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Online Scrap Collector Web Portal

Patel Aman Rashid[1], Pawar Aaditya Vilasrao[2], Sangamnere Nikhil Lalsing[3], Thube Mayur Dilip[4]
Mr. A. S. Dhomase[5]
Students, Department of Computer Engineering[1-4]
Guide, Department of Computer Engineering[5]
Matoshri Aasarabai Polytechnic, Eklahare, Nashik, Maharashtra, India

Abstract: *The rapid growth of urban waste and the inefficiency of traditional scrap collection methods necessitate a modern, digital approach to waste management. This paper presents the design and implementation of an Online Scrap Collector Web Portal — a web-based platform built using PHP, MySQL, HTML, CSS, and JavaScript — that digitally bridges scrap generators (households, offices, institutions) with registered scrap collectors and recycling agents. The system streamlines the entire process of scrap booking, real-time tracking, category management, digital payment handling, and administrative control through a structured, multi-role portal. Key modules include user registration and authentication, scrap pickup scheduling, collector dashboards, admin monitoring, notification systems, and secure transaction recording. The portal promotes environmental sustainability by encouraging proper recycling and reducing dependence on the informal scrap sector. Experimental analysis demonstrates that the system significantly reduces pickup response time, improves transparency in scrap pricing, and enhances operational efficiency for all stakeholders. The platform is scalable, cross-browser compatible, and designed to support future integration with GPS tracking, AI-based pricing, mobile applications, and IoT-enabled devices. This research contributes a viable, technology-driven solution toward smart and sustainable urban waste management..*

Keywords: Scrap Management, Web Portal, Online Booking, PHP, MySQL, Waste Recycling, Digital Platform, Smart Waste Management, E-waste, Sustainable Development

I. INTRODUCTION

The increasing urbanization and rapid growth of consumer economies have resulted in exponential generation of recyclable waste including metals, plastics, paper, glass, and electronic components. Conventional scrap collection operates largely in the informal sector, characterized by unstructured scheduling, opaque pricing, manual record-keeping, and poor coordination between waste generators and collectors. These inefficiencies lead to significant loss of recyclable resources, increased landfill burden, and environmental degradation [1].

The Online Scrap Collector Web Portal addresses these challenges by providing a technology-driven digital platform that formalizes and streamlines the entire scrap collection process. The system serves as an intermediary connecting households, offices, and businesses (scrap generators) with verified and registered scrap collectors through an organized, trackable online interface. Users can conveniently schedule pickups, browse scrap categories with transparent pricing, and track the status of their requests in real time, eliminating dependency on irregular vendor visits [2].

From an environmental perspective, the portal supports the principles of Reduce, Reuse, and Recycle by directing waste towards registered recycling partners and maintaining digital records of collected materials. This data can support government initiatives such as the Swachh Bharat Mission and municipal solid waste management programs [3].

The system is developed as a web application accessible on all standard internet browsers without the need for additional installation, making it platform-independent and accessible to a wide demographic. Its modular architecture supports three primary roles: end-user, scrap collector, and administrator — each with dedicated dashboards and

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specific access controls. The portal not only digitizes service operations but also brings transparency, reliability, and environmental accountability to the scrap collection ecosystem.

This paper is organized as follows: Section II presents a review of related literature. Section III describes the system architecture and methodology. Section IV covers the database design. Section V discusses implementation and results. Section VI addresses security and scalability, and Section VII concludes with future directions.

II. LITERATURE SURVEY

A comprehensive review of existing literature was conducted to understand the current state of scrap management systems, digital service platforms, and waste management technologies.

Researchers in the domain of solid waste management have consistently highlighted the deficiencies of informal scrap collection. Kumar and Singh [4] observed that traditional scrap markets lack transparency in pricing, proper scheduling mechanisms, and record maintenance, leading to inefficient resource utilization. They emphasized the need for structured digital platforms to formalize the sector.

Studies on information technology in waste management (Gupta et al. [5]) demonstrated that web-based and mobile-based platforms have been successfully deployed to monitor waste generation, schedule collections, and enhance stakeholder communication. These systems reduce manual intervention and introduce data-driven decision-making to waste operations.

The success of digital service aggregation models — such as cab booking (Ola, Uber) and food delivery (Swiggy, Zomato) — provides a strong framework for applying similar on-demand service architectures to scrap collection (Mehta [6]). These platforms use scheduling systems, user profiles, tracking features, and digital payments, demonstrating effectiveness in connecting service providers and consumers efficiently.

Environmental research strongly supports the case for digitizing scrap collection. The World Bank Report on Waste Management (2019) found that proper recycling of metals, plastics, and paper reduces landfill usage, conserves natural resources, and lowers greenhouse gas emissions. Digital collection portals that direct materials toward authorized recycling centers directly contribute to these sustainability goals [7].

From a UI/UX perspective, Nielsen (2020) [8] emphasized that platforms targeting diverse user demographics — including those with limited technical knowledge — require simple navigation, clear labeling, and responsive layouts. This influenced the design principles adopted in the Scrap Collector Portal. Furthermore, Silberschatz et al. [9] provided foundational guidance on relational database design used to structure the portal's multi-table data architecture.

A notable gap identified in the literature is the absence of integrated portals that combine scrap booking, real-time status tracking, transparent pricing, and administrative management in a single unified system tailored to the Indian informal waste sector. The proposed Online Scrap Collector Web Portal addresses this gap comprehensively.

III. SYSTEM ARCHITECTURE AND METHODOLOGY

A. Proposed System Overview

The Online Scrap Collector Web Portal is a three-tier web application consisting of a client-side presentation layer, a server-side application layer, and a backend database layer. The system connects three primary user roles — End Users (Scrap Generators), Scrap Collectors (Agents), and Administrators — through role-specific dashboards with controlled access levels.

B. System Modules

1. User Registration and Authentication Module:

Provides secure account creation and login for all user types. Users submit personal details including name, mobile number, address, and credentials. Scrap collectors undergo admin verification before activation. Authentication is enforced through session management and encrypted password storage.

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2. Scrap Pickup Request Management Module:
Enables users to create pickup requests by selecting scrap categories (paper, plastic, metal, e-waste, glass, etc.), specifying estimated quantity, and choosing a preferred date, time, and pickup address. Requests are stored with unique IDs and passed to the collector assignment engine.

3. Scrap Collector Module:
Allows verified collectors to view incoming requests, accept or reject assignments, update collection status (Assigned, On the Way, Collected), and maintain transaction history. Real-time notifications keep collectors informed of new and updated requests.

4. Admin Control Module:
The administrative dashboard provides full system oversight including management of users and collectors, updating scrap material rates, monitoring all active and completed bookings, generating reports, and handling user complaints. Sub-admin roles allow delegated management.

5. Payment and Transaction Module:
Records all financial transactions post-collection including scrap type, quantity, rate per kg, total amount, and payment method. Supports digital payment gateway integration and maintains transparent invoicing.

6. Notification and Communication Module:
Sends automated alerts via email and portal notifications for registration confirmation, booking confirmation, status updates (accepted, on the way, completed), and payment receipts.

C. System Architecture Diagram

The system follows a standard three-tier architecture: The Presentation Layer (HTML, CSS, JavaScript, Bootstrap) handles user interaction. The Application Layer (PHP) processes business logic, request routing, and module operations. The Data Layer (MySQL via phpMyAdmin) manages structured storage of users, bookings, categories, agents, and transactions. The Apache web server (via XAMPP) facilitates HTTP request handling and application deployment.

D. Technology Stack

Component	Technology Used
Frontend	HTML5, CSS3, JavaScript, Bootstrap, jQuery, AJAX
Backend	PHP (Server-side scripting)
Database	MySQL (via phpMyAdmin)
Web Server	Apache (XAMPP / WAMP)
Development IDE	VS Code, Sublime Text, Notepad++
Payment Integration	UPI / Digital Payment Gateway APIs
Security	Session management, MD5/bcrypt encryption, HTTPS

Table I: Technology Stack of the Proposed System

IV. DATABASE DESIGN

The system employs a relational MySQL database with a normalized schema. The primary database contains nine tables managing all entities of the portal:

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Table Name	Description
tbladmin	Stores administrator credentials and access details
tblusers	Maintains registered user profiles and contact information
tblscrapagents	Records scrap collector details, area coverage, and status
tblscrapcategories	Holds major scrap categories (Metal, Plastic, Paper, E-waste, etc.)
tblscrapsubcategories	Stores sub-categories and per-kg pricing under each main category
tblscrapbooking	Records all scrap pickup requests with status and timestamps
tblbookingitems	Stores individual scrap items per booking with quantity and pricing
tblcart	Manages user cart before booking confirmation
tbltrackinghistory	Logs real-time status updates for each booking request

Table II: Database Schema Overview

The Entity-Relationship (ER) model establishes relationships between Users, Collectors, PickupRequests, and Payments. A User can create multiple PickupRequests (one-to-many). Each PickupRequest is assigned to one Collector (many-to-one). Every completed PickupRequest generates one Payment record (one-to-one). The scrap category and sub-category tables provide structured classification with dynamic pricing managed by the admin.

V. IMPLEMENTATION AND RESULTS

A. User Interface Implementation

The portal features a responsive, multi-screen interface designed for accessibility across device types. Key screens implemented include:

Home Page: Navigation bar with Home, Admin, Staff, Category, and Contact options; Sign Up and Login CTAs; recycling-themed banner.

User Registration & Login: Form-based registration collecting name, email, mobile number, and password with client-side validation.

Admin Dashboard: Summary cards displaying total agents, categories, bookings (new, accepted, rejected, on-the-way), and sub-admin management.

Scrap Booking Interface: Category-based browsing, cart-based item selection, quantity entry, address confirmation, and date/time scheduling.

Collector Dashboard: View and manage assigned requests, update pickup status, access transaction history.

Contact Us Page: Query submission form with institution contact details.

B. System Workflow

The end-to-end workflow of the portal operates as follows:

User registers and logs in with verified credentials.

User browses scrap categories, adds items to cart, and submits a pickup booking with preferred date, time, and address.

System assigns the request to the nearest available scrap agent and sends confirmation notification.

Scrap agent receives the request, accepts it, and updates status to 'On the Way'.

Agent collects the scrap, weighs items, and updates status to 'Collected'.

System records transaction details including quantity, rate, and total payment.

User receives a final notification and can view complete transaction history.

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C. Performance Evaluation

The system was tested for functional correctness, usability, and performance under simulated load conditions. The following observations were recorded:

Test Parameter	Traditional Method	Proposed Portal
Pickup Response Time	1-3 days (irregular)	Within 24 hours (scheduled)
Price Transparency	No standard pricing	Category-wise rate display
Booking Process	Manual / phone-based	Online, anytime, any device
Status Tracking	Not available	Real-time tracking dashboard
Record Management	Paper-based / none	Fully digitized database
Payment Transparency	Cash, no receipts	Digital invoice & records
Scalability	Limited by locality	City/national level expansion

Table III: Comparison of Traditional vs. Proposed Digital Scrap Collection

User acceptance testing conducted with 20 trial users showed that 90% found the booking process intuitive, 85% reported improved confidence in scrap pricing transparency, and 95% rated the status tracking feature as highly useful. Average page load time measured under standard network conditions was under 2 seconds for all primary modules.

VI. SECURITY AND SCALABILITY

A. Security Measures

The portal incorporates multiple layers of security to protect user data and system integrity:

Authentication: Secure login with session-based access control prevents unauthorized entry.

Password Encryption: User credentials are stored using hashed encryption (MD5/bcrypt) in the database.

Role-Based Access Control (RBAC): Admin, Sub-Admin, Scrap Agent, and End User roles are enforced to restrict unauthorized feature access.

Input Validation: All form inputs are sanitized server-side to prevent SQL injection and Cross-Site Scripting (XSS) attacks.

Session Management: Automatic session timeout for inactive users prevents session hijacking.

HTTPS Support: SSL certificate integration enables encrypted client-server communication.

Firewall and Activity Logging: System access and user activities are logged for monitoring and anomaly detection.

B. Scalability Considerations

The portal is designed with scalability as a first-class concern. Its modular architecture allows independent scaling of modules without system-wide changes. The MySQL database is optimized with proper indexing and query tuning to handle large transaction volumes. Cloud-based hosting (AWS, Google Cloud, or Azure) can be adopted to enable elastic resource scaling during peak loads. The portal's geographic coverage can be expanded to additional cities by onboarding new collector networks and configuring location-based request routing.

VII. CONCLUSION AND FUTURE SCOPE

A. Conclusion

This paper presented the design, implementation, and evaluation of an Online Scrap Collector Web Portal that successfully digitizes the traditionally unorganized scrap collection sector. The system provides a structured, transparent, and efficient platform connecting scrap generators with verified collectors under administrative oversight.

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Key achievements include automated booking and request assignment, real-time status tracking, standardized pricing, digital transaction management, and a secure multi-role access framework.

The portal not only improves operational efficiency for all stakeholders but also contributes to environmental sustainability by promoting organized recycling and waste reduction. By formalizing the informal scrap sector through technology, the system supports broader smart city and Swachh Bharat initiatives. The comparative analysis demonstrated significant improvements over traditional methods across all key performance parameters.

B. Future Scope

The following enhancements are proposed for future development of the system:

Mobile Application: Development of dedicated Android and iOS apps for improved accessibility and real-time push notifications.

GPS and Route Optimization: Integration of location services to enable live collector tracking and route optimization for efficient pickups.

AI-Based Dynamic Pricing: Machine learning models to predict scrap rates based on real-time market demand and supply conditions.

IoT Integration: Smart weighing devices connected via IoT to automate scrap quantity measurement and eliminate manual errors.

Blockchain Transactions: Implementation of blockchain-based records for tamper-proof, transparent transaction history.

Multilingual Interface: Support for regional languages (Marathi, Hindi) to improve accessibility for diverse user demographics.

Advanced Analytics Dashboard: Data visualization tools for administrators to monitor recycling trends, environmental impact metrics, and system performance KPIs.

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