Software Engineering Lab Report III

# Electricity Billing System

Chhatrapal Nayak (16CO215)

Indrajeet Ratnakar (16CO116)

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# 1. Introduction

## 1.1 Purpose

The purpose of this SRS document is to provide a detailed overview of our software product, its parameters and goals. This document describes the project's target audience and its user interface, hardware and software requirements. It defines how our client and audience see the product and its functionality. It helps any designer and developer to assist in software development process.

## 1.2 Scope

The software ELECTRICITY BILLING SYSTEM can be used for computerizing the electricity bill preparation of the consumers. Three external entities admin, user and Electricity Board interact in this system. After authentication, user can utilize this software and by logging in, user can view his monthly electricity bill and previous records and one will be notified if one's current payment status is unpaid. User can edit his profile regularly. Admin can add new users and can view consumer's usage details and generate monthly electricity bill based on meter reading provided by Electricity Board.

## 1.3 Definitions, acronyms, and abbreviations

| S No. | Term | Definition |
|---|---|---|
| 1. | User | Someone who interacts with the mobile phone application |
| 2. | Admin/Administrator | System administrator who is given specific permission for managing and controlling the system |
| 3. | Consumer | One who is the consumer of electricity and uses this application to receive electricity Bills. |
| 4. | Electricity Board | Who provides the meter details and payment details of the consumers |
| 5. | DESC | Description |
| 6. | RAT | Rational |

| | | |
|---|---|---|
| 7. | DEP | Dependency |
| 8. | TAG | A unique, persistent identifier |
| 9. | XML | Extensible Markup language which will be used to design layout of any activity |

### 1.4 References

1. IEEE Software Engineering Standards Committee, "IEEE Std 830-1998, IEEE Recommended Practice for Software Requirements Specifications", October 20, 1998.

2. https://www.cs.odu.edu/~tkennedy/cs350/sum15/Public/reqts/index.html

3. https://www.cs.odu.edu/~tkennedy/cs350/sum15/Public/spreadsheetSRS/

4. www.cse.chalmers.se/~feldt/reqeng/examples/srsexample2010group2.pdf

## 2. Overall description

### 2.1 Product perspective

ELECTRICITY BILLING SYSTEM is an independent product that does not require additional hardware or software interfaces to function, other than the OS. When released, the final product would be the first version of the software. It is designed as a secured system, which could be accessed by the any authenticated user. The system restricts access to its various components, to users with varied characteristics.

### 2.2 Product Features

The following list offers a brief outline and description of the main features and functionalities of the Electricity Billing system. The features are split into two major categories: core features and additional features. Core features are essential to the application's operation, whereas additional features simply add new functionalities. The latter features will only be implemented as time permits.

## CORE FEATURES

### 1. USER REGISTRATION & LOGIN

- Only appears once (the first time the application is run)
- Allows the user to register with the Firebase server
- Enables the user/admin to customize his/her account settings and preferences

### 2. VIEW BILLS AND PAYMENT STATUS

- Enables user to view his/her electricity bill
- Allows user to check out payment status

### 3. ADD/REMOVE USERS

- Allows admin to add/remove users

### 4. GENERATE BILL

- Allows the admin to generate bill for particular user

### 5. STORING METER READING

- Enables the Electricity Board Employee to provide meter readings of users

## ADDITIONAL FEATURES

### 1. PAYPAL INTEGRATION

- Incorporates a mechanism for initiating real and secured transactions
- Automatically updates member balances as transactions occur

### 2. E-MAIL/SMS NOTIFICATIONS

- Extends the standard notifications service built into Electricity Billing system
- Automatically delivers notifications via e-mail and/or text message

### 3. ELECTRICITY BILLIING SYSTEM TUTORIAL

- Provides an abridged version of the Help menu for first-time users
- Offers a step-by-step run through of each feature, menu and the working of Electricity Board

## 2.4 Constraints

| S No. | Constraint | Description |
|---|---|---|
| 1. | Internet Connection | Since the application fetches data from the database over the Internet, it is crucial that there is an Internet connection for the application to function |
| 2. | Capacity of Database | The mobile application will be constrained by the capacity of the database. It may be forced to queue incoming requests and therefore increase the time it takes to fetch data. |
| 3. | Mobile platform | Since the application is designated for mobile handsets, limited screen size and resolution will be a major design consideration. |
| 4. | Operating Environment | The main component of the Electricity Billing project is the software application, which will be limited to the Android operating system. |
| 5. | Organizational constraint | Generating bill requires per unit electricity charge, which is decided by the state government. This poses as a constraint to the system. |

## 2.3 User characteristics

There are three types of users that interact with the system: Consumers, administrator and Electricity Board. Each of these three types of users has different use of the system so each of them has their own requirements.

- The Consumers can only use the application to view his bills and payment status.
- The administrator manages the overall system so there is no incorrect information within it. The administrator can manage the information for each consumer.
- The Electricity Board uses the application to provide meter details and payment details of consumers.

## 2.5 Assumptions and dependencies

- One assumption about the product is that it will always be used on mobile phones that have enough performance. If the phone does not have enough hardware resources available for the application, for example the users might have allocated them with other applications, there may be scenarios where the application does not work as intended or even at all.
- As mentioned previously, the features of Electricity Billing system are divided into two groups: core features and additional features. Core features are crucial to the basic functionality of the Electricity Billing system application. These features must all be implemented in order for the application to be useful. Optional features, however, are not critical to the function of the application. Thus, the implementation of these features is entirely dependent upon the time spent designing and implementing the core features. The final decision on whether or not to implement these features will be made during the later stages of the design phase.

### 2.6 Apportioning of requirements

In the case that the project is delayed, there are some requirements that could be transferred to the next version of the application.

## 3. Specific requirements

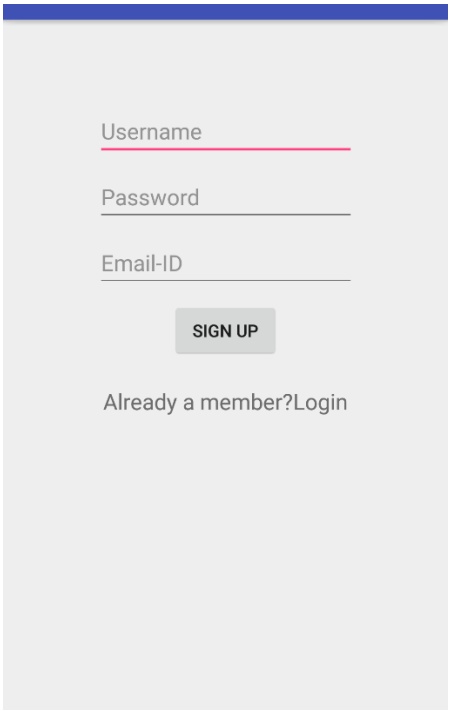
This section contains all of the functional and quality requirements of the system. It gives a detailed description of the system and all its features.

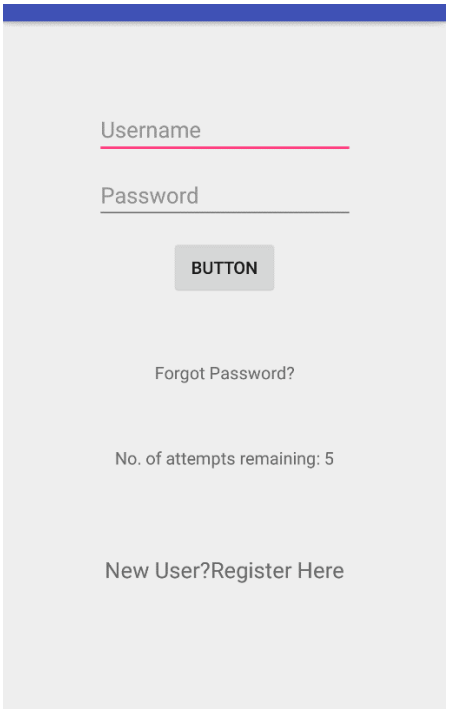
### 3.1 External interface Requirements

This section provides a detailed description of all inputs into and outputs from the system. It also gives a description of the hardware, software and communication interfaces and provides basic prototypes of the user interface.

#### 3.1.1 User interfaces

A first-time user of the mobile application should see the log-in page when he/she opens the application. The user can login either as Admin or a customer by selecting the login option as “Admin”, “Consumer” or “Electricity Board”. If the user has not registered, he/she should be able to go to the registration page. In the registration page, after filling all the required details a verification mail will be sent to the consumer’s email id.



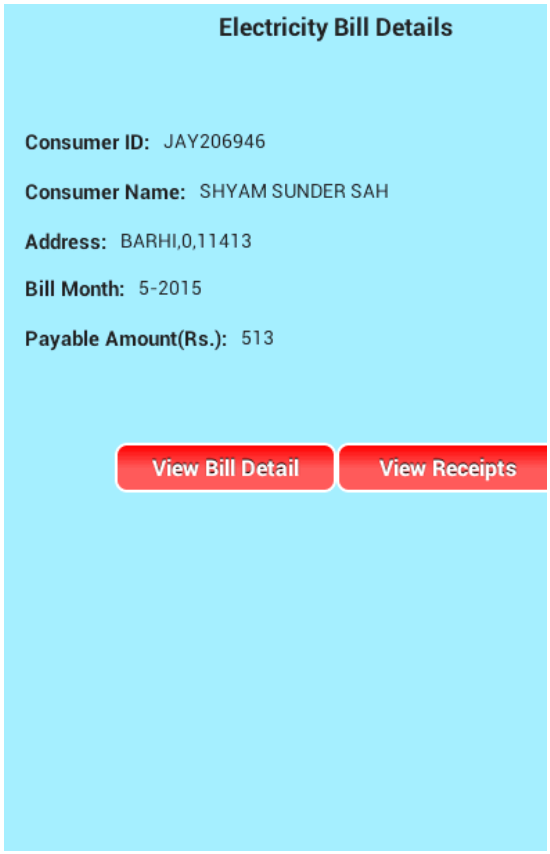




The user can also reset his/her password if he has forgotten it.

If the user has already signed-in he/she should be able to see the home page directly when the application is opened. Here the “consumer” user can navigate to different options view bills, view payment status, edit profile etc.

If the user has signed in as “Admin”, he/she is directed to a page where he can navigate to options manage consumers, generate bills etc.

If the user has signed in as “Electricity Board”, he’ll will be directed to a page where he can provide meter details of consumers.





### 3.1.2 Hardware interfaces

Electricity Billing system is intended as a mobile application for the Android platform and hence is solely supported on Android-powered devices. Messages, updates, and data exchanged between Android devices are transmitted to and handled by the Firebase server.

### 3.1.3 Software interfaces

The Electricity Billing app is to be developed under the Android operating systems using the Java JDK (Java Development Kit) and the Android SDK (software development kit) tools.

The application interacts with the database. The communication between the database and the mobile application consists of operations concerning both reading and modifying the data.

#### 3.1.3.1 INCOMING AND OUTGOING ITEMS

• Outgoing data consists of user information, bills and confirmations sent by users to the server.

• Incoming data consists of updates from the server regarding new member details, as well as any notifications deemed necessary.

### 3.1.4 Communication Interfaces

Communication will occur in occasional, short bursts between a user's phone and the server in the following situations:

- Whenever a user creates/confirms a new bill or transaction
- Whenever the server finishes any service it'll notify the user about completion or failure of the task.
- The application will notify the server when it successfully receives an update

## 3.2 Functional requirements

This section includes the requirements that specify all the fundamental actions of the software system.

### 3.2.1 User Class 1 - The Consumer

#### 3.2.1.1 Functional requirement 1.1

**ID:** FR1

**TITLE:** Download mobile application

**DESC:** A user should be able to download the mobile application through the android play store. The application should be free to download.

**RAT:** In order for a user to download the mobile application.

**DEP**: None

#### 3.2.1.2 Functional requirement 1.2

**ID**: FR2

TITLE: User registration

DESC: Given that a user has downloaded the mobile application, then the user should be able to register through the mobile application. The user must provide Name, password and e-mail address, phone No. and residential address. Here, the user will be provided a unique consumer number.

RAT: In order for a user to register on the mobile application.

DEP: FR1

### 3.2.1.3 Functional requirement 1.3

ID: FR3

TITLE: User log-in

DESC: Given that a user has registered, then the user should be able to log in to the mobile application. The log-in information will be stored on the phone and in the future the user should be logged in automatically, if he hasn't logged out.

RAT: In order for a user to log in to mobile application.

DEP: FR1, FR2

### 3.2.1.4 Functional requirement 1.4

ID: FR4

TITLE: Reset password

DESC: Given that a user has registered, then the user should be able to reset his/her password by email.

RAT: In order for a user to reset his/her password.

DEP: FR1, FR2

### 3.2.1.5 Functional requirement 1.5

ID: FR5

TITLE: Edit Profile

DESC: A user should have a profile page. On the profile page a user can edit his/her information, which includes the password, e-mail address and phone number.

RAT: In order for a user to have a profile page on the mobile application.

DEP: FR1

### 3.2.1.6 Functional requirement 1.6

ID: FR6

TITLE: View Bill

DESC: In the menu bar, by selecting “View Bill”, consumer will be directed to a page where he/she can view electricity bill of a particular month by filling consumer number and other necessary details.

RAT: In order to view electricity bill.

DEP: FR1

### 3.2.1.7 Functional requirement 1.7

ID: FR7

TITLE: View Payment Status

DESC: In the menu bar, by selecting “View Payment Status”, consumer will be directed to a page where he/she can view payment status (PAID or UNPAID) of a particular month’s electricity bill by filling consumer number and other necessary details.

#### Scenarios of Payment status

*Scenario: The Bill is Paid*

Then consumer will be able to see the payment details including payment id, paid amount, payment date.

*Scenario: The Bill is Unpaid*

Then a small window will be prompted instructing consumer to pay the bill amount before the due date.

RAT: In order for a user to check payment status of bills.

DEP: FR1

### 3.2.1.8 Functional requirement 1.8

ID: FR8

TITLE: Feedback

DESC: In the menu bar, by selecting “Feedback”, consumer should be able to fill out comments on software and by hitting submit button the feedback will be stored.

RAT: In order for a consumer to give feedbacks on the mobile application.

DEP: FR1

### 3.2.1.9 Functional requirement 1.9

ID: FR9

TITLE: User Log out

DESC: Given that the user is logged in, he should be able to log out of the mobile application.

RAT: In order for a user to log out of the mobile application.

DEP: FR1

### 3.2.1.10 Functional requirement 1.10

ID: FR10

TITLE: Print Electricity Bill

DESC: In the “view bills” page, after filling the consumer details and month the user should be able to print the electricity bill of that particular month

RAT: In order to print the electricity Bill.

DEP: FR1

### 3.2.2 User Class 2 - The Administrator

#### 3.2.2.1 Functional requirement 1.11

ID: FR11

TITLE: Admin log-in

DESC: The admin should be able to log in to the mobile application. The log-in information will be stored on the phone and in the future the admin should be logged in automatically, if he hasn't logged out.

RAT: In order for a user to log in to mobile application.

#### 3.2.2.2 Functional requirement 1.12

ID: FR12

TITLE: Manage Consumers

DESC: Given that the admin has logged in, he should be able to add new users, delete users etc.

*Scenario: Add a new consumer*

Given the administrator is logged in

When the administrator adds a new consumer

Then the new consumer should be added to the list of registered consumers

*Scenario: Delete a consumer 's account*

Given the administrator is logged in

When the administrator deletes a consumer's account

Then the deleted consumer's account should be removed from the list of consumers

### 3.2.2.3 Functional requirement 1.13

ID: FR13

TITLE: View consumer's Electricity usage details

DESC: In the menu bar, by selecting "View Consumer details", admin will be directed to a page where he/she can look for consumer's electricity usage details of a particular month by entering consumer number.

RAT: In order to check consumer's electricity usage.

DEP: FR1

### 3.2.2.4 Functional requirement 1.14

ID: FR14

TITLE: Generate Electricity Bill

DESC: In the menu bar, by selecting "Generate Bill", admin will be directed to a page where he can generate bill for a particular consumer by filling consumer Number, month and year of which the bill has to be generated. By pressing the "Generate" button the generated bill will be presented on the page.

RAT: In order for the admin to generate bill for a particular consumer.

DEP: FR1

### 3.2.2.5 Functional requirement 1.15

ID: FR15

TITLE: Reply to Feedbacks

DESC: In the menu bar, by selecting "Reply to Feedbacks", admin should be able to read comments on software and reply to that consumer.

RAT: In order for a user to have a profile page on the mobile application.

DEP: FR1

#### 3.2.2.6 Functional requirement 1.16

ID: FR16

TITLE: User Log out

DESC: Given that the admin is logged in, he should be able to log out of the mobile application.

RAT: In order for a user to log out of the mobile application.

DEP: FR1

### 3.2.3 User Class 3 - Electricity Board

#### 3.2.3.1 Functional requirement 1.17

ID: FR17

TITLE: Log in for employee of Electricity Board

DESC: The employee should be able to log in to the mobile application. The log-in information will be stored on the phone and in the future the admin should be logged in automatically, if he hasn't logged out.

RAT: In order for a user to log in to mobile application.

#### 3.2.3.2 Functional requirement 1.18

ID: FR18

TITLE: Provide meter readings

DESC: By clicking on "Provide Meter Readings" section, a page will be opened asking for consumer Number and latest month's Electricity usage in unit. After filling those details and clicking "Submit", details will be submitted. On successful completion of this task a dialog box should pop up saying "Successfully provided meter readings" otherwise "Task Failed".

RAT: In order for an electricity board employee to provide meter readings.

DEP: None

#### 3.2.3.3 Functional requirement 1.19

ID: FR19

TITLE: Provide Payment details

DESC: By clicking on “Provide Payment details” section, a page will be opened asking for consumer Number and payment details. After filling those details and clicking “Submit”, details will be submitted. On successful completion of this task a dialog box should pop up saying “task is successful” otherwise “Task Failed”.

RAT: In order for an electricity board employee to provide payment details of consumers.

DEP: None

#### 3.2.3.4 Functional requirement 1.20

ID: FR20

TITLE: Electricity Board Employee Log out

DESC: Given that the employee is logged in, he/she should be able to log out of the mobile application.

RAT: In order for an employee to log out of the mobile application.

DEP: FR1

## 3.3 Non-Functional requirements

This section includes the requirements that essentially specifies how the system should behave and these are the constraints upon the systems behavior.

### 3.3.1 Product Requirements

#### 3.3.1.1 Performance requirements

The requirements in this section provide a detailed specification of the user interaction with the software and measurements placed on the system performance.

#### 3.3.1.1.1 Prominent search feature

TITLE: Prominent search feature

ID: QR1

DESC: The search feature should be prominent and easy to find for the user.

RAT: In order for a user to find the search feature easily.

DEP: none

#### 3.3.1.1.2 Response time

TITLE: Response Time

ID: QR2

DESC: The software should not take much time to respond to any activity performed by the user.

### 3.3.1.2 Dependability requirements

TITLE: Internet Connection

ID: QR3

DESC: The application should be connected to the Internet.

RAT: In order for the application to communicate with the database.

DEP: none

TITLE: Application portability

ID: QR4

DESC: The application should be portable with Android.

RAT: The adaptable platform for the application to run on.

DEP: none

### 3.3.1.3 Safety Requirements

ID: QR5

DESC: The Electricity Billing app will not affect data stored outside of its servers nor will it affect any other applications installed on the user's phone. It cannot cause any damage to the phone or its internal components. The only potential safety concern associated with this application applies to virtually all handset apps: Electricity Billing app should not be used while operating a vehicle or in any other situation where the user's attention must be focused elsewhere.

ID: QR6

DESC: The system shall not get crashed if data overflow or any exceptions occurs and system shall be able to handle those exceptions.

### 3.3.1.4 Security Requirements

ID: QR7

DESC: If the user has not registered, he/she should be able to go to the registration page. In the registration page, after filling all the required details a verification mail will be sent to the consumer's email id.

ID: QR8

TAG: ConsumerLoginAccountSecurity

GIST: Security of accounts.

SCALE: If a consumer tries to log in to the application with a non-existing account then the consumer should not be logged in.

METER: 1000 attempts to log-in with a non-existing user account during testing.

MUST: 100% of the time.

ID: QR9

TAG: AdminLoginAccountSecurity

GIST: Security of accounts. SCALE:  If an admin tries to log in to the application with a non-existing account then the admin should not be logged in.

METER: 1000 attempts to log-in with a non-existing user account during testing.

MUST: 100% of the time.

ID: QR10

TAG: Electricity-Board Employee LoginAccount Security

GIST: Security of accounts.

SCALE: If an employee tries to log in to the application with a non-existing account then the admin should not be logged in.

## 3.3.2 External Requirements

### 3.3.2.1 Ethical requirements

ID: QR11

DESC: The system shall implement consumer privacy provisions and terms and conditions to use this software.

### 3.3.2.2 Regulatory requirements

ID: QR12

DESC: The software shall be approved for use by the Electricity Board.

## 3.3.3 Organizational Requirements

### 3.3.3.1 Development requirements

ID: QR13

DESC: The application will be developed in java programming language and xml language is used to design the layouts of the activities.