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An Undergraduate Internship on Power Meter Reader App

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An Undergraduate Internship on Power Meter Reader App

By

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Autumn, 2022

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January 23, 2023

Dissertation submitted in partial fulfillment for the degree of Bachelor of Science in Computer Science

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

This is to certify that this report is completed by me, Md. Abubakkar Siddik (1830221), submitted in partial fulfillment of the requirement for the degree of Computer Science and Engineering from Independent University, Bangladesh (IUB). It has been completed under the guidance of Mr. Mahmudul Islam (Supervisor). I also certify that all of my work is original which I have learned during my internship including all the sources of information used in this project and report.



23/01/2023

Signature

Date

Md.Abubakkar Siddik

Name

Acknowledgement

First and foremost, I want to express my sincere thanks to Almighty Allah, who's kindness and blessings have allowed me to go this far. Working as an intern with Automation Services Ltd. has been a fantastic honor. The members of Automation Services Ltd, who have years of expertise in software development, have been extremely kind and encouraging to me.

I'd want to express my gratitude to the Faculty of Computer Science and Engineering for providing internship credit in the graduate program's curriculum and giving me the chance to see what it's like to perform industry-related tasks and work in a field that interests me. I would like to thank my supervisor, Mahmudul Islam Sir, an R&D Officer in the Independent University Bangladesh Department of Computer Science and Engineering. Throughout this internship and the writing of this report, he inspired and guided me with his ongoing guidance, priceless instructions, fascinating recommendations, and astute advise.

I am truly thankful to Rehena Perveen Bithi, my external supervisor, and A B M Whaiduzzaman, CEO of Automation Services Ltd, for their kind encouragement, direction, constructive supervision, directives, and counsel as well as for inspiring me to complete my internship.

My appreciation also goes out to all of the other Automation Services Ltd personnel who helped me learn so much in the process of honing my own skills and helped me blend in with the team. Last but not least, I humbly thank my family, friends, and loved ones for their enormous sacrifices, well wishes, moral support, wise counsel, inspirations, and encouragement.

Letter of Transmittal

Md. Mahmudul Islam
R&D Office
Department of Computer Science and Engineering
School of Engineering and Computer Science
Independent University, Bangladesh
Subject: Submission of Internship Report for the completion of Graduation.

Dear Sir,

This is to let you know that, with all due respect, I am now submitting my internship report as a requirement for my computer science and engineering bachelor's degree program. Working under your direct direction is a noteworthy accomplishment. This report is based on my work and experiences I had while an intern at Automation Services Ltd. I had the opportunity to work for 3 months, underRehena Perveen Bithi and A B M Whaiduzzaman, CEO of Automation Services Ltd.

I gained both intellectual and practical experience from my internship. I've been able to network in the business environment thanks to the training. I made an effort to make my report as useful as I could using the information I learned during my internship. I adhered to the guidelines and sufficiently outlined the pertinent fields to produce a well-structured internship report. But I'm certain that this report will satisfy the requirements of my internship program.

I would be quite grateful if you would be so kind as to receive this report and offer your insightful criticism. It would make me happy if you found this report useful and enlightening in gaining a clear understanding of the problem.

Sincerely,
Md. Abubakkar Siddik
ID- 1830221
Department of Computer Science and Engineering
Independent University, Bangladesh

Evaluation Committee

Signature

Md. Mahmudul Kabir Peyal

Name

Internal Examiner-1 / Panel Member-1

Signature

Asif Bin Khaled

Name

External Examiner-2 / Panel Member-2

Signature

Mahmudul Islam

Name

Supervisor of the intern

Signature

Name

Head, Department of Computer Science & Engineering

Abstract

The responsibilities of a three-month internship at Automation Services Ltd. in Dhaka, Bangladesh, are described in this report. Starting in September 2022, my internship work assignment was to design the UI and engineer the UX for the Power Meter Reader app. I presented the app to the authority after completing the initial system analysis, UI/UX design, and engineering work, and they were pleased with it. Then I set out to use Flutter and Firebase to work on the mobile application's Android version.

I made an effort in this project to provide a project management tool for the team installing electric power meters. a place where they may keep track of their prior work and preserve essential data for future projects.

The project as a whole, the research and development process that went into it, and my experiences working for a company that focuses on fitness during my internship are all covered in this report.

Contents

Attestation i

Acknowledgement ii

Letter of Transmittal iii

Evaluation Committee iv

Abstract v

1 Introduction 1

1.1 Overview/Background of the Work 1

1.2 Objectives 2

1.3 Scopes 2

2 Literature Review 4

2.1 Relationship with Undergraduate Studies 4

2.2 Related works 5

3 Project Management & Financing 7

3.1 Work Breakdown Structure 7

3.2 Process/Activity wise Time Distribution 8

3.3 Gantt Chart 8

3.4 Process/Activity wise Resource Allocation 9

3.5 Estimated Costing 11

4 Methodology 12

4.1 Software Development Methodology 12

4.2 Chosen Software Development Methodology 12

4.3 Reason for choosing Agile methodology 13

5 Body of the Project 16

5.1 Work Description 16

5.2 Requirement Analysis 17
5.3 System Analysis 20
5.3.1 Six Element Analysis 20
5.3.2 Feasibility Analysis 20
5.3.3 Problem Solution Analysis 21
5.3.4 Effect and Constraints Analysis 21
5.4 System Design 22

6 Results & Analysis **25**
6.0.1 Mobile App UI 25

7 Project as Engineering Problem Analysis **28**
7.1 Sustainability of the Project/Work 28
7.2 Social and Environmental Effects and Analysis 29
7.3 Addressing Ethics and Ethical Issues 29

8 Lesson Learned **30**
8.1 Problems Faced During this Period 30
8.2 Solution of those Problems 30

9 Future Work & Conclusion **31**
9.1 Future Works 31
9.2 Conclusion 31

List of Figures

3.1 Work Breakdown Structure 7
3.2 Activity-wise Time Distribution Chart 8
3.3 Gantt Chart 9

4.1 Agile Methodology 13
4.2 Agile Methodology life-cycle 14

5.1 Rich Picture 17
5.2 Use Case Diagram 23
5.3 Activity Diagram 24

6.1 Login input forms 25
6.2 Input forms 26
6.3 Outputs 26
6.4 Other outputs 27
6.5 Software Updates 27

List of Tables

3.1 Activity Wise Resource Allocation 10
3.2 Estimated Costs 11

5.1 Functional Requirement - User Login 18
5.2 Functional Requirement - Add New Customer 18
5.3 Functional Requirement - View All Customer 18
5.4 Functional Requirement - Search Customer 18
5.5 Functional Requirement - Add New Meter Info 18
5.6 Functional Requirement - Add Replace Meter Info 18
5.7 Functional Requirement - View All Work History 19
5.8 Functional Requirement - Show Profile Info 19
5.9 Six Element Analysis 20

Chapter 1

Introduction

An internship is a professional learning experience that provides meaningful, applicable work that is connected to a student's field of study or career choice. An internship allows for professional growth and growth as well as the acquisition of new skills.

Currently, I am working at Automation Services Ltd., which is a software development company. Here I'm working as a Flutter app developer. In this report, I will discuss the background of my work, a literature review, and methodology.

1.1 Overview/Background of the Work

An internship is a practical application of theoretical knowledge. In my internship period, I will work on a field data management cross-platform mobile application called Power Meter Reader.

Some times we need to change our electrical power meter. For this process workers come and replace the old meter to the new meter. After that the workers needs to track the work and other necessary information. Which is done by manually like using pen and paper. Also, they need to keep track some sensitive data which can be missing or misleading. As a result, there is concern about data security because information can be lost. Also, they are not organized and difficult to find for future work.

The Power Meter Reader app solves the problems. With the app operator can enter necessary information like customers details, new and old meter details, old meter reading, transformer info as well as upload relevant photos. This mobile application replaces paperwork with fast, accurate, and mobile data collection methods.

During the meter reading procedure, the user will supply all necessary information from the meter as well as upload a real-time picture of that meter. If by chance, the data entered is incorrect, it may be remedied by checking the image, ensuring the data security.

All data will be saved and retrieved via a Google Cloud Services. The software will

be accessible for both Android and iOS devices.

1.2 Objectives

Project objectives are the targets we expect to achieve at the end of the project. A project's goal must be precise, measurable, within schedule and financial constraints, and most importantly, it must satisfy the needs of the client. The main objective of this app can be described as:

- Design of a user-friendly dynamic UI and UX.
- App user authentication.
- Convert the current manual data recording and processing system to a digital format.
- Organize information for easy access.
- Track all the customer's detailed information, energy consumption, and images.
- Dynamically add, update, or delete any information.
- Increase work efficiency and maintainability.
- Use Google Cloud Services to manage the data.
- Support for both Android and iOS operating systems.

1.3 Scopes

The app will be used to track electric power meters installation work. There will be a login screen in this app, and only the allocated individual will be able to log in with the right credentials. There will be no registration procedure because the user will set it from the admin side.

After logging in, the operator may view all of the meter installation information and search for items using keywords. Selecting an item from the meter installation list will be navigated to another screen. Where the user can see the details information like meter id, transformer id, customer name, address, and other meter information.

To add new meter information, the operator must enter all relevant meter and client information. In addition, a photograph of this meter must be included for future reference. Customer information can also be changed or deleted.

To replace the old meter, the operator will choose the desired item from the meter installed list, then add the old meter information and image, followed by the new meter information and installation pictures, and finally save the meter replaced data.

The operator can check the meter installation history for consumers by tapping the history tab. Where all meter-related information, including the installation picture, is shown.

There will be a profile interface that displays operator information such as ID, name, phone number, team name, and so on. The operator can specify or update the data storage path in the web services settings by supplying the right credentials.

Chapter 2

Literature Review

A literature review is a summary of previously existing literature on a certain subject. The literature review aids in the clarification and explanation of current research and debates on a particular topic or area of research.

2.1 Relationship with Undergraduate Studies

During my undergraduate program, I learned and gathered various knowledge and skills which helps a lot to understand and work on this project. The following courses were really beneficial to me:

- **CSE 203- Data Structure:** Stacks, queues, graphs, algorithm analysis, sorting algorithms, linked lists, and set implementations binary search trees and hash tables are all covered in this course. Because the software has a complicated data structure, this understanding will help me manage and build it. Also, helps to organize a large amount of data in such a way that can easily scale up in the future.

- **CSE 213- Object-Oriented Programming:** This course is all about the concept of objects, which contain code and data. Object-Oriented Programming is to design objects in a way that can, later on, be used which is the core concept for developing large-scale software. This knowledge helps to develop the Power Meter Monitor app. To develop the app I'll need to use Flutter, it uses Dart which is also an OOP programming language. The code reusability and modularity help me to write less code and give me more flexibility to add more features.

- **CSE 303- Database Management:** These courses teach the languages, applications, and programming used for the design and maintenance of large-scale databases. One of the core skills taught in this class is the use of SQL, the most widely used database management language. It describes how to design a project

appropriately and produce important materials that include the System Development Life Cycle, Rich Picture, Requirement Analysis, Entity Relationship Diagram, Business Process Model. Because it is all relevant to the software development process, it always helps me finish my task. This course's most useful lesson is SQL, which will help me design my program to manage data from APIs.

- **CSE 307 - System Analysis and Design:** Among the core topics covered in this course are Systems and Models, Project Management, Tools for Defining System Requirements, Data-Flow Diagrams, Decision Tables, System Analysis, System Development Life Cycle modeling techniques, Object-Oriented analysis, Use-Case designing, Feasibility analysis, System design and development, System System integration, Application Architecture, Database design, Software Management. As all this is related to developing a system, it helps me to make a proper work plan for my project. Also, helped to design the app working system.

- **CSE 451 - Software Engineering:** This course teaches industrial-level software engineering techniques and methodologies. It covers fundamental ideas such as software marketing, software development lifecycle models, software testing, and so on. This course taught me about the Waterfall, Incremental, Evolutionary, Prototyping, Spiral, and Agile models. Also learned how to conduct a literature study to gather data for new projects from existing projects. The software lifecycle models and software testing are the essential concepts that assist me in developing my project.

- **CSE 464 - Mobile Application Development:** This course teaches the development of Android applications. It includes the app development life cycle as well as software development paradigms such as MVC, MVVM, and more. It also teaches how to use various APIs, how to create safe authentication systems, and how to interact with databases such as local databases SQLite and Google cloud services-firebase, more. In my internship, I will be developing a mobile application, and the knowledge from this course will assist me in every way.

2.2 Related works

Many different technologies may be used to create mobile apps. Java, Kotlin, Flutter, Swift, React Native, and many others are examples. It is challenging to determine which application to develop using which technology. Furthermore, it is difficult to discover apps with identical characteristics. There are some apps that have similar features:

- **Meter Readings:** With this program, users may enter readings from non-remotely read meters accurately and rapidly. The app clearly shows which meters have been

read and which still need to be read. It is easier for each person to find the meters s/he is supposed to read when the task of reading is distributed among different persons in the company.

- **Energy Tracker:** App for the iPhone. Meter readings may be readily added, managed, and analyzed using Energy Tracker. Simply keep track of how much electricity, water, gas, and heat you use. For a quick setup, it needs to use the clever CSV import option.

- **Electric Meter Reading:** This program allows for the accurate reading of electric meters. Electric meters are equipped with a low-cost NFC tag that allows the meter to be identified subsequently. This prevents the incorrect entry of the electric meter number. Meter readings saved in the cloud are extremely valuable as a starting point for subsequent analysis.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

A work breakdown structure (WBS) is a graphical, hierarchical representation of a project's deliverable. It is a valuable project management diagram because it allows us to break down the scope of our project and visualize all of the steps required to complete it. To help with project management, we produced a work breakdown structure diagram. To adhere to the WBS, we used a top-down approach.

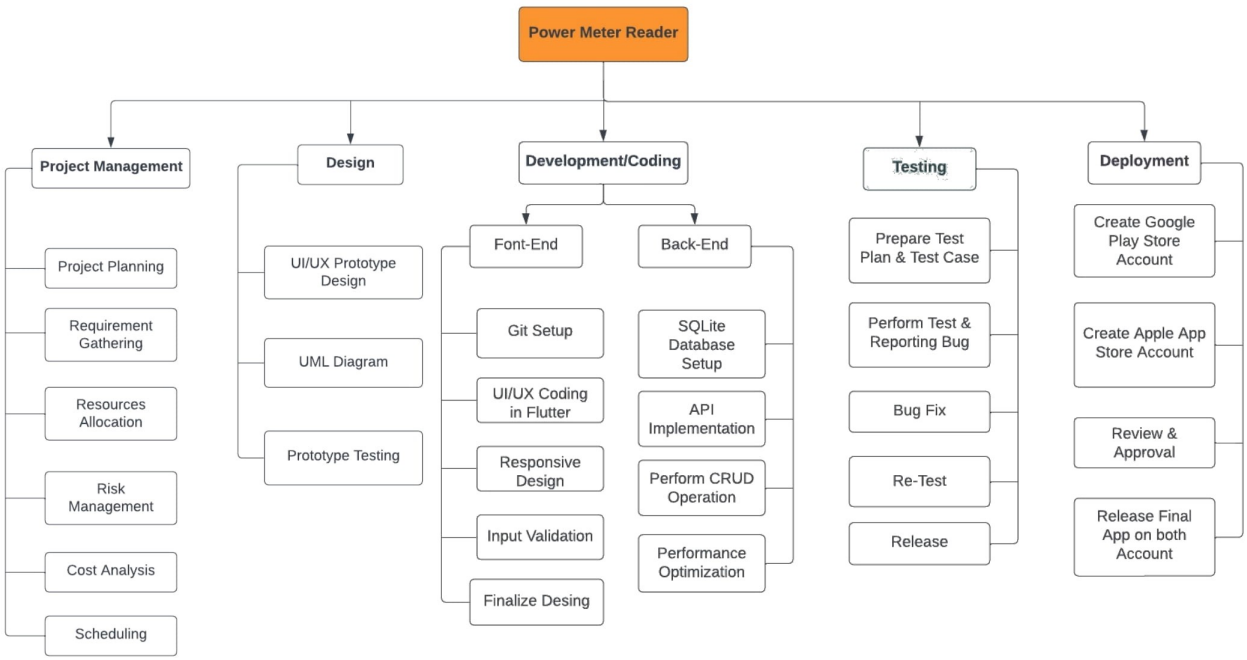


Figure 3.1: Work Breakdown Structure

3.2 Process/Activity wise Time Distribution

Schedule baseline estimates are estimates of how lengthy development work will take. They might take the shape of hours, days, weeks, or months, and are often used to refer to working or business hours. Forecasting the length of specific jobs might help in estimating the entire project timeline and generating an accurate project schedule.

To create the schedule, first, identify the activities, then sequence them correctly, estimate the resources needed, and estimate the time it will take to accomplish the tasks. It promotes overall efficiency by assisting team members in knowing what to do and when to do it. It can also assist to estimate project expenses and inform stakeholders about project objectives.

We divide time for our project as follows: Project Management is estimated to take around 16 working days or approximately 16.84% of the entire work. The Design process will thereafter take about 3 weeks, accounting for 22.11% of the overall effort. Following that, the Development phase will last almost 38 days and is worth 40.0% of the entire effort. Then we assign 12 days for testing, which is approximately 12.63% of the overall effort. Finally, the Deployment step requires at least 8 days or 8.42% of the total work.

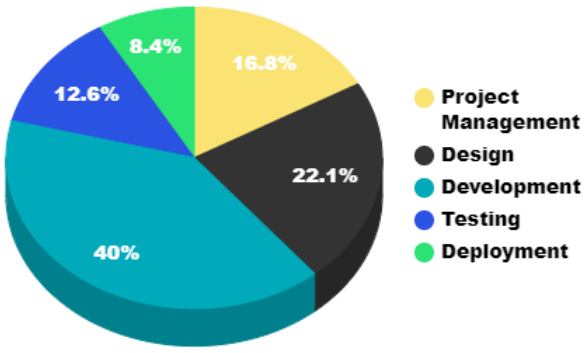


Figure 3.2: Activity-wise Time Distribution Chart

3.3 Gantt Chart

A Gantt chart is a typical graphical depiction of a project schedule. It's a type of bar chart that shows the start and finish dates of project elements including resources, planning, constituted, and interconnections.

It includes a list of tasks as well as progress bars for each action. Horizontal bars of varied lengths depict the project timetable, which may contain selected time frame, timeframe, and start and completion dates for each job.

The chart differentiates between jobs that may be accomplished simultaneously and

those that cannot be started or accomplished until others are finished. It can help spot potential bottlenecks and highlight tasks that might have overlooked in the project timeline.

The following Gantt chart is for our project:

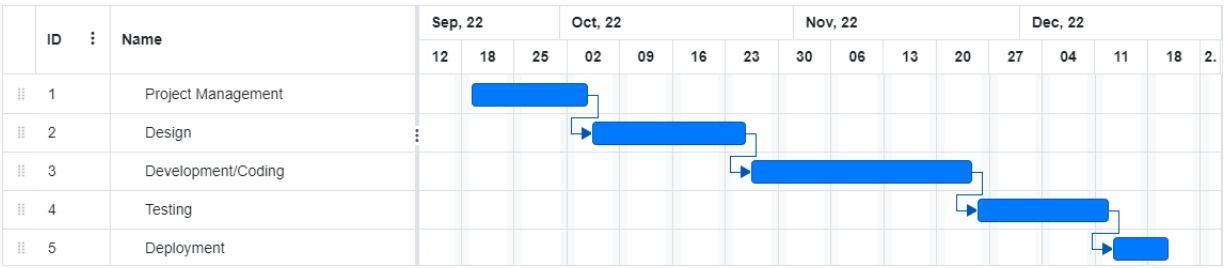


Figure 3.3: Gantt Chart

The five development activities are shown in this Gantt chart. The job will take 95 days, according to our schedule. We schedule 16 days for initial project management, 21 days for design, 38 days for development, 12 days for testing, and 8 days for project deployment.

3.4 Process/Activity wise Resource Allocation

The process of assigning resources available in an affordable way is known as resource allocation. In project management, resource allocation refers to the scheduling of operations and the required resources by these processes while taking both resources required and project length into account.

We believe manpower to be a resource for our project. Everyone involved in the project is considered a resource for the project. As a result, we must work together to complete this job and fulfill the dates. Because I'm working on this project by myself. I need to complete all of the stages to properly complete the projects, which I estimate will take roughly 95 days. The following are the steps that I must or will take:

- **Project Management:** It is the beginning of the project. Throughout this phase, the project concept is studied and developed. The goal of this phase is to determine the viability of the project. Furthermore, the project manager makes decisions after presenting the project proposal and discussing the entire project concept. This phase is critical because it defines and maintains scope, generates a work breakdown structure (WBS), gathers requirements, calculates the time schedule, necessary resources, and so on. Discuss how to approach the project, which strategy to use, and how to set goals to achieve deadlines. This initial phase is critical for

our project, and it is estimated to take roughly 16 working days or approximately 16.84% of the entire effort.

- **Design:** Design decisions may be made using the requirements list established during the project management phase. During the design process, one or more designs that appear to fit the project's purpose are generated. It contains user interface/user experience (UI/UX), diagrams, drawings, flow charts, prototypes, and UML schemes. The design must be correct since it will be followed during the development phase. This section will take about 3 weeks to complete, accounting for 22.11% of the overall effort.

- **Development / Coding:** The project's development phase involves organizing material that will be needed to complete it. After finishing the design phase, I will begin the development or coding step. System design in an integrated development environment is part of the coding step. It also involves software development methods, static code analysis, and code review for various device kinds. This section will last around 38 days and contributes to 40.0% of the overall effort.

- **Testing:** This step comprises evaluating the developed software. It assesses if the generated software meets the criteria stated in the beginning phase. Following the completion of the development phase, the application will enter the testing phase. It entails locating and repairing the bug. This procedure will take around 12 days, accounting for roughly 12.63% of the overall effort.

- **Deployment:** The deployment step will begin when the testing phase is completed. The software will be available in both the Google Play and Apple App Stores. The program must export in a specified file format before deployment. Both the Google Play Store and the App Store require a developer account. To launch the app, all of the necessary files and information must be uploaded. Following that, the app will be reviewed. The entire procedure will take at least 8 days. It accounts for approximately 8.42% of the total work.

Table 3.1: Activity Wise Resource Allocation

Activity Wise Resource Allocation		
Activity	Days	Work Percentage
Project Management	16	16.84%
Design	21	22.11%
Development	38	40.0%
Testing	12	12.63%
Deployment	8	8.42%
Total	95	100%

3.5 Estimated Costing

The pricing was determined by the functionality requested by the customer for the app. It is determined by the app's size, requirements, functionality, and design. This covers the cost of UI/UX design, logo design, server cost, Google and Apple app store account creation, and many other tools required to construct this app. The total project cost was projected to be Tk 263,550 (BDT).

Table 3.2: Estimated Costs

Estimated Costs	
Features	Costs (BDT)
App development	1,40,000
Design	40,000
API Development	80,000
Google Play Developer Account	2550
Apple Developer Program	11,000
Total	263,550

Chapter 4

Methodology

A methodology is just a grouping of methods, approaches, standards, and practices. Every segment of the project's lifespan has a step-by-step flow of activities and procedures that are included in project management approaches. They are comprehensive instructions that specify in great detail what needs to be accomplished next, why each task is important, and how a project cycle should be completed.

4.1 Software Development Methodology

An information system's development process is organized, planned, and managed using the software development approach. The primary feature of the agile methodology in this sort of methodology is that it without any technical components and instead relies on the development organization's careful planning of the software development life-cycle. Here are some popular software development methodologies:

- Agile
- Evolutionary
- Incremental
- Prototyping
- Spiral
- Water Fall

4.2 Chosen Software Development Methodology

We chose Agile Methodology for the Power Meter Reader app. A project is divided into many time frames known as sprints under the Agile method to project management.

It requires continuing interaction with stakeholders and ongoing growth at every level. Teams go through a cycle of planning, carrying out, and evaluating the job as it starts.



Figure 4.1: Agile Methodology

4.3 Reason for choosing Agile methodology

Unlike traditional desktop programs for PC, which may run for several years without any redesign, upgrade, or other changes, mobile apps should be substantially more versatile and adaptive for users. Users' requirements may alter on a frequent basis; thus, app owners should update the app whenever new modifications are required. Furthermore, choosing an agile methodology is the ideal way to create a high-quality mobile application with little modifications.

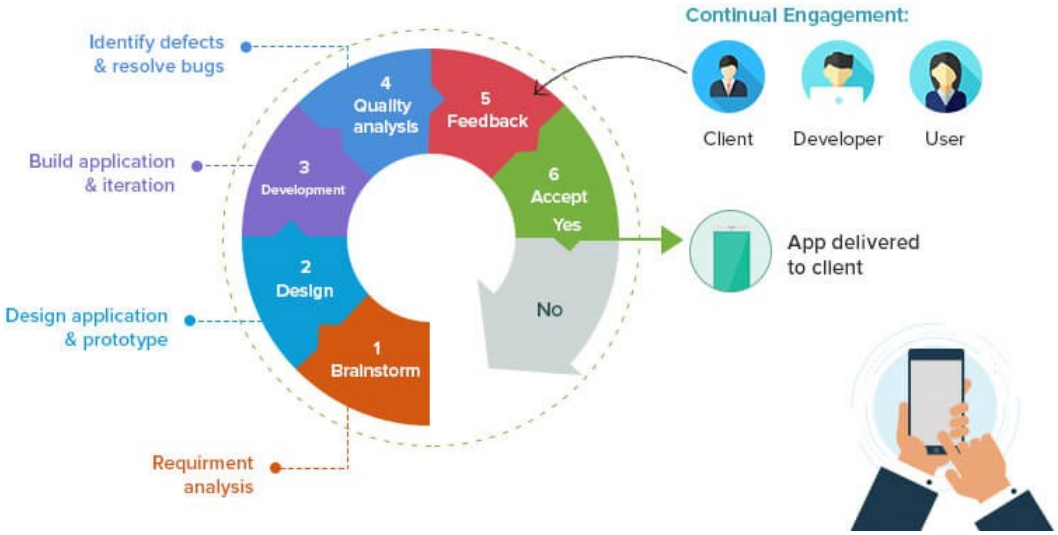


Figure 4.2: Agile Methodology life-cycle

1. **Enhances the Quality of Mobile Apps** The agile scrum approach includes testing and quality assurance (QA) at every sprint, ensuring that the software is built in accordance with quality standards and assuring its future in terms of maximum performance and acceptance.

2. **Increased Customer Satisfaction** Customers have obvious access to app progress since the Agile Method is built on consulting them at every level, and they are given an app presentation among each set of newly additional benefits following each sprint.

3. **Improved Transparency** Everyone is aware of the precise work that has to be done and its status because the agile strategy is founded on involving everyone engaged in the mobile development process, including the client.

4. **A quicker return on investment** Agile software development has two benefits, namely quicker development and ROI. Agile enables app development companies to launch the development process more quickly and to work on several areas of the process concurrently. This results in a shorter development time for the app when coupled with the ease of evaluating the app functionality by unit as you go.

5. **Rapid Changes** It is simple to modify apps when utilizing the Agile development approach for mobile app creation because sprints are incorporated. The best part is that the Scrum Agile application programming approach avoids modification, time, and expense difficulties, thus there is no adverse effect on development.

Chapter 5

Body of the Project

5.1 Work Description

Power Meter Reader is an electric power meter management app. It will track new customers alongside their meter installation, replacement, and other histories. This will help the organization to keep track of its work and manage the customers. This mobile application overcomes customer management and works management very quickly. The followings are the modules of the applications:

1. **Login:** After opening the app for the first time users are greeted with a Login page. Only the dedicated user can login with the username or email and password.

2. **Add and view customers:** If the user logs in successfully then they are sent to the home page. Where they can add a new customer by adding the required info. After successfully adding new customers they are redirected to the all-customers list.

3. **Search customer:** The user can search customers by name, CSN number, or address.

4. **Add new meter installation info:** The user can add a customer's new meter installation information by providing the required data. After successfully adding the data, the user will redirect to the home page.

5. **Replace meter info:** Here user can add a customer's replaced meter information by providing the required data. After successfully adding the data, the user will redirect to the home page.

6. **Remove customer:** The user can remove any customer from the customer list.

7. **View history:** The user can check all the works they have already done. Alongside it will provide all the details information for future use. Also, here the user can search the done work by plan id/data or name.

8. **View Profile:** Here the user can see their details information.

5.2 Requirement Analysis

Rich Picture

A rich picture is a depiction of a circumstance that emphasizes the essential components and connections that must be taken into account while working to make improvements.

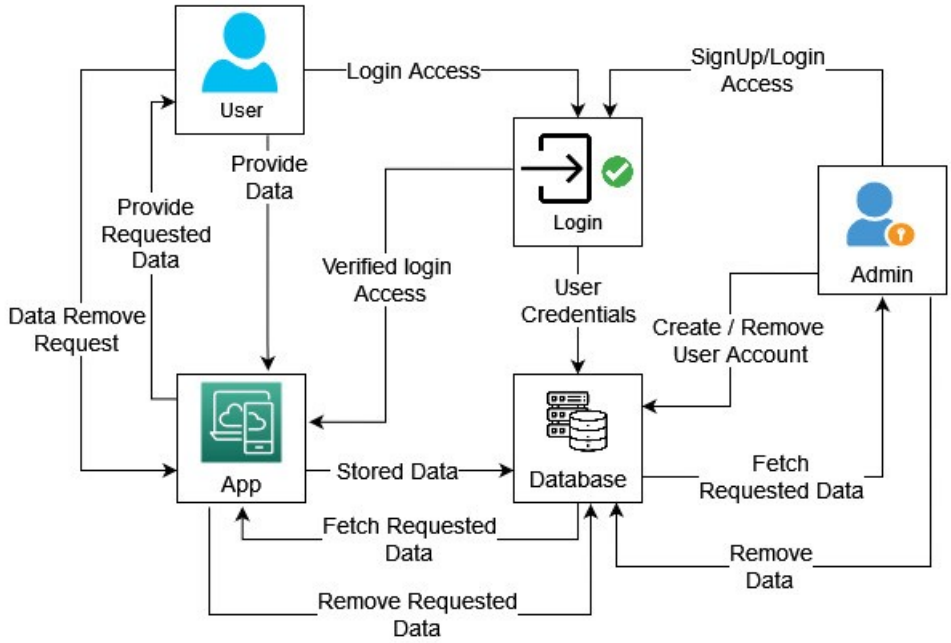


Figure 5.1: Rich Picture

Functional and Non-Functional Requirements

Functional Requirements: The core system behavior is described in functional specifications. This includes the system's capabilities and limitations as well as its response to inputs. If the functional conditions aren't met, the system won't work. User demands are at the core of the product characteristics known as functional requirements.

The following tables are the app's functional requirements:

Table 5.1: Functional Requirement - User Login

Function: User Login		
Input: Username/ email, password	**Process:** Check user credentials	**Output:** Give access to the app
Precondition: Must have internet access		
Postcondition: User gets redirected to home page		

Table 5.2: Functional Requirement - Add New Customer

Function: Add New Customer		
Input: Provide required customer information	**Process:** Save the information to database	**Output:** Customer will be created and add to the database
Precondition: Must have internet access		
Postcondition: Notify after adding a new customer and redirected to the home page		

Table 5.3: Functional Requirement - View All Customer

Function: View All Customer		
Input: Click Installation Tab	**Process:** Fetch all the customer data from the database	**Output:** Customers list with Name,CSN and Address info
Precondition: Must have internet access		
Postcondition: Clicking on a list item will show Install,Replace and Remove button		

Table 5.4: Functional Requirement - Search Customer

Function: Search Customer		
Input: Customer name/address / CSN number	**Process:** Find the match of the searched customer	**Output:** Searched customer will be shown up or show "No match found"
Precondition: Must have internet access		
Postcondition: Refresh the customer list		

Table 5.5: Functional Requirement - Add New Meter Info

Function: Add New Meter Info		
Input: Click the Install button from the customer list.Insert required meter info and customer id	**Process:** Save new meter info to database	**Output:** New meter info will save to the database
Precondition: Must have internet access		
Postcondition: Notify after data is added and redirected to the home page		

Table 5.6: Functional Requirement - Add Replace Meter Info

Function: Add Replace Meter Info		
Input: Click Replace button from the customer list.Insert required old meter info, new meter info, and customer id	**Process:** Save replaced meter info to database	**Output:** Replaced meter info will save to the database
Precondition: Must have internet access		
Postcondition: Notify after data added and redirected to the home page		

Table 5.7: Functional Requirement - View All Work History

Function: View All Work History		
Input: Click History Tab	**Process:** Fetch all work (New meter install and meter replace)history from the database	**Output:** Generate a list of work with all info
Precondition: Must have internet access		
Postcondition: Clicking on a list item will show the details info on another page		

Table 5.8: Functional Requirement - Show Profile Info

Function: Show Profile Info		
Input: Click Setting Tab then Profile option	**Process:** Fetch requested user info from database	**Output:** Show detailed info of the user
Precondition: Must have internet access		
Postcondition: User can't edit information		

Non-functional Requirements: A non-functional requirement is one that utilizes criteria to assess an overall system performance rather than particular activities. Requirements specification define certain conduct or functions; non-functional specifications don't.

1. **Performance and Scalability:** It is challenging to optimize this app for performance because there are several elements on the screen at once. Finding consumers, signing in, and entering data all need to be highly frictionless processes. It was also essential that the database's overall cost remain constant at a level that was predictable and acceptable. Hence, Google Cloud Service was introduced.

2. **Portability and Compatibility:** The software is accessible on Android mobile devices, and we have made it compatible with versions of Android 5 and up, which is very low given the state of Android right now. High-end tools or equipment are not necessary. Any smartphone may access this system, however, it requires an internet connection. Both a phone and a table may use the software.

3. **Reliability, Availability, and Maintainability:** We always try to make our code as modular as possible and to get rid of any unnecessary or inactive code. so that whatever adjustment we make will be more effective. Also, the app will go through a number of performance tests, and it can be inferred from the results of the tests that the system will work well for a sizable length of time. When the primary system needs repair, the backup system may be used since the system has backups. This simplifies maintenance.

4. **Security:** We utilize Google Cloud Service, which is initially quite secure, for user authentication and data storage. Each user's account password is encrypted

before being stored in the database, and the procedure is carried out automatically. Account credentials are saved into the database securely.

5.3 System Analysis

In order to solve problems, system analysis is a technique that looks at the larger system, analyzes its components, and determines how it functions. It is used in the field of information technology, where the structure and design of computer-based systems call for a specific study.

5.3.1 Six Element Analysis

Table 5.9: Six Element Analysis

Process	System Roles				
	Human	Hardware	Software	Database	Comm.& Networks
Login	User	Smartphone	Android	Firebase	WAN
Home Page	User	Smartphone	Android	Firebase	WAN
Add Customer	User	Smartphone	Android	Firebase	WAN
Customer Search	User	Smartphone	Android	Firebase	WAN
Add New Meter	User	Smartphone	Android	Firebase	WAN
Replace Meter	User	Smartphone	Android	Firebase	WAN
Remove Customer	User	Smartphone	Android	Firebase	WAN
View History	User	Smartphone	Android	Firebase	WAN
Add Meter Reading	User	Smartphone	Android	Firebase	WAN
Create User	Admin	Compute & smartphone	Web Browser	Firebase	WAN/ LAN

5.3.2 Feasibility Analysis

Feasibility analysis is the process of examining a proposed project to see if it is feasible and should move forward. The primary focus of this examination is the confirmation of the design, plan, and strategy. This may be used to verify presumptions, restrictions, choices, and methodologies.

1. **Technical Feasibility:** Technical feasibility involves evaluating the software, hardware, and other technical requirements of the proposed project. This evaluates the specifics of how we intend to offer goods or services to customers. Flutter UI was used in the creation of the Power Meter Reader app. The most recent versions of

Flutter, Dart, and SQL were used to develop a significantly quicker and more effective application. Additionally, these technologies are extensively employed within a developing community and are highly well-liked in the current sector.

2. **Operational Feasibility:** Operational feasibility is a metric for evaluating how successfully a proposed system addresses issues and meets system requirements that were determined during the project planning and problem analysis phases. Depending on the human resources available for the project, it is possible to forecast whether the system will be used once it has been developed and put into use. This app was designed in a way that makes using it extremely straightforward. Without a doubt, the general people will embrace it. The system was thoughtfully designed. Users don't need to have a lot of technical knowledge to utilize this system. Users easily understand every instruction.

3. **Economic Feasibility:** Economic feasibility identifies costs and benefits. It estimates cash flow and weighs the benefits and costs. Manufacturing and research & development costs are considered for profitability. If this approach successfully reaches the masses, it will surely be beneficial. On the one hand, it will cut down on costs related to wasting paper, pencils, and labor. However, advantages will appear depending on usage.

5.3.3 Problem Solution Analysis

Numerous problems arose when the project was being implemented. Initially, there were a lot of issues, and it is harder to recreate a bug. The procedure drags and takes longer if reproducing the bug requires time.

1. **Identification:** Giving beta testers access to the software so they may record their whole user experience up until the moment they find a defect and transmit the recording for repair. Additionally, Firebase's "Crashlytics," which offers incredibly comprehensive insights, has been included.

2. **Affected requirements:** We analyze the testing findings to see if the reported problem breaks the app or impairs the user's experience.

3. **Solution:** We analyze the bug and find the reason and then implement the fix.

4. **Test:** We develop and test the app partially.

5.3.4 Effect and Constraints Analysis

Effect: The market's availability of a large variety of mobile phones complicates problems since we need to ensure that the app has the largest potential user base. According

to statistics, only a small percentage of people use high-end smartphones to access mobile apps. As a result, for our app, we chose to target mid and low-end device users and optimize better for them in order to broaden consumer reach while providing a smooth and seamless user experience.

Constraint: This app was not published by a third party. This is an internal initiative, and business resources were utilized in production with no assurance of monetary returns.

5.4 System Design

System design refers to the process of creating system features including modules, infrastructure, modules, connections, and system requirements based on the stated requirements. It is the process of figuring out, creating, and designing systems to satisfy the particular objectives and demands of a business or organization.

UML Diagrams

A UML diagram is a diagram that is dependent on the UML (Unified Modeling Language) that aims to graphically describe a system along with its important players, roles, actions, objects, or classes in order to better understand, manage, or record system information.

Use Case Diagram: A method for compressing details about a system and the people using it is a use case diagram. It often acts as a visual depiction of the interactions between different system components.

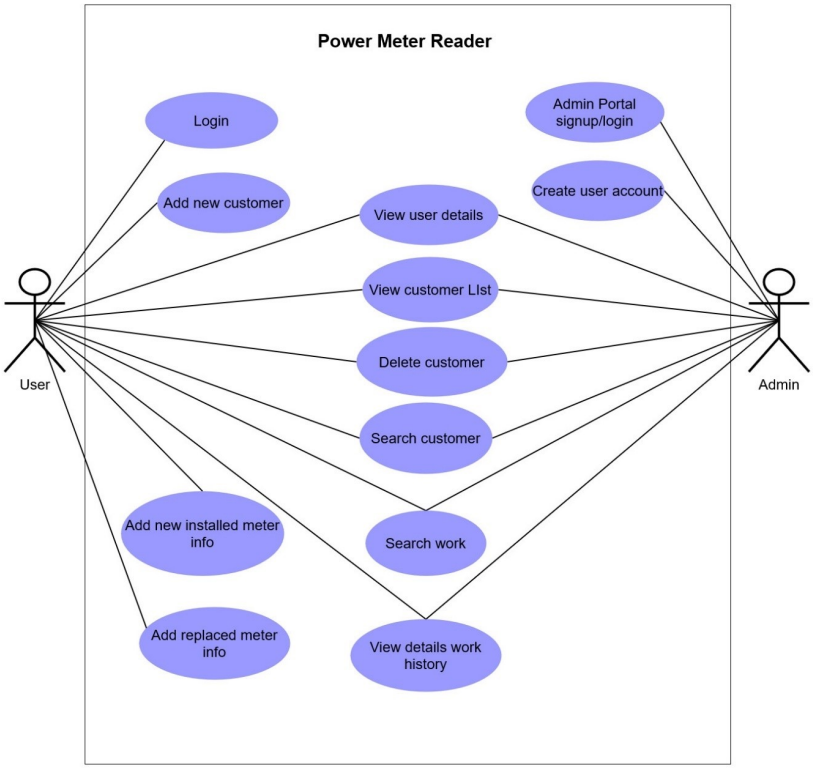


Figure 5.2: Use Case Diagram

Activity Diagram: Another crucial UML diagram for describing the dynamic system components is the activity diagram. An activity diagram is a diagram that shows how such action results in another.

The following diagram is the User activity diagram:

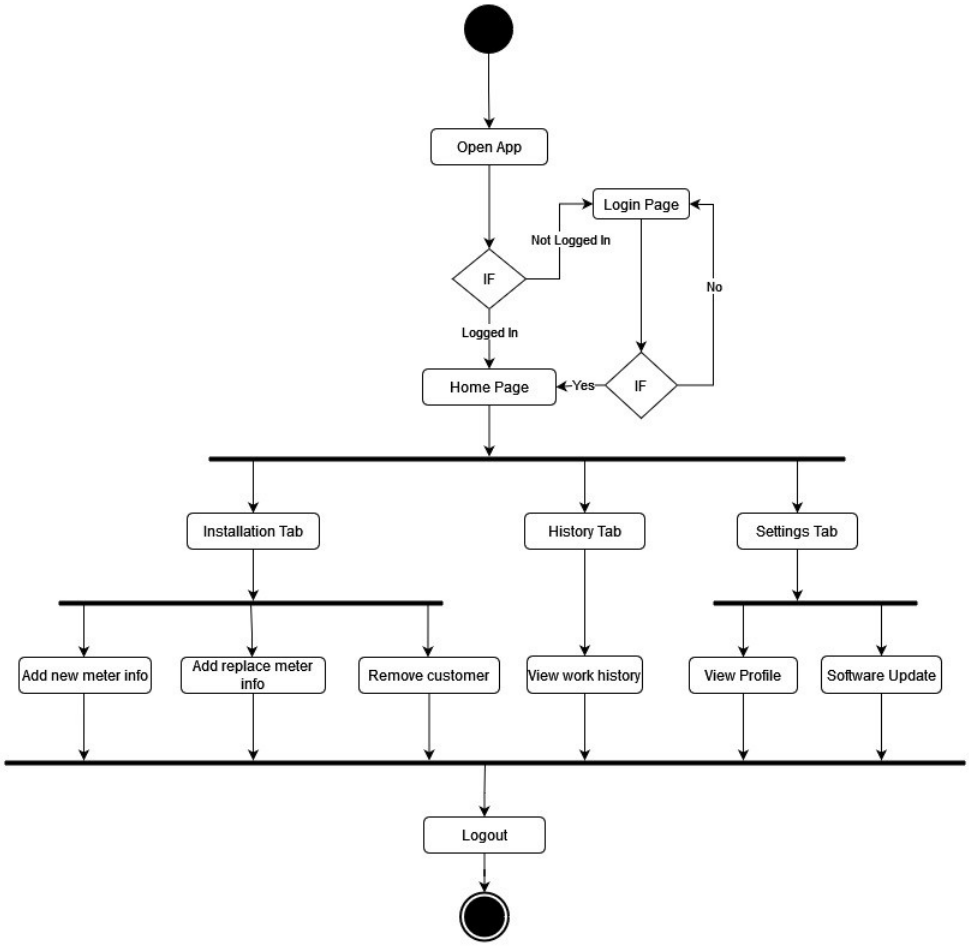


Figure 5.3: Activity Diagram

Chapter 6

Results & Analysis

We test the app on several smart phones when it is finished. During this time, we encounter a few minor problems, which we then resolve. After that, we tested the app once again and achieved the desired outcome. Additionally, we aim to add the features suggested by user reviews and recommendations.

6.0.1 Mobile App UI

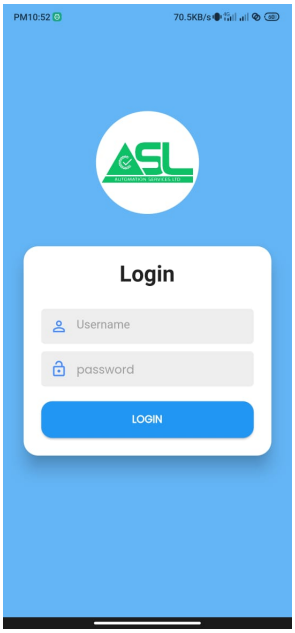


Figure 6.1: Login input forms

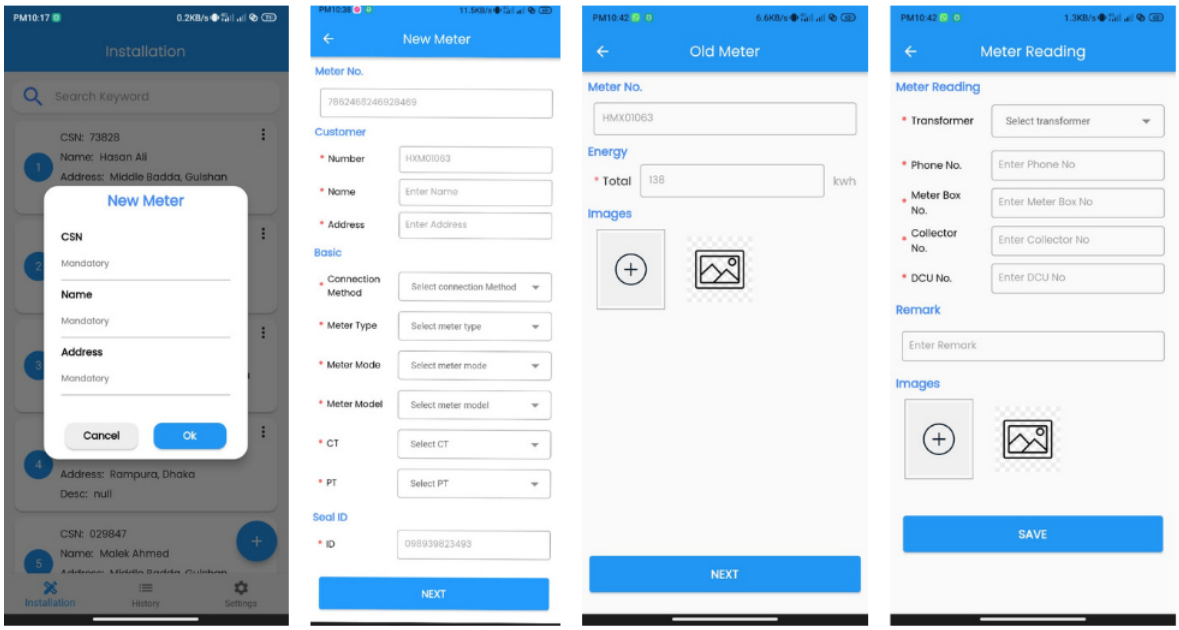


Figure 6.2: Input forms

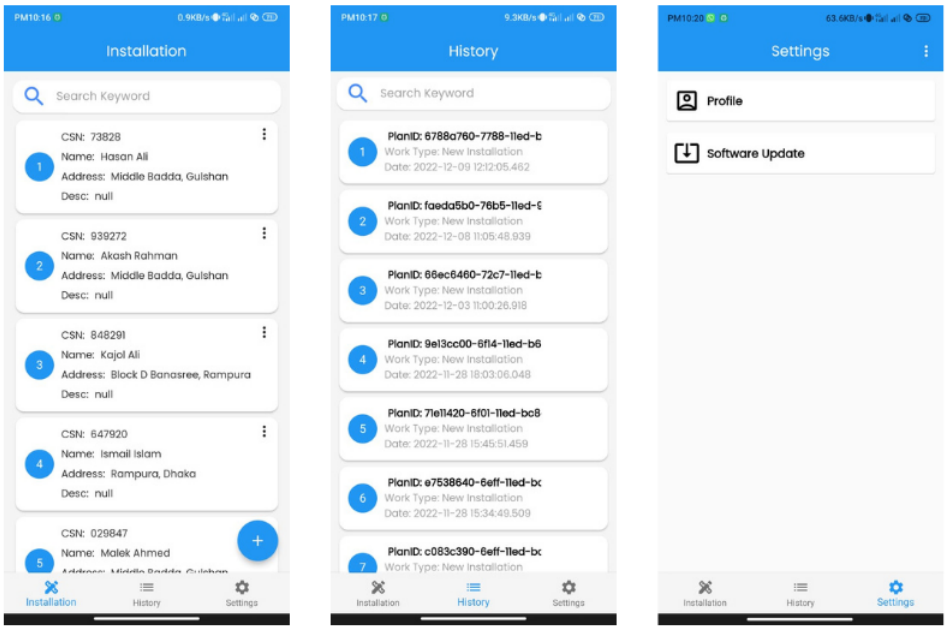


Figure 6.3: Outputs

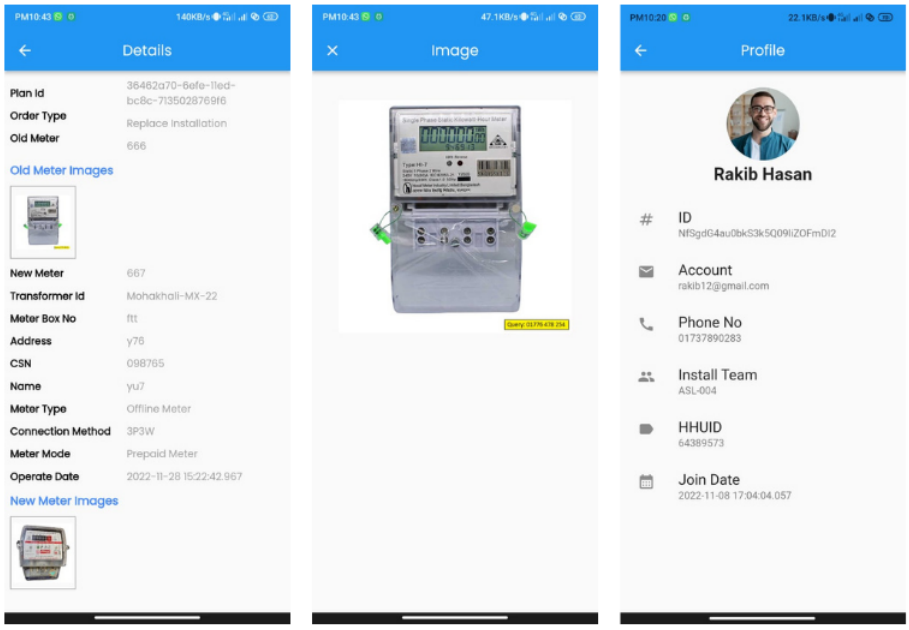


Figure 6.4: Other outputs

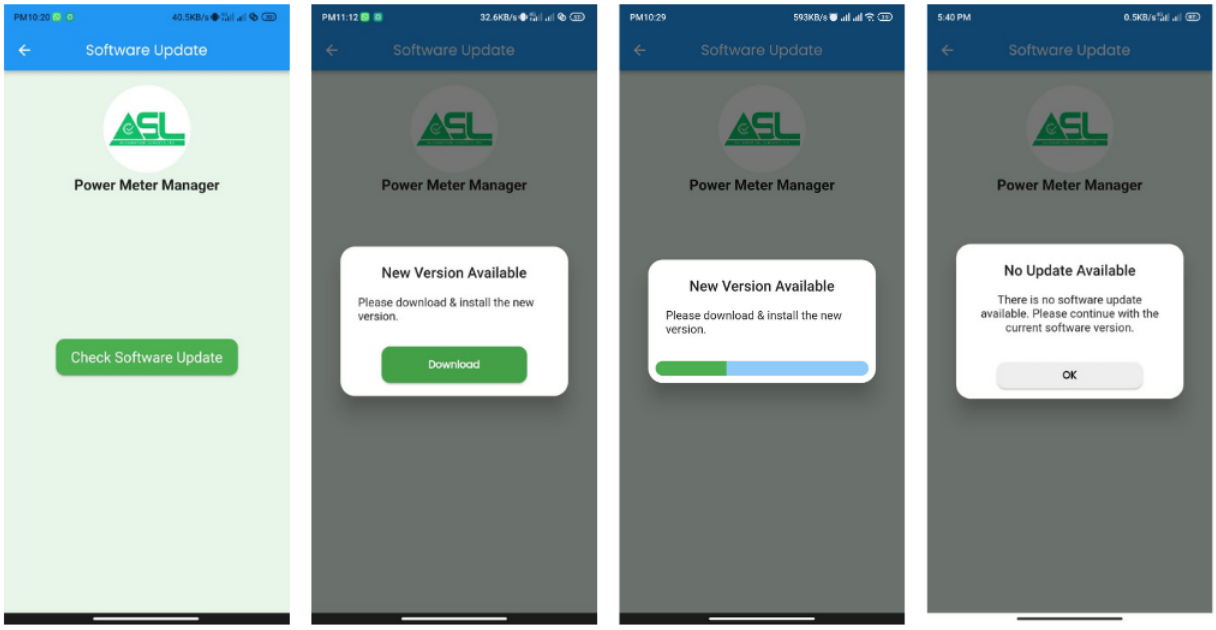


Figure 6.5: Software Updates

Chapter 7

Project as Engineering Problem Analysis

Internal project direction is provided via engineering problem analysis. It is the breakdown of sustainability, social and environmental impacts and analyses, ethics, and ethical difficulty of projected mental constituents in order to arrive at their key aspects and their links to each other and to external elements.

7.1 Sustainability of the Project/Work

The product's sustainability refers to its capacity to be maintained and updated. In today's environment, any program that is published must be maintained and constantly updated for its user base.

- **Community Sustainability:** Following the deployment and formal release of the Power Meter Reader app, it has consistently aided users in their job. The app is working as it should. We receive both favorable and negative feedback. We discover problems and issues by studying the reviews, and we are continually striving to improve the app for the users.
- **Financial Sustainability:** This pertains to how the application's operating costs will be maintained when it is published, as well as if it will produce enough income to make an acceptable profit. The software will be continually updated with bug corrections, and future versions may add new features based on user feedback and needs. We require programmers and designers to work on issue fixes, whether visual or in scripts. As a result, the major expense would be the compensation of the project's staff. Also, the app is now running on free cloud space from Firebase, but as the app becomes overburdened with data, we will need to upgrade the Firebase plan.

7.2 Social and Environmental Effects and Analysis

Social Effect: The Power Meter Reader functions similarly to a work manager. People who use this software will profit from the ease and efficiency with which they may track their work on the mobile app. The firm can more efficiently monitor the work, which aids in the growth of its business. The key result is that the software is better structured, simple to use, increases workflow, and saves time.

Environmental Effects: The software has no negative effects on the environment. Because this application emits no carbon into the atmosphere. In fact, it benefits the environment by decreasing paperwork.

7.3 Addressing Ethics and Ethical Issues

In this day and age, impersonating someone and using their credentials to accomplish unlawful or criminal acts has become incredibly easy. It has become critical to keep user data safe, as anybody may simply hack the system and steal personal information.

Fraud and Identity Theft: The software does not save any user information. Because this system lacks a payment gateway, customers will not be needed to provide any bank account or card information. Third-party software has no place in the app. Other than the legitimate user assigned by the company, no other user has access to the app.

Data Security: The server and database system will be accessible only to the lead developer. The database is protected by a username and password; without this information, no one else will be able to access the data gathering.

No Discrimination: No one is discriminated against because of their color, gender, sexual orientation, religion, political beliefs, racial or ethnic origin, money, place of birth, or any other status.

Chapter 8

Lesson Learned

For me, the internship is a whole new experience. During my training, I encountered several hurdles and problems, for which I had to find answers. It has taught me so many skills.

8.1 Problems Faced During this Period

- **Adapting to New Technology:** Because this was the first time I had ever worked on a hybrid application in production, I had to learn and adapt to the company's new technologies and apply them to production.
- **Working Speed:** Learning new technologies and putting them to use was a slow process for me at first because it was the first time I had ever utilized them in an office setting. As a result, meeting weekly targets became challenging, slowing the overall rate at which the program developed.

8.2 Solution of those Problems

- **Adapting to New Technology:** Despite the fact that I am familiar with native mobile applications. As a result, it was rather simple to acquire the skill set and use it in real-world environments. In addition, when I encountered too many tough challenges, the senior developer assisted me in resolving them.
- **Working Speed:** It was a slow process for me at first because it was my first time using it in an office setting. It got easy to sustain the job load and speed after a few days and finished my work within the deadline.

Chapter 9

Future Work & Conclusion

9.1 Future Works

There are several recommendations for the app's enhancements and new features. Among them are:

- Customer profile
- Categorize customers as per location
- Issue tracking

9.2 Conclusion

This internship has been an incredible experience for me. I consider myself quite fortunate to have discovered folks who are both patient and persistent in their efforts to teach me. The firm where I work has provided me with an enormous lot of resources and assistance, and they have chosen to offer me a permanent position. The folks here are always teaching and motivating me in every project I work on, and they are always willing to assist me when I am having difficulty with a job.

An Undergraduate Internship on
Power Meter Reader App

By

Md. Abubakkar Siddik
Student ID: 1830221
Autumn, 2022

Consent from Supervisor

The student modified the internship final report as per the recommendations made by his academic supervisor and/or panel members during and/or before final viva, and the department can use this version for archiving as well as the OBE course material for CSE499.

(Signature of the Supervisor)

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