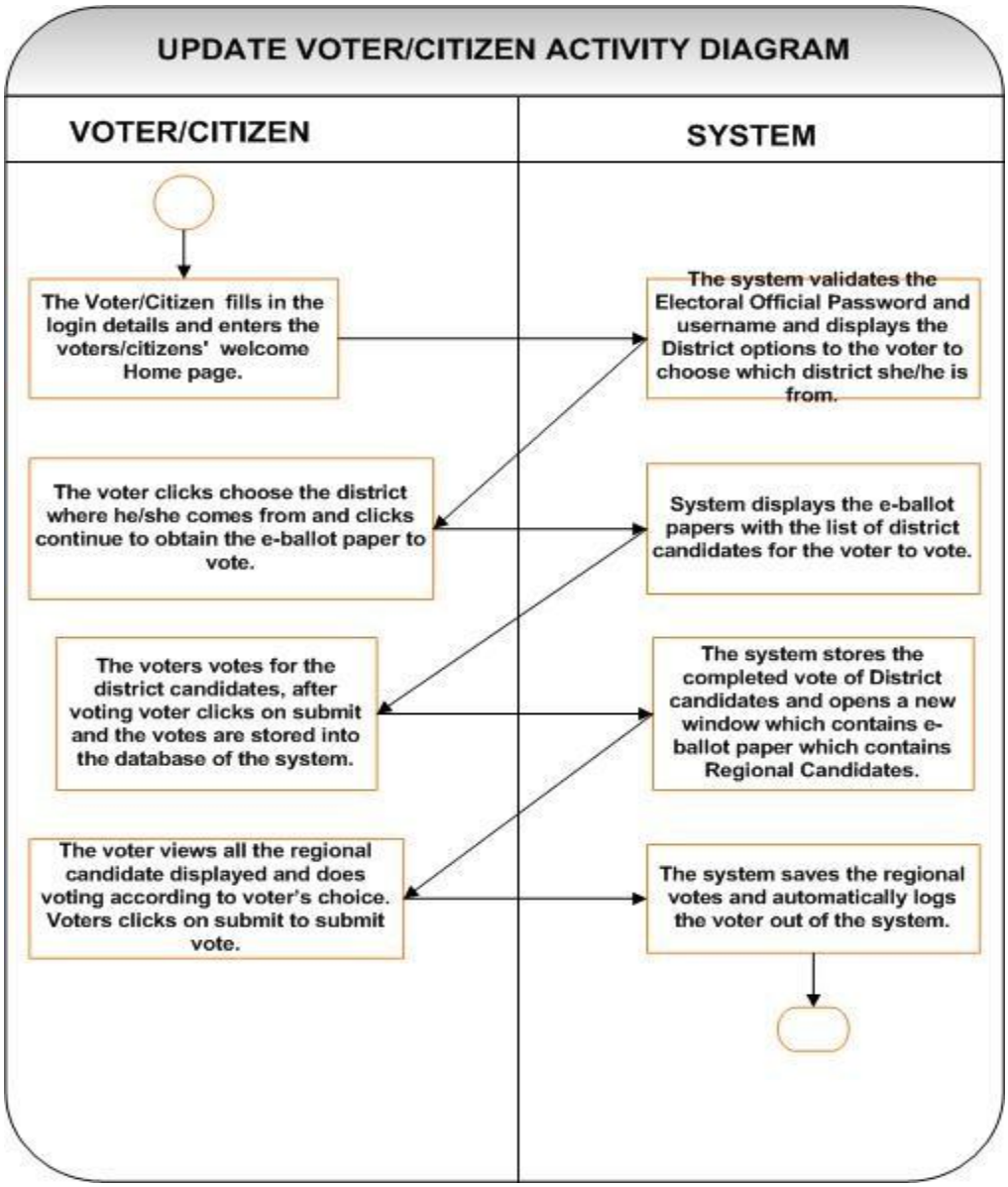


Figure 4.11: Activity diagram of updating a voter details in the system in a logical order, update voters is done by electoral official and for confirmation reason, the same report are sent to the Admin of the system to do confirmation.

9. Activity Diagram Display Candidate

Logical procedures on how the system displays candidates for voters to view and cast their votes, Electoral official to generally view and detect errors or missing details, and Admin to view and make edition and correction on details that needs correction.

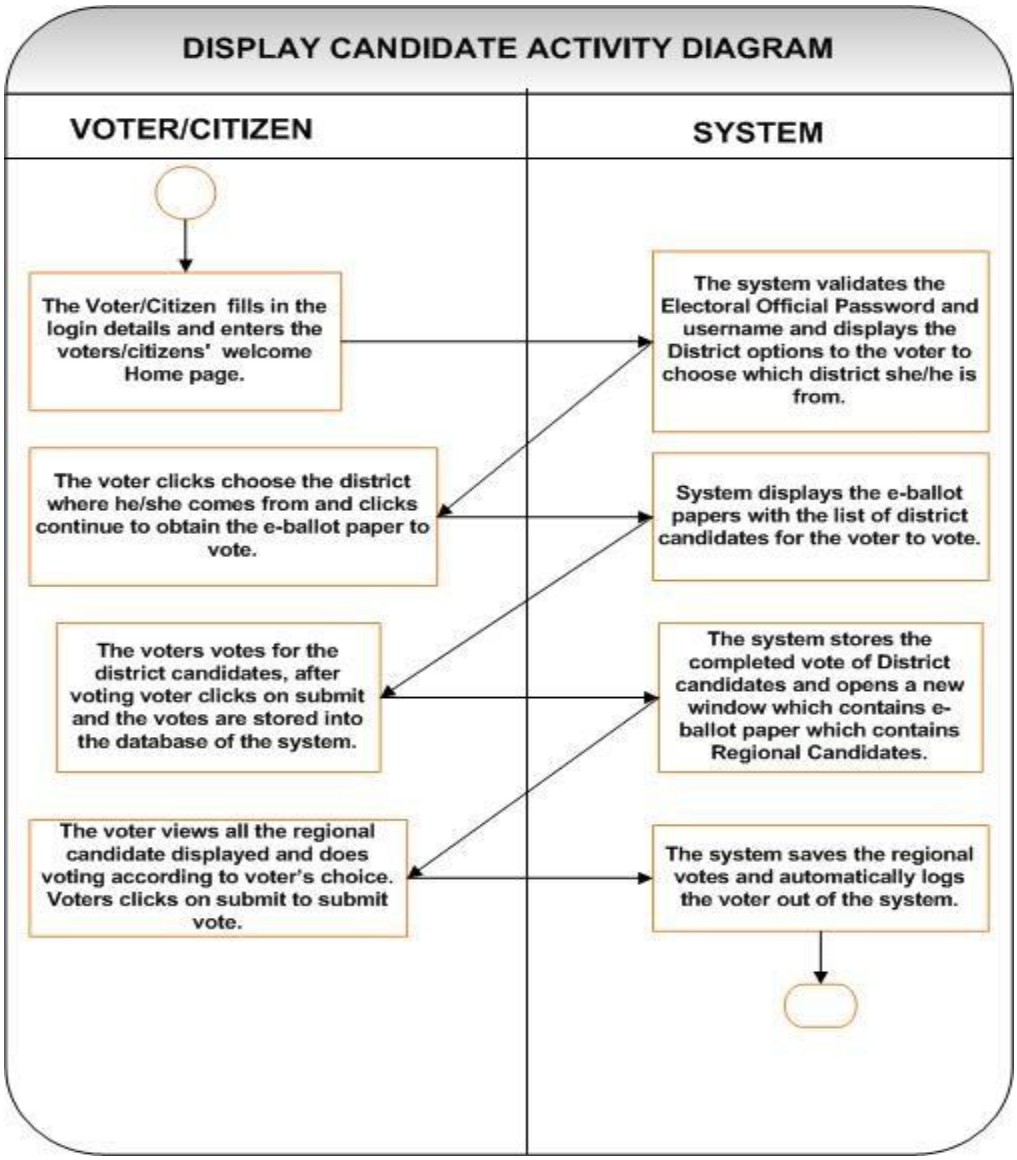


Figure 4.12: logical procedural activity diagram on how the system interacts with a particular voter to display candidates for voters to choose for voting.

10. Activity Diagram Display Voters

This activity diagram deals with displaying the voters to the parties concerned like the admin of the system and electoral officials of NCD electoral commission.

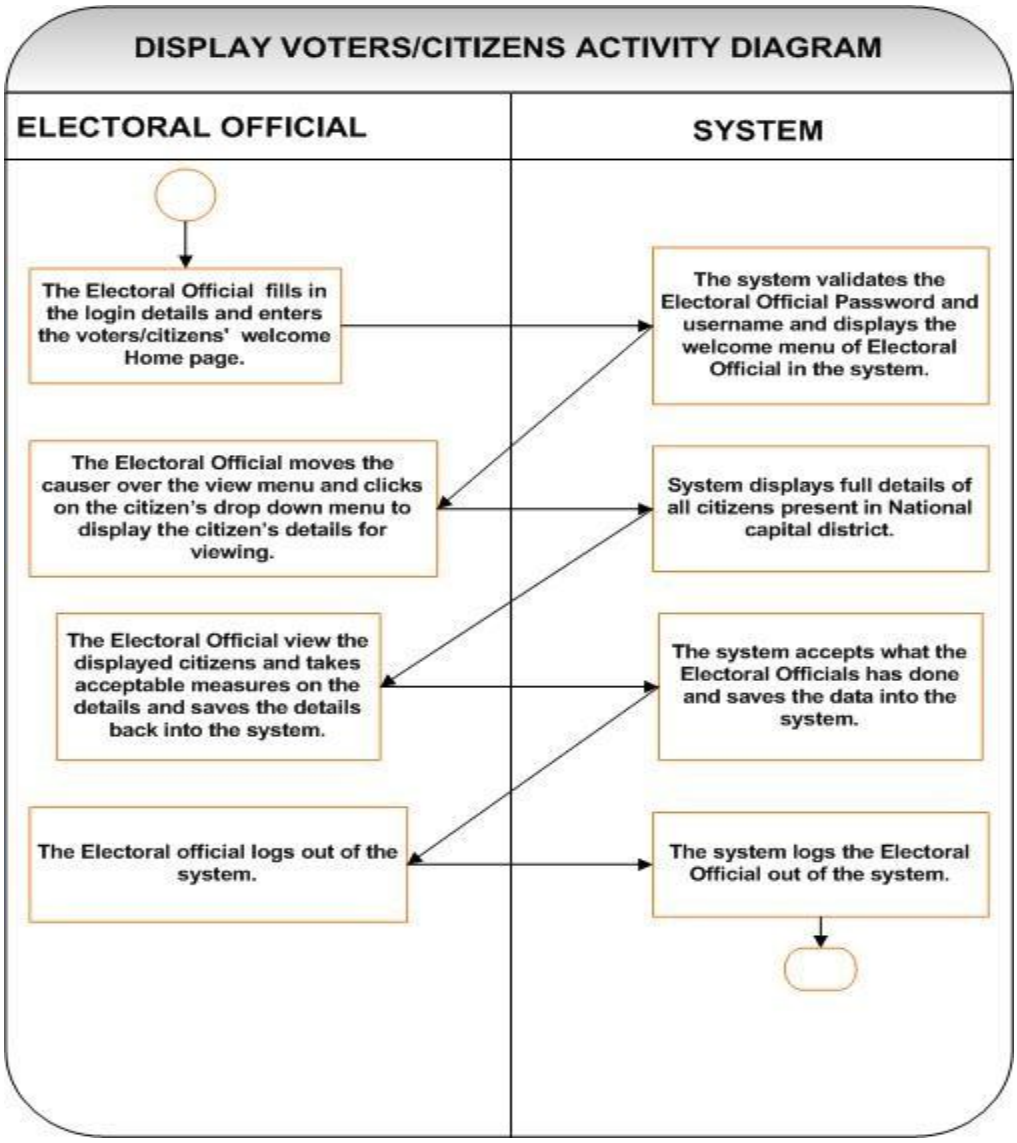


Figure 4.13: logical procedural activity diagram showing the interaction of the system and Electoral official to display citizen's details for viewing.

11. Activity diagram Cast Vote

This Activity diagram shows the full complete process on how voters interact with the system to vote.

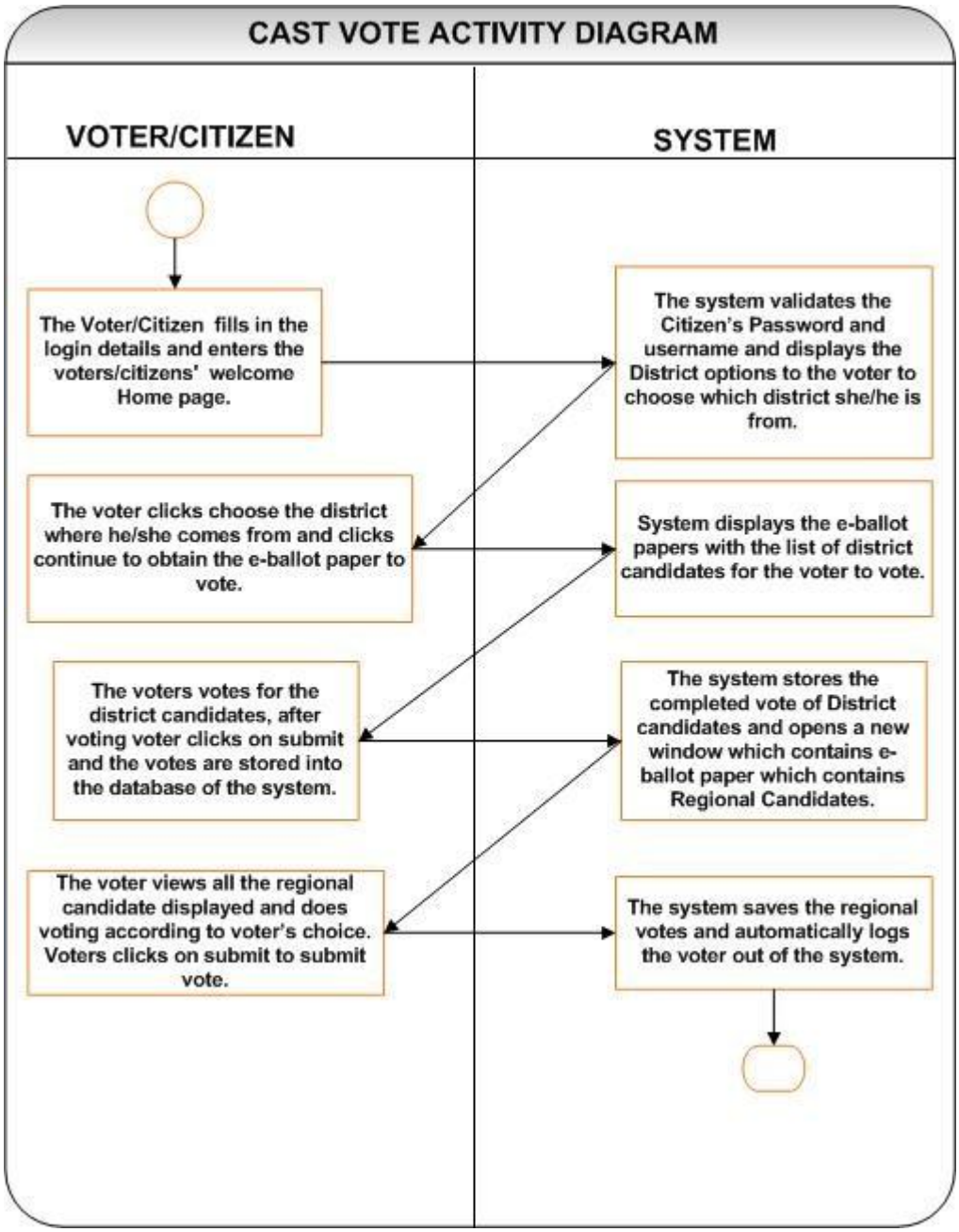


Figure 4.14: logical procedure of activity diagram of how a voter votes for regional and district candidates.

12. Activity Diagram Voters Profile

This activity diagram deals with the logical procedure that deals with displaying the voters profile for the Electoral Official to view them.

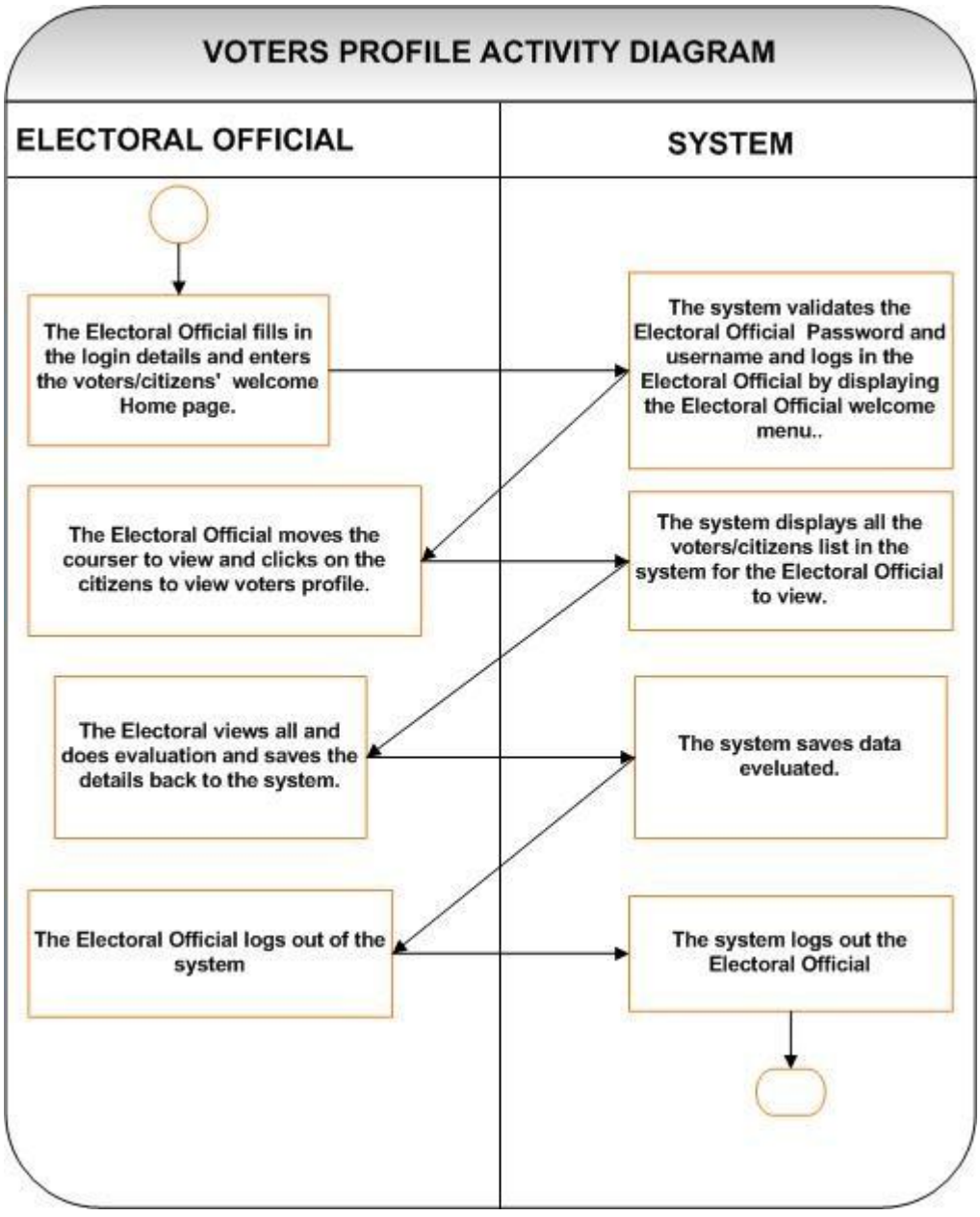


Figure 4.15: Logical Activity diagram of showing voters profile in an interaction of the system and the electoral official.

13. Activity Diagram Edit System

This activity diagram deals with how the Admin of the system interacts with the system to evaluate the system and does system edition.

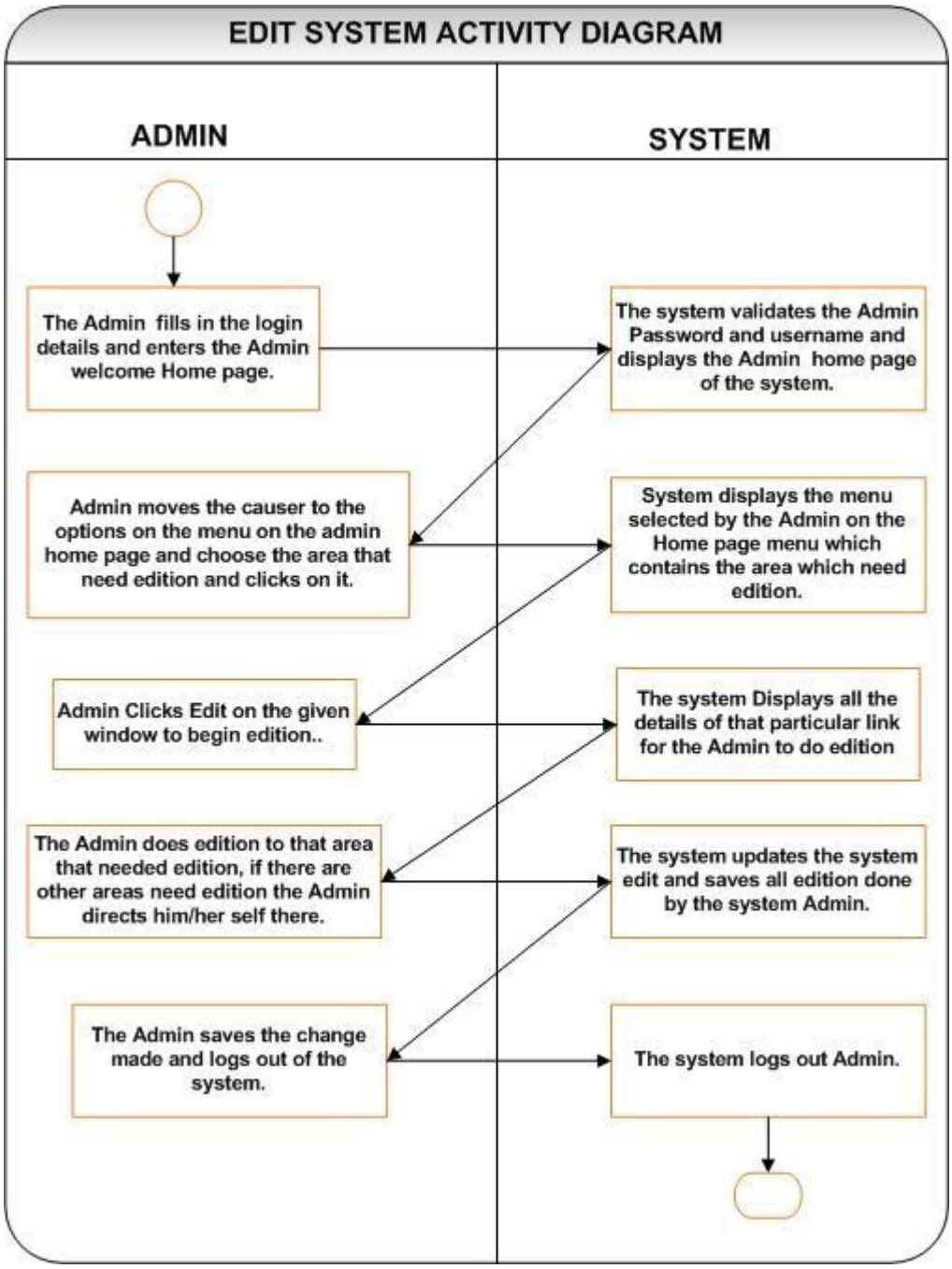


Figure 4.16: Logical general procedural activity diagram for System Admin to login to the system and do edition to any areas that need edition.

2. Sequence Diagram

A **Sequence diagram** is an interaction diagram that shows how processes operate with one another and in what order. It is a construct of a message Sequence chart. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the Logical View of the system under development. Sequence diagrams are sometimes called **event diagrams** or **event scenarios**.

The following are the three Main Sequence diagram of the three user's interaction with the system;

1. Admin Interaction Sequence Diagram with the system.

A. Sequence Diagram of Admin login and Registration of Electoral Official

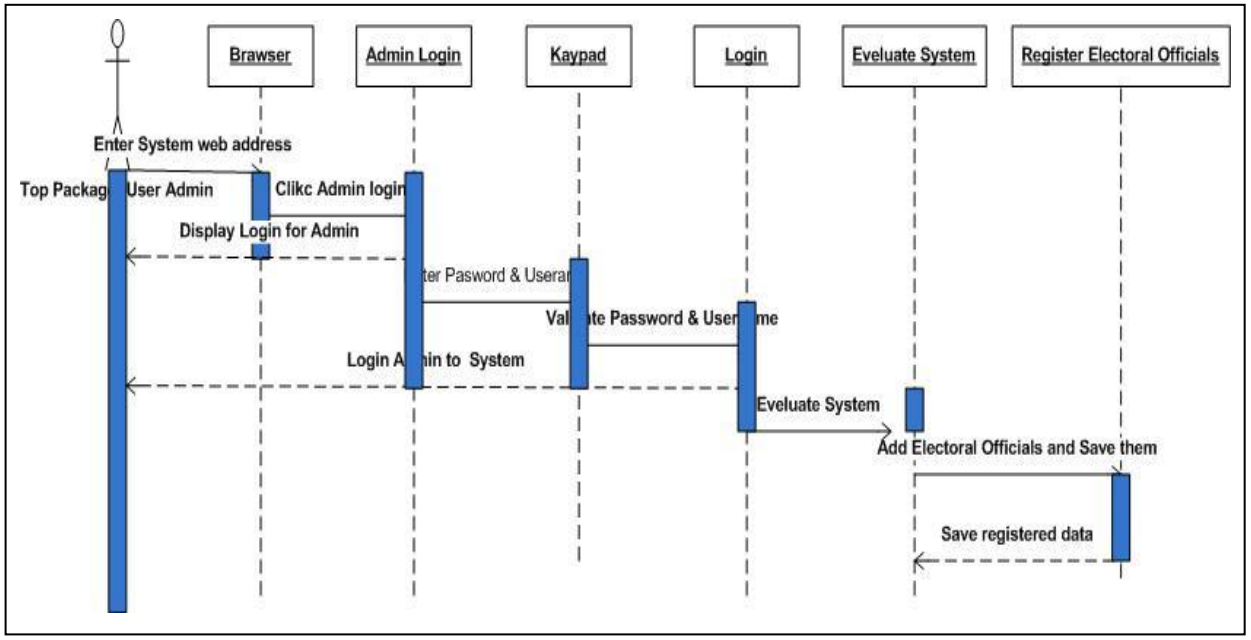


Figure 4.17: Sequence Diagram of Admin Login and Registering Electoral Official.

B. Sequence Diagram of Admin Filtering Results

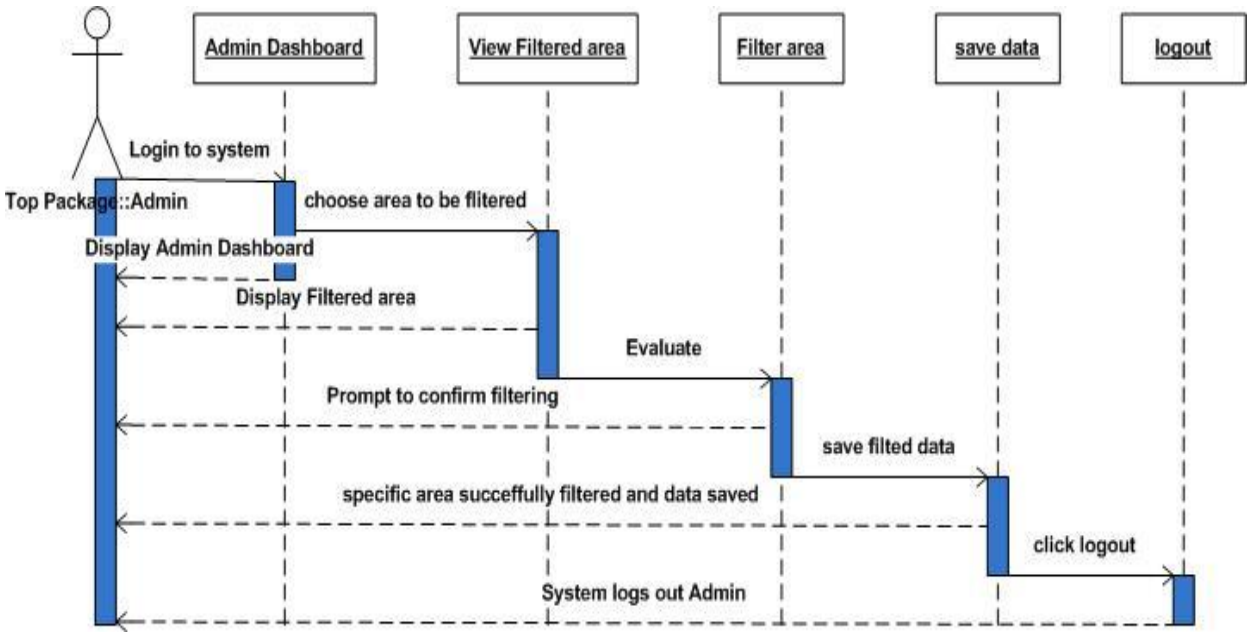


Figure 4.18: Sequence Diagram of Admin Filtering Results

C. Sequence Diagram of Editing System

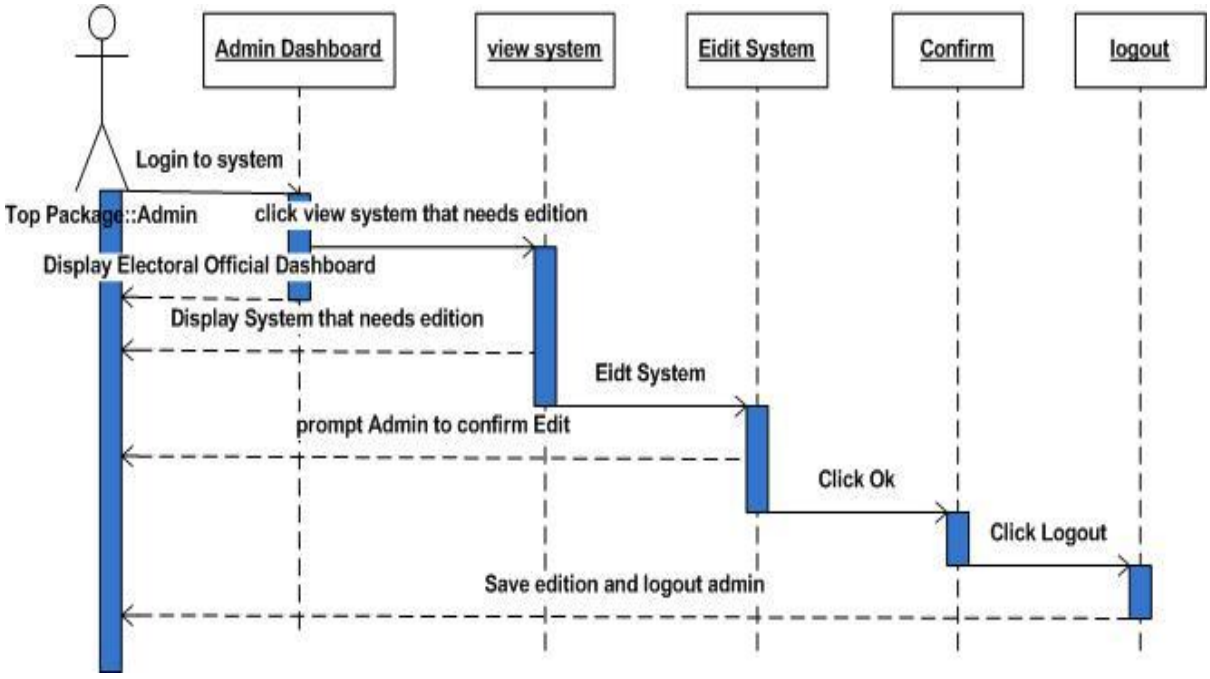


Figure 4.19: Sequence Diagram of Admin Editing System

2. Electoral Official Interaction Sequence Diagram with the system.

A. Electoral Official Login

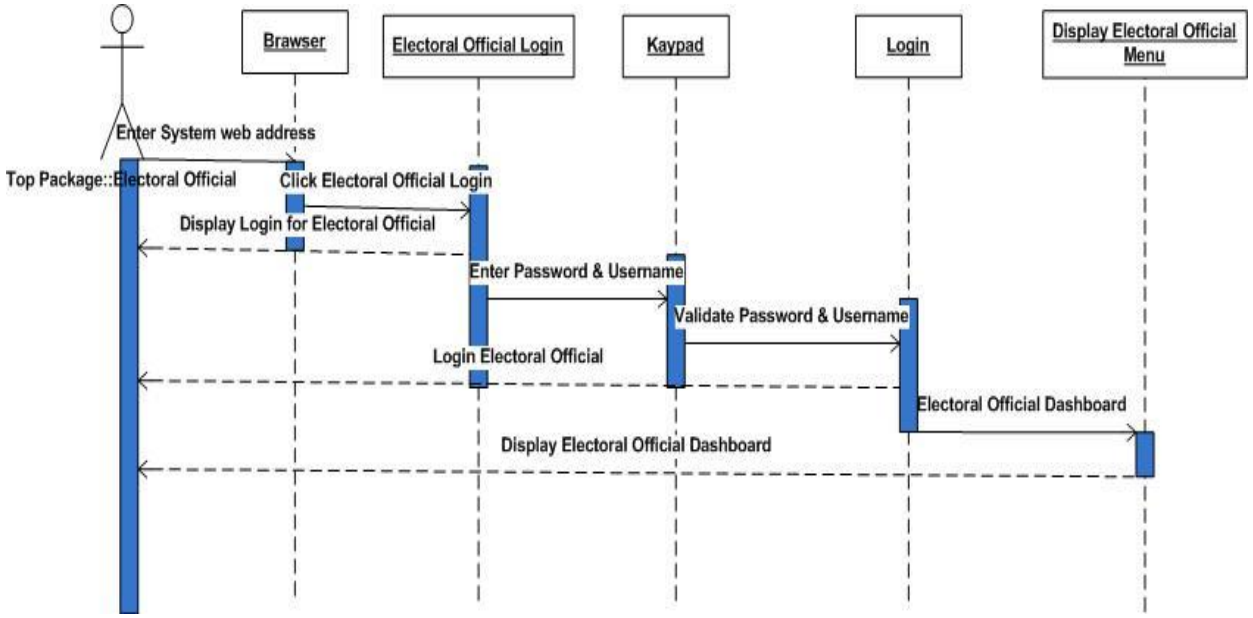


Figure 4.20: Sequence Diagram of Electoral Official Login

B. Sequence Diagram of Registration of Citizen

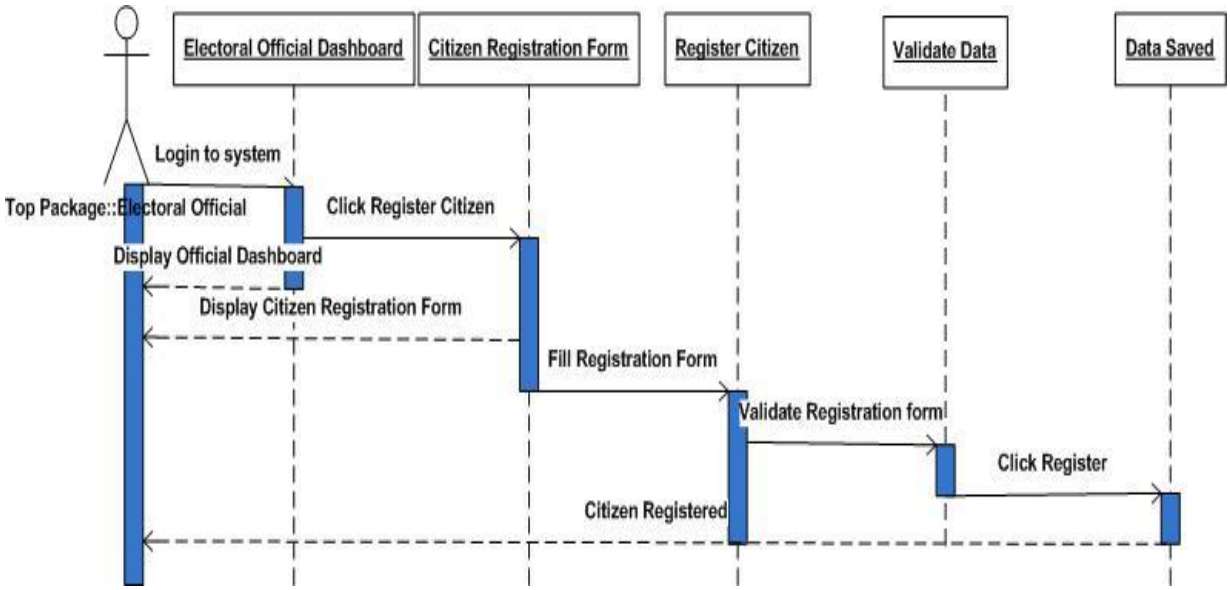


Figure 4.21: Sequence Diagram of Citizen Registration

C. Sequence Diagram of Registration of Candidate Registration

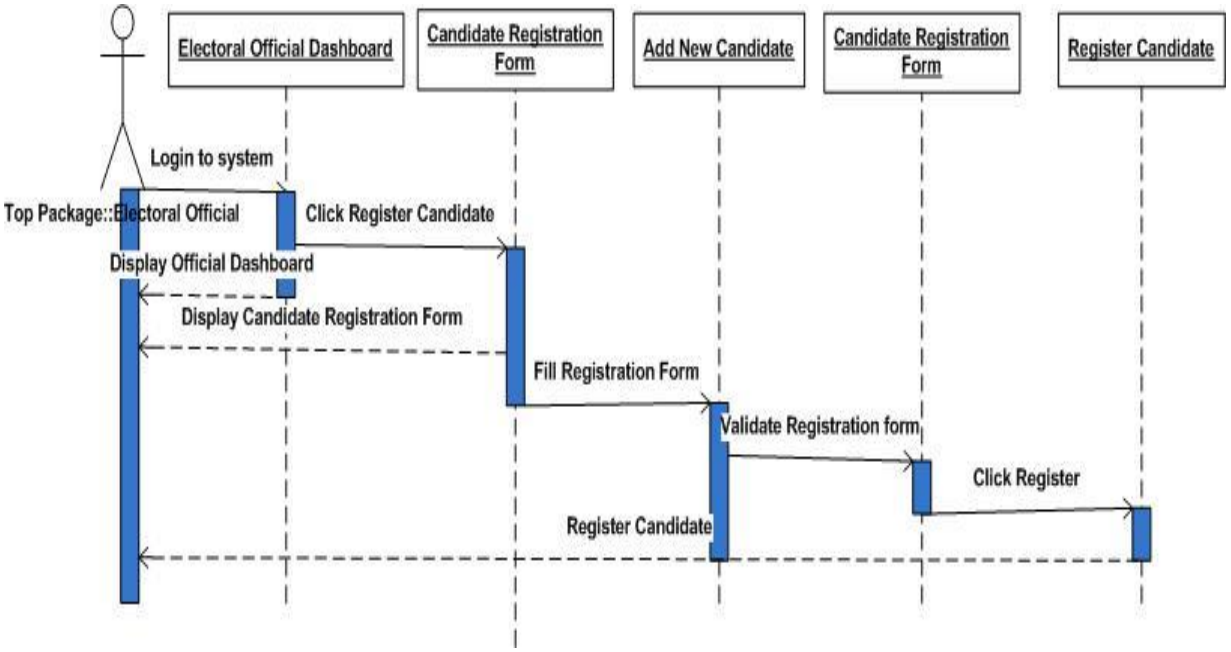


Figure 4.22: Sequence Diagram of Registration of New Candidate

D. Sequence Diagram of Viewing Citizen's Profile

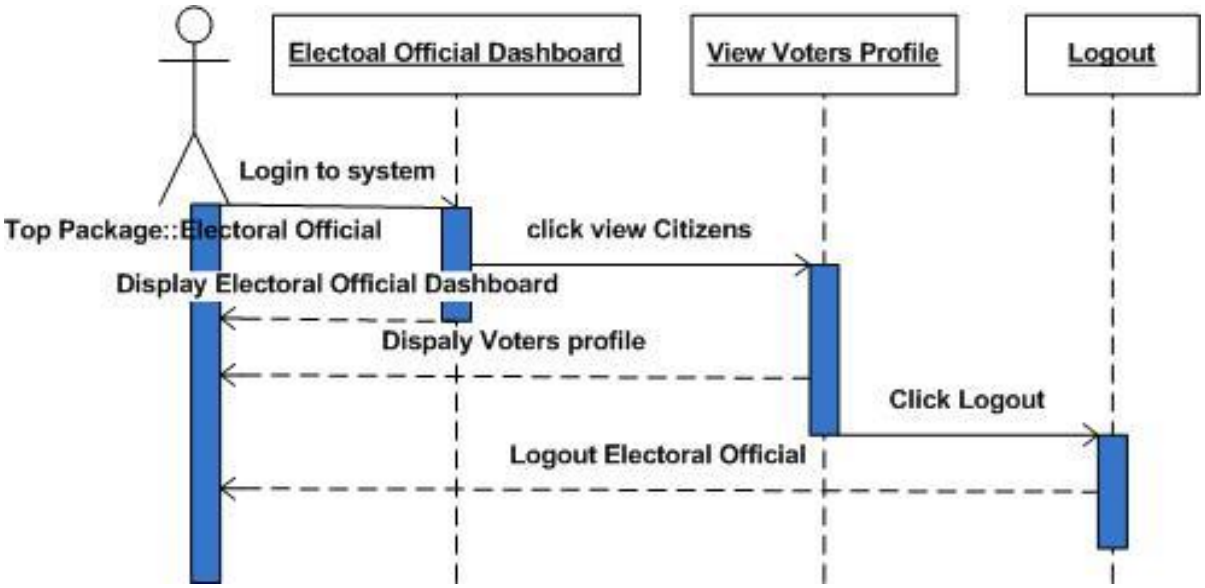


Figure 4.23: Sequence Diagram of Viewing Voter's Profile

E. Sequence Diagram of Viewing Candidates

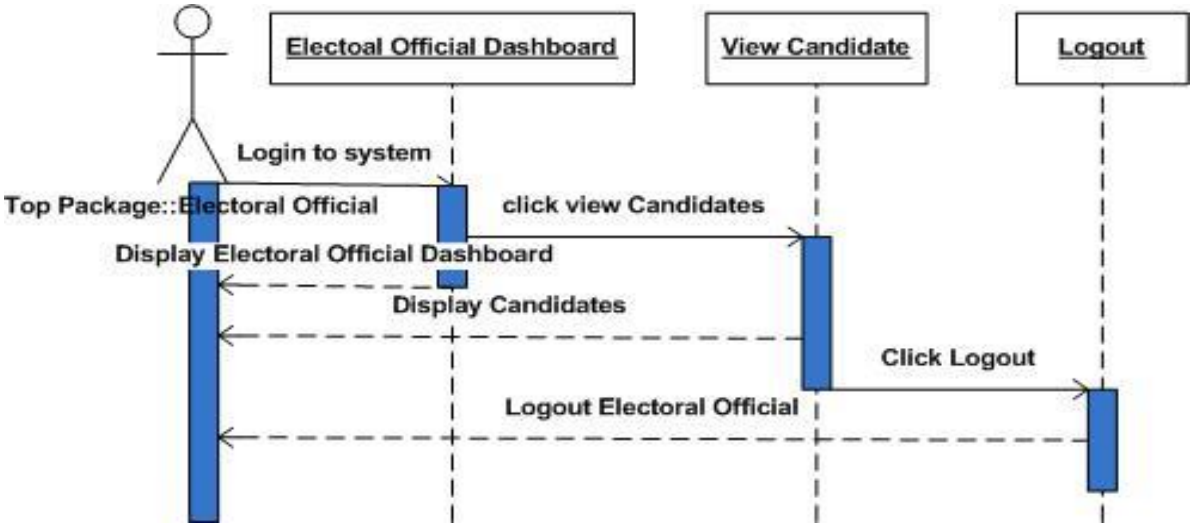


Figure 4.24: Sequence Diagram of Viewing Candidate

F. Sequence Diagram of Print Report

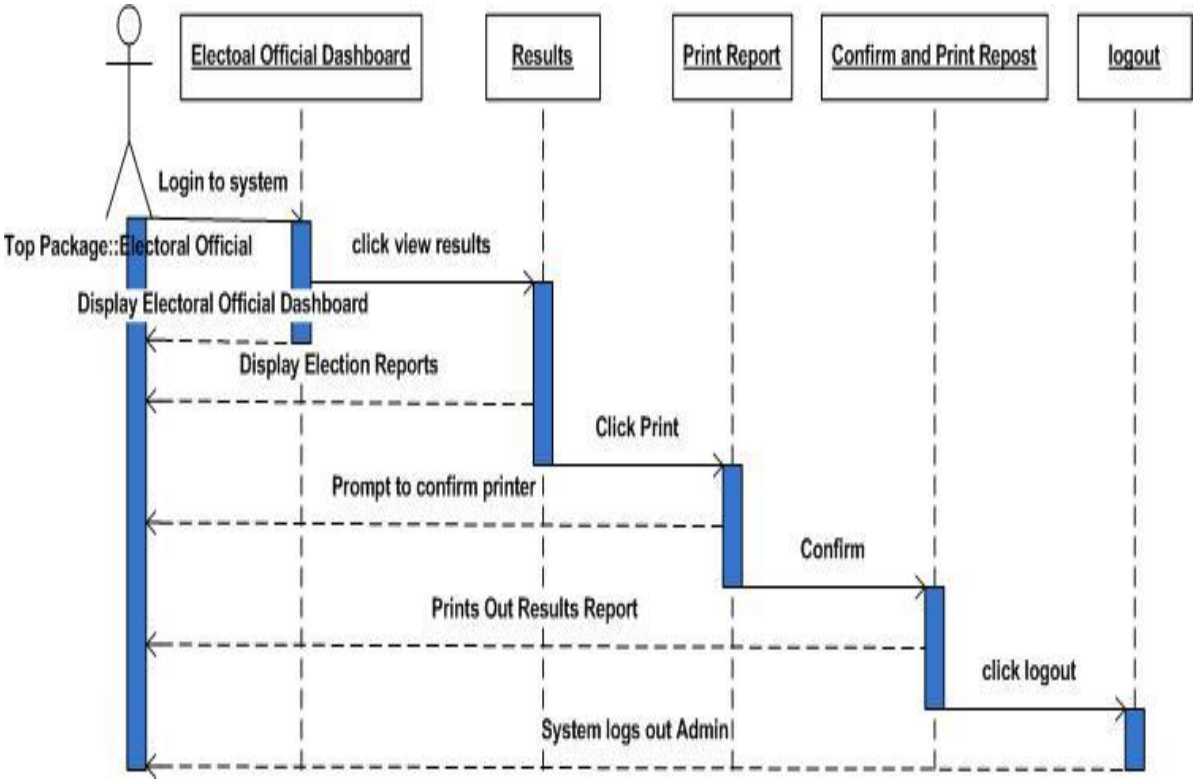


Figure 4.25: Sequence Diagram of Printing Report

3. Citizens/Voters Interaction Sequence Diagram with the system.

A. Sequence Diagram of Citizen's Login

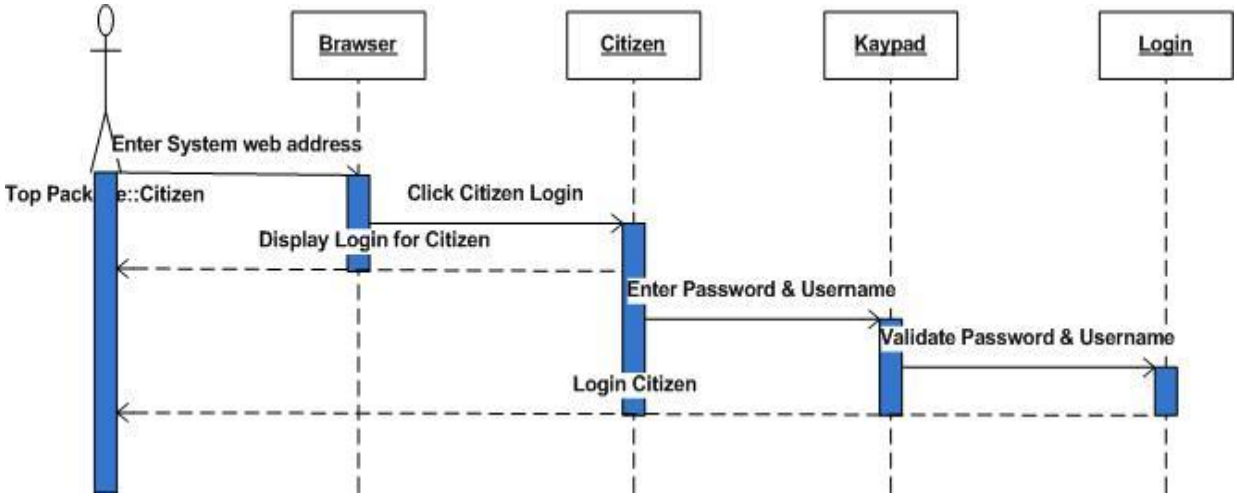


Figure 4.26: Sequence Diagram of Citizen Login.

B. Sequence Diagram of Casting Vote

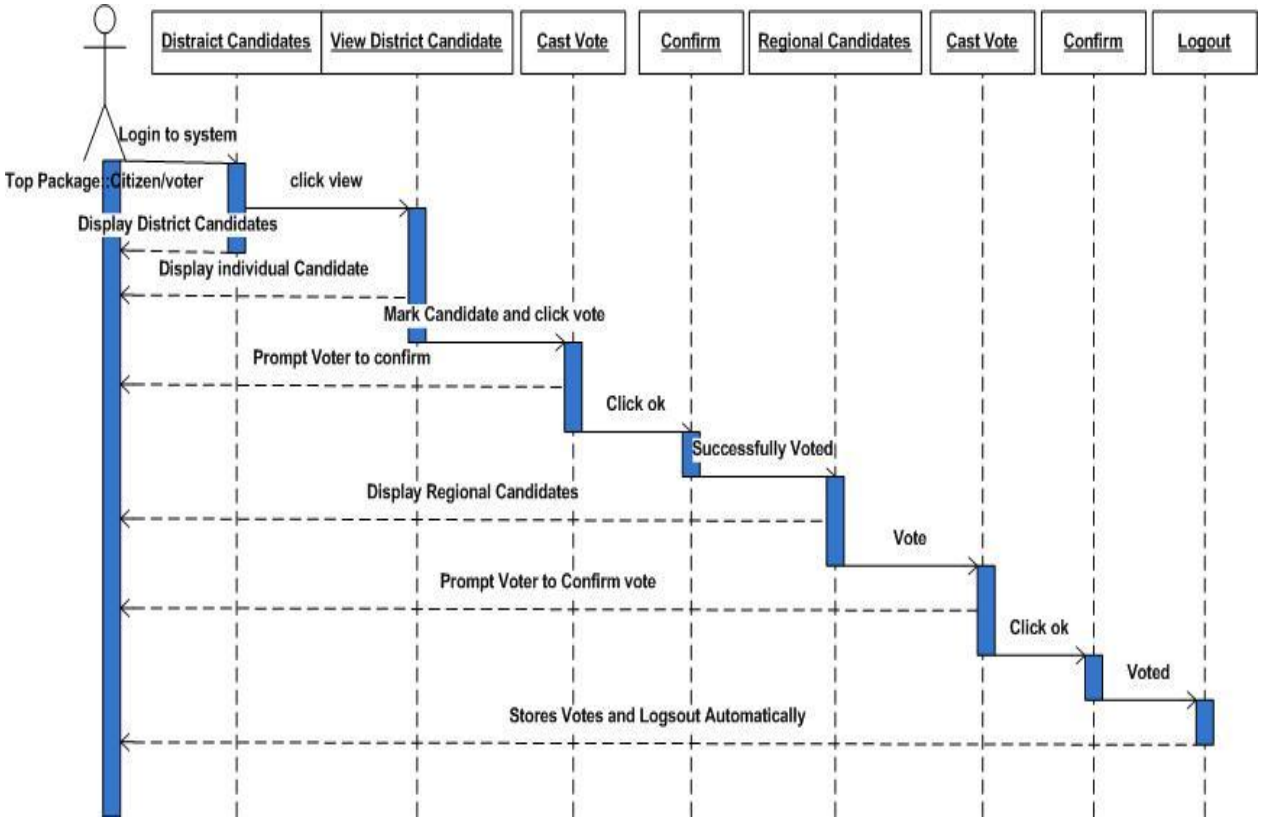


Figure 4.27: Sequence Diagram of Casting vote.

4.3.5. Class Diagram

A class diagram describes the attributes and operations of a class and also the constraints imposed on the system, according to the UML system development diagram Hierarchy, class diagram is the third level of UML diagram, In addition, class diagram is a type of static structured diagram that describes the structure of a system by showing the system's classes, their attributed, operation (or methods), and the relationship among objects. The class diagram of NCD e-voting system is as stated below:

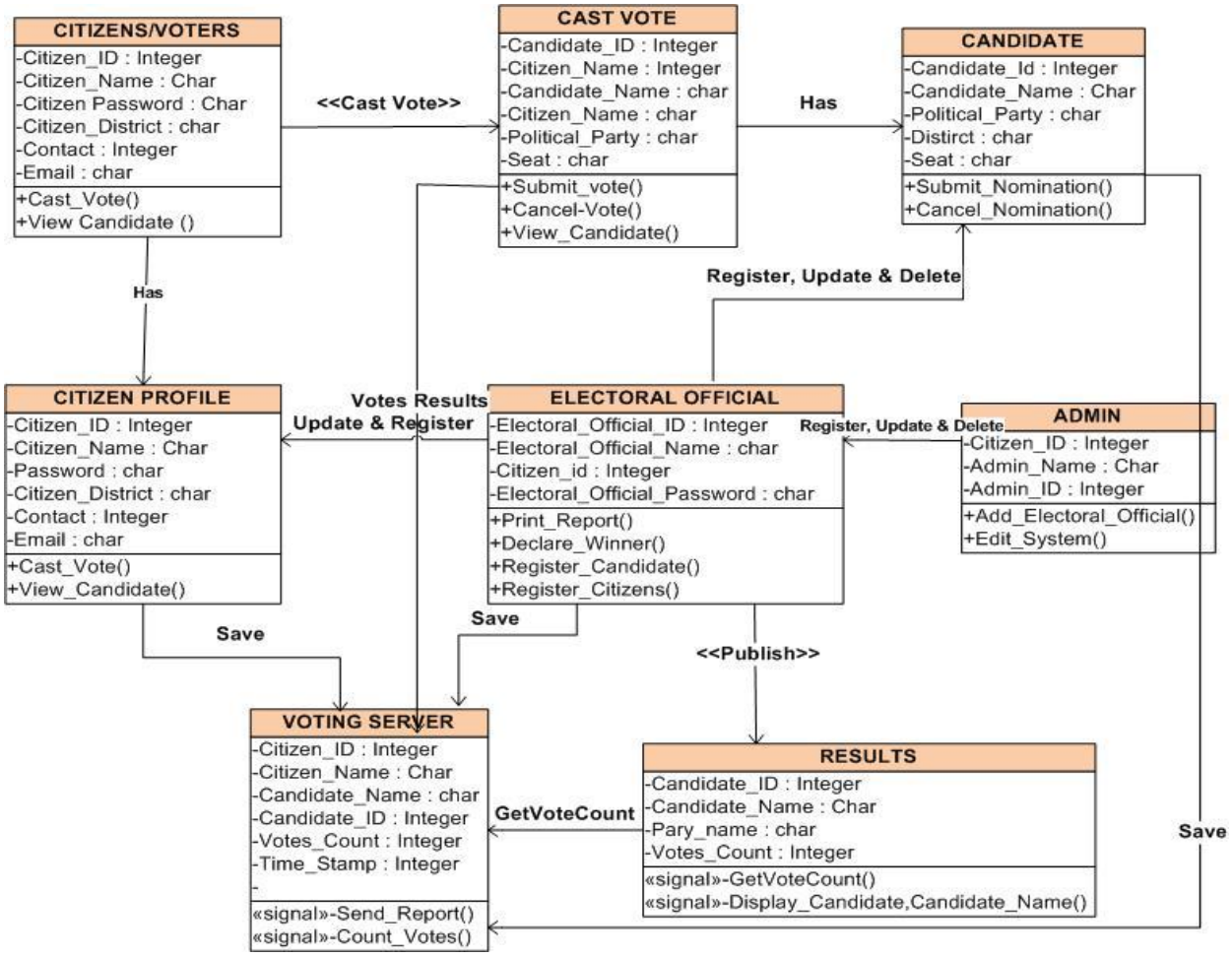


Figure 4.28: Class Diagram of National Capital Electronic Voting System-Papua New

The Deployment diagram or the physical diagrams describes in detail how the components to be deployed in the infrastructure system, it clearly show where the components will be located on the machine, server or hardware as illustrated below.

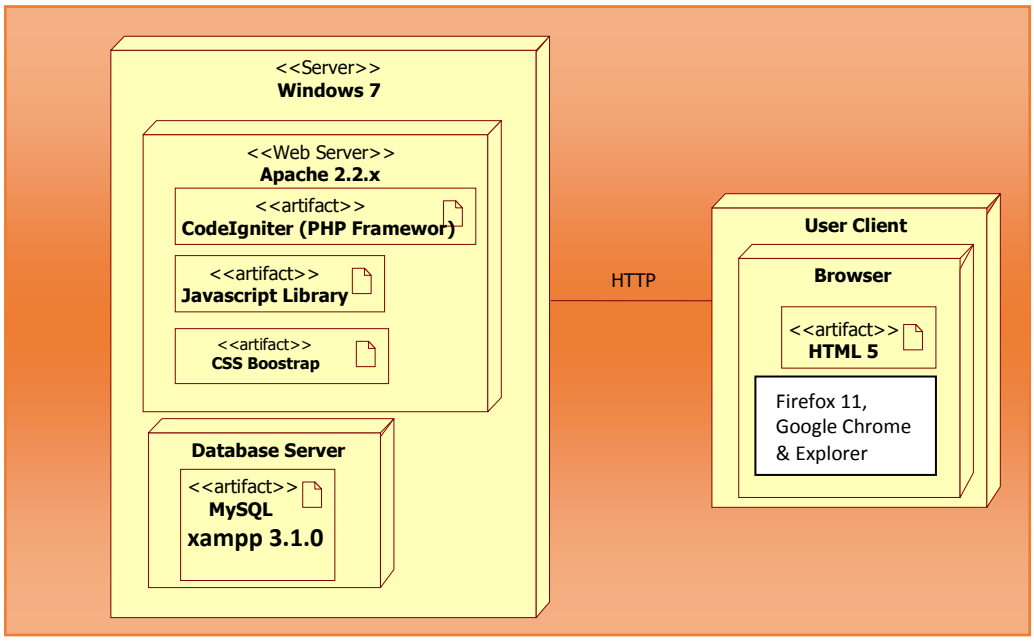


Figure 4.29: Deployment diagram of NCD e-voting system drawn using Unified Modeling Language.

b. Implementation

The prototype of NCD e-voting system is developed by PHP language integrated with some Java scripts using dream weaver, the system can be evolved into and modified with other much updated language. The PHP based system can run in any server with MYSQL standards as database, this prototype is powered run by xampp Apache 3.1.0. The system is web based and it is designed to be used both online and offline.

This system is purposely implemented to users to view and see how effective PHP web based system can perform; the users can interact with the system and state their criticism so developers can do more improvement on the system development

i. **Implementation limits**

The limits on the implementation of National Capital District E-Voting system are as follows;

1. Implementation of the application gives access to only there users, the system administrator, the Electoral Official (The electoral Commission) and the citizens or voters during election.
2. Implementation of a system application which is built only for National Capital District of Port Moresby, it cannot be used by other province, to do so it must be edited by the system administrator.
3. When the citizen login to vote, he/she must vote, if he logs out of the system, he/she cannot login to the system the next day and vote because their Citizen ID which is their password to access the system can only be used once to login to the system.
4. Only the Administrator of the system can register Electoral Official upon confirmation of the Electoral Official,
5. The Registration of the Citizens of National Capital District and the candidates are done by the Electoral Officials, it can also be overviewed by the system admin.

ii. Software Implementation

The software where the system can be implemented on can be a PC or laptop, operating systems Windows, Mac, Ubuntu, Linux and it can either be connected to the

Internet. Or not, the system can be operated offline on a local area network too. The software implementation is as follows:

1. Implementation of software PC / Laptop:
2. Operating System Windows XP / 7 / Windows 8..
3. XAMPP 3.1.0 for Internet and local database storage.
4. Adobe Dreamweaver CS3, Sublime Text to write coding in PHP program.
5. Code Igniter Framework 2.0
6. Mozilla Firefox 11 as a browser or Google chrome as browser :

iii. **Hardware Implantation**

To be able to run the system or applications designed it takes hardware as a supporter. The hardware described below are the current hardware that the system is running on, the system can run on other hardware platform and can perform much faster with maximum output. The hardware requirements are as follows:

Hardware implementation:

1.Processor: Intel (R) Celeron 1:80 GHz Core2Duo

2.32 bit Operation System.

3.Memory: 2024MB RAM

4.Hard drive: 300GB Seagate

5.VGA: Intel (R) HD Graphics

6.Monitor: 15 "Advance

iv. **Database Implementation (syntax SQL)**

Database Implementation taken based on the design of a database created previously. The following table structure implemented in the database:

1. **Create Database Voting**.

```
CREATE DATABASE VOTING;
```

Database ‘Voting’ is created and saved into the list of database in the xampp 3.1.0 MYSQL server.

2. Enabling Database

To use the created database, write a MYSQL Syntax to activate the database to be used.

```
USE DATABASE VOTING;
```

Now the Database ‘Voting’ is active to be used.

3. Create Table Admin

```
CREATE TABLE ‘ADMIN’(‘admin_id’ int (11)NOT NULL
AUTO_INCREMENT,‘username’ varchar(50) NOT NULL, ‘password’
varchar(50)NOT NULL);
INSERT INTO ADMIN (‘’,’username’,’ password’) VALUE
(Admin, admin);
```

4. Create Table Citizens

```
CREATE TABLE ‘CITIZENS’ (‘id’ (int) NOT NULL AUTO_INC
EMENT, ‘name’ varchar(50) NOT NULL, ‘citizen_id’
varchar(50) NOT NULL,’password’ varchar(50) NOT NULL,’leve
l’ enum(‘1’,’2’,’3’) NOT NULL,’gender’ enum(‘Male’,’Female
’) NOT NULL,’date_of_birth’ varchar(50) NOT
NULL,’maritual_status’ enum(‘Married’,’Divorced’,
’Single’) NOT NULL,’occupation’ varchar(50) NOT
NULL,’province’ varchar(50) NOT NULL,’district’
varchar(50) NOT NULL,’address’ varchar(50) NOT
```

```
NULL,'contact' varchar(50) NOT NULL,'email_address'
varchar(50) NOT NULL,'photo' varchar(50) NOT
NULL,'district_status' enum('0','1') NOT
NULL,'regional_status' enum('0','1') NOT
NULL,'registration_date' varchar(15));
```

5. Create Table District_Candidates

```
CREATE TABLE 'district_candidates'('id' int(11) NOT NULL
AUTO_INCREMENT,'candidate_number' varchar(50) NOT
NULL,'candidate_name' varchar(50) NOT NULL,'seat'
varchar(50) NOT NULL,'party' varchar(50) NOT NULL,'province
' varchar(50NOT NULL,'distirct'varchar(50) NOT
NULL,'votes' varchar(10) NOT NULL,'photo' varchar(50)   NOT
NULL,'register_date' varchar(50));
```

6. Create Table Officials

```
CREATE TABLE 'officials' ('id' int(11) NOT NULL AUTO_
INCREMENT,'name' varchar(50) NOT NULL,'username'
varchar(50) NOT NULL,'password'varchar(50) NOT NULL,'level'
enum('1','2','3') NOT NULL,'gender'
enum('Male','Female') NOT NULL,'date_of_birth'
varchar(50) NOT NULL,'marital_status'
enam('Married','Divorced','Single') NOT
NULL,'district'varchar(50)  NOT  NULL,'province'  varchar(50)  NOT
NULL,'contact'  varchar(50)  NOT  NULL,'emial'  varchar(50)
```

```
NOT NULL,'address' varchar(50) NOT NULL,'photo'
varchar(50) NOT NULL);
```

7. Create Table Regional Candidates

```
CREATE TABLE 'Regional_Candidates' ('id' int(11) NOT NULL
AUTO_INCREMENT,'candidate_number' varchar(50) NOT
NULL,'candidate_name' varchar(50) NOT NULL,'seat'
varchar(50) NOT NULL,'party' varchar(50) NOT
NULL,'province' varchar(50) NOT NULL,'district'
varchar(50) NOT NULL,'votes' int(10) NOT NULL,'photo'
varchar(50) NOT NULL,'register_date' varchar(50) NOT
NULL);
```

b. Implementation of the Interface

The interface of National Capital District E-Voting where three users can have access to the system, the system can be accessed by the System Administrator, The Electoral Official and the citizen or voter.

i. Following is the implementation of the citizen's or Voter's Interface

a. Admin Login

An initial appearance after opening the National Capital District E-Voting System application,the user will be given the login interface,the user must now enter the username and Password onto the given login form to enter the main menu upon clicking login.

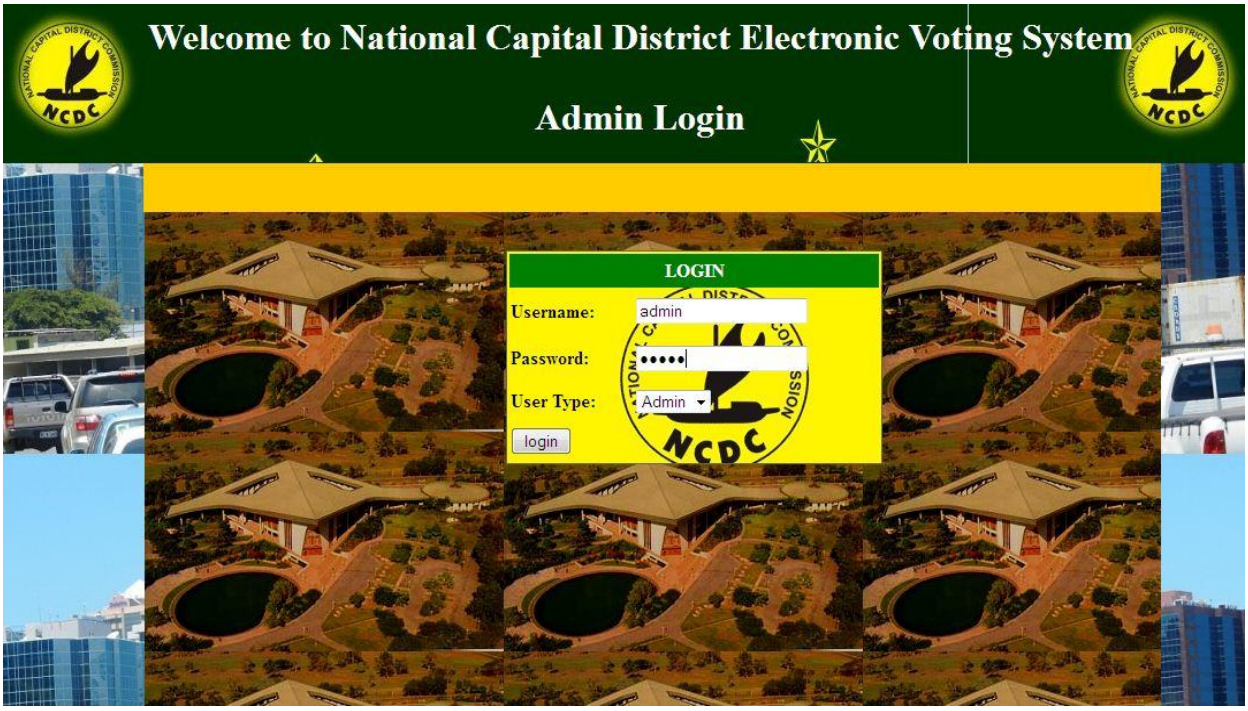


Figure 4.30: The Login user interface.

b. The Admin Login Dashboard

As soon is the admin login windows is logged in too, the system displays the admin dashboard for the admin to edit and evaluate the system.

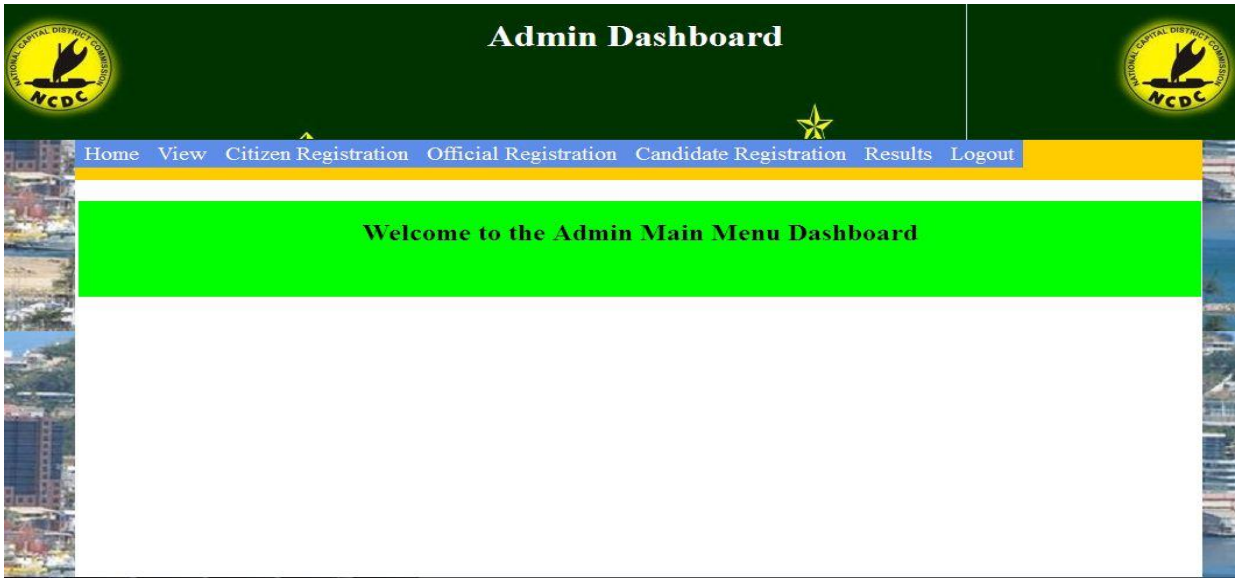


Figure 4.31: Figure showing the Admin main Dashboard Menu

c. Electoral Official Login.

The Electoral Official login is used by Electoral Official to login to the system to and enter necessary data needed by the system.

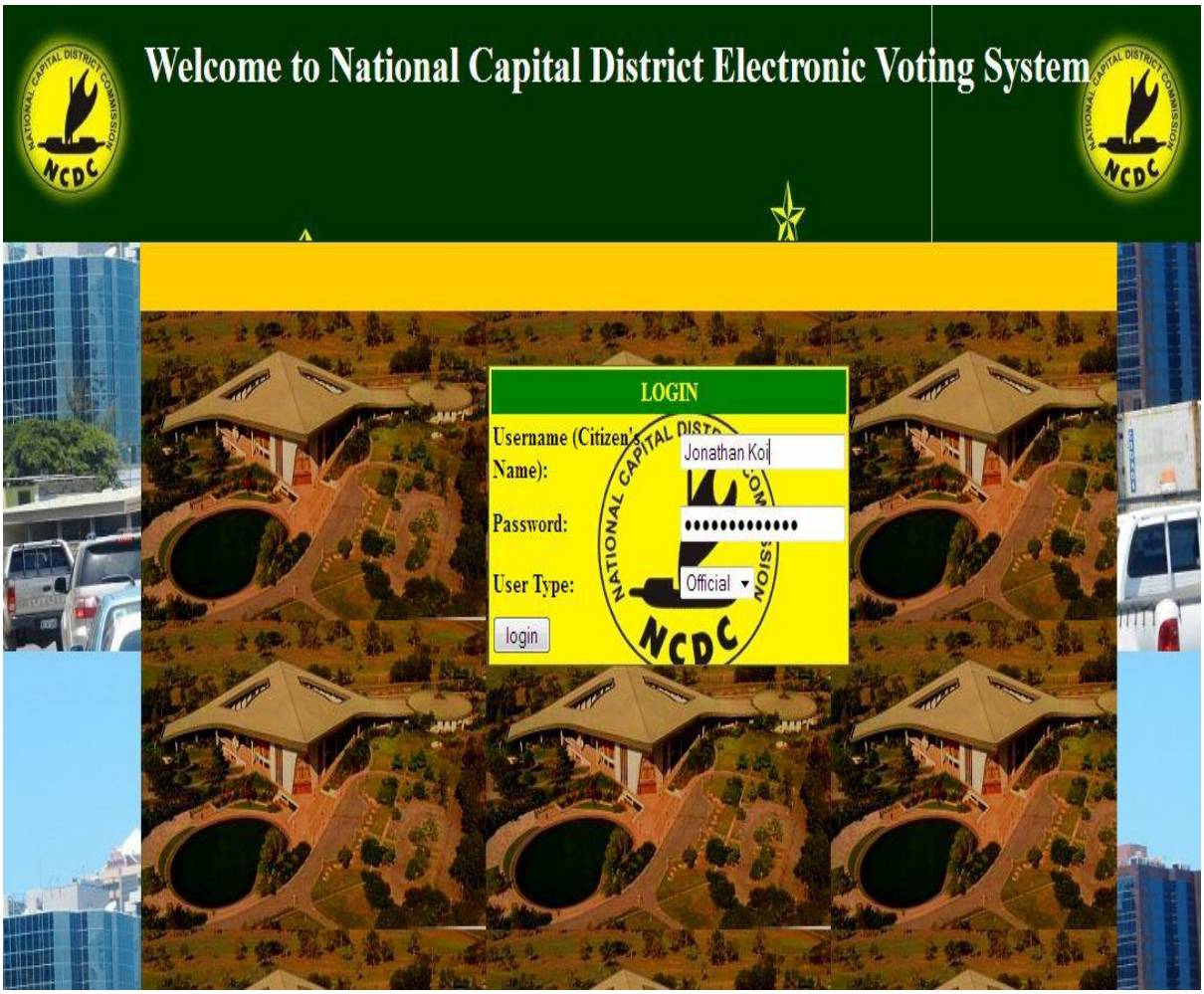


Figure 4.32: Login user interface for Electoral Offical.

d. Main Menu for Official Dashboard

When login to the Electoral offical user account, the system will display the Electoral Official main menu Dashboard.

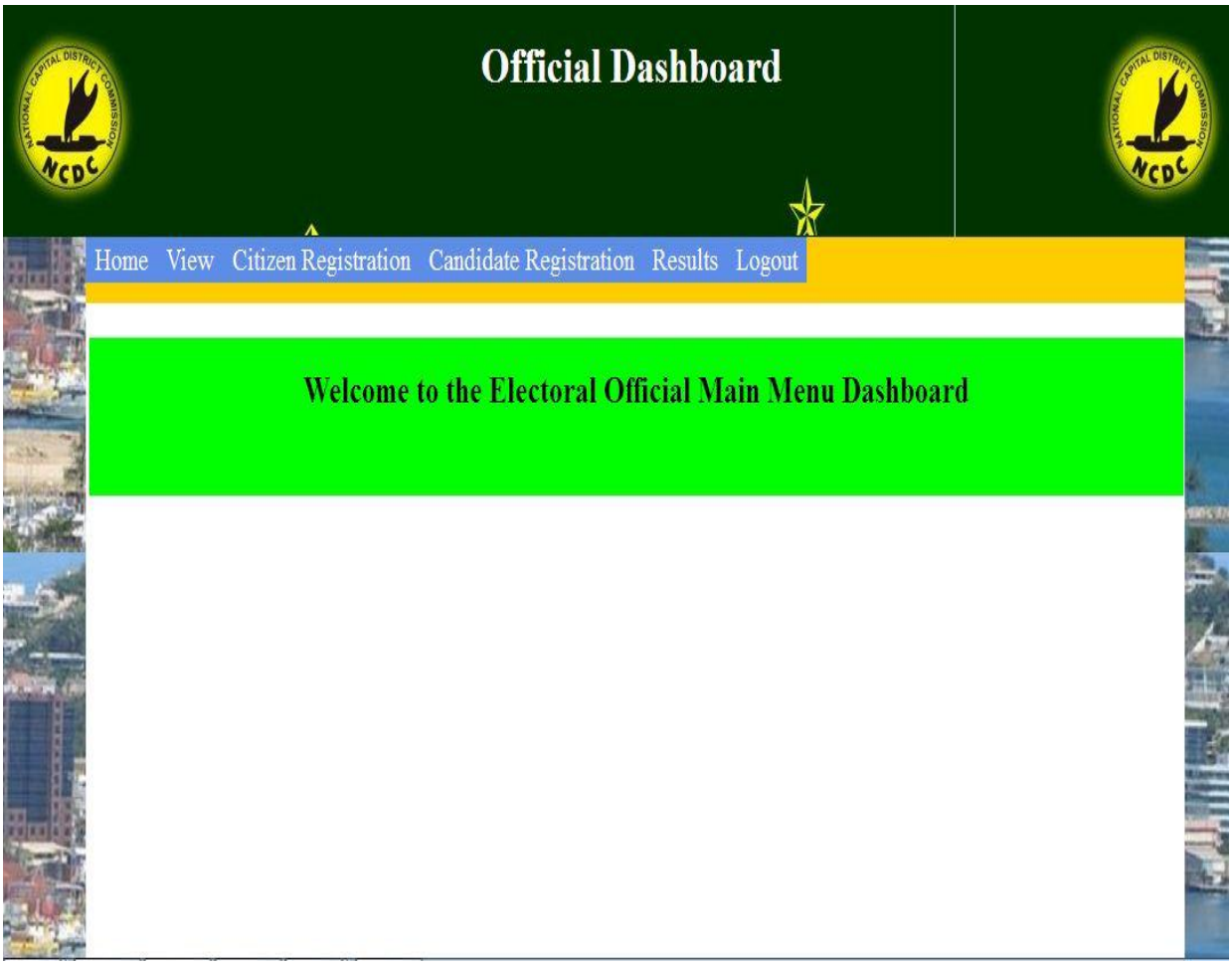


Figure 4.33: User interface of Main menu for Electoral Official user account.

e. Citizen Login

Citizen login user account is the user interface that citizens use to login to the system to cast their vote.



Figure 4.34: User interface for citizens to login to the system.

f. Citizen Main Dashboard



Figure 4.35: Dashboard user interface for Citizens to choose candidates.

g. Main Dashboard for Regional Candidate

The Main Dashboard user interface for citizens to choose their Regional Candidate.

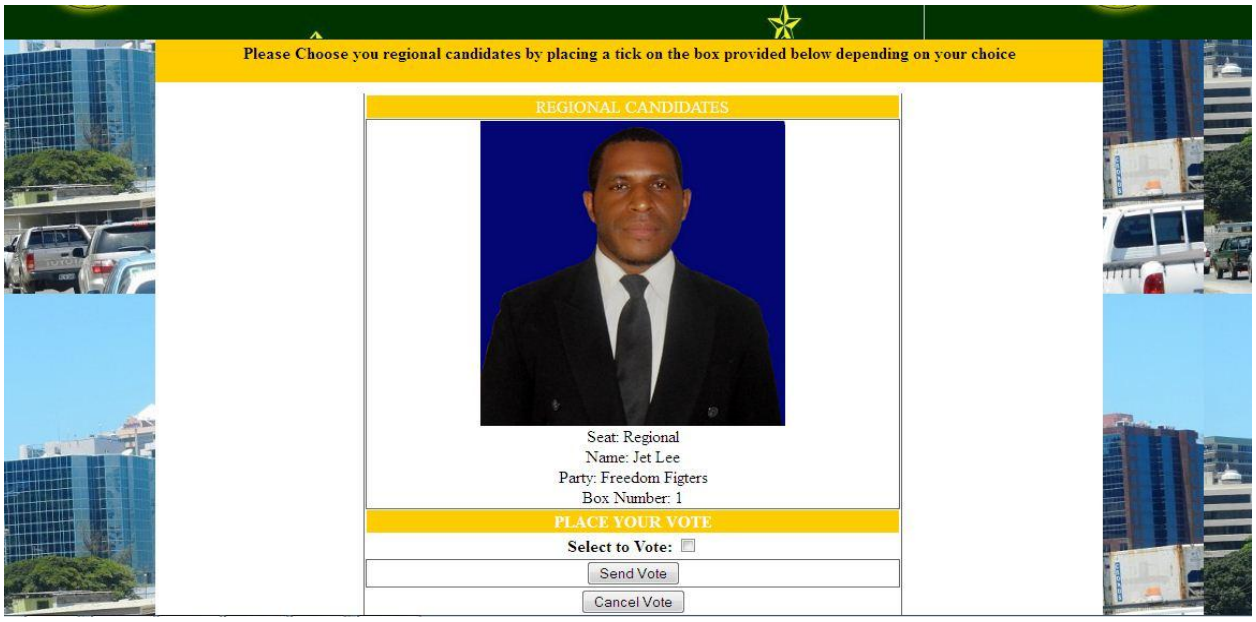


Figure 2:36: User interface for citizens to choose their regional Candidate.

c. Testing

i. Test Plan

a. Table 4.6 Testing Plan Page Admin

No	The Component Tested	Submenu	Scenario Test Item	Testing Results
1	Display user Login Admin	Admin Menu	Displays the login form to the user	Black Box
2	Main Menu Admin		Displays citizens' lists.	Black Box
			Display Official list.	Black Box
			Display District candidates	Black Box
			Display Regional Candidates	Black Box
			Display Citizen Registration Form	Black Box
			Display Official Registration form	Black Box
			Displaying candidate registration from.	Black Box
			Displaying Regional Candidate voting Results	Black Box
			Displaying District candidate voting results	Black Box
			Display Citizen voting statistics	Black Box
		Menu Electoral Official	Show Citizens list registered.	Black Box
			Show Officials list registered	Black Box
			Show District Candidate	Black Box
			Show Citizen Registration form.	Black Box
			Show Candidate Registration form.	Black Box

			Show results for voting statistics.	Black Box
			Show Results for election	Black Box
		Menu Citizens	Displaying District Candidate	Black Box
			Display view button for voter to choose to vote	Black box
			Display Regional Candidate.	Black Box
			Display voting box	Black Box
			Display Send vote	Black Box
			Display confirmation pop up.	Black Box

b. **Table 4.7** Testing Plan for Electoral Official pages.

No	The Component Tested	Submenu	Scenario Test Item	Testing Results
1	Display user Login to Electoral Official.		Displays the login form to the user Electoral Official	Black Box
2	Main Menu Electoral Official	View	Displays the Citizen lists	Black Box
			View District Candidates	Black Box
			View Regional Candidates	Block Box
		Citizen Registration	Displays the citizen registration form	Black Box
		Candidate Registration	Displays Candidate registration form	Black Box

		Results	Displays Results of regional and district candidates	Back Box
			Display Voters Statistics.	Black Box

c. Table 4.8 Testing Plan Student Page

NO	The Component Tested	Submenu	Scenario Test Item	Testing Results
1	Display user Login Citizen		Displays the login form to the user Citizen	Black Box
2	Menu Citizen	View District Candidate	Display District Candidate	Black Box
		Choice	Display Choice option to vote.	Black Box
		View Regional Candidate	Display Regional Candidate	Black Box
		Choose	Display choice option to vote.	Black Box

d. Cases and Test Results

Here is a case to test the software that has been constructed using the method based on table black Box testing plans that have been made previously,

a. Table 4.9 Cases and Test Results section Admin

No	Menu	Test Cases	Scenario Test Item	Expected Results	Testing Results
1	Admin	Display user Login	Choosing a login form to the user	When you first open the app will bring up the login form to the user	[] Accepted [ ] Denied
2	Menu Electoral Official	Display Citizen Registered	Selecting form citizen added	When choose view citizens, will bring up the list of citizens	[] Accepted [ ] Denied
		Display Electoral Official Registration form	Select from admin menu	When choose registration Electoral Official menu, the registration from must be displayed	[]Accepted [] Denied
		Display Registered Electoral Official	From Electoral Official added	When choose view Electoral Official, must display electoral official registered.	[]Accepted [] Denied
		Display Regional Candidate	Select from Regional Candidate added.	When Choose view Regional Candidate, will bring up the list of Regional Candidate.	[] Accepted [ ] Denied
		Display District Candidate	Select from District Candidate.	When choose view District candidates, District Candidates displayed.	[] Accepted [ ] Denied
	Menu Citizen	Display District Candidates	Select view to view the District candidate to vote.	When selecting view, The District Candidate must be shown for citizen to vote.	[] Accepted [ ] Denied
		Display Regional Candidate	Select view to view Regional Candidate	When selecting view, the Regional Candidate must be showed for the	[] Accepted [ ] Denied

				citizen to vote.	

b. Table 4.10: Cases and Test Results section Electoral Official

No	Menu	Test Cases	Scenario Test Item	Expected Results	Testing Results
1	Electoral Official	Display user Login	Choosing a login form to the user	When you first open the app will bring up the login form to the user	[] Accepted [ ] Denied
2	View	Display citizen and candidates to Menu.	Display citizen and candidates when viewed.	When selecting view for the citizen and candidate, show the citizen and candidates list.	[] Accepted [] Denied
3.	Citizen Registration	Display citizen registration menu	Display citizen registration form	When selecting the menu citizen registration, show the citizen registration from.	[] Accepted [ ] Denied
4	Candidate Registration	Display candidate registration menu	Selecting menu citizen registration	When selecting the menu candidate registration, the candidate registration from must be shown.	[] Accepted [ ] Denied
5	Results	Display results menu.	Selecting a menu on results, regional result or District results or voting result.	When selecting the menu then will it show, result of candidate or voting.	[] Accepted [ ] Denied

c. **Tabel 4.11**Cases and Test Results section of Citizen.

No	Menu	Test Cases	Scenario Test Item	Expected Results	Testing Results
1	Citizen	Display user Login	Choosing a login form to the user	When you first open the app will bring up the login form to the user	[] Accepted [ ] Denied
2	District Candidate list with view.	Display Candidate list with view link	Choosing view link	When selecting a view, the candidate details must display with voting option	[] Accepted [ ] Denied
4	View link	Display link view	Selecting the view link	When selecting the view link, display candidate details with voting option for the citizen to vote.	[] Accepted [ ] Denied
	Display Regional Candidate with view link.	Display view link	Selecting view link	When selecting the view link, the regional candidate must be displayed for the citizen to vote	[] Accepted [ ] Denied
	View link	Display view link	Selecting the view link, to progress.	When selecting the view link, the candidate with details of voting are displayed or the citizen to vote.	[] Accepted [ ] Denied

i. Conclusion Results of Testing

. Based on test results with sample test cases above, it can be concluded that the software is free of syntax errors and functionally release the results as expected. The following are some positive conclusion about the system;

1. Planned approach towards working: - The working in the organization will be well planned and organized. The data will be stored properly in data stores, which will help in retrieval of information as well as its storage.

2. Accuracy: - The level of accuracy in the proposed system will be higher. All operation would be done correctly and it ensures that whatever information is coming from the center is accurate.
3. Reliability: - The reliability of the proposed system will be high due to the above stated reasons. The reason for the increased reliability of the system is that now there would be proper storage of information.
4. No Redundancy: - In the proposed system utmost care would be that no information is repeated anywhere, in storage or otherwise. This would assure economic use of storage space and consistency in the data stored.
5. Immediate retrieval of information: - The main objective of proposed system is to provide for a quick and efficient retrieval of information.
6. Immediate storage of information: - In manual system there are many problems to store the largest amount of information.
7. Easy to Operate: - The system should be easy to operate and should be such that it can be developed within a short period of time and fit in the limited budget of the user.