ABSTRACT

Abstract

Plastic waste management poses a significant environmental challenge, with many individuals struggling to correctly identify plastic types, locate recycling centres, and find reliable recycling instructions. Current resources, such as online guides and community programs, are fragmented, lack personalisation, and do not provide sufficient engagement tools to encourage proper recycling. As a result, recyclable materials often end up in landfills, contributing to environmental degradation.

EcoSort overcomes these limitations by providing a centralized, user-friendly mobile application designed to guide users through plastic identification, recycling, and eco-friendly alternatives efficiently. The app helps users identify and recycle four common types of plastic by tapping on familiar product images, offering manual recycling guides, and discovering nearby recycling centres in Puducherry. EcoSort goes further by suggesting eco-friendly alternatives and reuse ideas to reduce plastic waste, making recycling both practical and sustainable.

The app also addresses the need for reminder systems by allowing users to confirm recycling actions, input recycled quantities, and schedule reminders with custom or default times. Users earn points based on the amount of plastic they recycle, and once they reach certain thresholds, EcoSort rewards them by displaying real-life products—like bags or T-shirts—made from the recycled plastic, progressing through levels—from *Eco Starter* to *Eco Legend*—motivating long-term sustainable habits.

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CHAPTER 1

1. INTRODUCTION

1.1 SYSTEM OVERVIEW

EcoSort is an Android-based mobile application developed to promote eco-friendly practices by helping users identify, manage, and recycle plastic waste. The app focuses on four commonly used plastic types and offers a simple, visual way for users to identify them through familiar household item images.

Once identified, users receive recycling guidance—including manual disposal steps, eco-friendly alternatives, and creative reuse ideas. If manual recycling isn't feasible, the app suggests nearby certified recycling centres in Puducherry for convenience.

EcoSort features a confirmation flow, where users can confirm recycling or schedule reminders using custom or default morning/evening times. Upon confirmation, users input the recycled quantity to earn points. As they accumulate points, they progress through levels—from Eco Starter to Eco Legend—and unlock visual rewards like bags or T-shirts made from recycled plastic, encouraging long-term sustainable habits.

Built using Android Studio (Koala version) with Firebase for authentication, storage, and notifications, EcoSort integrates key modules: Plastic Identification, Recycling Guide, Centre Locator, Alternatives, Reminders, Points System, Level Progression, and Reward Display. The app combines education, convenience, and motivation to make recycling a part of everyday life.

1.1 BACKGROUND

In today's world, plastic pollution has become a growing environmental concern. While awareness about recycling is increasing, many individuals still struggle with identifying plastic types, knowing how to recycle them properly, or finding the right place to do so. The lack of accessible, user-friendly tools for guiding people through the recycling process often results in recyclable materials ending up in landfills or the ocean.

To address this issue, I chose to develop EcoSort, a mobile application that simplifies plastic recycling by helping users identify plastic types, find recycling centres in Puducherry, and adopt more sustainable habits through reuse ideas and eco-friendly alternatives. EcoSort is designed to make recycling more approachable and actionable by turning complex recycling tasks into a smooth, interactive experience.

The motivation behind creating EcoSort was to contribute to a cleaner environment and promote sustainable practices using technology. This project combines my interest in environmental responsibility with my skills in mobile app development. EcoSort empowers users to take small, meaningful steps toward reducing plastic waste, proving that positive change can begin with simple, well-guided actions.

CHAPTER 2

SYSTEM STUDY AND ANALYSIS

2.1 PROBLEM STATEMENT

Proper recycling of plastic waste is often challenging for the public due to a lack of awareness about plastic types, recycling methods, and nearby recycling centres. Many citizens struggle to identify plastics correctly and find reliable information on how to dispose of them responsibly, leading to increased plastic pollution and wasted recycling opportunities.

The EcoSort mobile application addresses this issue by providing a simple, visual platform where users can easily identify four common types of plastic, access recycling instructions, find nearby recycling centres in Puducherry, and discover eco-friendly alternatives and reuse ideas. By integrating identification, guidance, location services, and a reward system into a single app, EcoSort encourages users to adopt sustainable practices, reduces plastic waste, and makes recycling an accessible and engaging part of daily life.

2.2 EXISTING SYSTEM

Currently, plastic waste management and recycling practices largely depend on individual awareness and scattered resources. People often struggle to correctly identify plastic types, find reliable recycling instructions, or locate nearby recycling centres. Although information exists through online articles, environmental websites, and community programs, there is no single, unified platform to guide users through the entire recycling process.

Most individuals either discard plastic waste improperly or store it without knowing how or where to recycle it. Identifying plastic types manually based on symbols or material feel can be confusing without proper knowledge. Moreover, the lack of accessible information about local recycling centres and eco-friendly alternatives makes responsible action difficult.

While general awareness campaigns exist, they often lack personalization, practical tools, and reminder systems needed to keep users engaged. As a result, valuable recyclable materials end up in landfills, contributing to environmental degradation.

The absence of an integrated, user-friendly mobile platform highlights the need for a solution like EcoSort, which simplifies plastic identification, provides clear recycling guidance, suggests nearby recycling centres, and motivates users through reminders and a points-based reward system.

2.2.1 Drawbacks

The current methods for plastic identification and recycling awareness present several challenges, making the process confusing and ineffective. Some of the key drawbacks include:

1. **Lack of a Centralised Platform:** Information about plastic types, recycling methods, and centre locations is scattered across various sources without a unified app to guide users easily.
2. **Difficulty in Identifying Plastics:** Manual identification based on symbols or appearance can be confusing for users without proper knowledge or guidance.
3. **Limited Access to Recycling Centres:** Finding nearby certified recycling centres is often difficult, leading to improper disposal of recyclable plastics.
4. **Lack of Personalised Reminders:** No existing system provides scheduled recycling reminders to encourage regular eco-friendly behaviour.
5. **No Reward or Motivation System:** Current awareness campaigns rarely offer interactive engagement, points, or rewards to motivate users to recycle consistently.
6. **Insufficient Promotion of Eco Alternatives:** Users are not easily guided towards eco-friendly alternatives or reuse ideas that could help reduce plastic consumption.

2.3 Proposed System

To overcome the limitations of the existing system, EcoSort is designed as a centralized, user-friendly mobile application that guides users through plastic identification, recycling, and eco-friendly alternatives efficiently. The system ensures users can easily recognise different types of plastic, find nearby recycling centres, and access practical recycling tips—all within one platform.

The application is divided into modules, including Plastic Identification, Recycling Guide, Centre Locator (Puducherry), Eco Alternatives, Reminder Scheduling, Points System, Level Progression, and Reward Display. Users can identify plastics by selecting familiar household item images and receive recycling instructions or eco-friendly alternatives instantly.

EcoSort also allows users to confirm recycling activities, input recycled quantities, and schedule reminders with custom dates or default morning/evening notifications. As users recycle more, they earn points, level up—from Eco Starter to Eco Legend—and unlock visual rewards showing real-world products made from recycled plastics, boosting motivation.

Built using Android Studio (Koala version) with Firebase for authentication, data storage, and notifications, EcoSort ensures secure access, smooth navigation, and real-time updates. By integrating all essential plastic recycling resources into one app, EcoSort simplifies recycling, encourages eco-friendly habits, and empowers users to contribute to a sustainable future.

2.3.1 Advantages

The EcoSort mobile application offers several benefits by providing a centralized, practical, and motivating platform for plastic waste management and recycling. Some of the key advantages include:

1. **Centralised Recycling Guidance:** EcoSort combines plastic identification, recycling tips, centre locations, eco-friendly alternatives, and reminders into a single, easy-to-access platform.
2. **User-Friendly Interface:** The app is designed with a simple, visual-based interface, making it easy for users to identify plastics and follow recycling instructions without confusion.
3. **Time-Saving Solution:** Users can quickly find recycling information, locate nearby centres, and manage their recycling activities without relying on multiple resources.
4. **Motivation Through Rewards:** The points system, level progression, and reward visualisations encourage users to recycle consistently and stay engaged by showing real-world outcomes of their efforts, such as reaching new eco-levels and viewing products made from their recycled plastic.
5. **Scheduled Reminders:** Users can set custom recycling reminders or use default morning/evening notifications, helping them stay consistent in their recycling habits.
6. **Awareness of Eco Alternatives:** EcoSort promotes sustainable living by suggesting reusable alternatives and creative reuse ideas for plastic products.
7. **Secure and Reliable:** Built with Firebase Authentication and Database, the app ensures safe user login, real-time updates, and secure data storage.
8. **Support for Local Recycling:** By integrating Puducherry's certified recycling centres, EcoSort encourages community-based recycling efforts and makes responsible disposal easier.

2.4 Requirements Specification

2.4.1 Functional Requirements

1. **User Registration & Login Modules:** Users register with their details and log in. After logging in, they see a personalised welcome message and can access and edit their profile (name, email, phone, points, level) with password re-entry.
2. **Plastic Identification Modules:** Users select from four plastic categories based on common household items, with image-based options and guidance to identify the type of plastic they are using.
3. **Recycling Guidance & Alternatives Modules:** After identifying the plastic, users get step-by-step recycling instructions, eco-friendly alternatives, and tips on reusing plastic items.
4. **Nearby Recycling Centres Modules:** Users can find 8 certified recycling centres in Puducherry using the app's GPS feature or manual input, with detailed addresses and contact information.
5. **Recycling Confirmation & Points System Modules:** Users confirm their recycling activity by entering the quantity. If the quantity reaches the required amount, they receive points and a visual of the product made from recycled plastic. They can also schedule a reminder if needed.
6. **Product Visualisation & History Modules:** Users can swipe through their recycled products, view owned items, and track their recycled plastic quantities, providing a tangible representation of their environmental impact.

2.4.2 Non-Functional Requirements

1. **Usability:** The application is designed with an intuitive and visual interface, making it easy for users of all ages to interact with the features.
2. **Performance:** The app ensures quick loading times, smooth transitions, and efficient handling of user actions.
3. **Security:** Firebase Authentication secures user login, and all personal and recycling data are safely stored.
4. **Compatibility:** The application supports Android smartphones running API level 21 (Lollipop) and above.
5. Scalability: The system is designed to accommodate future updates, such as adding more plastic types, new features, or expanding centre listings.

Table 2.5: Project Planning Timeline (Gantt/PERT Chart)

PHASE	START DATE	END DATE	DURATION (In Days)
Requirement Gathering	06-02-2025	10-02-2025	5
System Design	11-02-2025	18-02-2025	8
UI Design (XML Layouts)	20-02-2025	27-02-2025	8
Module Development-Plastic Identification	01-03-2025	05-03-2025	5
Recycling Guide Module Development	06-03-2025	12-03-2025	7
Nearby Recycling Centre Locator	08-03-2025	14-03-2025	7
Firebase Integration	15-03-2025	25-03-2025	10
Reminder & Notification System	26-03-2025	30-03-2025	5
Points & Reward System Implementation	31-03-2025	04-04-2025	5
Testing and Debugging	05-04-2025	20-04-2025	16
Final Review & Modifications	21-04-2025	23-04-2025	3

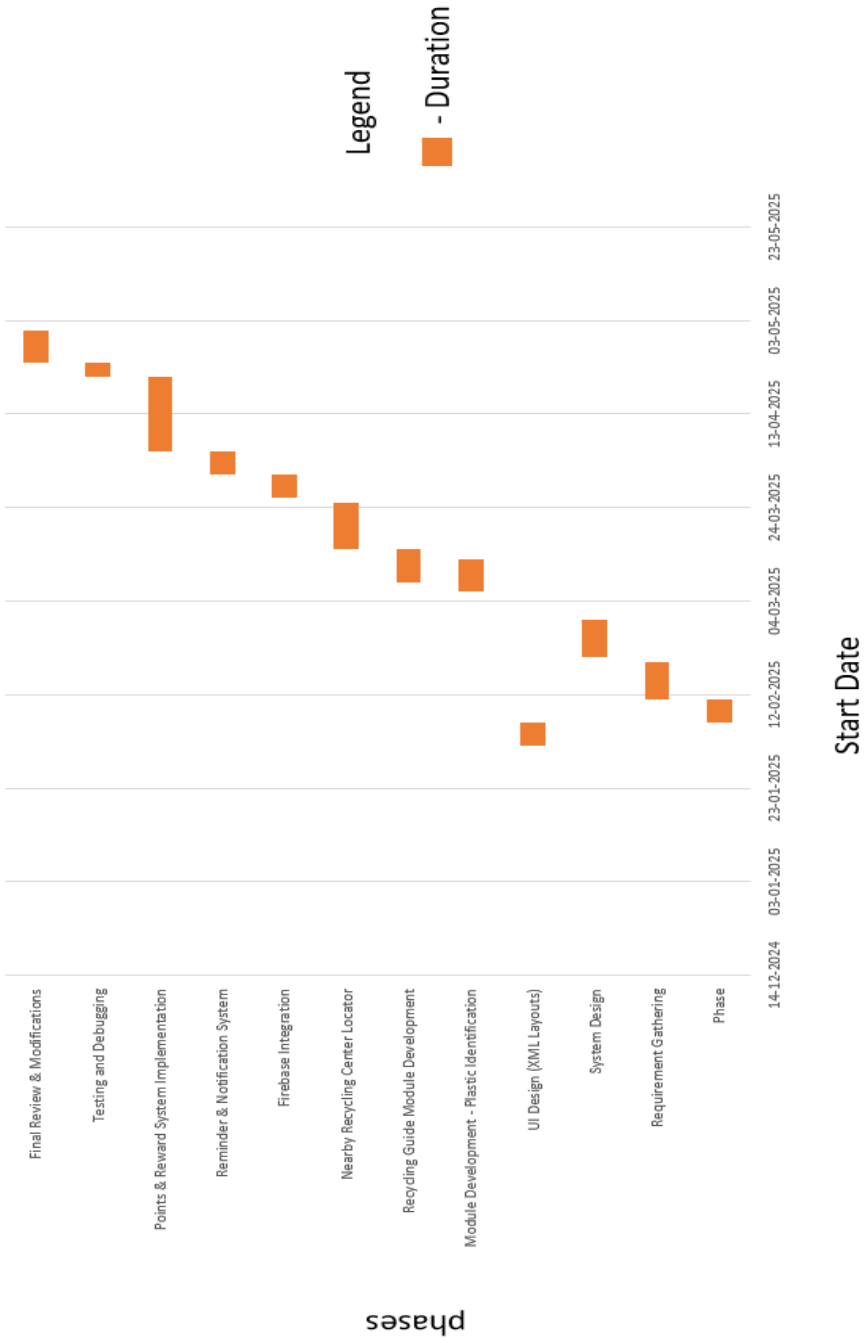

Figure 2.1 Gantt Chart for Project Planning.

Figure 2.1 illustrates the Gantt chart outlining the project timeline and planning phases for the development of the EcoSort mobile application. The chart maps the sequence

and duration of each major task from project initiation to completion, covering the period from February 13, 2025, to April 26, 2025.

The project begins with foundational activities such as Requirement Gathering, System Design, and UI Design (XML Layout), followed by development modules including Plastic Identification, Recycling Guide, Nearby Recycling Centre Locator, and Firebase Integration.

Key features such as the Reminder & Notification System and Points & Reward System (including user-level and badge functionality) are implemented in later phases. This structured timeline reflects a systematic and agile development approach, supporting the timely execution of the EcoSort project.

CHAPTER 3

DEVELOPMENT ENVIRONMENT

3.1 HARDWARE REQUIREMENTS

PROCESSOR	:	Intel i5
RAM	:	16 GB Memory

3.2 SOFTWARE REQUIREMENTS

LANGUAGE	:	Java
DEVELOPMENT ENVIRONMENT:		Android Studio
OPERATING SYSTEM	:	Windows 11
BACKEND	:	Firebase

CHAPTER 4

SYSTEM DESIGN

4.1 SYSTEM DESIGN

4.1.1 SYSTEM ARCHITECTURE

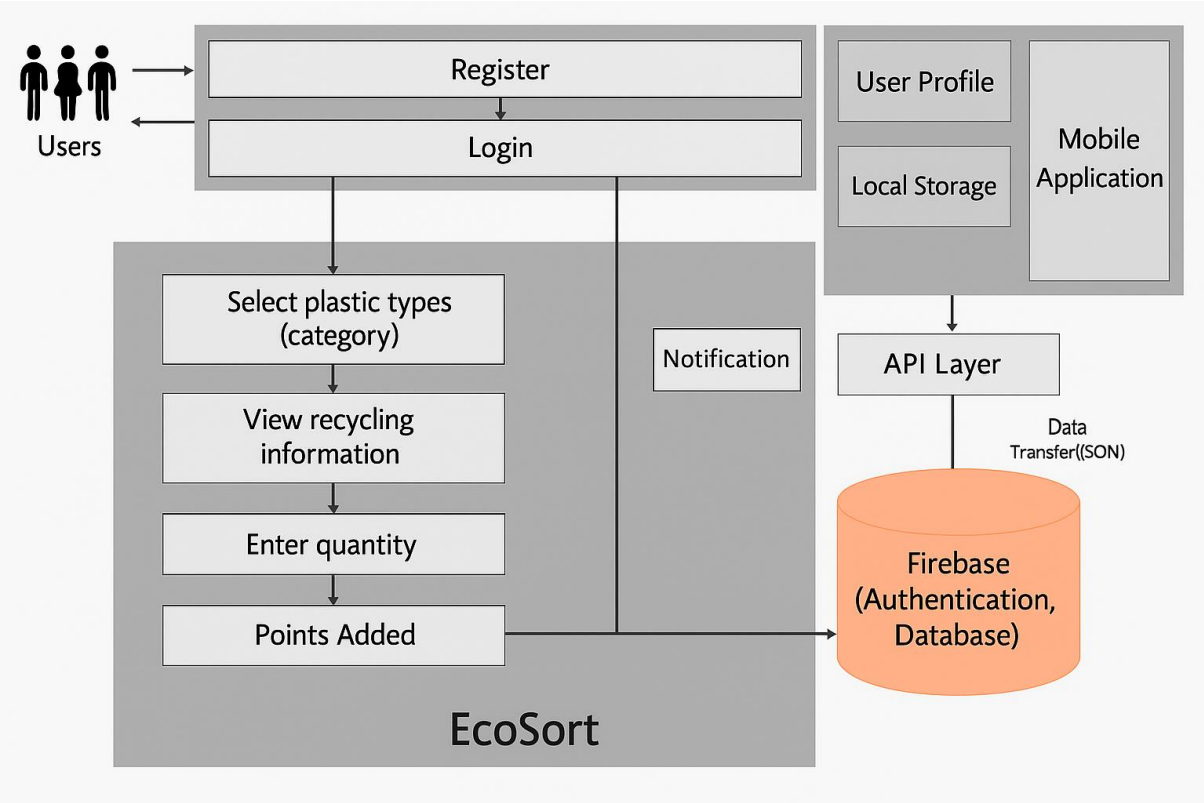

Figure 4.1 (System Architecture)

The **Figure 4.1** System Architecture illustrates the interaction between users and the EcoSort application. Users can register, log in, and access their profile to view or edit their details and earned points. The application allows users to identify different plastic types and categories, providing recycling guidance, alternative uses, reuse tips, and nearby recycling centres. After a confirmation process, users can schedule recycling reminders or enter the quantity of recycled items to receive rewards. The app also displays the recycled products owned by users and maintains notification scheduling, authentication, and data storage through Firebase services.

4.1.2 USE CASE DIAGRAM

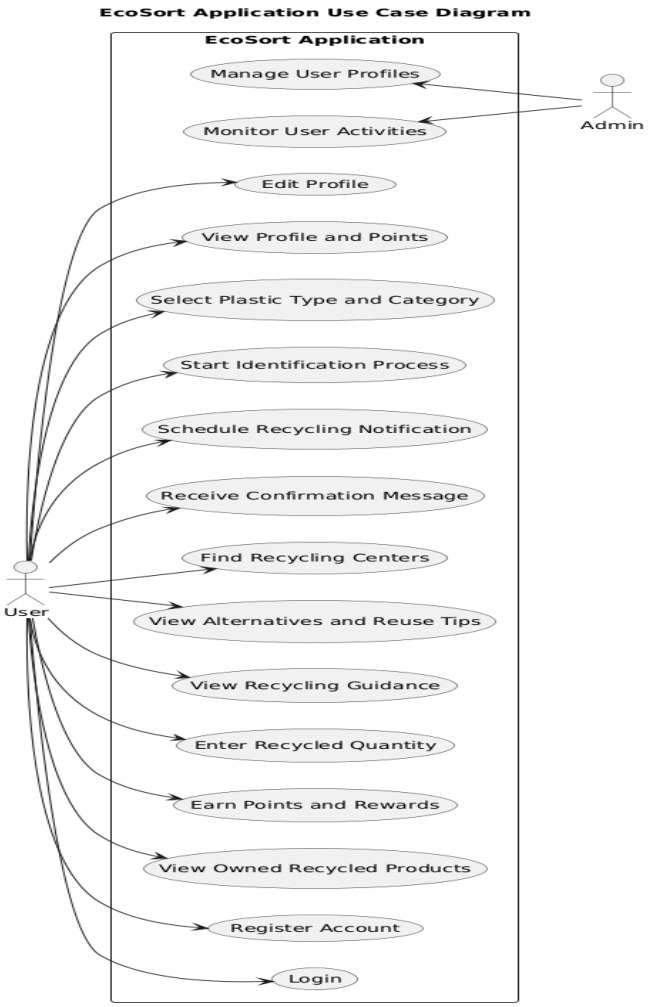

Figure 4.2 Use Case Diagram

The **Figure 4.2** Use Case**,** the EcoSort Use Case Diagram, outlines the primary interactions between the User (Citizen) and the EcoSort Application. It highlights key functionalities such as user registration, login, profile management, plastic type identification, recycling guidance, and scheduling notifications. The diagram demonstrates how the application enables citizens to engage with recycling services, track their recycling activities, and earn rewards.

4.1.3 ACTIVITY DIAGRAM

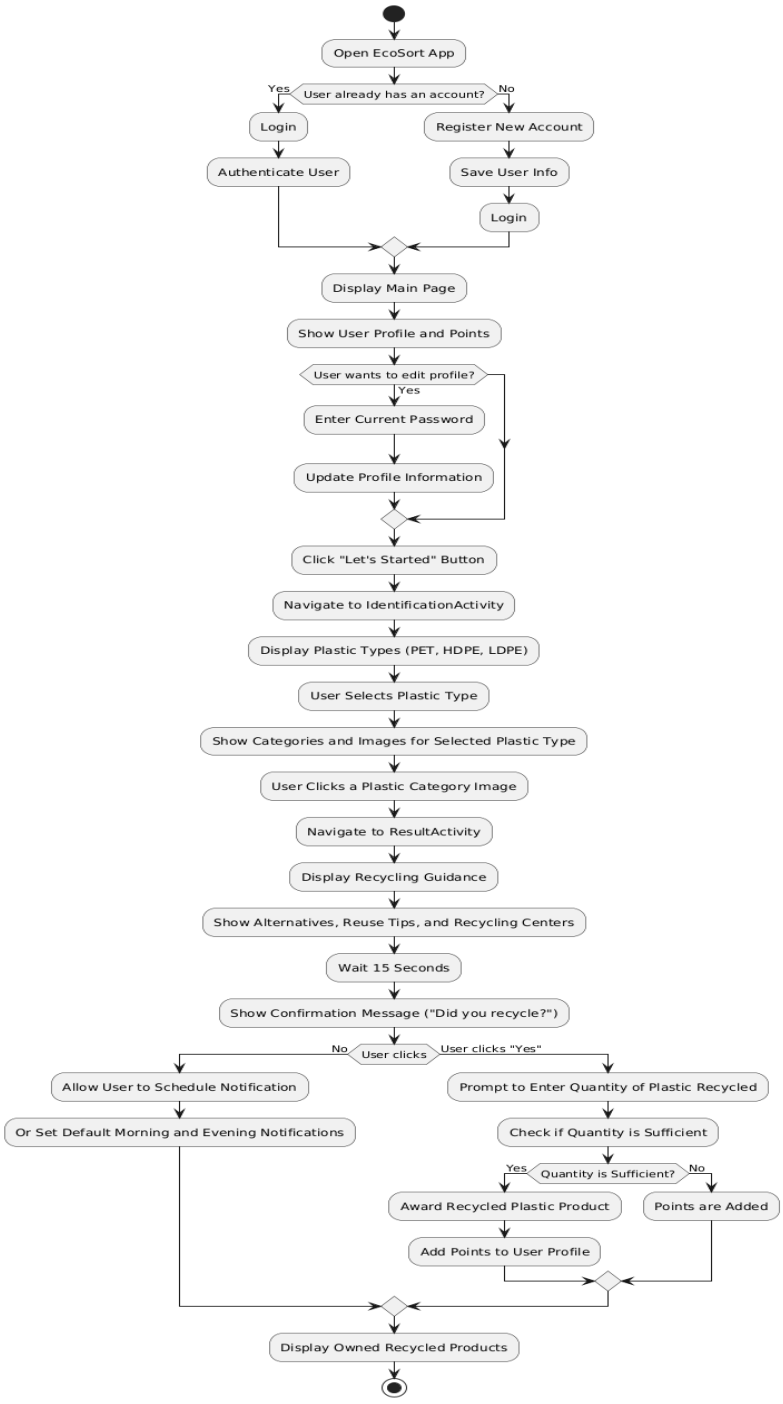

Figure 4.3 Activity Diagram

The **Figure 4.3** Activity Diagram of the EcoSort app user flow, starting from login or registration, navigating through profile management, plastic identification, recycling guidance, notification setup, and ending with displaying owned recycled products.

4.1.4 SEQUENCE DIAGRAM

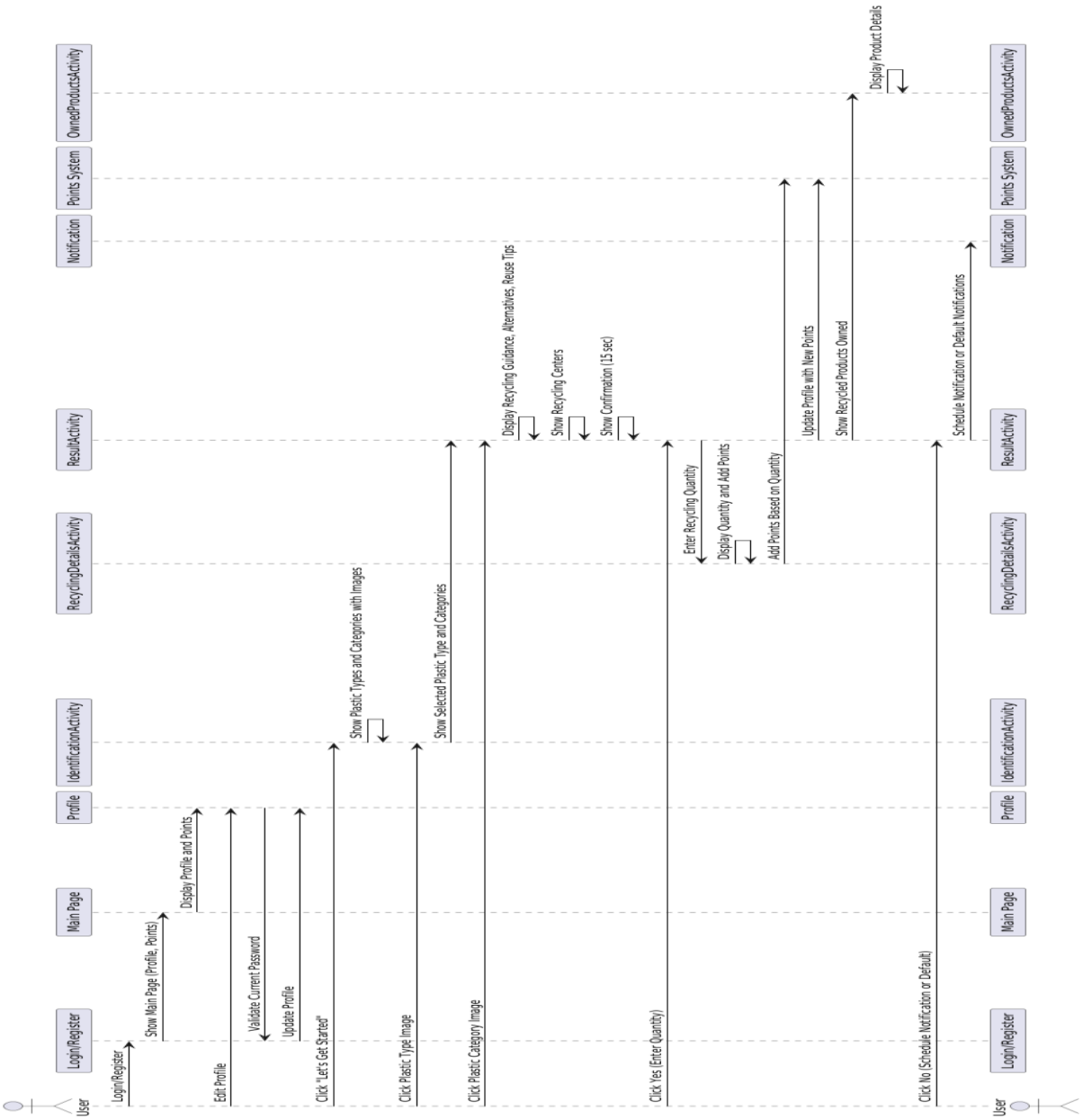

Figure 4.4 Sequence Diagram

The **Figure 4.4** Sequence Diagram depicts the interaction between the User and the EcoSort application components, highlighting processes such as Login/Registration, Profile Editing, Plastic Type and Category Identification, Recycling Quantity Entry, Scheduling Recycling Notifications, Earning Points, and Viewing Owned Recycled Products. The diagram shows the flow of actions between the User and system activities, including Main Page, Profile, IdentificationActivity, RecyclingDetailsActivity, ResultActivity, Notification, Points System, and OwnedProductsActivity.

4.2 DATA DESIGN

4.2.1 DATABASE SCHEMA

The EcoSort application utilises Firebase for backend storage, integrating Firebase Authentication and Cloud Firestore to manage user credentials, recycling history, feedback data, and product-related information.

1. Firebase Authentication

- **Purpose**: Stores user credentials securely, enabling user login and registration. Each user provides their Email, Password, and other details during registration. Firebase generates a unique User ID for secure authentication.

Collection: Users

- **Document ID: Auto-generated**
    - **email (String):** The user's email (used for login)
    - **phone (String):** The user's phone number
    - **points (Number):** Total points accumulated by the user
    - **username (String):** The user's chosen username

2. Cloud Firestore

- **Purpose**: Used to store user data such as recycling history, points, products recycled, and feedback information.

Collection: users

- **Document ID: Auto-generated**
    - **email (String):** User's email
    - **phone (String):** User's phone number
    - **points (Number):** Total points accumulated by the user
    - **username (String):** User's chosen username
    - **recycling_history (Subcollection)**: Contains records of the user's recycling activities.

Subcollection: recycling_history

Stores each recycling history entry for the user.

- **Document ID: Auto-generated**
    - **category (String):** The category of recycled materials (e.g., "Electronics & Automotive Parts")
    - **pointsEarned (Number):** Points earned from the recycling activity
    - **productOutcome (String):** Description of the outcome of the recycled product (e.g., " 🎛️ Electronic casing recycled!")
    - **quantity (Number):** Quantity of items recycled
    - **type (String):** Type of plastic used in the product (e.g., "PET (Polyethylene Terephthalate)")

Subcollection: products

Each product recycled by the user is recorded here. The products sub-collection stores detailed information about the specific products that were recycled.

- **Document ID: Unique identifier for each recycled product**
    - **outcome (String):** Description of the recycled product outcome (e.g., " 🥤 New juice container made! 🧴 Detergent bottle created!")
    - **product (String):** Product type and category (e.g., "HDPE (High-Density Polyethylene) - Food Packaging")
    - **quantity (Number):** Quantity of products recycled

4.3 USER INTERFACE DESIGN

1. Login Page

• Fields:

- Email (Text Input): Field to input the user's email address.
- Password (Password Input): Field to input the user's password with a toggle (eye) icon for visibility.
- Forgot Password? (Link): Link for users who forget their password.
- Login Button (Primary Button): To submit login details.
- No Account? Register (Link): Link to navigate to the Registration page.

• Design Considerations:

- Minimalistic and eco-friendly design with a clear focus on ease of use.
- Show error messages for invalid input entry (e.g., "Invalid email or password. Please try again.").

2. Registration Page

• Fields:

- Username (Text Input): User's full name.
- Email Address (Text Input): User's email address.
- Phone Number (Text Input): User's contact number.
- Password (Password Input): Password field with validation (e.g., must include special characters and capital letters).
- Confirm Password (Password Input): Field to confirm the entered password.
- Sign Up Button (Primary Button): To submit registration details.

• Design Considerations:

- Password Validation: Minimum of 6 characters, must include one uppercase letter, a number, and a special character.
- Confirm Password Field: Ensures the user correctly confirms their password.
- Toggle Eye Icon: Provided next to both password fields for easy visibility.
- User Guidance: Display a validation sentence under the password field explaining password requirements.

3. Main Page

• Layout:

- Top Navigation Bar:
    - Logo (Left): Display the "EcoSort" logo.
- Welcome Message: Example: "Welcome to EcoSort, [Username]".
    - Clicking on the welcome message navigates to the Profile Page.
- Main Content Area:
    - Button: "Let’s Get Started" — navigates to the Plastic Type page.

• Design Considerations:

- Large, easy-to-click buttons suitable for mobile users.
- Consistent eco-themed color palette (greens, blues).
- Clean, minimal home page for clear navigation.

4. Plastic Type Page

• Content:

- Swipe Layout: Users can swipe through four plastic types:
    - PET
    - HDPE
    - PP
    - LDPE
- Each type includes:
    - Name
    - Short description
    - Example items

• Design Considerations:

- Swipe gesture must be smooth and intuitive.
- Cards or images must be clickable and visually appealing.

5. Identification Page

• Content:

- Display a set of images under the selected plastic type, showing different Categories.
- User Action: Clicking an image selects the category and navigates to the Result Page.

• Design Considerations:

- High-quality, labelled images.
- Grid layout for easy selection.

6. Result Page

• Content:

- Plastic Type and Category: Clearly displayed.
- Information Sections:
    - Manual Recycling Guidance
    - Nearby Recycling Centres
    - Alternatives
    - Reuse Tips
- Confirmation Popup:
    - Question: "Did you recycle this plastic ?"
    - Options:
        - Yes: Proceed to Recycling Details page.
        - No: Open Calendar and Time Picker to schedule a recycling reminder.

• Design Considerations:

- Simple, user-friendly popup.
- Integrated calendar and clock pickers for easy scheduling.

7. Recycling Details Page

• Fields:

- Plastic Type and Category: Pre-filled and shown.
- Quantity (Number Input): Users input the amount of plastic recycled.

• Functions:

- Points are awarded based on the quantity entered.
- If a milestone is reached, users unlock a recycled product reward (e.g., T-shirt made from PET).

• Design Considerations:

- Friendly, motivational messages after submission.
- Clear progress tracking toward rewards.

8. Celebration Design

• Content:

- Display a Gift Box Animation (GIF) after a successful recycling action.
- Gift Button: User taps the gift to see owned products.

• Design Considerations:

- Fun, celebratory visuals to reward eco-friendly behavior.
- Smooth navigation to the Owned Products page.

9. Owned Products Page

• Content:

- List of all Products Owned by the user, each showing:
    - Product Image
    - Plastic Type
    - Category
    - Points Earned

• Design Considerations:

- Clean grid or list view.
- Highlight eco-achievements visually.

10. Profile Page

• Displayed Information:

- Username
- Email Address
- Phone Number
- Points Earned

• Functions:

- Edit Profile: Users can update their username, email, and phone number.
    - Password re-authentication is required before changes are saved.

• Design Considerations:

- Secure update system with re-authentication.
- Confirmation messages for successful update

CHAPTER 5

IMPLEMENTATION

5.1 AT USER SIDE

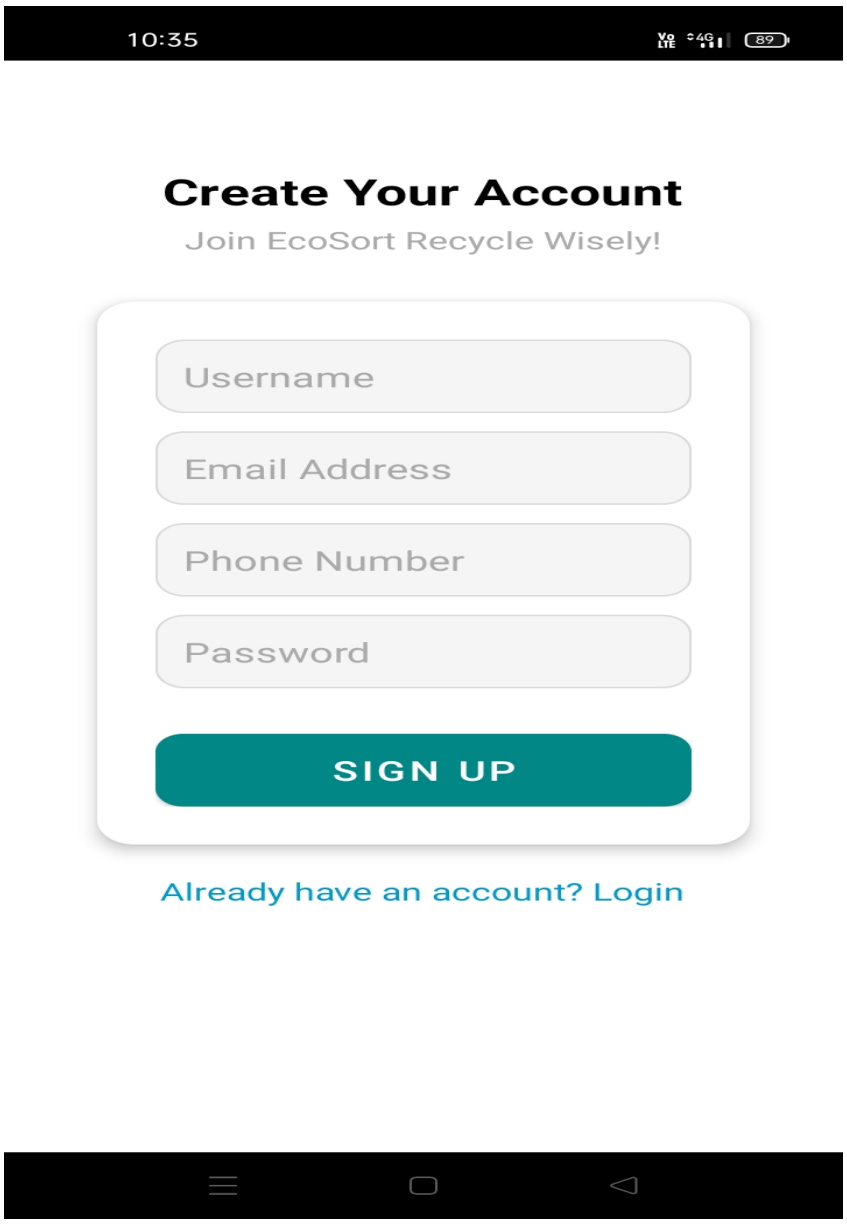

Figure 5.1 Register Screen

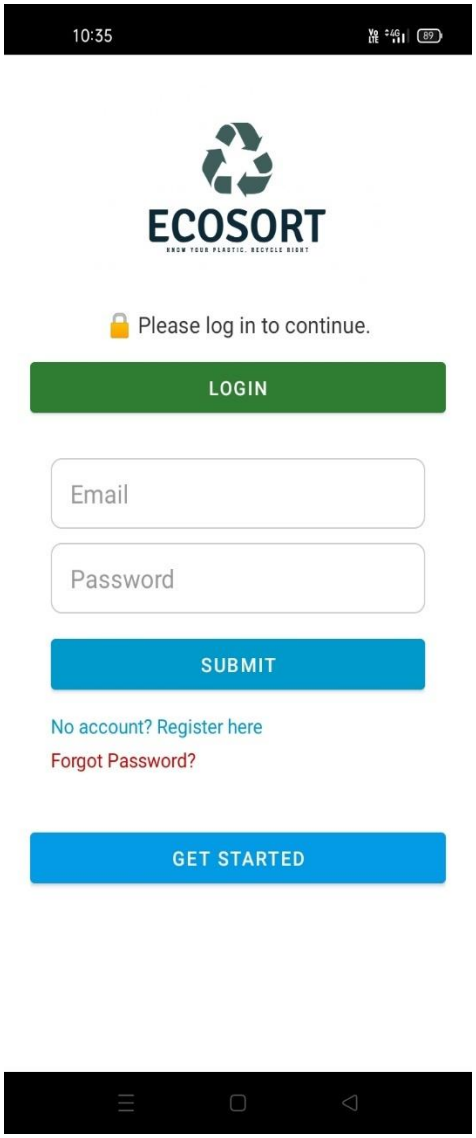

Figure 5.2 Login Screen

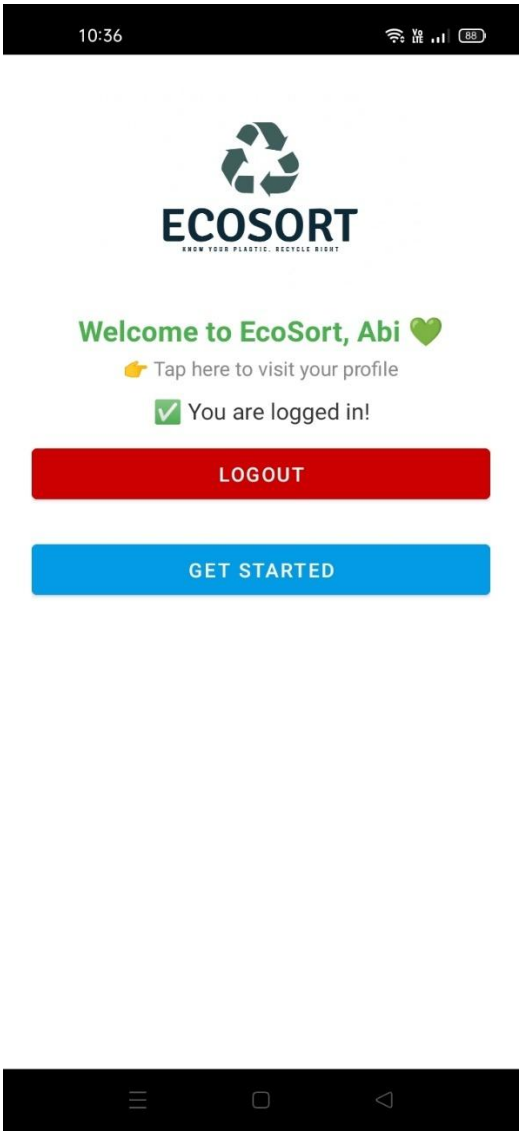

Figure 5.3 Main Screen

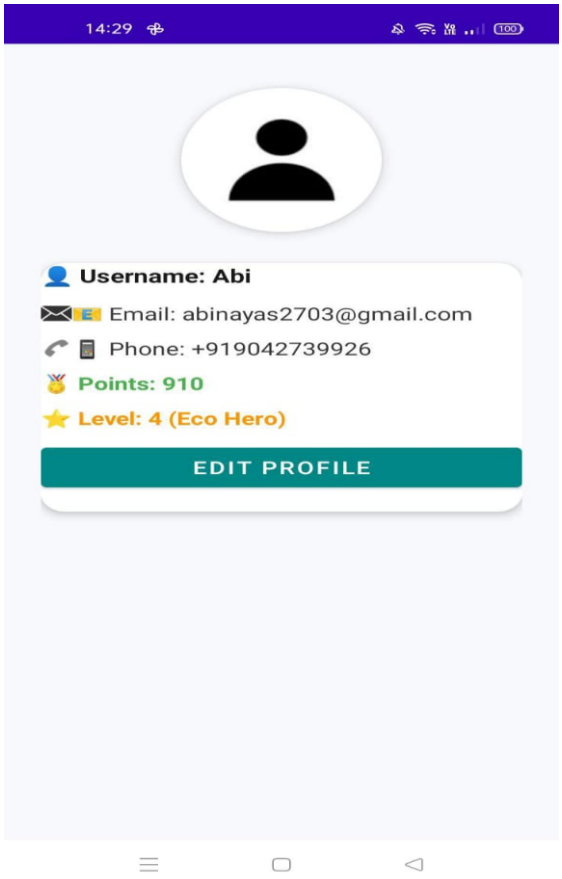

Figure 5.4Profile Screen

Figure 5.5 Identification Screen

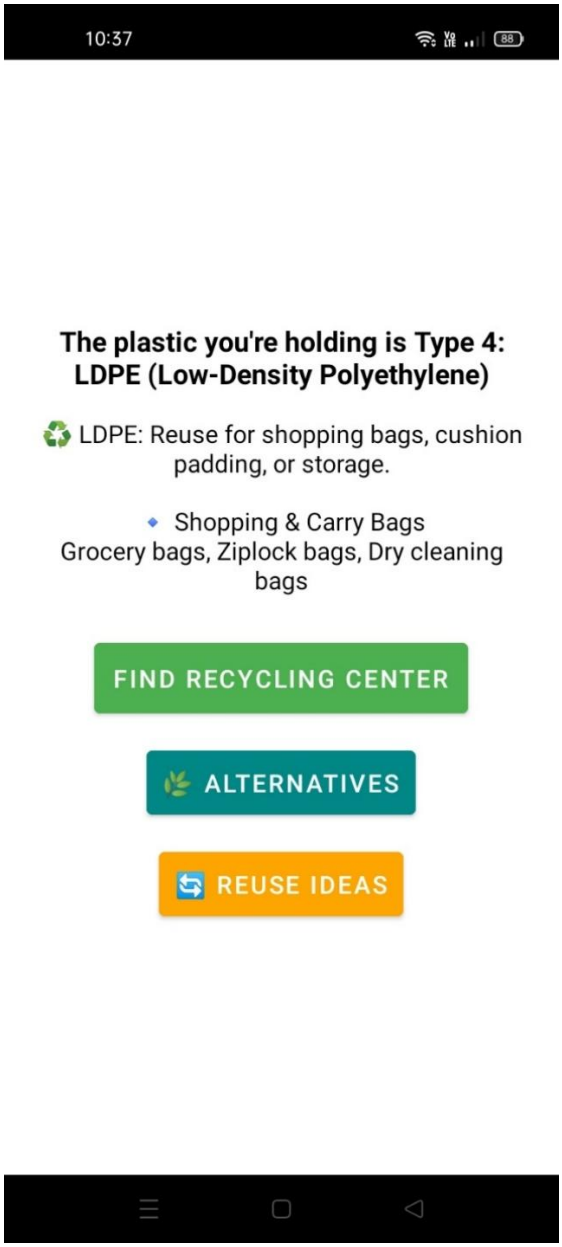

Figure 5.6 Result Screen

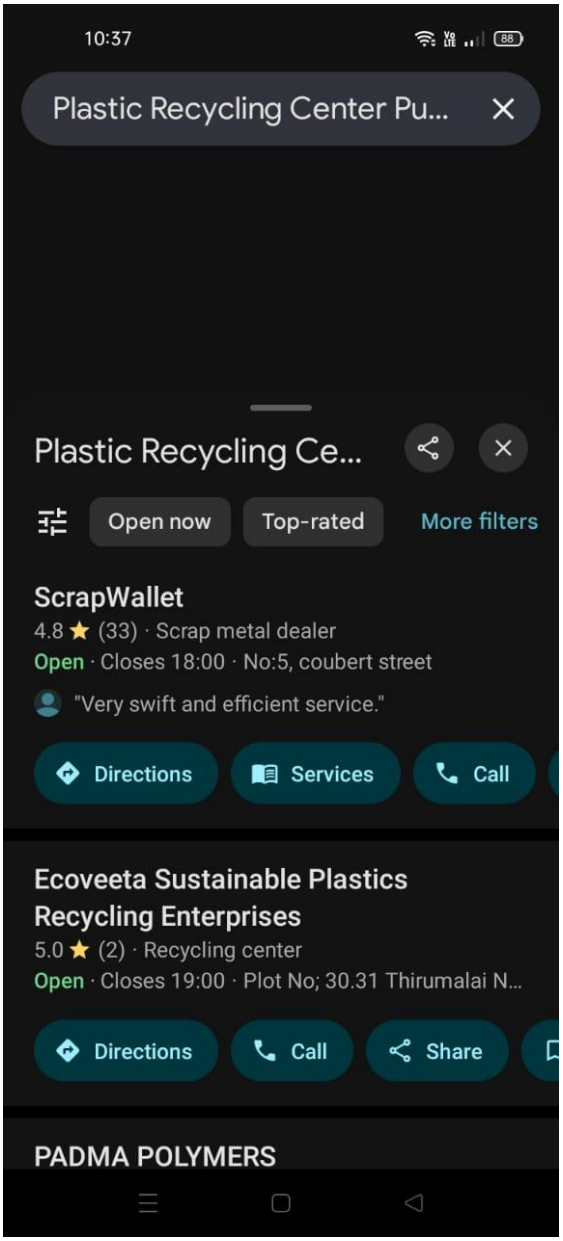

Figure 5.7 Centres Screen

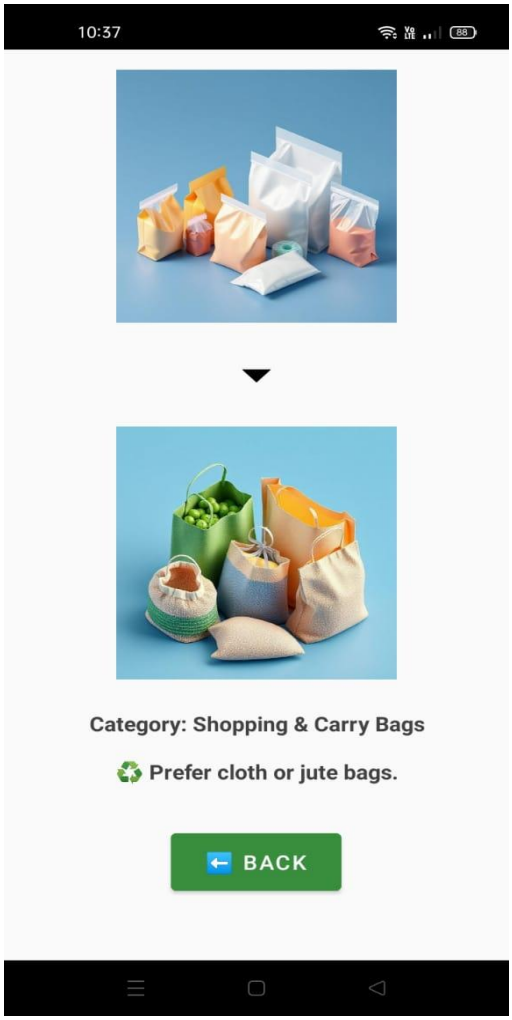

Figure 5.8 Alternatives screen

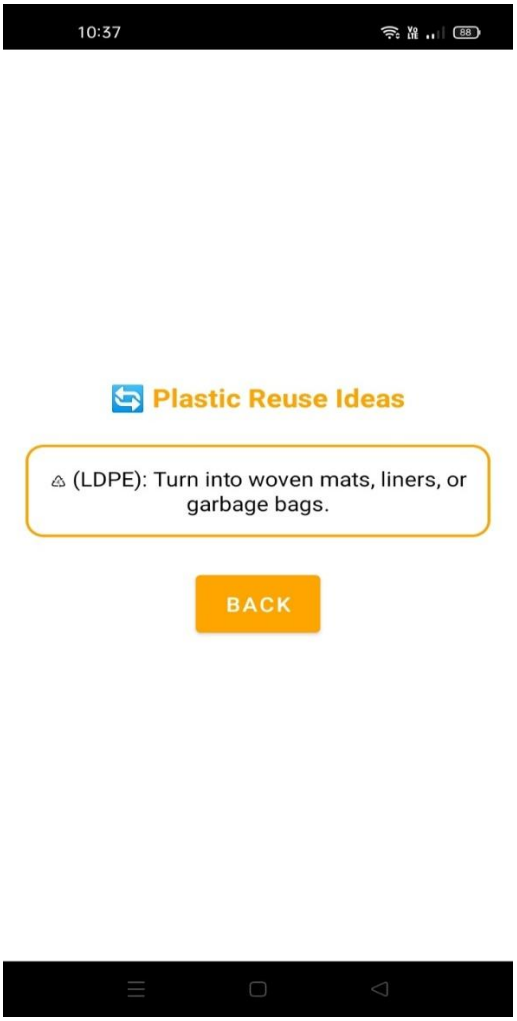

Figure 5.9 ReuseTips Screen

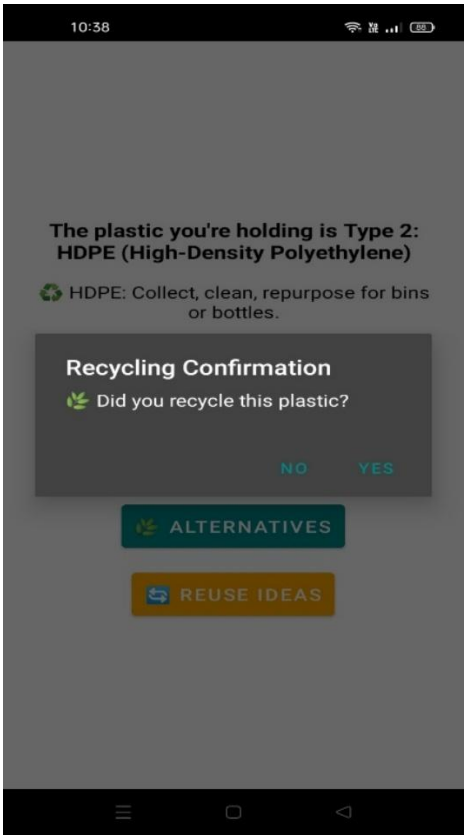

Figure 5.10 Confirmation Screen

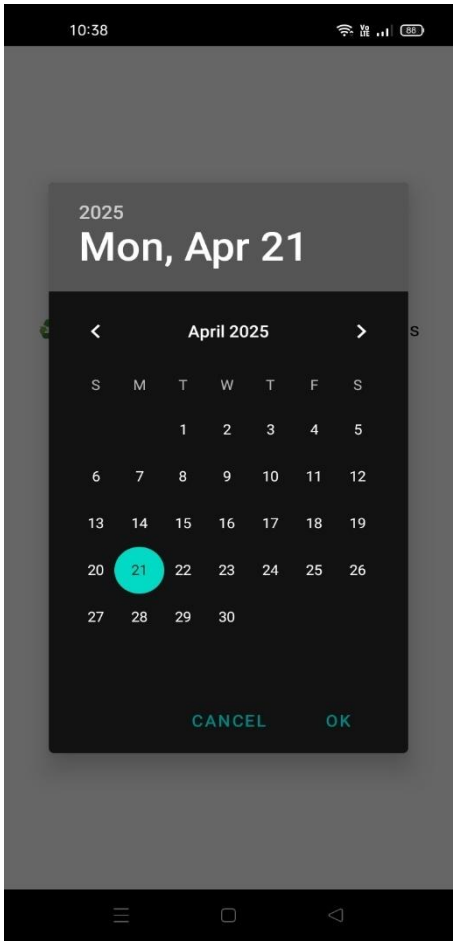

Figure 5.11 Scheduling Screen

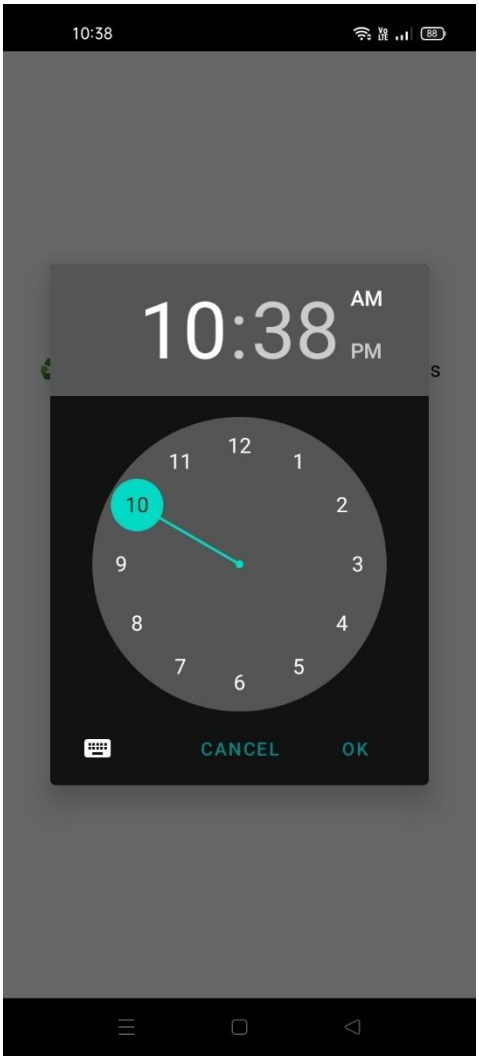

Figure 5.12 Notification Screen

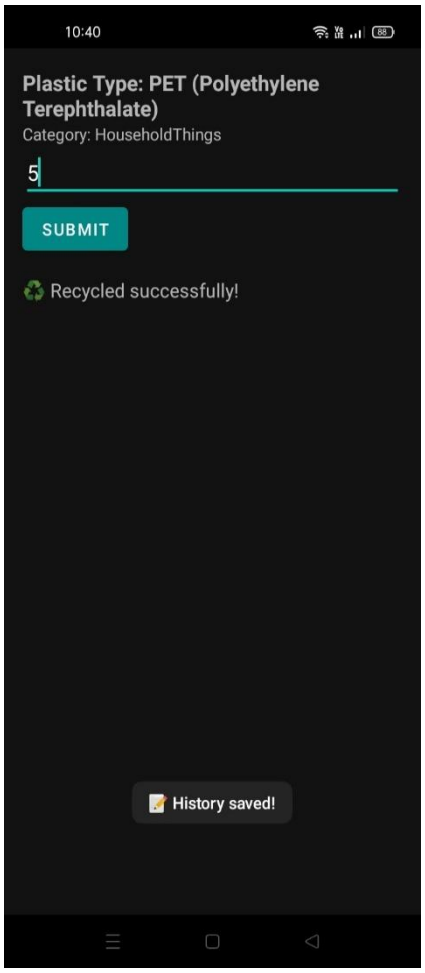

Figure 5.13 Recycling Detail Screen

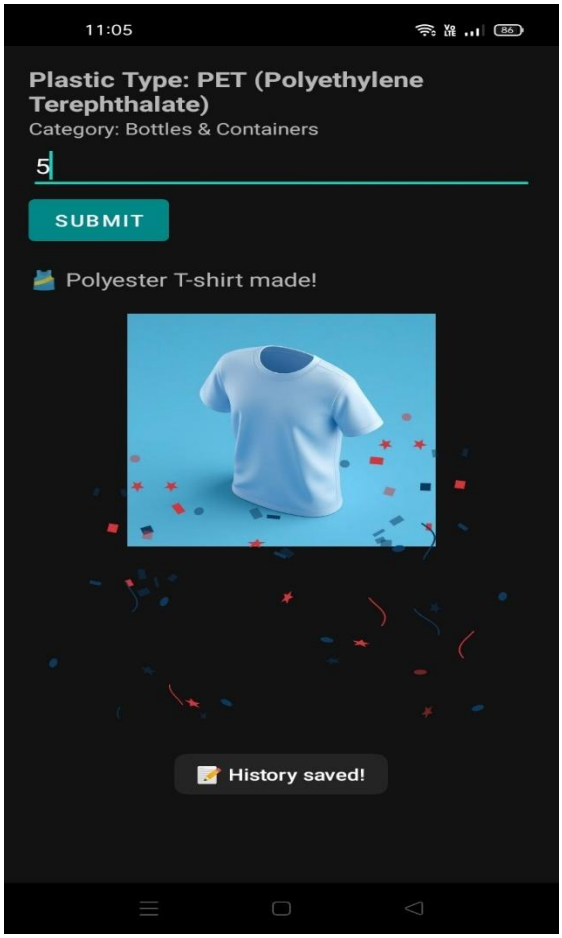

Figure 5.14 Product Own Screen

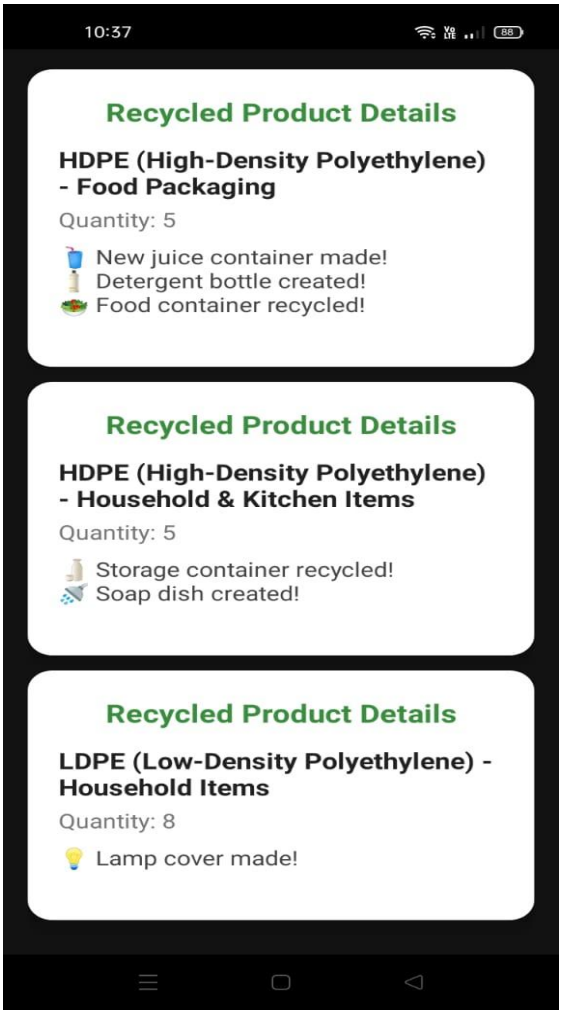

Figure 5.15 OwnProduct Detail Screen

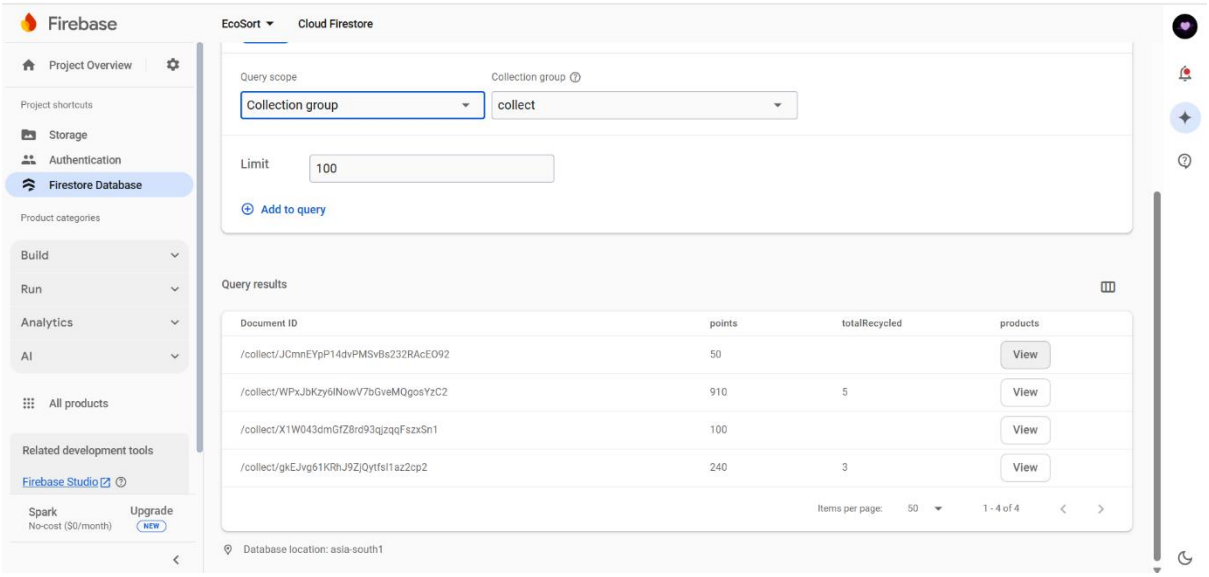

Figure 5.16 User Details Screen

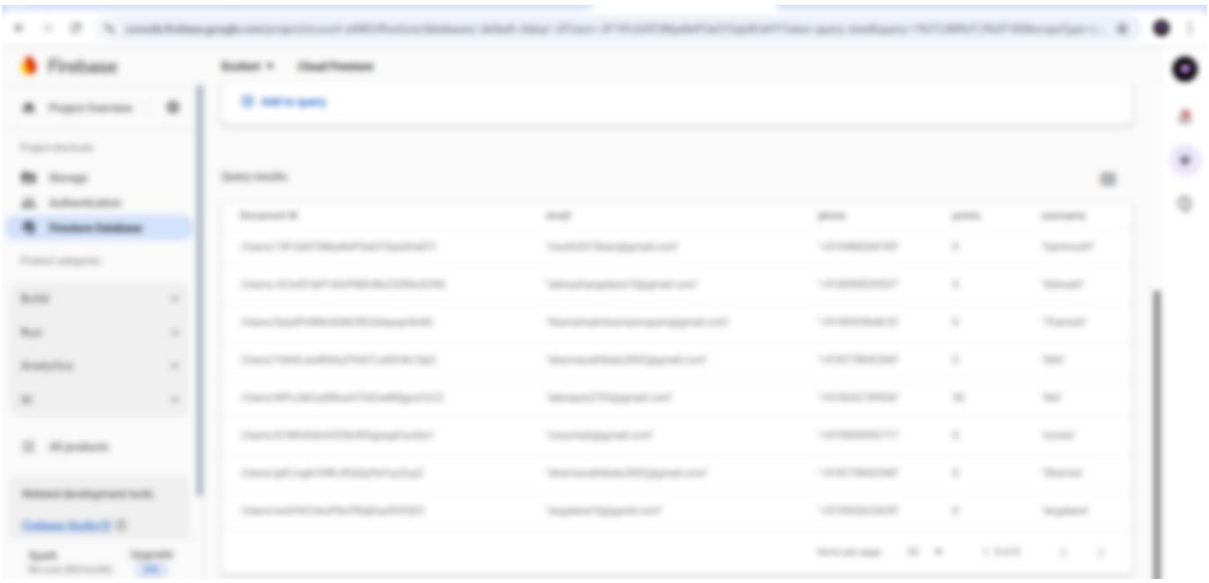

Figure 5.17 User Personal Detail Screen

CHAPTER 6

SOFTWARE TESTING

6.1 USABILITY TESTING

Usability testing was conducted to evaluate the effectiveness, ease of use, and user-friendliness of the EcoSort mobile application. The main objective was to observe real users interacting with the system and to identify any barriers in the plastic recycling journey offered by the app.

A group of students, environmental enthusiasts, and faculty members were selected as participants. They were asked to perform key actions in the EcoSort application, including:

- Logging into their accounts (if already registered)
- Registering as a new user
- Accessing the "Let's Get Started" feature and selecting an image to identify the plastic type
- Receiving recycling guidance and available recycling centres
- Confirming recycling activity (YES/NO flow)
- Scheduling reminders if recycling is postponed
- Viewing earned points, level progress and recycled products in their profile
- Navigating the owned products section

During the usability tests, the focus was on the app’s navigation clarity, speed, guidance accuracy, visual feedback, and ease of performing recycling-related actions. Observations and user feedback were collected for further enhancements.

TABLE 6.1.1 TEST SUITE

The test suite for the EcoSort application was meticulously designed to cover all core modules—user authentication, plastic identification, guidance delivery, recycling confirmation, points tracking, and user profile management.

The purpose of the test suite was to validate that EcoSort meets functional requirements, responds efficiently, and ensures a positive recycling journey for users.

Overview of Test Cases

Test Case ID	Module	Test Description	Expected Outcome	Result
TC001	Registration	Create a new user account	New account created and redirected to login	Passed
TC002	User Authentication	Log in with valid credentials	User successfully logs into EcoSort	Passed
TC003	User Authentication	Attempt to log in with invalid credentials	An appropriate error message is displayed	Passed
TC004	Plastic Identification	Select a plastic image for identification	Correct plastic type and category are shown	Passed
TC005	Recycling Guidance	Display recycling guidance after identification	Clear guidance and recycling centre suggestions are displayed	Passed
TC006	Recycling Confirmation	Confirm or schedule recycling after identification	User can mark item recycled or schedule a reminder	Passed

TC007	Points System	Earn points after recycling confirmation	The user's points increase correctly and level progress	Passed
TC008	Profile Section	View earned points and recycled products	Accurate profile data and owned items are shown	Passed

TABLE 6.1.2 TEST CASES

Each test case was carefully designed based on critical functions of EcoSort. Every case consists of objective, input conditions, expected outcome, and actual outcome upon execution.

Test Case ID	Test Scenario	Test Steps	Input Data	Expected Result	Actual Result	Status
TC001	New user registration	1. Open the EcoSort app 2. Tap 'Login' 3. Don’t have an account? Tap the 'Register' button 4. Fill in username, email, Phone Number, and password. 5. Tap the 'Register' button	Valid name, email, Phone Number, password.	Account created successfully and redirected to Login page	As expected	Passed
TC002	Log in with valid credentials	1. Open the Login page 2. Enter registered email and password 3. Tap 'Login'	The email and password used during registration	User successfully logged in	As expected	Passed
TC003	Log in with invalid credentials	1. Open the Login page 2. Enter incorrect email/password 3. Tap 'Login'	Wrong email or wrong password	Error message displayed: "Invalid credentials"	As expected	Passed
TC004	Plastic identification	1. Tap 'Let's Get Started'	Plastic item image	Correct plastic images and	As expected	Passed

		2. Select an image of plastic		category are displayed		
TC005	Display recycling guidance	1. After plastic identification 2. View the provided guidance	Plastic type identified	Recycling instructions, nearby centres, reuse tips and alternatives are shown	As expected	Passed
TC006	Recycling confirmation	1. After guidance, recycling confirmation appears 2. Choose 'YES' (enter quantity) or 'NO' (schedule reminder)	YES: Enter quantity NO: set reminder time	Points are awarded if recycled; a reminder is set if postponed	As expected	Passed
TC007	Points update in profile	1. Open the Profile page 2. Check points after recycling confirmation	1. Click Edit Profile 2. user edit their profile by valid password	Points updated correctly. Updated information saved successfully	As expected	Passed
TC008		1. Open the 'Owned Products' section on the last page. 2. Saw their products they owned	—	Product details (type, category, points) shown	As expected	Passed

6.1.3 INFERENCE

The development and testing of the EcoSort mobile application demonstrated how technology can effectively promote environmental sustainability and motivate recycling habits among users.

EcoSort provided a seamless journey for users starting from plastic identification to recycling confirmation, offering real-time guidance, location suggestions, and reward points to encourage ongoing participation.

The structured testing ensured that:

- Navigation is smooth and intuitive for first-time users.
- Recycling workflows (confirmation, postponement, points addition) work accurately.
- Profile management and ownership of recycled items are handled efficiently.

The testing phase confirmed that EcoSort meets all functional requirements and delivers a delightful and responsible experience for users. Further improvements, such as offline reminders, recycling event alerts, and personalised eco challenges, could be implemented in the future to make EcoSort even more impactful.

Thus, the project successfully fulfils academic and practical objectives, positioning EcoSort as a scalable, eco-conscious mobile platform for recycling empowerment.

CHAPTER 7

CONCLUSIONS

The EcoSort mobile application was developed with the objective of promoting responsible plastic recycling by helping users identify plastic types, locate nearby recycling centres, and earn rewards for eco-friendly actions. Through an intuitive interface and smooth navigation, the app provides quick access to plastic identification, recycling guidance, location services, and personalized recycling reminders. Additionally, the integration of user authentication, points tracking, and notification features ensures a secure and engaging experience.

This project not only highlights the role of mobile technology in encouraging sustainable behaviour but also demonstrates how digital solutions can contribute to environmental conservation. By focusing on practicality and user motivation, EcoSort stands as a valuable tool for citizens, empowering them to make greener choices and actively participate in plastic waste reduction.

The development of this application has provided deep insights into Android app development, user-centred design, and the fusion of technology with sustainability goals. Overall, EcoSort contributes meaningfully towards building a cleaner, greener, and more responsible society.

7.1 FUTURE SCOPE OF THE PROJECT

The EcoSort app has great potential for future expansion and enhancements. Some future development ideas include:

- **Plastic Recycling Challenges:** Adding weekly or monthly challenges to encourage more recycling activities with rewards.
- **More Detailed Plastic Types:** Including more detailed sub-categories for plastic identification to improve accuracy.
- **Real-Time Recycling Centre Updates:** Showing live status of recycling centres (e.g., open/closed, busy times) using real-time databases.
- **GPS-Based Pickup Services:** Allowing users to schedule recycling pickups through the app based on their location.
- **Educational Content:** Including short videos or articles on the impact of plastic pollution and ways to reduce it.
- **Social Sharing:** Allowing users to share their recycling achievements on social media to spread awareness.
- **Multilingual Support:** Expanding app usage by supporting multiple regional languages.
- **Offline Mode:** Allowing users to identify plastic types and view basic recycling tips even without internet access.
- **Image-Based Plastic Detection:** In future updates, the app will allow users to upload a photo of a plastic item, automatically detect the plastic type using image recognition technology, and provide recycling guidance based on the analysis.

With regular updates and user feedback, EcoSort can grow into a powerful platform for creating a greener tomorrow through collective citizen efforts.

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