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Islam, Rayhanul

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Waste Management and Distribution

By

Rayhanul Islam

Student ID: **1821355**

Summer, 2022

Supervisor:

Md. Abu Sayed

Lecturer

Department of Computer Science & Engineering

Independent University, Bangladesh

September 26, 2022

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 the report titled Waste Management and Trading system is completed by me, **Rayhanul Islam** (1821355), 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 **Md. Abu Sayed** sir (Supervisor). I also certify that all my work is original which I have learned during my Internship. All the sources of information used in this project and report has been duly acknowledged in it

Signature	Date
Rayhanul Islam	
Name	

Attestation

This is to certify that the report titled Waste Management and Distribution is completed by me, **Rayhanul Islam** (1821355), 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 **Md. Abu Sayed** sir (Supervisor). I also certify that all my work is original which I have learned during my Internship. All the sources of information used in this project and report has been duly acknowledged in it



Signature

14/09/2022

Date

Rayhanul Islam

Name

Acknowledgement

First of all, I would like to thank Almighty Allah for his grace.

I would like to express my gratitude to the Faculty of Computer Science and Engineering department to keep internship credit in the curriculum of the graduation program and give me a scope of tasting the flavor of industry-oriented tasks and the field of work with my interest. I would like to thank specially and heartily to my supervisor, Md. Abu Sayed, Lecturer, Department of Computer Science and Engineering, Independent University, Bangladesh, who encouraged and directed me with her continuous guidance, invaluable instructions, stimulating suggestions and thoughtful advice during pursuing this internship and preparation of this report.

I am also thankful to my supervisor Naimul Baset, managing partner at TechTrioz Solutions. He helped me with his kindness, support, guidance, instructions and advice as well as motivating me to achieve more what I even expected. I am very proud and gratified that I was working under his supervision.

I am also indebted to the employees of the TechTrioz Solutions and also my office seniors, who gave me immense support while working. I didn't feel that I was new in that office and this was my first industrial work experience. Lastly, I would like to thank my family members for their eternal support given to me.

Letter of Transmittal

Md. Abu Sayed
Lecturer
Department of Computer Science and Engineering
School of Engineering and Computer Science
Subject: **Submission of Internship Report** for the completion of Graduation.

Dear Madam,
I am hereby submitting my Internship Report, which is a part of the Bachelor Program in Computer Science and Engineering curriculum. It is a great achievement to work under your active supervision. This report is based on, "Internship at TechTrioZ Solutions.". I have got the opportunity to work at TechTrioZ Solutions. for three months, under the supervision of Naimul Baset, Managing Partner at TechTrioZ Solutions.

This internship has given me both academic and practical exposures. The internship has given me the opportunity to develop a network with the corporate environment. I tried to make this report as much informative as possible with the experience I have gained during my internship period. In order to prepare a well-organized internship report, I have followed the guidelines and described the required fields with sufficient details. I, however sincerely believe that this report will serve the purpose of my internship program. I shall be highly obliged if you are kind enough to receive this report and provide your valuable judgement. It would be my immense pleasure if you find this report useful and informative to have an apparent perspective on the issue.

Sincerely yours,
Rayhanul Islam
ID: 1821355
Department of Computer Science and Engineering Independent University Bangladesh

Evaluation Committee

.....

Signature

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Name

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Supervisor

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Signature

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Name

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Internal Examiner

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Signature

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Name

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External Examiner

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Signature

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Name

.....

Convener

Evaluation Committee

Signature .....

Name Md Abu Sayed

Supervisor

Signature .....

Name Ajmiri Khan

Internal Examiner

Signature .....

Name Nai'mul Basef

External Examiner

Signature .....

Name .....

Convener

Dr. Mahady Hasan
Head, Department of CSE
School of Engineering & Computer Science
Independent University, Bangladesh (IUB)



An Undergraduate Internship/ Waste management & Trading System

By

Rayhanul Islam

Student ID: **1821355**

Summer, 2022

Consent Form

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

Asayed

(Signature of the Supervisor)

Md. Abu Sayed, Lecturer

Department of Computer Science & Engineering

Independent University, Bangladesh

Abstract

Internship is defined as obtaining practical experience from various organizations, which helps in the formation of a connection between theoretical and practical knowledge. It is very important because it is the first time for a student to acquire a keen practical knowledge from the different organizations. When I was offered an internship at TechTrioZ Solutions, I got the chance to work and learn with developer team. The project's goal was to create a System so that general users & companies could Trade Waste materials. This report covers the whole project that I learned about throughout my internship period. By the mercy of Allah I had prior development experience and knowledge about the flutter and Firebase framework thus I was able to take responsibility for the development of this application.

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Chapter 1

Introduction

Internships are the means of gaining valuable real world experience. The purpose of the internship program is to help students focus on their career interests and learn more about their own potential. This allows students to connect their theoretical knowledge with practical real world implementation and also to expand their existing skills to a new height. **Independent University, Bangladesh** offers Internship opportunities under the **"Computer Science and Engineering"** program for completing one's graduation. As a student of the undergraduate program my self, it's required that I complete my Internship with a reputable company and as such I have completed my 3 months internship from **"Tech Trioz Solutions"**.

In this report, I have elaborated my experience of the internship period spent at **"Tech Trioz Solutions"**.Also a proper overview of the work I have done, what I have learned and how it has helped me to grow professionally.

1.1 Overview/Background of the Work

I started my Internship as a Junior Software Engineer at **"Tech Trioz Solutions"** from **29th May 2022**. I was given the opportunity to work on a Mobile application for Trading and Managing household and industrial waste. The application needed to be deployed on android and IOS. Moreover, this application should be built for the Malaysian customer base.

Normally, trash collectors went to each household and purchased or collected the different types of waste. Then they sold the waste to collection centers and at last the trash was bought by Warehouse for final disposal and recycling. This manual method is functional but it had a lot of problems due to lack of information such as, the collector might only trade in one particular category of waste, household members might not be available when the collector is visiting, the collection center might need more or less waste of a particular category or sub category, the amount of incoming and outgoing waste can't be determined or unnecessary waste of recyclable products due to lack of proper handling.

This mobile application was developed with the aim to solve all these problems and more. By using this application users should be able to Trade and Manage recyclable waste more efficiently. Attain the proper amount of waste in required categories, collectors will be able to work more efficiently and effectively. Moreover, general customers will get proper pricing on their product.

1.2 Objectives

This system went into development with specific objectives in place that needed to be executed. They are as follows,

- Must meet client's Functional and non Functional requirements
- Development cost and deadline for the final delivery must be suitable for the client
- Digitalis the current process of waste management and by doing so making it more easy and efficient
- Creating a trading system to ensure user interest in the system and ensuring a healthy environment
- Emitting waste and ensuring an easy way to communicate for transaction
- Delivering an easy to use application for the general public
  - Bug less system
  - Native and innovative UI/UX for android and ios

1.3 Scopes

This mobile application based real time solution for waste Trading and Managing system is a great help for the people of **Malaysia** and the **Environment**. It's very effective for ensuring proper collection, distribution and recycling of household and Industrial waste. This application has four different types of user base and as such users are able to sign up based on their requirement and business type. Every user is unique and so is their needs, while keeping this in mind this application is effective in solving various problems in the process of waste management and trading while making it easy for the user to sell, collect and manage the wastes.

Chapter 2

Literature Review

2.1 Relationship with Undergraduate Studies

Knowledge and skills gained from undergraduate courses have helped in the development of **"Waste Management and Trading System"** project. It would have proven more difficult if these courses were not covered before working on this project. Some of the courses are:

Object Oriented Programming, CSE213+L: This is our first object-oriented programming course. I learned here total OOP concept with the programming language JAVA. But in my project, I have used Dart. But main fact is that the structure and main concept of OOP is same in every programming language.

Database Management, CSE303+L: This is the course where I learned about database in detail. In this course, I learned how to connect a server with database and how it works also I learned MySQL and Querry. In our project, I need this concept to connect with a server and keeping safe the data in a database using Firebase as the backed.

System Analysis and Design, CSE307: In system analysis and design, I learned in detail with a system. We learned the paperwork about Business Requirement Document (BRD), System Requirement Specification (SRS), Software Design Document (SDD). So, this course will helped me to complete this project. Without analyzing a system, we can't move forward as well as without any proper design of any project what should we do.

Software Engineering, CSE451: Basically, in software engineering, I learned about a systematic approach to develop a software. I also learned some methodology, how to create WBS etc. and so many. So, this is really helpful for us to complete this project within a proper guideline.

2.2 Related works

There are a few relatable applications in the market till date which are simile to my application but the percentage of similarities are not very high. As we have user Flutter & Firebase to create this complete application its very high performing & portable as well as dynamic. Other related applicatins are given bellow:

1. **Trash To cash:** An application for trading waste directly to a collection center. Individual vendors can gain access to this system neither collection center can gain parches access on it
2. **Recycle!:** An application for trading waste. Its already published in the market. Search on map and more updated features are implemented for searching. Similar features will be implemented in our project

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

Work Breakdown Structure (WBS) is a hierarchical structure which demonstrates a project's breakdown into smaller segments. For our project, we have produced a WBS so that our work is coordinated. WBS covers a visual of all the scopes, risks, points of communication, responsibilities, costs and guarantees that it does not skip essential deliverable. For brainstorming and collaboration, it is the ideal tool for the team. In our WBS, we have used the top-down approach.

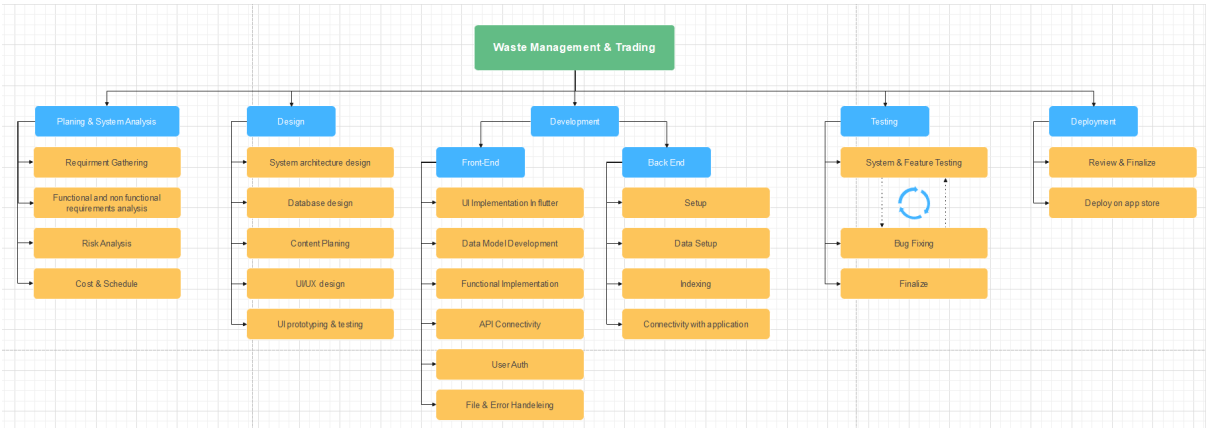

Figure 3.1: Work Breakdown Structure

3.2 Process/Activity wise Time Distribution

The estimated time required to end a project successfully defines process wise time distribution. This helps the developers create a mind map as to how efficiently they need to work in order to meet the deadlines. The most significant challenge in correctly designing an application is time and time management. So, first and foremost, the content must be fixed, and development must be based on this context. The technique of planning and regulating how much time to spend on various tasks is known as time management. Good time management allows an individual to do more in less time, reduces stress, and leads to professional success. Time distribution is greatly needed to complete any project.



Figure 3.2: Process/Activity wise Resource Allocation

Here, we need 11 days for project planning & System Analysis, 19 days for designing, 40

days for Development which includes 30 days for front end development and 10n days for back end development & 9 Days for testing. After that the Phase 1 o the application were deemed complete and now this application is in Malaysia where the client is testing the current features.

In the development process, used time for front end & back end development overlapped as the back end is build on Firebase the changes were done simultaneously.

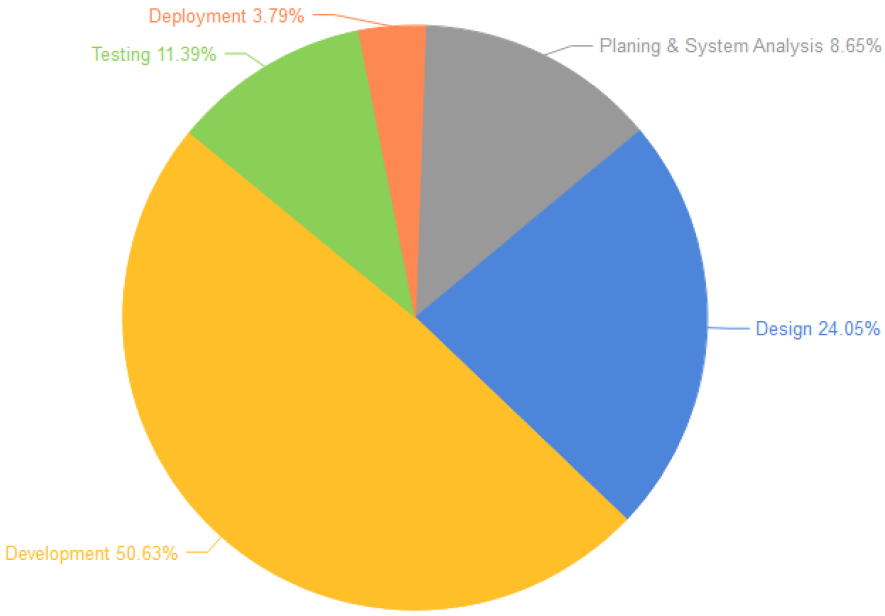

Figure 3.3: Critical Path Method for Waste management and trading

3.3 Grant Chart

A Grant chart is a project management tool assisting in the planning and scheduling of projects of all sizes, although they are particularly useful for simplifying complex projects.Project management timelines and tasks are converted into a horizontal bar chart, showing start and end dates, as well as dependencies, scheduling and deadlines, including how much of the task is completed per stage and who is the task owner. This is useful to keep tasks on track when there is a large team and multiple stakeholders when the scope changes.

A Grant chart is used for the following activities:

- Establish the initial project schedule - who is going to do what, when and how long will it take.
- Allocate resources - ensure everyone knows who is responsible for what.
- Make project adjustments - the initial plan will need many adjustments.
- Monitor and report progress - helps you stay on schedule.
- Control and communicate the schedule - clear visuals for stakeholders and participants.
- Display milestones - shows key events.

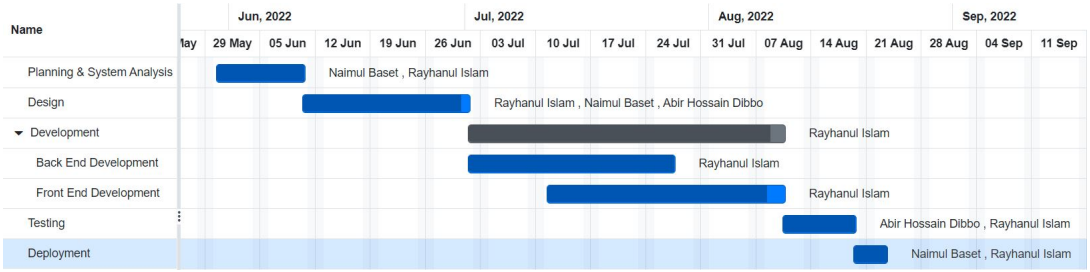

Figure 3.4: Grant Chart

In this Grant Chart, we divided our work in 5 steps. Project Planning & System Analysis, Design, Development, project testing and project closure. Here, we start our work from the end of May in 2022 and approximate time to finish the project 27th August of 2022.

3.4 Process/Activity wise Resource Allocation

With the intention of developing this **Waste Management &Trading System**,necessary resources and man working hours were allocated. In the **Grand Chart** 3.4 I have added the responsible personal for step wise completion.

Planning & System Analysis: In order to complete this project, we had to collect the requirements from our client. The requirements were related to how the client wanted the mobile application to look, feel and work. In this stage we discussed the scope, feature & risk involved with the development of such application. With the requirements gathered,

project planning took place with the stakeholders, and the time line for other activity's were set for next four stages.

Design: In this stage we Developed the design & architecture of the application. This stage involved System architecture design, Database design, Content Planning, UI/UX design and Prototyping. For the proper development and completion of this stage tools such as Figma, EdwarMax were used for designing flowcharts, Activity diagram, Workflow, Database architecture and the mobile application UI. After completion of this stage we discussed it over with the client & after finalization we moved on to development.

Development: The development phase is primarily concerned with the creation of the application. In this stage I was responsible for developing & delivering the planed software. So to complete this stage, the tasks were divided into small sub task & modules and it was reviewed by **Naimul Baset (Managing partner)** of our company. After end of every successfully module we moved on to the next one after conducting an alpha testing of the application.

Testing: During this phase, the application was tested at the same time as it was being developed. It was required for me to debug at every stage of the development process when the application was being tested. The final step in this phase was to show the client the final application and obtain his approval before the phase's deadline.

Deployment: As of today the first targeted phase of the application is complete & currently it's being tasted by a selected group of people. Based on the feedback from the client and involved stake holders work on the next Phase will start soon.

3.5 Estimated Costing

The cost was calculated on the basis of the features requested by the client. As till date the first phase of the development is complete. The given costing for project completion is an estimation and not the actual costing.

The estimated costs was Tk 1,90,000 (BDT) for the whole project. If any additional service support is required within 1 year of deployment, then some additional charges will be taken

	Tasks	Working Days	Resourse	Percentage
	Planning & System Analysis	11	Naimul baset Rayhanul Islam	8.69 %
	Design	19	Naimul baset Rayhanul Islam Abir Hossain Dibbo	24.05 %
	Development	40	Rayhanul Islam	50.63 %
	Testing	9	Naimul baset Rayhanul Islam Abir Hossain Dibbo	11.39 %
	Deployment	3	Naimul baset Rayhanul Islam	3.79 %
Total	5	79		100 %

Figure 3.5: Process/Activity wise Resource Allocation

Tasks	Costs
Firebase Services(Under Development)	5000 tk
System Analysis & Design	40000 tk
Development	100000 tk
Testing	25000 tk
Deployment & Utility	15000 tk
Google Map API (Development Phase)	5000 tk
Total	190000 tk

Figure 3.6: Table for Estimated Costing

Chapter 4

Methodology

Methodology refers to the overarching strategy and rationale of our project. It involves studying the methods used in our field and the theories or principles behind the selection process to develop an approach that matches our objectives. The methodology is a system of methods that we use in a specific area of study or activity. The methodology is the detailed procedures used to identify, select, process, and analyze information about a subject. The mobile application I have developed is a functional application, and it was developed using modern developing technologies. [1]

Software Development life cycle (SDLC) is a functional model used in project management that defines the stages include in an information system development project, from an initial feasibility study to the maintenance of the completed application. There are different software development life cycle models specify and design, which are followed during the software development phase. These models are also called "Software Development Process Models." Each process model follows a series of phase unique to its type to ensure success in the step of software development. Here, are some important SDLC life cycle:

For this project we have chosen the Agile Methodology. Sometimes it works in iterative development as well. Agile is a process by which a team can manage a project by breaking it up into several stages and involving constant collaboration with stakeholders and continuous improvement and iteration at every stage. This approach starts with customers portraying how the finished result will be utilized and what issue it will solve. It doesn't fabricate a whole framework on the double, yet rather grows steadily. [2]

Reasons for choosing agile methodology:

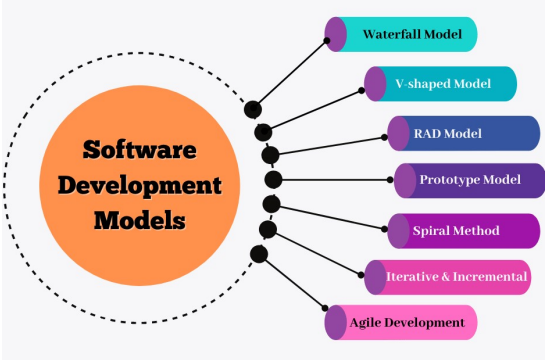

Figure 4.1: SDLC Models

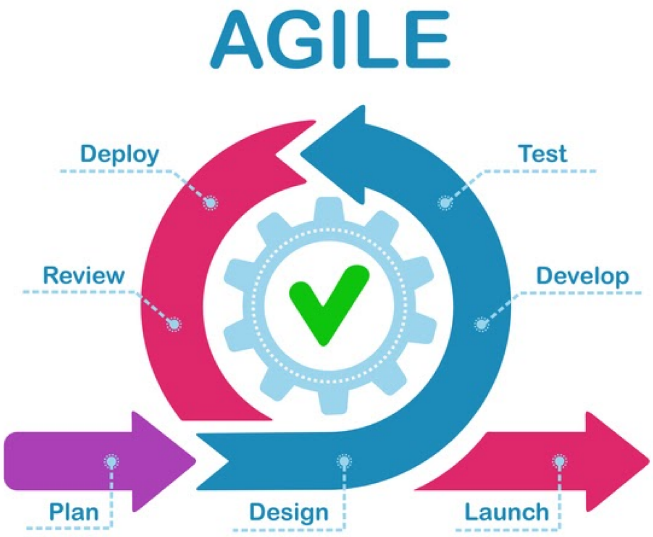

Figure 4.2: Agile Model Structure

1. **Faster time to market:** Heaps of people that choose to go lithe are pretty tired of multi month delivery cycles that frequently convey an inappropriate item to showcase and our clients simply aren't keen on purchasing. The possibility of two weeks' delivery cycles and quarterly release cadences is quite engaging. Our business sectors and our opposition are simply moving excessively quick. So, we must show signs of improvement at getting working items out the door faster.

2. **Customer satisfaction:** Making products that our customers can use and meet their needs. They are also pleased with the option to frequently add new highlights based on their feedback. As a product customer, I can think of nothing worse than investing resources in a product that doesn't work, doesn't do what we need it to do, and we can't see a way to improve it. Agile enables us to forge strong connections with our clients, ones in which we collaborate to find solutions to problems.

3. **Build the right products:** Whether or not we are building the specific features that our customers want, consistent delivery encourages us to build them in the way that our customers will actually use them. When we deliver in smaller chunks, we have the opportunity to let our clients see the evolving product, respond to it, and make changes as we go. Agile aids in the team and customer coming to the best decision possible.

4. **Early risk reduction:** Agile doesn't regard risk as a different area to be overseen. Agile is risk management. By conveying early and getting feedback, we lessen the danger of building an inappropriate product. By ceaselessly incorporating and fabricating imperfection free programming, we decrease the risk that our stuff wasn't constructed right not long before we have to put it up for sale to the market.

5. **Better quality:** Agile fixes time, cost, and quality and gives us the tools to change the business and specialized extent of the arrangement. You probably won't get all that you sought after, however you can believe what was delivered.

6. **Efficiency:** People are aware that big future plans typically end up being useless in the long run. People are aware that the people in their functional silos don't communicate well with one another. Lithe promises to assist us in eliminating the unnecessary information so that we can focus on creating useful software.

Chapter 5

Body of the Project

The body of the project in the report is a detailed discussion of the work for those readers who want to know in some depth and completeness what was done. The body of the project shows what was done, how it was done, what the results were, and what conclusions and recommendations can be drawn.

5.1 Work Description

Waste Management & Trading System aims to create easy transaction method between the general household & the industry in regards of trading waste.In this system we have created a trading system for everyone. We have created a Marketplace where general public can trade their waste and collectors and companies who are involved in the training or re-purposing waste, can easily purchase them directly from the clients or from the collectors. Till date we have developed the first phase, which includes two types of users and they are the collector's and the end user's. These two types of users generally interact to each other directly but even with direct contact the transaction system is not as fluent as it should be. Thus we have developed this system so that the end user can easily post any of the products they want to dispose or they would like to trade it for money and the collector's can see this product's in the Marketplace and offer any amount the deemed fit. Multiple collector's can bid for a single product and the end user can communicate with all the Collector's who are interested in the product and make a final Decision about the transaction we believe this system will benefit the waste management and trading industry a greatly.

Major modules & requirement's of the system are described bellow:

1. **User Authentication:** In this module we have developed a system to authentication the users using Firebase through their email address and password we also collect information such as their names phone number and what kind of users they want to login as. As different users have different roles in the system it is very important

2. **Registration & Login:** For registration the user needs to provide valid information regarding their phone number email address password and what kind of user they want to login as and on the other hand to login the user will just input their password and email address in the system and the user will directly be taken to a dedicated dashboard for this particular user.

3. **Role based tasks & Dashboard:**In the system we have four types of users such as the end-user, collector, collection centre, and warehouses. Each of the users have different significance and task they should be performing, so to enable them for completing the task and fulfilling their demands for the accomplishment of trading waste materials we will develop dedicated dashboards and user friendly interfaces for this purpose. Till date we have developed the Applications for end user's & collector's.

4. **Post Waste for dispose or trading:**As the main task of the system is to enable users in trading waste materials, being able to post in the Marketplace is the most crucial feature of this application. This feature is available for every users except the Collection Center type users. Primarily we have developed this system in the end users portal and the collector's portal till date. To post any products in the Marketplace the up-loader of the product needs to go through three stages in the first stage they upload images of the product in the second stage the relative information regarding the product and in the final stage the pickup address or visiting address is provided by the post creator.

5. **User address management:**While developing the system we came across a problem, and the problem was a particular user has to input the same data over and over again as their address for different posts. Later on we decided to make an address management system inside of the main system so that the user could save addresses under different tags and reuse this addresses while they were posting products in the market place so that they don't have to fill up a form every time with the same data. Currently in the system they can just click and select whatever address they want to assign to a particular post and multiple addresses can be saved for a single account

6. **Viewing Post in Market:**This feature is one of the most important feature for every other user except the end user the collector, collection centre and warehouses will be able to see the purchasable items in the Marketplace and from there they can add those products to the interest or offers list

7. **Different Market for Different users:** For the benefit of this industry we have decided our goal market into 3 different sections the first section is for the collector's where they will be able to see all the post from end-users and the second section is for the warehouses where they will be able to see the posts from Collector's and end users and the final store is for the collection centres from where only the collection centre accounts will be able to view the post from warehouses and the collector's

8. **Sending Proposal to Purchase waste:** This is one of the core features of this application for a single product. Multiple users or buyers can bid for the same product. The building feature is only applicable for the collector, warehouse and collection centres after this trees uses send the proposal the one who posted the product can communicate with all this users simultaneously through application

9. **Transaction Module:** This is the very important feature on this application after buyer has shown interest to any Sellers product if the seller accepts the proposal then this transaction process starts.In this transaction process the seller gets multiple visiting time proposals from the buyer if any of the dates are acceptable by the seller they accept the date this is the first stage after an accepted date is set the the buyer can go and pick up the product. Then from the buyers application if the buyer confirms the product has been picked up the seller also gets another prompt to ensure that the product was actually picked up and on the other hand the buyer is asked to provide the estimated price or the actual price they have paid for this product after both parties have confirmed about the transaction this transaction is added to the history

10. **Selling & Buying History:**Every record of a product purchase or sale is kept under the history tab of individual users. From there they can preview their previous sales and parches. This data can also be filtered by date and time & type.

11. **Communication Module:** Through out this application communication module is the most important one after a buyer shows interest in a product or users are on the transactions state communication between them is essential for the process to go forward and to ensure that in this application we have included and separate chatting system where the buyer and seller can easily chat send out individual appointment date and also send images of the product if necessary and they can also make phone calls or text directly from their phone using their personal cellular service

5.2 System Analysis

System analysis is a problem-solving method that involves looking at the wider system, breaking apart the parts, and figuring out how it works in order to achieve a particular goal. It is applied to information technology, where computer-based systems require defined analysis according to their makeup and design.

5.2.1 Six Element Analysis

Process Name	System Roles				
	Human	Computing Hardware	Software	Database	Network & Communication
Registration	All User	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Login	All User	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Post Product	End-User, Collector, Warehouse	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
View & Filter posts in Market Place	Collector, Warehouse, Collection Center	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Send purchase offer	Collector, Warehouse, Collection Center	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Receive Purchase Offer(Multiple Bidding)	End-User, Collector, Warehouse	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Transaction (Product Exchange)	All User	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Buying History	Collector, Warehouse, Collection Center	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Selling History	End-User, Collector, Warehouse	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Communication (Chat Module)	All user	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network
Address Management	All user	Mobile Phone	Mobile Application	Firebase Firestore(NoSQL)	Any Network

Figure 5.1: Six Element Analysis for Waste Management and Trading

5.2.2 Feasibility Analysis

The analysis of a proposed project is to determine whether it is feasible and should go ahead is called feasibility analysis. Confirmation of design, plan and strategy is the main priority of this analysis. This can be used to validate assumptions, constraints, decisions and approaches.

There are some main parts of feasibility analysis. They are -

1. **Technical Feasibility:** Technical feasibility involves performing an assessment of the proposed system's software, hardware, and other technical requirements. This evaluates the specifics of how we plan to provide customers with a good or service. Consider the following when thinking about your coworkers: materials, transportation, the location of our company, and the technology required to make it all happen.

   In the **Waste Management & Trading** application we have use the latest technologies available in the market for Cross platform development and that is **Flutter** moreover as the back-end of the application We have used the most popular serverless back-end framework **Firebase**. Including for authentication services we are use Firebase Auth for storage we have use Firebase storage to store images. This user technologies are highly excepted in the market & it also insures a smooth user experience.

2. **Operational Feasibility:**Operational feasibility is a metric used to assess how well a proposed system addresses the issues and complies with the specifications established during the scope definition and problem analysis phases. It involves estimating whether the system will be used if it is developed and implemented and depends on the amount of human resources that are available for the project.

   In the modern world managing and disposing day to day and industrial waste is very crucial for the preservation of the environment. **Waste Management & Trading** system was built on such premise that, this application is very easy to use and also very easy to manage. The customers of this application complete their fundamental tasks by themselves and may need support only regarding a few topics. In the system we have used a server less back-end and the security and maintenance part solely depends on Firebase so no maintenance cost is required.

3. **Economic Feasibility:** Costs and benefits are identified in economic viability. It calculates cash flow and values costs and advantages. Economic feasibility takes

production and development costs into account. This system will undoubtedly be advantageous if it can reach the users. On the one hand, it will lower the costs associated with wasting human labor, pens, and paper. However, advantages will appear depending on uses.

5.2.3 Problem Solution Analysis

One of the biggest problem in software development is undefined or ambiguous scope & system analysis. Majority of the project delay happens for this particular reason. Then again changing requirements causes more delay and it becomes very hard to keep track of changes thus causing more delay in final delivery.

For solving this kind of misshapes we used the agile model with strong recherche on the system, business needs and processes. More over,

1. Describe the project's scope.
2. Make no assumptions about what is required.
3. Communication between teams is essential.
4. Make a list of requirements.
5. Clients should be involved from the start.

This logic's were also followed.

5.2.4 Effect and Constraints Analysis

Effect: Due to the manual process the waste management industry is not fully functional and the importance is not well known by everyone involved. As this system introduces a brand new horizon to facilitate and benefit all involved party will be benefited in the process of transaction, maintenance and overall convenience. There are multiple remarkable features such as multiple bidders for same post, communication module, transaction module, offering model and history module which will help to set an industry standard for every waste material and also will help people to understand the importance off the maintenance, management and value of this industry

Constraints: The manual process has been in place for long time and to shift from a completely manually handled industry to the digital version of it will take some time. Also in the beginning the requirements were not completely finalize but letter on they were well established then our higher Management divided them into achievable targets within a delivery date but as every development projects new requirements and bounds where being introduced after every meeting but they didn't change enough to completely restart the work from the very beginning thus the project was done in due time.[3]

5.3 System Design

Systems design is the process of defining elements of a system like modules, architecture, components and their interfaces and data for a system based on the specified requirements. It is the process of defining, developing and designing systems which satisfies the specific needs and requirements of a business or organization.[4]

5.3.1 Rich Picture

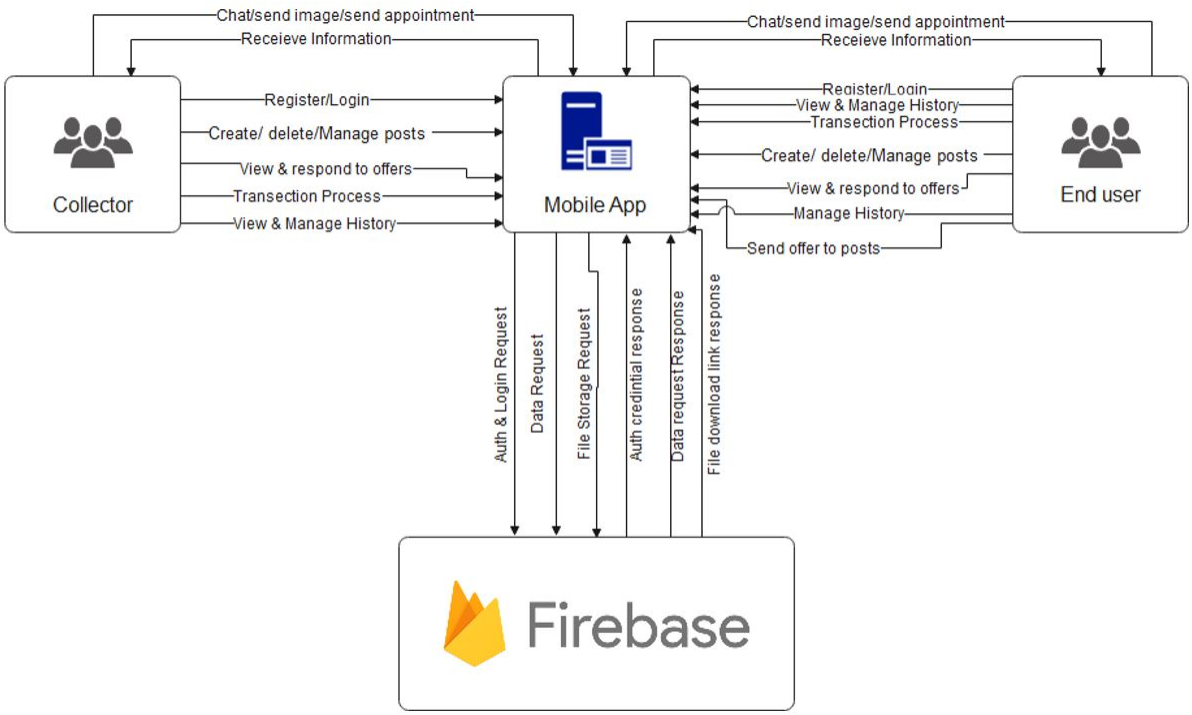

Figure 5.2: Rich Picture for Waste Management and Trading

5.3.2 UML Diagrams

Firebase is a noSQL database. As the system was built using Firebase, we cannot properly draw a UML diagram for this system but still the given below diagram is a reference of the database structure we have used in our system

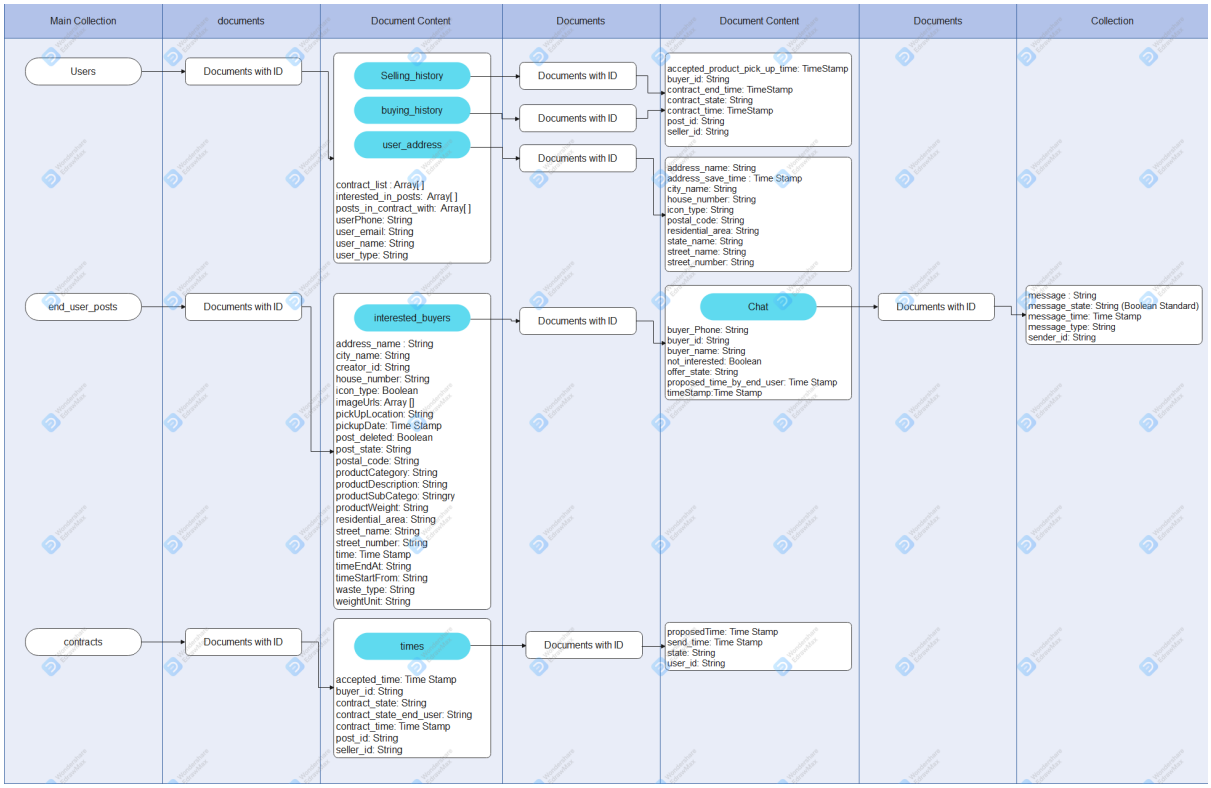

Figure 5.3: UML Diagram for Waste Management and Trading

5.3.3 Functional and Non-Functional Requirements

1. **Functional Requirements:**

Function	Users can register in the system		
Input		Process	Output
• Email • Phone Number • Name • Password • User Type		• Open App • Click Signup Button • User will Provide necessary information in the Register screen • Click Sign Up	Go to user type based dedicated dashboard
Precondition	• App must be Installed • Proper Internet Connection		
Post condition	Go to Dashboard		

Figure 5.4: Functional Requirement 1

Function	Registered users can Login to the system		
Input		Process	Output
• Email • Password		• Open App • User will Provide necessary information in the Login Screen • Click Login Button	Go to user type based dedicated dashboard
Precondition	• App must be Installed • Proper Internet Connection		
Post condition	Go to Dashboard		

Figure 5.5: Functional Requirement 2

Function	Create Waste Selling Post		
Input		Process	Output
• Images • Post Related Information • Address		• Click Trade • Provide Images • Click next • Provide Information • Click next • Select or add Address • Click Upload	Success message for product upload
Precondition	• App must be Installed • Proper Internet Connection • Must be authenticated user		
Post condition	Post should be visible in My Bin		

Figure 5.6: Functional Requirement 3

Function	Send offer to post from market		
Input		Process	Output
• Filter options • Category selection • Upload time range		• Go to Dashboard • Click Shop • Filter & search posts • Click post to view details • Click Interested button	Success message for offer send
Precondition	• App must be Installed • Proper Internet Connection • Must be authenticated user		
Post condition	Success message for offer send		

Figure 5.7: Functional Requirement 4

Function	Chat with other users		
Input		Process	Output
• Message		• Go to chat page of different users from post offers • Enter message, Images, appointment time • Send Message • Receive Message	Preview message on screen
Precondition	• App must be Installed • Proper Internet Connection • Must be authenticated user		
Post condition	Preview message on screen		

Figure 5.8: Functional Requirement 5

Function	Seller can complete Transection		
Input		Process	Output
		• Accept an offer for a post • Go to Transection Page • Accept a pickup time • Confirm pickup	View transection in history
Precondition	• App must be Installed • Proper Internet Connection • Must be authenticated user		
Post condition	View transection in selling history		

Figure 5.9: Functional Requirement 6

Function	Buyer can complete Transection		
Input		Process	Output
• Pickup Date times • Actual or estimated price		• Go to Transaction page • Select post • Provide time • Input price • Confirm pickup	View transection in buying history
Precondition	• App must be Installed • Proper Internet Connection • Must be authenticated user		
Post condition	View transection in buying history		

Figure 5.10: Functional Requirement 7

Function	Add address in address module		
Input		Process	Output
• Address		• Go to Dashboard • Click address prompt • Provide Address • Set Name • Add address	
Precondition	• App must be Installed • Proper Internet Connection • Must be authenticated user		
Post condition			

Figure 5.11: Functional Requirement 8

Function	Manage & View History of purchase & sell		
Input		Process	Output
		• Go to Dashboard page • Click History • Filter & View	View History
Precondition	• App must be Installed • Proper Internet Connection • Must be authenticated user		
Post condition	View History		

Figure 5.12: Functional Requirement 9

2. **Non-Functional Requirements:** Non-Functional Requirements in Software Engineering presents a systematic and pragmatic approach to building quality into'software systems. Systems must exhibit software quality attributes, such as accuracy, performance, security and modifiability.[5]

   Non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. Non-functional requirement are contrasted with functional requirements that define specific behavior or functions.

   Key factors which we focused on:

   (a) Performance

   (b) Scalability

   (c) Portability

   (d) Compatibility

   (e) Reliability

   (f) Availability

   (g) Security

while talking about non functional requirements of an application we generally focus on the usability and user friendliness of the application or how much hassle less that application is for the users to use. So for achieving maximum user-friendliness from this application we have focused primarily on few elements and they are performance, scalability, portability, compatibility, reliability, availability and security of this application. Regarding the performance we have used the latest technology to develop the software so it insurance and guarantees that the performance of this application will be top notch secondly the application is completely scalable based on the Framework we have used it's portable as we have used for flutter that can be easily implemented in different platforms with the same code base. Is compatible as we have used and earlier SDK for Android its reliable and based on the server used the security and availability issue are managed as Firebase insurance in the targeted region the security and availability of the software 24/7.

5.4 Product Features

Product features generally refer to the benefits the customers will get by using the application, down bellow we have discussed about the benefits of using waste management and trading system in details

If we want to conclude the features available in the waste management training system in a nutshell that would be enabling users to trade their wastes in a auction type Building System where market standard can be set. Users can easily and dynamically trade their products to whom ever they wish to as the buyers can collect the products through a maintain process which we refer to as transaction process again users can also view their history of purchase and sell and also the buyers can send offers to multiple post at a time and for a single post every seller can get multiple proposals from different buyers and on top of that there is a communication module by which the users can easily communicate with each other.

5.4.1 Input

5.4.2 Output

Waste management and trading system is an extremely dynamic application where for every single action there are different outputs and leaves available for example in the transaction process for every step there is a a indicator that changes when the state changes or if a post got an offer from a buyer the buyer won't be able to see that post in the Marketplace anymore but it will be visible in his interest. As their are so many changes everywhere, identifying every output is quite hard but it would be more easier to show everything in the demo portion of the paper.

5.4.3 Architecture

Architecture of the software generally referred to the structure information of the data flow. Waste management and trading systems general architecture is very simple but effective. As we have used Firebase for our back end development, for authentication and data and image storage everything is handled in the back end server moreover in the front

Inputs of Waste Management & Trading System		
Sr. no	**Process**	**Fields Type**
1	Login	1. Email 2. Password
2	Registration	1. Email 2. Name 3. Password 4. Phone Number 5. User Type
3	Create Post	1. Images List (minimum 1) 2. Product Category 3. Product Sub Category 4. Wright 5. Weight Unit 6. Discerption 7. Visiting Date 8. Visiting Start Time 9. Visiting End Time 10. Address
4	Create Address	1. Address name 2. Address save time 3. City name 4. House number 5. Icon type 6. Postal code 7. Residential area 8. State name 9. Street name 10. Street number
5	Send Offer for Post	Filter Options
6	Communication Module	Chat Message
7	View Market Place	Filter Options
8	Transection of seller	Accept Offer & Confirm pickup
9	Transection of Buyer	1. Pick up Date time offer 2. Price

Figure 5.13: Inputs for Waste Management Application

end we have used Flutter to build the mobile application for different users and this users directly use their mobile device to communicate with the database and through that to every other user.

Chapter 6

Results & Analysis

Several flaws were discovered during the program's testing. This was a small problem that we were able to fix. Test cases were documented when these issues were resolved. All test cases were justified using testing approaches. The work is done till phase one and now its being tested in Malaysia in a closed group. After the testing is complete & we receive feedback, further development will resume.

6.1 Graphical User Interface Result

The graphical user interface is a form of user interface that allows users to interact with electronic devices through graphical icons and audio indicator such as primary notation, instead of text-based user interfaces, typed command labels or text navigation. Here I attached only my work that I have done in this project and it was successfully done.

6.1.1 Login & Sine Up

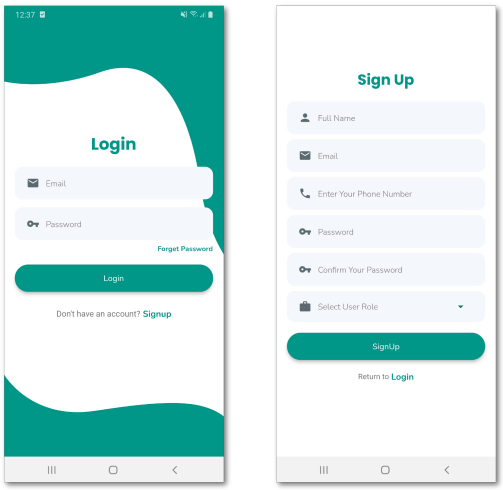

Figure 6.1: Login & Sine Up for Waste Management Application

6.1.2 Create Post

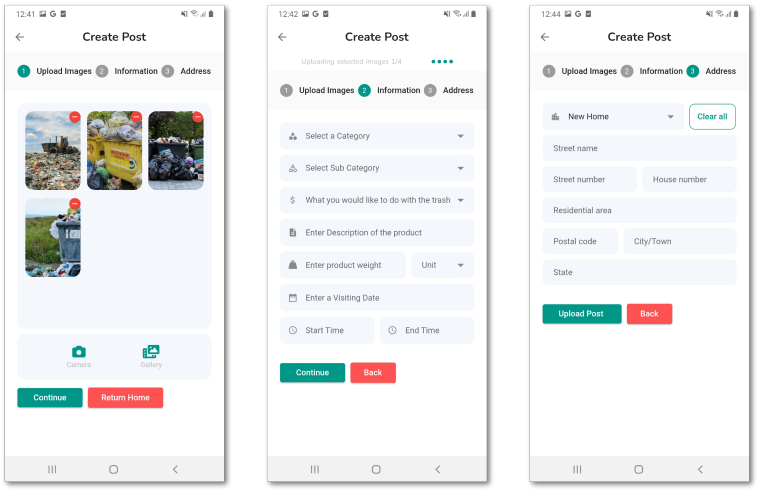

Figure 6.2: Create Post for Waste Management Application

6.1.3 My Posts

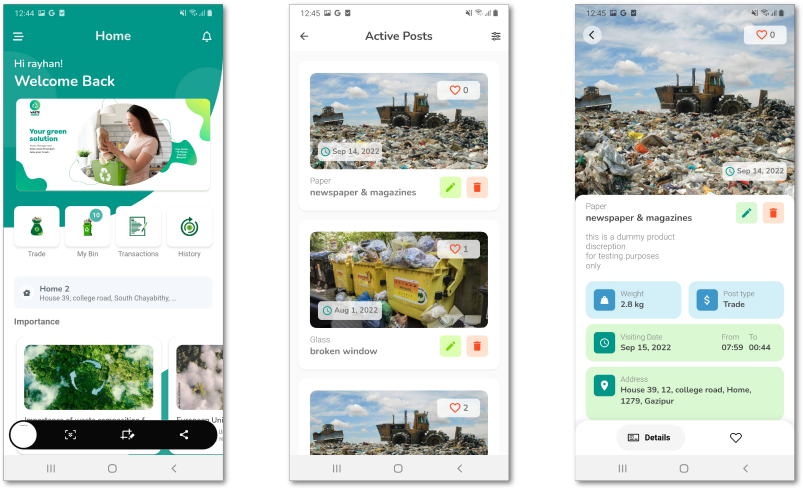

Figure 6.3: My Post for Waste Management Application

6.1.4 Transaction process of the seller

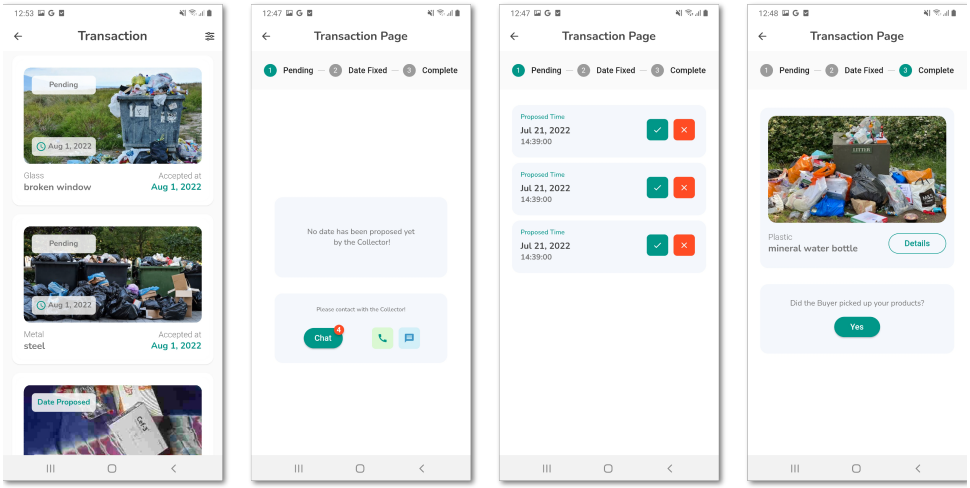

Figure 6.4: Transaction for Waste Management Application

6.1.5 History

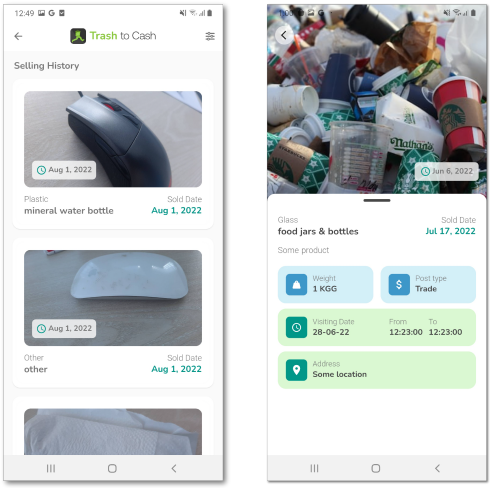

Figure 6.5: History for Waste Management Application

6.1.6 Others

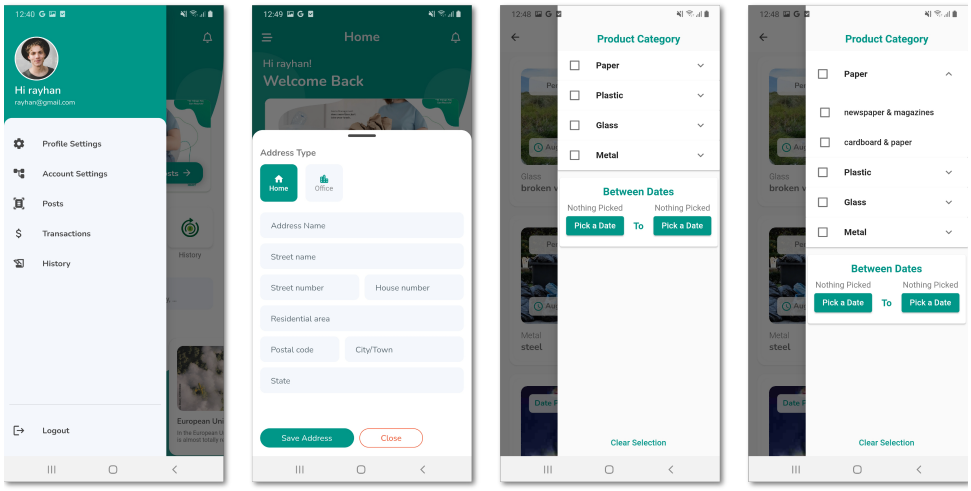

Figure 6.6: Others for Waste Management Application

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

In our changing world, sustainability in projects is more important than ever. Project sustainability involves both individual and organisational responsibility to ensure that outputs, outcomes and benefits are sustainable over life cycles and during their creation, disposal and decommissioning. Building sustainability into the vision at the very start of the project. If sustainability is planned in as a key requirement from the outset, it can't be traded or forgotten.

while designing a project Sustainability was one of the main targets. Some research was concluded to ensure the sustainability of the project as the processes and the project plan was developed based on that.

7.2 Social and Environmental Effects and Analysis

This system will be responsible for creating huge social and economic change in the market. Primarily the focus of this software is to ensure the health of the environment and to enlighten people about the importance of recycling and proper disposal of their wastes.

As in one hand we are taking a completely manual process to a digital version and with that we are creating a brand new dimension of economic change in the market. Till now people are not ever of the importance in value of the waste produced in the daily life. This product can be sold or re-purpose and by that ensuring the health of the environment and to make new raw materials.

Through this application this tasks will be done in a digital environment, thus ensuring new challenges & changes.

Chapter 8

Lesson Learned

I was doing my internship as a Programmer on a software farm named TechTrioZ Solutions. When I was offered an internship at TechTrioZ Solutions., I got the chance to work as a developer and I learn a lot from them. Our project's goal was to create a system for TechTrioZ Solutions. named "Waste Management & Trading System". As a front-end developer I have to develop the system with a framework. It was completely new experience for me to work with and organizational team. During this period, I didn't face many problems but got the chance to learn a lot.

8.1 Problems Faced During this Period

Coping up with the new environment from the very beginning I wasn't that much difficult as I had my seniors from my own University there to guide and support me and moreover the management structure of the the Institution is phenomenal everyone is there to support and help everyone out and they worked as a perfectly sync team to complete the task.

8.2 Solution of those Problems

Still as a new developer I had to learn a lot for coping up with my seniors. How to handel a meeting and to keep my clients & the management of the office up to date about my

works & progress.

Chapter 9

Future Work & Conclusion

We have completed the first phase of the application. Soon the development of the next phase will start. By the mercy of Allah, I will be joining TechTrioZ Solutions for the future upgrades and updates of this project.

9.1 Future Works

In the next Phase of the development we are planing to implement:

1. Collection Center dashboard
2. Warehouse Dashboard
3. Geo location tracking and direction
4. Google Map
5. More compact & useful product search
6. More Compact UI/UX
7. Different Sign up System for users
8. Upgrading the already implemented interactive features

9.2 Conclusion

The internship has been a very faithful and worthy experience for me. During this internship, I learned a lot of things. I had not any knowledge about the industrial activities. But I know how to cope with any environment because I gained the practical knowledge and experience. It will help me in future. Intern means to be learned a lot of things from the organization where they will appoint for Internship. Yes, I learned a lot of things, such as, how to gather requirements, team management, tools that we used and finally techniques for developing a project and so on. I am very glad to work as a team member with a Software Developer team. In the end, I would like to thank both my internal and external supervisors whose guidance and motivations have pushed me to do the project successfully.

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