DIRE DAWA UNIVERSITY
INSTITUTE OF TECHNOLOGY
SCHOOL OF COMPUTING
DEPARTMENT OF COMPUTER SCINCE

TITLE: - WEB BASED ELECTRIC BILLING SYSTEM

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A Project Document Submitted to Dire Dawa University School of Computing Department of Computer Science in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in computer science

Advisor: Ins. Shemelis H. (Msc)

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This is to declare that the project is prepared by *Besufekad Terefe, Bikila Mitiku, Haftia Adisalem, Helen Solomon, Henok Megersa* and titled: *"web based electric billing system"* and submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in computer science in accordance with the university's rule and regulation and meets acceptance with respect to quality and originality.

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Acknowledgement

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Abstract

This project was proposed for Dire Dawa city electric power utility for personal bill generation. The proposed system consolidates bills for the user so the user will not need to go to the organization to pay the bills. Personal users can save time and effort on paying bills every month and will less likely forget to pay for the bills thus avoiding paying late payment punishment. The proposed system can also provide functionalities for the users to follow their bill status back in time and online from anywhere. Reports can also be generated for all bills monthly, which is a very useful tool for employees and admin to know and plan their expenses.

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CHAPTER ONE

1. INTRODUCTION

Now a day our world is globalized with the help of technologies and other applications. For that reason developed and some developing countries are using the application and other computer technologies to be part of the globalized world. Many organization and individuals have their computer based applications for the purpose of running their business, to perform different activity.

1.1 Background of the Organization

Dire Dawa city electric power utility is found in Dire Dawa city around shell. Currently there are 410 employees found in the organization with in this 276 are males and 134 females (kidist, 2021). It has around 21 departments (stuffs). It distributes the service based on user's requirement. That means whether the service is residential, commercial or other services.

1.2 Background of the project

The distributed electric power billing system that is proposed to develop is a system that provides billing system service for electric power utility of Dire Dawa city. The system controlled by central administrator. Currently the organizations use desktop application to do the job and process the data of customer.

The purpose of this proposed project is to establish the method electric power billing service for the city community. As well to establish the specification pertaining to the design and maintenance of decentralized treatment and full service as well as facilities within the city service boundary.

1.3 Statement of the Problem

Many problems that exist in Dire dawa city electric power billing system to finish their works properly and the organization are currently facing a some challenge among thus there are losing of data because for the current system there is not such suitable to store and retrieve data. And also time consuming process for the customers by going to the organizations to bill. In addition to this the current system is not user-friendly and not accurate to read data from everywhere because it is window based. Generally, this all recommend us to develop web based billing system to make the operation easy, accurate, flexible and to prevent data loss.

1.4 Objective of the project

1.4.1 General Objective

The general objective of this project is to develop web based system for Dire dawa city Electric Billing System.

1.4.2 Specific Objectives

The specific objective of this project is:-

- Collecting relevant data and analysing the collected data.
- Designing the system using UML language.
- Implementing the system
- Testing the system

1.5 The Scope of the project

The scope of this project focuses mainly on functional aspects of electric billing system such as:-

- Customer registration
- View current service
- Deactivate Existing User from the system
- Enable the users to send complaints to the organization
- Enable the employee or the admin to view complaints of customer
- Enable the employee to view the bill
- Enable the employee to generate reports of bill
- Enables employee to Import information of user
- Enable the employee to assign the service
- Enable the employee to view customers information
- Enable the user to pay money for bill
- Enable the employee to check payment of customer

1.6 Limitation of the project

Since the system needs some media to conduct transactions, every transaction will be passed via internet. Therefore, a user must have an access to internet.

The other limitation of the project is

- In order to pay the bill online the user must have CBE account with balance and that is integrated with electric utility providers.
- The system doesn't read the distance.
- It is Web based system.

1.7 Constraint

While doing this project we faced different types of problems that obstacles our work in order to finish work timely. Some of these problems are listed below.

- Absence of sufficient time
- Absence materials that used to use
- While collecting data absence of a person who is willing to give us information precisely.

1.8 Methodology

1.8.1 Data Gathering Methodology

✓ **Interview:**

We interviewed with some of the employees about their existing system functionality, their problems and background. The collected information helps us:

- To deeper understanding of the data resources used by the system.
- To know what the current level of system usage by the office.

✓ **Observations:**

We observed that the present manual system has lot of functionalities which can overcome by proposed system such as time, manpower, readiness of customer details etc.

✓ **Reading documents:**

To have detailed awareness about our project we used documents such as books. During the Analysis of documents, we give a special consideration to those documents which can bring more features to our system.

✓ **Questioners :**

We would conduct questioners for the Dire Dawa city electric power utility to study the existing system and develop the new system.

1.8.2 System Analysis and Design Methodology

For the proposed system or new system, we preferred the object oriented system analysis and design (OOSAD) approach, which is by using unified modelling language (UML). Because it

includes the overall features of OOSAD. The other reason is that using object-oriented programming we can write clear, more reliable, more easily maintained programs.

Object Oriented Analysis (OOA)

During this phase the team used to model the function of the system (use case modelling), find and identify the business objects, organize the objects and identify the relationship between them and finally model the behaviour of the objects.

We preferred Object-oriented approach for the following advantages: -

- Simplify the design and implementation complexity of our program.
- Increase reusability*:* it helps us for reusability of the system's code
- It helps us to upgrade our system easily.
- Reduce communication complexity between our team and client because it allows us to design both the static and dynamic part of the system.

Generally, object oriented principle makes this method powerful than other method of system development approach. Therefore, we enforced to select this system development approach.

1.9 System Development Approach

There are many different development approaches available those are:

- Waterfall
- Prototyping
- Incremental
- Iterative
- Spiral.

From those developments methodology's we will use incremental model. In this model, each module passes through the requirements, design, implementation and testing phases. A working version of software is produced during the first module, so we have working software early on during the software life cycle. Each subsequent release of the module adds function to the previous release. The process continues till the complete system is achieved. Additionally we choose the incremental model because it has advantages we listed below.

Advantages of Incremental model:

- ✓ This model is more flexible, less costly to change scope and requirements.
- ✓ It is easier to test and debug during a smaller increments.
- ✓ In this model customer can respond to each built.
- ✓ Lowers initial delivery cost.
- ✓ A new technology will be used during a smaller increments.
- ✓ Easier to manage risk because risky pieces are identified and handled during it's incremental.

1.9.1 System Development Tools

There are some tools that are used to develop the system. These are:

1.9.1.1 Software Tools

- **WAMP server 2.5:** we use it as server.
- **Adobe Photoshop:** for editing images.
- **Notepad++ 6.7.4, vs code:** also for text editing.
- **Google Chrome 1.3.26.9:** to run the system
- **MS office 2016:** used for documentation part of our project.
- **Visio2016:** to draw different diagram
- **Edraw-max:** to draw user interface prototype
- **Snipping tools:** to screen shoot the picture

1.9.1.2 Hardware Tool

- **Flush disk**: for backup and file transfer.
- **Data cables:** to transfer files from mobile to PC.
- **Printer:** to print the document.
- Laptop with the following specification
  - CPU Core I3
  - 500 GB disk space
  - 2GB RAM
  - Windows 10 operating system
  - Intel(R) Core(TM) i3-4005U CPU @ 1.70GHz processor

1.9.2 Programming Language

- **HTML:** for describing webpage and interface application.
- **JS:** designing to add interactivity to HTML through validation.
- **CSS:** we have used it add style to HTML elements for decoration and attractively.
- **PHP 5.5.12:** we used it as a server script because of it run on different platform like Linux, windows, and on other servers like Apache server.

1.10 Significance of the project

The benefits gained from the project after implementation is :-

- Save times of employee and customers
- Make the system easier for the users
- Reduces work burden of employees of the organization
- Prevent data loss
- Enable the administrator to manage data easily
- Create fast and efficient sharing of critical information for users and employee of the organization.

1.11 Beneficiaries of the project

The outcome of this project solve electric power billing system problems that addresses on customer's service, then all the customers and service provider was more beneficiary and satisfied because it helps to save resources like:-

- time,
- money,
- power and
- Increase efficiency and effectiveness.

So, it results in excellent out come to the organization.

1.12 Feasibility

While doing this project, it is fair to see some conditions with regard to cost, clients (end users) and also about the system developer.

1.12.1 Technical Feasibility

At the implementation stage, we will use the latest technology development tools. Such as HTML, CSS and JavaScript for front end, and WAMP server and PHP as back end which is the most recent and open source popular technologies to develop web based systems and to design the database. As the result our system is technically feasible.

1.12.2 Operational Feasibility

When the system is installed and become operational the organization personnel or who is supposed to manipulate this system shall train how to work with the new system. Therefore, the proposed system or the new system would be operationally feasible because:

- The new system fits with the existing operational system.
- Satisfy the user need or requirement.

1.12.3 Economic Feasibility (Cost Benefit Analysis)

Economic feasibility consists of tangible and intangible feasibility which are described as follows.

Tangible cost:

- Reduce the amount of resource required in office.
- Reduce transportation cost for the customers.

Intangible cost:

- Getting well organized information in short period of time
- Make quick decisions based on the organized information retrieved
- Better service to Customer
- Easy and better way of doing activity in the electric power billing office.

The cost benefit analysis of our project is described in table 1.1 below.

Table 1.1 Budget of the project

No	Name of item	Quantity	Single price	Total
1.	Flash-disk	2	180	360

2.	Paper	1 packet	130	130
3.	Printing paper	232 pages	3	682
4.	Laptop computer	1	11,000	11,000
5.	Pen	10	5	50
6.	Transport	2	10	20
7.	Mobile card	10	10	100
8.	CD-RW	2	8	16
Total				12,358

1.12.4 Schedule Feasibility

For the plan of our project, we have calculated the time that each task will take from us. So by following schedule plan time we can finish and deliver the project on time. For that of reason, the system is time feasible. The following figure describes time schedule of our project.

Table 1.2 schedule plan

Id	Task name	Start	Finish	Duration (days)	2021 (month) June July Aug Sept Oct
1	Data collection	20-06-21	04-07-21	14d	
2	Requirement analysis	05-07-21	29-07-21	25d	
3	System analysis	30-07-21	22-08-21	23d	
4	Implementation	23-08-21	07-10-21	44d	
5	Testing	08-10-21	20-10-21	12d	

CHAPTER TWO

2. Requirement Elicitation

2.1 Overview of existing system

The existing system of the billing system for electric is working slowly in different places. Whatever be the process involved in the system is working through desktop way, there is a lot of complexities involved in the system. When any customer takes new interaction with the system then separate files are maintained. Updating of data is very tedious job. It is not easy to do several administrative works like managing rates of calls, addition or modification of metered calls & customer entries. The existing system required different data about customer name, sex, nationalities, Keble, house number which are customers give to the employee. In this system administrators accept the request of the customer from employee and the administrator sends customer request to the central administrator and the central administrator provide registration number of customer to the administrator then the administrator gives the bill number to the customer.

2.2 Existing system

2.2.1 Existing System Description

The existing system of the electric power billing system for Dire Dawa city is working window based. Therefore, there are a lot of problems involved in the system. For example, the system doesn't allow the users to follow their bill information everywhere and at any time, inserting, deleting and updating of data is very tedious job for customer and employee of the organization and it is not easy to do several administrative works.

2.2.2 Supplementary Requirements

1. Business Rules

The main business rules or principles of the existing system are:

- Costumers will pay money for what they use per month. And no payment difference for the same service.

- Costumer should get the bill paper for what they are paying.
- Some gap is given for a costumer to pay their bill payment. If they didn´t pay within a given day, it postponed to the next month.
- Anyone who wants to use the service must have an identity card with its legal number.
- Anyone who wants to use the service must have legal house.
- Every customer's age must be greater than 18.
- Every user must pay their payments within the given period of time
- The employee stops the service of anyone who don't pay his/her bill payment
- Any user who lost his/her bill paper will inform to the office and can get its copy.

2.3 Advantages Existing system

The current system was carried out window based and no need of web association. What is more, the other significance of the existing system is that electric utility power did not hire an expert administrator who has a place to actually monitor the billing online.

2.4 Disadvantages Existing system

The organization has many drawbacks. Some of these are list below.

Customer information not properly handling: -

- ✓ They use window to store customer information's.

Lack of security of data: -

- ✓ All files are kept on desktop computer they are exposed to theft and other environmental disaster.

Time consuming: -

- ✓ It is difficult to generate daily, monthly and annually report on timely and it may have errors as they work in quickly.

Tiredness of employees: **-**

- ✓ As they search some data is takes time for the employees who assigned on this work and they are unsatisfactory on the existing system which leads to endanger on the sustainability of the company.

More man power is needed: -

- ✓ Requires many numbers of peoples to billing selling and maintenance.

Lack of materials: -

- ✓ They have no enough materials that used to facilitate their services like computers, printers.

- ✓ Duplication of data occurs when data input in to the system.
- ✓ Checking the validity of input data is difficult
- ✓ The services provided by the office are not as fast as possible.

2.5 Proposed Solution

During our observation and interview of users we have observed certain problems from the window based system; the general overview of our proposed system is to address the problem of the existing window system of electric power bill. The proposed system solves those problems in the existing system. Because the system is very integrated and it controls all the data input and error which happened during filling any forms whether during bill information registration or any other actions. The new system will be able to access and retrieve different data effectively and efficiently.

The proposed system will be able to:

- ➢ Reduce wastage of time
- ➢ Retrieve bill information from the database
- ➢ Update the bill information
- ➢ Give data availability
- ➢ Generate the report within needed time.
- ➢ Facilitate the activity of the organization.
- ➢ Easy to use (user friendly).
- ➢ Reduce the need of paper

2.6 Prefered solution

The preferred solution is to develop web-base electric billing system.

Following are reasons we prefer web-based electric billing system: -

- Web-based electric billing system allows administrator to interact with a remote server through a web browser interface.
- Electric utility power doesn't have to install additional software.
- Web-based electric billing system work on any device that can run a supported browser and has an active internet connection.

- The system is accessible anywhere and anytime, as long as administrator have access to a device with an Internet connection, and the system is great at storing data

2.7 Domain modelling with CRC card

Table 2.1 CRC Diagram for Customer

Customer<<actor class>>	
Customer id Customer name Phone number Address	Admin, employee
Feed back Transfer Money Pay Money Add money	

Table 2.2 CRC Diagram for Admin

Admin<<actor class>>	
Admin id Name Address	Customer , employee
add account deactivate account Report	

Table 2.3 CRC Diagram for Admin

Employee<<actor class>>	
Employee id Name	

Address	Customer , Admin
add account deactivate account Report	

2.8 Essential Use Case diagram

A use case is a collection of interactions between external actors and a system. In UML, a use case is the specification of a sequence of actions, including variants, that a system (or entity) can perform, interacting with actors of the system (Fowler).

2.8.1 Actor Identification

In the existing system there are numbers of actors each having their own responsibility.

1. **Customer:** someone who want to access the service.
2. **Administrator:** users of the system who can control access right for other users.
3. **Employee:** is a person who controls bill information.

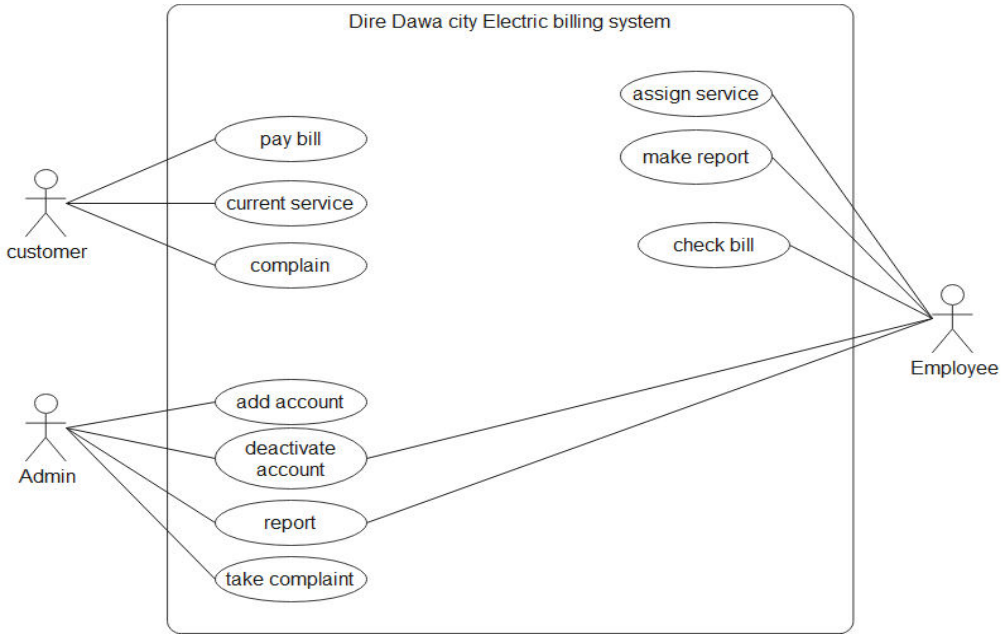
2.8.2 Use Case Identification

- **Current service: -** allows the customer to see his service status.
- **Pay bill**: - allows the user to pay his/her bill payment.
- **Complain:** - allows the user to send his complaints.
- **Deactivate account:** - allows administrator to block employee account.
- **Add account:** - allows the administrator to add employee account.
- **Make report:** - allows the employee and the administrator to view the report.
- **Take complaint:** - allows the employee and the administrator to view the complaints.
- **Make report:** - allows the employee to generate the report.
- **Assign service:** - allows the employee to assign deactivated services.
- **Check bill:** - allows the employee to view all bills status.

2.8.3 Use Case Diagram

Use Case Diagram represents user requirements gathered during requirement elicitation, contains use case, actors, system boundary and their relationships.

Figure 2.1 use case diagram of existing system



2.9 Use Case Description

Use case description includes descriptions of the use case, preconditions, post conditions, flow of event and whatever which is important in modelling the user goal. The description of each use case is described below.

Table 2.4 Use case Description for Current Service

Section	**Purpose**	
Name	Current service	
Identifier	01	
Description	It allows the user to see the status of the current service.	
Actor	Customer	
Precondition	none	
Basic flow of events	**Actor action**	**System response**
	1. User sees the current service	2.The System provides the status of the current service
Post condition	User see detail information	

Table 2.5 Use case Description for Pay Bill

Section	**Purpose**
Name	Pay bill
Identifier	02
Description	It allows the customer to pay their bill.
Actor	Customer
Precondition	The customer must use first.
Basic flow of events	Step1:- meter reader reads the amount electricity the customer used. Step2:- the employee calculates the money for the electric used by user according to the calculations interval. Step3:- customer pay bill
Alternative flow of events	If there is an error reading and calculating it is redone.
Post condition	Customer pay his/her bill birr

Table 2.6 Use case Description for Complaint

Section	**Purpose**
Name	complain
Identifier	03
Description	It allows the customer to report their complaints.
Actor	Customer

Precondition	The customer must take the complain form first.	
Basic flow of events	**Actor action**	**System response**
	1. User fill the complaint form	2.The System accepts the complaint form
Alternative flow of events	If the form filled is not correct again the customer fill it.	
Post condition	Customer complaint accepted	

Table 2.7 Use Case Description for Deactivate Account

Section	**Purpose**	
Name	Deactivate account	
Identifier	04	
Description	It allows the administrator to deactivate the accounts.	
Actor	Administrator	
Precondition	The Admin must have users account first.	
Basic flow of events	**Actor action**	**System response**
	1. The administrator takes the account.	2.The System blocks the selected account
Post condition	The selected account deactivated.	

Table 2.8 Use Case Description for Add Account

Section	Purpose	
Name	Add account	
Identifier	05	
Description	It allows the administrator to add new employee account.	
Actor	Administrator	
Precondition	The administrator must take customer.	
Basic flow of events	**Actor action**	**System response**
	1. The administrator takes the add account form 3. The administrator fills the employee details.	2.TheSystem provide add account form 4. System check the filled information
Alternative flow of events	The system shows an error message or incorrectness of any employee data then stay on step2.	
Post condition	Employee account created.	

Table 2.9 Use case Description for View Report

Section	Purpose	
Name	report	
Identifier	06	
Description	It allows the administrator and the employee to see reports.	
Actor	Administrator and Employee	
Precondition	The administrator and the employee must login first.	
Basic flow of events	**Actor action**	**System response**
	1. The administrator or employee takes report.	2. The System view report information's.
Post condition	The administrator or the employee viewed the report.	

Table 2.10 Use case Description for View Complaint

Section	**Purpose**	
Name	take complaint	
Identifier	07	
Description	It allows administrator and employee to view complaints of users.	
Actor	Administrator and Employee	
Precondition	Administrator and employee must have access first.	
Basic flow of events	**Actor action**	**System response**
	1. Administrator or employee view complaint	2.The System displays user complaint information
Post condition	Administrator or employee viewed users complaint.	

Table 2.11 Use Case Description for Generate Bill

Section	**Purpose**	
Name	check bill	
Identifier	08	
Description	It allows the employee to generate the bill.	
Actor	Employee	
Precondition	The employee must have access first.	
Basic flow of events	**Actor action**	**System response**
	1. Employee takes the generate bill form 3. Employee fills the current metre reading and dates.	2.TheSystem displays bill generation form window 4. System calculate in birr
Alternative flow of events	The system shows an error message for incorrectness of the current metre reading then stay on step2.	
Post condition	Bill generated.	

Table 2.12 Use Case Description for Generate Report

Section	**Purpose**	
Name	make report	
Identifier	09	
Description	It allows the employee to generate the report.	
Actor	Employee	
Precondition	The employee must have authority first.	
Basic flow of events	**Actor action**	**System response**
	1. Employee generate report 3. Employee select the date	2.TheSystem displays report generation form 4.success
Post condition	Report generated.	

Table 2.13 Use case Description for Assign Service

Section	**Purpose**	
Name	Assign service	
Identifier	10	
Description	It allows the employee to assign services.	
Actor	Employee	
Precondition	The employee must have access first.	
Basic flow of events	**Actor action**	**System response**

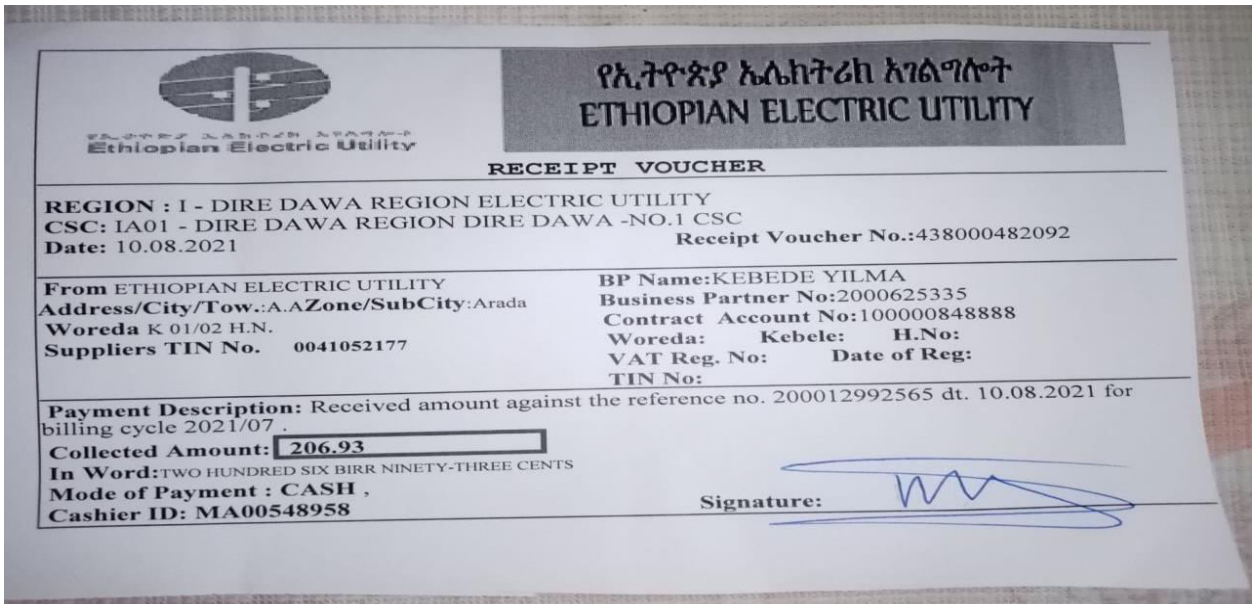
	1. The employee takes the assign service form 3. The employee assign the required service from the list sand fill the metre number and press assign button.	2.TheSystem displays the deactivated services 4.The system assigns metre number for the new service
Alternative flow of events	The system shows an empty select menu if there are no deactivated services in the system.	
Post condition	The user service assigned.	

Table 2. 14 Use Case Description for View bill

Section	**Purpose**	
Name	View bill	
Identifier	10	
Description	It allows the employee to view all bills information.	
Actor	Employee	
Precondition	The employee must have the authority.	
Basic flow of events	**User action**	**System response**
	1. Employee clicks the view bill button 3.Employee view the all bills Information including payment status	2.TheSystem displays all bills detail
Alternative flow of events	The system shows an empty table if there is no bill in the system.	

Post condition	Employee viewed all bill information.

2.10 Essential User Interface Prototyping



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ETHIOPIAN ELECTRIC UTILITY

Ethiopian Electric Utility

RECEIPT VOUCHER

REGION : I - DIRE DAWA REGION ELECTRIC UTILITY
CSC: IA01 - DIRE DAWA REGION DIRE DAWA -NO.1 CSC
Date: 10.08.2021 **Receipt Voucher No.:**438000482092

From ETHIOPIAN ELECTRIC UTILITY
Address/City/Tow.:A.A**Zone/SubCity**:Arada
Woreda K 01/02 H.N.
Suppliers TIN No. 0041052177

BP Name:KEBEDE YILMA
Business Partner No:2000625335
Contract Account No:100000848888
Woreda: **Kebele:** **H.No:**
VAT Reg. No: **Date of Reg:**
TIN No:

Payment Description: Received amount against the reference no. 200012992565 dt. 10.08.2021 for billing cycle 2021/07 .
Collected Amount: 206.93
In Word:TWO HUNDRED SIX BIRR NINETY-THREE CENTS
Mode of Payment : CASH ,
Cashier ID: MA00548958
Signature:

CHAPTER THREE

3. SYSTEM ANALYSIS

System analysis is the process of understanding and identifying basic requirements that the system need and should do. System analysis documentation discuss the over view of the new system, this topic explain functions provided by the system and its operational constraint. These system requirements can be seen in two different perspectives, one is what the system should do and the other is what it needs in order to accomplish its work.

3.1 Overview of New system

The proposed system consolidates bills for the user so the user will not need to go to the organization to pay the bills. Personal users can save time and effort on paying bills every month and will less likely forget to pay for the bills thus avoiding paying late payment punishment. The proposed system can also provide functionalities for the users to follow their bill status back in time and online from anywhere. Reports can also be generated for all bills monthly, which is a very useful tool for employees and admin to know and plan their expenses.

3.2 System requirement

3.2.1 Functional Requirements

A functional requirement specifies what the proposed system should do. And describe the interactions between the system and its environment (Booch, 1994). For example, functional requirement of our system is must assign customer bill account and make accessible for a user, allow the employees to manage data easily and allow the administrator to control account. The main requirement that used to handle are observable tasks or processes that must be performed by the system:

- Make accessible interface for system user
- Assign new customers to the system
- Generate report at any time
- Allow the customer to follow their bill information at any time and everywhere.
- Allow the customer to send their complaints
- Allow the employee to view customer's complaint
- Allow the administrator to create account for employees
- Allow system users to change their passwords

3.2.2 Non-Functional Requirements

It describes user-visible aspects of the system that are not directly related with the functional behaviour of the system. Non-functional requirements include quantitative constraints, such as:-

- Response time (i.e., how fast the system reacts to user commands) or
- Accuracy (i.e., how precise).

The constraints are described below: -

Performance

Performance requirements define acceptable response times for system functionality. Response time of the distributed electric power billing System should be faster than the existing system. Response time refers to the waiting time while the system accesses, queries and retrieves the information from the databases. And also the system should support many users at a time

User Interface

- The forms prepared for the information are easy to user they can easily understand.
- The system should include attractive interfaces and should replace existing system.

Security and Access permissions

- The system should be secure because the admin page and user page is developed separately by different language
- The system should be secure and must use encryption to protect the databases. Users need to be authenticated before having access to any personal data.

3.3 System modelling

3.3.1 System use case diagram

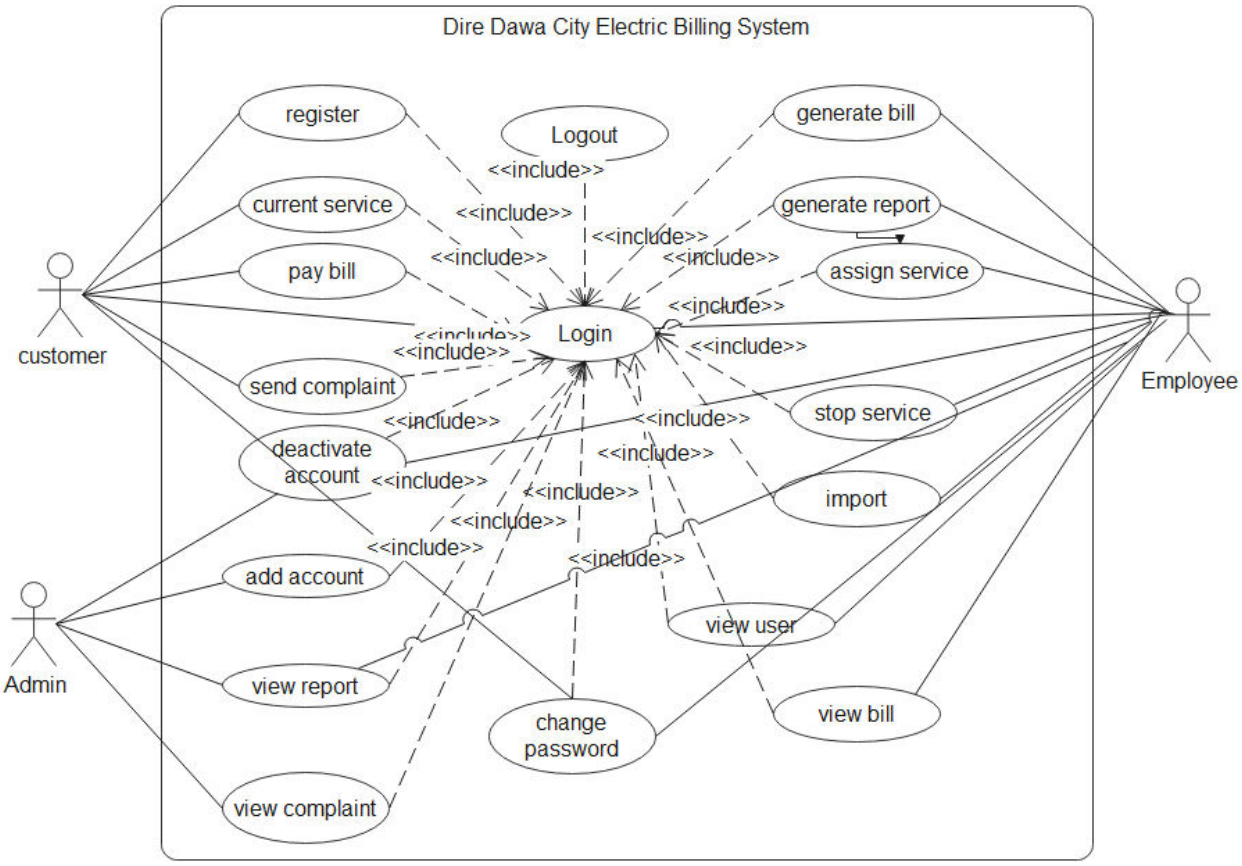


Figure 3.1use case diagram of existing system

3.3.2 System use case diagram documentation

Table 3. 1use Case Description for Register

Section	**Purpose**	
Name	Register	
Identifier	1	
Description	The customer will create an account for himself.	
Actor	Customer	
Precondition	The customer must have valid identity and house number.	
	User action	**System response**

Basic flow of events	1. The customer will click on register tab of the main window. 3.the customer will fill all the information's and click ok.	2. The system will display registration form. 4. The system will check entered data and then display successful creation of account and gives privilege for the customer.
Alternative flow of Events	1. The system verifies and informs to re-enter again if incorrect information is given and stay on step2.	
Post-condition	Account will be created for the customer.	

Table 3.2 Use Case Description for Login

Section	**Purpose**	
Name	Login	
Identifier	2	
Description	It allow the actor enter to their page.	
Actor	Administrator, Employee and customer	
Precondition	The actor must have correct user name and Password.	
Basic flow of events	**User action**	**System response**
	1. User clicks the login button 3. User fills his/her user name and password.	2.TheSystem displays login window 4. System authenticates the user And displays the required window
Alternative flow of events	The system shows an error message for incorrectness of the username and password then resume to step2.	
Post-condition	System user logged in to the system	

Table 3.3 Use Case Description for Current Service

Section	Purpose	
Name	Current service	
Identifier	3	
Description	It allows the user to see the status of the current service.	
Actor	Customer	
Precondition	The user must login first.	
Basic flow of events	**User action**	**System response**
	1. User clicks the current service button	2.TheSystem displays the status of the current service
Post condition	User view detail information	

Table 3. 4 Use Case Description for Pay Bill

Section	Purpose	
Name	Pay bill	
Identifier	4	
Description	It allow the customer to pay their bill.	
Actor	Customer	
Precondition	The customer must login first.	
Basic flow of events	**User action**	**System response**
	1. customer clicks the pay bill button 3. Customer fills his/her credit card number.	2.TheSystem displays pay bill form window 4. System checks the entered credit card number whether it is correct or not and
Alternative flow of events	The system shows an error message for incorrectness of the account balance and credit card and stay at step 2.	
Post condition	Customer pay his/her bill birr	

Table 3. 5 Use Case Description for Send Complaint

Section	**Purpose**	
Name	Send complaint	
Identifier	5	
Description	It allows the customer to send their complaints.	
Actor	Customer	
Precondition	The customer must login first.	
Basic flow of events	**User action**	**System response**
	1. User clicks the send complaint button 3. User write his/her complaints.	2.TheSystem displays complaint form window 4. System checks the either message is entered or not and display success message.
Alternative flow of events	The system shows an error message if no data is inserted then stay on step2.	
Post condition	Customer complaint sent	

Table 3. 6 Use Case Description for Change Password

Section	**Purpose**	
Name	Change password	
Identifier	6	
Description	It allow the system users to change their passwords.	
Actor	Administrator, customer and employee	
Precondition	Any of the actors must login first.	
Basic flow of events	**User action**	**System response**

	1. User clicks the change password button 3. User fills his/her old password and new password	2.TheSystem displays change password form 4. System checks the entered password And displays success message
Alternative flow of events	The system shows an error message for incorrectness of the entered old password and the new password confirmation then resume to step2.	
Post condition	Users changed his/her password.	

Table 3. 7 Use Case Description for Deactivate Account

Section	**Purpose**	
Name	Deactivate account	
Identifier	7	
Description	It allows the administrator to deactivate the accounts.	
Actor	Administrator	
Precondition	The administrator must login first.	
Basic flow of events	**User action**	**System response**
	1. The administrator clicks the deactivate button	2.TheSystem blocks the selected account 4. System display success message.
Post condition	The selected account deactivated.	

Table 3. 8 Use Case Description for Add Account

Section	**Purpose**
Name	Add account
Identifier	8

Description	It allows the administrator to add new employee account.	
Actor	Administrator	
Precondition	The administrator must login first.	
Basic flow of events	**User action**	**System response**
	1. The administrator clicks the add account button 3. The administrator fills the employee details.	2.TheSystem displays add account form 4. System check the filled information And displays success message
Alternative flow of events	The system shows an error message or incorrectness of any employee data then stay on step2.	
Post condition	Employee account created.	

Table 3. 9 Use Case Description for View Report

Section	**Purpose**	
Name	View report	
Identifier	9	
Description	It allows the administrator and the employee to see reports.	
Actor	Administrator and Employee	
Precondition	The administrator and the employee must login first.	
Basic flow of events	**User action**	**System response**
	1. The administrator or employee clicks the view report button 3. Administrator or employee view the report	2.The System displays report information's.
Post condition	The administrator or the employee viewed the report.	

Table 3.10 Use Case Description for View Complaint

Section	Purpose	
Name	View complaint	
Identifier	10	
Description	It allows administrator and employee to view complaints of users.	
Actor	Administrator and Employee	
Precondition	Administrator and employee must login first.	
Basic flow of events	**User action**	**System response**
	1. Administrator or employee clicks the view complaint button 3. Administrator or employee view users complaints	2.TheSystem displays user complaint information window
Post condition	Administrator or employee viewed users complaint.	

Table 3.11 Use Case Description for Generate Bill

Section	Purpose	
Name	Generate bill	
Identifier	11	
Description	It allows the employee to generate the bill.	
Actor	Employee	
Precondition	The employee must login first.	
Basic flow of events	**User action**	**System response**
	1. Employee clicks the generate bill button 3. Employee fills the current metre reading and dates.	2.TheSystem displays bill generation form window 4. System calculate in birr
Alternative flow of events	The system shows an error message for incorrectness of the current metre reading then stay on step2.	

Post condition	Bill generated.

Table 3.12 Use Case Description for Generate Report

Section	**Purpose**	
Name	Generate report	
Identifier	12	
Description	It allows the employee to generate the report.	
Actor	Employee	
Precondition	The employee must login first.	
Basic flow of events	**User action**	**System response**
	1. Employee clicks the generate report button 3. Employee select the date	2.The System displays report generation form window 4. System display success message
Post condition	Report generated.	

Table 3.13 Use Case Description for Assign Service

Section	**Purpose**	
Name	Assign service	
Identifier	13	
Description	It allow the employee to assign services.	
Actor	Employee	
Precondition	The employee must login first.	
Basic flow of events	**User action**	**System response**

	1. The employee clicks the assign service button 3. The employee clicks the required service from the list sand fill the metre number and press assign button.	2.TheSystem displays the deactivated services 4.The system assigns metre number for the new service
Alternative flow of events	The system shows an empty select menu if there are no deactivated services in the system.	
Post condition	The user service assigned.	

Table 3. 14 Use Case Description for Stop Service

Section	**Purpose**	
Name	Stop service	
Identifier	14	
Description	It allows the employee to stop the working services.	
Actor	Employee	
Precondition	The employee must login first.	
Basic flow of events	**User action**	**System response**
	1. Employee clicks the view users button 3. The employee clicks the required service from the lists	2.TheSystem displays all services 4. The system deactivates the selected service.
Alternative flow of events	The system shows an empty table if there is no any services in the system.	
Post condition	The system blocks the service.	

Table 3. 15 Use Case Description for View bill

Section	Purpose	
Name	View bill	
Identifier	15	
Description	It allows the employee to view all bills information.	
Actor	Employee	
Precondition	The employee must login first.	
Basic flow of events	**User action**	**System response**
	1. Employee clicks the view bill button 3.Employeeview the all bills Information including payment status	2.TheSystem displays all bills detail
Alternative flow of events	The system shows an empty table if there is no bill in the system.	
Post condition	Employee viewed all bill information.	

Table 3. 16 Use Case Description for View Users

Section	Purpose	
Name	View users	
Identifier	16	
Description	It allows the employee to view all users information.	
Actor	Employee	
Precondition	The employee must login first.	
Basic flow of events	**User action**	**System response**

	1. Employee clicks the view users button 3.Employee view the all users Information	2.TheSystem displays all users detail
Alternative flow of events	The system shows an empty table if there is no users in the system.	
Post condition	Employee viewed all users' information.	

Table 3.17 Use Case Description for Import

Section	**Purpose**	
Name	import	
Identifier	17	
Description	It allows the employee to import user id and house number.	
Actor	Employee	
Precondition	The employee must login first.	
Basic flow of events	**User action**	**System response**
	1. Employee clicks the import button 3. Employee browse the excel file and click import button below the file.	2.TheSystem displays import form 4.the system display success message.
Alternative flow of events	The system display error message if we select another data format.	
Post condition	User id and house number successfully imported.	

Table 3.18 Use Case Description for Logout

Section	**Purpose**	
Name	Logout	
Identifier	18	
Description	It allow the all the actors to leave out their pages.	
Actor	Administrator, Employee and customer	
Precondition	They must login first.	
Basic flow of events	User action	System response
	1.Userclicks the logout button	2.TheSystem displays login window
Post condition	System user logged out from the system.	

3.4 Sequence diagram

Sequence diagrams show a succession of interactions between classes or object instances over time.

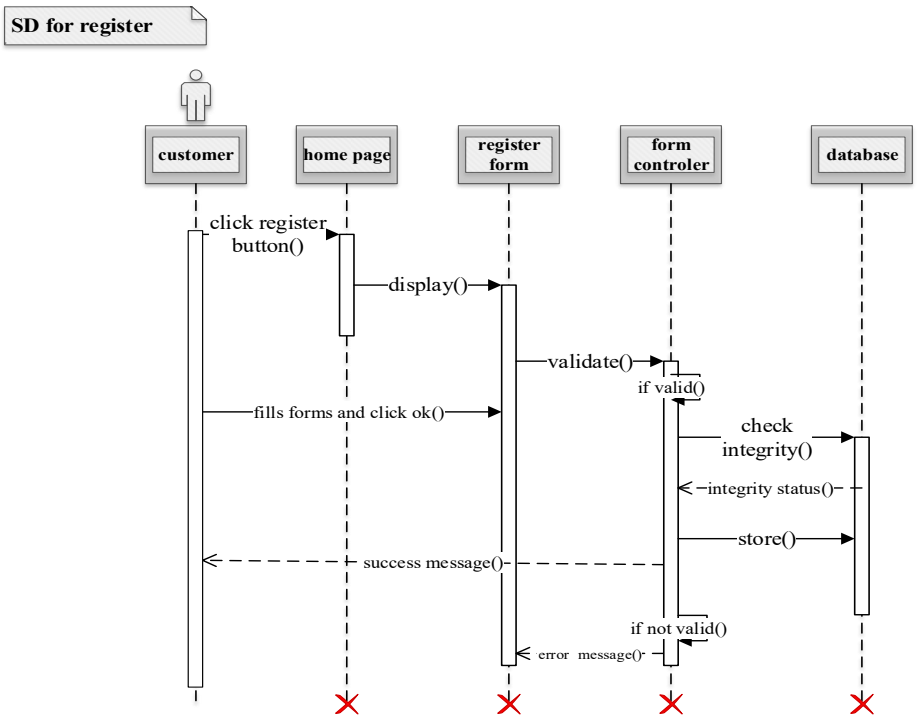


Figure 3. 2 Sequence Diagram for Register

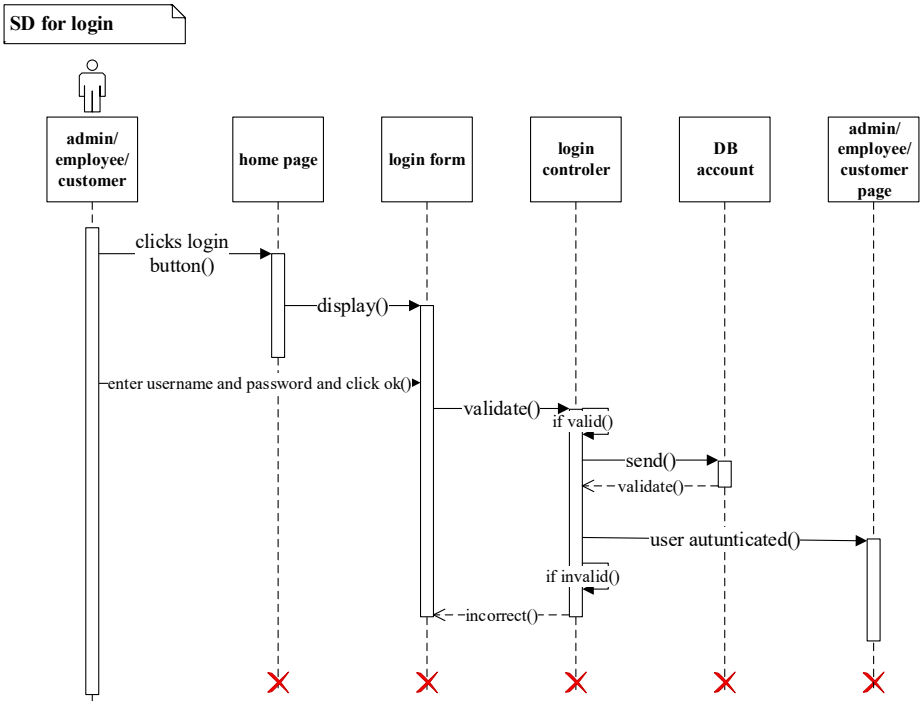


Figure 3. 3Sequence Diagram for Login

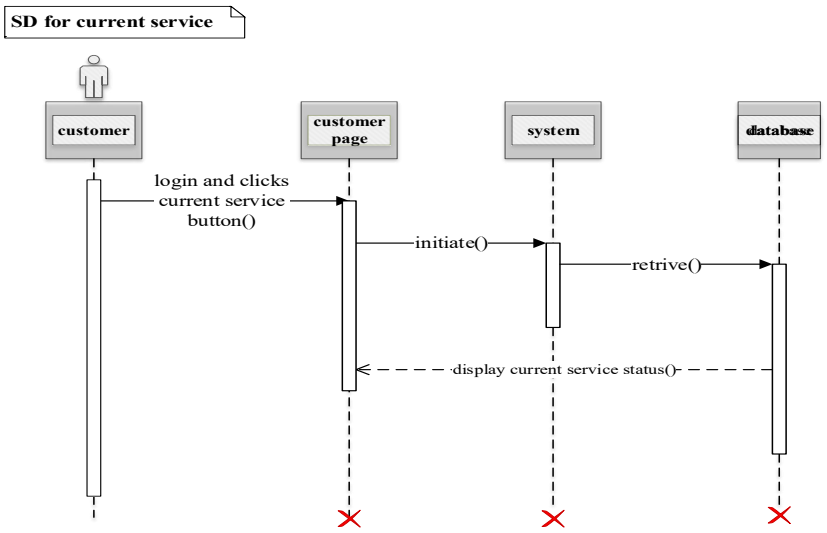


Figure 3. 4Sequence Diagram for Current Service

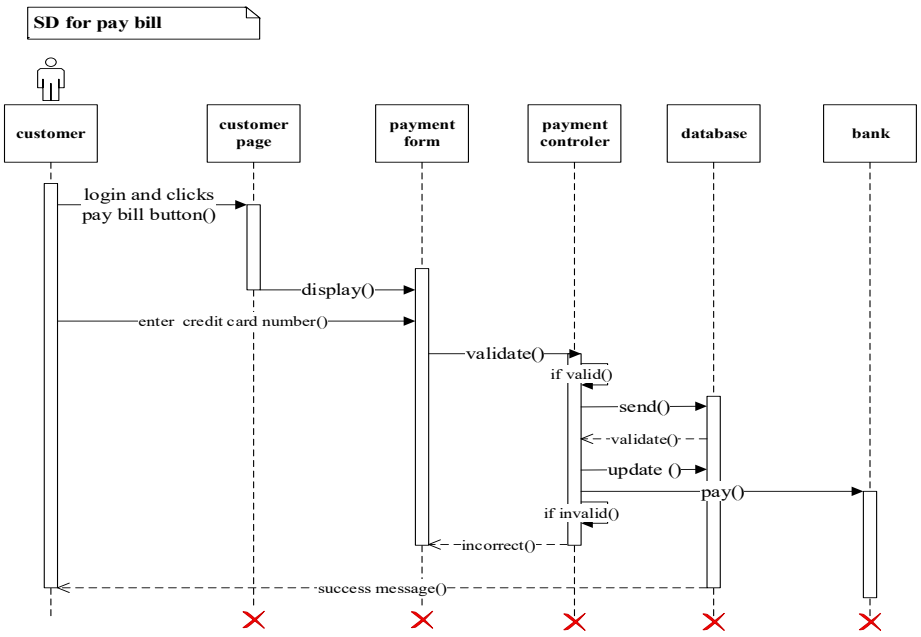


Figure 3. 5Figure 2.5 Sequence Diagram for Pay Bill

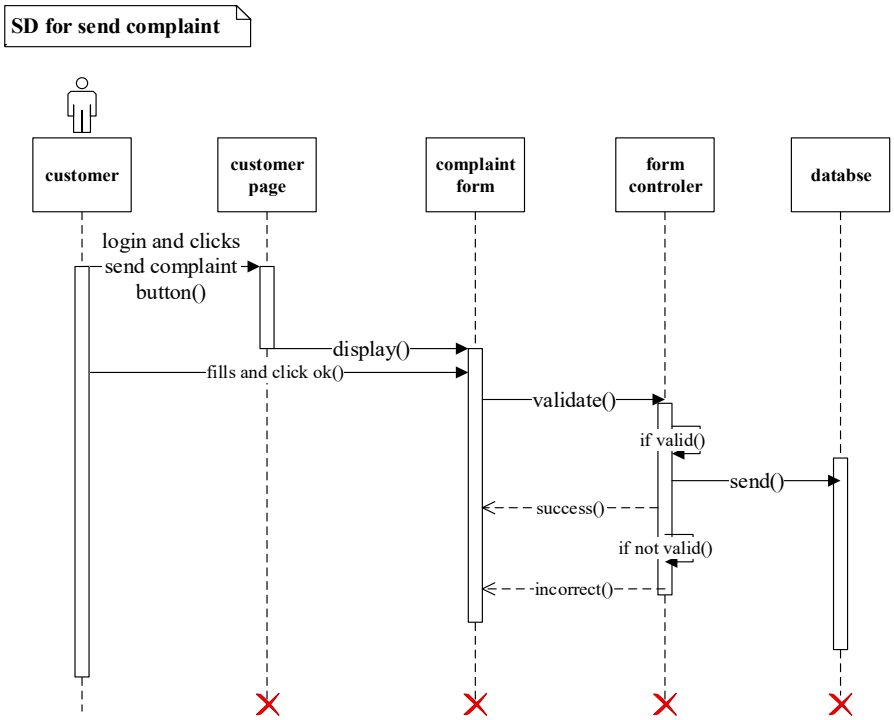


Figure 3. 6 Sequence Diagram for Send Complaint

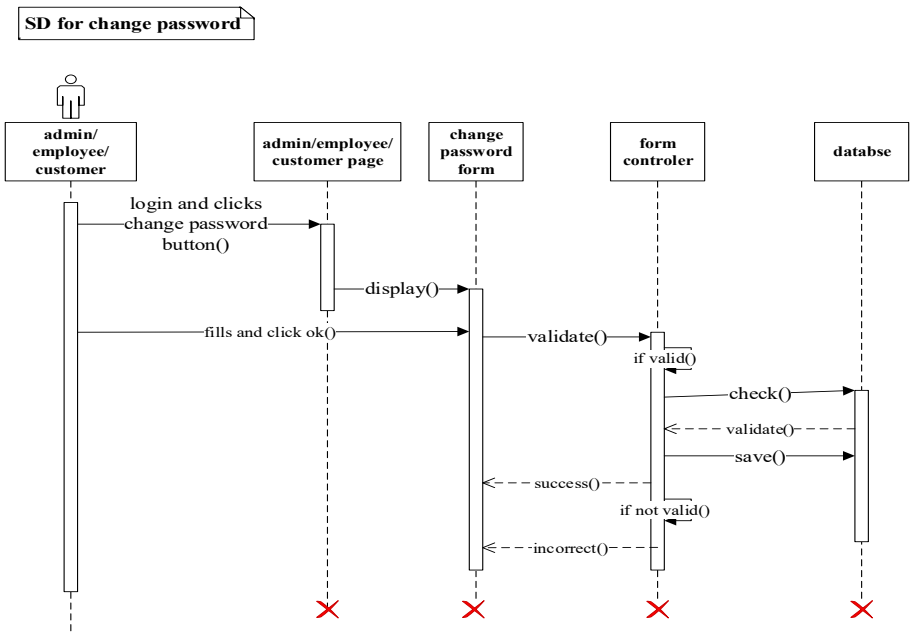


Figure 3. 7 Sequence Diagram for Change Password

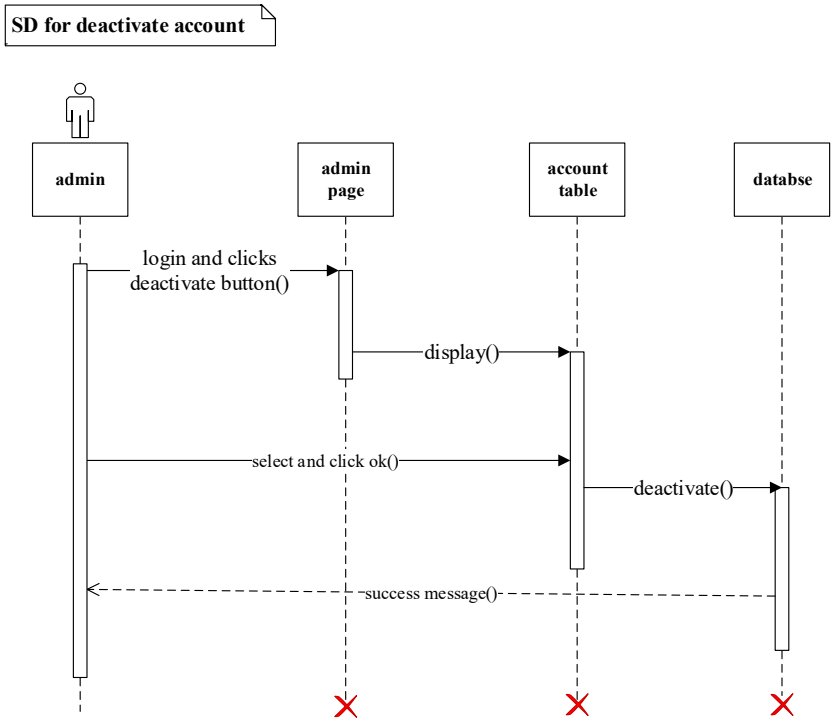


Figure 3. 8 Sequence Diagram for Deactivate Account

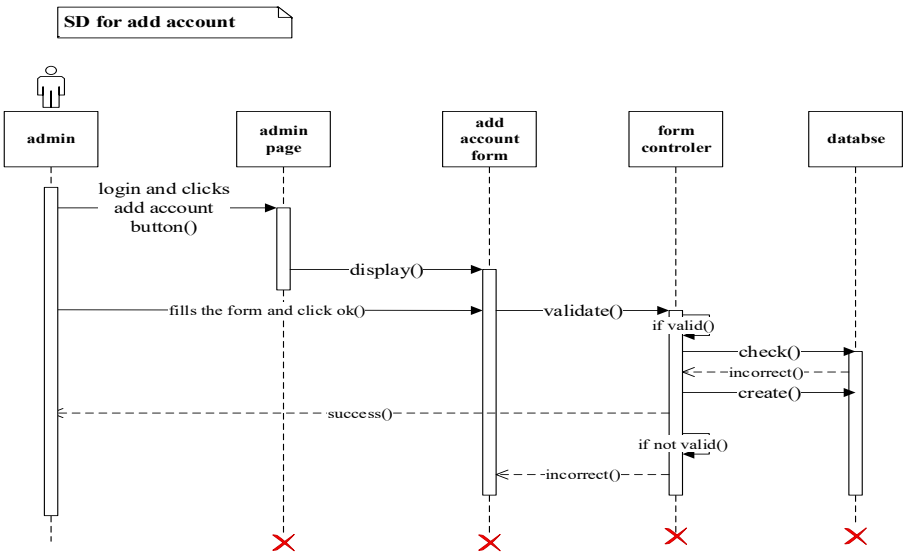


Figure 3. 9 Sequence Diagram for Add Account

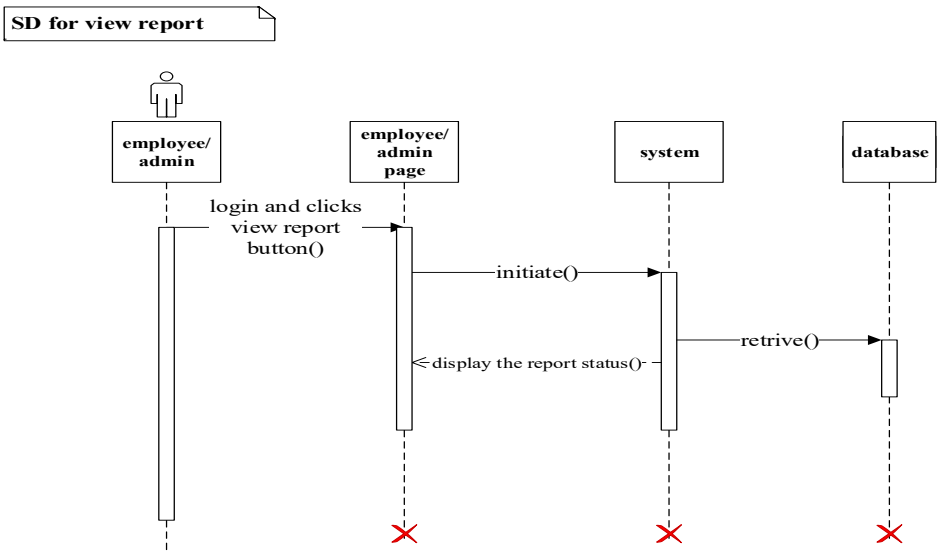


Figure 3. 10 Sequence Diagram for View Report

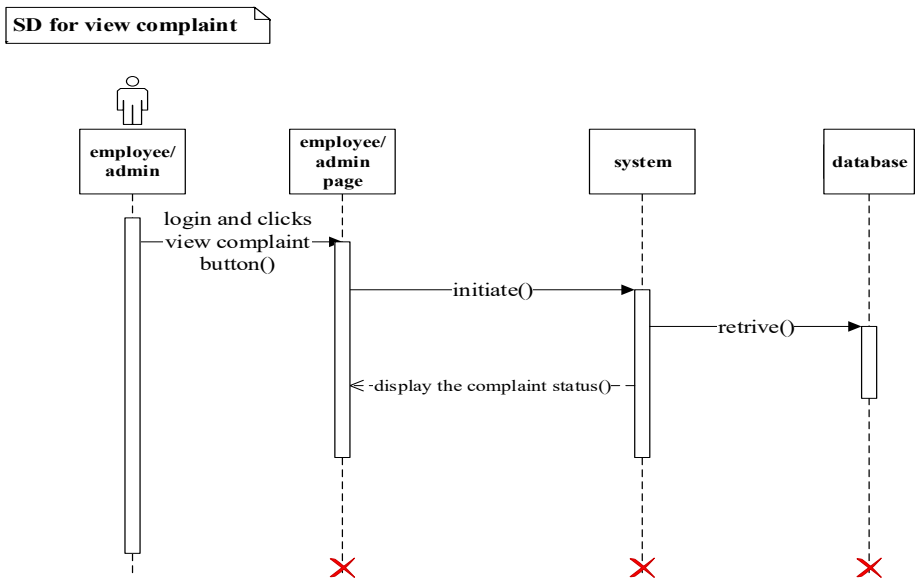


Figure 3. 11 Sequence Diagram for View Complaint

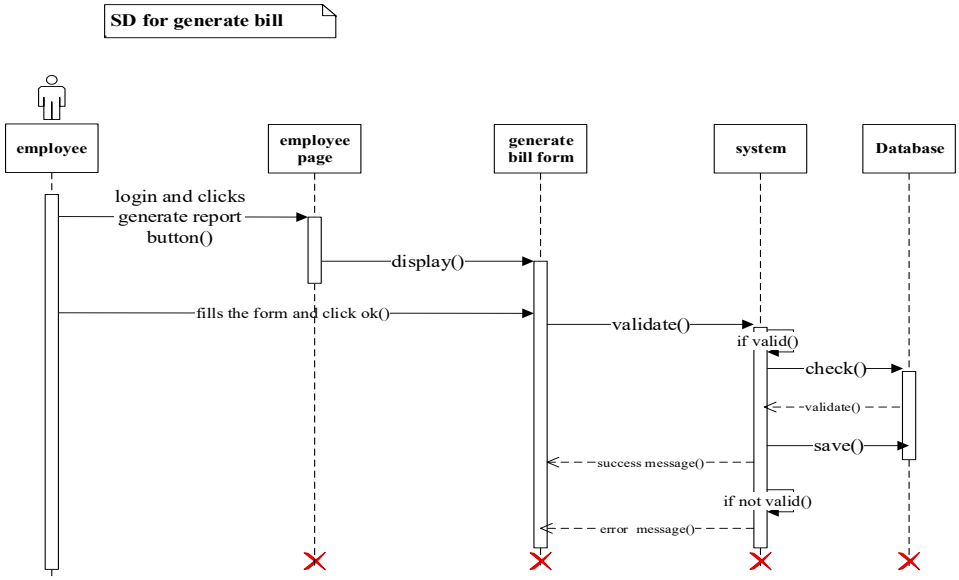


Figure 3. 12 Sequence Diagram for Generate Bill

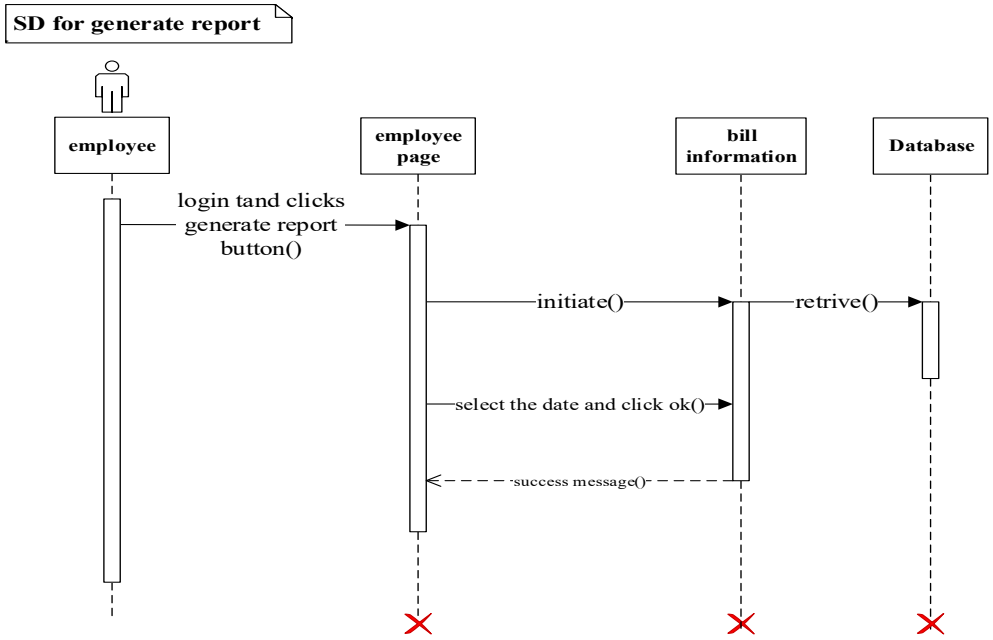


Figure 3. 13 Sequence Diagram for Generate Report

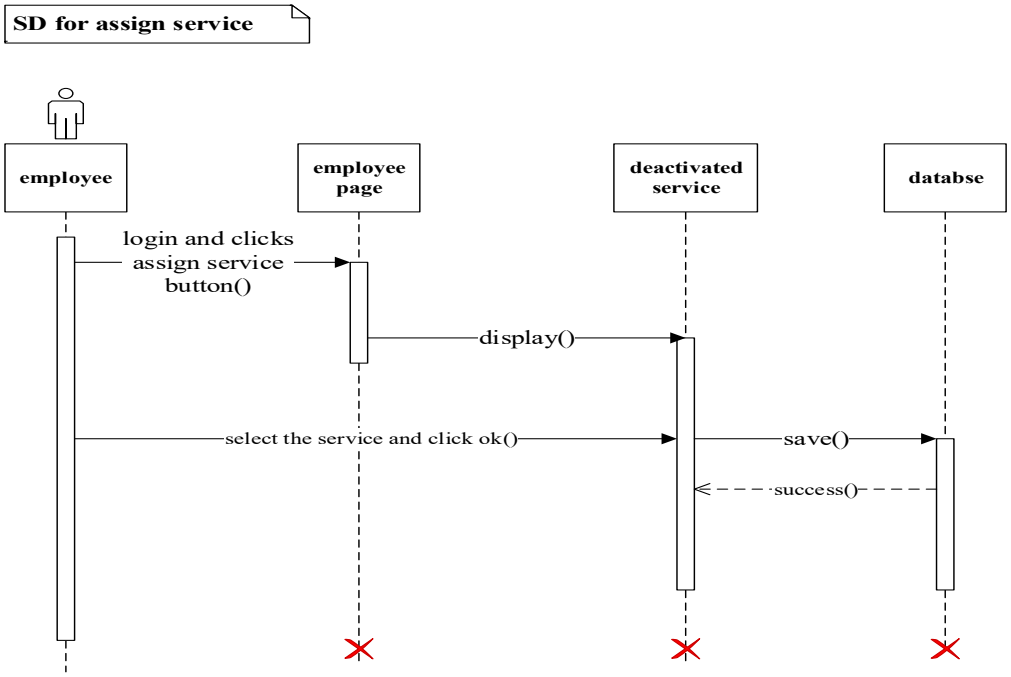


Figure 3. 14 Sequence Diagram for Assign Service

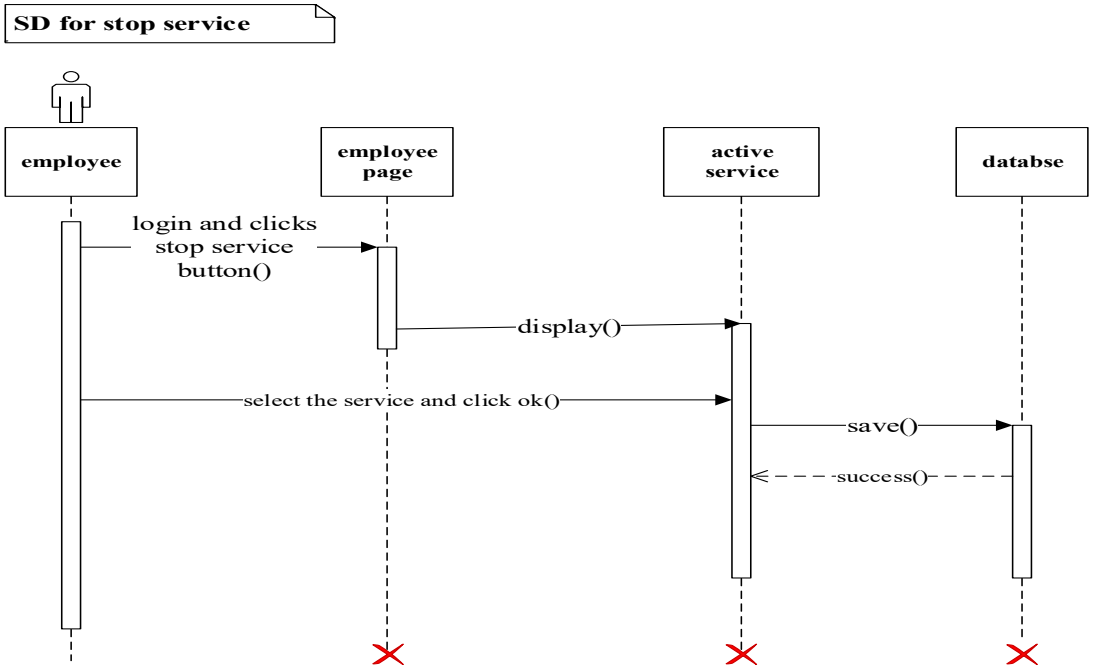


Figure 3. 15 Sequence Diagram for Stop Service

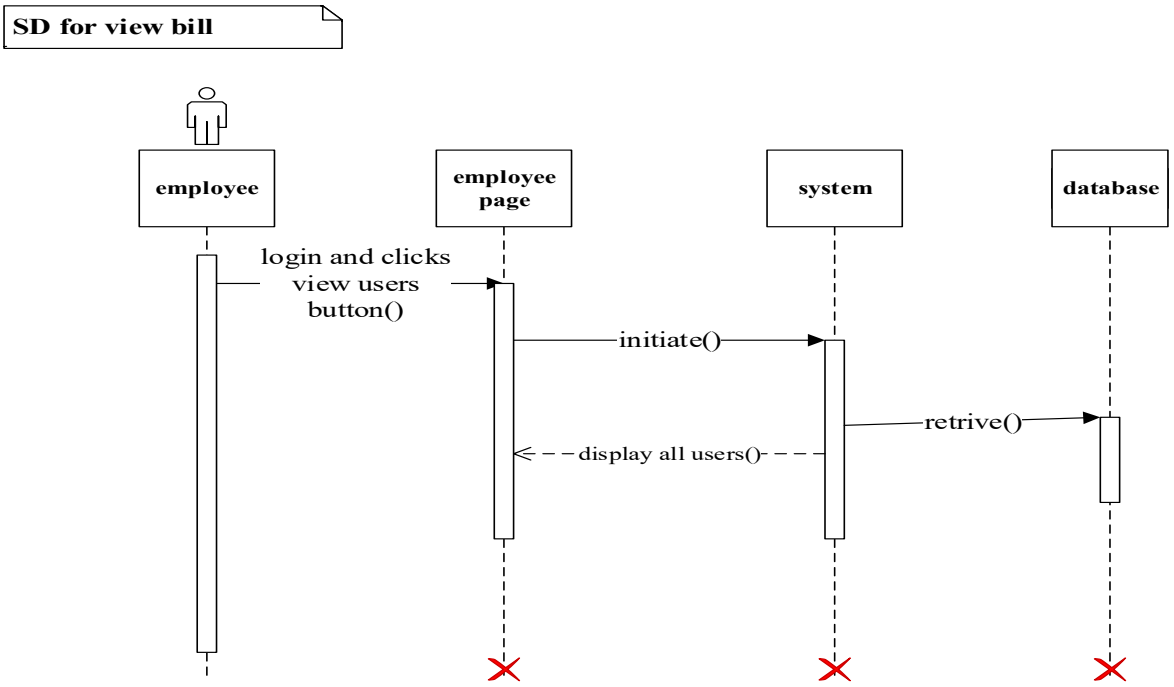


Figure 3. 16 Sequence Diagram for View Bill

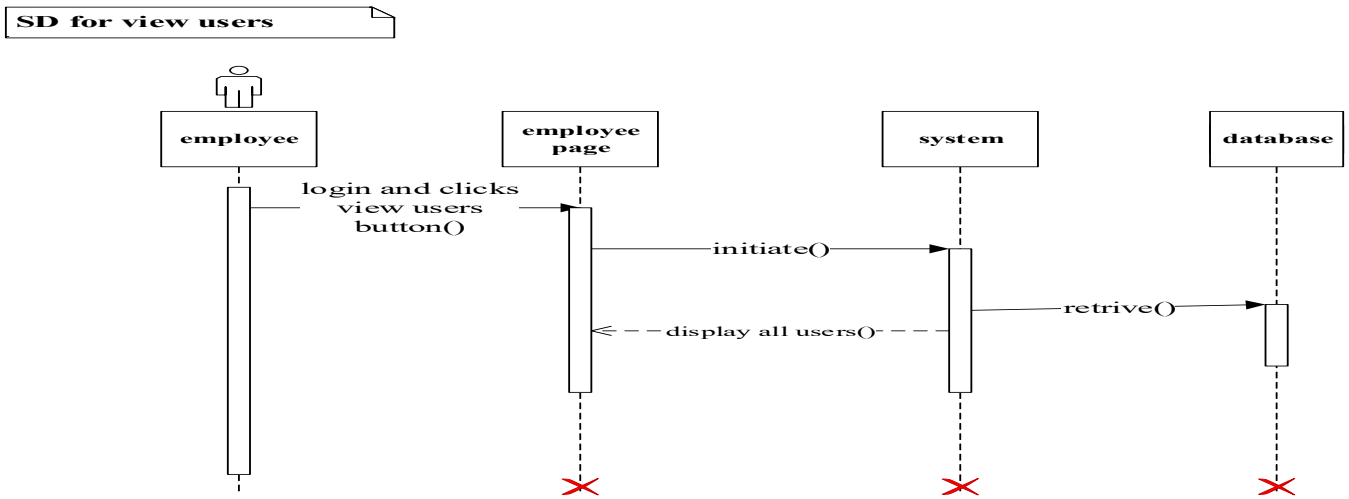


Figure 3. 17 Sequence Diagram for View user

3.5 Activity diagram

Activity diagram used to emphasize the flow of control from activity to activity or to model the flow of an object as it moves from state at different points in the flow of control.

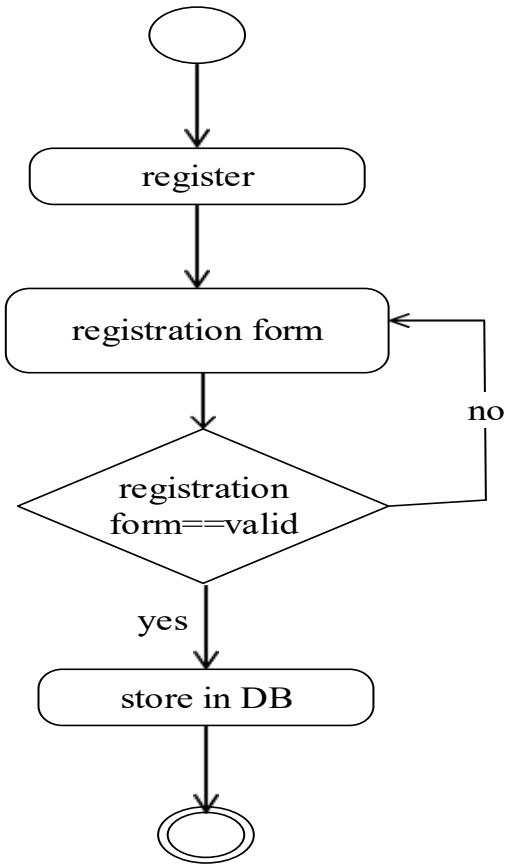


Figure 3. 18 Activity Diagram for Register

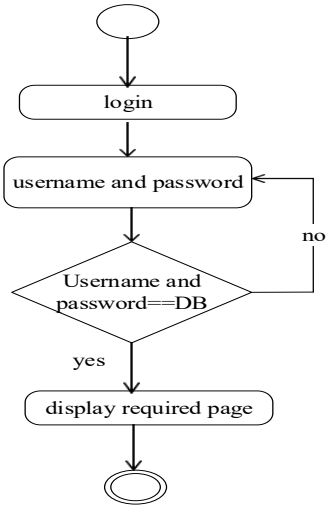


Figure 3. 19Activity Diagram for Login

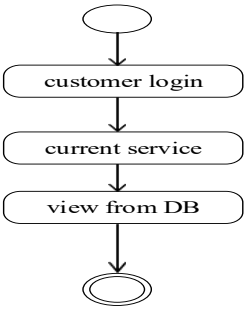


Figure 3. 20Activity Diagram for Current Service

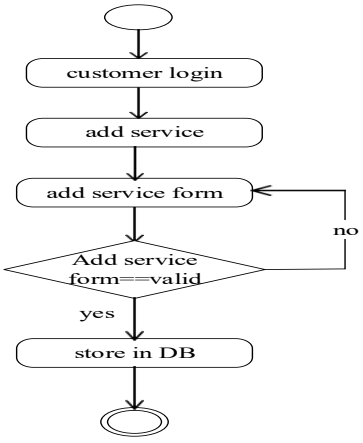


Figure 3. 21 Activity Diagram for Add Service

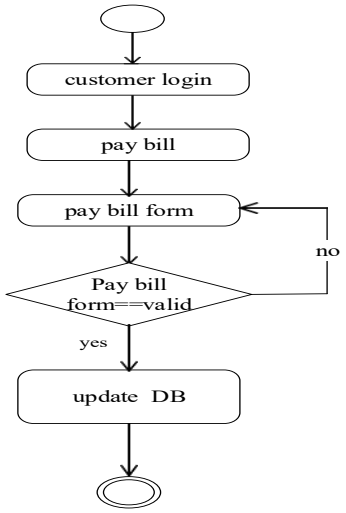


Figure 3. 22 Activity Diagram for Pay Bill

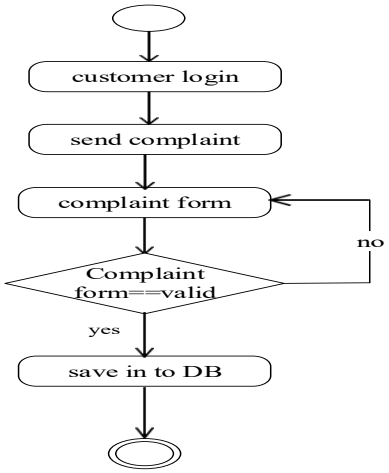


Figure 3. 23 Activity Diagram for Send Complaint

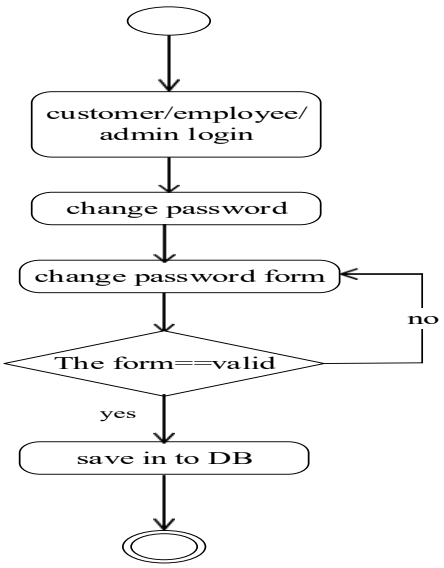


Figure 3. 24 Activity Diagram for Change Password

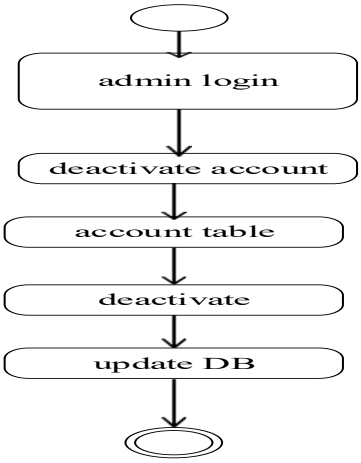


Figure 3. 25 Activity Diagram for Deactivate Account

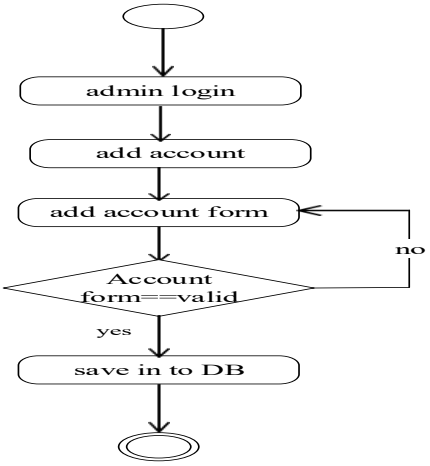


Figure 3. 26 Activity Diagram for Add Account

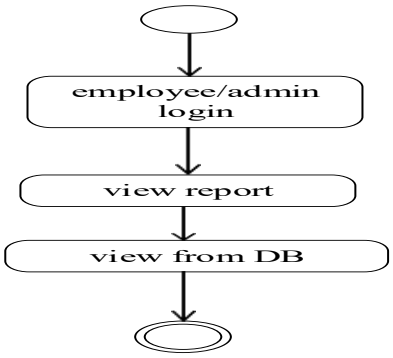


Figure 3. 27 Activity Diagram for View Report

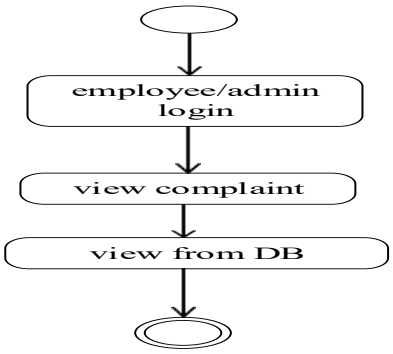


Figure 3. 28 Activity Diagram for View Complaint

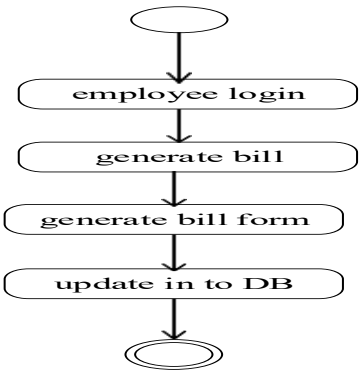


Figure 3. 29 activity Diagram for Generate Bill

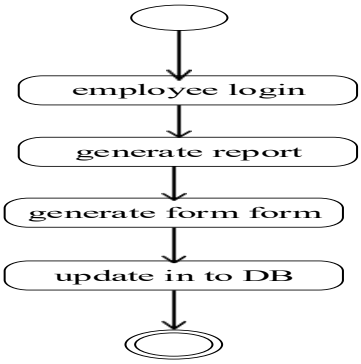


Figure 3. 30 Activity Diagram for Generate Report

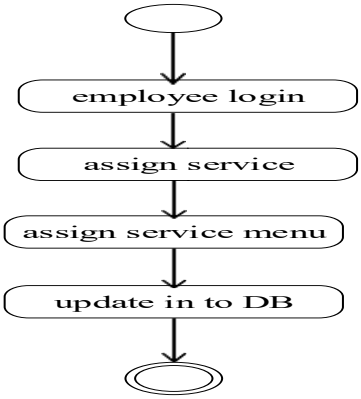


Figure 3. 31Activity Diagram for Assign Service

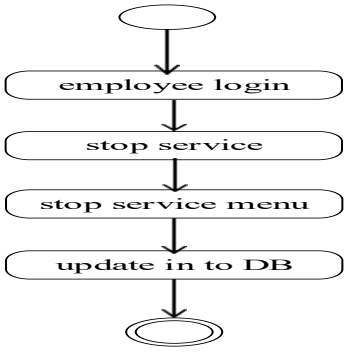


Figure 3. 32 Activity Diagram for Stop Service

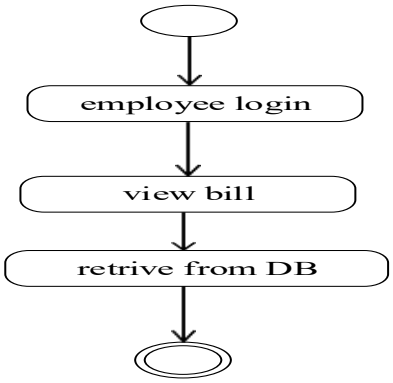


Figure 3. 33 Activity Diagram for View bill

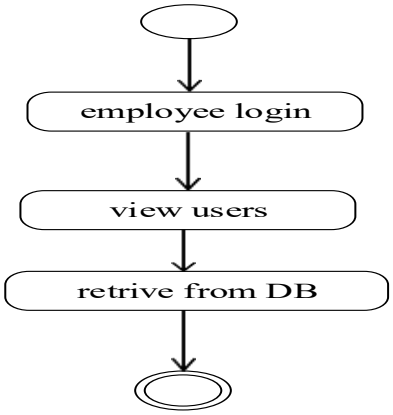


Figure 3. 34Activity Diagram for View users

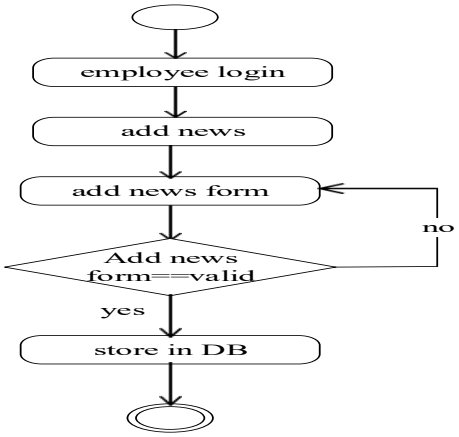


Figure 3. 35Activity Diagram for Add News

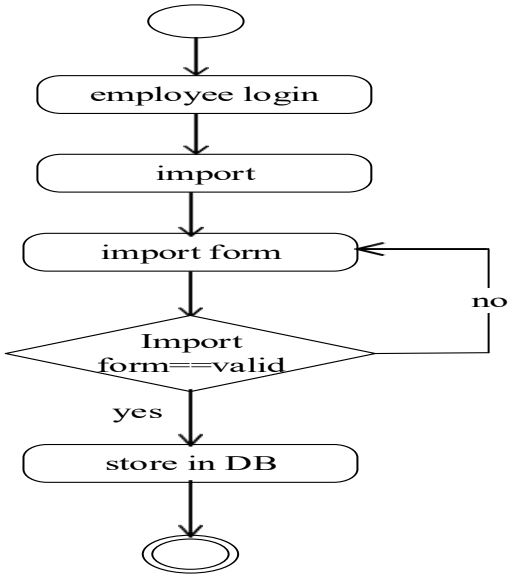


Figure 3. 36 Activity Diagram for Import

3.6 Class diagram

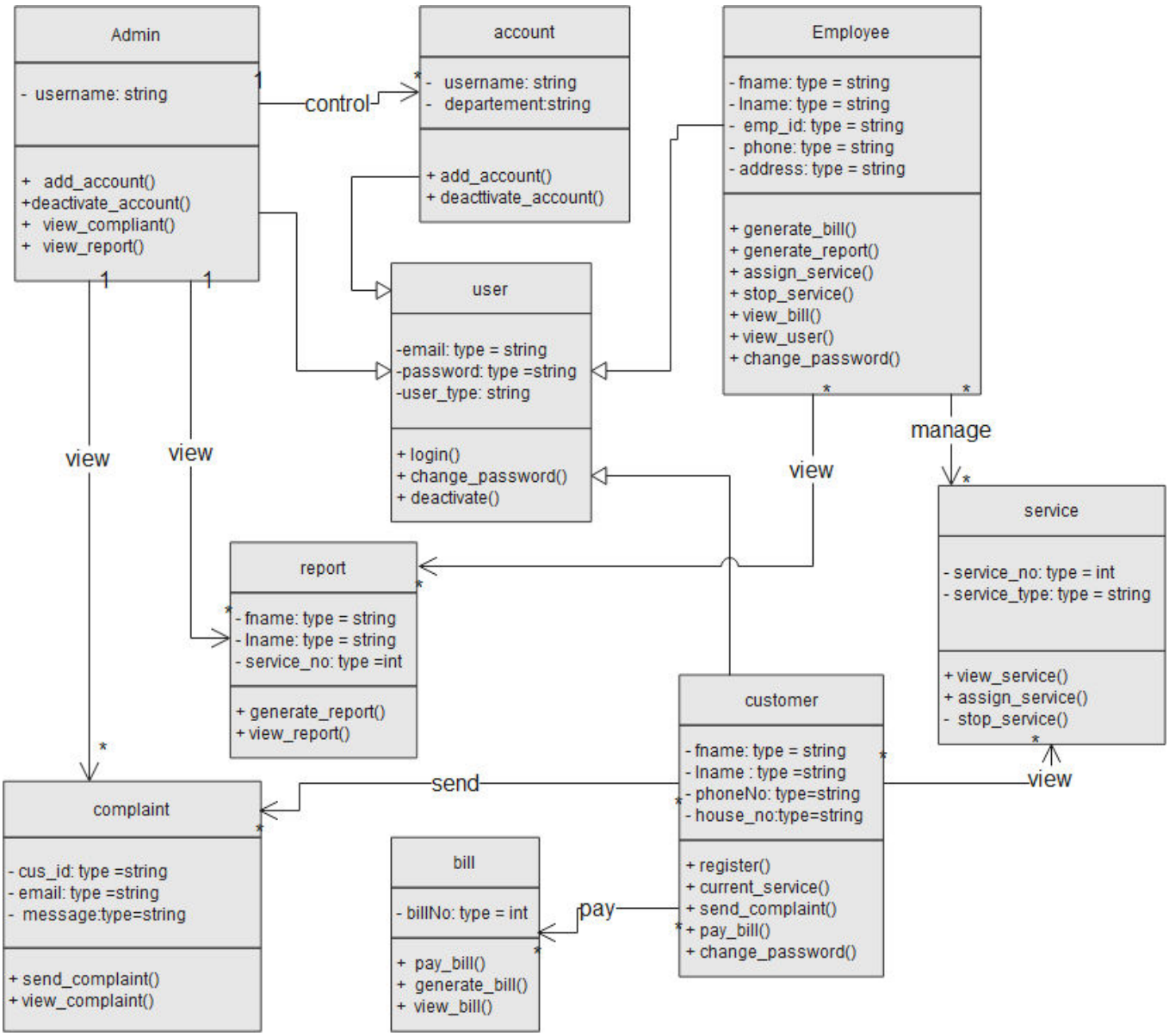
Class are the basic components of any object oriented software system and UML class diagrams provide an easy way to represent the system. As well as showing individual classes, in detail, class diagrams show multiple classes and how they are related to each other.

A class consists of: -

- A unique name (conventionally starting with an uppercase letter)

- A list of attributes (int, double, Boolean, string etc.)

Figure 3. 37 class diagram



CHAPTER FOUR

4. SYSTEM DESIGN

System design is the transformation of the analysis model into a system design model. During system design, developers define the design goals of the project and decompose the system into smaller subsystems that can be realized by individual teams. The result of system design is a model that includes a clear description of each of these strategies, subsystem decomposition, and a UML deployment diagram representing the hardware/software mapping of the system. This chapter mainly concerned with the design part of all about the billing system.

4.1 Design goal

Design goals describe the qualities of the system that developers should optimize. The design goals are derived from the non-functional requirements.

Some of the design goals are:

Security:- Since the system hold an important information (data), the system require strong security features to protect that valuable information i.e. not allow other users or unauthorized users to access data that has no the right to access it.

Performance: - They should have a fast response time (real time) with maximum throughput. In the case of the timetabling subsystem, the system should be more reliable in order to satisfy the constraints than fast response time.

Maintenance:-The system should be easily extensible to add new functionalities at a later stage. It should also be easily modifiable to make changes to the features and functionalities.

Fault Tolerance:-The system should be able to give response (error message) When the user enter incorrect input. This recommends the user to enter correct input.

Throughput:-Since electric billing system has web application it is able to perform many tasks at any time.

Robustness: - The system has the ability to survive wrong applicant inputs. Besides this end applicant that use electric billing system site have limited access regarding info about applicant (like name phone no, email address).

Modifiability:-The proposed system able to handle applicant data based on selected service centre such as electric service.

Usability: - electric billing system provide easy user friendly interface for users of the systems.

4.2 System Architecture

Architecture of the System provides a strategy for layering the classes of the system to distribute the functionality of the software among classes. Furthermore, architectures of the system provide guidance as to what other types of classes a given type of class will interact with, and how that interaction will occur. This increases the extensibility, maintainability, and portability of the systems.

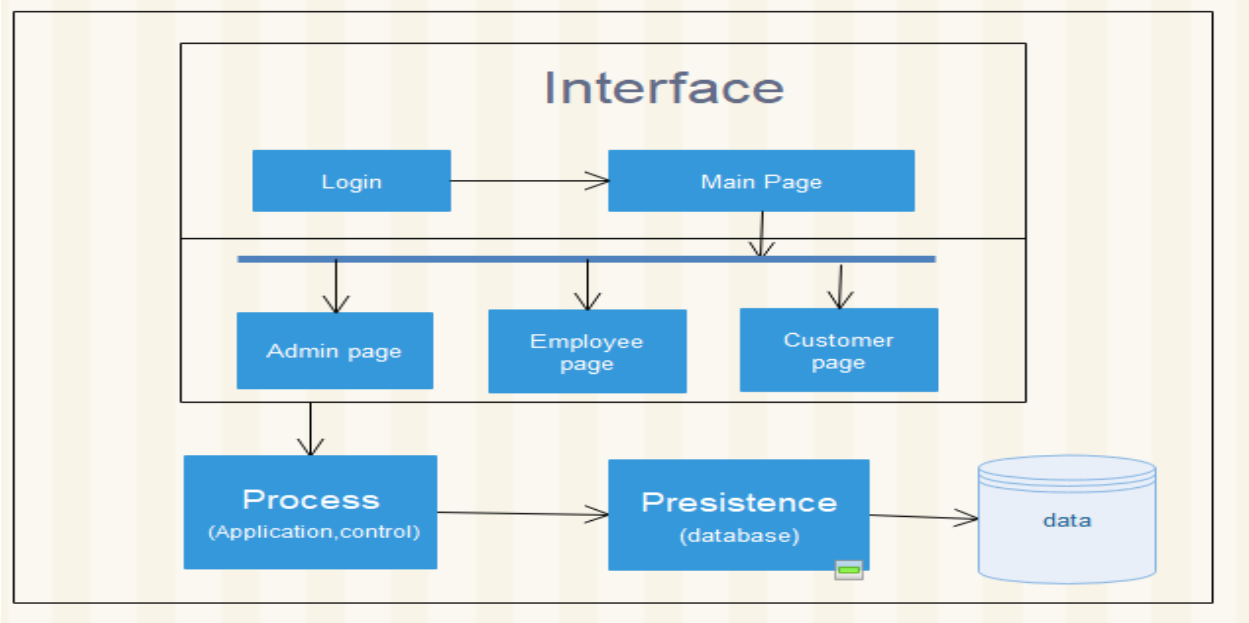


Figure 4. 1 system architecture

4.3 Sub-system Decomposition

Subsystem decompositions help to reduce the complexity of the system. Subsystem is the collection of classes, associations, operations, events and constraints that are closely interrelated with each other.

Actors of electric billing systems are:-

- Admin,
- Employee and
- Customer.

Admin user account

- add account
- deactivate account
- View complaint
- View report

Employee/Bill officer use account

- Assign service
- View user
- Generate report.
- Generate bill.
- Change password.
- View bill
- Import
- Stop service
- View report

Customer use account

- Register
- Current service
- Pay bill
- Change password
- Send complaint

4.4 State chart diagram

State chart diagram is used for modelling the dynamic aspects of systems. It is similar to activity diagram. Both activity and state chart diagrams are useful in modelling the lifetime of an object. However, activity diagram shows flow of control from activity to activity; whereas state chart diagram shows flow of control from state to state. State chart modelling is a dynamic

modelling technique, one that focuses on identifying the behaviour within our system, behaviour specified to the instances of a single class. It tries to show different state that an object passes through its life span. However, it is not necessary to build state chart for every class in the system; only state charts of complex objects are necessary to be modelled. State chart diagram enables us to observe the state of complex that simplifies.

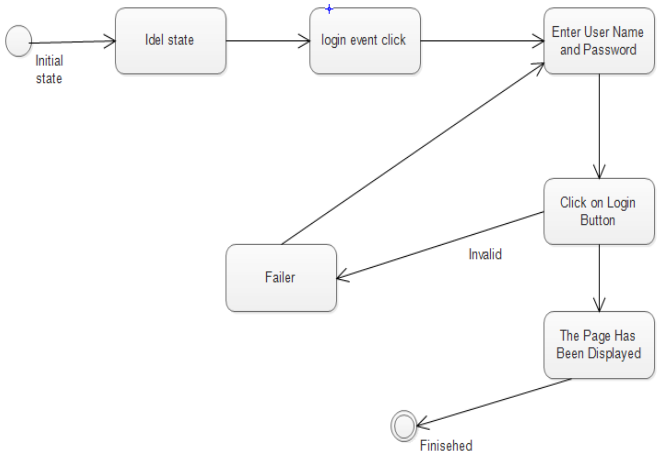


Figure 4. 2 state diagram for login

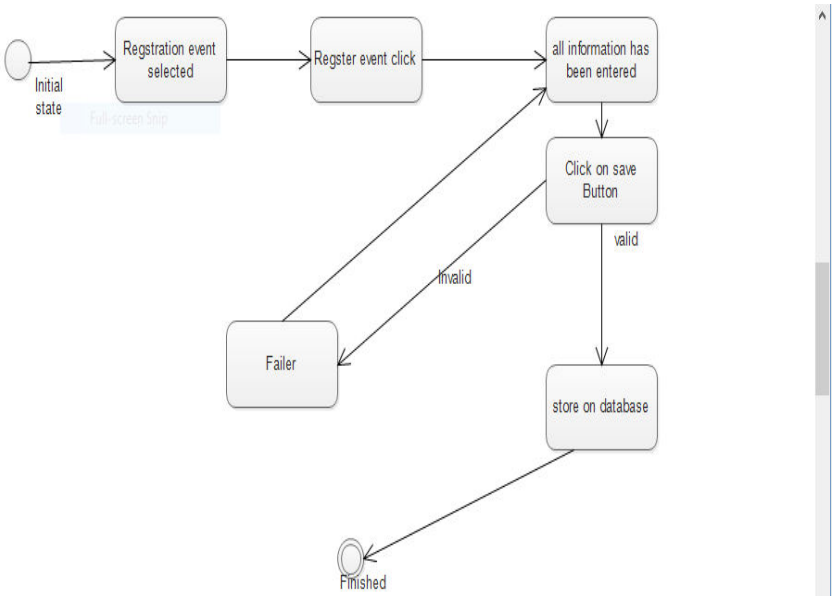


Figure 4. 3 state diagram for registration

4.5Collaboration Diagram

Collaboration diagram represent a combination of information taken from class, sequence, and use case diagrams describing both static structure and dynamic behaviour of a system.

Collaboration diagram show the message flow between objects in an object oriented (OO) application, and also imply the basic associations or relationships between classes. The rectangle represent the various objects involves that make up the application, and the line between the classes represents the relationships (association, aggregation, composition, dependencies, or inheritance).Use a collaboration diagram (collaboration diagram: An interaction diagram that shows, for one system event described by one use case, how a group of objects collaborate with one another.) to show relationships among object roles such as the set of messages exchanged among the objects to achieve an operation or result.

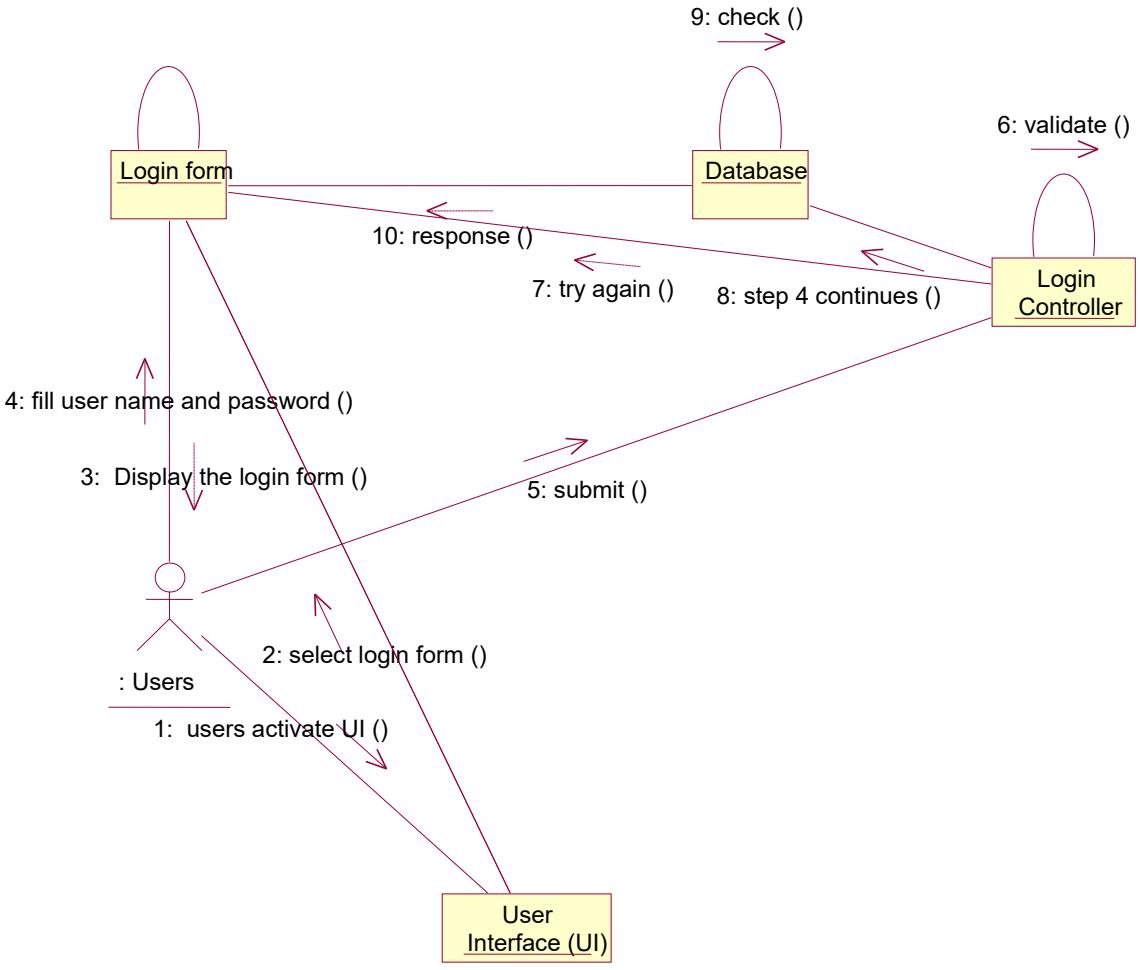


Figure 4.4 collaboration diagram for login

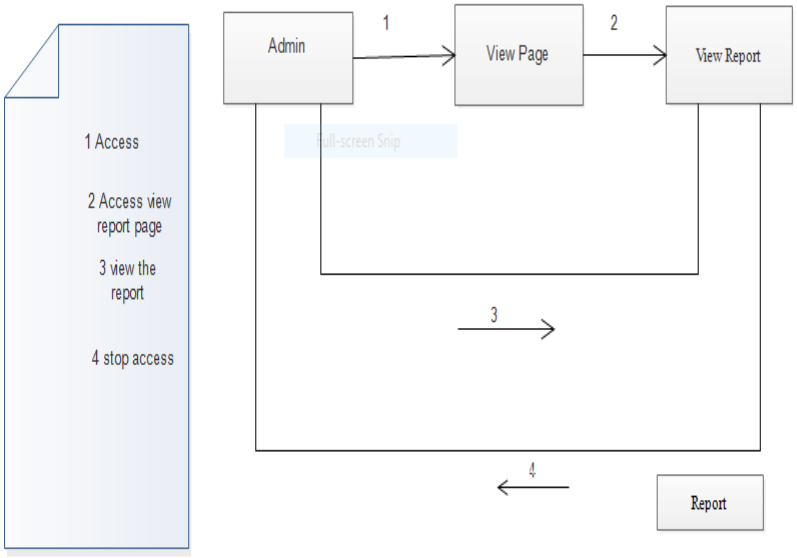


Figure 4. 5 Collaboration diagram for view report

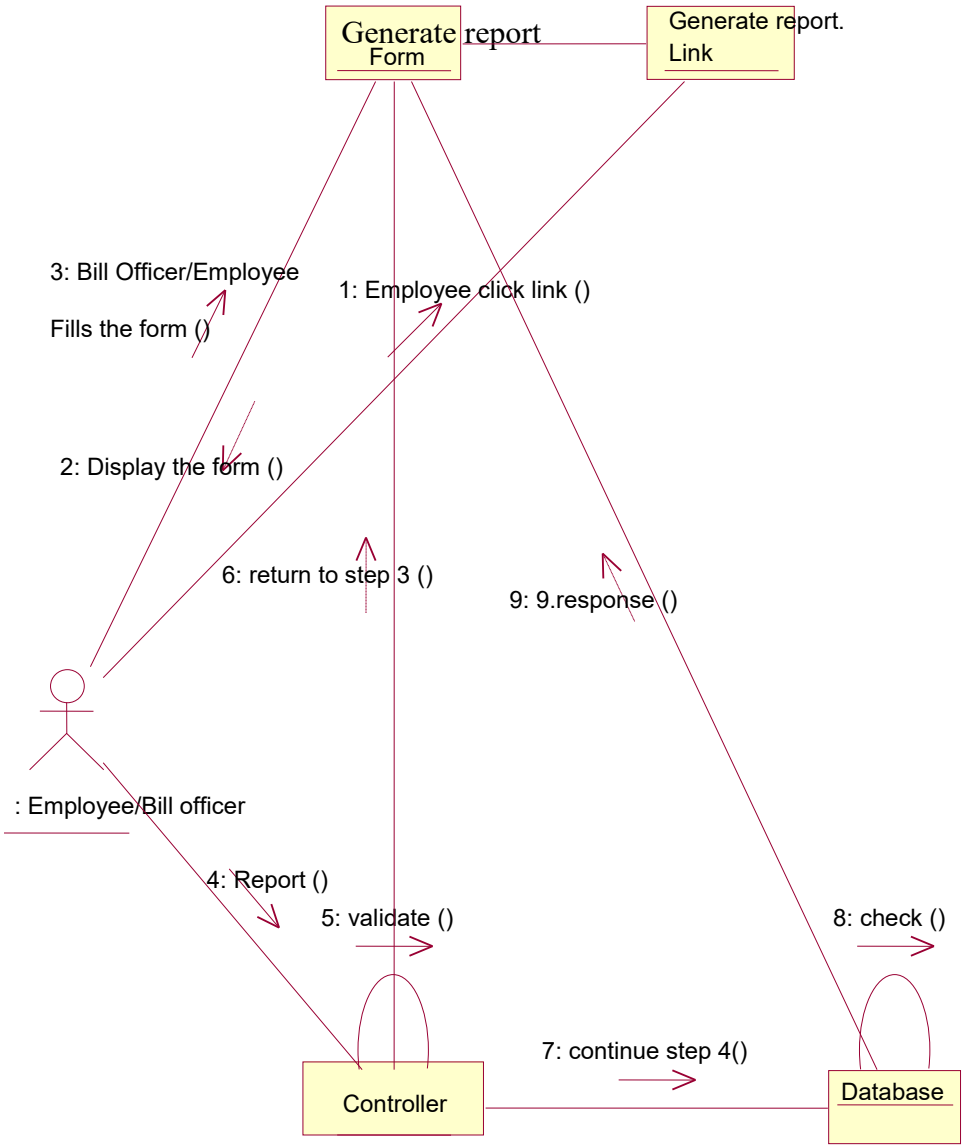


Figure 4.6 Collaboration diagram for Generate report

4.6 Deployment Diagram

Deployment diagram depicts static view of the run time configuration of processing nodes and the components that run on those nodes. Deployment diagram also shows the hardware for the system, the software that is installing on that hardware and the middleware used to connect the disparate machines to one another. A deployment diagram in the unified modelling language models the physical deployment of artifact on nodes. The nodes appear as boxes, and the artifacts allocated to each node appear as rectangles within the boxes. Nodes may have sub nodes, which

appear as nested boxes. A single node in a deployment diagram may conceptually represent multiple physical nodes, such as a cluster of database servers.

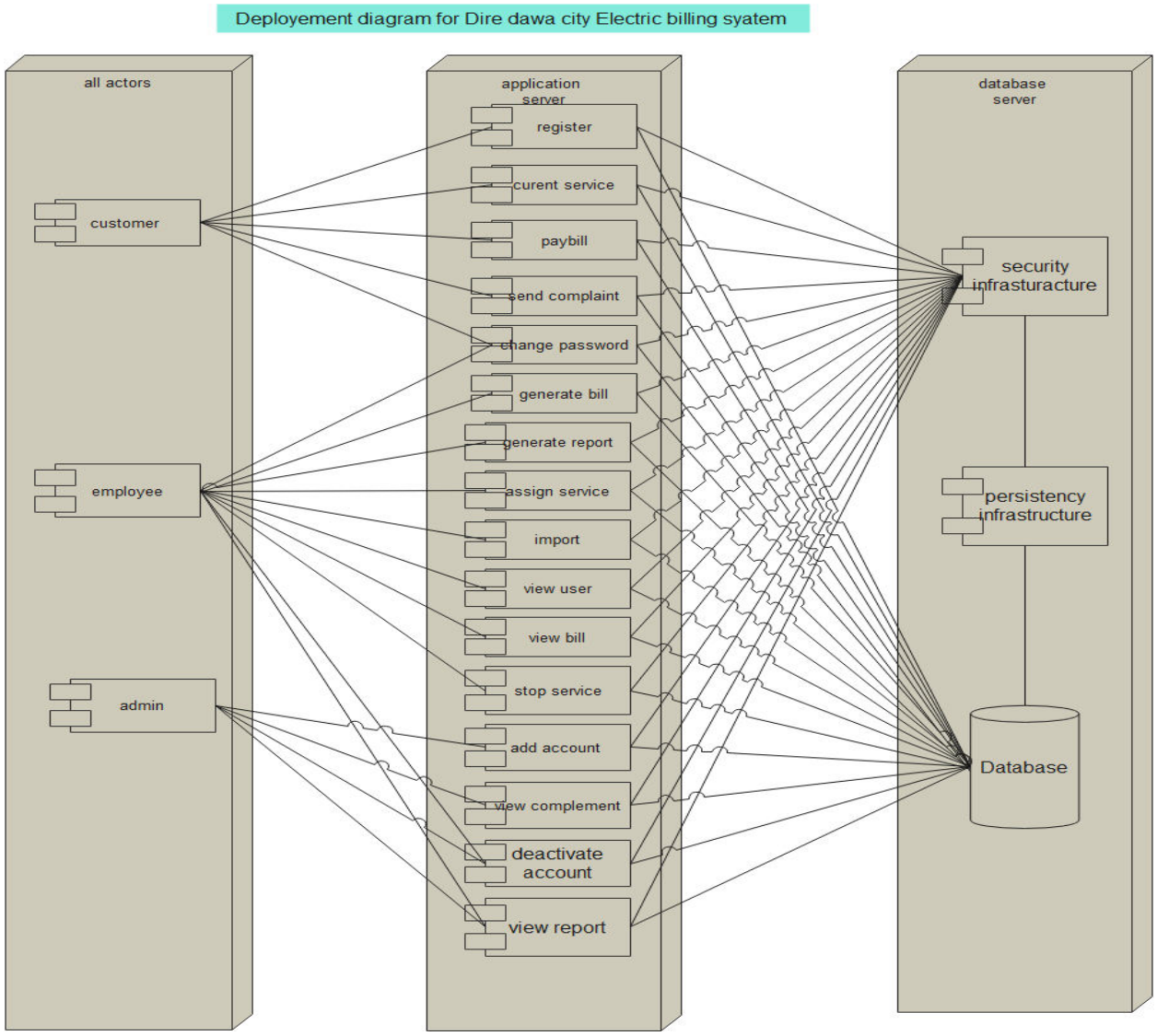


Figure 4. 7 deployment diagram

4.7Persistent data storage and management

Persistence models also called data model or Entity relationship (ER) models, are used to communicate the design of a database, usually a relational database, to both users and other developers. Persistence are used the schema of database. The strength of persistence models is that data entities are conceptually the same as the table of relation data base and that attributes are the same as table columns.

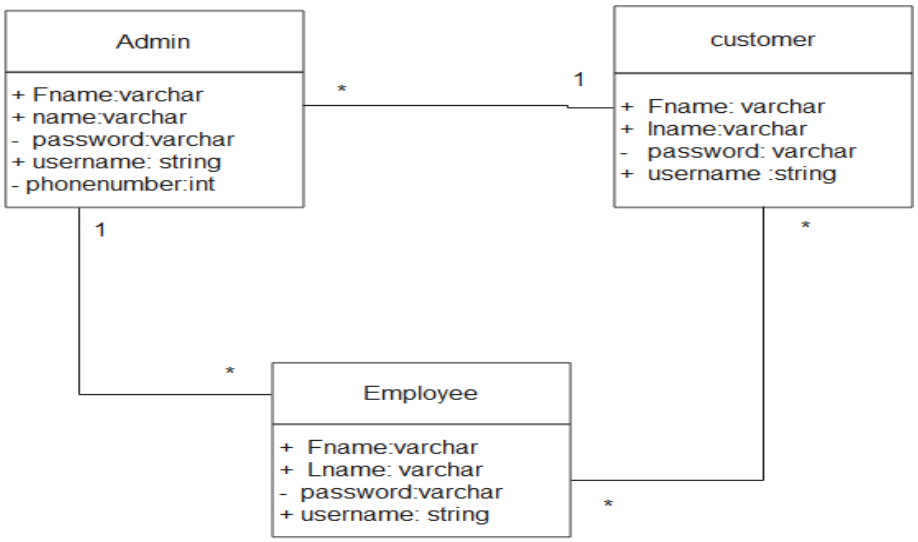
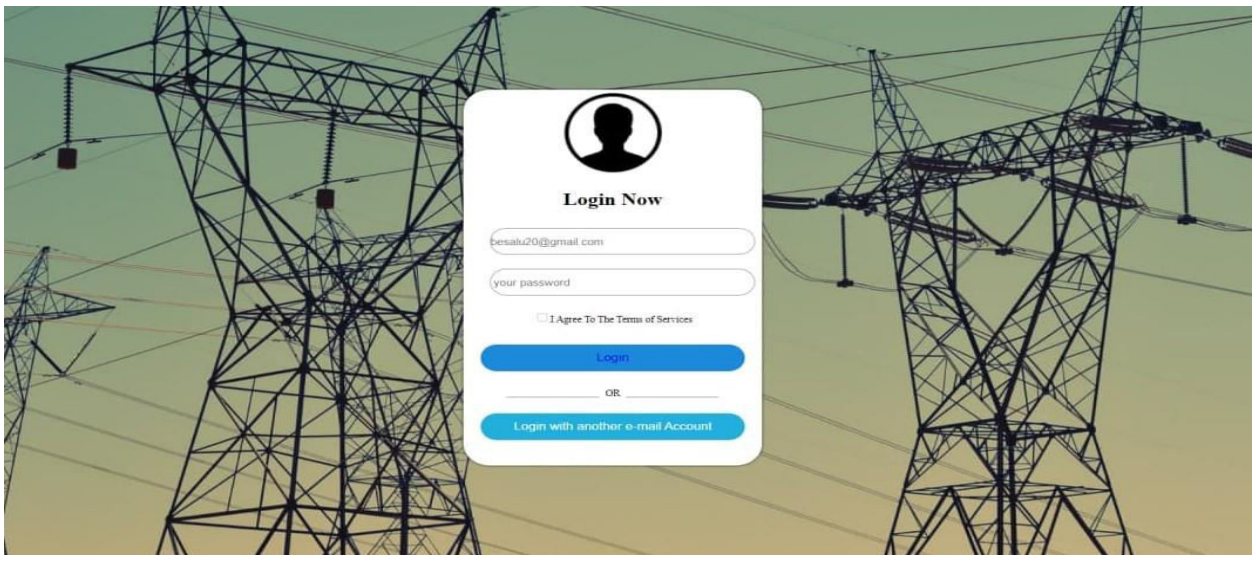


Figure 4.8 Persistent data storage

4.8Graphical user interface Design

User interface design is the overall process of designing how a user will be able to interact with a system. The goal of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals.

Figure 4.9 User interface for login page



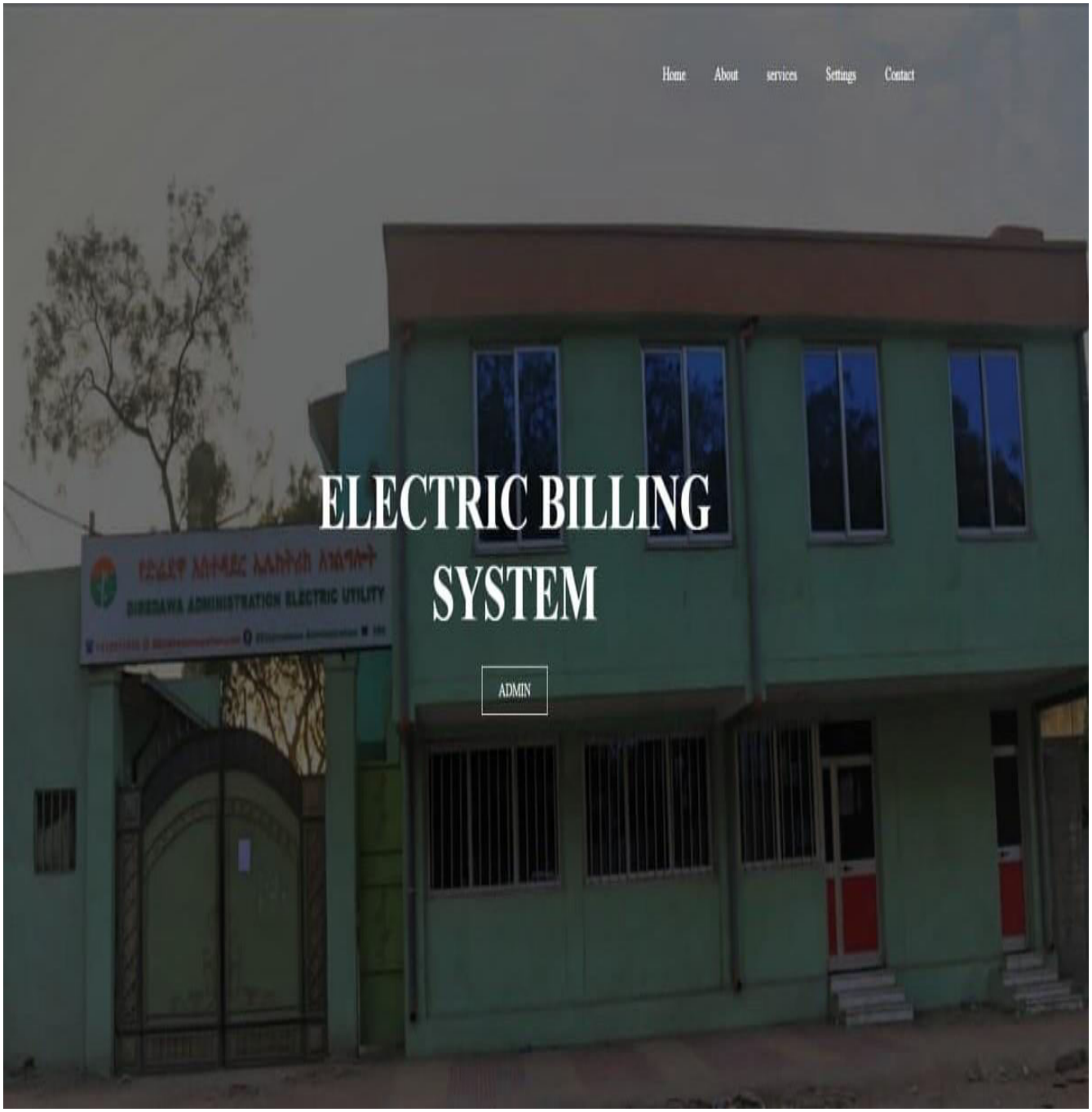


Figure 4. 10 User interface for Admin page

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The outcome of this project solve electric power billing system problems that addresses on customer's service, then all the customers and service provider was more beneficiary and satisfied because it helps to save resources like time, money, power and increase efficiency and effectiveness. So, it results in excellent out come to the organization.

5.2 Recommendation

We strongly recommend that one who under goes through this project can succeed, and they pay attention for Dire Dawa electric power billing. Most of the time has been taken for understanding the working of existing system, how applications are written in existing system and how a third party tool can be integrated in this system. The final recommendation towards the target group who need to work on and improving it can even think of different Billing system entirely developed for every country. If anybody can their will be functional interface that we didn't do so using our project as a source you can improve your own system.

Reference

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