

Food Waste Monitoring and Redistribution System: A Smart Digital Approach

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Abstract- Food waste is one of the most pressing issues the world faces today, contributing significantly to environmental degradation and food insecurity. Despite the abundance of edible food being discarded daily, millions of people around the world still suffer from hunger and malnutrition. This research focuses on developing a smart food waste monitoring and redistribution system that bridges the gap between food donors and recipients, particularly orphanages, and offers an effective solution for addressing both food waste and hunger. The study outlines the design, implementation, and operational evaluation of a web-based platform built on Django that integrates various modern technologies such as real-time tracking, automated notifications, database management, and secure communication protocols.

The core aim of this system is to create a seamless connection between those willing to donate surplus food and those in need, with a special emphasis on orphanages, which are often at the forefront of food insecurity concerns. The platform ensures transparency and accountability by providing real-time updates on food availability, enabling quick and efficient redistribution. In addition to its practical functionalities, the system offers insights into the food donation process and provides scalable solutions for communities looking to mitigate food waste. This study also emphasizes the significance of security measures and automated notifications to foster trust and ease the donation process. Ultimately, the research seeks to demonstrate the effectiveness of a digital platform in enhancing food distribution efforts, reducing waste, and promoting social equity.

Key contributions include the development of a modular, scalable web application capable of handling a wide range of food donation and redistribution scenarios, from small community-based initiatives to larger urban programs. The research also evaluates the operational performance of the platform by assessing its efficiency in minimizing food waste and optimizing the impact on recipient communities. Through case studies and data-driven analysis, the study further explores the potential of digital solutions in transforming traditional food

donation practices into more structured, streamlined, and impactful processes.

1. INTRODUCTION

Food waste is a critical global issue that has significant economic, environmental, and social implications. Each year, nearly one-third of the food produced for human consumption is wasted, which not only contributes to unnecessary greenhouse gas emissions but also strains valuable natural resources. In contrast, millions of people, especially children, suffer from hunger and malnutrition, with food insecurity being a persistent problem worldwide. This stark contrast between surplus food and hunger calls for innovative solutions that can bridge the gap and make food distribution more efficient.

The proposed research focuses on developing a smart food waste monitoring and redistribution system that aims to address both food waste and hunger, particularly by assisting orphanages. These organizations often struggle to access enough nutritious food, despite the availability of surplus items in local communities. The system connects food donors, such as restaurants, supermarkets, and individuals, directly with orphanages in need, ensuring that surplus food is efficiently redistributed to those who need it most. By utilizing Django for web development, the platform is designed to be secure, user-friendly, and scalable, enabling both donors and recipients to manage donations and requests with ease.

In addition to providing an efficient redistribution mechanism, the system emphasizes realtime tracking, secure communication, and automated notifications. These features aim to reduce logistical barriers, improve coordination, and ensure the timely transfer of food. The platform also integrates feedback mechanisms, allowing both donors and recipients to

rate their experiences and offer suggestions for improvement. This approach fosters transparency and builds trust between all parties involved, while also providing valuable data to optimize the redistribution process over time. Through this digital solution, the research demonstrates how technology can play a pivotal role in addressing food waste and insecurity on a global scale.

2. METHODOLOGY

Research Design

The research follows an experimental approach that integrates digital platform development with real-world testing for food waste reduction. The aim is to design a responsive system to facilitate food donations between surplus providers and needy recipients like orphanages. It focuses on real-time food tracking, smart request handling, and alert generation. The

experimental structure allows for iterative improvements and future AI integration.

Data Collection

Data is gathered from multiple stakeholders using online forms and automated logging. Collected data includes:

Donor registration credentials (name, type, contact, license)

Food attributes: quantity, type, storage method, shelf life

Pickup location and timings

Orphanage registration documents and feedback logs

This data informs matching, tracking, and performance evaluation.

Auto-flagging repeated fake entries

Alerts notify admins and recipients instantly upon event triggers.

Automated Response and Moderation

System Flow Diagram

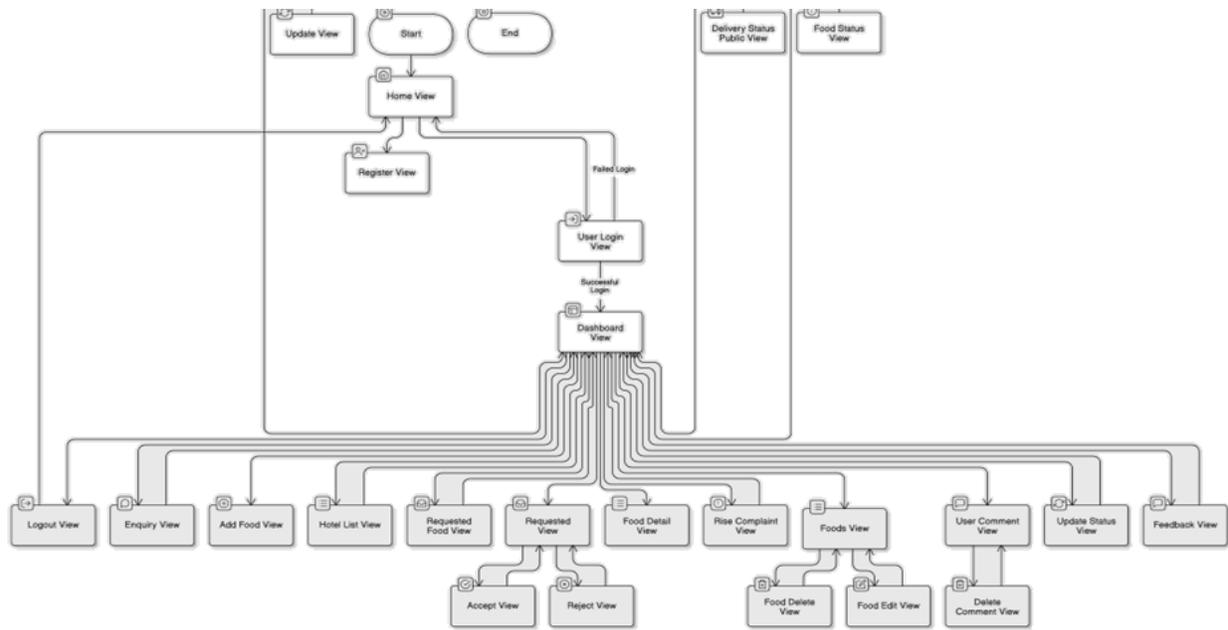


Figure 1: System Flow Diagram

This diagram represents the workflow of a food donation management system. It begins at the Home View, allowing users to register or log in. Upon successful login, users access a Dashboard with various functionalities, including viewing hotel lists,

adding or requesting food, managing requests, and lodging complaints. Additional features include editing or deleting food entries, tracking delivery status, and viewing feedback or comments.

Data Flow Diagram

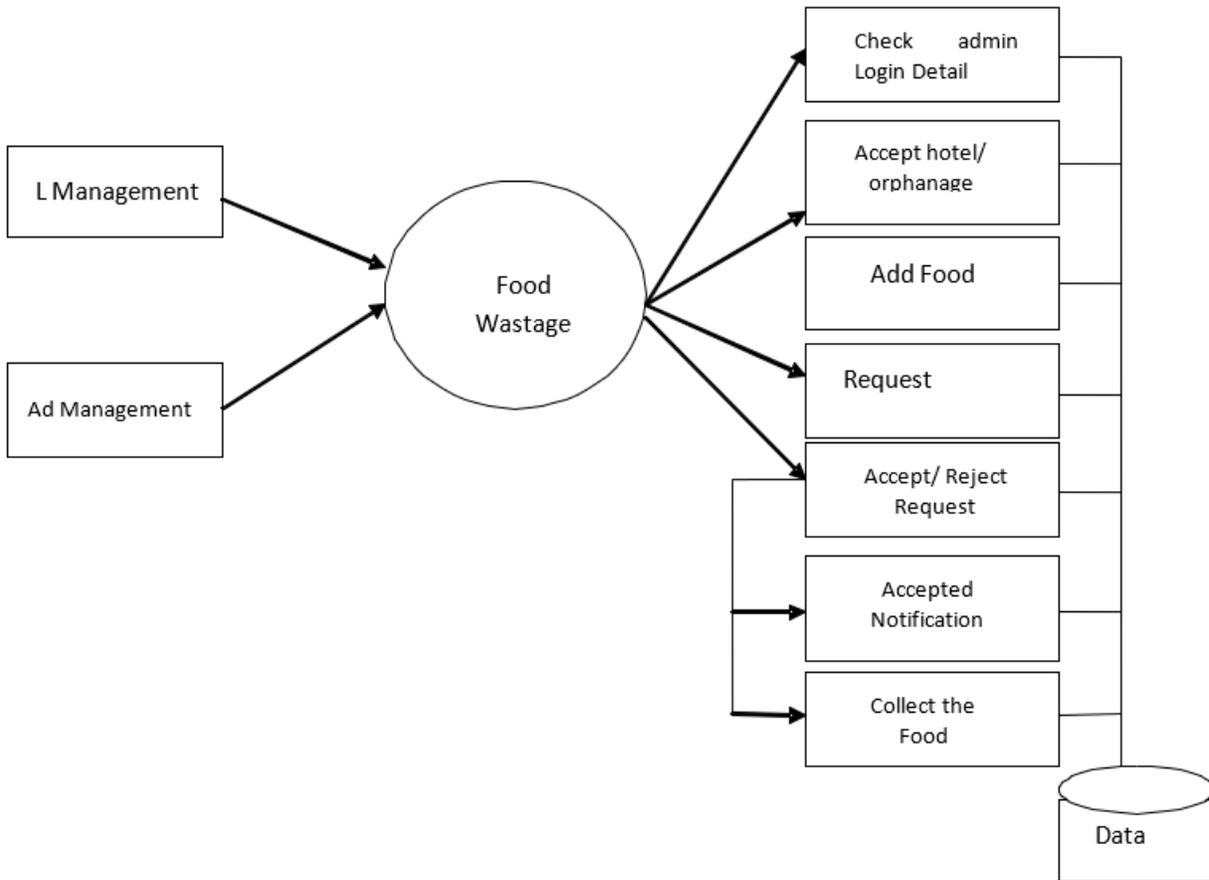


Figure 2: Data Flow Diagram

This DFD diagram represents a Food Waste Management System. It starts with Login and Admin Management interacting with the central process, "Food Wastage." Key functions include verifying admin login, accepting hotels/orphanages, adding food, requesting food, accepting/rejecting requests, sending accepted notifications, and collecting food. All data is stored in a connected database. The system ensures a smooth flow of information, promoting food redistribution and minimizing wastage through organized request and approval processes.

RESULTS AND DISCUSSION

The performance of the food waste redistribution system was analyzed using both system-generated metrics and user feedback over a period of one month during pilot testing. The following insights were drawn:

A. Transaction Efficiency

A total of 120 food donations were posted during the testing phase.

Out of these, 102 were successfully matched with orphanages, giving a transaction success rate of 85%.

Most successful transactions occurred within 2 hours of posting, indicating strong responsiveness enabled by real-time notifications.

B. Donor Retention and Engagement

76% of donors made at least one additional donation after their initial use.

Donors expressed that the simple interface and quick feedback loop encouraged repeated participation.

Lack of incentives, however, was cited by a small group (15%) as a reason for reduced long-term engagement.

C. Orphanage Response and Satisfaction

Orphanages responded to 67% of listings within 30 minutes, indicating high engagement and system accessibility.

A post-transaction survey showed 92% satisfaction, with particular appreciation for:

The clarity of food listing details

Alerts for availability

Timely donor confirmation

D. System Reliability

The platform operated at 99.3% uptime, ensuring minimal disruption.

Latency for alert delivery averaged under 5 seconds, which supported prompt responses.

No major security breaches or data integrity issues were recorded, reinforcing system stability.

E. Geographic and Infrastructure Impact

Urban donors and orphanages showed the highest usage and responsiveness.

Rural participants had lower success due to limited internet access, emphasizing the need for offline or SMS-based support in future upgrades.

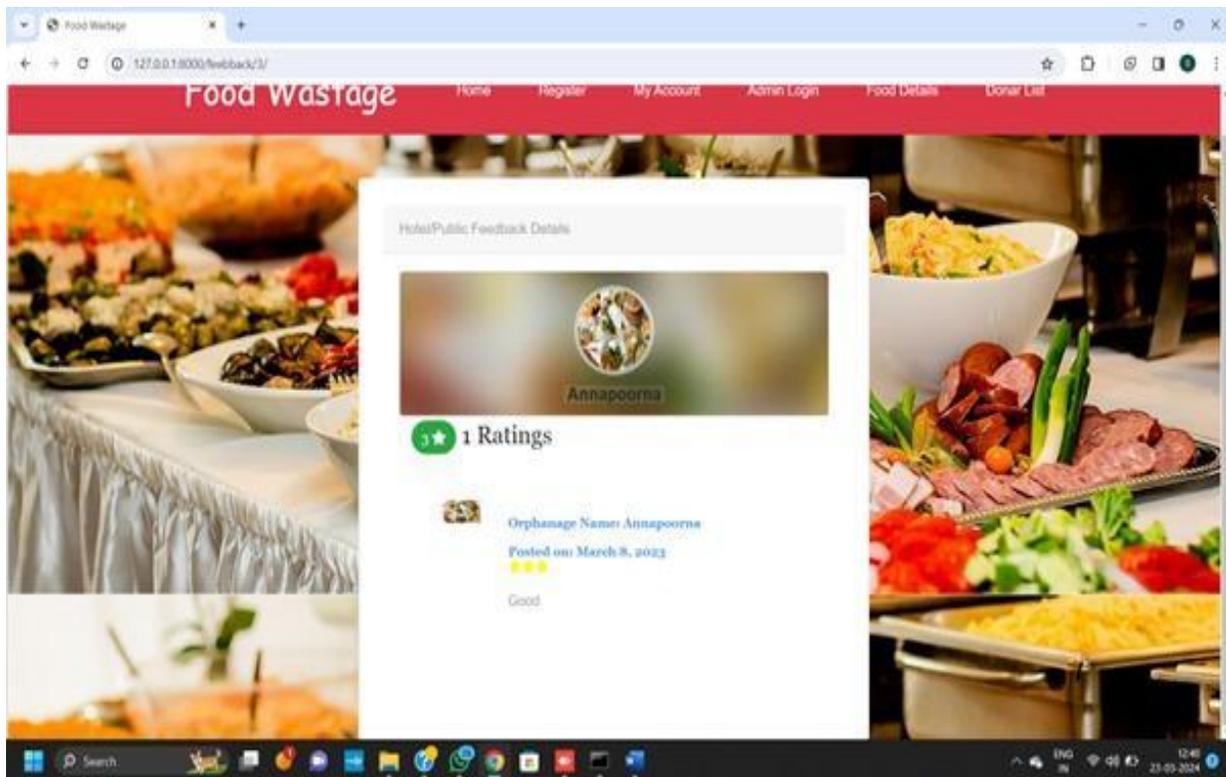


Figure 3: Food Rating

The image shows a webpage for "Food Wastage" with a feedback pop-up. The feedback details a 3-star "Good" rating given by user "Annapoorna" on March 8, 2023. The rating is for an orphanage also named "Annapoorna," suggesting a platform for food-related feedback.

CONCLUSION

This research explored the application of digital innovation to address the critical global issue of food waste. By creating a smart, accessible, and structured platform for connecting food donors with orphanages, the system proved instrumental in not only reducing environmental waste but also improving food security for underserved communities. It brings efficiency, transparency, and scalability to the traditionally

unstructured process of food donation, empowering users with technology to make a social impact.

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