Implementation of a Digital Solution for Efficient Food Donation and Waste Reduction

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Abstract: Food waste is a global issue with severe environmental, economic, and social impacts, and many underprivileged individuals face chronic food insecurity. The "Imdad" project presents a mobile app connecting food donors, restaurants, caterers, and households with orphanages in need. This paper explores its development, implementation, and impact in reducing waste, improving distribution, and fostering social responsibility. With real-time tracking, automated donor-recipient matching, and data analytics, Imdad offers a structured, user-friendly, and scalable solution for efficient food redistribution.

Keywords: Food waste management, food donation, NGOs, mobile application, digital transformation, social impact, sustainable food distribution.

1. Introduction:

Food insecurity and waste are closely linked global issues, with nearly 40% of food produced in India going to waste, while millions, especially orphaned children, face hunger. This highlights the need for an organized, tech-driven solution for food redistribution.

Imdad is a mobile-based platform designed to bridge the gap between food donors—such as restaurants, caterers, and households—and orphanages in need. Donors can register surplus food, which is then matched with nearby orphanages. The system facilitates food collection and delivery, ensuring timely distribution.

With features like real-time tracking, automated notifications, donor impact reports, and feedback mechanisms, Imdad streamlines food redistribution and guarantees consistent access to nutritious meals for underprivileged children. It also encourages social engagement, promoting community-driven food donation and fostering a culture of shared responsibility.

2. Literature Review:

Food donation and security have been the focus of multiple applications, research initiatives, and government schemes aimed at addressing hunger and reducing food wastage. Various applications and initiatives have been developed, each with distinct methodologies, advantages, and limitations.

The "Donate and Save" website, using JavaScript, connects donors with NGOs for surplus food distribution, ensuring transparency and ease of use. However, its success depends on widespread adoption, and digital literacy barriers may limit accessibility. Similarly, the "Donate a Day" mobile app employs Rapid Application Development (RAD) for quick development and user feedback, but requires significant involvement and may not suit complex projects.

2025. In Mangesh Ghonge et al. (eds), Proceedings of First International Conference on Emerging Technologies and Computing Innovations ICETCI-2025, 2025, pp. 37-43.
https://doi.org/10.32622/978-81-931579-0-9-202

The Akshaya Patra Foundation delivers nutritious meals to underprivileged children through government-run school programs. While effective in combating hunger, its focus on government schools may exclude other vulnerable groups. The National Food Security Mission, launched in 2007, enhances food security through increased production and improved soil health but faces issues like dietary diversity neglect, water stress, and subsidy dependence. Technology-driven solutions like the SeVa food donation app use Human-Computer Interaction (HCI) principles, providing a user-friendly and cost-effective design. However, iterative design complexities and scalability concerns persist. Feeding India, leveraging online tools for logistics and impact measurement, effectively tackles hunger through partnerships but depends heavily on these collaborations.

3. Proposed Methodology:

The development and implementation of Imdad followed a systematic and structured approach, comprising research, design, development, testing, and deployment phases. The initial phase focused on requirement analysis, during which surveys and interviews were conducted with orphanage administrators, food donors, and non-governmental organizations (NGOs) to identify core challenges and key functional requirements. This research phase provided valuable insights into the logistical, technical, and operational barriers to efficient food redistribution, ensuring that the application was designed to address these issues comprehensively.

Following are the requirement analysis, the system design phase commenced, where user flow diagrams, wireframes, and architectural frameworks were developed to create an intuitive and scalable application. Special attention was given to user experience (UX) and user interface (UI) design, ensuring that both donors and recipients could easily navigate the application with minimal effort. The development phase adopted an agile methodology, allowing for iterative improvements based on user feedback. Regular testing and quality assurance processes were implemented to detect and resolve potential issues, ensuring a smooth and reliable user experience. Finally, the application was launched in phases, beginning with a pilot testing phase in select regions before rolling out full-scale implementation.

Module 1 - User Module:

The User Module ensures a seamless experience for donors and volunteers contributing food to orphanages. Upon accessing the app, users are first checked for authentication. If not logged in, they are directed to a Get Started screen to sign up or log in. Once authenticated, they reach the Home Screen, the main navigation hub, where they can make donations, update profiles, track donation history, submit reviews, browse FAQs, and contact support. With a user-friendly interface catering to all tech skill levels, the module enhances donor engagement, encouraging consistent participation in food donation activities.

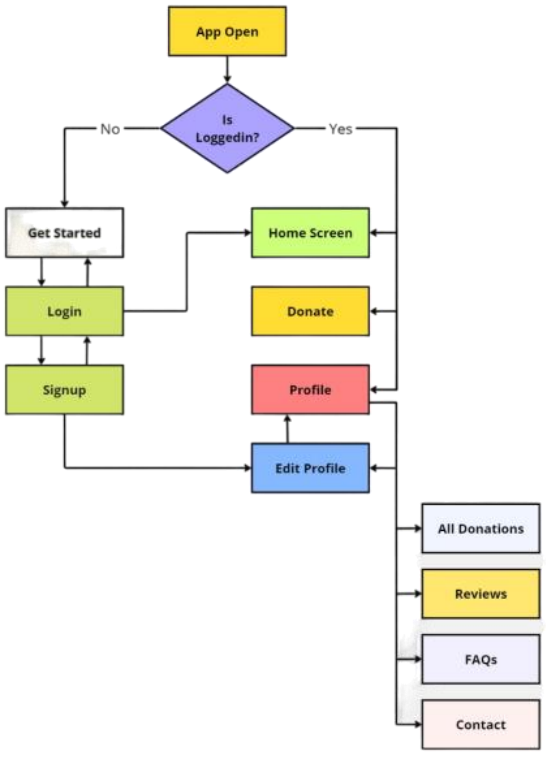

Fig 1. User Module – Flow Diagram

Module 2 - Admin Module:
The Admin Module is tailored for orphanage administrators and organizational managers responsible for overseeing food donations and coordinating recipient logistics. Upon launching the application, administrators are required to log in to access their personalized dashboard. The Admin Dashboard functions as the central management hub, offering a comprehensive view of all donation activities. Administrators can track and analyze incoming food donations, view donor profiles, manage user accounts, respond to reviews, update their profile information, and oversee frequently asked questions (FAQs) to provide better assistance to users. Additionally, the platform includes an integrated contact feature, allowing direct communication between administrators, donors, and volunteers to facilitate smoother coordination. To enhance efficiency, data analytics tools are incorporated within the Admin Module, enabling orphanage managers to generate reports, gain insights into donation trends, and make data-driven decisions to optimize food redistribution efforts. This structured system ensures a well-organized and transparent food donation process, ultimately benefiting both donors and recipients.

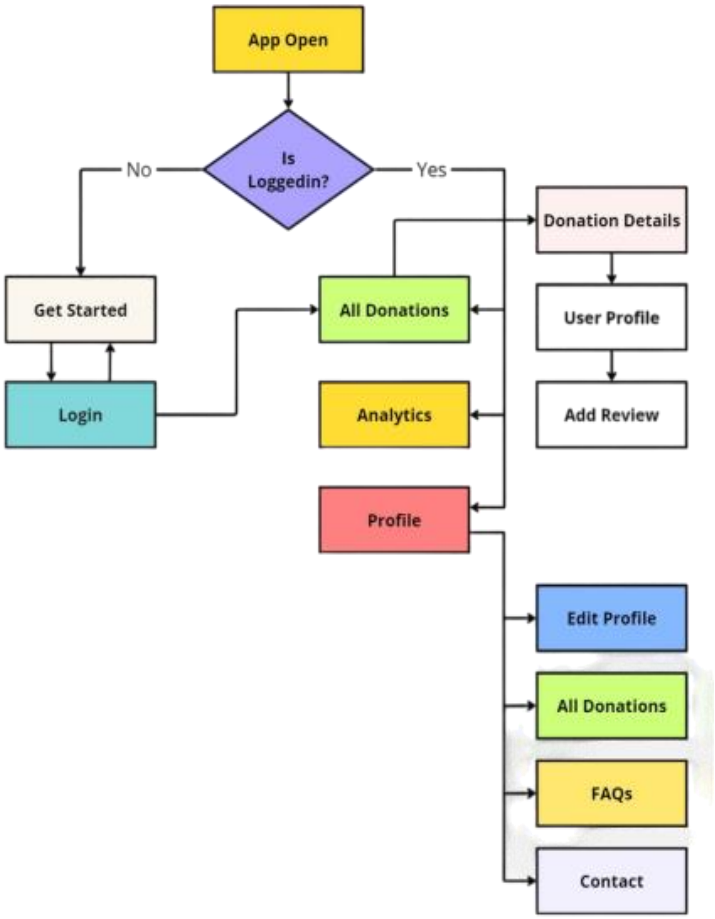

Fig 2. Admin Module – Flow Diagram

Module 3 - User Authentication and Authorization module:
The User Authentication and Authorization module ensures secure user access and credential management. New users can register through the Sign Up page by providing their email and password, with a clearly visible "Sign Up" button for easy access. A link at the bottom allows users to switch to the Sign In page if they already have an account. Existing users can log in on the Sign In page using their email and password, with a "Forgot Password?" option for password recovery. There's also a link for users to navigate to the Sign Up page if they haven't registered yet. When users request to reset their password, they receive a secure email with a link to initiate the password reset process. On the Change Password page, users can enter and confirm their new password once they click the reset link in the email, enhancing app security. This flow ensures a seamless and secure experience for users, covering registration, login, and password recovery.

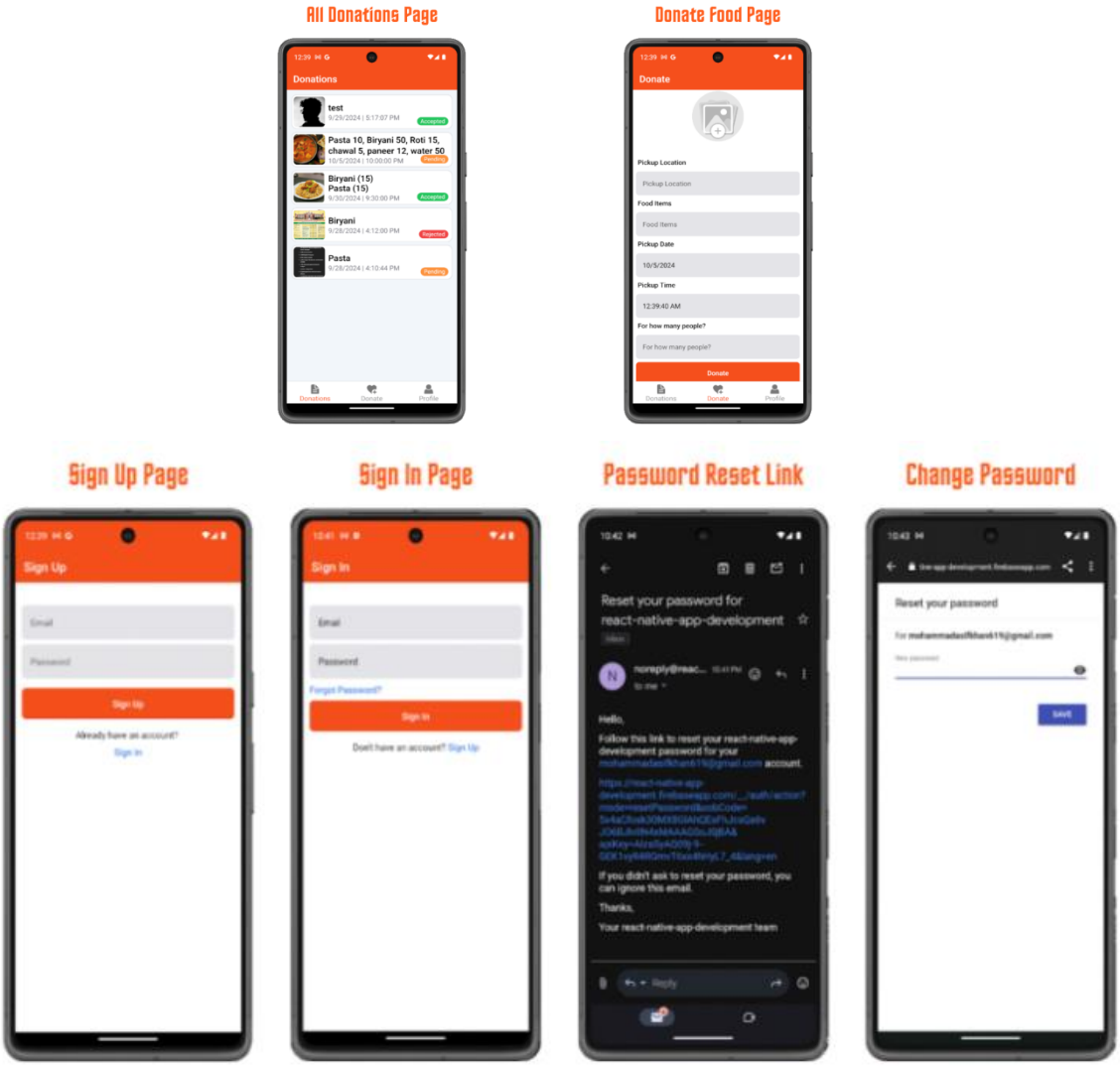

Fig 3. Sign up and Sign in Page for user

Module 4 - Donor Module:

The Donation Process within the app is designed to make it easy and efficient for users to contribute food to the orphanage. The interface is user-friendly, ensuring that donors can quickly input all necessary details for a smooth donation experience. Users can start by uploading an image of the food items they wish to donate by clicking on the image upload section at the top of the screen. This helps the orphanage staff visually verify the donation.

Next, donors need to enter the pickup location, specifying where the food will be collected, ensuring that volunteers can reach them easily. The food items section allows donors to describe the type of food they are offering, helping the orphanage plan meal distribution efficiently. To streamline logistics, donors must select the pickup date and time, allowing for proper scheduling of collection. Additionally, they are required to specify how many people the food can serve, ensuring the orphanage can allocate the donation appropriately.

Once all details are entered, users can confirm their donation by clicking on the "Donate" button. The request is then sent to the orphanage team for approval and collection. Donors can track their past contributions under the "Donations" tab in the bottom navigation bar, ensuring transparency in the process. They can also manage their account details in the "Profile" section for a seamless user experience. This structured process ensures convenience for donors while helping the orphanage efficiently manage food distribution resources.

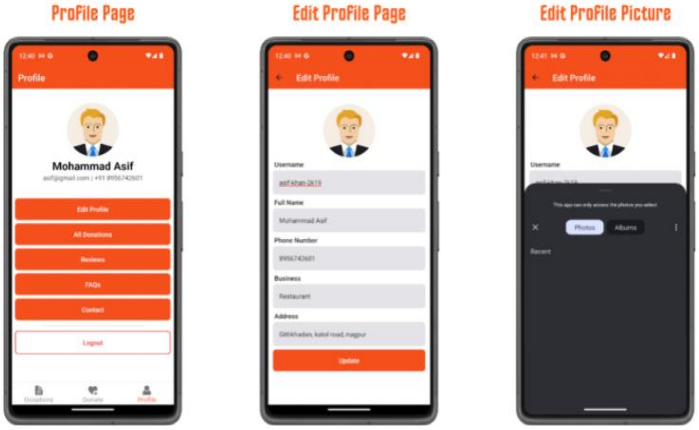

Fig 4. Profile and Edit Profile Page

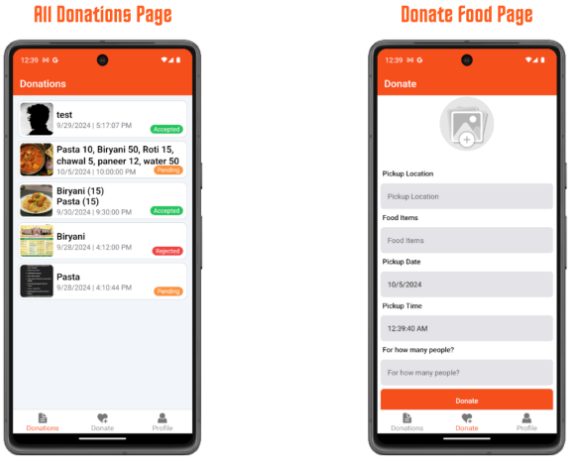

Fig 5. Donate Page

Fig 6. FAQ's and Contact Page

Module 5: Orphanage Module:

The orphanage model of the food donation app ensures efficient and transparent food distribution. Donors list available food with details such as quantity and time, which orphanages can browse on the All Donations Page. Donations are marked as Accepted, Rejected, or Pending for easy management. When selecting a donation, orphanages access essential pickup info, including the donor's contact details and the number of people the food serves. The User Details Page lets orphanages review donor profiles, past donations, and ratings. The app also allows orphanages to rate donors, ensuring accountability, minimizing waste, and ensuring quality food reaches those in need.

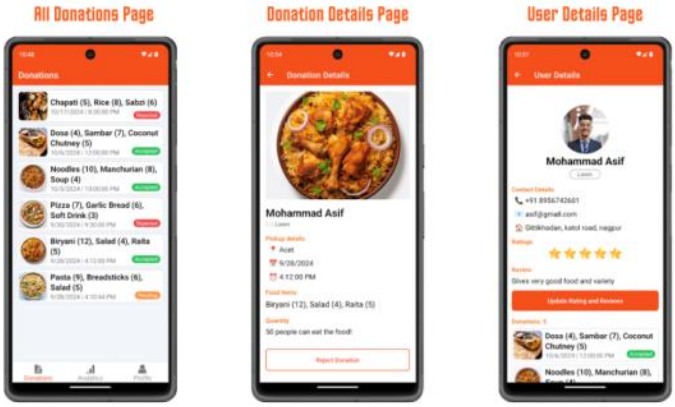

Fig 7. All Donation and Details page for user

Module 6: Rating and Review:

The Rating and Review feature in the food donation app allows users to evaluate and provide feedback on donors based on their food quality and variety. The first User's Reviews Page shows an empty rating section with a message indicating that no ratings have been given yet. Once a user receives reviews, the second User's Reviews Page displays an overall rating (e.g., 5 stars) along with written feedback, such as "Gives very good food and variety." The Update Rating and Reviews Page enable users to modify their rating and review if needed. This feature helps maintain transparency, allowing orphanages to assess donors based on past experiences, ensuring better food quality and reliability in future donations.

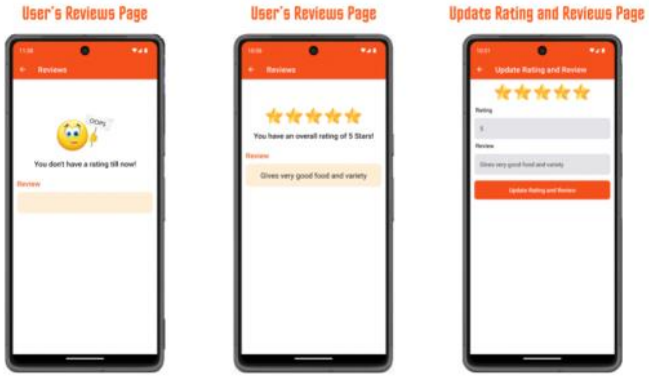

Fig 8. Rating and Reviews page

Module 7: Reports and Analytics:

The Analytics Page provides insights into donation activities, categorizing them as Accepted (3), Pending (1), and Rejected (2). A graph visually represents donation trends over different months. The Users section lists donors and their contributions, with Mohammad Asif leading at 5 donations. This helps track donation success and recognizes active contributors. The page enables better food distribution management for orphanages and organizations.

Fig 9. Analytics Page

4. Applications:

Imdad empowers businesses and individuals to fulfil their social responsibility by donating surplus food, fostering a culture of generosity while contributing to community welfare and environmental sustainability. By providing an efficient platform for food donation, the app ensures that edible surplus food is redirected to those in need rather than wasted, promoting responsible resource management.

One of the key beneficiaries of Imdad are orphanages, which receive reliable and consistent meal supplies through the app. This guarantees that vulnerable children have access to nutritious food daily, addressing food insecurity and improving their overall well-being. Additionally, by receiving donated food, orphanages can significantly reduce their expenses on purchasing meals, enabling them to allocate their resources toward other essential needs such as education, healthcare, and infrastructure.

Beyond its direct impact on food security, Imdad fosters meaningful social connections. It bridges the gap between donors and orphanages, creating a sense of community and shared responsibility for social causes. The platform also encourages volunteerism by offering individuals opportunities to contribute through food distribution and other supportive tasks. This active engagement not only strengthens community bonds but also promotes a culture of giving and social cohesion.

5. Conclusion

The Imdad initiative leverages technology to connect food donors with orphanages, reducing waste and ensuring underprivileged children receive consistent, nutritious meals. Its efficient system features real-time tracking, automated donor-recipient matching, and a user-friendly interface, making donations seamless and scalable. Beyond food security, Imdad fosters social responsibility, engaging individuals, businesses, and organizations in charitable giving.

Despite its impact, challenges include logistics, internet dependency, and outreach. Ensuring food safety and stakeholder coordination requires ongoing monitoring and strong partnerships. Expanding to new regions demands significant infrastructure and funding. Looking ahead, Imdad plans to integrate AI for optimized food distribution, using predictive analytics to enhance donation forecasting. Collaborations with NGOs, corporations, and governments will expand its reach, while multilingual support and offline capabilities will improve accessibility. Imdad exemplifies a sustainable food redistribution model, tackling food insecurity, reducing waste, and inspiring community-driven change. With evolving technology, it has the potential to set a global standard in innovative food donation.

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