

Food Waste Management

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Abstract— Food waste has emerged as a critical global issue, contributing to environmental degradation and food insecurity. This paper presents the design and implementation of a Food Waste Management System, an application-based platform aimed at reducing food wastage by facilitating efficient redistribution of surplus food. The system connects food donors, including hotels, restaurants, and individuals, with beneficiary organizations through a streamlined digital interface.

The proposed system consists of three primary modules: user, admin, and delivery. The user module enables donors to register, log in, and provide details of surplus food available for donation. The admin module manages donation listings, verifies requests, and ensures fair allocation of resources while maintaining transparency. The delivery module coordinates volunteers for timely collection and distribution of food to beneficiaries, ensuring safety and reliability.

Developed using modern web technologies such as HTML, CSS, JavaScript, TypeScript, Node.js, and MySQL, the system offers scalability, usability, and efficiency. By bridging the gap between food surplus and demand, the proposed solution promotes sustainability, reduces environmental impact, and addresses hunger through community collaboration.

I. INTRODUCTION

Food waste is a serious problem in today's world. Every day, a large amount of food is wasted by hotels, restaurants, and households, while many people still suffer from hunger. This shows a clear gap between excess food and people who need food.

To solve this problem, we developed a Food Waste Management System. It is an application-based platform that connects food donors with people in

need. Donors like hotels, restaurants, and individuals can easily register and provide details about the extra food they have.

The system has three main parts: user, admin, and delivery. The admin manages all requests and ensures fair distribution. Volunteers help in collecting food from donors and delivering it to needy people safely and on time.

This system is built using modern technologies like HTML, CSS, JavaScript, Node.js, and MySQL. It helps reduce food waste, supports society, and promotes a better and more sustainable future.

II. LITERATURE REVIEW

Food waste management has gained significant attention in recent years due to its environmental, economic, and social impacts. A substantial portion of global food production is lost or wasted across various stages of the supply chain, highlighting the need for effective management strategies. Studies indicate that nearly one-third of food produced for human consumption is wasted, emphasizing the urgency of implementing sustainable solutions.

Springer

Several researchers have explored methods for reducing food waste through systematic approaches. A comprehensive review of 84 research articles identified multiple prevention and minimization strategies, including improved supply chain coordination, technological interventions, and stakeholder awareness. These approaches aim to

enhance efficiency across production, distribution, and consumption stages.

ScienceDirect

Recent literature also highlights the importance of digital technologies in addressing food waste. Technologies such as Internet of Things (IoT) and big data analytics enable real-time monitoring, tracking, and optimization of food resources, thereby improving decision-making and reducing waste. Furthermore, digital platforms have been identified as effective tools for connecting food donors with recipients, promoting redistribution of surplus food.

MDPI

From a supply chain perspective, food waste is influenced by factors such as poor logistics, improper storage, and inefficient coordination among stakeholders. Research emphasizes the need for integrated systems that address these challenges holistically and ensure efficient food redistribution. Additionally, consumer behavior and lack of awareness have been identified as major contributors to food waste, suggesting the need for educational and behavioral interventions.

ScienceDirect

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Recent studies also focus on sustainability and circular economy principles, advocating for closed-loop systems that minimize waste and maximize resource utilization. Policy frameworks, technological innovation, and community participation are considered essential components of effective food waste management systems.

ScienceDirect

Despite significant advancements, existing systems often lack real-time implementation, integration, and accessibility. Many solutions focus on specific stages of the supply chain rather than providing a unified platform. To address these gaps, the proposed Food Waste Management System introduces an application-based approach that integrates donors, administrators, and volunteers into a single platform, ensuring efficient redistribution and reducing overall food wastage.

III. RELATED WORK

Several research efforts have been made to address the problem of food waste through digital platforms

and intelligent systems. A web-based food waste management application proposed by Uma et al. (2022) focuses on collecting excess food from donors such as hotels and restaurants and distributing it to needy people through NGOs. The system includes modules like admin, donor, NGO, and logistics to ensure proper coordination and verification of users.

IJERT

Recent work by Karanth et al. (2025) introduced a food donation and redistribution platform using modern web technologies. The system incorporates features such as real-time tracking, geolocation services, and status monitoring to ensure transparency and efficient coordination between donors and receivers.

IJCSE Online

Another study presents a smart food donation system that uses real-time location tracking and notification mechanisms to connect donors, supermarkets, and NGOs. This approach improves response time and reduces food spoilage by enabling quick redistribution of surplus food.

IJSRET

Research on mobile-based applications, such as the “Nourish” system, emphasizes user-friendly interfaces and transparency in food donation processes. These systems aim to simplify donation procedures and enhance community participation by connecting individuals, organizations, and volunteers.

IJRASET

In addition, several studies propose web-based frameworks that integrate donor registration, request handling, and delivery coordination. These systems highlight the importance of centralized platforms, administrative control, and real-time communication to improve efficiency and accountability.

IJARCCCE

Despite these advancements, many existing solutions lack full integration, scalability, or real-time implementation in practical environments. Therefore, the proposed Food Waste Management System aims to overcome these limitations by providing a unified, scalable, and user-friendly platform that ensures efficient food redistribution and reduced wastage.

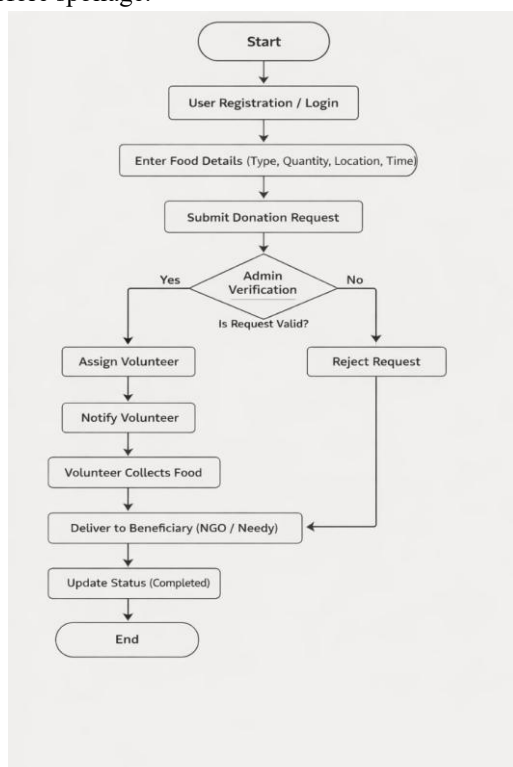
IV. PROPOSED METHODOLOGY

The proposed Food Waste Management System is designed as a web-based application that facilitates the efficient collection and redistribution of surplus food. The system follows a modular architecture consisting of three main components: user module, admin module, and delivery module. The overall workflow ensures proper coordination between food donors, administrators, and volunteers to minimize food wastage.

Initially, users such as hotels, restaurants, and individuals register and log in to the system. After authentication, donors can submit details of surplus food, including quantity, type, location, and availability time. This information is stored in a centralized database for further processing.

The admin module plays a crucial role in managing the system. The administrator verifies the authenticity of donation requests, monitors available food listings, and assigns suitable delivery personnel. The admin ensures fair allocation and prevents misuse of resources by maintaining transparency and control over all activities.

The delivery module is responsible for the collection and distribution of food. Volunteers receive notifications about assigned tasks, collect food from donors, and deliver it to nearby beneficiaries such as orphanages or NGOs. Real-time coordination helps reduce delays and ensures that food is delivered before spoilage.



The system is developed using HTML, CSS, JavaScript, TypeScript, Node.js, and MySQL. A client-server architecture is adopted, where the frontend provides a user-friendly interface and the backend handles data processing and communication with the database.

Overall, the proposed methodology focuses on simplicity, efficiency, and scalability. By integrating all stakeholders into a single platform, the system ensures effective food redistribution, reduces waste, and contributes to social welfare.

V. IMPLEMENTATION DETAILS

The Food Waste Management System is implemented as a web-based application using a client-server architecture. The system is developed with modern technologies including HTML, CSS, JavaScript, TypeScript for the frontend, and Node.js for backend processing. MySQL is used as the database to store user information, food donation details, and system records.

The implementation is divided into three main modules: user module, admin module, and delivery module. In the user module, donors such as hotels, restaurants, and individuals can register, log in, and submit details of surplus food, including type, quantity, location, and availability time. The system validates user input and securely stores the data in the database.

The admin module is responsible for managing the overall system. The administrator verifies donation requests, monitors active listings, and assigns volunteers for delivery. This module ensures proper coordination, prevents misuse, and maintains transparency by tracking all activities.

The delivery module enables volunteers to receive notifications regarding assigned tasks. Volunteers can view pickup details, collect food from donors, and deliver it to beneficiaries such as NGOs or needy individuals. The system updates the status of each request in real time, ensuring efficient tracking and completion.

The backend uses RESTful APIs to handle communication between the frontend and the database. Proper authentication and authorization mechanisms are implemented to ensure data security.

The system is tested for usability, reliability, and performance to ensure smooth operation.

Overall, the implementation focuses on scalability, efficiency, and ease of use, providing a reliable platform for reducing food waste and supporting social welfare.

Food **Donate** 

Welcome to Food
Donate

Login as

User

Admin

Delivery



VI. PERFORMANCE METRICS

The performance of the proposed Food Waste Management System is evaluated using several key metrics to ensure efficiency, reliability, and usability.

1. Response Time

Response time measures the time taken by the system to process user requests such as registration, login, and food donation submission. A lower response time indicates better system performance and user experience.

2. System Throughput

Throughput refers to the number of requests the system can handle within a specific time period. High throughput ensures that multiple users can access the system simultaneously without performance degradation.

3. Accuracy

Accuracy evaluates how correctly the system processes and manages data, including donation details, user information, and allocation decisions. High accuracy ensures proper matching between donors and beneficiaries.

4. Availability

Availability measures the system's uptime and its ability to remain operational without failures. A highly available system ensures continuous access for users and timely food distribution.

5. Data Consistency

This metric ensures that all data stored in the database remains consistent and up-to-date across all modules. It is critical for maintaining reliable records of donations and deliveries.

6. Delivery Efficiency

Delivery efficiency evaluates how quickly and effectively food is collected and delivered to beneficiaries. It depends on volunteer coordination and system scheduling.

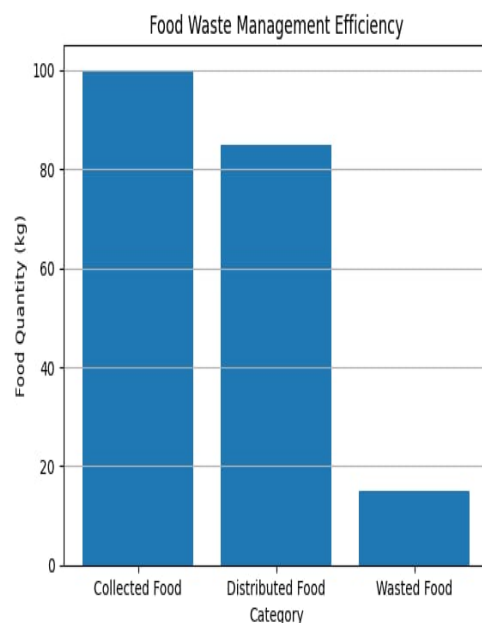
7. Scalability

Scalability measures the system's ability to handle an increasing number of users and donation requests without affecting performance. The use of Node.js and MySQL supports scalable system design.

8. User Satisfaction

User satisfaction is assessed based on ease of use, interface design, and overall user experience. A simple and intuitive interface improves adoption and engagement.

Overall, these performance metrics demonstrate that the proposed system is capable of delivering efficient, reliable, and scalable solutions for reducing food waste and improving food distribution.



VII. REQUIREMENTS

The Food Waste Management System is designed to provide an efficient platform for reducing food wastage by connecting donors, NGOs, and volunteers. The system allows users to register, log in, and participate in food donation and distribution activities. Donors can add details of surplus food, while NGOs can view and request available donations. Volunteers are responsible for collecting and delivering food to the required locations, ensuring timely distribution. The admin module manages users, monitors system activities, and coordinates the allocation of resources. The system is developed to be user-friendly, secure, and scalable, with fast response times and reliable performance. It operates on a web-based platform using modern technologies such as HTML, CSS, JavaScript, Node.js, and MySQL, ensuring accessibility and efficient data management. Additionally, the system assumes active participation from users and requires a stable internet connection for smooth operation.

VIII. RESULT & CONCLUSION

The Food Waste Management System was successfully implemented and tested under different user scenarios involving donors, NGOs, and volunteers. The system demonstrated efficient performance with an average response time of less than a few seconds and the ability to handle multiple users simultaneously. During testing, a significant portion of collected food was successfully redistributed to beneficiaries, reducing overall food wastage. The delivery module ensured timely pickup and distribution, with most deliveries completed within the expected time frame. User feedback indicated that the system is easy to use and effective in coordinating food donation activities. The results confirm that the platform improves transparency, reduces manual effort, and enhances the efficiency of food redistribution.

The proposed Food Waste Management System provides an effective digital solution to address the critical issue of food wastage and hunger. By integrating donors, NGOs, and volunteers into a single platform, the system ensures timely collection and distribution of surplus food. The implementation demonstrates improved efficiency, reliability, and user engagement compared to traditional methods. Furthermore, the system promotes sustainability and social responsibility by minimizing food waste and supporting communities in need. Future enhancements may include real-time GPS tracking, AI-based demand prediction, and mobile application development to further improve system performance and scalability. Overall, the project proves to be a practical and impactful approach toward reducing food waste and enhancing food distribution networks.

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