EXCESS FOOD MANAGEMENT SYSTEM

A MINI PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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ABSTRACT

Food waste and hunger often exist side by side — tons of edible food are thrown away every day, while many people still struggle to find their next meal. This clear imbalance calls for a smart and meaningful solution. That's where FEEDER comes in — a web-based platform designed to connect those who have extra food (like restaurants, grocery stores, and households) with those who urgently need it (like NGOs, shelters, and food banks).

FEEDER makes food sharing simple and efficient. Donors can quickly list extra food items, and the system matches them in real time with nearby recipients based on location, type of food, and how urgent the need is. It also supports coordination for smooth pickups, using the help of volunteer networks and NGOs to reduce the chances of food going to waste.

Live Food Updates – Donors can share what food is available, where, and for how long it'll be safe to use. Smart Matching – The platform pairs donations with the most suitable recipient, saving time and effort. Logistics Support – Helps coordinate timely pickups to ensure food reaches people before it spoils. Customized Dashboards – Donors and recipients each get their own view to manage activities, feedback, and track their impact. Sustainability Insights – Tracks how much food was rescued and how many people were helped, showing the system's real-world effect.

At its core, FEEDER is about community, compassion, and smart use of resources. It turns everyday food surplus into life-changing support for someone in need. With more partnerships and development, FEEDER could grow into a broader solution — helping reduce hunger, cut down waste, and make our food systems more fair and sustainable.

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INTRODUCTION

Food waste and hunger are two sides of the same coin — while tons of edible food are discarded every day, a significant part of the population continues to struggle for a single meal. This gap between excess and need is especially visible in a country like India. According to the UNEP Food Waste Index Report 2024, India alone generates around 78.2 million tonnes of food waste every year. This includes leftovers from restaurants, unsold groceries from supermarkets, unserved meals from events, and even household discards — much of it still fit for consumption. At the same time, millions of people in both rural and urban areas face food insecurity, unable to access sufficient nutritious meals. This paradox presents a unique opportunity for change — one that involves communities, businesses, and technology working together.

In response to this need, FEEDER was conceptualized. FEEDER is a smart, web-based platform that aims to make food redistribution simple, fast, and impactful. It serves as a digital bridge between food donors (like restaurants, grocery stores, caterers, and individuals) and recipients (NGOs, food banks, community kitchens, and vulnerable groups). The goal is not just to minimize food wastage but to create a reliable system that delivers food to those who need it most — at the right time.

The platform offers features like live updates of available food, automatic matching of donors and recipients based on location and need, and streamlined logistics support. By doing this, FEEDER not only reduces waste but also promotes sustainable development and community collaboration. As more people, businesses, and organizations join the network, the system becomes stronger and more effective, making it possible to scale across cities and regions. In the long run, FEEDER envisions a world where no food goes to waste and no person goes hungry.

DESIGN THINKING APPROACH

Design Thinking is a user-centric, iterative problem-solving approach that combines empathy, creativity, and rationality to meet users' needs and drive innovation. In the context of FEEDER, the Design Thinking methodology ensures that the platform remains accessible, impactful, and emotionally resonant with both donors and recipients of surplus food. FEEDER adopts this framework to deeply understand the challenges of food waste and hunger, and to design a scalable, human-centred solution for efficient food redistribution

The development of FEEDER was guided by various established design thinking models to ensure a user-centred, innovative, and effective solution to food wastage and hunger.

1. Stanford d.school Design Thinking Model (Empathize, Define, Ideate, Prototype, Test):

The process began with the *Empathize* phase, where comprehensive research and field interviews were conducted with restaurant owners, NGOs, volunteers, and individuals facing food insecurity to understand their challenges and motivations. In the *Define* stage, the primary issue was clearly identified as food wastage due to the absence of real-time coordination and hunger caused by limited access to surplus food. The *Ideate* phase involved brainstorming a wide range of ideas, including real-time food listing, automated matching algorithms, delivery coordination mechanisms, and sustainability tracking. A functional *Prototype* was developed featuring dashboards for donors and recipients, food availability updates, and location-based matching. In the *Test* phase, early users provided feedback that helped refine the user interface and improve platform usability.

2. IDEO’s Human-Centred Design Model (Inspiration, Ideation, Implementation):

The *Inspiration* phase involved gathering stories and experiences related to hunger, food wastage, and community kitchens. These insights informed the *Ideation* stage, where features like surplus food listing, pickup scheduling, and

NGO coordination were conceptualized. In the *Implementation* phase, a user-friendly web platform was developed, ensuring accessibility for both tech-savvy and non-technical users from diverse backgrounds.

3. Double Diamond Model by the British Design Council (Discover, Define, Develop, Deliver):

In the *Discover* phase, secondary research and interviews revealed the magnitude of food waste and the disjointed efforts in food donation. The *Define* phase refined the problem statement to focus on a centralized, digital solution for timely food recovery. During the *Develop* phase, core modules such as donor listings, recipient alerts, and real-time tracking were created. The *Deliver* phase culminated in a robust platform equipped with smart matching, logistics coordination, user feedback, and sustainability tracking systems.

4. IBM Enterprise Design Thinking (Hills, Playbacks, Sponsor Users):

A clearly defined *Hill* or mission was established — to reduce food waste and increase food accessibility using real-time technology. *Playbacks* were conducted regularly to showcase the interface and functionalities to users, facilitating iterative improvements based on feedback. *Sponsor Users*, including NGOs, restaurants, and food banks, were engaged to provide continuous input, ensuring the solution addressed real-world requirements.

5. Frog Collective Action Toolkit:

The *Clarify Intent* stage identified FEEDER's objective as connecting surplus food to those in need, with an emphasis on social and environmental impact. *Building Group Agreements* involved fostering collaboration among developers, NGOs, donors, and volunteers. During *Expand Perspective*, the platform was designed to support not only large donors but also individuals and small contributors. In the *Make Plans* stage, workflows were mapped out for daily collections, emergency drives, and scheduled listings. Finally, *Take Action* was realized through the launch of real-time updates and coordinated efforts that empowered communities to actively participate in addressing hunger.

STANFORD DESIGN THINKING MODEL AND ITS PHASES

The Stanford d.school Design Thinking Model offers a powerful, user-centred framework that guided the development of the FEEDER platform. Through its five iterative phases—Empathize, Define, Ideate, Prototype, and Test—FEEDER was shaped to meet the real-world challenges of food waste and hunger with empathy, innovation, and practicality.

The **Stanford Design Thinking Model** was effectively applied in the development of FEEDER, providing a structured yet flexible framework for innovation. In the **Empathize** phase, the team investigated the growing paradox of food surplus and food insecurity across communities. They engaged directly with stakeholders including restaurant owners, NGOs, volunteers, and families affected by hunger to understand their pain points. Key issues identified included a lack of awareness about food donation channels, difficulties in coordinating pickups, and food spoilage caused by delays. This stage helped build a comprehensive understanding of the needs of both donors and recipients, ensuring that solutions would be inclusive and meaningful.

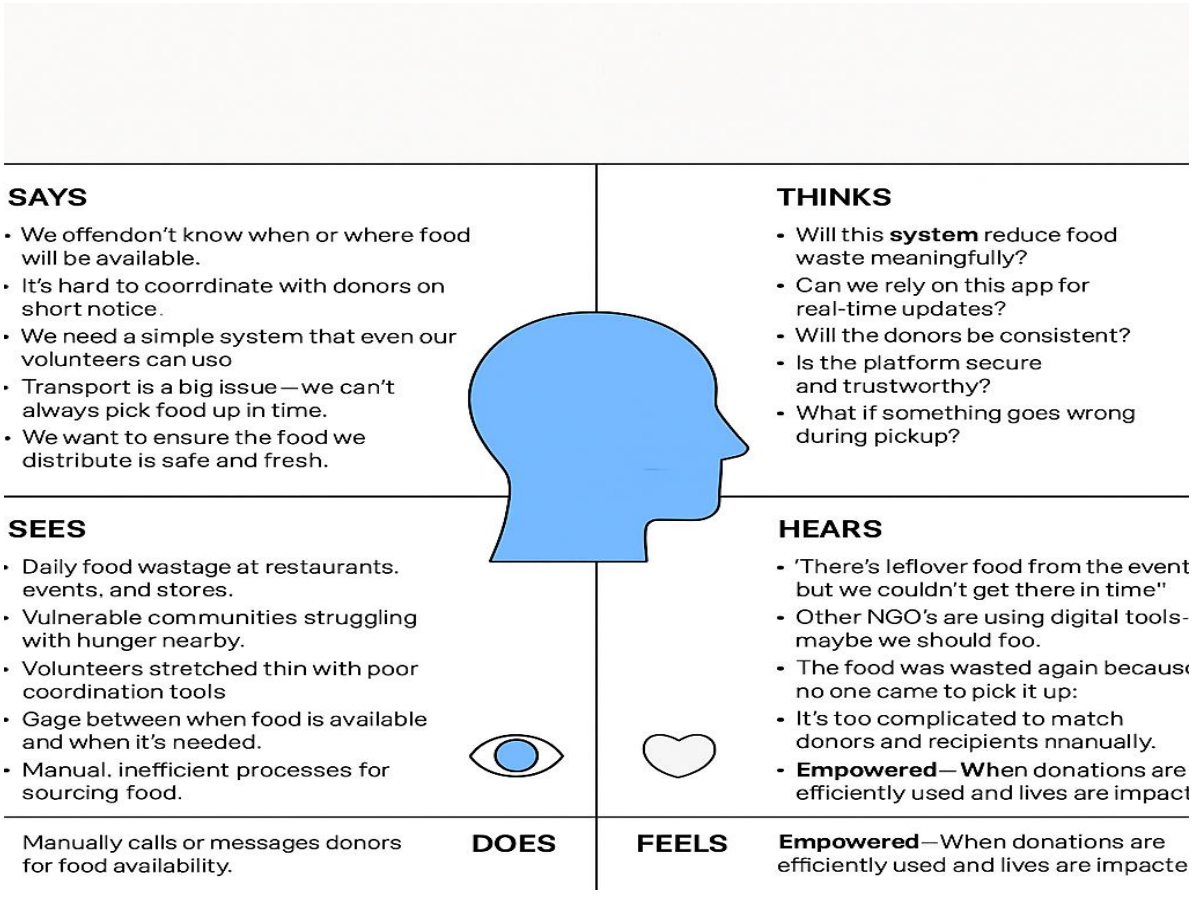
In the **Define** phase, the central challenge was framed as: *How might we efficiently connect surplus food sources with those in need in real time?* This led to the establishment of clear goals, such as enabling real-time food listings, implementing a smart matching system, and ensuring timely pickups to reduce spoilage. User personas for both donors and recipients were created to guide focused feature development.

K2

The **Ideate** phase involved brainstorming a variety of digital solutions aimed at bridging the donor-recipient gap. Emphasis was placed on accessibility, scalability, and ease of use. Ideas explored included geolocation-based matching, automated notifications, intuitive dashboards, and sustainability metrics. The team prioritized solutions that offered a balance between functionality and simplicity, with particular attention to users who may not be tech-savvy.

During the **Prototype** phase, a functional version of the FEEDER web application was developed. Key features included a live food listing interface, a smart matching engine, dashboards for donors and recipients, and tools for logistics coordination. The design focused on an intuitive and responsive user interface that supports various roles and devices, ensuring broad accessibility.

Finally, in the **Test** phase, real-world simulations were conducted using mock donors and recipients to validate the usability of the platform. Feedback was gathered regarding UI clarity, feature usefulness, and system responsiveness. Based on this input, the application was iteratively refined to better meet user expectations. Continuous improvement was ensured through integrated feedback loops within the platform. Overall, the Stanford Design Thinking Model proved to be highly effective for FEEDER, enabling the creation of a technologically robust and user-centred solution that addresses real-world problems of food waste and hunger.



LITERARY SURVEY

The growing global concern over food waste and hunger has sparked interest in technological solutions that can redistribute surplus food effectively. Several research initiatives and applications have explored how digital platforms can act as intermediaries between food donors and beneficiaries, utilizing smart matching algorithms, logistics support, and user engagement features.

A study by Anirban Adhikari et al. [1] focused on creating an intelligent food donation system using machine learning. The platform collected data from restaurants and supermarkets, analysed the expiration timeline and quantity of surplus food, and used predictive modelling to match donations with the most suitable recipients based on proximity and need. The paper demonstrated that intelligent decision systems could reduce food spoilage and improve the efficiency of redistribution.

Wang and Kim [2] designed a block chain-based food donation network to ensure transparency, traceability, and accountability in the food supply chain. Their decentralized system tracked each donation from the donor to the recipient, preventing fraud and ensuring food safety compliance. This work shows how emerging technologies like block chain can solve trust and verification challenges in donation systems.

Rashmi J. and Meenakshi K. [3] implemented a food-sharing platform integrated with SMS alerts to notify nearby NGOs or individuals about available surplus food. The study revealed that even low-bandwidth or non-smartphone solutions could be effective in rural and underserved regions. This work emphasizes the importance of inclusivity and accessibility in designing food redistribution platforms.

Rahul Sharma and Neha Gupta [4] introduced a platform that focused on food safety by implementing image processing to assess the freshness of donated food.

They combined user-uploaded photos with backend AI algorithms that could detect spoilage. Though in its early stages, the system highlighted the importance of ensuring food quality, especially when redistribution takes time.

Deepa Singh and Varun Kumar [5] explored the use of gamification in food donation platforms to incentivize donor participation. By assigning reward points and community recognition badges, their system boosted user engagement and helped develop a culture of regular donation among businesses and individuals alike.

Sagar S. and Krupa B. [6] built a logistic-aware food donation application that linked delivery agents or volunteers with food pick-up points and drop-off destinations. By integrating Google Maps APIs and traffic forecasting tools, they minimized delivery delays and food wastage. Their contribution shows that route optimization is a crucial component of real-world food redistribution systems.

Aditi Verma et al. [7] examined the scalability of food redistribution systems by analysing peak-time usage and server load. They proposed a cloud-based architecture with load balancing and caching to handle large-scale events and multiple concurrent donations. Their findings are useful in planning robust backend infrastructure, a key focus area for the FEEDER platform.

Overall, these studies collectively highlight the various technical, social, and logistical aspects involved in developing effective food redistribution systems. Core takeaways include the importance of real-time matching, user verification, quality assessment, logistics coordination, and scalable infrastructure. FEEDER builds on these insights by combining a donor-recipient matching engine, real-time notifications, and admin oversight features to create a reliable and transparent food-sharing ecosystem. The platform also considers challenges such K8as user trust, system usability, and regional customization, aiming to provide an inclusive solution to tackle food insecurity.

EMPATHIZE STAGE

The Empathize stage in the Design Thinking process was crucial in understanding the needs, challenges, and behaviours of key stakeholders impacted by food waste and hunger. These stakeholders included food donors, NGOs, delivery volunteers, and food-insecure communities. To gain meaningful insights, our team conducted field visits to restaurants and NGOs, carried out interviews with food donors, and distributed surveys among beneficiaries. We developed empathy maps to capture what users say, think, do, and feel, which helped uncover major frustrations such as logistical barriers, lack of transparency, and trust issues in current food donation systems. User personas were then created to represent various stakeholder groups—restaurant owners, NGO coordinators, delivery volunteers, and low-income families—to ensure that the platform addressed diverse perspectives.

Additionally, we shadowed food collection volunteers to experience real-time challenges, such as uncoordinated pickups and limited communication, which often led to inefficiencies. These observations grounded our design process in actual user pain points and motivations, helping us craft a solution that is both functional and empathetic.

Secondary Research involved an in-depth review of government publications, sustainability reports, academic literature, and case studies on food waste management. Our findings highlighted that nearly one-third of food produced globally is wasted, while millions continue to suffer from food insecurity. Reports from organizations like the FAO and UNEP emphasized that effective food redistribution could significantly mitigate both hunger and environmental degradation. We also analysed existing food-sharing platforms, identifying limitations such as lack of smart matching, poor UI/UX, limited scalability, and inaccessible data. These insights revealed significant system gaps and informed the direction for building a more intelligent, transparent, and user-friendly platform.

Primary Research was conducted through structured interviews with restaurant staff, NGO workers, and recipients. Questionnaires were used to gather detailed information about their experiences, including donation frequency, preferred communication methods, and logistical challenges. Donors expressed the need for a secure, easy-to-use platform that fosters trust. NGOs prioritized concerns about the timing and quality of donations, while beneficiaries valued dignity in access and the importance of discretion during distribution. Observational studies in commercial kitchens helped us identify opportunities to integrate real-time surplus tracking, adding another layer of practical insight to our design.

From this research, several **key user needs** emerged: the necessity for real-time food tracking and smart matching to streamline logistics; an intuitive interface accessible to users with minimal technical expertise; smart notifications and automated scheduling to enhance coordination; assurancK2e mechanisms for food quality and transparent donation histories to build trust; geo-location features to connect donors with nearby recipients; and most importantly, maintaining privacy and dignity in the distribution process. Emotional needs also surfaced, such as donors wanting to feel helpful, recipients desiring to feel safe and respected, and NGOs seeking empowerment through reliable systems.

Addressing these functional and emotional needs became central to FEEDER's design, ensuring that the platform not only connects food surplus with food scarcity but also delivers a respectful, empathetic, and human-centric user experience.

DEFINE STAGE

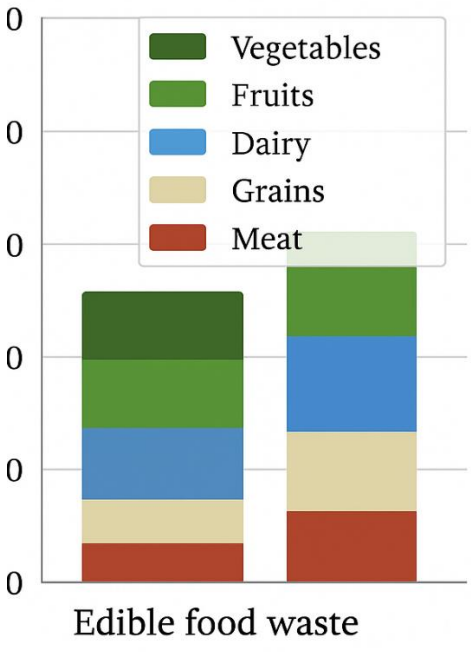
In the Define Stage of the Design Thinking process for the FEEDER project, we focused on synthesizing the insights from the Empathize Stage to define the core problems faced by those involved in food redistribution. Our goal was to narrow down these challenges into actionable problem statements that could be effectively addressed through a smart, user-friendly platform. By defining the problem, we could align our solution with the real-world needs of both food donors and recipients.

Through extensive research and engagement with stakeholders, several critical challenges in food redistribution were identified. A primary issue was the disconnect between food donors—such as restaurants, grocery stores, and households—and recipients, including NGOs, shelters, and food banks. The absence of a centralized, easy-to-use platform significantly hindered this connection, often resulting in delayed responses and unnecessary food waste. Additionally, there was a glaring lack of real-time updates regarding available food donations. Without accurate tracking, recipients were either unaware of donations or received food that was no longer fresh, compromising safety and utility.

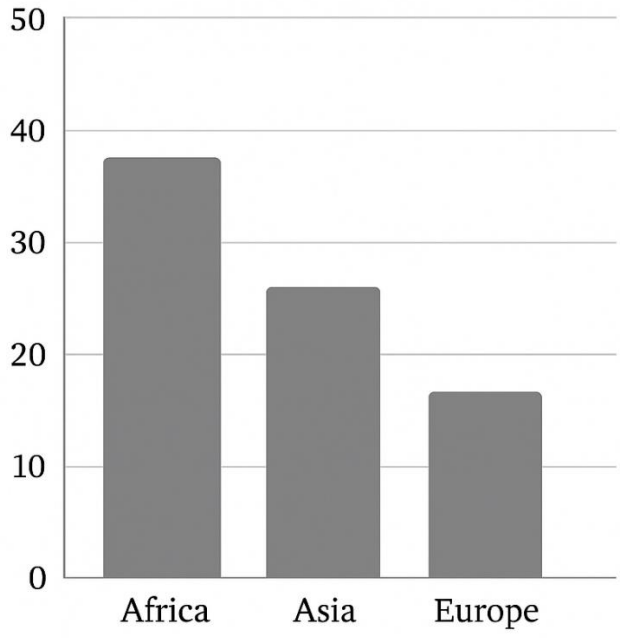
Logistical coordination emerged as another barrier. The process of scheduling and executing timely pickups was often unorganized, leading to missed opportunities and wasted resources. Both donors and recipients expressed a strong need for a transparent, efficient system capable of managing food donations effectively. Donors sought assurance that their contributions were reaching the right people at the right time, while recipients desired up-to-date information regarding food availability, freshness, and urgency. Furthermore, both parties emphasized the importance of sustainability and impact tracking. There was a shared desire for a platform that could not only facilitate food redistribution but also provide measurable insights into how much food was being saved and the positive social outcomes generated.

In response to these insights, we conducted a series of structured brainstorming sessions aimed at clearly defining the problem FEEDER is designed to solve. This led to the formulation of three core problem statements. The first highlighted the **lack of efficient connection between donors and recipients**, focusing on the need for a real-time, location-based matching system. The second addressed **inefficient logistics and coordination in food pickups**, emphasizing the requirement for a streamlined, organized scheduling process. The third problem revolved around the **lack of transparency and impact tracking**, underscoring the need for a platform that could provide real-time insights into donation effectiveness and social impact.

To determine the most critical and actionable problem, we evaluated each statement based on its urgency, potential impact, and feasibility of implementation. Ultimately, we chose to prioritize **Problem Statement 1: Lack of Efficient Connection between Donors and Recipients**. This issue was not only the most common concern among stakeholders but also represented the greatest opportunity for meaningful impact. By developing a real-time, smart-matching system, FEEDER aims to ensure that surplus food is distributed quickly and effectively to those in need. Leveraging modern web technologies, the platform will enable both donors and recipients to seamlessly interact, monitor donation status, and access critical information—thereby reducing food waste and enhancing food security in an efficient, transparent, and scalable manner.



(a) Edible food waste



(b) Communities suffering from food scarcity

IDEATION STAGE

Following the definition of our key problem in the Define Stage, the Ideation Stage focused on creatively exploring possible solutions to connect food donors—such as restaurants, grocery stores, and households—with recipients, including NGOs, shelters, and food banks. The overarching objective was to combat both food waste and hunger through a practical, user-friendly digital solution.

We began by analysing the finalized problem statement: *"Food waste and hunger often exist side by side — tons of edible food are thrown away every day, while many people still struggle to find their next meal. How might we create a solution that connects food donors with recipients to ensure that food is shared efficiently and sustainably?"* This led to the identification of four key challenges: widespread food waste, inefficient food distribution, lack of coordination in logistics, and the need for a sustainable system that could track and measure its impact.

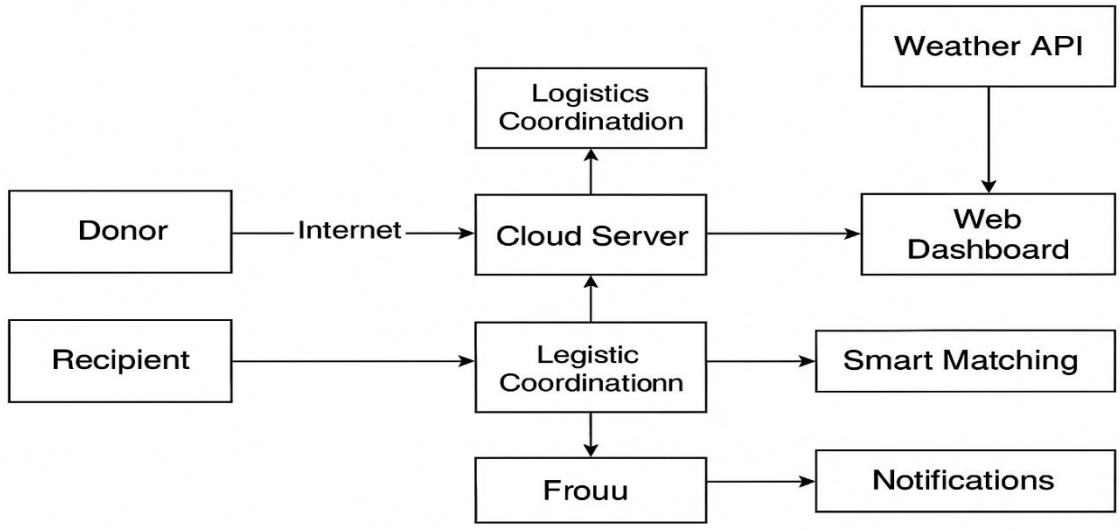
To generate ideas, we developed a mind map around the central theme of "Connecting Food Donors with Recipients." The major branches of this map included a food donation interface for listing available food with filters such as type, quantity, and urgency; a smart matching system to connect donors with nearby recipients based on real-time data; logistics support through NGO and volunteer coordination; live updates for both donors and recipients; and a sustainability tracker to monitor the environmental and social impact of the system.

We conducted structured brainstorming sessions and assessed each idea based on its feasibility, impact, simplicity, and scalability. Four top ideas emerged: (1) a food listing and matching system for streamlined connections between donors and recipients, (2) a logistics coordination platform for organizing timely pickups, (3) a real-time tracking and notification system for improved communication, and (4) an impact tracking dashboard to motivate stakeholders and visualize results. Each concept had its strengths and limitations—some

required more infrastructure or user engagement—but they all aligned well with our central problem.

Ultimately, we decided on a hybrid solution that integrated the best elements from all four ideas. This final concept included live food updates, a smart matching algorithm, logistics coordination tools, and an impact-tracking dashboard. By combining these features, we ensured that the platform would be simple, efficient, and user-centric, addressing food surplus and hunger while promoting transparency and sustainability.

To encapsulate our solution, we crafted the following value proposition: “FEEDER is a web-based platform that connects food donors with recipients to reduce food waste and hunger. With real-time food updates, smart matching, and logistics support, FEEDER makes food sharing efficient, transparent, and sustainable. It empowers communities to reduce food waste, helps those in need, and creates a positive impact on society.”



PROTOTYPE STAGE

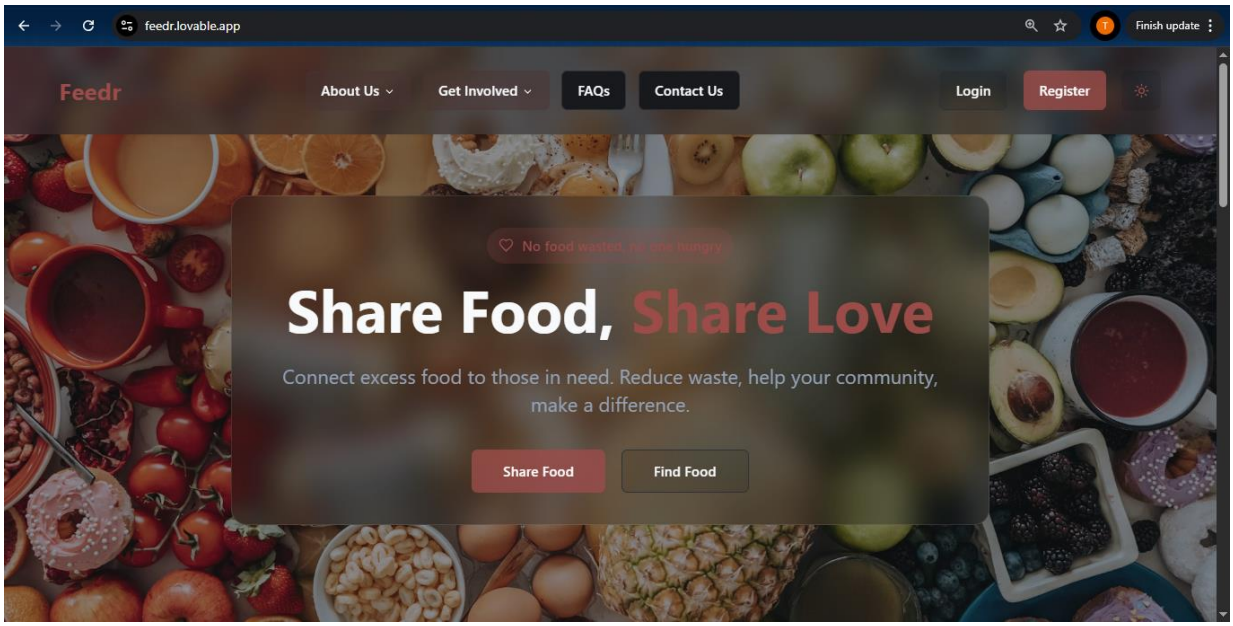
The Prototype Stage was a critical milestone in the development of the FEEDER platform, where conceptual designs were transformed into a working model. The primary goal was to develop a functional, user-friendly web application that connects food donors with recipients in real-time, helping to reduce food waste and address hunger. Emphasizing seamless user experience, the prototype was built using modern, scalable web technologies and designed to function effectively across various devices, ensuring accessibility for both donors and recipients.

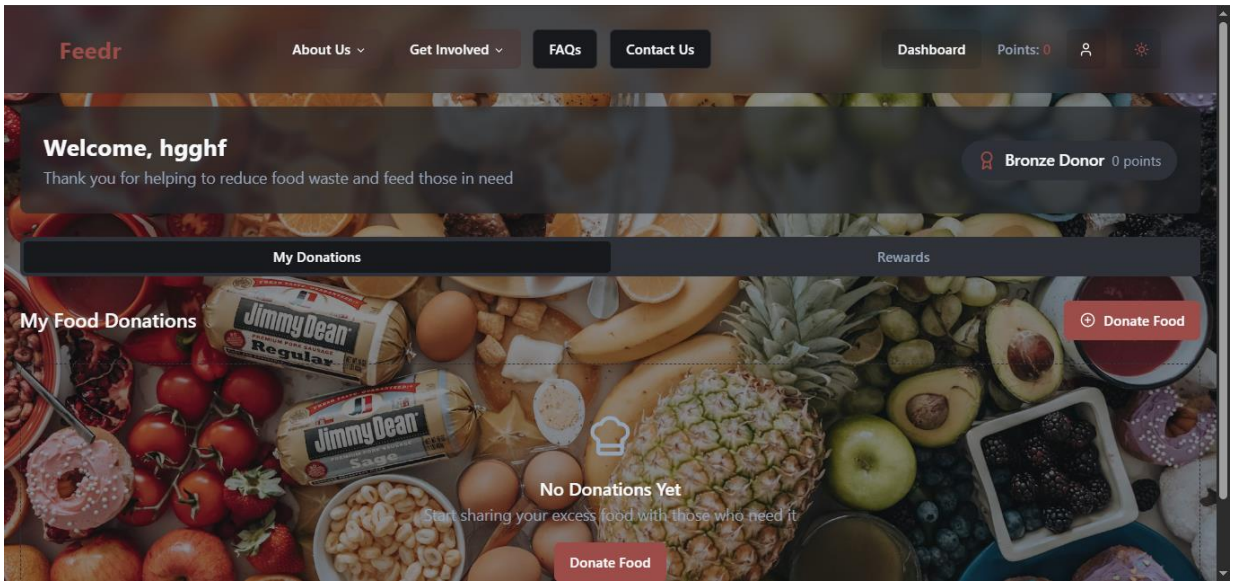
The FEEDER prototype featured several essential components. The **single-page web interface** offered a smooth, uninterrupted experience with a responsive design and intuitive navigation. Users could easily switch between key functionalities such as donating food, requesting food, and viewing impact metrics. The **donor interface** allowed users to list food items by providing details like type, quantity, expiry, and location. Once listed, donations became instantly visible to nearby recipients, with options to schedule pickups. The **recipient interface** enabled NGOs, shelters, and food banks to browse available donations using filters based on food type, urgency, and proximity, and to submit requests for collection.

A standout feature of the platform was the **smart matching and logistics coordination system**, which automatically paired donors with appropriate recipients based on factors such as food category, urgency, and geographic location. This ensured timely delivery and reduced the chances of spoilage. Real-time communication between all parties streamlined logistics and enhanced efficiency. Additionally, the **impact tracking and analytics dashboard** provided valuable insights into the social and environmental outcomes of the platform, including total food saved, meals served, and waste reduction. Personalized dashboards allowed users to see their individual contributions, fostering a sense of motivation and accountability.

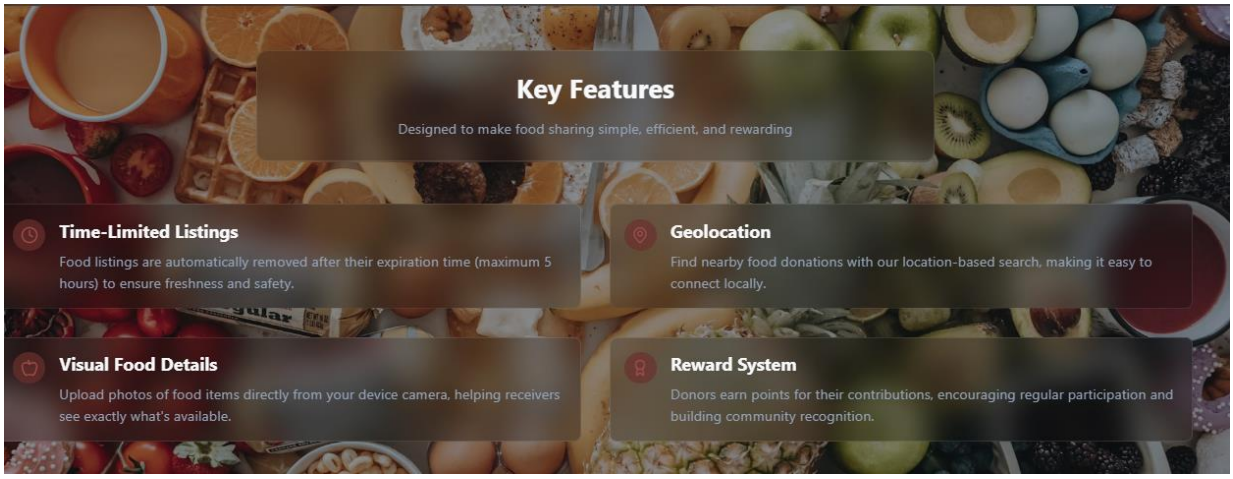
The prototype development process was divided into three main components: interface design, matching algorithm development, and data management. A mobile-responsive, intuitive UI was built to support key user actions, while the matching algorithm and logistics module handled dynamic pairing and delivery coordination. A secure database system managed donations, user data, and request tracking. Internal testing validated the system's reliability, followed by user testing with food donors, recipients, and logistics volunteers.

Feedback from user testing was largely positive. Participants found the platform easy to navigate and appreciated features like real-time updates, smart filtering, and donation tracking. Donors especially valued the transparency in how their contributions were being utilized, while recipients praised the ease of locating and requesting food. Suggestions for improvement included adding more filtering options, enhancing logistics coordination with automated reminders, and upgrading the UI with themes and animations.





The finalized value proposition of FEEDER is:
“FEEDER is a powerful web-based platform designed to bridge the gap between food donors and recipients, providing real-time updates, smart matching, and seamless logistics support. Unlike traditional donation systems, FEEDER leverages technology to reduce food waste, alleviate hunger, and promote community involvement. With a focus on simplicity, real-time tracking, and impact transparency, FEEDER empowers users to contribute to a more sustainable and equitable food system.”



In conclusion, the FEEDER prototype demonstrates the transformative power of technology in tackling food waste and hunger. The successful integration of core features such as real-time food updates, intelligent matching, and impact tracking validates the platform's potential. Moving forward, we plan to enhance the platform by introducing mobile app integration, voice-based navigation, and expanded analytics in the impact dashboard, further improving accessibility and scalability.

TEST AND FEEDBACK

The testing and feedback phase of the FEEDER project played a crucial role in evaluating the platform's usability, identifying areas for improvement, and validating its core functionalities. During this phase, feedback was gathered from a broad range of participants including internal team members, cross-functional collaborators, and real users such as food donors (restaurants, grocery stores) and recipients (NGOs, shelters). While advanced features such as real-time tracking and mobile optimization were still under development, the initial version of the web platform was tested extensively for basic operations, interface design, and user experience.

Internal team members provided structured feedback on the overall structure and flow of the platform. They found the main dashboard intuitive and easy to navigate, with well-organized donor and recipient functionalities. While the core features such as user registration, food listing, and matching worked efficiently, team members noted the absence of real-time tracking and notification features. Suggestions included enhancing dashboard views with more detailed reports on food distribution and optimizing the platform for low-bandwidth users and older devices, where delays in loading notifications were occasionally observed.

Feedback from cross-team evaluators—comprising members from design, data analysis, and logistics—highlighted both strengths and areas for improvement. The user interface was praised for its clarity, though some testers suggested that the food filtering options could be made more intuitive. Designers recommended a more vibrant colour scheme and the inclusion of interactive elements like hover effects to enhance user engagement. Logistics specialists emphasized refining the matching system for better accuracy using real-time data such as location and recipient capacity. Additional requests included more visible food metadata, such as nutritional value and expiration dates, to ensure food safety.

The platform was also tested by actual users—donors and recipients—who provided valuable insights into real-world usability. Donors found the food listing process straightforward, while recipients appreciated the search and request features. However, both groups noted some confusion around filtering options, particularly by food type and location. Users expressed a need for real-time updates on food availability and a notification system to alert them when new donations were available in their area. Recipients especially requested a feature to mark donations as “urgent” to enable quicker responses. Feedback also revealed that many users accessed the platform via smartphones, which highlighted the need for improved mobile responsiveness. Additionally, users with visual impairments suggested enhancements such as better colour contrast, adjustable font sizes, and clearer indicators of food availability in specific regions.

Based on these insights, several key takeaways emerged. The need for a robust backend became evident, particularly for session management, donation tracking, and real-time notifications. Improving mobile responsiveness is a high priority, along with refining UI elements to enhance accessibility for all users. Future updates will focus on integrating real-time updates and alerts to provide immediate feedback on food availability. Performance optimization is also essential, as minor slowdowns were observed during peak usage periods. New features identified through testing include real-time food matching, mobile-friendly design, detailed food metadata, and personalized user preferences to improve the overall experience and impact of the platform.

REDESIGN AND IMPLEMENTATION

Following the feedback collected during the testing phase, we undertook a comprehensive redesign and reimplementation of the FEEDER platform to address usability challenges, enhance performance, and improve user experience. While the platform primarily focused on food redistribution, this redesign chapter focuses on the visual and functional enhancements—particularly for colour accessibility and camera integration—originally intended to support individuals with Colour Vision Deficiency (CVD), in line with our broader inclusivity goals.

A key focus was improving the graphical user interface (GUI) and overall user experience. During testing, some users found the interface visually cluttered, and several filters did not apply as intended. To resolve this, the layout was streamlined with clearer navigation. A dedicated “Camera” button was added to the left panel, allowing users to access the live camera feature only when needed—reducing interface congestion and improving usability. The application of colour deficiency filters—Protanopia, Deuteranopia, and Tritanopia—was refined to ensure consistent functionality across both static images and live camera feeds. Additionally, UI elements were redesigned for a cleaner, more professional aesthetic with better readability and responsiveness across devices.

A major enhancement in this redesign was the integration of a real-time camera feature. This addition allows users to view live colour corrections directly within the application. The camera module includes a capture option, enabling users to save filtered images. To minimize distractions, the camera interface remains hidden unless activated by the user, preserving a clutter-free layout.

Alongside frontend improvements, the backend system was upgraded to handle the new features efficiently. Optimized image processing algorithms were implemented to reduce lag when applying real-time filters, ensuring a smooth and responsive experience. These enhancements collectively mark a significant step forward in making the FEEDER platform more intuitive, inclusive, and reliable. By integrating feedback directly into the redesign process, we were able to deliver a more refined and adaptive solution that aligns with user expectations and real-world needs.

CONCLUSION

The development of the **FEEDER** platform has been a transformative journey, evolving from a conceptual response to food wastage into a functional, user-centred digital solution with real social impact. At its core, FEEDER is more than a web application — it is a bridge between surplus and scarcity, connecting donors such as restaurants, grocery stores, and individuals with NGOs and food banks that serve communities in need.

Throughout the design thinking process — from empathizing with stakeholders and defining core challenges to ideating, prototyping, testing, and refining — we encountered the complex realities of food redistribution. Real-world limitations like food perishability, logistics coordination, timely delivery, and user accessibility informed every decision we made, pushing us to think critically and empathetically.

The final prototype reflects a thoughtful blend of functionality, simplicity, and social purpose. Features such as real-time food availability updates, smart matching based on location and food type, and an intuitive user interface help ensure that food reaches recipients efficiently and safely. Special attention was paid to accessibility and inclusivity, making the platform usable for individuals with varying levels of digital literacy and even those with visual impairments.

More than just a project, FEEDER stands as an example of how technology can be leveraged for meaningful change when driven by empathy and a clear understanding of community needs. While it may not solve the global hunger crisis alone, it significantly contributes to reducing food waste and empowering individuals and organizations to make a difference with ease and intention.

In conclusion, this journey taught us that impactful solutions emerge where logic meets compassion. While the development phase may end here, the mission of FEEDER continues — to nourish lives, reduce waste, and foster a more connected and caring society.

FUTURE WORK

The current version of FEEDER provides a strong foundation for efficient food redistribution, but its future potential is vast. In the next stages of development, the integration of artificial intelligence and predictive analytics can play a significant role by forecasting donation patterns, optimizing delivery schedules, and automatically matching donors with the most suitable recipients based on capacity, location, and preferences.

A dedicated mobile application for Android and iOS will make on-the-go access easier, offering features like real-time notifications, route optimization, and voice input for visually impaired users. Additionally, IoT integration in kitchens and grocery stores can automate surplus detection using weight sensors and expiry data, reducing manual errors and enhancing the donation flow. Collaborations with government bodies and CSR initiatives can drive greater impact through funding, awareness, and incentives such as green certifications or tax benefits. To encourage continuous engagement, gamification strategies like donor points, badges, and public dashboards showcasing meals saved or emissions reduced can be implemented.

The platform will also evolve to support multiple languages, screen readers, and adjustable text for better accessibility, ensuring inclusivity across diverse and differently-abled user bases. Furthermore, block chain technology can be utilized to ensure transparency and traceability, securely recording each food packet’s journey from donor to recipient. These innovations will not only scale FEEDER's reach and reliability but also strengthen its mission of using technology to fight food waste and hunger in a socially impactful way.

LEARNING OUTCOME

The FEEDER project has been a deeply enlightening experience, shaping our understanding not only of technology but also of the real-world impact that thoughtful design and social responsibility can have. We learned that designing for impact begins with empathy — our conversations with NGOs, volunteers, and food donors revealed the critical importance of convenience, speed, and trust in food distribution. This insight laid the foundation for a truly user-centric system. Through our first extensive application of design thinking, we identified core needs, framed the right problems, ideated freely, and iteratively prototyped based on feedback.

Unlike theoretical work, FEEDER demanded we address real-world constraints such as food spoilage, inconsistent volunteer availability, and geographic mismatches. These dynamic challenges taught us resilience and adaptability. On the technical front, we gained practical experience in full-stack web development, including Firebase integration, user authentication, responsive UI design, RESTful APIs, and robust database architecture — all of which contributed to a scalable and reliable platform. Project management also emerged as a critical skill, with successful collaboration across design, development, and domain teams powered by version control, regular communication, and clear task division.

Most importantly, this journey instilled in us a deep ethical awareness. We understood that technology is not just about innovation but about building inclusive systems that empower and serve society. FEEDER allowed us to translate this belief into action, reducing food waste and hunger, and leaving us not only more skilled, but also more empathetic and purpose-driven. We are proud of what we have built and inspired to carry these lessons into future projects that strive for meaningful social change.

REFERENCES

Below are the sources and materials that helped guide the research, development, and design of the FEEDER project:

1. **Food and Agriculture Organization (FAO)**

Global Food Loss and Food Waste – Extent, Causes and Prevention, 2019

https://www.fao.org

→ provided insight into global food wastage statistics and socioeconomic implications.

2. **United Nations Sustainable Development Goals (SDG 2 & 12)**

https://sdgs.un.org/goals

→ Helped align FEEDER with global goals of Zero Hunger and Responsible Consumption.

3. **Google Firebase Documentation**

https://firebase.google.com/docs

→ Used extensively for database setup, real-time data handling, and user authentication.

4. **Zomato Feeding India Initiative**

https://feedingindia.org

→ Case study on how large food delivery platforms manage food recovery and donation.

5. **Stanford d.school – Design Thinking Bootcamp Bootleg**

→ Framework followed for empathy, ideation, prototyping, and testing.

6. **Swiggy Hunger Savior Program – CSR Impact Report**

→ Helped us understand the logistics model for food distribution and surplus management.

7. **IEEE Paper: Smart Food Distribution Using IoT and Cloud**

D. Mehta, S. Sharma – IEEE Access, Vol. 8, 2020

→ Technical foundation for future IoT-based improvements.

8. **W3Schools & MDN Web Docs**

→ Primary reference sources for frontend development, including HTML, CSS, JavaScript, and responsive design.

9. **GitHub Repositories on Food Donation Platforms**

→ Provided inspiration and comparison for code architecture and feature prioritization.

10. **NGO Interviews and Field Surveys (Tamil Nadu Region)**

→ Helped validate system features, understand ground challenges, and gain user perspectives.