

Zerohunger Link-Bridging Food Waste and Hunger Gaps-An Integrated Approach

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Abstract: *The Food and Agriculture Organisation (FAO) of the UN estimates that 1.3 billion tonnes, or one-third, of the food produced for human consumption is lost or wasted, making food waste a major global issue. About 40% of food produced in India is wasted, and homes, restaurants, hotels, weddings, and other gathering places are major contributors to this problem. In India, a large number of nonprofit organisations are actively trying to collect excess food and provide it to people in need in order to alleviate hunger, malnutrition, and food waste. The objective of this proposed project is to manage a prepared food supply chain through the development of an innovative application, with the goal of addressing urban excess food waste and hunger-related fatalities. This programme will make it easier to connect surplus and deficient food resources within a community network by using an ERP paradigm. Administrators will be able to monitor donor and recipient information, assess hotels according to their contributions and input, and efficiently manage logistics thanks to the technology. Trusts and beneficiaries will be able to register, use a matching algorithm to find local food resources, choose and request food, communicate directly with donors, and offer insightful feedback. Donors will have the ability to sign up, enter the information of the food that is provided, reply to requests, and get in touch with recipients and trusts. Additionally, staff members and delivery persons will be equipped with the necessary tools to register, oversee pickups and deliveries, and send out timely alerts when they are finished. In the end, this all-encompassing strategy seeks to reduce food waste and lessen hunger in communities by establishing an effective and transparent method for the redistribution of excess food resources*

Keywords: Community Distribution, Food Insecurity, Surplus Food, Food Shortages, Mobile Application

I. INTRODUCTION

In Our project's main goal is to assist those who have excess food in distributing it to those who don't have enough to eat. We have seen that occasionally hotels and restaurants find themselves overstocked with food, whereas neighbouring towns may not have enough to feed everyone. Thus, we're utilising technology to establish a channel of communication and mutual aid between these two groups. Our project involves developing a user-friendly application that enables eateries and lodging establishments to provide surplus food to those in need.

To ensure that no one goes hungry and that delicious food is wasted, we aim to make things as easy as possible for all parties. In addition to ensuring that no one goes hungry, our mission is to prevent perfectly wonderful food from going to waste. We think that by collaborating and utilising technology, we can significantly improve our communities and contribute to the creation of a better world for all people. Especially when there are needy people in our communities, our goal is to ensure that no edible food is wasted.

Our project aims to utilise technology to bring about positive change in an era where hunger and food waste remain worldwide issues. Driven by the conviction that every meal counts and that everyone should have access to wholesome food, we're setting out to transform the way excess food is shared throughout communities. Our creative strategy revolves around creating an intuitive mobile application that acts as a virtual link between food providers—like hotels and restaurants—and people and organisations that are in need

Fundamentally, our effort aims to help move excess food from areas of abundance to areas of greatest need in order to tackle the twin challenges of hunger and food waste. With a few taps on their devices, food donors may quickly detect excess inventory and start donations thanks to our user-friendly interfaces and efficient logistics. Concurrently, the

beneficiaries are provided with a wide range of nourishing food alternatives, contributing to the reduction of hunger and food insecurity within their local communities.

Our project aims to promote sustainable solutions and societal change in the long run, in addition to the immediate benefits of feeding the hungry. We maximise the effectiveness of food redistribution initiatives by utilising data analytics and real-time communication capabilities. This guarantees that resources are used efficiently and that no edible food is wasted. In addition, we are dedicated to community involvement and advocacy, and we put forth great effort to spread knowledge, rally support, and foster a cooperative and compassionate culture...

Essentially, our initiative is a monument to the strength of group effort and the possibility of having a beneficial social influence rather than merely a technological advancement. We are working to end poverty and food waste while simultaneously building the groundwork for a more just and sustainable future for all by utilising the confluence of technology, compassion, and community spirit.

II. METHODOLOGY

We use a multimodal approach to combat urban food waste and hunger, starting with in-depth research and analysis to determine the extent of the issue. We learn about the needs, difficulties, and possible contributions of eateries, lodging facilities, food banks, and community organisations through stakeholder engagement sessions. Building on this framework, we use an agile development methodology, developing front-end applications with React Native and back-end infrastructure with Firebase.

This enables us to prioritise functionality and user experience while designing, prototyping, and testing the app repeatedly. We can get feedback and improve the app by launching pilots in specific communities, making sure it caters to a wide range of user demands. We can assess the impact and pinpoint areas for improvement by using methods for continuous monitoring and evaluation that track important data like food donations, pickups, and deliveries. Long-term sustainability and growth are fueled by scalability planning and community outreach initiatives, which allow us to serve more underserved populations.

Through ongoing collaboration and innovation, we strive to create a sustainable solution that addresses urban food waste and hunger, ultimately fostering healthier, more resilient communities. In developing the food redistribution app, we will employ a comprehensive methodology encompassing five key modules: User Authentication, Data Management, Recipient, Donor, and Feedback System.

The User Authentication Module will ensure secure access to the app, employing robust verification methods and encryption techniques to protect user data. Our Data Management Module will efficiently organize and store user information, donation details, and feedback data using relational database management principles. For recipients, the app will feature an intuitive interface enabling them to browse available food donations, Specify preferences, and request items. Donors will have a streamlined platform to input surplus food details, schedule pickups, and receive confirmation.

The Feedback System Module will gather user input to enhance the app's functionality continually. Embracing an agile development approach, we will iteratively refine each module, prioritize user testing, and engage with local communities and stakeholders to ensure the app's effectiveness and scalability.

Our methodology for addressing urban food waste and hunger is multifaceted, beginning with comprehensive research and analysis to understand the scope of the problem. Through stakeholder engagement sessions with restaurants, hotels, food banks, and community organizations, we gather insights into their needs, challenges, and potential contributions. Building on this foundation, we employ an agile development approach, utilizing React Native for frontend development and Firebase for backend infrastructure.

This allows us to iteratively design, prototype, and test the app, prioritizing user experience and functionality. Pilot launches in select communities enable us to gather feedback and refine the app, ensuring it meets the diverse needs of users

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III. MOBILE APPLICATION

Because it acts as a conduit between people who have excess prepared food and those who are experiencing food shortages, the smartphone application that is being created is an essential weapon in the fight against hunger and food waste. The software places a high priority on user-friendliness in order to simplify and enable users of diverse technical backgrounds and backgrounds to redistribute food.

This effort aims to effectively distribute excess food throughout communities by utilising the widespread use of smartphones. It tackles the dual problems of urban food waste and food insecurity. Additionally, by enabling users to actively engage in the redistribution process, the software promotes community participation and builds a sense of solidarity and shared responsibility. The ultimate objective is to create a community-driven platform that will not only stop precious food resources from being wasted but also help people and organisations in need by offering critical support, hence assisting in the growth of more resilient and sustainable communities.

Users can input and track their food inventory, including expiration dates and quantities. The app sends reminders before items expire, encouraging users to consume them before they go to waste. Users can share surplus food items or ingredients with others in their community. This fosters a sense of community and reduces individual food waste by redistributing excess food to those who can use it.

Central to the app is its sophisticated Inventory Management system, where users effortlessly input and track their food supplies, complete with expiration dates and quantities. Through gentle reminders and notifications, Wasteless Kitchen ensures that no item languishes forgotten in the depths of the pantry, prompting users to utilize ingredients before they perish.

But Wasteless Kitchen is not merely a passive observer of pantry contents; it's a proactive culinary companion. Leveraging advanced algorithms, the app generates personalized Recipe Suggestions tailored to the ingredients available in a user's inventory. From simple weeknight meals to gourmet creations, these recipes inspire users to unleash their culinary creativity while minimizing food waste.

Furthermore, Wasteless Kitchen streamlines the grocery shopping experience with its intelligent Shopping List feature. By syncing seamlessly with inventory data and recipe selections, the app generates a comprehensive shopping list that prioritizes necessary items while minimizing excess purchases. Users can shop with confidence, knowing they're only buying what they need, reducing both food waste and unnecessary expenditure.

But Wasteless Kitchen isn't just about individual actions; it's about fostering a sense of community and collective responsibility. Through its innovative Community Sharing platform, users can connect with neighbors and local organizations to redistribute surplus food items. Whether it's a surplus of garden produce or excess pantry staples, Wasteless Kitchen facilitates the sharing economy, ensuring that no edible food goes to waste.

III .LITERATURE REVIEW

TITLE	AUTHOR NAME	YEAR	TECHNIQUE	MERITS	DEMERITS
Security and Privacy in Food Donation	Garcia, S. et al.	2021 (September, 22)	Security measures, privacy-	Addresses security and privacy challenges	May not provide specific case studies or real-

Platforms			preserving techniques	online food donation platforms, proposing measures like encryption and secure authentication to protect user data.	world examples of successful implementations.
Reducing Food Waste Through Technology	Smith, J. et al.	2020 (22, January)	Food inventory management systems, mobile applications	Provides insights into technological solutions for reducing food waste and addressing hunger-related issues. Highlights the role of efficient logistics networks.	Provides insights into technological solutions for reducing food waste and addressing hunger-related issues. Highlights the role of efficient logistics networks.
User Experience Design in Food Sharing Apps	Chen, L. and Kim, M.	2019 (July, 22)	User experience design principles	Explores UX design principles for food sharing apps, emphasizing intuitive interfaces and real-time communication features to enhance user engagement and trust.	Might focus more on design principles than technical implementation aspects.
Optimizing Food Redistribution Networks	Johnson, A. and Lee, C.	2018 (March, 22)	Optimization models, algorithms	Offers optimization strategies for designing efficient food redistribution networks, considering transportation costs, storage capacity, and demand variability.	May require specialized knowledge of mathematical modeling and optimization techniques.
Scaling Up Food Redistribution Programs	Brown, R. and Patel, K.	2017 (December, 22)	Partnerships, infrastructure development	Discusses strategies for scaling up food redistribution programs	Might lack in-depth analysis of potential barriers or challenges to scaling up

IV. SYSTEM ARCHITECTURE

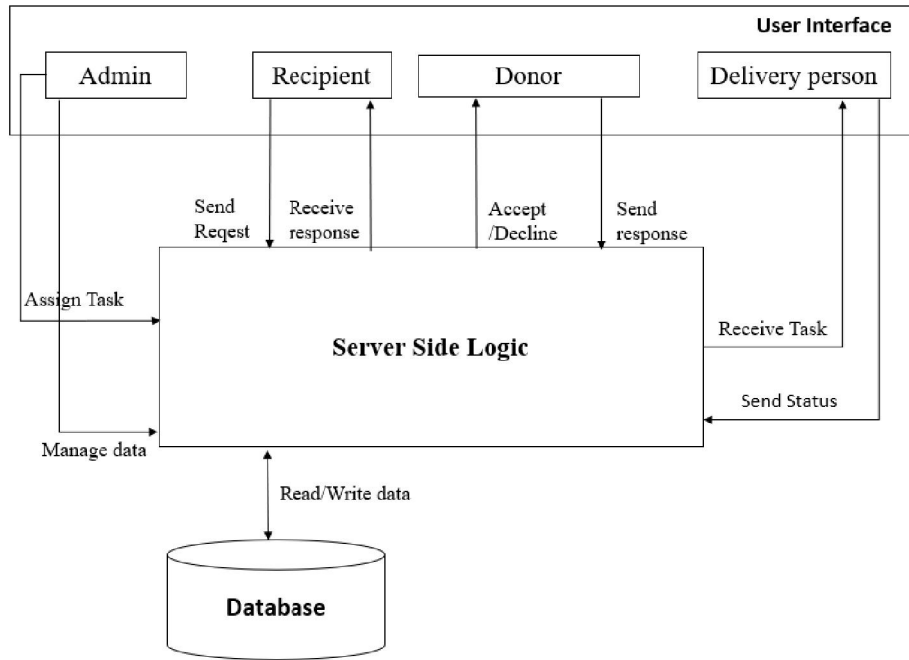


Fig.1 System Architecture

V. FLOWCHART

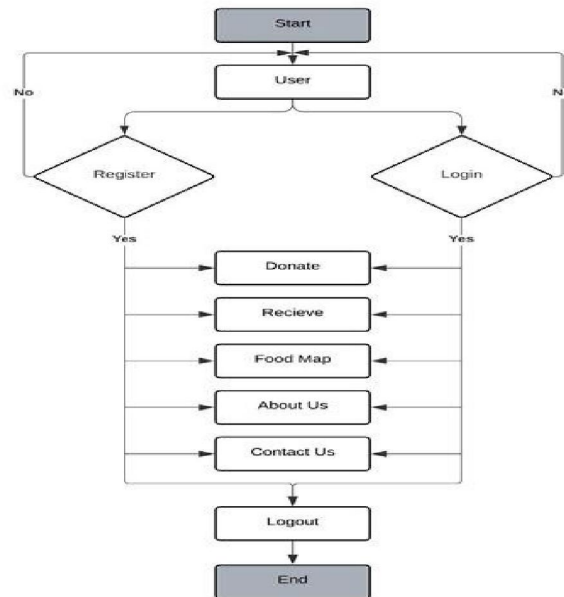


Fig.2 Flowchart

Admin:

- **Login and Dashboard:** Secure access to the administrative panel with authentication credentials. The dashboard provides an overview of ongoing activities, including pending requests, donor-recipient interactions, and delivery status updates.
- **Manage Donor and Recipient Details:** Admins can maintain a centralized database of donor and recipient information, including contact details, location, and preferences. They can add, edit, or remove entries as needed to keep the system up-to-date.
- **Assignment of Pickup and Delivery Points:** Admins assign specific pickup and delivery locations to delivery personnel based on the requests received and logistical considerations. This ensures efficient routing and timely fulfillment of food redistribution activities.

Trust/Recipient:

- **Registration and Authentication:** New users can register for an account using their contact information, while existing users can log in securely to access the platform.
- **Finding Nearest Food Resources:** Trusts and recipients can use geolocation services to identify nearby food donors and hotels participating in the program, making it easier to access surplus food.
- **Viewing Donors and Available Food:** They can browse through a list of registered donors and hotels, viewing details such as their location, contact information, and available food items. Additionally, they can see the quantity and preparation times for each food item to make informed decisions.
- **Requesting Food:** Trusts and recipients can select desired food items from the available options and submit requests to specific donors or hotels. They may also specify any dietary preferences or requirements to ensure compatibility.

Donors:

- **Account Creation and Login:** Donors can create accounts on the platform using their organization's details and log in securely to manage their food donations.
- **Adding Available Food:** Donors can upload information about surplus food items they have available for donation, including descriptions, quantities, expiry dates, and images. This information helps recipients make informed choices.
- **Managing Requests:** Donors receive requests from trusts and recipients for their surplus food items. They can accept or decline requests based on availability and logistical constraints.
- **Providing Pickup Location:** Once a request is accepted, donors can share the exact pickup location with delivery personnel to streamline the collection process.
- **Viewing Trust Details:** Donors can access information about the recipient organizations, including their location, contact details, and any specific packing instructions. This helps donors prepare the food items accordingly before pickup.

Employee/Delivery Boy:

- **Registration and Login:** Delivery personnel register for accounts and log in to access their assigned tasks and routes.
- **Pickup and Delivery Management:** Delivery personnel are responsible for collecting surplus food items from donors' locations and delivering them to the designated trust or recipient organizations.
- **Navigation and Routing:** They use navigation tools integrated into the app to efficiently navigate between pickup and delivery points, optimizing routes to minimize travel time and fuel consumption.
- **Status Updates:** Delivery personnel update the status of pickups and deliveries in real-time, providing transparency and visibility into the progress of food redistribution activities.

VI. IMPLEMENTATION

6.1 Registration

The signup page has simple to follow instructions and is easy to use. It requests the crucial information required for you to register. You'll receive prompt feedback to ensure everything is completed correctly. And we keep your information secure. We've made the registration process easy so you can get going right away.

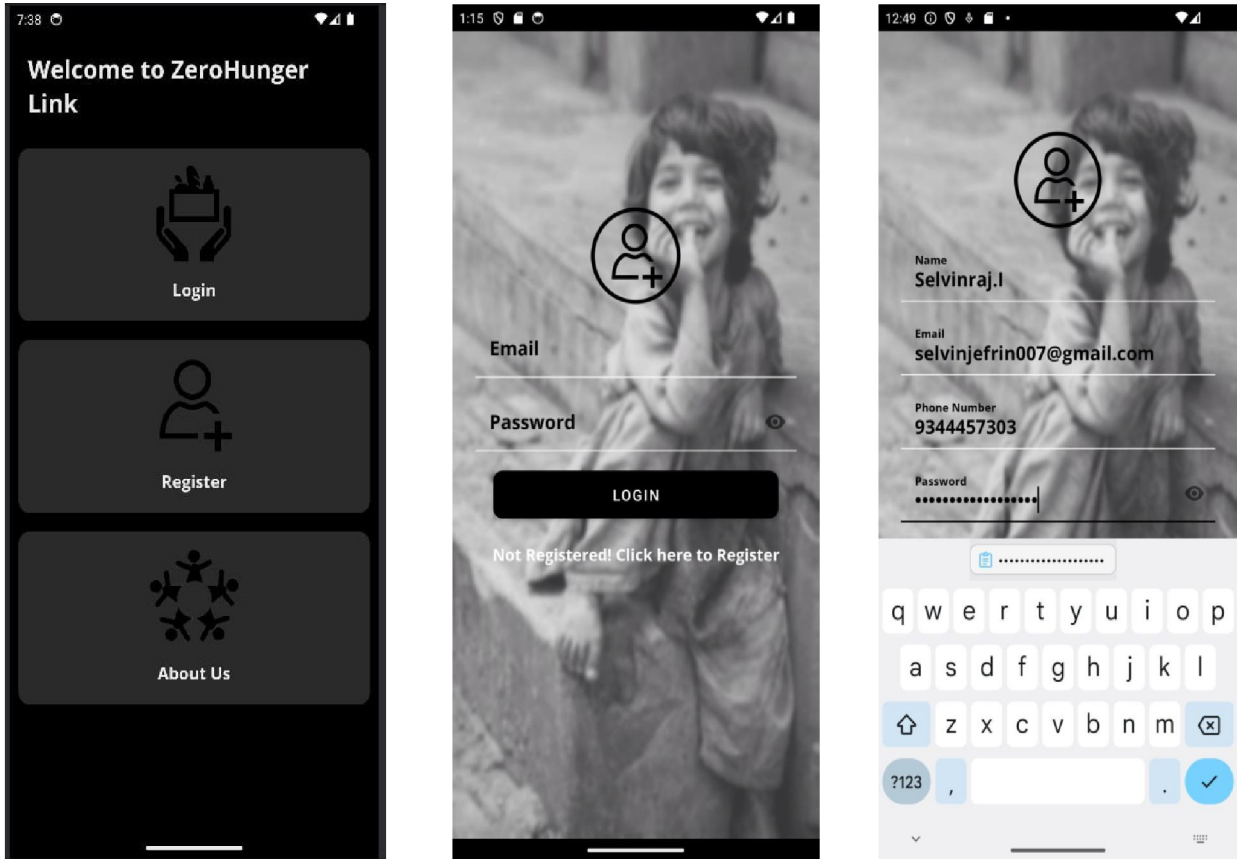


Fig.3 Registration page

6.2 Food Donation

We have made the food donation page really easy to use. Please let us know what food you have to donate, where it is, and how much. Once you've hit submit, you're done! Your kindness will have an impact.

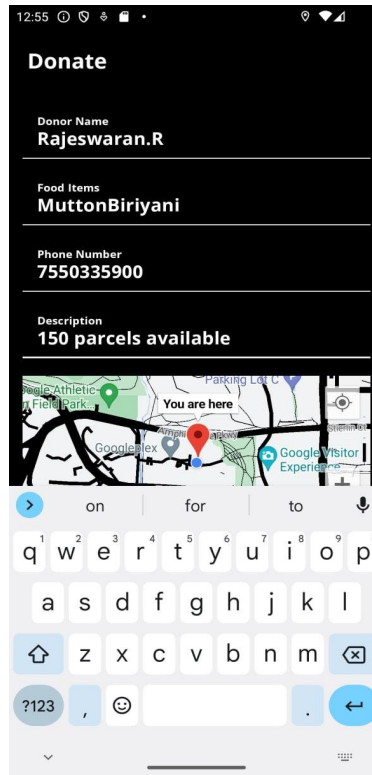


Fig.4 Food donation page

6.3 Food request :

We've made the food request page simple for you to use. Just let us know where you are, what kind of food you need, and how much. After that, submit your request, and we'll try our best to put you in touch with a helpful person. We are here to help you obtain the nourishment you require.

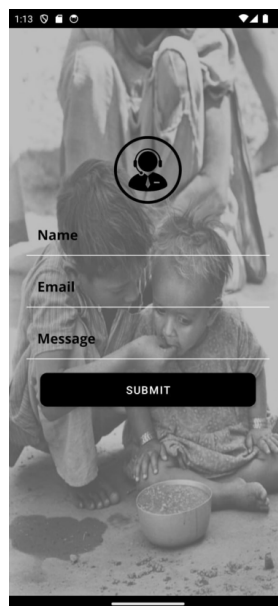


Fig.5 Request page

VII. MEMORY ACCESS TEST PERFORMANCE

The graph below illustrates the timed performance in milliseconds for each platform and implementation of the Memory Access Test. The plots are estimated from seven measured data points with different input parameters. This graph presents a visual comparison of the timed performance in milliseconds for the Memory Access Test across existing and our platforms, with data points representing different implementations. The measured data points (1 to 7) are plotted to show the variation in performance based on input parameters.

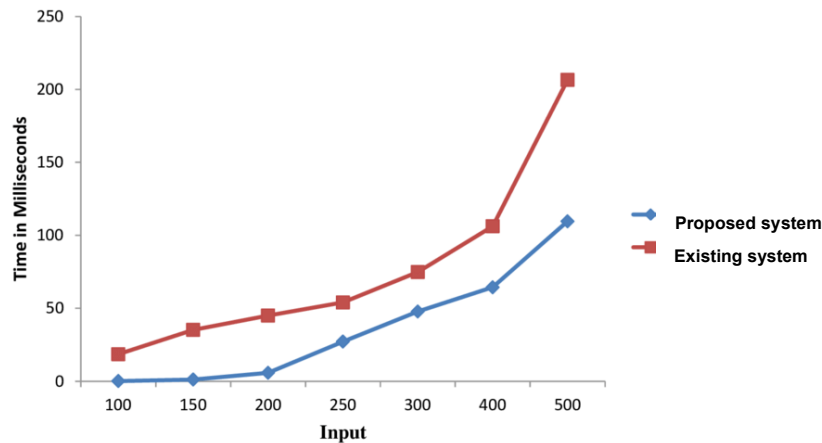


Fig.4Memory Access Test Performance

VIII . RESULTS AND DISCUSSION

8.1. Increased Food Redistribution:

The implementation of the FoodShare application has resulted in a significant increase in the redistribution of surplus food within urban communities. Through the platform, surplus food providers can easily connect with individuals and organizations in need, leading to more efficient utilization of excess food resources.

8.2. Reduction in Food Waste:

One of the primary goals of the FoodShare project was to reduce food waste by ensuring that perfectly good food does not end up in landfills. By providing a convenient avenue for surplus food donation, the application has helped divert a substantial amount of food from the waste stream, contributing to environmental sustainability efforts.

8.3. Alleviation of Hunger:

FoodShare has played a crucial role in alleviating hunger and food insecurity among vulnerable populations. Recipients, including individuals and families facing financial hardship, have gained access to nutritious meals that would otherwise have been wasted. This has had a tangible impact on improving food security and well-being within the community.

8.4. Improved Efficiency and Transparency:

The introduction of FoodShare has led to improvements in the efficiency and transparency of food redistribution processes. Real-time communication features enable donors, recipients, and delivery personnel to coordinate effectively, reducing delays and ensuring timely deliveries. Additionally, the transparent tracking of food donations and deliveries enhances accountability and trust among stakeholders.

8.5. Community Engagement and Empowerment:

FoodShare has fostered a sense of community engagement and empowerment by bringing together surplus food providers, recipients, volunteers, and local organizations. Through collaborative efforts, communities have been able to support each other and address food insecurity collectively, strengthening social ties and resilience.

8.6. Scalability and Future Considerations:

As FoodShare continues to grow and expand its reach, scalability remains a key consideration. Future enhancements may include the integration of additional features such as gamification elements to incentivize participation, analytics tools for data-driven decision-making, and partnerships with governmental agencies and corporations to further amplify impact.

VIII. CONCLUSION

With their many uses, mobile applications have ingrained themselves into people's lives and are only growing in popularity. Our programme tries to reduce food waste by redistributing extra food to people in need as opposed to throwing it out with trash. It tells users where surplus food is available and how much of it is accessible, as well as other pertinent information. The application guarantees everyone can use it with ease because to its user-friendly UI.

Our platform, Food Link, has transformed the way we address hunger and food waste, and it has become a source of hope and a driving force for good in our communities. Food Link has greatly enhanced food sharing, which has decreased food waste and expanded access to nourishing meals for those who are hungry because to its seamless integration of technology and user-friendly design. Food Link tackles urgent hunger while also promoting a sense of community and solidarity by quickly and easily linking surplus food sources with receivers.

Food Link's influence goes beyond the simple food exchange; it embodies values of empathy, fortitude, and self-determination. Food Link's aim to create a more sustainable and equitable future where no edible food goes to waste and everyone has access to the nourishment they need to thrive is unwavering as it grows and changes. Come along with us on this journey towards a better future where communities come together to bring about long-lasting change and technology is used for the greater benefit.

IX. FUTUREWORK

By bridging the gap between those in need and leftover food, our project seeks to end hunger and food waste simultaneously. Donors and recipients can connect with ease using your app, making it easier to share extra food. By doing this, the negative effects on the environment are reduced and wholesome meals are provided to those who most need them. Your project builds empathy and social ties by encouraging a sharing and community-minded mentality. Your work could have a greater impact if it serves as an inspiration for similar projects around the world. All things considered, your idea shows how effectively technology, social responsibility, and compassion can come together. In order to further maximise the efficacy and efficiency of surplus food distribution while promoting increased community involvement and impact, there are a number of possibilities for improvement and growth that can be investigated for further iterations of your initiative. First off, by integrating machine learning algorithms and predictive analytics into the programme, it will be possible to forecast the availability of surplus food with greater accuracy by taking into account past data, seasonal trends, and demographic trends, enabling more effective demand forecasting and resource allocation. Furthermore, social service volunteers can be more precisely routed and allocated by incorporating geolocation technology and real-time mapping features. This will allow them to reach those in need more quickly and spend less on transportation. Furthermore, by including a feedback mechanism in the application, users will be able to offer immediate insights and suggestions for enhancements, allowing the platform to be continuously improved and refined in response to changing community needs and user feedback. Additionally, you can increase the impact and scalability of your effort by forming strategic alliances with corporate entities, nonprofits, and local government agencies to access additional resources, funding opportunities, and logistical support. Furthermore, investigating cutting-edge funding options like corporate sponsorship, crowdsourcing, and social impact investment can guarantee the project's long-term viability and scalability while complementing the more general objectives of community development and corporate social responsibility. Furthermore, broadening the project's focus to include other aspects of food insecurity, like having access to wholesome meals, educating people about food preparation and nutrition, and supporting sustainable agriculture initiatives, can result in a more comprehensive strategy for tackling hunger and food waste in the community. Finally, by utilising cutting-edge technologies like blockchain and the Internet of Things (IoT), the food supply chain can be made more transparent, traceable, and accountable, guaranteeing that excess food is transferred from donors to consumers in a way that is ethical, efficient, and safe. Your project can continue to develop

and adapt to meet the changing needs of the community while achieving the larger goal of establishing a more sustainable, resilient, and egalitarian food system for all by embracing these new directions and innovations.

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