Innovation and Design Thinking

Project Features and Tech Stack

1. Introduction

Electronic waste (e-waste) refers to discarded electrical and electronic devices such as computers, mobile phones, televisions, batteries, and circuit boards. With rapid technological advancement and frequent product upgrades, e-waste generation is increasing at an alarming rate worldwide. In many developing regions, e-waste is handled by informal sectors that lack proper tools, training, and safety measures. These unregulated recycling practices expose workers and nearby communities to toxic materials like lead, mercury, cadmium, and arsenic. Such exposure can cause serious health problems and environmental pollution. Addressing this issue requires a systematic, technology-driven solution that promotes safe handling, monitoring, and disposal of e-waste.

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2. Problem Statement

Informal e-waste recycling methods such as open burning, acid extraction, and manual dismantling release toxic substances into the air, soil, and water. Workers involved in these activities often operate without protective equipment and awareness of health risks. As a result, they face severe health hazards including respiratory disorders, neurological damage, and long-term diseases. The absence of organized collection systems, tracking mechanisms, and regulatory monitoring contributes to improper disposal. Therefore, there is a need for a structured digital system that ensures safe collection, monitoring, recycling, and awareness regarding e-waste management.

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3. Proposed Solution

The proposed system is a **Smart E-Waste Management Platform** that integrates digital tracking, user participation, and authorized recycling channels. The system will allow individuals, organizations, and recycling agencies to coordinate e-waste collection and disposal safely. Users can register e-waste items, schedule pickups, locate nearby authorized recycling centers, and receive incentives for responsible disposal. Authorities can monitor waste flow, ensure compliance, and identify illegal recycling activities through data analytics. This platform bridges the gap between waste generators and certified recyclers, reducing dependence on unsafe informal practices.

4. Features

- User registration and login authentication
- E-waste item submission portal
- Pickup scheduling system
- Geo-location of authorized recycling centers
- Real-time tracking of waste disposal status
- Awareness and educational section
- Reward/incentive system for users
- Admin dashboard for monitoring and reporting
- Complaint reporting against illegal recycling
- Data analytics for waste trends

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5. Technology Stack

Frontend

- HTML, CSS, JavaScript
- React.js (UI development)
- Tailwind CSS (styling)

Backend

- Node.js
- Express.js

Database

- MongoDB (NoSQL database for flexible data storage)

Other Tools & Services

- Google Maps API (location tracking)
- Firebase / JWT (authentication)
- Cloud hosting (AWS / Vercel / Render)

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6. System Modules

1. User Module

Handles user registration, login, profile management, and e-waste submission.

2. Collection Module

Manages pickup scheduling, waste categorization, and logistics coordination.

3. Recycler Module

Allows certified recyclers to receive requests, update processing status, and confirm safe disposal.

4. Admin Module

Provides monitoring dashboard, analytics reports, user management, and violation tracking.

5. Awareness Module

Displays educational resources about e-waste hazards and safe disposal methods.

6. Incentive Module

Tracks user participation and assigns reward points or certificates.

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7. Functions of the System

Function	Description
Registration	Creates user accounts
Authentication	Secure login verification
Waste Submission	Upload item details
Pickup Scheduling	Book collection slot
Tracking	Monitor disposal progress
Notification	Alerts via email/SMS
Data Analysis	Generate reports
Complaint Handling	Report illegal practices
Reward System	Incentivize participation