Web-based Registration Management System for the National Election Board of Ethiopia (NEBE)

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Abstract

This project is undertaken to develop a web-based voter registration management system for the National Election Board of Ethiopia **(NEBE)**. *The team tries to identify the problems in the existing system and proposes a new system that alleviates the previously faced problem. In an objective analysis, the team tries to verify the system requirements using case modeling. User cases and user interface are identified and documented. Sequence diagrams are drawn for each user case diagram. Classes of the new system and their relationships are identified and documented in conceptual modeling. User interfaces are also prototyped.*

Key words: Election, NEBE, user cases, user interface, democracy

1. Introduction

Elections are understood to be the key mainstay of democracy all over the globe and voting is one of the electoral routes that ensure the sustenance of democratic system in any civilization. Voting is the process that allows the general public or the people to choose their leaders and articulate views on how they will be governed. The veracity of democratic systems is primary to the veracity of election itself. Consequently, the election system must be satisfactorily secured to survive a range of fraudulent behaviors and must be sufficiently translucent and comprehensible that voters and candidates can accept the outcome of an election.

1.1 Background

After the downfall of the Derg regime, a Transitional Government was established. Based on the Charter of the Transitional Government, an Electoral Commission was established by Proclamation number 11/1984.E.C. In February 1984 E.C. the Electoral Commission conducted the election for transitional administration committee members at the Woreda and Kebele levels. In May of the same year it conducted elections for National, Regional and Woreda Councils.

After the completion of its mission the Electoral Commission was replaced by the National Electoral Board of Ethiopia, which was established by Proclamation number 64/1985 E.C. The Board is accountable to the House of Peoples Representatives, and is an independent and autonomous organ for conducting elections having its own legal personality. According to Article 6 of the amended proclamation number 532/1999 E.C, the Board has permanent employees working at the Head Office and regional branch offices of the Secretariat. In addition it has temporary electoral officers recruited from various governmental and non-governmental organizations who assist the Board during elections. Currently the Board has 547constituencies and around 43,500 polling stations.

The Board has objectives to provide like ensure the establishment of a Government elected through free, fair, and impartial elections held in accordance with the Constitution, ensure the existence of an electoral system that enables political parties and private candidates, which respect the constitution and institutions established by it, compete equally and impartially and enable citizens to exercise their constitutional democratic right to elect and be elected.

Powers and Duties of the Board include: execute impartially any election and referendum conducted in accordance with the Constitution, prepare and distribute documents and materials necessary for conducting elections, widely provide to the public civic and voter education relating to election and follow and supervise their activities. They also have to recruit on permanent and temporary basis, competent and non-partisan electoral officers required for conducting elections at every level.

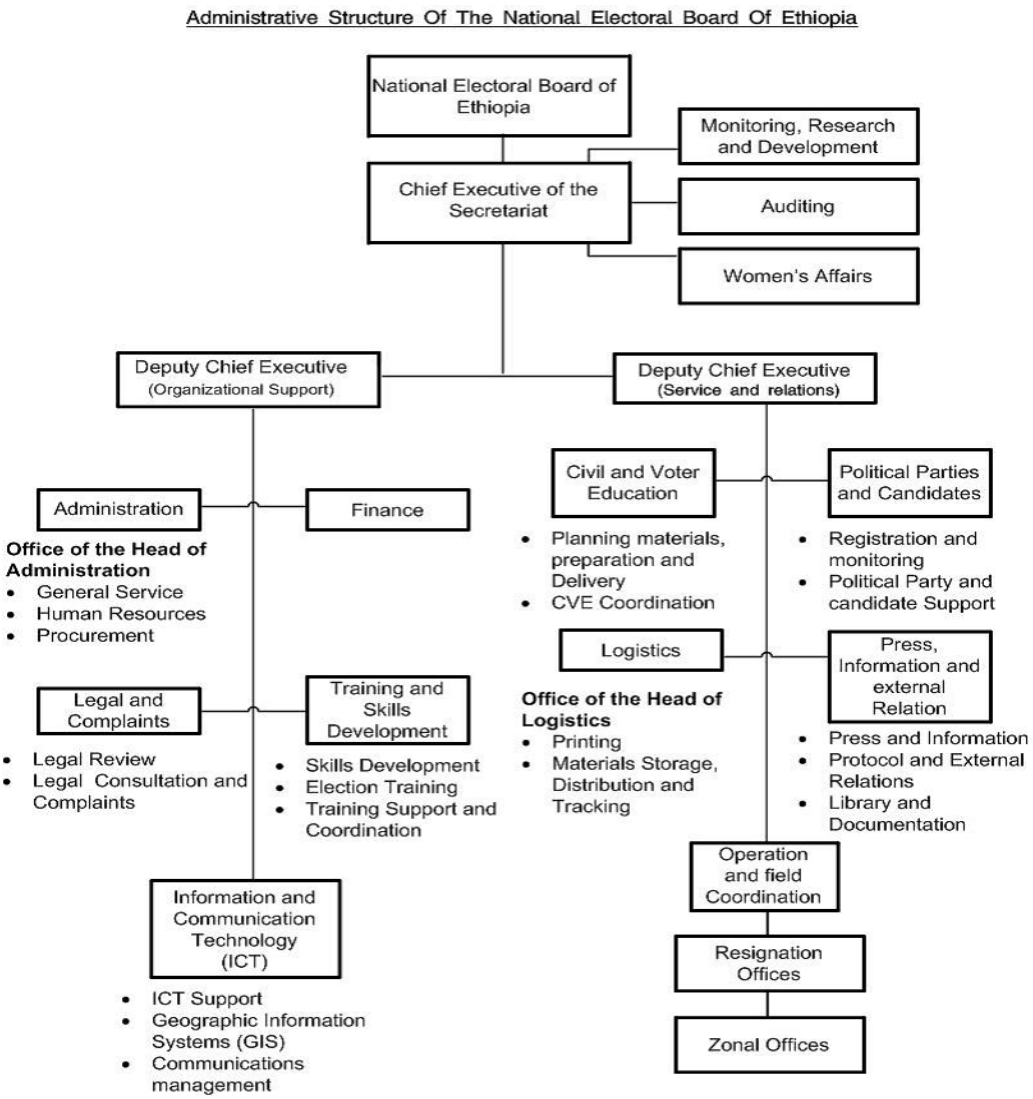
Evaluate the implementation of periodical elections and electoral laws, undertake studies, collect and compile statistical data, identify areas that need amendments and submit to concerned body, keep properly any electoral documents; and finally it certifies and officially announces election results.

The Board has established 11 permanent Regional Branch Offices, one in each State of the Federation and in each of the Federal cities, Addis Ababa and Dire Dawa. The Head of the Regional Branch Office reports to the Chief Executive through the Deputy Chief Executive. The Board established a temporary Constituency Office with a three member Election Execution Committee, headed by the Chief Electoral Officer of the Constituency. A constituency represents one sit in the House of Peoples' Representatives (Parliament), there are 547 sits in the House of Peoples' Representatives.

Polling stations register voters, enact the voting, count votes and send the voting results to the constituency offices. There are around 43,500 polling stations in the country; however the number is not constant because of the growing number of voters. A polling station is organized for 1000 voters assumed. The increase in the number of polling stations does not increase the number of constituencies.

Vision of the organization is to see the realization of strong constitutional system wherein the nations, nationalities and peoples of Ethiopia exercise their right of electing and being elected in a peaceful and fair manner. And the mission is to develop the understanding of the society on civics to let them understand their right to elect and be elected for contributing their role in the continuation of the democratization process.

And some of the values include, honesty, impartiality, accountability, supremacy of the law, offering fast response, team work, integrity, reliability and motivation for work.



1.2. Statement of the Problem

The problems of the existing manual system of voting include: they are **expensive and time-consuming**. The process of collecting data and entering this data into the record takes too much time and is expensive to conduct. For example, time and money is spent in printing data capture forms, in preparing registration stations together with human resources, and there after advertising the days set for registration processes including sensitizing voters on the need for registration, as well as time spent on entering these data to the database. There is **too much paper work**; the process involves too much paper work and paper storage which is difficult as papers become bulky with the population size.

Furthermore there are immense errors during data entry. Loss of registration forms**:** after being filled in with voters' details this will create inconveniencies for the voter when the time comes.

1.3. Alternative Solutions, Assessment of Project Feasibility and Selection of the Optimal Solutions

1.3.1. Alternative Solutions

The solution for the current problem is electrical voting system. This system will solve most of the outputs that our system is required to do. But the main reason why our system is preferable is that due to cost, for the electrical voting system to work requires a machine specially designed for this specific purpose. Our system can operate in any window-based machine through the internet.

1.3.2. Assessment of Project Feasibility and Selection of the Optimal Solutions

Technical Feasibility

We, the developers, have gained enough understanding of the manual voter registration system that will be changed to computer-based online system. Plus, we are efficient enough in Web programming languages like PHP, JavaScript, and HTML and CSS. Hence, we are confident enough in terms of technical feasibility.

Economic Feasibility

We need only laptop computers and Internet to develop this system. We may need some money to move to some offices for data Collection but we will manage it. Hence, we are free of other costs to develop this system.

Operational feasibility

The new system can work without disturbing the remaining section of the bureau, business rules, and regulation and work environment. The system facilitates the organization's task and, also, it will not be against the organization's work structure and the organization's (Election Board's) vision.

1.4. Objectives of the Project

1.4.1. General Objective

The general objective of this project is to have a fair and transparent election system and to simplify the voter registration process.

1.4.2. Specific Objectives

The specific objective of this project is to simplify the voter registration process; when our system runs, the voters can register from wherever they are; especially for the sick and the elderly, it will help very much.

1.5. Purpose, Scope, and Applicability

1.5.1. Purpose

The purpose of this project is to make the voting process easy, elegant, and more accountable for the benefit of the people. With this program up and running, voters may register online, especially for voters who are unable to go in person or to weak to get out of bed.

The other purpose of this project is that it helps ensure the accountability of the election; and it will be convenient for the voters and the election committees to supervise the election.

1.5.2. Scope

The scope of the project is that it will register the voter in the voting site. Through this all the details of voters are saved in a database, and they will act as the main security to the voting system. It is an advanced technology used now days. This application will register voters for all types of election that will be held in our country.

1.5.3. Applicability

Regarding the applicability of this system is, it gives confidence in voting system; only the legitimate voter is allowed to gain access to voting; and using of online voting has the capability to reduce or remove unwanted human errors, in addition to its reliability. Online voting can handle multiple modalities and provide better scalability for large elections. Online voting is also an excellent mechanism that does not require geographical proximity of the voters. For example, soldiers abroad can participate in elections by voting online.

Our project enables a voter to register through internet without going to a registration booth. Additionally registering him/her for voting in advance, proxy vote or double voting is not possible. It is fast to access, highly secure, easy to maintain all information of voting, highly efficient and flexible. Hence, with this voting system, percentage of voting will increase drastically.

1.6. Software Development Methodology

Object-oriented is a methodology which treats instead of defining system as separate part but as a collection of interacting objects. We use the object-oriented system development methodology because it considers optional such as recording, updating and deleting of data. It is based on building software from reusable items called class, a template from which objects are created or instantiated. Therefore, the team will use an object-oriented approach to analyze, to develop and design the proposed system.

1.6.1. Methods of Determining System Requirements

The methodology we used for collecting data from Ethiopian Election Board and its institution techniques are listed as follows:

- Observation which is participatory and external observation about voter registration system;
- Review procedural manual documents, registration formats and different related forms which are used for voter that are recorded; and
- Interviewing the appropriate person. On-site observation of voter registration control system shall be made.

1.6.2. Software Development Process Model

Waterfall model

The waterfall model was the first process model to be introduced. It is very simple to understand and easy to use. In a waterfall model, each phase must be completed fully before the next phase can begin. This type of model basically was used for the project which was small; and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard

the project. In this model the test starts only after the development is complete. In waterfall model, phases do not overlap.

Steps of waterfall model

Requirement gathering and analysis→System design → Implementation→ Testing→ Deployment of System Maintenance

Some of the disadvantages of waterfall model are that once an application is on testing stage, it is very difficult to go back and change something that was not well – throughtout the concept stage. No working software is produced until late in the life cycle; there is high amount of risk and uncertainty; it is not a good model for complex programs and is not suitable for projects where requirements are at a moderate to high risk of change.

The advantage of waterfall model include: simple and easy to understand and use; it is also easy to manage. Due to the rigidity of the model each phase has specific deliverables and review process. In this model, phases are processed and completed one at a time. Phases do not overlap. Waterfall model works well for smaller projects where requirements are very well understood.

Waterfall model is mostly used for situations where the requirements are very well known, clear and fixed; product definition is stable and technology is much understood.

V-model

Also known as verification and validation model, just like the waterfall model, the v-shaped life cycle is a sequential path of execution of processes. Each phase must be completed before the next phase begins. Testing of the product is planned parallel with the corresponding phase of development.

Developer life cycle (verification phase)

BRS (business requirement specification) →SRS (system requirement specification)→ HLD (high level design)→ LLD (low level design) →coding

Tester life cycle (validation phase)

Acceptance testing→ system testing→ system integration→ testing component→ testing unit testing

The advantage of V-model is it is Simple and easy to use. Testing activities like planning and test designing happens well before coding. This saves a lot of time hence higher chance of success over the waterfall model. It works well for small projects where requirement are easily understood.

And the disadvantage of V-model is that it is very rigid and least fixable. Software is developed during the implementation phase; so no early prototypes of the software are produced; and, if any change happens in midway, then the test documents along with requirement documents have to be updated.

The V-model should be used for small to medium sized projects where requirements are clearly defined and fixed and should be chosen when sufficient technical resources are available with needed technical expertise. High confidence of customer is required for choosing the V-model approach. Since no prototypes are produced, there is a very high risk involved in meeting customer expectations.

Incremental

In incremental model the whole requirement is divided into various builds. Multiple development cycles take place here, making the life cycle a "multi-waterfall" cycle. Cycles are divided-up into smaller, more easily managed modules. Each module passes through the requirements, design, implementation and testing phases. A working version of software is produced during the first module, so you have working software early on during the software life cycle. Each subsequent release of the module adds function to the pervious release. The process continuous till the complete system is achieved.

Steps of incremental model

Requirements→design and development→testing→implantation

The advantage of the incremental model is that it generates working software quickly and early during the software life cycle; and this model is more flexible, less costly to change scope and requirements.

It is also easier to test and debug during a smaller iteration. In this model customer can respond to each built; it also has a lower initial delivery cost; easier risk management because risky pierces are identified and handled during is iteration.

Disadvantage of the incremental model is that it needs a clear and complete definition of the whole system before it can be broken down and built incrementally. The total cost is higher than waterfall.

We use the incremental model when the requirements of the complete system are clearly defined and understood. The major requirement must be defined; however, some details can evolve with time. There is a need to get a product to the market early. And resources with needed skill set are not available.

RAD model

Rapid Application Development model (RAD). It is a type of incremental model. In RAD model the components and functions are developed in parallel as if they were mini projects. The development is time boxed, delivered and then assembled into working prototype. This can quickly give the customer something to see and use and to provide feedback regarding the delivery and their requirements.

Advantage of RAD model is reduced development time; increase reusability of components, quick initial review occurs, encourages customer feedback; and integration from very beginning solves a lot of integration issues.

Some of the disadvantages of RAD model is only systems that can be modularized can be built using RAD; it requires highly skilled developers/designers; high dependency on modeling skills; inapplicable to cheaper projects as cost of modeling and automated code generation is very high.

We use this model when there is a need to create a system that can be modularized in 2-3 months of time. If there is high availability of designers for modeling and the budget is high enough to afford their cost along with the cost of automated code generation tools if resources with high business knowledge are available.

Iterative model

Iterative model does not attempt to start with a full specification of requirements. Instead, development begins by specifying and implementing just part of the software, which can then be reviewed in order to identify further requirements. This process is then repeated, producing a new version of the software for each cycle of the model.

1.6.3. Software Engineering Methodology

We use the object-oriented system development (incremental) methodology because it considers optional such as recording, updating and deleting of data and it is based on building software from reusable items called class, a template from which objects are created or instantiated. Therefore, the team will use an object-oriented approach to analyze, to develop and design the proposed system.

The techniques chosen to be used are the UML (unified modeling language) techniques such as Use case modeling, Sequence modeling, Development diagram, Activity diagram, Component diagram, Package diagram.

Those techniques are very helpful to identify the user and Ethiopian election board requirement in an understandable way using standard diagram and symbol.

2. Survey of Technologies

C# Advantages:

You don't need to write destructors in C#, the garbage collector will clean it up for you, and the **.net** class library will allow for rapid prototype development, it will do a ton of tings for you. The CLS, Common Language Specification, makes it simple to write classes in other .NET languages like VB or J# (Java) and just instantiate and call them. If you wanted to call an old C++ function that you like, you just put a simple C# wrapper around it. You can access it as a COM+ object.

Another option would be to rewrite the C++ function in managed C++.NET and call it. You could just go to managed C++.NET. It's not nearly as nice a language as C# but it works.

Disadvantage:

C# is expensive; it is not available for the public for free.

C++ *Advantages:*

C++ is vendor-neutral which means it is the same in any platform or compiler, Efficient which means it compiles into highly optimized CPU-specific machine code with little or no runtime overhead. It is multi-paradigm i.e. it allows the use and penalty-free mixing of procedural, OOP, generic programming, functional programming, etc.

It is statically typed unlike Python. For example, a large amount of logic and sometimes even calculations can be proved and performed at compile time, by the type checking/inferring system.

It also has deterministic memory management (as opposed to Java, C#, and other languages with garbage collectors) the life time of every object is known with absolute precision, which makes destructors useful and RAII possible.

Disadvantages:

It is very complex; the learning curve is steep and takes a long time to climb, especially for those who know C or C# or other superficially similar languages; and it has the concept of "undefined behavior". Just like C a large class of errors that neither compiler nor the runtime system is required to diagnose.

And it also has some design flaws; although they are largely fixed by boost libraries and the new language standard, it lacks network and a sync I/O, graphics, concurrency, serialization, and many other facilities expected of modern languages, although that is also largely fixed by boost libraries and as far as concurrency is concerned the new language standard.

Java *Advantage:*

Java program is platform-independent. It can run on any PC or any operation system. And it is dynamic, simple and robust; it is also purely OOPS language having all the OOPS concept.

Disadvantage:

The disadvantage of java programming language is that it takes more time to execute than “C language" as it runs first on JVM (Java Virtual Machine) and there is also more memory consuming than other languages.

PHP

Hypertext preprocessor is the exact expansion of PHP, though it doesn’t fit to the exact spell; and it is adjusted to the word of mouth, called as PHP. PHP is a web-scripting language. Let us see some of the basic queries, which we come across PHP.

PHP is a server side scripting language; server side scripting language is one, which has the capability of executing the script on the server and serving the output as a HTML File. Server side script has the main advantage of interacting with the databases and performs all types of server manipulations directly. Server side scripting language is responsible for manipulating the data which is filled in the entire web forms, anywhere in the net.

But this is not the case of a client side script. Some of the client side scripting languages is the JavaScript and VB script, but there are exceptions where client side script can also be used for server side scripting, which is limited to some extent.

We usually use HTML with PHP, like the other scripting languages you can do so. It is not a compulsory act for you to use PHP with the HTML. You can very well get the output with PHP alone. But the expected output, which is exhibited by PHP, is not that attractive for display. By attractive, we mean the formatting done by PHP.

We can also run PHP on a windows machine. PHP is a cross platform support language, which means, PHP can run on various platforms like the Linux, Windows etc. Your web servers PWS, IIS, Apache can be configured to work PHP.

If you are aware of programming concepts and the application of the logic, then, you will find it ok to code any programming language if you simply understand the syntax. In the same way, other scripting languages and PHP, have virtually the same function methodology. The only thing that matters is your requirement, how you are going to apply

the logic and code PHP to your logic. PHP's syntax is similar to the C language. People with basic knowledge of C will find it very easy migrating as well as other aspects, an easy task.

If you are very blind to programming, then it is difficult to learn PHP because you may need to learn the programming concepts. This means you require an understanding of the logic, and to be able to troubleshoot the program. If you happen to know at least one programming language, then it is very easy to learn PHP. PHP is pretty easy compared to other scripting languages.

PHP is very much compatible with MYSQL and POSTGRESQL Databases. PHP can also be programmed to interact with any database right from a simple text file to DB2. It is believed that PHP interacting with the database has the highest performance, unlike the other scripting languages.

PHP supports various platforms, which mean PHP can be installed on almost every operating system, like the window-x, Linux, etc. You may choose the appropriate version and follow the instructions accordingly given in the Manual.

PHP syntax is quite easy to code. All the syntax is similar to the C language syntax. If you are very new to the programming environment, then it will be a bit difficult task for you to code the PHP.

PHP is believed to be fast when compared with other programming languages because of execution speed. In the case of large interactions with the database PHP really plays a good role of execution in performing the interaction. Now, today's major web sites have been migrating to PHP because of the performance.

PHP is the only scripting language, which has won the hearts of many web servers, has been moving on enormously day-by-day. The main advantage of the open source is that, if there is a problem, that particular problem is shared by millions of programmers across the world. But in the case of a licensed version scripting languages, it is very limited to a set of a small community.

As innovative ideas are studied from all the programmers across the world, new ideas are implemented making the language strong. There is no problem in using PHP, which is open source. We shall conclude by saying that, all the scripting languages have their own demerits; one of the disadvantages of PHP is the Error Handling. It is believed that PHP has very poor handling errors qualities. But these disadvantages can be overcome using advantage methods.

SQL *Advantages:*

It also has high speed and its queries can be used to retrieve large amounts of records from a database quickly and efficiently. It is also a well-defined standard. Exist, SQL databases use a long-established standard, which is being adopted by ANSI and ISO. Non-SQL databases do not adhere to any clear standard.

And there is No Coding Required using standard SQL. It is easier to manage database systems without having to write substantial amount of code.

Disadvantages:

There is difficulty in interfacing. Interfacing an SQL database is more complex than adding a few lines of code; more features are implemented in proprietary way. Although

SQL databases conform to ANSI and ISO standards, some databases go for proprietary extensions to standard SQL to ensure vendor lock-in.

3. Analysis

3.1. Introduction

3.1.1. Requirements Specification

The main requirement for this system is a system that will make elections **fair**, **simple** and **accountable** is necessary. This system will improve the current registration system drastically.

3.1.2. Software and Hardware Requirements

We tried to minimize the software and hardware requirements for our project. Our system should run on windows, OS systems, and phones so that our users can access them from any where. And for urban areas with no internet access we will need a portable satellite to connect that registration booth with the rest of the system.

3.1.3. Requirements Identification

This document contains the requirements identified for the state-wide voter registration system in Ethiopia.

+Category Codes Used As Requirement Number Prefixes		
Category Code	**Category**	**Sub-Category**
A-1	Address Library Management	Data Management
D-1	District and Precinct File Management	Data Management
Q-1	Queries and Reports - General	General Extract/Query/Report
Q-2	Queries and Reports - General	Canned Extract/Query/Report
S-1	System	Administration
S-3	System	Hardware/Software/Network
S-4	System	Security
S-6	System	System Configuration
S-7	System	User Interface

Req #	Requirement	Type	Compliance	Vendor Comment or
	Address Library Management Data Management			
A-1-2	The Ministry shall allow address management by individual region, alerting each region involved if addresses potentially overlap adjoining regions. The Ministry will need to identify the region associated with each entry in the Address Library.	M		

Req #	Requirement	Type	Compliance	Vendor Comment or Description
A-1-6	The system shall provide authorized users with the ability to look up streets by whole or partial k/k name or sub-city name depending on his/hers clearance level.	M		
A-1-12	The address being entered can then be corrected or the Voter Registration record can be stored in pending status until an authorized user resolves the conflict between the voter's address and the Address Library.	M		
	D. woreda and correctional File Management D-1 Data Management			
D-1-1	The system shall provide the capability to add and update woreda and correctional records.	M		
D-1-10	The system shall provide the capability to re-assign voters during the process to add, modify (including split) and delete polling stations.	M		
D-1-12	The system shall have the ability to track the active registered voter total by woreda or sub city to help meet statutory size requirements.	M		
D-1-14	The district and precinct files/tables shall be available to other system modules (Address Library Management, Voter Registration, Election Management and Petition Management).	M		
	Q. Queries and Reports – General			
Q-1-1	The system shall provide a software solution that includes a general-purpose report writer that allows extraction of data from the voter registration The solution can involve a third party report writer to supplement any capabilities that are internal to the voter registration software.	M		
Q-1-3	The system shall provide the capability for authorized users to search voter registration records using both "exact match" and "wildcard" search functions. Search criteria shall be allowed, at a minimum, in the fields for first name, last names, date of birth, SSN and registration-id. For example, the system shall provide the capability for an authorized user to search on the exact name of "Mesfin Fantaye" by entering: " Fantaye " in the last name field, " Mesfin " in the first name field, and Additionally, the system shall provide the capability for an authorized user to search and retrieve one or more listed names by using wildcard characters in one or more fields. For example:	M		

Req #	Requirement	Type	Compliance	Vendor Comment or
	"fan*" in the last name field to find all last names starting with "fan". "*sfi* in the last name field to find all last names containing “sfi ". "*aye" in the last name field to find all last names ending in “aye ". "fan*" in the last name field and "mes*" in the first name field to find records with last names starting with "fan" and first name starting with "mes". If more than one person is found during the search, the system shall display a pick list of records that met the search criteria and allowing the user to select a person from the list to display applicable detail.			
Q-1-4	The system shall display the selection criteria used in generation of every report at least on the first or last page of every printed report.	M		
	ueries and Reports - General Q-2 Canned Extract/Query/Report			
Q-2-1	The system shall provide authorized users with a library of standard, pre-defined reports prepared for use. The standard reports and other output shall provide authorized users with selection options to filter or sort by any political jurisdiction.	M		
Q-2-3	The system shall allow authorized users to generate any system report and to output that report to a PDF file.	M		
Q-2-4	The system shall allow the user to generate reports and view them on the screen, with actual and accurate data, prior to deciding to print the report. The system shall also allow the user the ability to print selected pages of the report.	M		
Q-2-8	The system shall provide the ability for authorized users to generate files and reports containing registered voter counts statewide, by sub city and in any county by k/k and woreda.	M		
Q-2-12	The system shall have the capability to print a transaction report by user per session. This report will be used to validate data entry with the original documents.	M		
	ystem S-1 Administration			
S-1-1	The system's objects shall be protected, controlled and maintained through the system Administrator.	M		
S-1-10	The automated task scheduling capability must have the security capability to assure that each authorized user will have access to add, modify,	M		

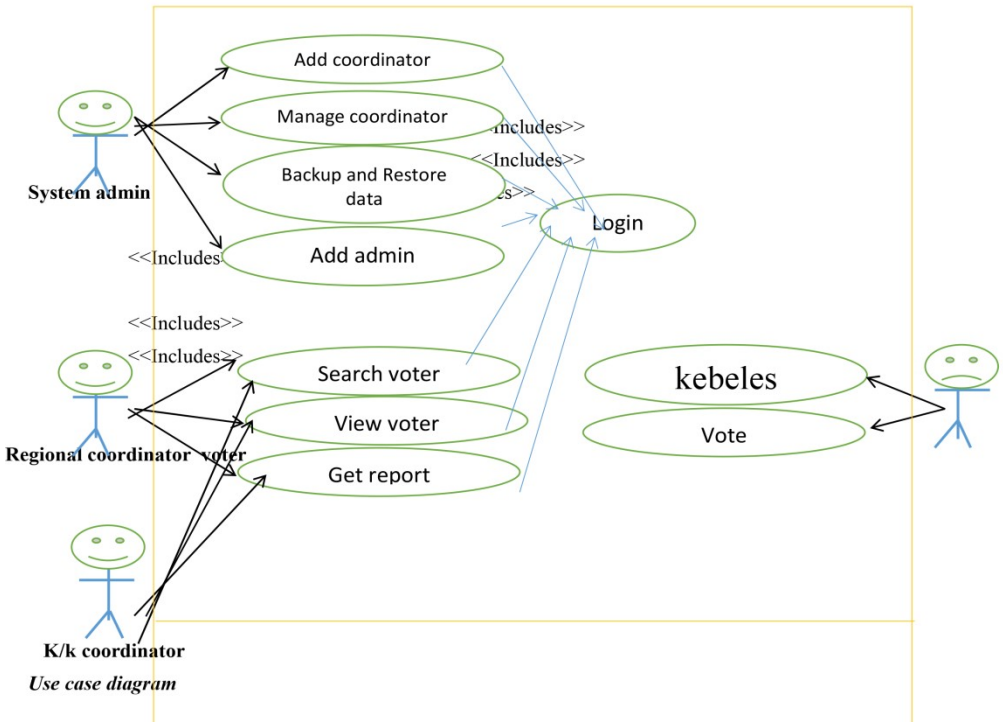
Req #	Requirement	Type	Compliance	Vendor Comment or
	delete, and view only the administrative tasks (and results of those tasks) for which they are authorized.			
	ystem S-3 Hardware/Software/Network			
S-3-11	The system shall allow stored images to be exported in any file format.	M		
	ystem S-4 Security			

S-4-1	The ministry must provide a Security Architecture Model. This model will be a product from analysis of the requirements and interviews with key project stakeholders. The model will contain but not be limited to: Security policy, procedures, standards, baselines, and guidelines; Risk analysis to assess availability, integrity, and confidentiality of protect information resources; Information classification and controls; Encryption, Authentication, and Authorization plans; Establish roles, responsibilities and access controls; Development, operations, physical, network, security; Business Continuity Plan; Security Test Plans; Breach recover plan; Establish metrics for continued monitoring. This plan will be used to develop the design, development, implementation, and retirement of security technology and tools.		
S-4-3	The ministry shall participate in the development of a clear, enforceable security policy for the system, with input from state and county staff.	M	
S-4-4	The system shall provide a database security management capability that allows at least two persons, identified by the Department of State, to act as security and recovery managers, controlling access and authorization privileges for all other users. This capability will also leave an audit trail of changes that identify persons and changes made to the database. It shall be the responsibility of the ministry to specify and implement this security capability during the implementation. It shall be the responsibility of the ministry to implement the database management system in such a manner that no one can circumvent the application software in such a manner as	M	

	to gain unauthorized access to the underlying database.		
S-4-5	The software shall have the ability for the system administrator to establish statewide, county, workgroup, and individual levels of access permissions to various files/tables in the database. For example, the security managers might decide to establish "read-only" data access for all users in one region to every element of every record in the database. However, only five authorized users in that county might be able to "update" any data record in the Address Library file, but not have the ability to "delete" any record in the file. Only one person might be authorized to view, add, create, delete, and print the address library file. This requirement shall mean that the system provides the system/security administrator with the capability to establish and maintain security and access controls for individuals and groups.	M	
S-4-6	The system shall provide the system administrator(s) the ability to grant different levels of access and authorization privileges to separate modules in the integrated database application. For example, the solution must allow a coordinator to have a different level of access and authorization to the voter registration modules. By way of further example, a designated county user might have full access and authorization privileges to view, modify, and delete data using the voter registration modules in the system. However, the system must provide the functional ability for system administrators to restrict a user's access and authorization privileges within the address library modules (for example, only allowing access to certain read-only address library screens).	M	
S-4-7	The system shall notify any user attempting to add, modify, or delete any record relating to a certified, "locked down" election that they are attempting to carry out a prohibited action on a certified election and shall prohibit them from taking that action.	M	
S-4-8	The transaction audit log shall record the identification of the user and date and time of the attempted operation (modifying a locked down election) on a certified election. The transaction audit log need not record inquiry, display, or print actions attempted or taken on certified elections.	M	
S-4-9	The system shall notify any user attempting to add, modify, or delete any record relating to a closed-out, locked down petition that they are attempting to carry out a prohibited action on a closed out petition and shall prohibit the user from taking that action.	M	
S-4-10	The transaction audit log shall record the identification of the user and date and time of an attempted record modification operation on a closed-out petition.	M	

	The transaction audit log need not record inquiry, display, or print actions attempted or taken on closed-out elections.		
S-4-11	The system shall provide a high level of confidentiality and integrity of the statewide and county-specific data. Data in all modules of the system must have adequate security to ensure correct county access. The system security shall be structured in a manner that will prohibit users in one region from being able to read, modify in any way, or delete data in any other region.	M	
S-4-12	The system shall provide the capability to prevent and log unauthorized attempts to penetrate the system and unauthorized procedures by authorized users (i.e., attempts to self promote).	M	
S-4-14	The system shall allow field-level security at the user level. For example, certain users may not have authority to modify particular fields on a screen, while other users might have the authority.	M	
S-4-15	The system will support security such that a county user's read and write access can be restricted. Most typically, a regional coordinator will have read/write access to one or more of these type records within their county, but read only access to one or more of these type records in other counties.	M	
S-4-16	The system will support separation of duties so that separate steps must be performed by different, identified personnel creating a need for collusion in order to manipulate the system or data (i.e. deletion of system objects, assigning privileges, authorization, and authentication, or any data change that will limit the voter's right to vote). All changes and users will be Included in the audit log.	M	
S-4-17	The system must support a single sign on (only one user-id and password needed to fully utilize the system).	M	
	ystem S-6 System Configuration		
S-6-1	The system shall support local desktop scanning of documents.	M	
S-6-2	The system shall support local desktop printing.	M	
S-6-3	The system shall support local desktop print to fax and print to file functions for reports and other printed output.	M	
S-6-4	The system may have an automated method for "print to email" for sending a file to a selected, email address.	O	
	ystem S-7 User Interface		
S-7-1	The system shall allow the date of update, when modifying records, to default to the current date when a change is made to the record, with user override capability.	M	
S-7-2	The system shall provide users with warning, informational and notice messages. User should be able to access a Help function to obtain further instructions related to a message being displayed.	M	

S-7-3	The system shall provide standard data entry edit checking and automatic data formatting.	M	
S-7-4	The system shall have the ability for entry, storage, processing and display of dates using an eight-digit field: (mm/dd/yyyy).	M	
S-7-5	The system shall include an online, indexed "help" capability to assist users and administrators in finding information relative to system and application functions and operations.	M	
S-7-6	The system shall allow each user the ability to change personal information,	M	
S-7-7	The system shall use dropdown menus, icons, and/or shortcut keys to navigate to the desired application function.	M	
S-7-8	The system shall provide users with clear and useful error messages from an error-handling module.	M	
S-7-9	The system shall prevent the need for a user to enter the same data twice.	M	
S-7-10	The system shall have screens with a consistent look, feel, object location, and navigation across modules.	M	



Use case diagram

Use Case Description

Name	Login
Description	Help to get authentication to use the system.
Actor	**Coordinators and system administrator**
Pre-Condition	To log to the system the users must have register as user and should have user name and password.
Post Condition	The users can access the system with respect to its clearance level
Basic course of action 1. The Users wants access the system. 2. The Users enter user name and password using home page or login screen 3. The system check the user name and password are exist or not. 4. The system display main menu window according to their role.	
Alternate course of action: 4. The system displays “Password or user name is incorrect”.	

Table 1: Use case description of Login

Name	Add coordinator
Description	Register the coordinator
Actor	System Admin
Pre-Condition	The coordinates who register as user have to be public officers that serve the people.
Post Condition	The registered user can access the system with respect to its role.
Basic course of action 1 The system admin want to add the coordinator who uses the system. 2 The system admin log to the system using. 3 The system displays the admin main menu window. 4 The admin select “add coordinator” from the admin main menu window. 5 The system displays add user form. 6 The admin fills the coordinator id, username, password and role of the coordinator. 7 The system check the coordinator id exists or not. 8 The system inserts the coordinator id, username, password and role 9 The use case end.	

Table 2: Use case description of Add user

Name	Search voters
Description	This tab gives the list of all voters.
Actor	Coordinator
Pre-Condition	The voter will be search would be in the list.
Post Condition	Can be selects an voter from voter searched list.
Basic course of action 1 The Coordinator wants to search voters. 2 The Coordinator log to the system using 3 The system displays the Coordinator main menu window. 4 The Coordinator select "voter Manage" from the main menu. 5 The system displays voter manages form "UI5". 6 The Coordinator select "Search" from voter manages form. 7 The System display search form 8 The Coordinator enters Ssn, or name. 9 The system check the give Ssn or name is exists or not. 10 The system displays employee found. 11 The use case end.	
Alternate course of action: If id or name not found. 10 The system informs there is not match. 11 The system displays the search form. 12 The use case end.	

Table 3: Use case description of Search voter

Name	Backup and restore database
Description	The admin should keep a backup of the system incase anything goes wrong.
Pre-Condition	There should be a previously backup data for restoration.
Basic course of action 1 The admin wants to Backup and restore database. 2 The admin logs in to the system using his/her password. 3 The system displays the admin menu window 4 The admin selects "backup/ restore" from the admin menu window. 5 The system display selected form respectively. 6 The system display Backup/ restore database form respectively. 7 The use case end.	
Alternate course of action	

Table 4: Use case description of View personal information

Name	Get Report
Description	The coordinator wants to get reports depending on their clearance level.
Actor	Coordinators
Pre-Condition	None.
Post Condition	The coordinators get reports.
Basic course of action 1 The coordinator wants to get reports. 2 The coordinator log to the system 3 The system displays the main menu window 4 The coordinator selects "get report" from the main menu window. 5 The system display get report form 6 The coordinator selects the report they want form the get report form. 7 The system display the report selected. 8 End Use case.	
Alternate course of action	

Activity diagramming

Activity diagram are graphical representations of workflows of stepwise activities and actions with support for choice, interaction and concurrency. In the Unified modeling Language, activity diagrams are intended to model both computational and organizational processes (i.e. workflows). Activity diagrams show the overall flow of control.

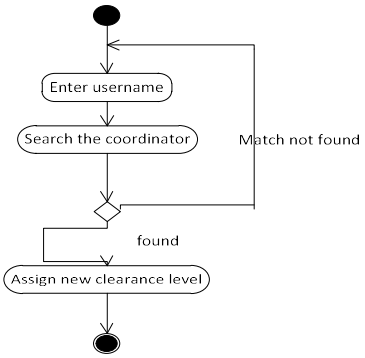


Figure 1: Activity Diagram of Search

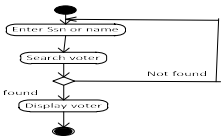


Figure 2: Activity Diagram of Search Voters

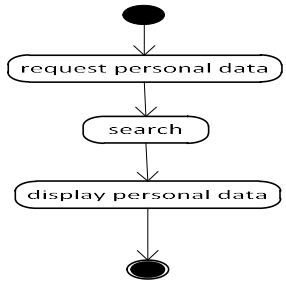


Figure 3: Activity Diagram of View Personal Data

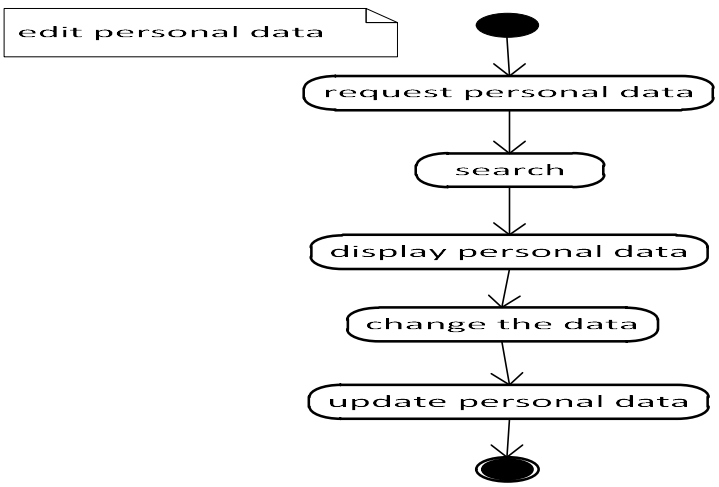
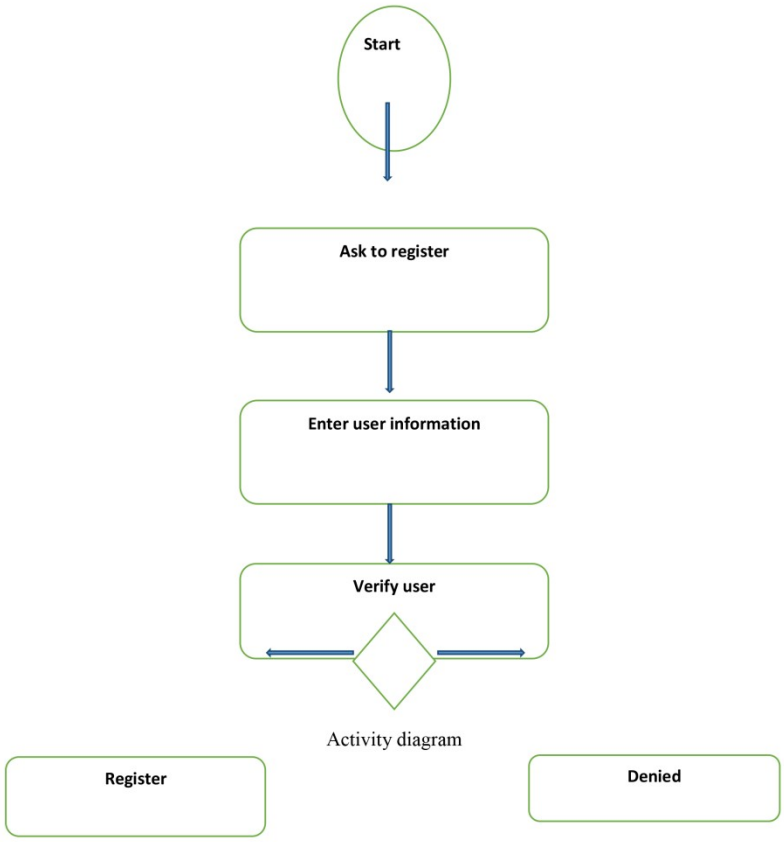
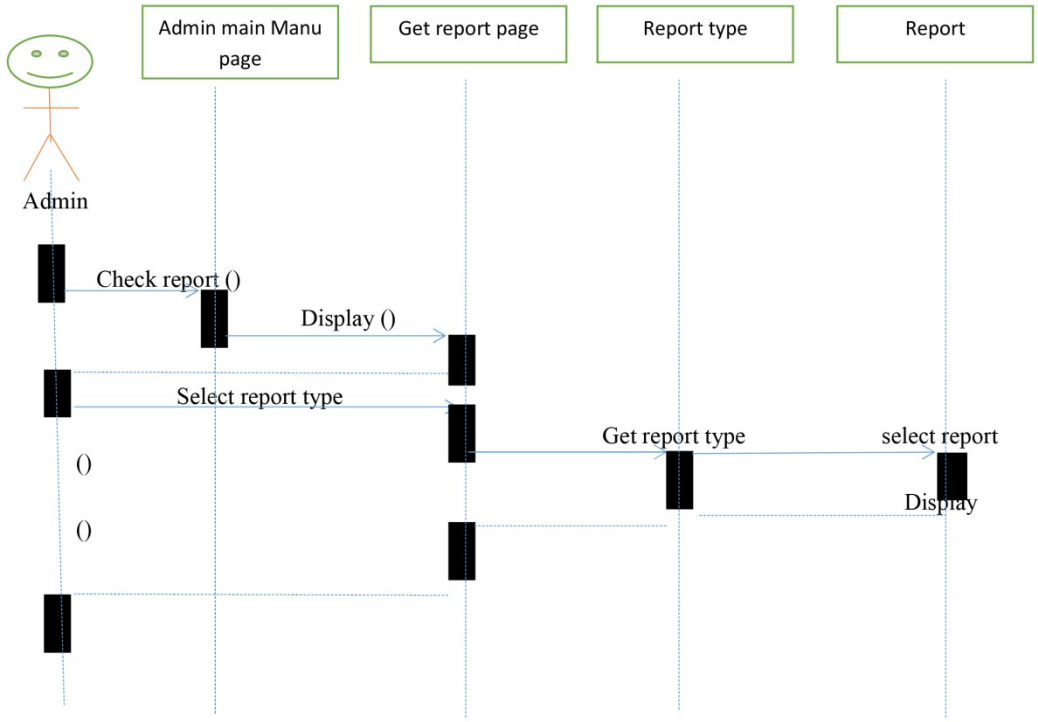


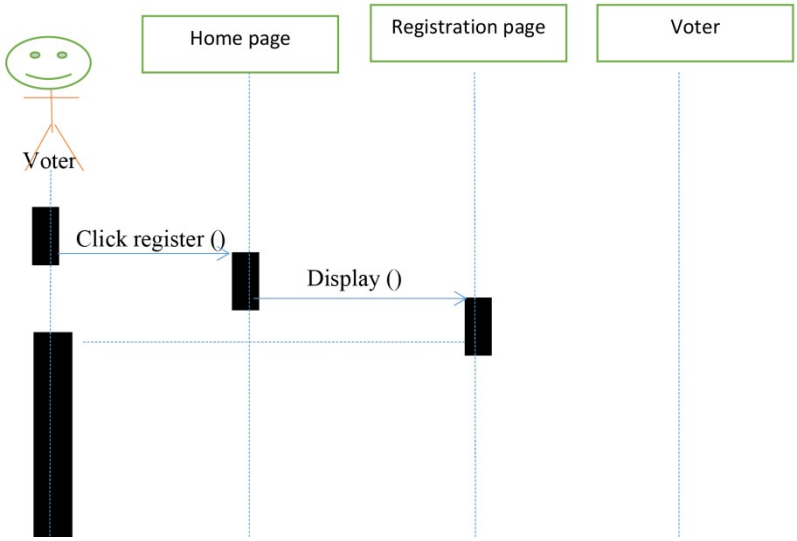
Figure 4: Activity Diagrams of Edit Personal Data



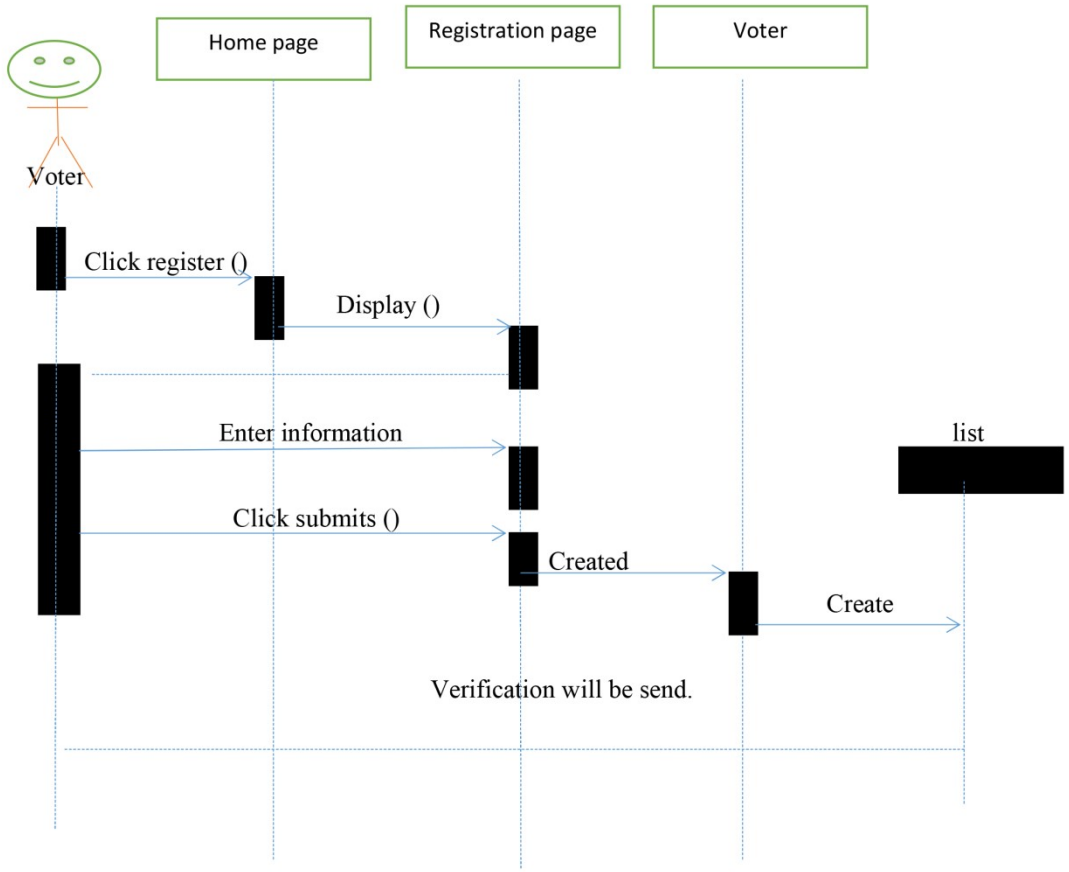
Sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. It is a construct of a message sequence chart. A sequence diagram shows object interaction arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of the 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.



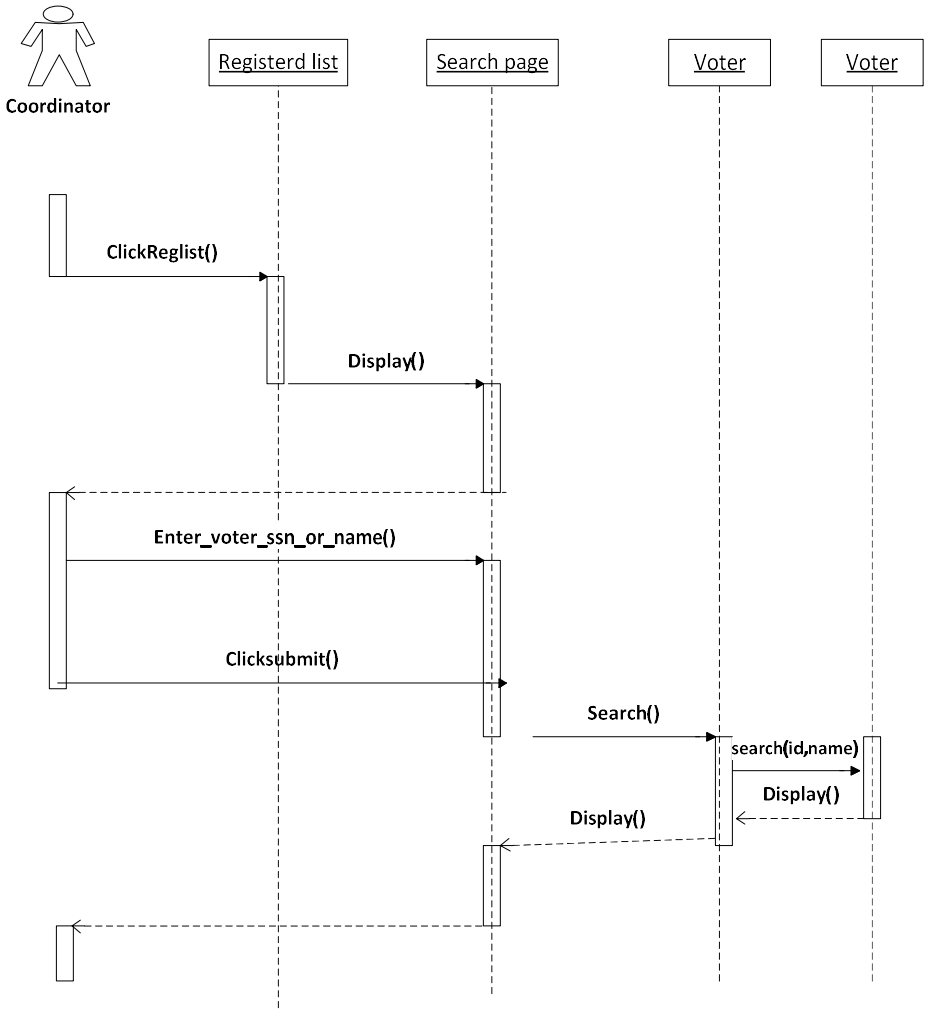
Sequence Diagram for Report Generation



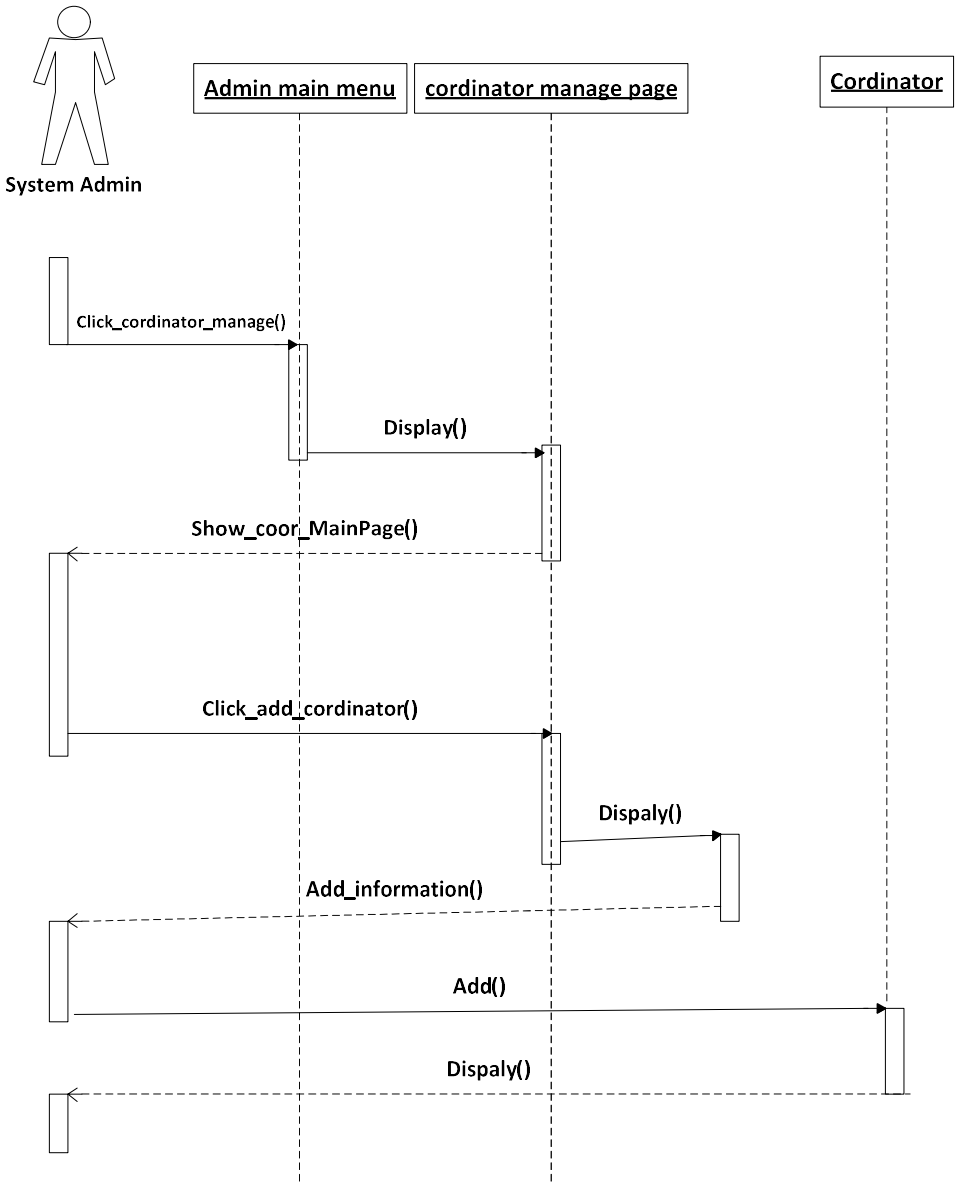
Sequence Diagram for Report Generation



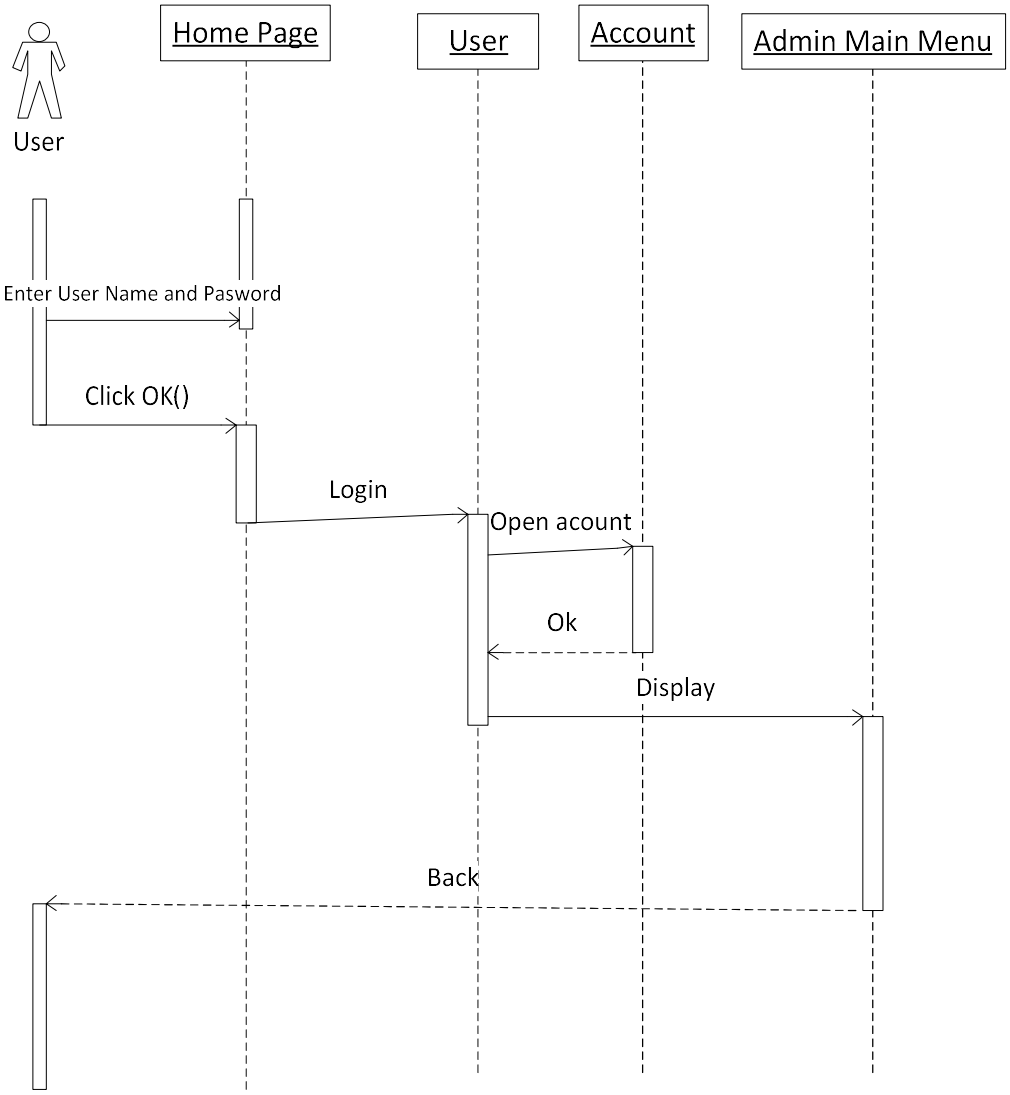
Sequence Diagram forVoter Register



Sequence Diagram For checklist



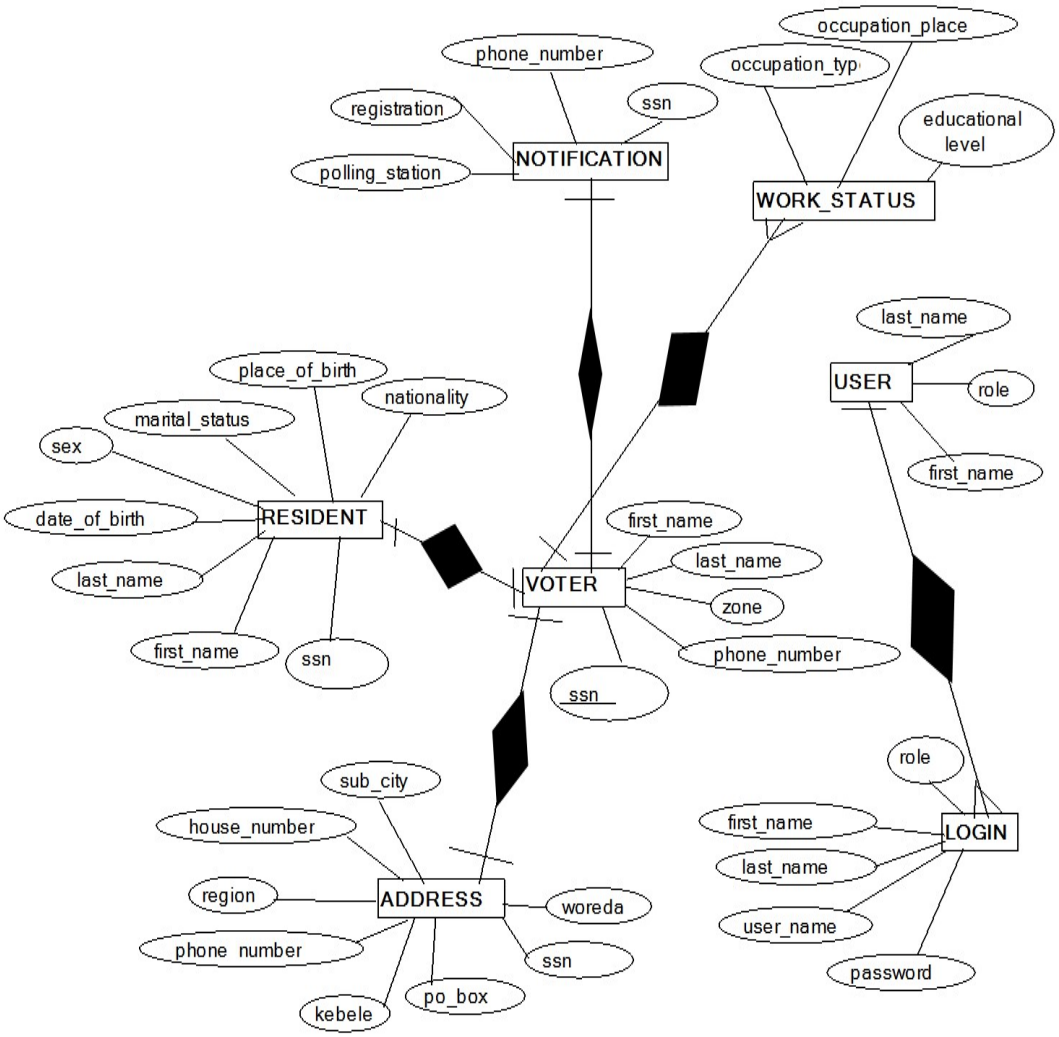
Sequence Diagram for managing Coordinators



Sequence Diagram for admin Login

ER diagram

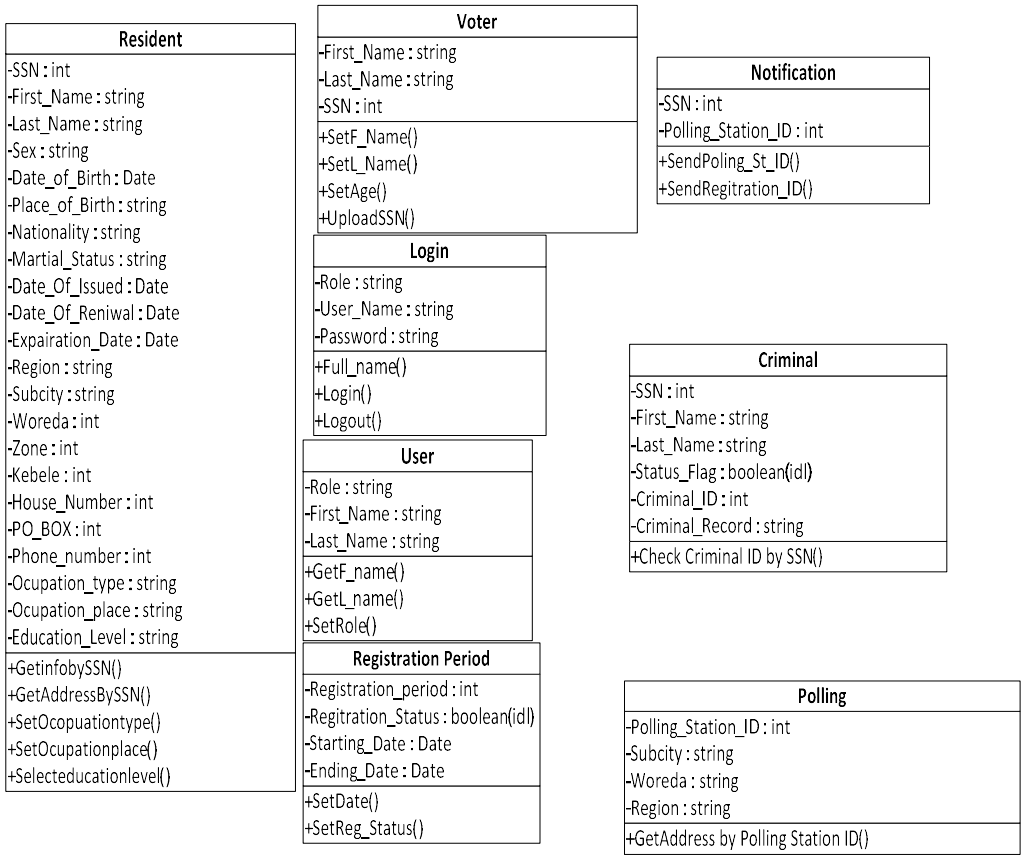
ER diagram is a graphical representation of the system which shows the relationship between attributes and their respective entities.



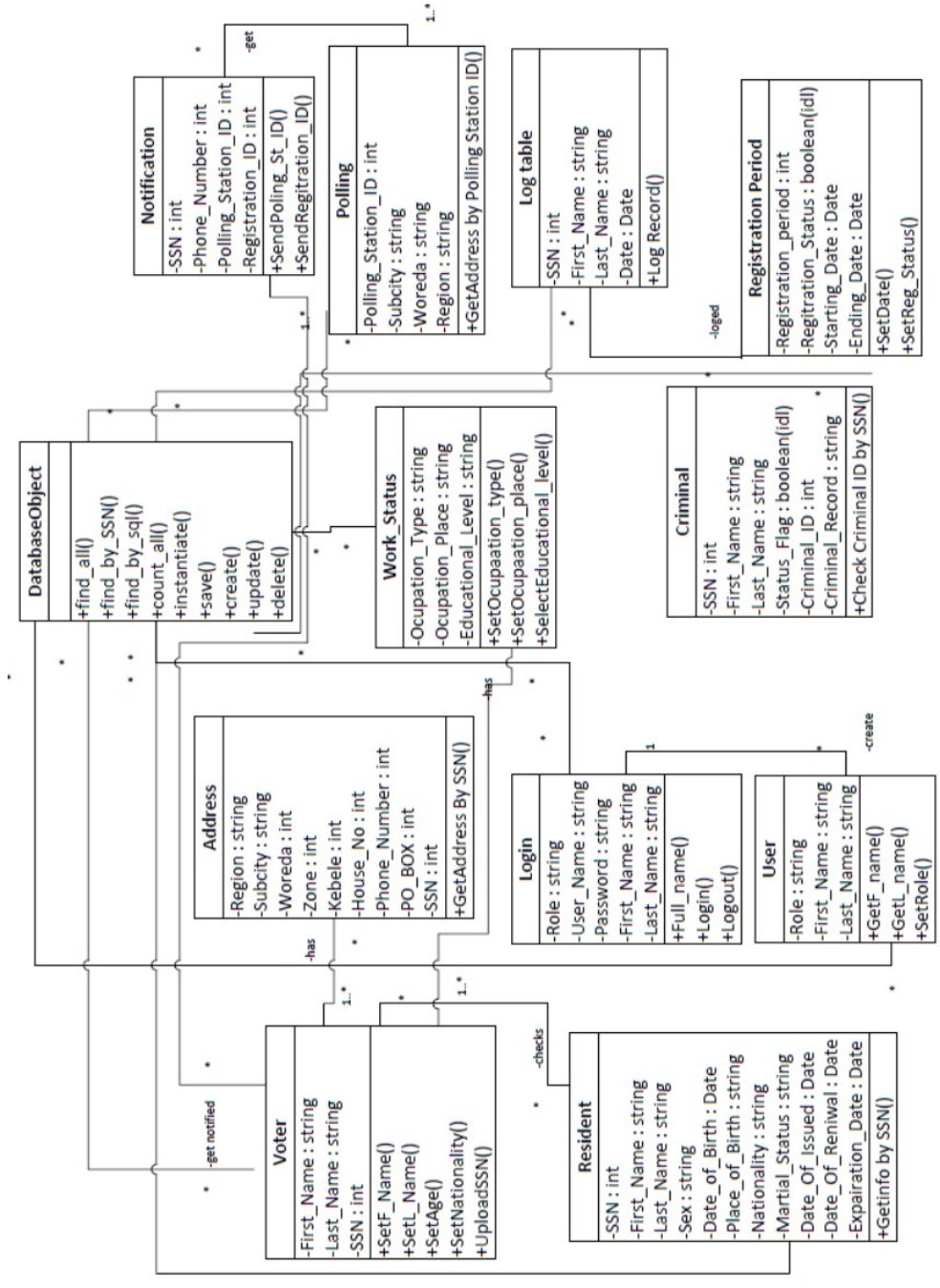
Class Diagram

The class diagram is the main building block of object-oriented modeling. It is used both for general conceptual modeling of the systematic of the application, and for detailed modeling translating the models into programming code. Class diagram can also be used to data modeling. The classes in a class diagram represent both the main objects, interactions in the application and the classes to be programmed.

Unrefined class diagram

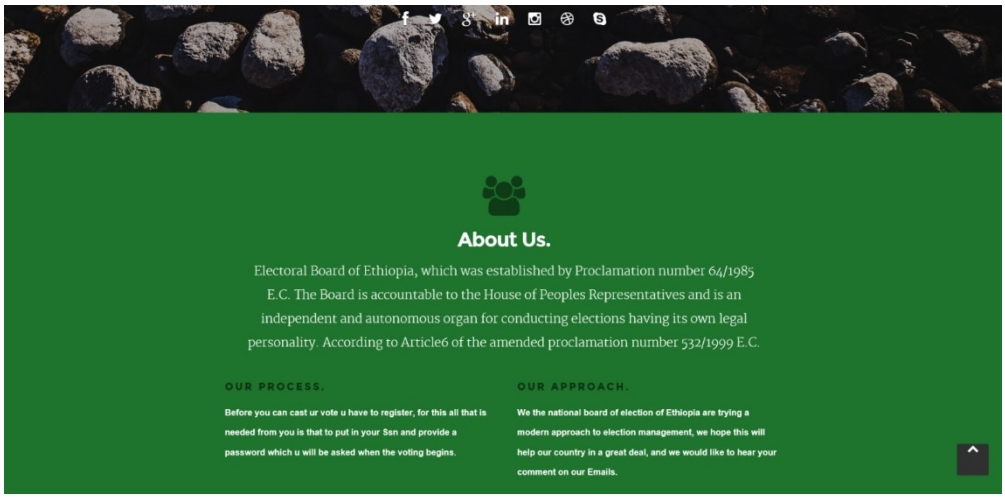


Class decomposition

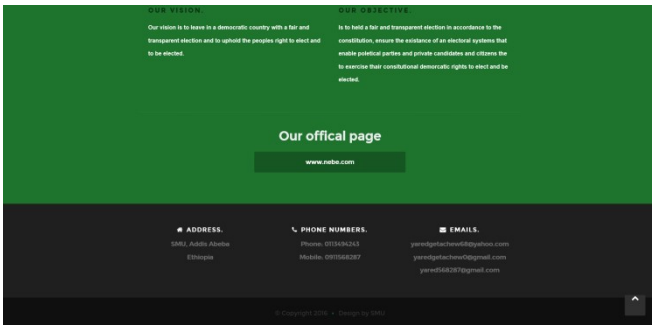


4.

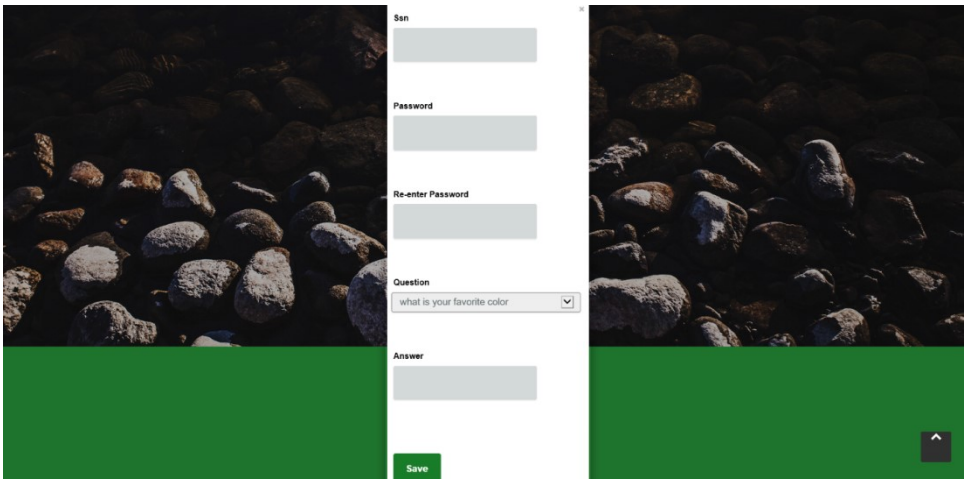
Home Page Shoot 1



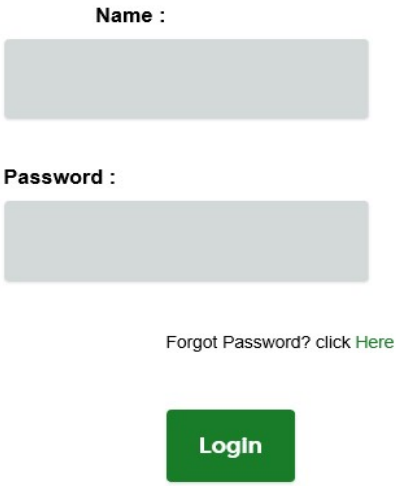
Home Page Shoot 2



Home Page Shoot 3



Home Page Shoot 4



5. Conclusion and Recommendation

5.1. Conclusion

Generally the aim of the Project is to improve the voter registration process and document handling management system for National Election Board of Ethiopia. To achieve this objective the team set different objectives and study the privies of the manual system in details that uses for trying to understand what the user needs and their usage of the system. The process is performed in different steps starting with ratifying the system, developing methodology, requirement documentation, setting project time line; conduct a feasibility study to determine whether a given solution will work or not. In the development process, include object-oriented analysis and object-oriented design. And also the project should

define the requirements analysis by categorizing functional and nonfunctional requirements system related to identified business needs or opportunities. Then, define the level of details sufficient for system design.

To understand the requirements the team tries to use UML diagrams for describing the aspects of architectural model that cleaned and easily summarized the performed activity in the analysis phase by use case diagram, sequence diagram, class diagram, and activity diagram.

5.2. Recommendations

We recommend better programmers with better skills. Training should be given to system developers and operators. This voter registration management system does not include some functionality like security encryptions, the team recommends that this features should be included to have better system. The team also recommends the end user to have a better understanding of computer skill to use this system.

References

-National Election Board of Ethiopia manual and official web site, www.NEBE.org.

-Statewide Voter Registration System Requirements for state of Colorado proposal. www.google.com