ITS 63504 Human Computer Interaction (HCI)

ASSIGNMENT 1

Project Based Learning (PBL) with Purpose Learning
"Be a Hero, make a change!"
A world where technology helps solve the toughest problems

HAND OUT DATE: 21 April 2025 (Monday) (week 1)

HAND IN DATE: 2 June 2025 (Monday) (week 7)

WEIGHTAGE: 30%

Instructions to students:
The assignment should be attempted in groups of 3-5 students.
Complete this cover sheet and attach it to your assignment – this should be your first page.

Student declaration:
I declare that:
• *I understand what is meant by plagiarism*
• *The implication of plagiarism have been explained to us by our lecturer*
This project is all our work and I have acknowledged any use of the published or unpublished works of other people.

Names of Group Members	
Name	**Student ID**
1. Hans Andre	0354227
2. HuXiaoXiang	0377752
3. Zhaojunyi	0370624
4. Arifin Islam Rafeen	0359455
5. Mashnoon Mazumder	0366445

Avoid copy and paste job in your report and it is considered as plagiarism. Plagiarism in all

5.0 Marking Scheme

Criteria	Marks (10 marks for each criterion below)			
	Excellent **(10-9)**	**Good** **(8-7)**	**Average** **(6-4)**	**Poor** **(3-1)**
1.0 Vision, Mission and Problem definition				
2.0 Solution & Innovation				
3.0 Technical architecture diagram, and technical feasibility				
4.0 Social impact of your project				
5.0 Business viability				
6.0 **Questionnaire design**				
7.0 **Requirements gathering and elicitation** ✔ Minimum 10 functional requirements				
8.0 **Requirements gathering and elicitation** ✔ Minimum 3 non-functional requirements ✔ Minimum 5 data requirements				
9.0 Prototype **(low fidelity prototype of alpha version is required).** User interface (UI)/User experience (UX) must implement at least 5 of the 10 Jacob Nielsens' usability principles.				

10.0 Conclusion and future enhancement				
SUB-TOTAL (100 marks)* ***will scale down to 30%***				
Total Marks (30 marks)				

Lecturer's Feedbacks:

Assessment Declaration Form

Hans Andre

TAYLOR'S

Taylor's University / Taylor's College

ASSESSMENT SUBMISSION DECLARATION FORM

Module Code:	ITS63504
Module Name:	Human Computer Interaction
Assessment:	Assessment 1

Student Name:	Hans Andre Bin Azwan Rasyid
Student ID:	0354227
Semester/Year:	Semester 5/April 25

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	Use Gen AI to polish language before further modification for final submission	I acknowledge the use of to improve the academic tone and accuracy of language, including grammatical structures, punctuation and vocabulary. I have also provided the prompt used, the output generated by the Gen AI tools, how the output was modified further to better represent my tone and style of writing. *Note: Please modify the above as per your lecturers' needs*
	I attached Appendix in this assignment the chat history, including all the prompts that I used and the output from the Gen AI tool(s) for this assignment.	

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MLA	…. ("prompt").	"Description of prompt" prompt. *Name of AI tool,* version of AI tool, Company, date text was generated. URL. ***Example (Text):*** "Identify the themes in Mcteague by Frank Norris" prompt. ChatGPT, 21 November version, OpenAI, 4 Dec. 2023. https://chat.openai.com/share/2f2be19d-eadd-4151-8ceb-0785319074b3 ***Example (Image):*** Fig. 2. "Create impressionist painting of a cat

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e) This assignment is my own work, and I have properly acknowledged all sources, tools, and external contributions, including the use of Gen AI where applicable.
f) I acknowledge and authorize the submission and/or storage of my work in a database for the purpose of verifying its originality and/or conducting tests using artificial intelligence software, and I hereby consent to this process.
g) I acknowledge that this submission is subject to Taylor's University/College Academic Integrity Procedure (THE-ACA-PROC-AINT) and all applicable university regulations.

Name & Student ID	Hans Andre Bin Azwan Rasyid (0354227)
Signature	
Date	2/6/2025

HU XIAO XIANG

TAYLOR'S

Taylor's University / Taylor's College

ASSESSMENT SUBMISSION DECLARATION FORM

Module Code:	ITS63504
Module Name:	HUMAN COMPUTER INTERCTION
Assessment:	Assessment 1

Student Name:	HUXIAOXIANG
Student ID:	0377752
Semester/Year:	Semester 2

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Name & Student ID	**HUXIAOXIANG 0377752**
~~**Signature**~~	胡潇祥
~~**Date**~~	2025/6/2

Arifin Islam Rafeen

Taylor's University / Taylor's College

ASSESSMENT SUBMISSION DECLARATION FORM

Module Code:	ITS63504
Module Name:	Human Computer Interaction
Assessment:	Assessment 1

Student Name:	Arifin Islam Rafeen
Student ID:	0359455
Semester/Year:	6

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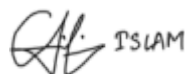|		using neutral colors" prompt. DALL-E, version 2, OpenAI, 27 Nov. 2023. https://labs.openai.com/
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Arifin Islam Rafeen (0359455)

ISLAM

02/06/2025

Name & Student ID	
Signature	
Date	

TAYLOR'S

Taylor's University / Taylor's College

ASSESSMENT SUBMISSION DECLARATION FORM

Module Code:	ITS63504
Module Name:	HUMAN COMPUTER INTERCTION
Assessment:	assessment 1

Student Name:	Mashnoon Mazumder
Student ID:	0366445
Semester/Year:	4/2

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Use of Gen AI is not applicable

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AI Tool Used	Prompts	Outputs	How the output was changed for use into the assignment	Specify the page(s) in the assignment where the output is used
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INFORMATION ON PENALTIES RELATING TO ACADEMIC MISCONDUCT

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For full details, refer to the Student Handbook (link)

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b) **Filing of Report** -A Report on Academic Misconduct (THE-ACA-FORM-AINT) is submitted to the Academic Integrity Officer (AIO).

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SECTION 2: STUDENT ACKNOWLEDGEMENT AND DECLARATION
*(*This section is to be completed by students. Students must submit the completed and signed copy of this form together with their assessment)*

Acknowledgment by the student

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	Type	Acknowledgement
	Gen AI is allowed but student chooses not to use it	I did not use any Gen AI tools for this assignment.
	Generate content which is modified in the final assessment submission	I acknowledge the use of to general materials such as ……………. in this assessment. I have also provided the prompt used, the output generated by the Gen AI tools, how the output was used and the pages where the Gen AI-generated content can be found.
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Declaration

I confirm that:
a) I understand what constitutes academic integrity violations, including plagiarism, collusion, fabrication, falsification, contract cheating, and improper use of Gen AI.
b) I confirm that my work or any part of this assessment has neither been previously and is not concurrently submitted for any other programme at Taylor's University or any other institution, save except when re-use of the same work is permitted by the module leader.
c) I acknowledge that using Gen AI or any external assistance without proper attribution constitutes academic misconduct and may be sanctioned accordingly.
d) I understand that if there are indications of academic integrity breaches, including improper Gen AI use, my work will be subject to investigation.
e) This assignment is my own work, and I have properly acknowledged all sources, tools, and external contributions, including the use of Gen AI where applicable.
f) I acknowledge and authorize the submission and/or storage of my work in a database for the purpose of verifying its originality and/or conducting tests using artificial intelligence software, and I hereby consent to this process.
g) I acknowledge that this submission is subject to Taylor's University/College Academic Integrity Procedure (THE-ACA-PROC-AINT) and all applicable university regulations.

Name & Student ID	Mashnoon Mazumder 0366445
Signature	
Date	02.06.25

Zhaojunyi

Taylor's University / Taylor's College

ASSESSMENT SUBMISSION DECLARATION FORM

Module Code:	I TS63504
Module Name:	Human computer interaction
Assessment:	Assessment 1

Student Name:	Zhaojunyi
Student ID:	0370624
Semester/Year:	Sem 4

Dear Students,

Taylor's University/College upholds the highest standards of academic integrity. Students must complete their work honestly and ethically, ensuring that all submitted assessments reflect their own understanding and efforts. Any form of academic misconduct, including but not limited to plagiarism, collusion, contract cheating, falsification, and unauthorised use of Gen AI tools, is strictly prohibited and will be subject to disciplinary action in accordance with university regulations.

In this form, there are two (2) sections namely: **Section 1 Instruction on the use of Generative Artificial Intelligence** (to be completed by the module leader) and **Section 2 Student Acknowledgement and Declaration** (to be completed, signed and submitted by the students together with their assessment).

Students are responsible for properly acknowledging all sources, tools, and external contributions in their work. Misuse of AI-generated content, failure to attribute sources, or engagement in dishonest practices may result in penalties ranging from warnings to expulsion, as outlined in the **Student Handbook** (link).

This Assessment Submission Declaration Form is attached to the assessment brief. **Students are required to complete the Assessment Submission Declaration Form in any piece of work submitted** at Taylor's University/College, except for assessments completed and submitted in controlled environments. **For group assessments, each member of the group must complete an Assessment Submission Declaration Form**.

SECTION 1: INSTRUCTION ON THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE FOR THIS ASSESSMENT

The section below is to be completed by the module leader, i.e. module leader is to put a ' v' in the relevant checkbox.

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Name & Student ID	Zhaojunyi 0370624
Signature	
Date	2025.6.2

Table of Content

I. Introduction

EcoSort is a smart, waste-sorting application that promotes environmental responsibility through interactive and educational features. It is designed with a vision to motivate people, families, and communities to adopt green waste management habits and make the world a better place. Through gamified learning, AI support, and recycling access in their area, EcoSort helps users make environmentally responsible decisions in daily life.

Vision

Our vision is to create a generation of green citizens who are aware and encouraged to responsibly dispose of waste. We are confident that through inculcating waste-sorting awareness and eco-friendly habits in children, we can enable the creation of a culture of environmental stewardship among communities that is long-lasting.

Our intention is to achieve this through the creation of a mobile application that will render learning about waste management easy, convenient, and fun for everyone. Through this, we contribute to making Sustainable Development Goal (SDG) 12: Responsible Consumption and Production a reality.

Mission

Our mission is to create an educational, fun, and inclusive mobile app that teaches users how to sort and recycle their trash correctly. By combining AI, gamification, and human-centered design, EcoSort delivers education, learning pathways, and motivation for users to promote recycling behaviors.

We want to weave sustainability into everyday practice, not ideals alone. EcoSort is more than an app, it's a vehicle for positive behavioral change and community involvement.

II. Problem

Improper waste management is one of the most pressing environmental issues facing our world today. According to the World Bank, over 2.01 billion tonnes of municipal solid waste is generated globally each year, with at least 33% of it not managed in an environmentally safe manner (Kaza et al., 2018). If current trends continue, this figure is expected to rise to 3.4 billion tonnes by 2050. The consequences of this are severe: polluted oceans, overflowing landfills, toxic emissions from incineration, and irreversible harm to ecosystems and wildlife.

Despite rising environmental awareness, many individuals are still unaware of correct waste-sorting practices, especially when it comes to differentiating between general waste, recyclables, and special waste like electronics or batteries. Even where public recycling systems exist, participation is inconsistent due to lack of education, unclear labeling, or accessibility issues (Wilson et al., 2012).

Moreover, the complexity of packaging materials contributes to the confusion. Many products are made from mixed materials, or biodegradable-looking containers that are actually non-recyclable. This results in "wishcycling," where users toss items in the recycling bin hoping they'll be processed correctly. Unfortunately, this leads to contamination, which can result in entire batches of recyclables being sent to landfills.

Additionally, technology overload and lack of guidance have created an ironic gap. While most people now own smartphones and have access to digital tools, very few of these tools focus on environmental education or actionable sustainability. The market is saturated with entertainment and lifestyle apps, but interactive, educational tools about waste sorting and sustainability are still lacking, especially those that are accessible, family-friendly, and localized to users' needs.

Current waste sorting apps typically offer static information with little to no user engagement. There is no motivation to return, no feedback loop to help users improve, and no consideration of family or community use cases.

Our project directly addresses this issue by providing a practical, engaging solution to bridge the gap between knowledge and action. EcoSort aligns with our vision by offering a digital platform that educates users in an accessible format, while helping communities reduce waste through practices.

III. Solution

Our team conducted research by distributing a survey to university students to better understand the issues surrounding waste disposal and environmental awareness. We received around 21 responses, and 70% of respondents admitted they have a vague understanding of how to sort their waste correctly. This shows that there is a clear gap in knowledge when it comes to proper recycling and waste sorting.

As a result, our goal is to create an application called EcoSort that focuses on guiding users on how to manage their waste in a responsible and sustainable way. We wanted to address this problem because, as university students ourselves, we noticed that many people around us still throw recyclable items in the wrong bin or are unaware of how to dispose of things like batteries or electronics safely. This not only harms the environment but also shows the lack of education on waste management.

From the same survey, we found that 80% of students said they would be interested in using an app that helps them sort their waste more effectively. This confirms that there is real potential for an application like EcoSort among our target users like students, and environmentally conscious individuals.

We believe EcoSort will help users form good environmental habits. Teaching responsibility around waste is not only a practical skill, it also supports global efforts toward Sustainable Development Goal 12 (SDG 12): Responsible Consumption and Production.

Our app will not only provide information but also educate, engage, and motivate users to become more responsible about what they throw away and how they do it. Even though there are other recycling-related apps in the market, EcoSort is distinguished by its integration of education, accessibility, AI, and gamification. Our app combines multiple features into one convenient platform. Instead of being just a reference tool, it's a daily-use app that encourages real behavioral change through fun, learning, and collaboration.

We understand that some people want to do better for the planet, but they need a little help, guidance, and motivation. Our app teaches users why it matters and guides them through it in a fun, simple, and interactive way.

Our hope is that EcoSort will encourage long-term behavioral change and help our users become more mindful of their daily impact on the environment.

IV. Impact of Solution

Our project, EcoSort, aims to make a meaningful impact on individuals, especially those who are still unaware or do not have a good understanding of how to properly manage their waste and understand the importance of responsible consumption. From the research and observations conducted by our team, we found that many people have problems with identifying how to correctly sort their waste. This confusion often leads to improper disposal of items that could otherwise be recycled, reused, or safely discarded. We discovered that individuals also don't always take initiative to sort garbage, maybe because they are overwhelmed or unsure about how to go about it. This can lead to habits like throwing everything into one bin or ignoring local recycling efforts altogether. With EcoSort, we hope to provide a solution that supports and guides these users in a friendly, non-judgmental, and educational way.

We believe that EcoSort has the potential to create a significant impact by encouraging behavioral change. We are not trying to force users to suddenly become environmental experts, but instead, we are offering a tool that makes learning about waste sorting simpler, more engaging, and even enjoyable. Our goal is to target users who are willing to make an effort, no matter how small, to improve their waste disposal habits. Through interactive features like quizzes, voice commands, AR sorting, and eco tips, we offer practical guidance to those who are ready to take the first step.

The impact of EcoSort may also vary among users, some may use the app occasionally when they are unsure about an item, while others may use it regularly to track their recycling efforts or educate their children. Just like any other behavioral tool, the effectiveness of EcoSort depends on the users themselves. Either way, we believe that even a small behavioral shift can contribute to a larger cultural shift in environmental responsibility. For families, EcoSort can be a bonding tool to learn together about sustainability. For schools, it can be used as a teaching aid. For communities, it can be a digital companion to support local waste management systems. Our hope is that by providing this kind of support, users will gradually adopt better habits.

In conclusion, while EcoSort may not solve the entire global waste issue on its own, it provides a stepping stone for individuals and families to start making small, positive changes in their daily lives. We believe these small changes, when multiplied across communities, can lead to meaningful impact in promoting sustainable practices and achieving SDG 12: Responsible Consumption and Production.

V. Business Viability Application

Our EcoSort application is technically and economically viable as the core technologies and programming tools required for development are widely used, and cost-efficient. Existing competitors such as iRecycle, Recycle Coach, and MyWaste have shown that mobile apps for recycling education and waste management similar to EcoSort are technically stable and serve a real societal need. However, it seems these apps often fall short in terms of user engagement, education, and behavioral reinforcement. This provides a gap which EcoSort can and aims to fill through a more interactive and AI-powered approach.

Should it become a product, we plan to develop EcoSort for both the Android and iOS platforms, as the predicted target audience for EcoSort includes mainly students, families, and environmentally conscious individuals whose biggest device use are mobile devices. We aim to achieve this using ReactNative, an open-source mobile development framework that supports cross-platform deployment while offering near-native performance. ReactNative also is also UI focused which is crucial for an app that targets all age groups.

Using ReactNative also helps reduce development costs, as code can be reused for both Android and iOS, potentially saving 40–50% of the effort and budget needed for development. This makes EcoSort economically viable even for a small startup team with a limited budget.

Business Model Canvas of EcoSort

Key Partners	Key Activities	Value Propositions	Customer Relationships
- Schools & Universities - Recycling authorities - Cloud service providers - Environmental NGOs	- App development and updates - Gamified learning module creation - Partnership development - Regular data analysis and user feedback processing - Educational content integration	- AI-powered waste sorting education - Gamification & AR integration - Interactive family mode for joint learning - Feedback and rewards system - Promotes responsible waste sorting aligned with SDG 12	- AI Chatbot Helpdesk - In-app feedback portal - Email & live support
Key Resources	**Channels**		**Customer Segments**
- Cloud database - Development & content team - Educational and environmental content repository - UX/UI design and testing tools	- Google Play and Apple App Store - Social media marketing - School webinars and events - Collaborations with recycling campaigns		- Families - Students - Schools - Environmental NGOs
		Cost Structure	**Revenue Streams**
		- App development and maintenance - Server and cloud infrastructure costs - Marketing and promotional campaigns - Salaries for development and support staff	- In-app subscriptions for premium features - In-app advertising (for free users) - Institutional contracts (schools)

Our customer segments are broad but focused. We primarily target families, educators, and students. Additionally, we aim to engage local municipalities, and eco-conscious communities who can benefit from our tool as part of sustainability outreach and education programs.

Our value proposition lies in providing an engaging and educational platform for waste sorting. EcoSort uses interactive learning, AI-based recommendations, and gamified activities to encourage users to sort waste correctly and sustainably. Features like voice interaction, family progress tracking, quizzes, and augmented reality make the app both useful and fun.

We will reach our customers through digital platforms such as Google Play Store and Apple App Store, and we also plan to market the app via webinars, school programs, and social media campaigns. Customer relationships will be maintained through in-app feedback forms, an AI-powered chatbot helpdesk, and a responsive support team.

SWOT Analysis of EcoSort

Strengths	Weaknesses
- Engaging, educational, inclusive UI/UX - Family & gamified approach increases use	- Dependent on device camera/voice quality - Requires regular content updates
Opportunities	**Threats**
- Partnerships with eco-NGOs, schools, governments - Expansion into schools or CSR eco-programs	- Competing apps with more funding or government backing - Tech limitations in low-end phones

SWOT Analysis of Competitors

Competitor	Strengths	Weaknesses	Opportunities	Threats
Recycle Coach	Localized info, municipal tie-ins	Lacks gamification and family features	Partner with schools/municipalities	EcoSort's interactive learning edge
iRecycle	Huge recycling center database	Outdated interface, minimal learning content	Revamp UX for modern users	Better UI/UX apps may replace it
MyWaste	Customizable reminders, simple UI	No learning tools, limited user engagement	Add gamification and tracking	Similar apps with more features may dominate

Future Potential

EcoSort is currently only a theoretical idea. However, with moderate funding and a small team, a functional prototype can be developed and tested with early adopters. The features are supported by existing technology, and our approach offers a compelling and socially relevant use case for environmentally minded users.

By blending education, gamification, and community engagement, EcoSort is positioned as a prototype-ready application with strong future potential in the growing green tech market.

VI. Architectural Overview
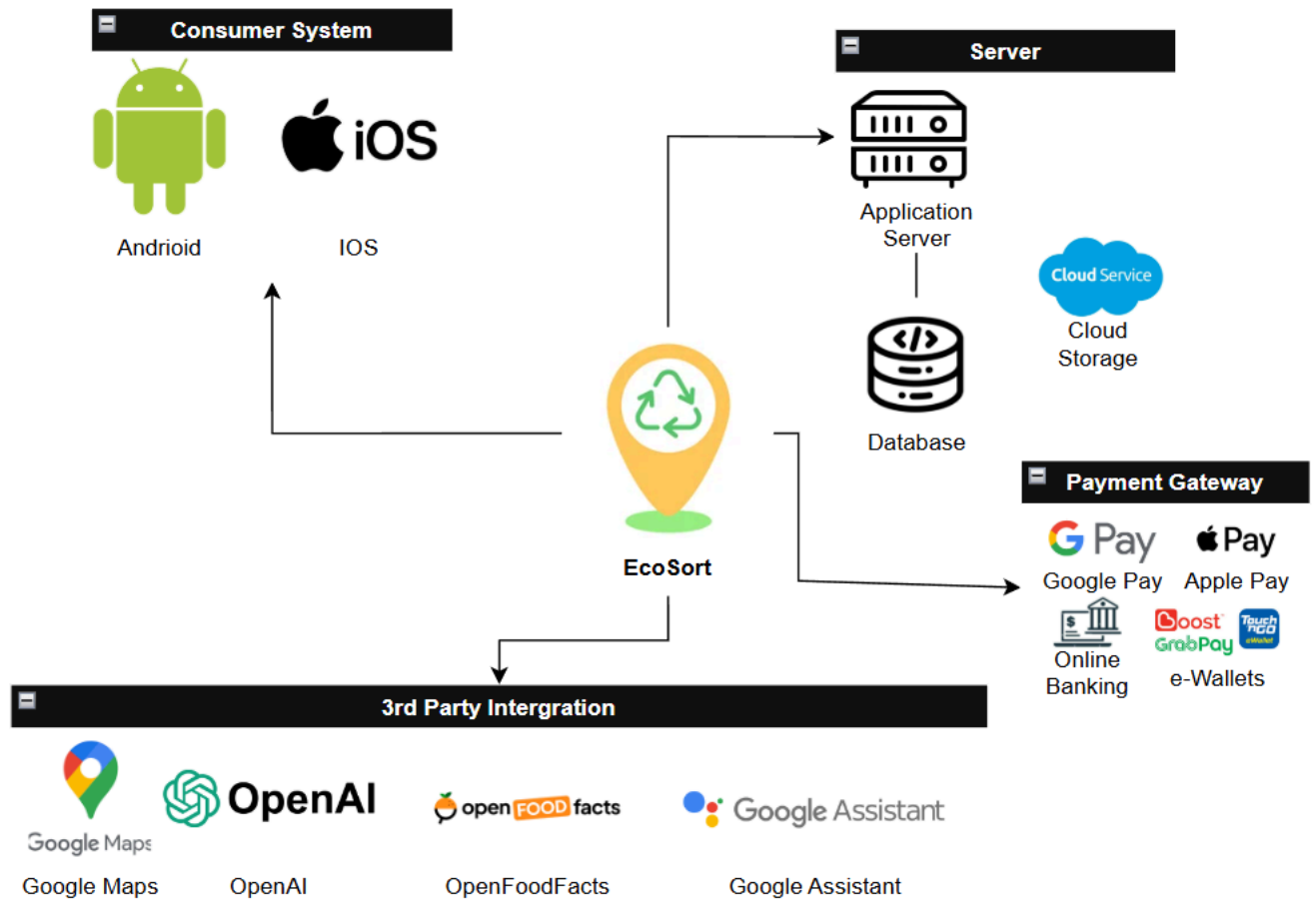
The EcoSort app will be available on Android and iOS platforms. Users can download the app on the official app stores of Google Play Store for the Android users, while for the iOS users, the download will be from the Apple App Store. In order to ensure maximum performance, the minimum operating system requirements are Android 5.0 or above and iOS 9.0 or later. Distribution through these secure platforms ensures security and authenticity along with regular updates and support from the platforms, thus ensuring a peaceful experience to our users and, in turn, to our developers.

EcoSort maintains a Cloud connection to its backend for real-time access and updates of user data. The Application Server is responsible for the core logic and maintenance of the app, whereas the Database is used for the secure storage of all user data such as the name, location, scanning history, and waste sorting preferences. The transactional capabilities of these backend components will ensure a personalized, smooth, and functional experience.

Intelligent waste sorting by EcoSort relies on AI classification techniques powered by OpenAI and external product databases like OpenFoodFacts. When users scan a product or a barcode, the AI applies a set of rules and datasets to effectively classify waste into the appropriate category (i.e. recyclables, organics, or hazardous). This intelligent system lightens the user's effort toward reducing sorting accuracy and environmental benefits.

Following this, EcoSort is graced by integration with popular mapping and voice assistant platforms: Google Maps will assist users in finding the closest recycling centers and waste disposal points.Voice interaction via Google Assistant, Alexa, Siri, and Bixby will allow users to ask questions such as, "Where can I recycle plastic bottles?" or "Log this as recyclable."

In the future, EcoSort anticipates plugging into local waste management APIs for municipalities and school platforms (for example, those associated with university sustainability programs) so that these institutions can measure and track usage and encourage responsible behaviors that can lead to reward for students for green practices.

Payment Gateway Integration (optional)

While EcoSort is currently free, some premium options could be explored such as tracking carbon footprints, intelligent alerts, and gamified reward systems that fall under a subscription. The app is, therefore, going to have a proper transaction database, as well as a secure payment gateway integrated into it. The system will support Google Pay, Apple Pays, Online Banking, and E-Wallets. All payment information will be encrypted and securely processed through a trusted payment server that then communicates with financial networks to authenticate and settle the transaction. The transaction database will record everything from payment confirmations to the status of user subscriptions.

Feasibility Study

Technical Feasibility

In terms of technical feasibility, EcoSort needs a solid backend system, which will include Cloud Infrastructure, Application Server, and Database. The Application Server will manage core business logic and ensure service smoothness: AI recognition, barcode decoding, and user profile synchronization. Scalable performance will be supported by the Cloud, enabling integration of OpenAI, OpenFoodFacts, and real-time user interaction.

The AI algorithm, resting in the cloud, will classify user inputs against rules defined by the project and metadata sourced from external sources. Fulfilling this technical vision with seamless user experience demands the interest of developers who should be competent in mobile, cloud architecture, and AI integration.

Financial Viability

Infrastructure for server support, AI-processing resources, integration of third-party APIs, application deployment in the app store, bug fixes, and marketing campaigns make up the most significant cost of developing an application. Marketing will focus on green audiences through Instagram, TikTok, and YouTube, where environmental champions are working hard to expand the value of EcoSort.

Funding is expected to be through competitions for green technology startups, crowdfunding websites, and institutional sustainability grants. Apart from these programs being sources of financial sustenance, they also build the credibility and outreach that will characterize the EcoSort brand.

VII. System Requirements and Scope

User Requirement Analysis via Questionnaire

To gather accurate insights from potential users of EcoSort, we designed a questionnaire targeting students, families, and environmentally conscious individuals. The purpose of this survey was to understand their current waste management practices, knowledge gaps, feature expectations, and motivational factors.

Below are key sample questions:

Questionnaire:

1. How often do you sort your waste at home?

   Always / Often / Sometimes / Rarely / Never

2. Are you familiar with the categories of recyclable vs. non-recyclable waste?

   Yes / Somewhat / No

3. Would you use a mobile app that helps you sort waste properly?

   Definitely / Maybe / Unlikely

4. What features would you expect in a waste-sorting app?

   (Select all that apply): Barcode scanner, Waste category guide, Gamification, Quizzes, Progress tracking, Nearby recycling centers, Voice commands

5. What would motivate you to continue using a waste-sorting app?

   (Select all that apply): Rewards, Reminders, Eco-feedback, Family leaderboard, Easy interface, Custom tips

6. Do you think educational content about sustainability is important in such an app?

   Yes / No / Not sure

7. Would you pay for premium features like carbon footprint tracking or advanced sorting tips?

   Yes / No / Depends on features

8. How often would you prefer to receive notifications/reminders?

   Daily / Weekly / When needed / Never

Analysis of Responses:

- Over 70% of users sometimes or rarely sort waste at home.
- Over 70% of users expressed only basic or vague understanding of waste categories.
- 80% said they would likely use an app if it made sorting simpler and more fun.
- Users prefer barcode scanning, gamification, and recycling center locators as essential features.
- Continued usage is likely if rewards, ease of use, and personalized suggestions are included.
- Over 90% of users think educational content about sustainability is important in such an app
- 70% would prefer to not pay for premium features
- 90% of users prefer to receive notifications/reminders only when needed

These responses formed the foundation for the system requirements.

System Requirements

Functional Requirements

1. User Registration & Login: Users can sign up and log in using email or social accounts.

2. Waste Scanner: Users can scan barcodes or upload images to identify the waste type using AI.

3. Categorization Engine: The system classifies scanned items into correct waste categories (organic, recyclable, hazardous, etc.).

4. Daily EcoTips: App displays daily sustainability tips.

5. Gamification System: Points and badges are awarded for consistent waste-sorting efforts.

6. Leaderboard: Displays rankings among users or families based on their recycling progress.

7. Quiz Module: Users can take short quizzes to learn more about waste sorting and recycling.

8. Recycling Center Locator: Displays nearby recycling stations using Google Maps integration.

9. User History Tracker: Stores history of sorted items and tracks behavior over time.

10. Notification System: Sends personalized reminders for waste sorting and educational content.

Non-Functional Requirements

1. Performance: App should load within 3 seconds and process scans in under 2 seconds.

2. Usability: The interface must be intuitive and accessible for all age groups, including children.

3. Security: All user data, including payment and profile information, must be securely stored and transmitted using encryption.

Data Requirements

1. User Profile Data: Name, email, location, preferences, and family group (if applicable).

2. Waste Item Logs: Date, time, item scanned, classification, and points earned.

3. Quiz Results: User answers, scores, and progression data.

4. Recycling Center Locations: Geolocation data and categorization of facilities.

5. Subscription & Payment Records: Transaction logs, plan details, and renewal status.

VIII. Prototype and User Interface Design (UID)

1.We design UID in canvas

Canvas link：
https://www.canva.com/design/DAGpGjFRvO8/pR6134junPiYogL9UCUHgQ/edit?utm_content=DAGpGjFRvO8&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

The interface design of EcoSort is centered on the core concepts of "environmentally friendly, intuitive operation, and educational orientation". The overall style is unified and the colors are gentle, highlighting the theme of green environmental protection and serving its goal - to enhance users' awareness and ability of garbage classification in a simple and pleasant way. The entire UI system takes the functional process as the main line. From the user's first contact with the application to long-term use, the design logic is rigorous and the interaction is clear.

The application starts with the login interface and the account creation interface, adopting a simple graphic and text structure to guide users to get started quickly. The colors are fresh and the ICONS are uniform, lowering the entry threshold. After the user completes the registration, they enter the main function page, namely the Feature Hub. This page focuses on showcasing the core functional modules: Waste Item Scanner, Visual Bin Guide, Quiz, Reminders, etc. Each functional icon is distinguished by color and enhanced with graphics to increase its recognizability and child-friendliness.

Each functional page is designed around the transformation of user learning and behavior. For example, the Waste Item Scanner page supports input or photo recognition. The page design emphasizes the immediacy of feedback and the clarity of classification. The Visual Bin Guide page uses a large number of ICONS and color schemes to help users understand the categories of garbage intuitively; The Quiz page stimulates learning interest through question-and-answer and reward mechanisms, and is particularly suitable for use by families and children. The Reminders page provides a to-do list to encourage users to continuously participate in environmental protection behaviors.

On this basis, the application design extends to a deeper level of behavior management and intelligent guidance.

The AI Timeline Scheduling Screen utilizes artificial intelligence to personalize environmental protection tasks, presents daily plans in the form of a calendar, and enhances the systematicness of user behaviors.
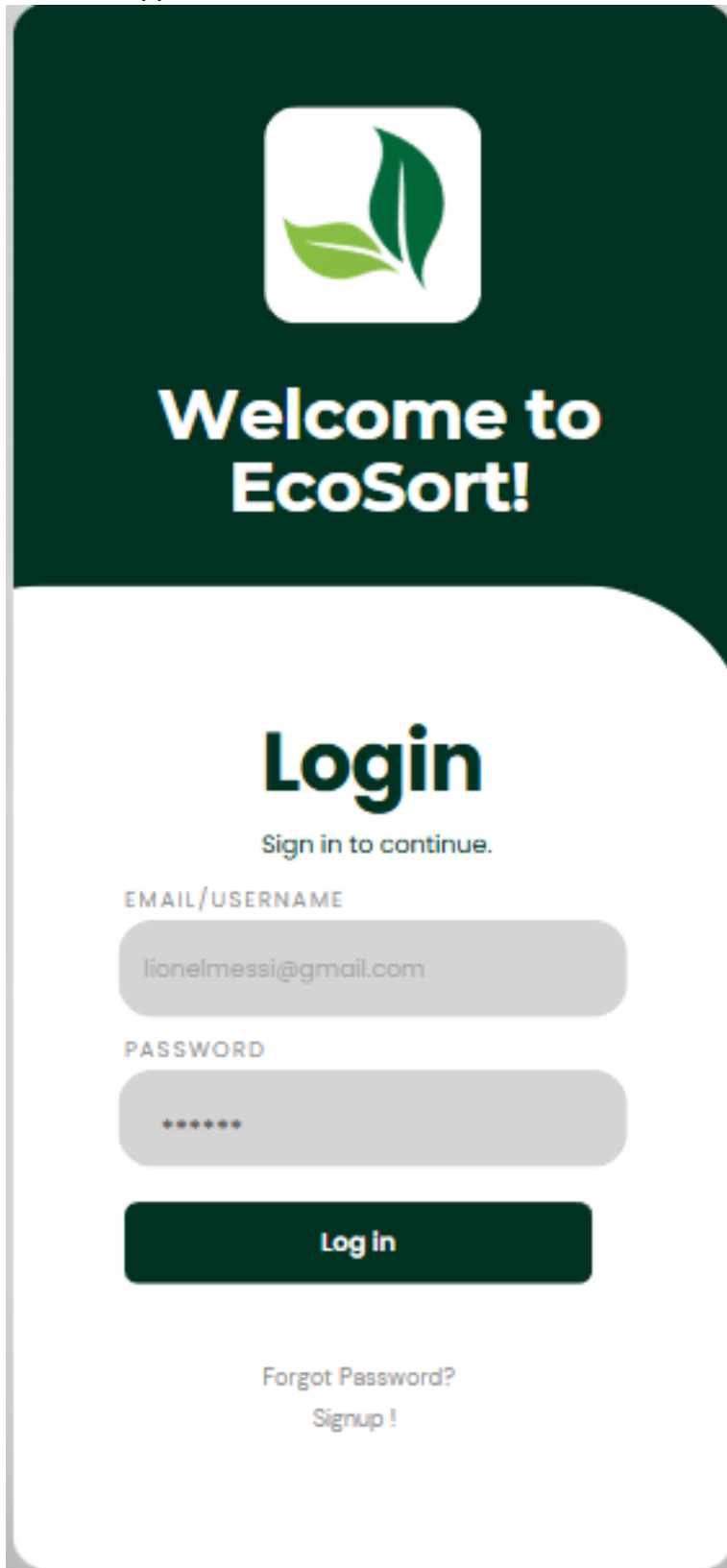
The Project Timeline Screen displays the timeline and progress of the entire garbage classification campaign, guiding users to set goals and periodic tasks.

Reminders Screen is a centralized management interface for task reminders. Its design emphasizes the urgency of tasks and the clarity of execution.

The Completed Tasks Screen is used to display the completed environmental protection behaviors and point feedback, enhancing users' sense of positivity and encouraging them

The overall UI design is rather natural, with green as the main color and gray and white as the background. It is complemented by graphic guidance and a small amount of text description to ensure both ease of use and visual comfort. Both children and adult users can conduct garbage classification learning and daily practice through a simple and clear interface, truly achieving the integration of technology and the Sustainable Development Goals (SDG 12).

1. Mobile Application Screens Overview

2. Application Login screen

Create new Account

Already Registered? Log in here.

NAME

Lionel Messi

EMAIL

lionelmessi@gmail.com

PASSWORD

••••••

DATE OF BIRTH

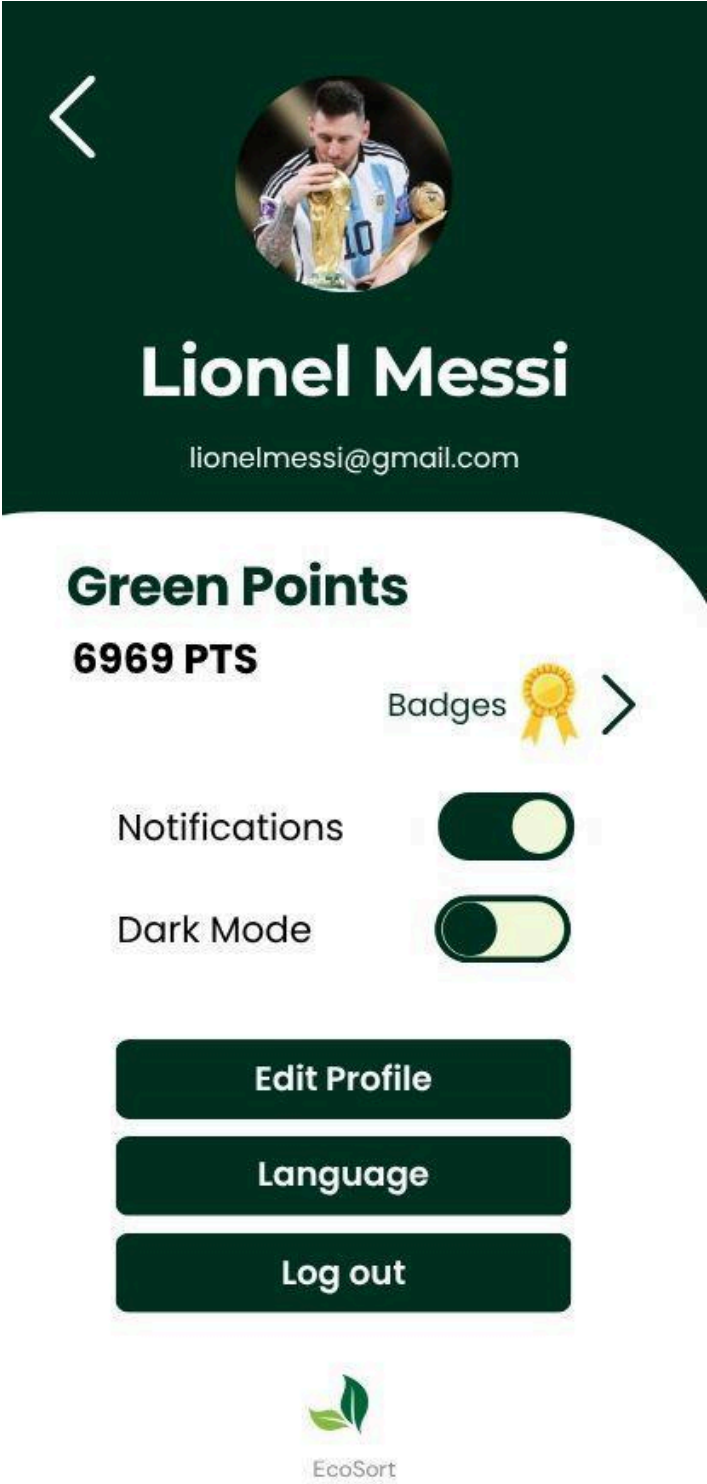Select

Sign up

3. Application Main menu screen

Visual Bin Guide

PLASTIC

Plastic waste, a persistent environmental problem, describes discarded plastic objects that haven't been properly recycled or disposed of. It's a significant source......

GLASS

Glass waste, a significant component of municipal solid waste, is the discarded glass from various sources like bottles, jars, and broken items. It's a substantial and often challenging.......

PAPER

Paper waste refers to discarded paper materials that are no longer needed and are destined for disposal. Paper waste is a

---

Hello, Messi

WASTE ITEM SCANNER

VISUAL BIN GUIDE

QUIZ MODE

REMINDERS

4. Application Profile and setting screen

Lionel Messi

lionelMessi@gmail.com

Green Points

6969 PTS

Badges 🏅 ›

Notifications

Dark Mode

Edit Profile

Language

Log out

EcoSort

5.vision AI timeline and scheduling screen

6. Project timeline screen

7. Reminder screen

8.vision completed screen

Completeld
Task

Completed
Scan Identificat
Today · 9.30 AM

Completed
Food Waste Quiz
Yesterday · 2.15 PM

Completed
Scan Identification
This Week · Tuesday
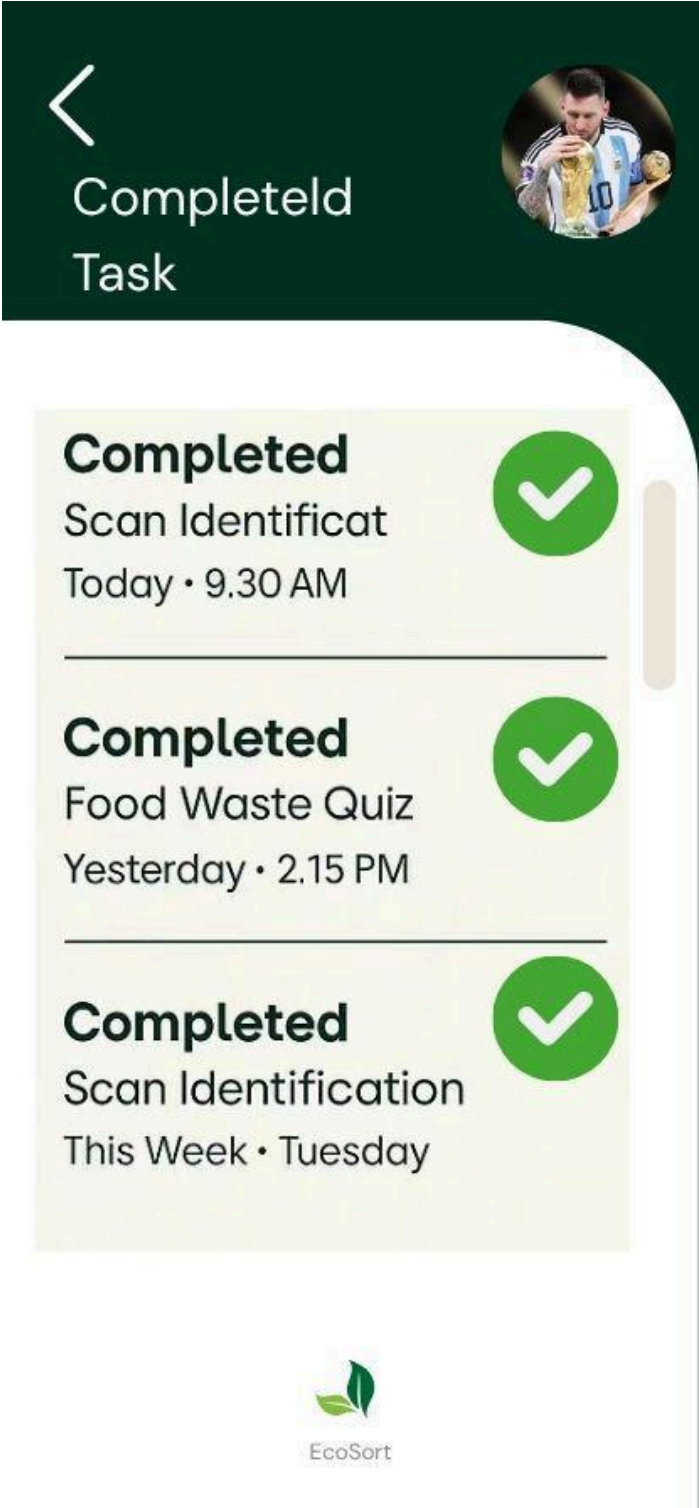
EcoSort

IX. Conclusion and Future Enhancement

EcoSorts' idea is to help people sort their waste more easily and responsibly, taking a step toward sustainable living through technology, education, and behavioral change. But as we researched, surveyed users, and looked deeper into the problem, we see that this issue goes far beyond just tossing things in the right bin. It's about changing habits and making sustainability a part of everyday life. EcoSort is our way of helping to bridge the gap between awareness and action, motivating users to adopt sustainable habits aligned with Sustainable Development Goal 12: Responsible Consumption and Production.

We designed EcoSort with a focus on inclusivity, user-friendliness, and local relevance. The business model, technical architecture, and implementation roadmap all indicate that EcoSort is a feasible and impactful solution with long-term potential. Through features like AI-powered waste classification, gamified learning, and local recycling guides, EcoSort aims to make responsible waste management more approachable and fun for everyone. We've built it not just as a utility app, but to support small but impactful behavior changes that can collectively drive a larger environmental movement. While the app alone won't solve the global waste crisis, it offers a realistic, accessible step that individuals and communities can take.

Future Enhancements

While the current version of EcoSort is still theoretical, there are many possible opportunities for future enhancement.

- Municipal Integration and API Expansion: Future versions of EcoSort can incorporate APIs from local waste management systems, allowing users to sync with real-time local guidelines and schedules.
- Machine Learning for Improved Waste Recognition: Leveraging user-generated data, the AI model can be continuously trained to improve accuracy in classifying waste materials.
- Carbon Footprint Tracker: A personalized carbon tracking based on waste disposal habits. Users will receive feedback on how their sorting contributes to emission reductions over time.
- Augmented Reality (AR) Sorting Assistant: Users could use their camera to visually identify items and receive real-time feedback in AR, making learning and sorting more intuitive and hands-on.
- Accessibility and Localization Improvements: The app can support more languages, local waste symbols, and even dialect-based voice commands to serve more userbases.

EcoSort is still in its early stages, but it could go even further. We believe that with continued support, feedback from users, and collaborations, EcoSort can grow into a powerful tool that helps create a more sustainable future. As awareness of sustainability grows and technology advances, EcoSort is well-positioned to become a vital companion in the global effort toward responsible consumption and environmental education.

X. Reference

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