A Digital Framework for Sustainable Household Resource Redistribution and Local Collaboration

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ABSTRACT

The System is a web-based application designed to promote sustainable living and strengthen community collaboration by enabling local residents to share, exchange, and reuse unused household items. In today's consumer-driven society, many usable items are discarded prematurely, leading to increased waste and environmental impact. This system addresses the problem by providing a digital platform where individuals can connect within their neighborhood to efficiently redistribute resources. The application is developed using React.js for the frontend to deliver a responsive, user-friendly interface and Django Representational State Transfer (REST) Framework for the backend to handle business logic, authentication, and secure data processing. A My Structured Query Language (MySQL) database is used for reliable storage and management of user information, items, and request records. The system follows a role-based access model consisting of Admin and User roles. New users must register and wait for admin approval to ensure platform authenticity and safety. Once approved, users can add items they wish to share, browse items posted by others, and send item requests. Item owners have full control to approve or reject incoming requests. Upon approval, the requester is granted access to the owner's contact details, ensuring privacy and controlled communication. Administrators are responsible for approving users, monitoring listed items, and removing inappropriate or inactive entries. The platform emphasizes transparency, data integrity, and ease of use while preventing duplicate requests and unauthorized access. By encouraging reuse over disposal, the System contribute to waste reduction, resource optimization, and stronger neighborhood engagement. The system demonstrates a practical implementation of full-stack web development principles while addressing real-world environmental and social challenges.

Keywords: Community Sharing, Item Reuse, Neighborhood Exchange, Sustainable Living, Resource Optimization.

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1. Introduction

In the same city, there are diverse socioeconomic characteristics among neighborhoods that may influence residents' needs [1,2]. Shared needs can enhance the sense of proximity between residents and help them to become recognized as a community [3,4]. It is arguable that geographical proximity is not the only factor influencing the connections between neighborhoods within the same city. Neighborhoods are places where

people live or work near each other. Neighbors are residents who share the same spatial geographical area, but also include shop owners and their employees. In other words, people who frequently visit the neighborhood [5,6]. It is possible to build the connections between different neighborhoods due to human activities and commutes between them, even though they are not directly adjacent to each other.

On the one hand, the affective attachment of residents to a neighborhood may vary based on the amount of time that neighbors spend in the area, the local facility usage, and/or its demographic patterns (e.g., the number of children, non-working adults, and elderly people who live in the community). On the other hand, the intensity of the connection between neighborhoods could also depend on the sharing of the same social needs. For example, community behavior is influenced by several factors, including, but not limited to, socioeconomic status, social networks, education, ethnicity, working conditions, physical environment, and health [7].

Therefore, taking into account the diverse characteristics of different neighborhoods would ensure that policies are tailored to the unique needs of the local residents in each neighborhood. A key element to a better understanding of citizens' needs is encouraging them to share these needs. This will help to strengthen the relationship between institutions and communities, which involves the possibility for citizens to contribute to the decision-making process and planning activity. Recent years have seen a resurgence in the interest in involving society in the coproduction or the planning and implementation of government development programs [8,9].

2. Literature Survey

Neha Singh, 2022 [10] presented a web-based system that enabled structured listing and tracking of reusable items. It discussed waste generation due to improper disposal of reusable items and identified manual redistribution methods as inefficient. The proposed system provided a structured platform for listing and tracking reusable goods, contributing to effective waste reduction. The implementation supported efficient waste reduction through systematic reuse management. Karan Malhotra, 2023 [11] implemented a community collaboration platform that supported repeated item exchanges. It highlighted the importance of community collaboration in sustainability initiatives. Proposed platform enhanced interaction, structured exchanges, and repeated participation, thereby promoting sustainable neighborhood practices. The system design focused on improving user interaction and sustaining long-term community participation.

Pooja Nair, 2023 [12] proposed an application implementing role-based access control and simplified exchange workflows. Addressed inefficiencies in residential item sharing. The application introduced role-based access and simplified exchange workflows, improving convenience and reducing unnecessary purchases. This approach enhanced usability and reduced unnecessary item purchases within residential communities. Rohit Sharma, 2024 [13**]** implemented a localized sharing economy model using a web platform. Explored neighborhood-focused sharing economy models. The proposed system enabled localized exchanges, reducing cost, improving speed, and strengthening social ties within communities. The system supported faster exchanges, reduced costs, and strengthened neighborhood-level social interaction.

Ananya Rao, 2024 [14] implemented secure authentication and controlled user access to ensure safe participation. focused on security issues in community exchange platforms. By implementing authentication and controlled access, the proposed system improved trust and safe participation among users. Security mechanisms were integrated to build trust in community resource exchange platforms. Vikram Iyer, 2024 [15] proposed digital platform implemented peer-to-peer item exchange to extend product life cycles. This study emphasized digital reuse platforms as enablers of circular economy principles. The system extended product lifecycles through peer-to-peer exchanges, supporting

sustainability and efficient resource utilization. The system supported circular economy principles through structured reuse mechanisms.

Priya Deshmukh, 2020 [16] This study implemented a web-based sharing system that enabled community members to reuse household items. The study discussed how web platforms enabled sustainable development by promoting community-level sharing of unused household items. The system improved accessibility and reduced resource wastage. The platform improved accessibility and reduced resource wastage through organized digital sharing. Aman Gupta, 2020 [17] implemented a digital solution for optimizing neighborhood resource usage. It explored digital tools for optimizing neighborhood resource usage through structured sharing platforms, reducing unnecessary purchases. The system reduced repeated purchases by enabling structured sharing among residents.

Shreya Joshi, 2021 [18] proposed implementation focused on online platforms that enhanced community engagement while supporting reuse practices. The highlighted the role of online platforms in enhancing community engagement while supporting reuse practices. User interaction was improved through accessible digital exchange features.

3. PROPOSED METHODOLOGY

The proposed System is a centralized web-based system designed to enable secure and organized sharing of reusable household items within local communities. As shown as Figure 1 The system replaces informal and unstructured sharing methods with a verified, role-based digital platform. It allows users to register, obtain admin approval, list items, browse available resources, and request items efficiently. The admin module ensures authenticity by approving users and monitoring shared items. Item owners retain full control over approving or rejecting requests, ensuring safe exchanges. By integrating React.js, Django REST Framework, and MySQL, the system provides a scalable, reliable, and user-friendly solution that promotes sustainability and community collaboration.

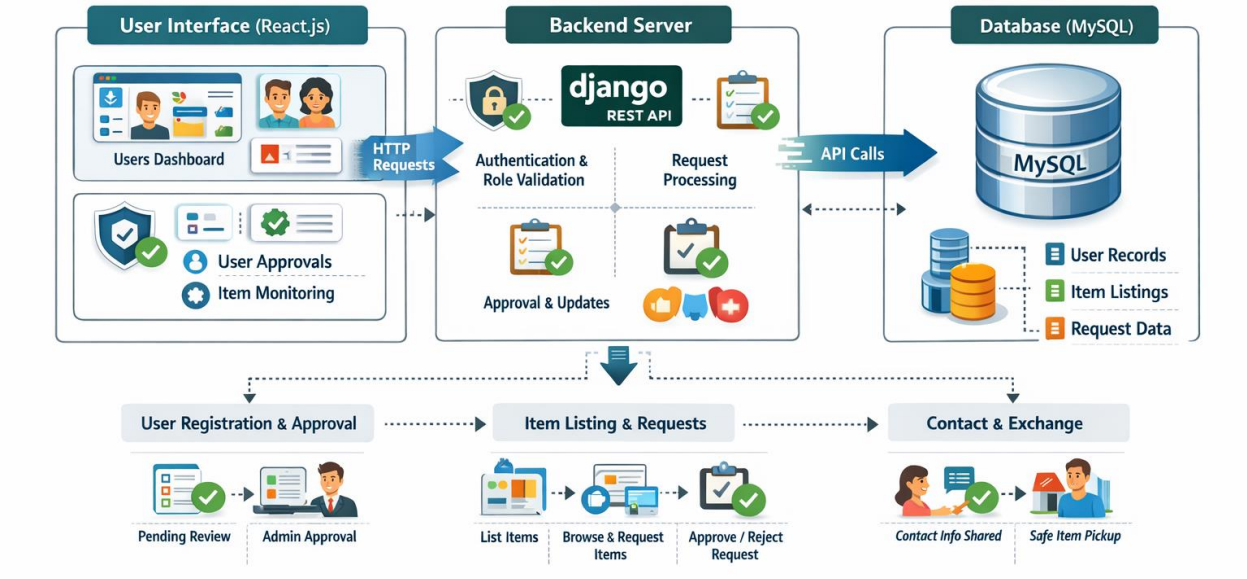


Figure 1: Proposed System Architecture of CREH.

User Interface (Web Browser – React): The user interacts with the system through a browser-based graphical interface developed using React.js, which provides simple and intuitive navigation. Features such as user registration, login, profile viewing, item listing, item browsing, and request management are designed for ease of use. Separate dashboards are provided for users and administrators, allowing role-

specific access to system functionalities. Users can add items, request items, and track request status, while administrators access approval and management controls. All user interactions are converted into secure Hyper Text Transfer Protocol (HTTP) requests and sent to the backend for processing.

Backend Server (Django REST Framework): The backend server functions as the central control unit that processes all incoming requests from the React frontend. It handles user authentication, role validation, admin approval checks, item management, and request handling operations. Core application logic such as preventing duplicate requests, enforcing permissions, approving or rejecting item requests, and status updates is implemented at this layer. The Django REST Framework ensures secure Application Programming Interface (API) communication and smooth coordination between frontend and database layers.

Database Layer (MySQL): The MySQL database is responsible for storing and managing all persistent information used by the system. It maintains structured records of users, roles, approval status, shared items, item requests, and request statuses. Relational queries ensure efficient retrieval and updating of data while maintaining consistency and integrity. Conditional data access, such as revealing contact details only after approval, is enforced through controlled queries.

User Registration and Approval Flow: When a user submits registration details, the information is validated and stored securely with a pending approval status. This mechanism prevents unauthorized access and ensures platform safety. The administrator reviews and approves legitimate users before granting access. Once approved, users can log in and access their respective dashboards.

Admin Management Module: The administrator acts as a system supervisor responsible for approving users, viewing platform activity, and managing shared items. Admins can monitor all listed items, remove inappropriate or inactive entries, and ensure proper system usage. This module maintains trust, security, and smooth platform operations.

User Item Sharing and Request Module: Approved users can list items they wish to share, browse items posted by other users, and send item requests. Item owners receive and manage requests by approving or rejecting them. Upon approval, requesters are granted access to the owner's contact and address information, enabling safe and controlled exchanges.

End-to-End Operational Flow: All system activities follow a structured flow from the React interface to the Django backend and MySQL database. Requests are validated, processed, and stored using secure API mechanisms. Role-based access control ensures users interact only with permitted features. The integrated workflow supports transparency, efficient resource reuse, and community-driven sustainability.

9.2 Results description



Figure 2: Admin dashboard page.

Figure 2 provides a centralized control interface for managing and monitoring the activities of the System. This page displays summary information such as the total number of registered users and the total number of items listed on the platform, allowing the administrator to quickly assess system usage and activity levels.

Through the dashboard and associated navigation options, the admin can approve newly registered users and manage item-related activities, ensuring that only verified users participate in the exchange process. The dashboard plays a critical role in enforcing administrative control, maintaining system integrity, and supporting secure and organized operation of the platform.

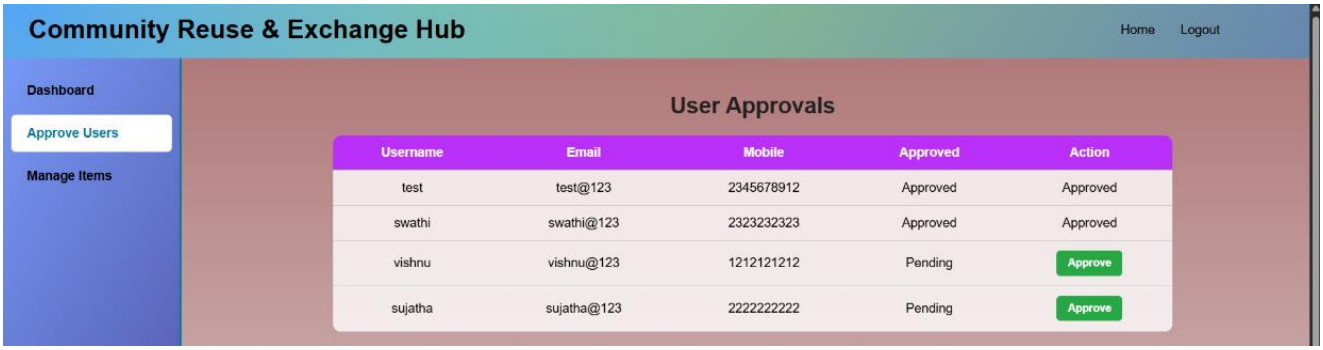


Figure 3: User approval management page.

Figure 3 allows the administrator to review and control access to the System. This page displays a list of registered users along with their details such as username, email address, mobile number, and current approval status. The administrator can approve pending user accounts through this interface, ensuring that only verified and authorized users are allowed to access the platform features. By providing a clear approval mechanism, this page strengthens security, prevents unauthorized participation, and maintains trust within the community. The results shown on this page demonstrate effective administrative control over user onboarding and system access.



Figure 4: Admin – manage item page.

Figure 4 provides a centralized view of all items shared by users in the community. It displays key details such as item name, description, owner, and current status to support effective monitoring. Administrators can take immediate action by removing inappropriate or inactive items to maintain platform quality. This interface ensures controlled item management and helps uphold trust and compliance within the system.

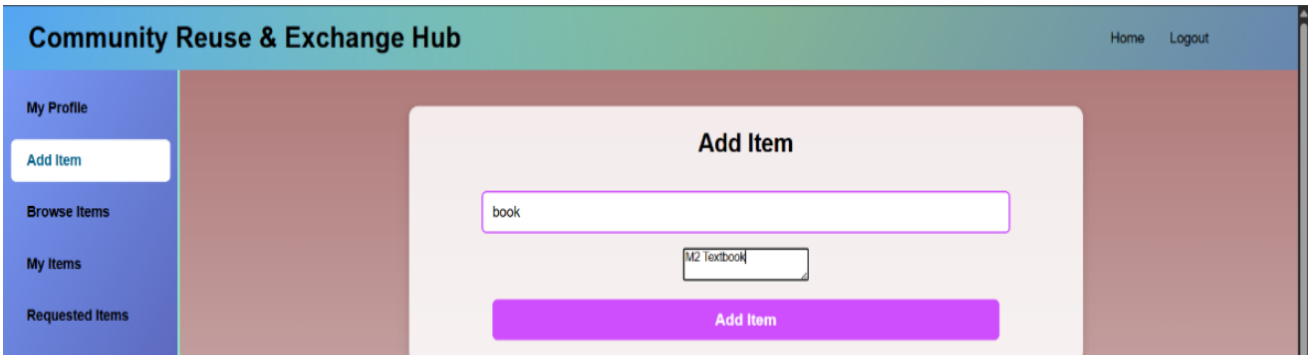


Figure 5: Add item page.

Figure 5 allows users to contribute unused or reusable items to the System for sharing within the neighbourhood. Through this interface, users can enter item details such as the item name and a brief description, enabling other community members to clearly understand the nature of the listed item. Once submitted, the item becomes part of the available listings that can be viewed and requested by other approved users. This page supports active user participation by making the item listing process simple and structured. The results demonstrate that users can easily add items to the platform, thereby increasing resource availability and encouraging reuse instead of unnecessary new purchases.

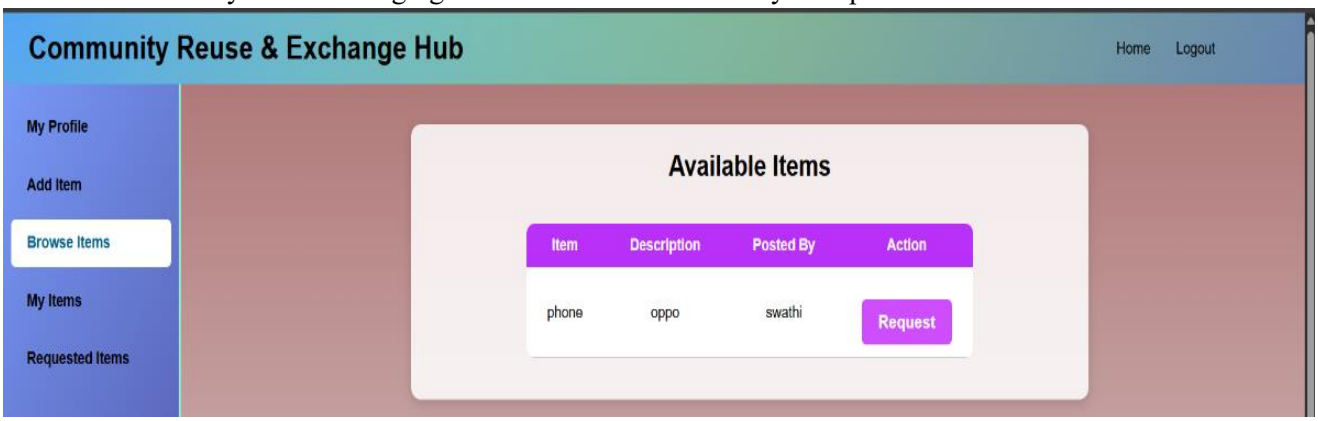


Figure 6: Browse items page.

Figure 6 displays the list of items currently available for reuse and exchange within the System. This page allows users to view item details such as item name, description, and the user who has posted the item, providing transparency in the exchange process. By presenting all available items in a structured format, the system enables users to easily identify resources that meet their needs. The request option provided for each item allows interested users to initiate an exchange request directly through the platform. This page demonstrates effective sharing of community resources and supports the research objective of reducing repeated purchases through organized item reuse.

Figure 7 allows users to view and manage the items they have listed on the System. This page displays item details along with their current status, enabling users to track whether an item is active and available for exchange. In addition, the page presents incoming item requests from other users, showing the requester details and request status. The item owner is provided with options to approve or reject each request, ensuring full control over item sharing decisions. This page demonstrates the core exchange functionality of the system by supporting transparent request handling, controlled approvals, and organized coordination between community members.

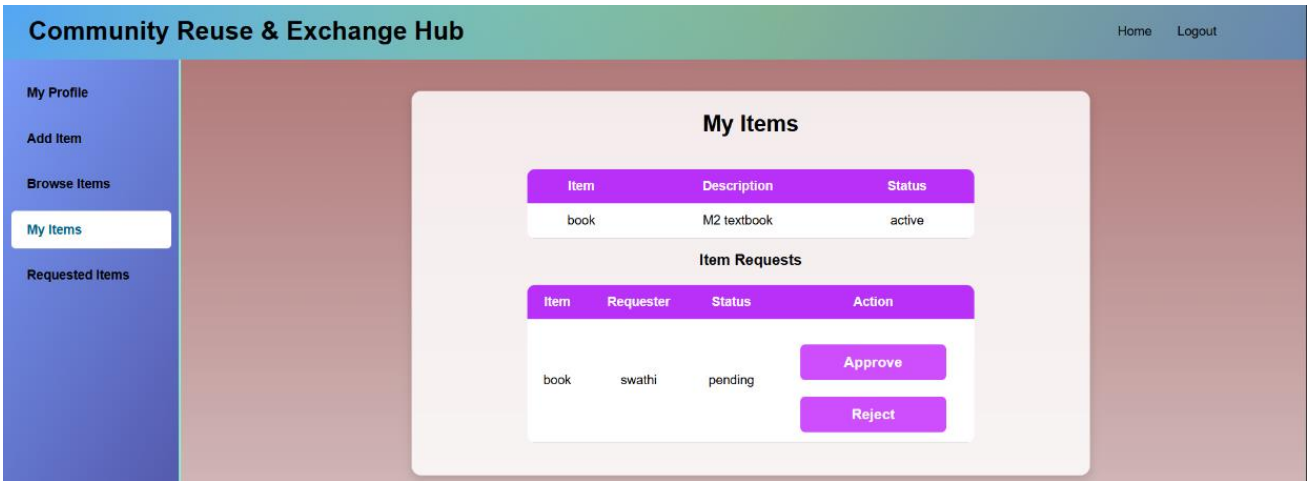


Figure. 7: My items page.

Figure 8 displays the list of items that a user has requested from other community members through the System. This page shows essential details such as the item name, item owner, request status, and contact information. Once a request is approved by the item owner, the user is able to view the owner's contact number and location, enabling direct coordination for item collection. This controlled visibility ensures privacy while supporting effective communication after approval. The page demonstrates successful completion of the item request workflow and reflects transparent and secure exchange between users within the community.

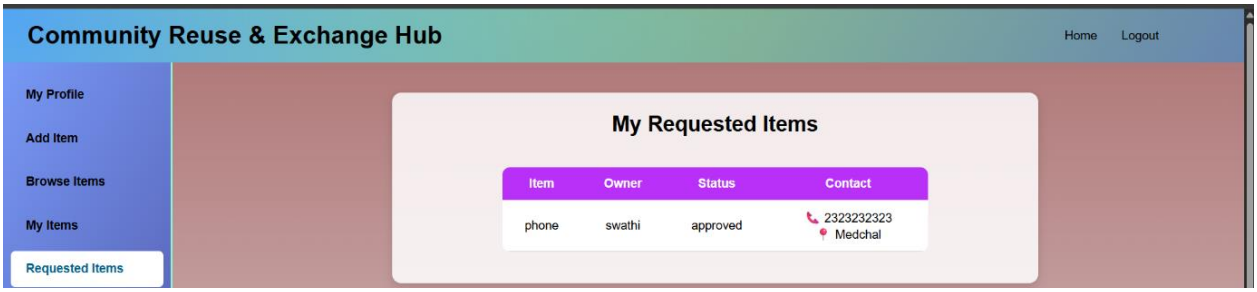


Figure 8: My requested items page.

5. Conclusion

The System successfully demonstrates an effective and secure approach to promoting sustainability and community collaboration through a web-based platform. The system replaces informal item-sharing methods with a structured, role-based solution that ensures trust, transparency, and controlled access. By integrating React.js for a responsive frontend, Django REST Framework for robust backend processing, and MySQL for reliable data storage, the platform delivers smooth performance and efficient data handling. Admin approval workflows enhance security by verifying users before granting access. Performance improvements are achieved through optimized API communication, reduced page reloads, and efficient database queries. Real-time updates ensure faster item request handling and status synchronization. Modular architecture improves maintainability and scalability while minimizing system latency. Automated request validation prevents duplicate entries and unnecessary processing overhead. Efficient state management in the frontend enhances user experience. The system reduces administrative effort, improves response times, and encourages responsible reuse of household items, contributing positively to environmental sustainability and neighborhood engagement.

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