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A PROJECT REPORT ON

E-Waste and Inventory Management System

Submitted in partial fulfillment for Degree of

MASTER OF COMPUTER APPLICATIONS

By

Mr. Rahul R. Khedekar

Mr. Vishal A. Jogale

Mr. Aditya Y. Main

Under the guidance of

Prof. Harshada U. Salvi

(Department of MCA)

Mr. Prashant G. Acharya

(Aaryak Solutions Pvt. Ltd.)

Submitted to

FINOLEX ACADEMY OF MANAGEMENT AND TECHNOLOGY, RATNAGIRI

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This is to certify that the project report titled:

E-Waste and Inventory Management System

Submitted By:

Mr. Rahul R. Khedekar

Mr. Vishal A. Jogale

Mr. Aditya Y. Main

In partial fulfillment of the award for degree of

MASTER OF COMPUTER APPLICATIONS

From Mumbai University

And is the bonafide record of the work done by them during the Semester IV of A.Y. 2024-25.

Internal Guide	**Head of Department**	**Principal**
(Prof. Harshada U. Salvi)	**(Prof. Tejas V. Joshi)**	**(Dr. Kaushal K. Prasad)**

CERTIFICATE OF APPROVAL

This is to certify that the project titled

E-Waste and Inventory Management System

Is the bonafide record of project work done by

Mr. Rahul R. Khedekar (_____)

Mr. Vishal A. Jogale (_____)

Mr. Aditya Y. Main (_____)

This project is approved for the degree of

MASTER OF COMPUTER APPLICATIONS

Mumbai University

_____

(Examiner)

Internship Certificate

Date: **23rd June 2025**

<u>To whomsoever it may concern</u>

This is to certify that **Mr. RAHUL RAMESH KHEDEKAR** has done his internship as a Trainee Software Developer at **AARYAK SOLUTIONS PRIVATE LIMITED**, Ratnagiri, from 1st Jan 25 to 20 June 25.

He has worked on a project titled **E-Waste and Inventory Management System**. As part of the project, he was engaged in the all phases of SDLC.

During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

For Aaryak Solutions Pvt. Ltd.

Prashant Acharya

Director

Internship Certificate

Date: **23rd June 2025**

To whomsoever it may concern

This is to certify that **Mr. VISHAL AATMARAM JOGALE** has done his internship as a Trainee Software Developer at **AARYAK SOLUTIONS PRIVATE LIMITED**, Ratnagiri, from 1st Jan 25 to 20 June 25.

He has worked on a project titled **E-Waste and Inventory Management System**. As part of the project, he was engaged in the all phases of SDLC.

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We wish him all the best for his upcoming career.

For Aaryak Solutions Pvt. Ltd.

Prashant Acharya

Director

Internship Certificate

Date: **23rd June 2025**

To whomsoever it may concern

This is to certify that **Mr. ADITYA YASHWANT MAIN** has done his internship as a Trainee Software Developer at **AARYAK SOLUTIONS PRIVATE LIMITED**, Ratnagiri, from 1st Jan 25 to 20 June 25.

He has worked on a project titled **E-Waste and Inventory Management System**. As part of the project, he was engaged in the all phases of SDLC.

During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

For Aaryak Solutions Pvt. Ltd.

Prashant Acharya

Director

Acknowledgement

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Abstract

The "E-Waste and Inventory Management System" is a comprehensive web-based solution built using the MERN (MongoDB, Express.js, React.js, and Node.js) stack to streamline inventory tracking and facilitate responsible electronic waste (e-waste) management.

The system provides a centralized dashboard where users can manage inventory efficiently, track asset life cycles. The e-waste management module enables users to categorize, schedule, and monitor the disposal or recycling of outdated electronic devices, ensuring compliance with sustainability policies. Additionally, it integrates with authorized recycling recycler for proper waste handling and generates reports by combining inventory and e-waste management into a single solution, this platform enhances operational efficiency, reduces electronic waste, and promotes sustainable business practices. Its user-friendly interface, real-time tracking capabilities, and automated reporting make it an essential tool for organizations looking to optimize asset management and minimize environmental impact.

Introduction

Project Introduction:

The "E-Waste and Inventory Management System" is a dynamic web-based application that provides a unified solution for organizations to efficiently manage electronic inventory and dispose of e-waste responsibly. Built on the MERN stack, it ensures rapid performance, flexibility, and scalability, which are critical in today's data-driven environments.

It provides transparency and control to administrators and ensures regulatory compliance in e-waste handling.

In today's digital era, the exponential growth of electronic devices has also led to an increase in e-waste. Many organizations struggle with untracked, outdated, or redundant electronic devices, which results in both operational inefficiency and environmental harm. This system aims to address this challenge through real-time tracking, integration with vendors, and detailed reporting.

Proposed System:

The proposed system includes the following main modules:

1. **Inventory Management Module:**
   - Tracks electronic assets by category, user, location, and status.
   - Allows entry of details like asset type, brand, model number, purchase date, warranty, and depreciation.
   - Provides inventory reports for audits and internal tracking.

- o Supports bulk import/export for easier management in large organizations.

2. **E-Waste Management Module:**
   - o Identifies and flags assets that have reached end-of-life.
   - o Schedules pickups or recycling through authorized vendors.
   - o Maintains compliance logs with disposal certificates.
   - o Generates reports on disposed, recycled, and active assets.

3. **Admin Dashboard:**
   - o Role-based access for users, admins, and vendors.
   - o Centralized interface to monitor overall system health and key statistics.
   - o Alert mechanisms for scheduled pickups, asset expiry, and low stock notifications.

4. **Recycler Management:**
   - o Lists registered recycling vendors.
   - o Enables scheduling and tracking of waste collection.
   - o Integrates vendor feedback and ratings for quality assurance.

The system uses secure authentication (JWT), scalable backend APIs, and a responsive frontend interface that works on both desktop and mobile devices.

Scope:

This system can be deployed in a wide range of sectors, such as:

- **Educational Institutions** for tracking computers, projectors, lab equipment.
- **IT Companies** to manage laptops, servers, and network devices.
- **Corporate Offices** for general IT asset tracking and recycling.

Future extensions may include barcode/QR code scanning for faster asset check-in/check-out, AI-powered analytics for predicting asset lifespan, and blockchain-based logging for immutable e-waste disposal records.

System Planning and Analysis

FeasibilityStudy:

The system is feasible in terms of technical, operational, and economic factors. The MERN stack ensures scalability and flexibility. Users and administrators can easily adapt to the system through its user-friendly UI. Cost-effectiveness is achieved by using open-source technologies and cloud deployment.

1. Technical Feasibility:

- The MERN stack offers a solid foundation for building scalable, maintainable applications.
- MongoDB's flexible schema supports dynamic data handling for assets and waste items.
- The system's modular API structure enables integration with external vendor platforms, cloud services, and analytics tools.

2. Operational Feasibility:

- The user interface is designed with a clean, intuitive layout to minimize the learning curve for users.
- Role-based access control simplifies user-specific views, ensuring streamlined operations.
- Administrators can efficiently monitor asset movement, generate reports, and ensure policy enforcement.

3. Economic Feasibility:

- The application leverages free, open-source tools (React, Node.js, MongoDB), reducing development and deployment costs.

- Cloud deployment ensures reduced infrastructure overhead, scalability on demand, and remote accessibility.
- Automated features (alerts, reports, scheduling) reduce manual labor, increasing overall cost-effectiveness.

4. Legal and Environmental Feasibility:

- Adheres to environmental regulations for e-waste disposal (e.g., E-Waste Management Rules in India, RoHS compliance).
- Maintains logs of e-waste handling and disposal with vendor receipts and certification, helping institutions avoid fines.

5. Time Feasibility:

- The development life cycle is designed to be completed in six months, including requirement analysis, system design, development, testing, and deployment.
- Agile methodology allows iterative delivery and feedback from stakeholders during the project.

Software Requirement and Specification

Functional Requirements:

- User Authentication and Authorization

- Inventory Registration and Update

- E-Waste Categorization and Scheduling

- Waste Pickup Scheduling

Nonfunctional Requirements:

- System Usability

- Performance and Scalability

- Reliability and Data Integrity

- Secure Access and Data Protection

Hardware Requirements:

- Processor: Intel i5 or higher

- RAM: 8 GB or higher

- Storage: 100 GB HDD/SSD

- Network: Stable internet connection

Software Requirements:
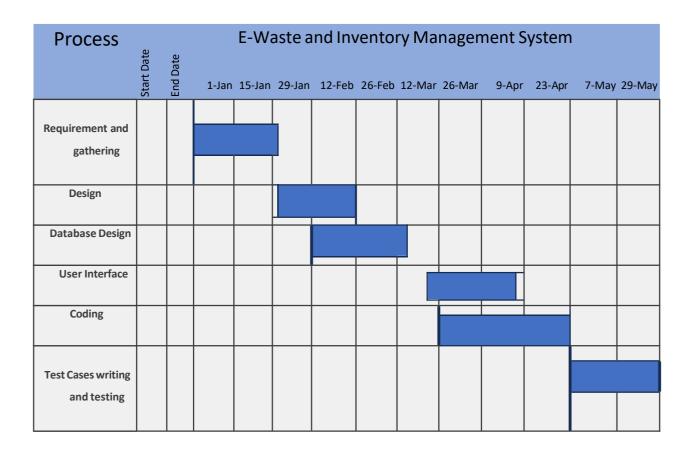
- Frontend: React.js

- Backend: Node.js with Express.js

- Database: MongoDB

- Environment: Node.js Runtime, Browser (Chrome), Postman for API
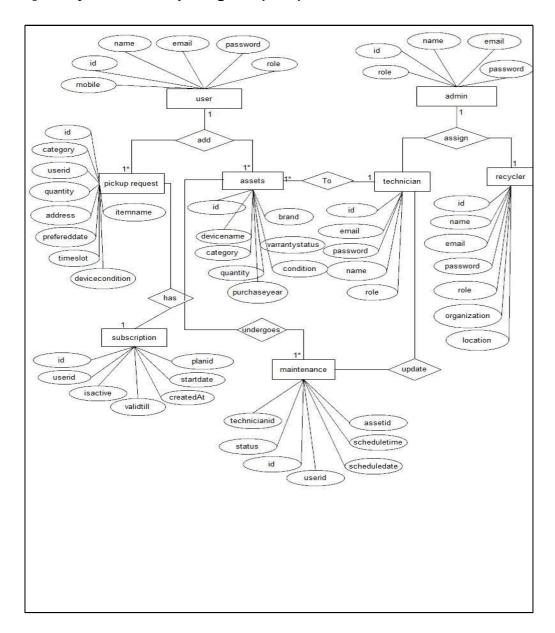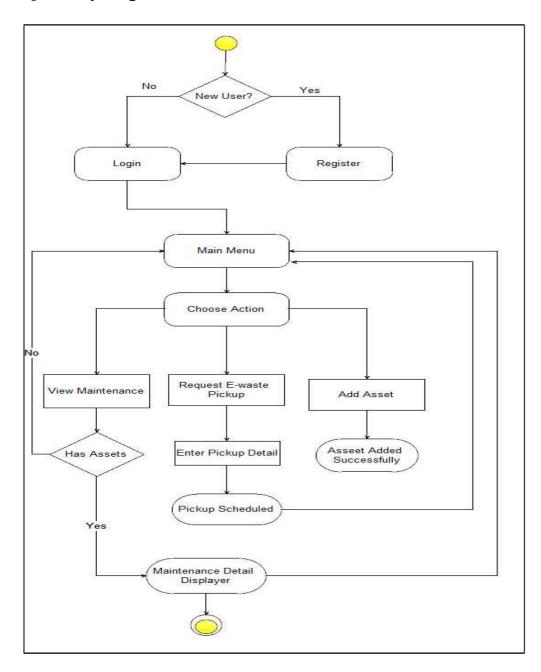testing

Estimation and Planning

Gantt chart:

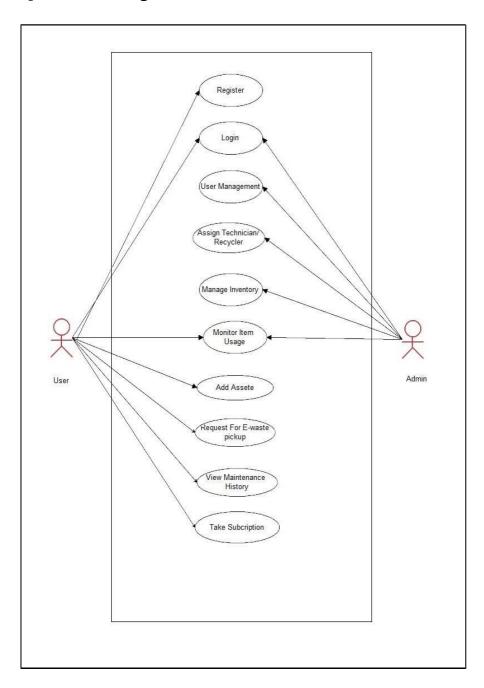| Process	Start Date	End Date	E-Waste and Inventory Management System										
			1-Jan	15-Jan	29-Jan	12-Feb	26-Feb	12-Mar	26-Mar	9-Apr	23-Apr	7-May	29-May
Requirement and gathering			████	████									
Design					████								
Database Design						████							
User Interface									████				
Coding									████	████			
Test Cases writing and testing												████	

System Design (UML Diagrams)

1] Entity Relationship Diagram (ERD)
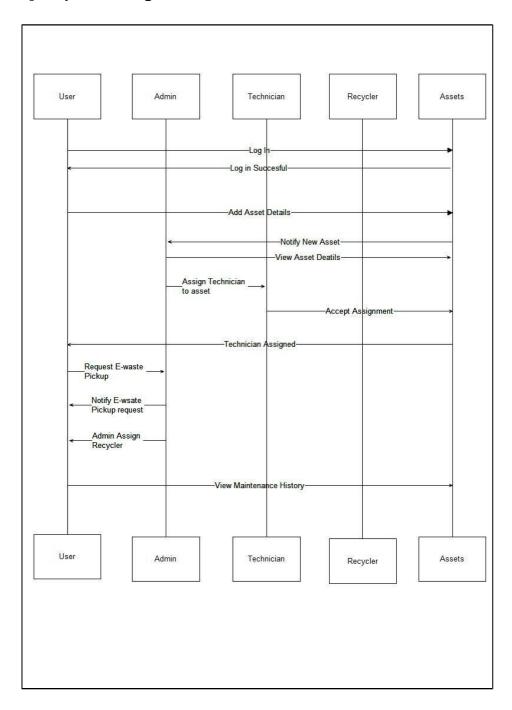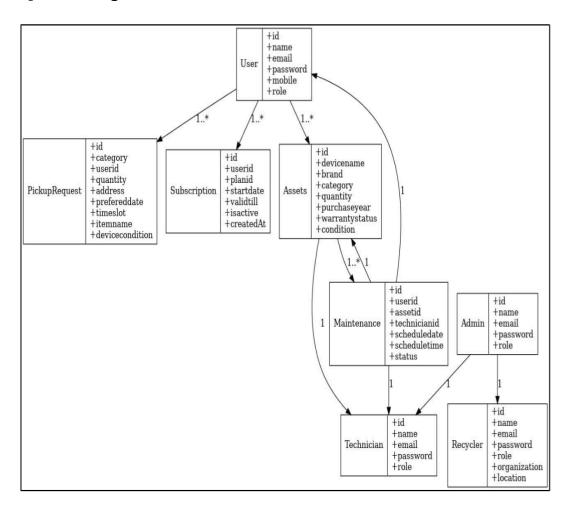
2] Activity Diagram

3] Use Case Diagram

4] Sequence Diagram

5] Class Diagram

Data Dictionary

1] User Collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique identifier for each user	Auto-generated by MongoDB
name	String	Full name of the user	Required
email	String	Email address for login	Required, Unique
password	String	Encrypted password	Required, bcrypt hash
role	String	Role of the user	Enum: admin, user
createdAt	Date	Timestamp when user was created	Auto-generated (Mongoose timestamps)
updatedAt	Date	Timestamp when user was last updated	Auto-managed by Mongoose

2) Recycler Collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique identifier for each recycler	Auto-generated
name	String	Full name of the recycler	Required
email	String	Email address	Required, Unique
password	String	Encrypted password	Required, bcrypt hashed
role	String	Role of user	Fixed: "recycler"
organization	String	Name of recycler's organization	Optional but recommended
location	String	City or region location	Required

3) Technician Collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique identifier for each technician	Auto-generated
name	String	Full name of the technician	Required
email	String	Email address	Required, Unique
password	String	Encrypted password	Required, bcrypt hashed
role	String	Role of user	Fixed: "technician"
createdAt	Date	Account creation date	Auto-generated
updatedAt	Date	Last updated timestamp	Auto-managed

4) Assets Collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique identifier for the asset	Auto-generated
deviceName	String	Name of the electronic device	Required
category	String	Device category (e.g., Laptop, TV)	Required
quantity	Number	Number of devices	Required, default: 1
brand	String	Brand of the device	Required
purchaseYear	Number	Year of purchase	Optional
warrantyStatus	String	Warranty state	Enum: "Valid", "Expired"
condition	String	Condition of the device	Enum: "Working", "Repairable", "Dead"
description	String	Additional notes or details	Optional
addedBy	ObjectId	Reference to user who added the asset	Refers to users._id
createdAt	Date	Timestamp of asset entry	Auto-generated by Mongoose
__v	Number	Version key	Internal versioning field (Mongoose)

6) Inventories collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique identifier for the inventory item	Auto-generated
itemName	String	Name of the item	Required
category	String	Category (e.g., Mobile, Laptop)	Required
quantity	Number	Quantity of items	Required
condition	String	Item condition	Enum: "Working", "Repairable", "Dead"
addedBy	ObjectId	Reference to recycler/admin who added it	Refers to users._id or recyclers._id
sourcePickupId	ObjectId	Reference to pickup from which item came	Refers to pickup_requests._id
addedOn	Date	Timestamp of inventory entry	Auto-generated
__v	Number	Version key	Internal field

5) Maintenances Collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique maintenance request ID	Auto-generated
assetId	ObjectId	Reference to the asset	Refers to assets._id
userId	ObjectId	Reference to user who raised request	Refers to users._id
technicianId	ObjectId	Assigned technician	Refers to technicians._id
scheduledDate	Date	Scheduled maintenance date	Required
scheduledTime	String	Scheduled time slot	Required (e.g., "11:00 AM - 01:00 PM")
issueDescription	String	Description of issue reported	Required
status	String	Current status of maintenance	Enum: "Pending", "In Progress", "Completed"
technicianRemark	String	Final notes/remarks by technician	Optional

7) Pickup Requests Collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique pickup request ID	Auto-generated
userId	ObjectId	User who created the pickup request	Refers to users._id
itemName	String	Name of the item to be picked up	Required
category	String	Category of the item (e.g., Mobile, Laptop)	Required
quantity	Number	Quantity of items	Required
address	String	Pickup address	Required
preferredDate	Date	User's preferred pickup date	Required
timeSlot	String	Preferred time slot (e.g., "10am - 12pm")	Required
notes	String	Additional user notes	Optional

8) User Subscription Collection

Field Name	Data Type	Description	Constraints / Notes
_id	ObjectId	Unique pickup request ID	Auto-generated
userId	ObjectId	User who created the pickup request	Refers to users._id
itemName	String	Name of the item to be picked up	Required
category	String	Category of the item (e.g., Mobile, Laptop)	Required
quantity	Number	Quantity of items	Required
address	String	Pickup address	Required
preferredDate	Date	User's preferred pickup date	Required
timeSlot	String	Preferred time slot (e.g., "10am - 12pm")	Required
notes	String	Additional user notes	Optional

User Persona & Wireframe

1] User Persona 1

2] User Persona 2

Amanda Robertson

Archetype: Committed Recycler
Age: 36
Location: Fairfield, Victoria
Local Council: City of Darebin
Occupation: Receptionist
Marital Status: Married
Dwelling: Free-standing Home
No. of Bins:
7, including green waste, recycling and landfill bin. Also has 2 kitchen bins, 1 bathroom bin and a bin for paper, in her office at home.
No. of Occupants: 4

'I can get quite frustrated when I say that people aren't sorting rubbish in an appropriate way or in a way that is futile because it will end up in landfill anyway.'

Biography

Amanda is a receptionist living in Fairfield, Victoria. She is a mother of three. She is committed to recycling and uses her commingled recycling bin and green waste bin provided by the local council. She also enjoys exercising, where she goes out jogging through the park and along the beach. She has about average knowledge on recycling and feels she can do more to reduce the waste in her household. She also ensures she reuses takeaway containers. Other members of her household are also committed to recycling. She also volunteers with a local community group to pick up litter. She also disposes of hard waste on average of twice per year, where she books a council pick up.

Amanda disposes of soft plastics sometimes hard plastic items in the general rubbish, because she is unsure if they are recyclable. She also has a vague understanding of the numbered recycling codes on plastic containers. She also disposes of old batteries in the general waste bin as well, as she is unsure if they are recyclable. She is also not fully aware of all the recycling programmes in her local area and at her supermarket, such as battery recycling.

Amanda is searching for a way to keep informed of the recycling programmes in her area and to learn how to properly dispose of batteries and further separate her waste. She would also like some tips on how to reuse certain items and would also like a more in-depth understanding of the numbered recycling codes. She would also like some suggestions on how to further minimise her waste, such as buying loose fruit and vegetables.

Goals

- She would like to understand what waste can and cannot go in the household refuse and recycling bins and how the waste should be properly disposed of.
- She would like to be aware of any recycling programmes at her local supermarket and in her local area.
- She would like some daily tips and suggestions of items she can reuse.

- She would like to discover ways to keep her landfill waste to a minimum.
- She would like some product suggestions that use alternatives to plastic.
- She would like to search for products that use less packaging.
- She would like to dispose of her litter in public recycling bin or take it home to be recycled where possible.
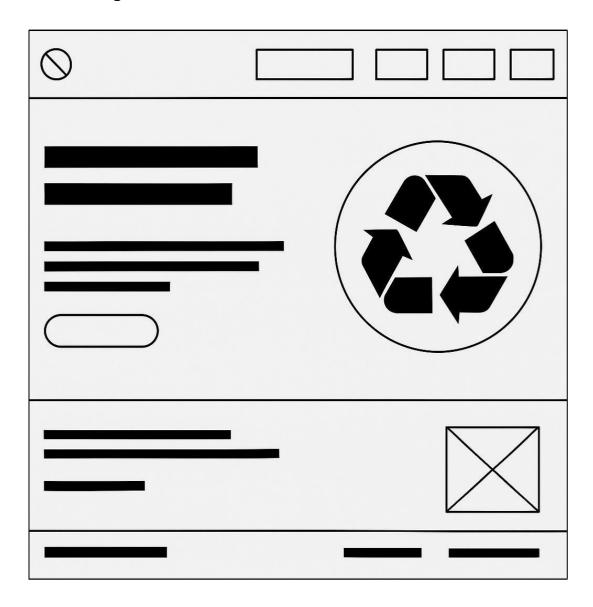
Must Do

- Suggest things to reuse e.g. takeaway containers, cups.
- Make suggestions on how to sort her waste e.g. getting a worm farm.
- Explain what things can and cannot go into the recycling and waste bins.
- Suggest some products that use alternatives to plastics.
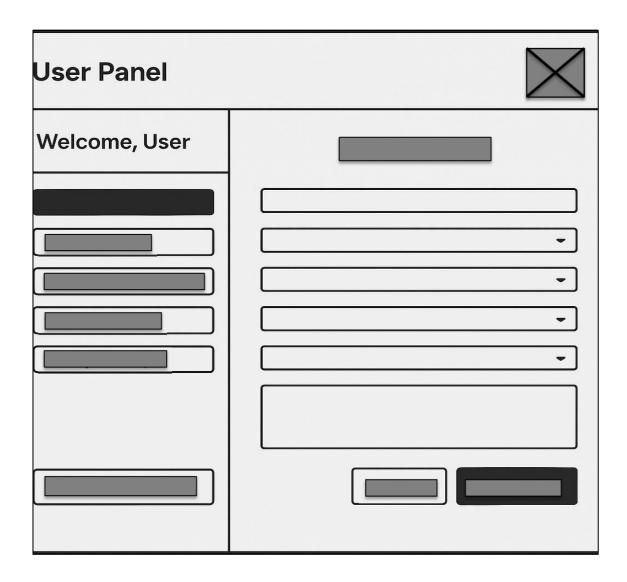- Actively promote any recycling programmes in her local area.

Must Not Do

- Make her travel long distances to dispose of things.
- Give her out of date information on recycling.
- Make her constantly dispose of things in the general rubbish.
- Suggest and initiative when she does not have the space to accommodate it, for example, suggesting a compost bin when there is not enough space or soil in her backyard or does not have a backyard at all.
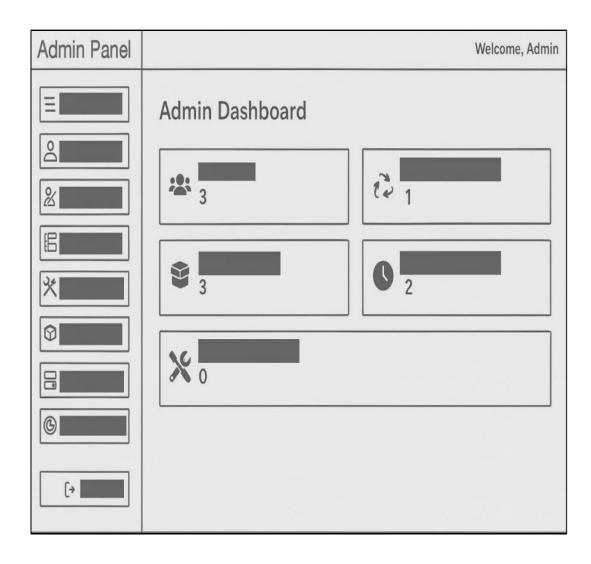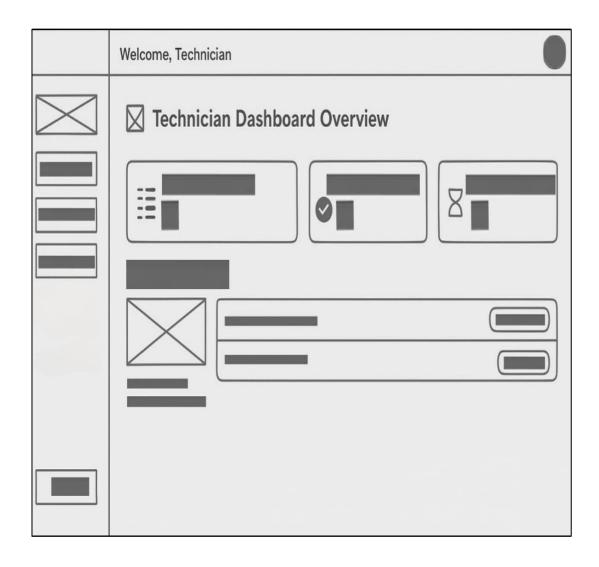
Wireframe

1] Home Page

2] User Panel

User Panel

Welcome, User

3] Admin Dashboard

4] Technician Dashboard

5] Recycler Dashboard

Screens

1] Register

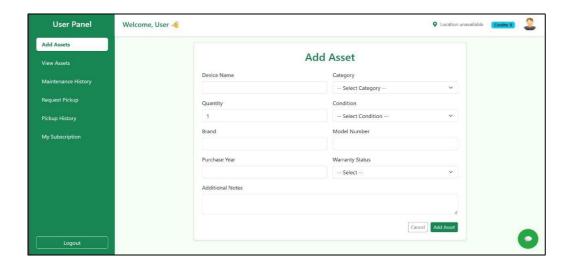

2] Login

3] Home Page

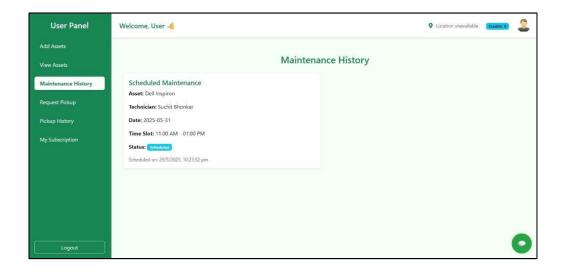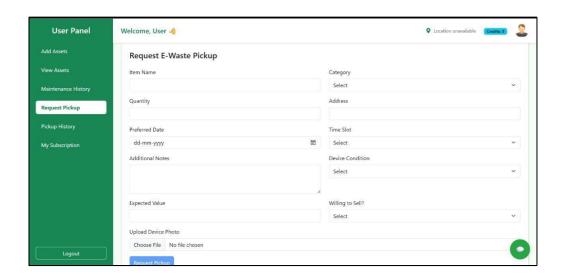**4] Our services**

5] User Dashboard
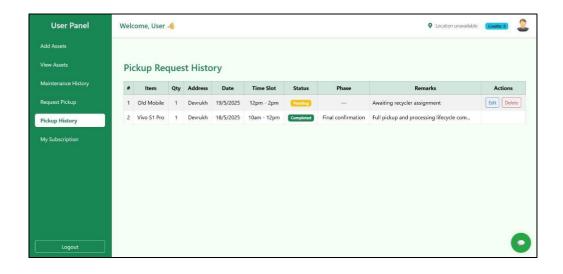

6] Add asset

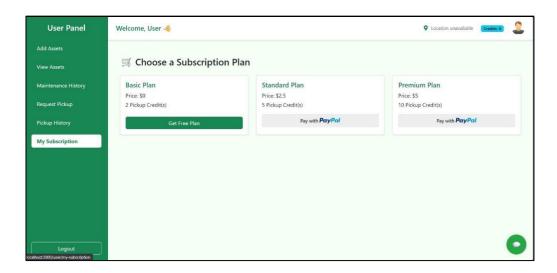## 7] View asset

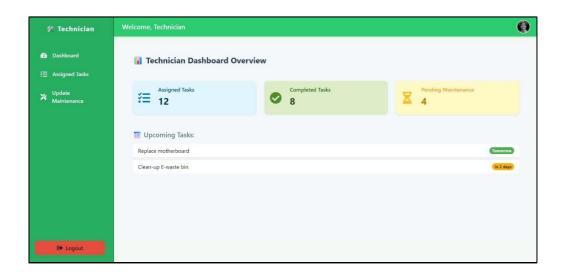## 8] Maintenance History

9] Request Pickup
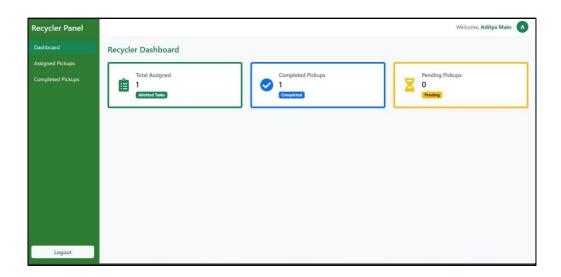

10] Pickup History
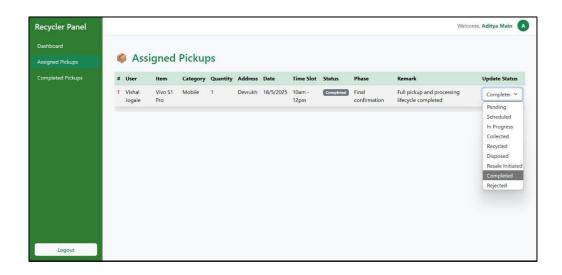
11] Subscription
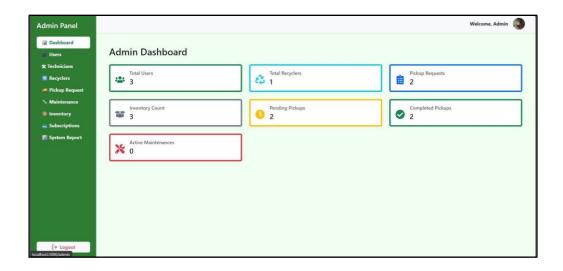

12] Technician

13] Recycler panel

14] Assign pickup
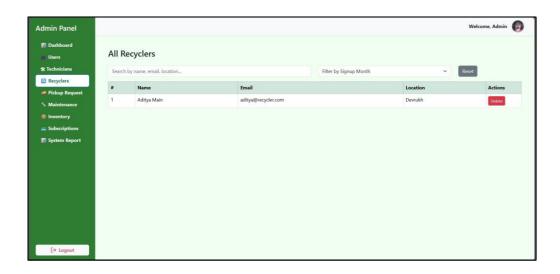
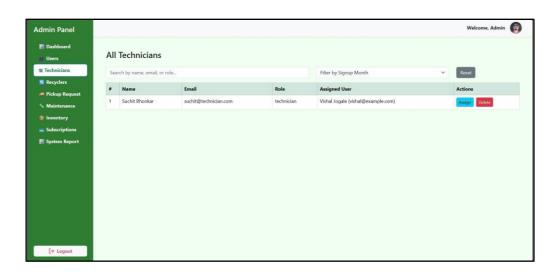## 15] Admin Dashboard

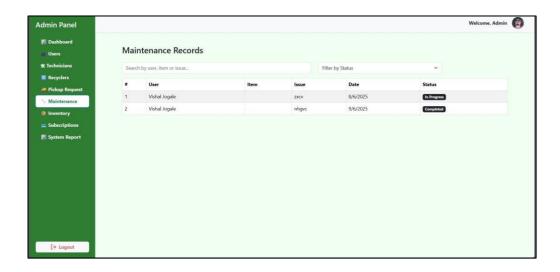## 16] Pickup requests

17] Users Records
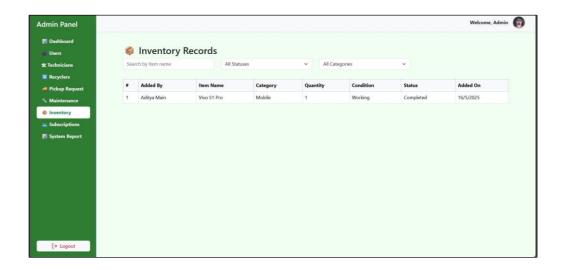

18] Recyclers Records

19] Technician Records
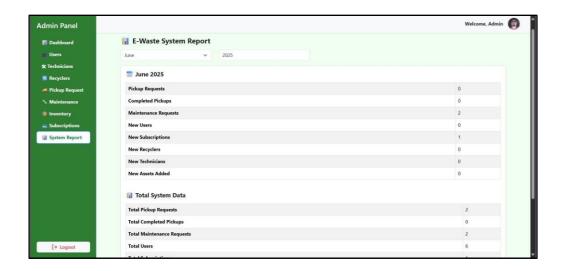

20] Maintenance Records

21] Inventory Records

22] Subscription Records

23] System Reports

24] System Reports Print as PDF/CSV

Testing Details

User Module

Test Case ID	Description	Input Data	Expected Result	Result
TC_U_01	Register new user	Valid name, email, password, mobile, and role	User registered successfully	Pass
TC_U_02	Login user	Correct email and password	Login successful	Pass
TC_U_03	Invalid login	Incorrect password	Error message shown	Pass

Admin Module

Test Case ID	Description	Input Data	Expected Result	Result
TC_A_01	Admin login	Correct admin credentials	Admin dashboard opens	Pass
TC_A_02	Assign technician/recycler	Select technician/recycler and asset	Assignment successful	Pass

Pickup Request

Test Case ID	Description	Input Data	Expected Result	Result
TC_P_01	Submit pickup request	Item details, category, quantity, address, preferred date and time	Pickup request created	Pass
TC_P_02	Invalid pickup submission	Leave required fields empty	Error message shown	Pass

Assets Module

Test Case ID	Description	Input Data	Expected Result	Result
TC_AS_01	Add asset	Device details: name, brand, category, etc.	Asset added	Pass
TC_AS_02	Assign asset to technician	Select technician and asset	Asset assignment confirmed	Pass

Maintenance Module

Test Case ID	Description	Input Data	Expected Result	Result
TC_M_01	Schedule maintenance	Assign technician, asset, date/time	Maintenance scheduled	Pass
TC_M_02	Update maintenance status	Change status (e.g., Completed)	Status updated	Pass

Subscription Module

Test Case ID	Description	Input Data	Expected Result	Result
TC_S_01	Add subscription	Plan ID, dates, and user ID	Subscription added	Pass
TC_S_02	Check subscription validity	Check with current date	Active/Expired message shown	Pass

Recycler Module

Test Case ID	Description	Input Data	Expected Result	Result
TC_R_01	Recycler login	Valid credentials	Login successful	Pass
TC_R_02	Update recycler details	Edit name, email, or location	Details updated	Pass

Limitation & Enhancements

While the "E-Waste and Inventory Management System" delivers a comprehensive approach to managing electronic assets and waste, it has a few limitations that can be addressed in future versions:

- o **Barcode/QR Code Support:** Currently, the system lacks barcode or QR code integration, which can simplify inventory tracking.
- o **Mobile App Availability:** The system is web-based only; a mobile application would increase accessibility for technicians and field workers.
- o **Offline Functionality:** Internet connectivity is required for all functions, which may be a limitation in remote or offline areas.
- o **Limited AI Integration:** Predictive analytics or AI-based suggestions for asset lifecycle decisions are not implemented yet.
- o **Scalability for Larger Enterprises:** While scalable, high-volume operations may need performance tuning or distributed architecture.

Future Enhancements:

- Mobile application for Android and iOS.
- Barcode/QR code scanning feature.
- AI-driven asset usage prediction and reporting.
- Integration with ERP and accounting systems.
- Blockchain logging for secure and verifiable asset disposal records.

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