

FOOD RECOVERY AND REDISTRIBUTION: BRIDGING SURPLUS AND NEED

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ABSTRACT

Millions of citizens continue to face the problem of food insecurity, at the same time as vast quantities of food face destruction year by year. This solution addresses these two issues by using a safe, role-based web platform that consolidates administrators, donors, recipients and volunteers.

The donors are then required to input data about surplus food, with description, expiration date, and photos; this is after finishing their identities verification to build trust. Monetary donations are also received on the site through a payment gateway incorporated in this site. The recipients are able to just locate available donations through Google Maps by searching a specific radius, ethical filters and request the donation digitally. Volunteers can also join as a delivery or event assistant and express the availability, and receive their tasks instantly.

Every user has personal donation, request, opportunity and future events dashboard. Impact reports draw attention to people with the help of charts and figures.

It included the profit earned, NGOs sponsored and the trend of donations. SMS/email or push-enabled notifications provide a time-sensitive reminder to the user regarding imminent requirement, food about to be wasted, and other possibilities. Administrators can approve users, listings, control the content and generate reports on the amount of food collected and community level outcomes. To maintain the engagement, the site has some gaming aspects such as the usage of award and appreciation of contributions. The system eradicates waste of foods, hunger, and promotes the sustainable utilization of materials through incorporation of eco-friendly technology into the society.

Keywords: Food insecurity, Food waste, donors, recipients, volunteers, Sustainability, role-based platform.

INTRODUCTION

The problem of food waste and hunger continue to be sharp problem across the globe and thus there is dire need to have effective redistribution systems. It was

estimated that every year one third of all food produced to feed human or feed animals is disposed of and there are over eight hundred million hungry people in the world already. Such a paradox brings an extreme gap between surpluses and shortages that can be significantly narrowed down by synchronous implementation of technological advances. In most societies, spoiled food in households, restaurants, and events is discarded simply because insecure groups find it hard to access the adequate amount of meals on a daily basis. Conventional methods of donation are usually fragmented, lack accountability, transparency and scale. Such restrictions not only makes redistribution less effective; the trust that stakeholders have in it is undermined by them.

To address these problems, the proposed integrated web-based food waste reduction and redistribution platform will connect the donors, recipients and volunteers directly to the administrators in a secure manner. It aids in taking in the donated food and financial help with the right verification systems in place that only the genuine donors could be assured that the donation is indeed accepted. Donors may enter detailed listings of foods, expiration dates, and delivery services to a beneficiary location, and beneficiaries may use advanced search filters and geolocation services, and Google Maps to find donor relevant donations. The volunteering opportunities could then be signed up giving delivery assistance, volunteering at events or creating awareness with real-time task notification on demand. The use of role-based dashboards will also increase accessibility through ensuring that different users have access to those features that only they are needed, improvement of

communication tool and notification systems will also facilitate managing different stakeholders, and visualization of data to reflect social impact on a personal statistic, trend, and success stories.

LITERATURE REVIEW

Technology, transport/logistics and community-based solutions have to a large extent been the focus of food recovery and redistribution research. The drawback of the NGOs and traditional food banks is that they can be scalable, transparent, accessible to real-time coordination. In the recent research findings, it was established that mobile and web-based applications such as feeding America (USA) and diversion (UK) can appropriately tackle the problem of providing access to the surplus food and reducing food wastage. It is also stated in literature that there are geolocation services and some mapping APIs that to a large degree can mitigate delays and spoilage, whereas the responsiveness is enhanced by notification systems (SMS, emails or push alerts).

The sections of the scholarly research which concentrate on the issue of data visualization and impact metrics in attaining credibility and sustaining interest of donors are reflected in the articles. As is the case with the research encryption in the aspects of issues of accessibility and verification, since the redistribution of the food does not address randomness on the continuous basis, the research introduced that the platform requires an organized verification of secure users, dashboards (concerning the capacities), and volunteers management to remain efficient, dependable and viable in the long run.

EXISTING SYSTEM

Such an issue as food waste and redistribution has been backed by several developed platforms and community initiatives. Some examples of initiatives implemented across the world include Robin Hood Army (India), Olio (UK), and Feeding America (USA), which primarily involves connecting the food donor, including people, restaurants and supermarkets, to the NGOs and the communities being served by the needy. On these sites, functions such as volunteer management, donor-seeker matching and basic location-based searching are present. However a majority of the systems that have been present so far are very manual intensive, insufficient coverage of certain regions, and failure to offer real-time tracking. This is greatly dependent on the social media publicity and, hence, can be delayed or missed due to this loss.

Problems with current Systems:

- Utilize impact visualization and reporting very little.
- Poor automation of notification and expiry warnings.
- There are no gamification to secure the attention.
- These initiatives reduce wastage but there is still need to have more comprehensive, safe and expansive system.

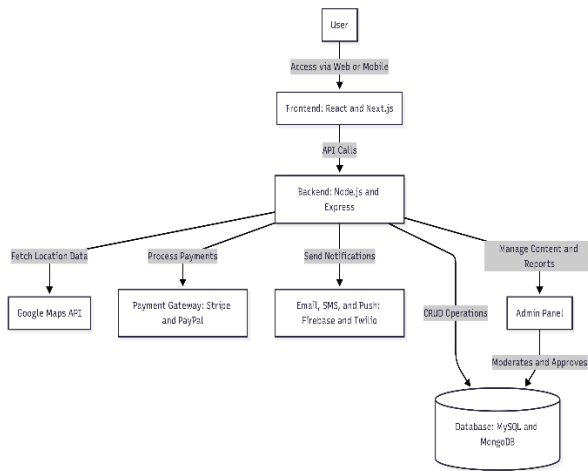
PROPOSED SYSTEM

All the issues of using the available software in food redistribution are presented as what can be solved by a comprehensive, role-based cloud-based solution. The system actually unites the donors, receivers,

volunteers and the administrators in the previously agreed interface where there is a transparency, trust and economy about the redistribution action.

In signing in, donors go through identification procedures to ensure authenticity in the posting of donations. They can also post food excessively with details such as food type and amount, expiration date, pictures and collection or deliveries. The suggestion is that Google maps can be used to visualize how close to expiry a donation is and filter donations by distance and query on weight and on dietary restrictions and provide timely access to safe food.

The reward factor of badges and achievement levels will enrich and encourage the users because of the element of gamification. The benefits of the Proposed System: The donor, recipient and volunteer parts, as well as the administrative parts of the solution can be integrated. Authenticated donors prove more credible Instant alerts and expiry alerts help cut down wastage. The observability of the contributions of work enhances easier understanding and mobilisation of the donors. The frequency of activities will be initiated by gamifying Scalable architecture to allow scale to other donations (clothes, medicines and essentials). The administrative panel will have the privilege of controlling, manage events and reports.



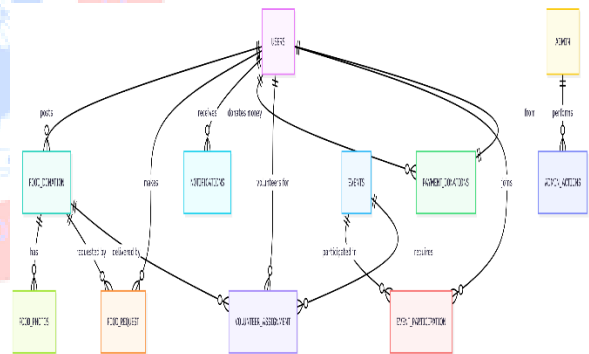
IMPLEMENTATION

The objective of the project of the Food Recovery and Redistribution Platform implementation is to realize the system specification into the development of a convincing scalable application.

Performance and flexibility is realized with the use of a MERN architecture. The frontend will be built with React/Next.js and include responsive dashboards that are simple to navigate to by the administrators, donors, recipients and volunteers. The backend is implemented by using Node.js and express and ensures several key backend functions including deliveries, confirmation of requests, giving donation, and the authentication. Data has been managed in a safer way as Information are encrypted and HTTPS protocol has been applied.

Efficient protocols and encryption of data over HTTPS ensures a higher level of security. The data layer, based on MongoDB will be used to store the profile of its users, the collection of the donation, the log of the transactions and the delivery records which will enable a fast retrieval and possible increase in the data stored in there.

Cloudinary will manage the photographing of foods and their optimisation and Google map API will offer location-based searches as well as navigation and route optimisation. The Real time feature encompasses the feature of real time communication through notifications via email and SMS APIs. In addition, Stripe/ PayPal integration will assist in collecting money and sharing the same to meet logistical expenses. The platform is based on an elastic cloud platform that is high available in addition to being high scalable. The complexity is mitigated with strict unit, integration and user testing to ascertain reliability and high usability and smooth flow with a real-world application.



RESULTS

In order to make sure that the proposed food recovery redistribution platform is credible, the system was placed through major testing in order to ascertain that the system works, the effectiveness of the system and the effectiveness of the system. Unit testing, integration testing and user acceptance testing (UAT) of this system has been done to ensure that the various modules, donor, receiver, volunteer and the administrator modules, are functional as per the expected output. Another area that was very essential

was Authentication because this is one of the core components of platform trust in regard to role-based access. Test scenarios were envisaged with reference to valid and invalid logins, role-based access to dashboards and improper access to pages.

Test Case ID	Description	Input	Expected Output	Result
TC-Autn-01	Valid login with donor credentials	Donor email + correct password	Dashboard loads with donor privileges	Pass
TC-Autn-02	Invalid login attempt	Donor email + wrong password	Error message: "Invalid credentials"	Pass
TC-Autn-03	Admin login	Admin email + password	Redirect to admin panel	Pass
TC-Autn-04	Receiver login	Receiver email + password	Redirect to receiver dashboard	Pass
TC-Autn-05	Unauthorized page access	Donor tries admin URL	Access denied / redirect to login	Pass

Table: Test case of authentication

Table 1 summarizes the authentication test results. The results supported the truth, that authentication module is secure and reliable, it does not permit unauthorized access and is easily navigable with reference to the role. The general testing of the system also demonstrated efficient and effective feature of donation management, notification and location services showing the capabilities of the platform to scale.

The results have shown that the authentication module is secure and reliable, the unauthorized access cannot be achieved and the manner of navigation is user friendly dependent on the roles. All the system testing showed good operation of donations, notifications and geolocation services which demonstrates both stability and scalability of the platform.

CONCLUSION

Food waste and hunger in the world are urgent problems, and in order to find a solution to these problems, it is worth scientifically considering effective systems that will redeem food. The food donation and reuse system proposed addresses this issue by developing a safe role-based architecture connecting the donors, receivers, voluntary assistants and administrators on a single interface.

By introducing the elements of donor checking, food posting with a detailed metadata, request and volunteers management and geolocation services along with real-time notifications, the platform will ensure that the volume of surplus food redistribution is organized efficiently, transparently, and in time. Extensive testing of the modules including the authentication, donor/receiver registration as well as request workflows worked well as the interaction between the frontend, backend and database layers was successful. Security tests and performance assessments served to validate the integrity of the systems in a manner that also ensured not only the credibility of user used systems but also in guaranteeing the operativeness of ultimate use in real world.

In addition to technical success, the system is one that works in the community as a team effort. Excess food is donated without attributing any fuss to them the volunteers make the process run smoothly, and the beneficiaries also receive the assistance at the right time further reducing wastage and hunger. The platform also utilizes its impact visualization and transparency tools which activates long term interest to the users and stakeholders. Conclusory, then, the system has performed well in bridging this gap

between food supply and demand, implicating that even technology can be used to do good to the society. With demand prediction using AI, improved analytics, and adjustment to larger types of distribution networks it can be a highly sustainable, large-scale solution to food insecurity in the future.

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