Reducing Food Waste and Hunger: A Mobile Application for Orphanage Support

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Abstract Food wastage and hunger are pressing global challenges. While large quantities of food go uneaten, many people struggle to find their next meal. This mobile application connects food donors, such as households, restaurants, caterers, and organizations like NGOs, with those in need. By incorporating effective functionalities, advanced libraries, and data analytics, the platform ensures an efficient and organized redistribution process. Beyond being a technological solution, it promotes a culture of sharing and community engagement, making food donations more effective and transparent, thus reducing waste and providing meals to those in need.

Keywords Food Donation, Food redistribution, sustainable food management, social impact mobile application, digital innovation, social impact, community engagement.

1 Introduction

In a world where food insecurity and uneven resource allocation are the order of the day, creative solutions are needed. This Mobile Application is meant to address the double problem of food wastage and hunger, particularly in India. With an alarming 40% of food being wasted every day, and most underprivileged communities suffering from chronic hunger, there is a critical need for a solution that is both efficient and effective. The platform offers an organized digital platform that makes it simple for donors to register excess food.

The platform allows donors to simply register excess food. It cleverly connects these donations to the orphanage and coordinates pick-up and delivery, getting food to those in need fresh and safely.

Facilities like real-time donation and donor impact analysis make the process more efficient, allowing donors to view the positive impacts. A feedback system also provides transparency and ongoing improvement, building trust among volunteers, donors, and recipient organizations.

Beyond redistribution, the platform fosters a feeling of collective responsibility and invites people to join the struggle against hunger and food waste. Through the combination of technology and social action, it makes food donation a sustainable, community-based effort instead of an intermittent act of charity.

2 Literature Review

Various initiatives are underway to address food insecurity and hunger. These include:

Mobile Application: Donate a Day discuss platforms that bridge the gap between donors and NGOs, promoting transparency and efficiency. However, they face limitations such as internet access requirements and platform specific constraints [1].

Akshaya Patra Foundation A non-profit organization focused on providing mid-day meals to school children. It has expertise in managing complex supply chains, ensuring efficient delivery of meals to millions of children across India [2].

National Food Security Mission (NFSM) A government-driven program aimed at strengthening India's food security infrastructure. NFSM's two-pronged approach involves enhancing food production and improving distribution systems [3].

SeVa A food donation app designed to reduce food waste and combat hunger. Developed using Android Studio and SQLite, it connects food suppliers with consumers in need, employing principles of Human-Computer Interaction [4].

Feeding India A prominent player in the fight against hunger, with a network of food donors, NGOs, and shelters. It efficiently manages food redistribution through a dedicated volunteer force and operates kitchens to provide cooked meals directly [5].

This platform builds upon these existing models, adopting their strengths while mitigating their weaknesses. It offers a structured, transparent, and scalable system for food redistribution, ensuring efficient collection, tracking, and delivery of surplus food to those in need. Through a user-friendly interface, real-time coordination, and data-driven insights, it facilitates seamless and impactful collaboration between donors, volunteers, and recipient organizations, striving for a future without food waste or hunger.

3 Proposed System

The system to be proposed is a mobile app intended to enable food donations from multiple donors to an orphanage through a cloud-based backend. The system is developed with React Native (with the Expo framework) for cross-platform front-end and Firebase for authentication as well as data storage. The primary goal is to offer an effortless platform that enables users to donate excess food, and the orphanage to manage and monitor these donations in an efficient manner.

3.1 Frontend Technologies

React Native Expo It is a framework that simplifies React Native development with pre-configured tools and APIs. It eliminates the need for native code, offers Expo Go for real-time testing, and supports OTA updates for instant app changes. Ideal for fast, cross-platform app development.

Tailwind CSS It is a utility-first CSS framework that simplifies UI development with pre-defined classes. It speeds up styling and ensures consistency, mainly for web projects but can also be used with React Native web applications.

3.2 Backend Technologies

Firebase It is a backend-as-a-service (BaaS) by Google, offering authentication, Firestore(real-time NoSQL database), cloud messaging, and storage. It helps developers build scalable apps without managing backend infrastructure.

3.3 Other Tools and Dependencies

- **react-native -** Core framework for building mobile applications using React.
- **react** - JavaScript library for building user interfaces.
- **expo** - Framework for developing React Native apps with managed and bare workflows.
- **firebase** - Backend-as-a-service for authentication, and, database.
- **expo-router -** File-based routing system for Expo and React Native apps.
- **expo-notifications** - Handles push and local notifications in Expo apps.

- **@react-native-async-storage/async-storage** - Persistent key-value storage for React Native.
- **react-native-reanimated** - Advanced animations and gestures for React Native.
- **react-native-screens** - Native screen management for better navigation performance.
- **react-native-safe-area-context** - Handles safe area insets for different devices.
- **expo-image-picker** - Provides access to the device's media library and camera.
- **react-native-gifted-charts** - Library for creating beautiful charts in React Native.
- **react-native-svg** - Library for rendering SVG graphics in React Native.
- **nativewind** - Tailwind CSS integration for styling in React Native.
- **tailwindcss** - Utility-first CSS framework for styling applications.
- **@react-native-community/datetimepicker** - Native date and time picker component.
- **@react-native-picker/picker** - Native picker component for dropdown selections.

3.4 Modules of the application

3.4.1 User Module

The (→ Fig. 1) represents the overall workflow for the User Module. As soon as the user launches the application, the system verifies if the user is already logged in or not. If the user is not logged in, the user is sent to the Login Page and the user can navigate to the Signup Page as well.

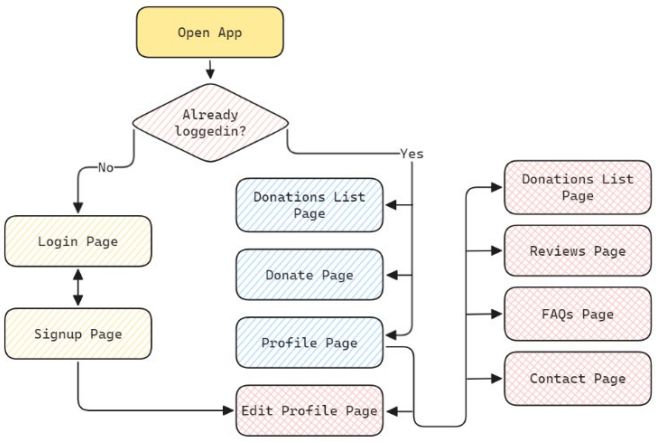

Fig. 1 User Module Flow Diagram

After the user has logged in successfully, he or she can use basic features like seeing a list of all the donations that have been made by him/her (Donations List Page), adding new donations (Donate Page), and editing personal information (Profile Page).

Also, from the Profile Page, the user is able to link to other support and information pages such as the Donations List Page, Reviews Page, FAQs Page, and Contact Page. This modularity implies that users are able to authenticate, create or read donations, edit their profile, and access relevant information easily.

3.4.2 Orphanage Module

The (→ Fig. 2) represents the Orphanage Module that streamlines the management of donations by equipping representatives with vital tools necessary for reviewing, tracking, and addressing donation requests.

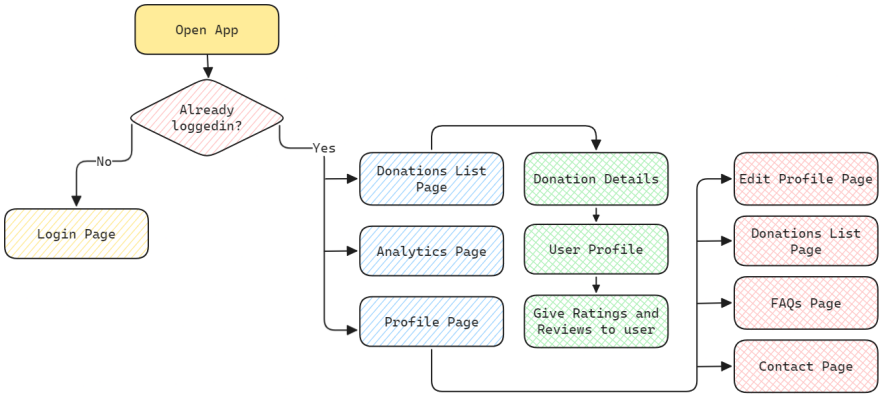

Fig. 2 Orphanage Module Flow Diagram

Upon launching the application, the orphanage representative's login status is verified. If they are not logged in, they are redirected to the Login Page to input their credentials. After a successful login, they are granted access to the main dashboard, which features the Donations List Page, Analytics Page, and Profile Page.

The Donations List Page acts as the primary interface where representatives can oversee and manage all incoming donation requests. From this page, they can delve into Donation Details, which offer extensive information regarding each donation. Additionally, they can view the User Profile of the donor to confirm their information and provide feedback if needed. Representatives also have the ability to Give Ratings and Reviews to Users, thereby fostering trust and accountability within the system.

The Analytics Page presents valuable insights into donation trends, enabling representatives to monitor and evaluate the frequency and volume of donations over

time. This functionality aids in recognizing donation patterns and optimizing the allocation of resources.

The Profile Page allows representatives to adjust their account settings and provides swift access to important sections such as Edit Profile, FAQs, Contact Page, and the Donations List Page. These features ensure that representatives can effectively manage donation-related responsibilities while facilitating smooth communication with donors and administrators.

This organized workflow significantly improves the overall experience of donation management, ensuring that the orphanage can effectively process donations, engage with donors, and track essential performance metrics.

3.4.3 Authentication and Authorization Module

The (→ Fig. 3) represents a structured overview of the authentication process within the food donation application, detailing user registration, login, password recovery, and email validation.

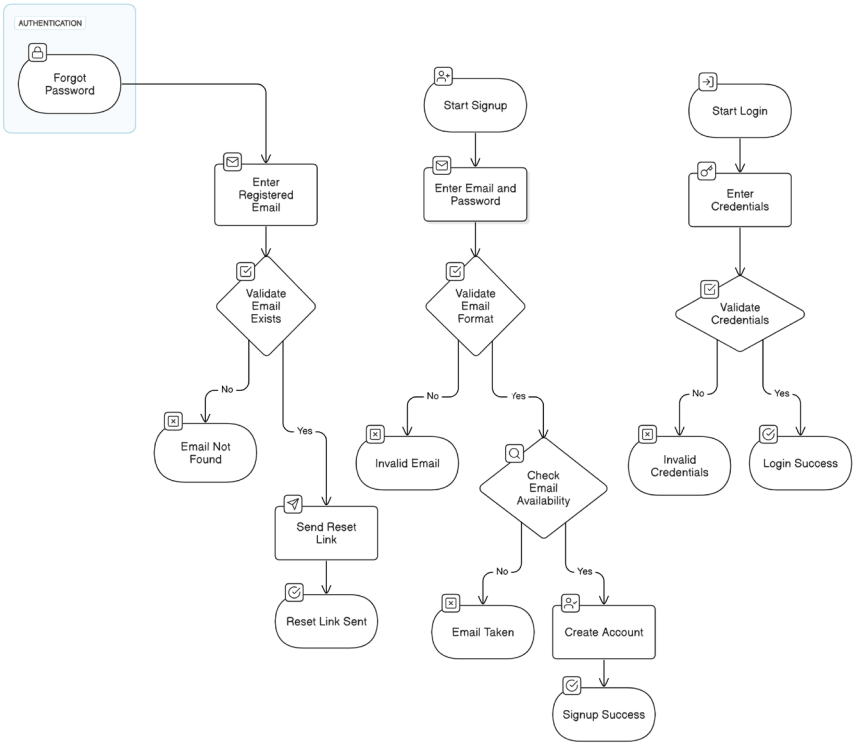

Fig. 3 User Signup, User Login and Forgot Password Flow Diagram

All these features are implemented using the Google Firebase Authentication and the workflow ensures security, data integrity, and seamless user experience through systematic validation steps and error handling mechanisms.

User Signup
The signup process begins when a user selects "Start Signup" and enters their email and password. The system first verifies whether the email format is valid and then checks its availability. If both validations pass, the account is successfully created, leading to a "Signup Success" confirmation. However, if the email format is incorrect or the email is already registered, the user receives an appropriate error message, such as "Invalid Email" or "Email Already Taken."

User Login
To access the application, users initiate the login process by entering their credentials. The system verifies the input data, granting access upon successful validation. If the credentials match the records, the user is logged in, achieving "Login Success." If the credentials are incorrect, an "Invalid Credentials" error message is displayed, prompting the user to re-enter the correct information.

Forgot Password
For users who have forgotten their password, the system offers a secure recovery mechanism. The user starts by entering their registered email. The system then verifies whether the email exists in the database. If the email is found, a password reset link is sent to their email, and a "Reset Link Sent" message appears, allowing the user to reset their password. If the email does not exist, an "Email Not Found" error message is displayed, guiding the user accordingly.

3.4.4 Edit Profile

The (→ Fig. 4) explains the process of editing and updating the details of the users and the orphanage. Both users and orphanages can update their profile details at any time. During signup, it is mandatory to provide all required details, ensuring a complete profile from the beginning. However, after registration, they have the flexibility to edit any information as needed.

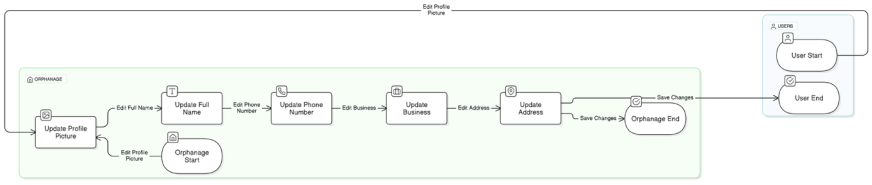

Fig. 4 Edit Profile Flow Diagram

The profile update process includes options to change the profile picture, full name, phone number, business details, and address. Since all details are already stored, users and orphanages can update them in any order without restrictions.

When an edit is made, the system validates the input before saving the changes. Once saved, the updated information is reflected in the profile instantly. This flexible and user-friendly approach ensures that users and orphanages can manage their profiles effortlessly.

3.4.5 Donation Module

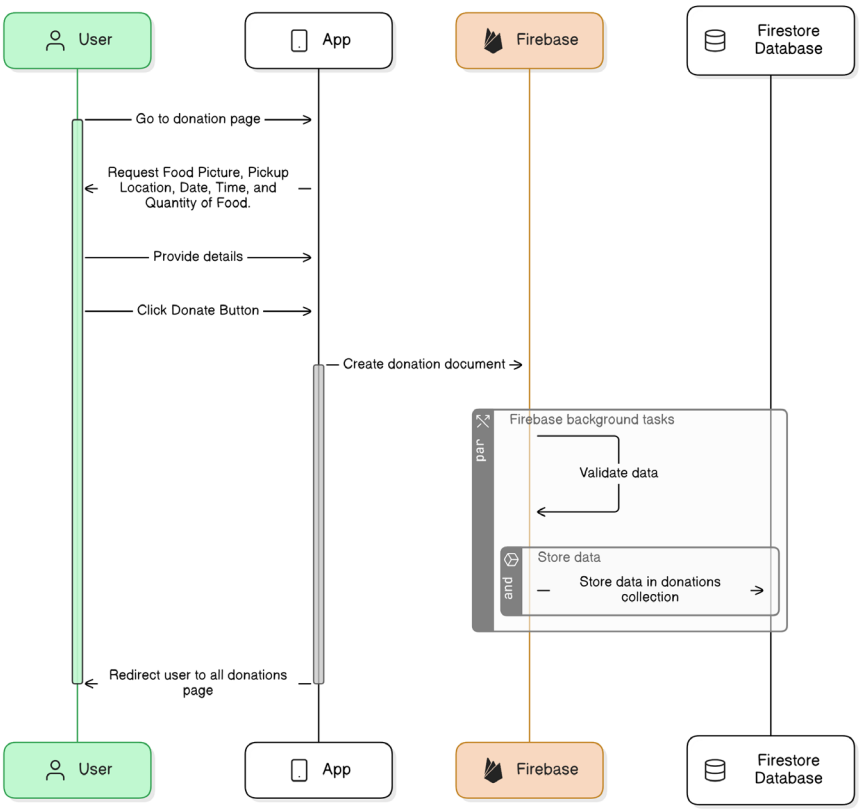

Fig. 5 Donation Module Sequence Diagram

The sequence diagram in (→ Fig. 5) illustrates the donation process in the food donation application, outlining the interaction between the User, App, Firebase, and Firestore Database. Below are the detailed steps:

1. The user navigates to the donation page within the application, where they are prompted to provide essential donation details, including a food picture, pickup location, date, time, and food quantity.
2. After entering the required details, the user clicks the "Donate" button, initiating the donation process. The app then creates a donation document containing the provided information.

3. The donation document is sent to Firebase, where background tasks validate the data. This ensures that all fields are correctly filled, checking for missing or incorrect details before proceeding further.
4. Once the validation is successfully completed, Firebase stores the donation details in the Firestore Database under the "donations" collection, making it accessible for tracking and processing.
5. After the donation is successfully recorded, the application redirects the user to the "All Donations" page, allowing them to view their submitted donations along with their current statuses.

3.4.6 Ratings and Reviews

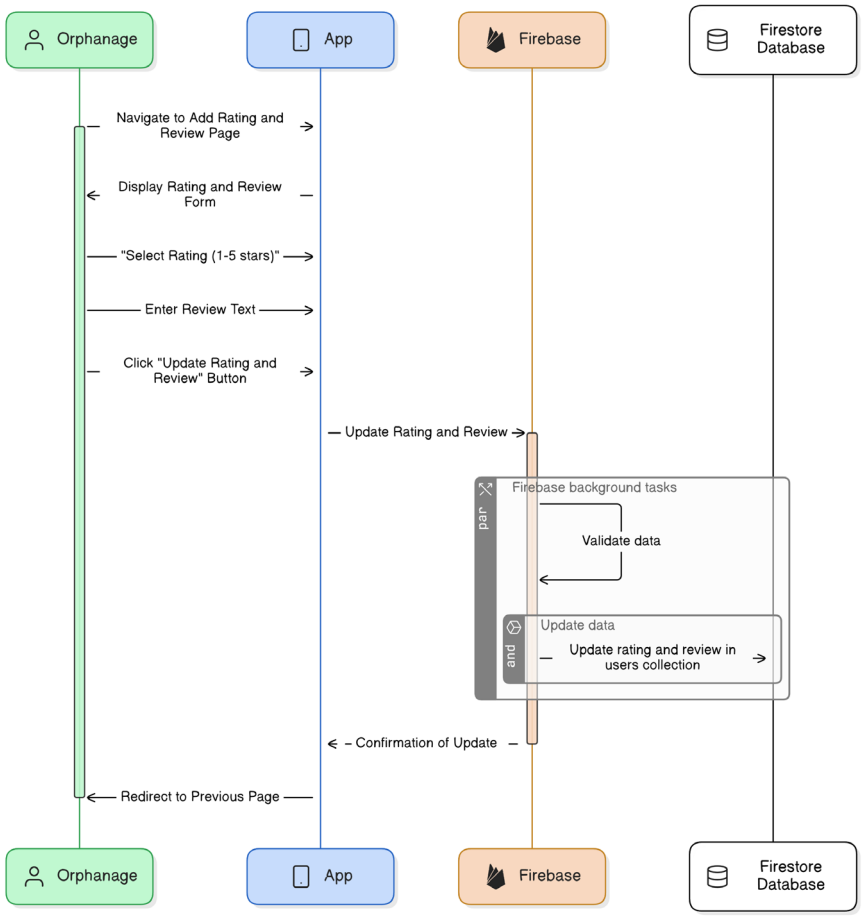

Fig.6 Update Ratings and Reviews Sequence Diagram

The sequence diagram in (→ Fig. 6) illustrates the process of updating a rating and review by the orphanage within the food donation application. The interaction involves the Orphanage, App, Firebase, and Firestore Database. Below are the detailed steps:

1. The orphanage navigates to the "Add Rating and Review" page within the application. The app then displays a form where the orphanage can input their ratings and review for the user.
2. The orphanage selects a rating between 1 to 5 stars and enters their review text in the provided input field.
3. After providing the rating and review, the orphanage clicks the "Update Rating and Review" button, which triggers the update process. The app then sends the updated rating and review data to Firebase.
4. Firebase performs background validation to ensure the data is correctly formatted and does not contain any missing fields. Once validated, Firebase updates the “users” collection in Firestore with the new rating and review.
5. Upon successful completion of the update, Firebase sends a confirmation response back to the app. The app then redirects the orphanage to the previous page, completing the process.

3.4.7 Reports and Analytics

The flowchart in (→ Fig. 7) represents the gathering of reports and analytics in the food donation application. This page provides a detailed overview of donation data, including the total count of accepted, rejected, and pending donations, a graph of monthly donations, and a list of all registered users along with their respective donation contributions. The process follows these steps:

1. The process starts by fetching donation data from the database. This step ensures that all relevant information is available for analysis and display.
2. The system retrieves all donation records, including their statuses. It then processes this data to calculate the total number of accepted, rejected, and pending donations. These counts are later displayed as separate statistics on the analytics page.
3. Simultaneously, the system fetches monthly donation data, processes it, and generates a monthly donations graph. This graph provides a visual representation of donation trends over time, helping to analyze how donations fluctuate across different months.
4. In addition to donation statistics, the system retrieves user-specific donation data. It lists all registered users and displays the number of donations each user has made. This helps track user engagement and contribution levels.
5. Finally, after processing all the data, the analytics page displays the calculated donation status counts, the monthly graph, and the list of users with their respective donations. This completes the analytics process, providing a comprehensive summary of donation activities.

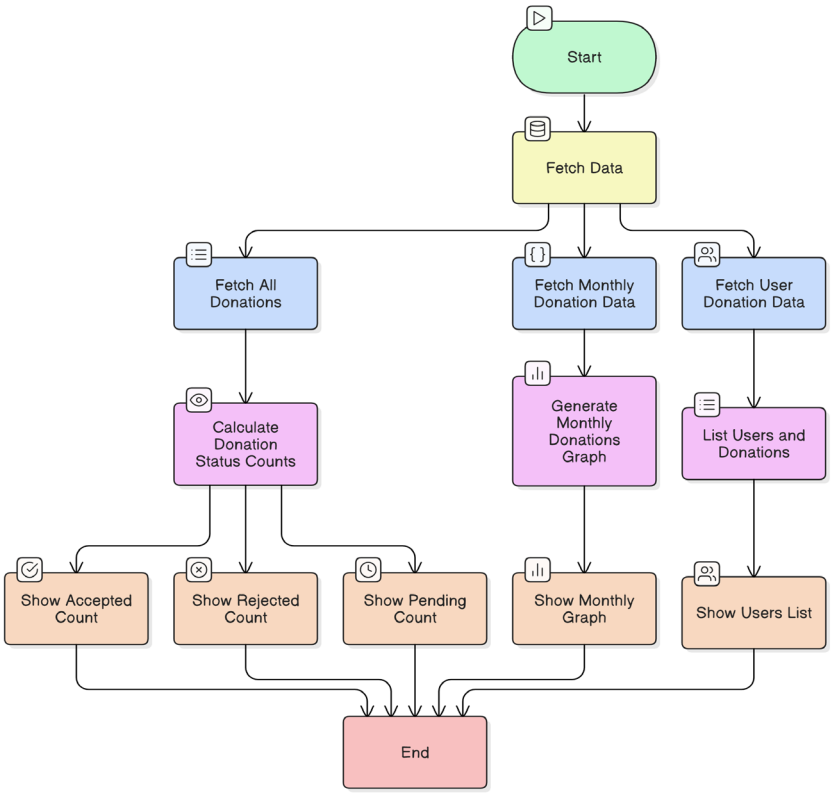

Fig.7 Reports and Analytics Flow Diagram.

4 Applications

This application empowers businesses and individuals to make a real difference by donating surplus food, turning what would be waste into a valuable resource for those in need. By simplifying the food donation process, the platform fosters a culture of generosity while simultaneously benefiting community wellbeing and environmental sustainability. Instead of discarding edible surplus food, the app ensures it reaches those who need it most, promoting responsible resource use and minimizing food waste.

Orphanages are key beneficiaries, gaining consistent access to nutritious meals. This helps ensure vulnerable children receive proper nourishment daily, reducing food insecurity and improving their overall health. Furthermore, by lowering food expenses, orphanages can allocate limited resources to other essential areas like

education, healthcare, and infrastructure, ultimately enhancing the quality of care provided.

Beyond addressing hunger, this application strengthens social connections. It bridges the gap between donors and orphanages, cultivating a sense of community and shared responsibility. The platform also encourages volunteerism by creating opportunities for people to contribute through food distribution or other support roles. These collective efforts strengthen community bonds and nurture a culture of giving empathy, and social cohesion.

5 Conclusion

This platform provides a structured and scalable solution to the intertwined problems of food waste and hunger However, its long-term success depends on overcoming challenges such as infrastructure limitations and expanding its reach.

Future plans include integrating enhancements like AI-driven donation predictions, multilingual support, and offline functionality to better serve a broader user base. By leveraging digital innovation, this platform aspires to establish a global benchmark for sustainable food redistribution, contributing to a future with minimized food waste and reduced hunger.

6 References

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