MOBILE APPLICATION-BASED STRATEGY FOR DISTRIBUTING CONSUMABLE FOOD WASTE

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Abstract

500 million tonnes of farm waste are produced in India every year, and 50 kilograms of food is wasted in Indian househild in an average. The overall losses for the primary agricultural crops and related goods each year is Rs 92,651 crore. Economic loss is not the only issue, though. The improper handling of this garbage has also resulted in pollution of the air, water, and soil, harming both human health and the environment. In the long run, this pollution may also have an impact on the nation's food and nutritional security. Nowadays, a number of charity NGO's attempt to provide food donations by using their own money, which restricts their ability to feed the hungry. The goal of this research is to develop a system that will link these organisations with people or entities that are interested in donating extra food.

1. INTRODUCTION

Despite a plentiful food supply, the UN estimates that over 190 million Indians are still undernourished. According to other estimates, India loses about 92,000 crores per year as a result of food waste. Although these figures are quite dismal, they should demonstrate how severe India's problems with food waste and inequality are. No country can be fully sustainable or developed without taking in consideration the food wastage issue, and while the work in front of us may seem impossible, some acts must be taken more swiftly than others [1][2].

Findings:

- On average, 18.7 kg of food are discarded daily at one Safal shop. This implies that 400 Safal restaurants in Delhi trash an estimated 7.5 tonnes of food every day.

- A total of 84.7% of the consumable leftover food is recorded to be dumped, while the remainder was either fed to animals or the less fortunate.

- A significant portion of the food that is discarded is still consumable.

- According to our research, if Safal's edible food was redirected, at least 2000 people could be fed every day.

- Just two of the ten restaurants tested were moderately waste aware, which means they separated edible food from inedible food and ensured that food arrived non consumable state to empty bellies. One of them tossed away their lunch at midday so that it might be given to

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the surrounding cows. The other claimed that at the end of the day, it would give away all edible food waste to local labourers and staff for free [3][4].

As a result, we may conclude that there is a general lack of knowledge about wasted food throughout the city [5].

Before food even reaches the consumer's plate, the problem of food waste is far more deeply established in the storage, handling, and moving of food grains and vegetables. Yet it is impossible to ignore the issue of food wastage at the retail level, especially given that an estimated 7.5 tonnes of food are wasted per day, and that's just in Delhi's 400 Safal stores [6].

The aim of this research is to create a mobile platform that may link food givers, charitable organisations, and hungry people in India. This essay will cover some of the business procedures in the social communities that already exist, the design of the platform, and some suggestions for additional research [7].

2.1 Social Entrepreneurship

Those who can apply novel ideas to alleviate social issues are known as social entrepreneurs. Social entrepreneurs' main goal isn't to make money; instead, they want to raise society's overall welfare. The money they make is just a means to an end—a tool to carry out their social objectives [8][9].

One such organisation is the Akshaya Patra Foundation. It is an Organization in India with its headquarters in Bangalore. The organization's goal is to tackle classroom hunger problem by implementing the Mid-Day Meal Program in public and government-aided schools. Moreover, this organization promotes the right of socioeconomically disadvantaged children to attend school and combat malnutrition [10][11].

This organisation is currently the world's biggest NGO if its kind, serving nutritious meals to over 2 million kids in 19,039 schools in 14 Indian states and two union territories each school day.The nonprofit group Feeding India is another one of them. A non-profit group called Feeding India is working to end hunger and reduce malnutrition in India.In order to fulfil this purpose, we provide raw grains and freshly prepared food to marginalised populations in addition to funding extensive structural reforms [12][13].

By giving dependents regular meals, Feeding India collaborates with local non-profit partners tackling issues like education and maternal and child malnutrition[14][15].

2.2 Sustainable Development Goals

The Sustainable Development Goals are a set of universal objectives adopted by UN members that call for the eradication of poverty, the abolition of hunger, the protection of the environment, and the realisation of peace and prosperity for everyone by the year 2030. (SDG). SDGs feature seventeen interrelated targets, with actions in one sector impacting outcomes in others. The purpose of this research is to develop applications that will help us reach our goals of Zero Hunger and Responsibly Producing and Consuming SGD [16][17].

According to the second SDG, all types of malnutrition and hunger shall be eradicated by 2030. This is accomplished by increasing the income and agricultural output of small-scale food producers by twofold, as well as by maintaining a food production system that is

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sustainable and gradually raising the quality of soil. 40% of the world's population depends on agriculture for their livelihoods, making it the single largest industry in the world and the main source of income for low-income rural people [18][19].

Majority of the global energy usage and f greenhouse gas emissions are attributed to the food business. The 12th SDG can only be accomplished if each nation takes care to avoid harming the environmental, economic and social situations of other countries, through their production practises and consumption. Reduced inequality in the utilisation of natural resources is the key goal of this SDG's planning. In order to raise the standard of living in undeveloped nations, rich countries are urged to set the example by implementing sustainable production and consumption methods. For instance, minimising food waste may result in lower food prices globally, which will help the poor. Additionally, raising awareness of sustainable consumption must coexist with improving the purchasing power of the poor [20][21].

2. LITERATURE REVIEW

In[16] They worked upon connecting the food source and the people who needed the food. Much research worked upon just connecting several NGO's together, but they did not work upon saving the potentially consumable food that gets generated on sites like restaurants, marriage halls or any functions. One major research that worked upon the connecting these sites where consumable food waste was produced and the organisations that worked for the distribution of that consumable waste food was the FoodX application.

In[16] The FoodX application simply provided a platform to connect them, we have worked upon that research to overcome the several shortcomings of thiet method.They used multiple platforms, we have reduced the number to one, which have reduced the complexity for both the developer and the end user. We have implemented a feature which sorts the results for the NGOs based on the distance of the food source from the NGO.NGOs are notified as soon as a new food token gets uploaded that too based on distance from the food source.

In[10] This study describes a web and mobile-based strategy for redistributing edible waste foods. The major goal of this article is to design a web and mobile application to redistribute waste food to needy individuals in society to promote efficiency in the redistribution of consumable waste food. This project implements a system that combines the subjects of food surplus and necessities shortage. Our suggested solution receives around 70% acceptability in UI and 75% acceptance in UIF. Consequently, this proposed system is dependable enough to meet the requirement for a centralised system to disperse food waste. This technique will assist the poor in obtaining waste food. Both mobile and online applications are simple to use.

In[7][8] Nonprofit organisations and organisations with both financial and social purposes make up the two main categories of social entrepreneurship (hybrid). Non-profit organisations (NGOs) are non-governmental organisations that fall under this category. Often started by a regular person, this organisation may receive funding from the government, a foundation, a corporation, or an individual. Some were started with no funding at all and were run entirely by volunteers. Social and economic hybrids are further separated into the second category. Both are organisations that serve a social or financial goal. The major objective of the two, which are both more social or economic in nature, is what sets them apart. In social hybrid organisations, the social mission is prioritised more than making money, which is the secondary goal. Normally, organisations that promote sustainability employ financial

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incentives. On the other hand, a hybrid economic organization's primary goal is profit. active participant in social events, though. In other words, companies that practise social responsibility are categorised under this heading.

3. PROPOSED METHODOLGY

The prototyping approach is used to develop and design the proposed mobile platform. This method helps to shorten the time for development and also helps to take several user reviews. This method is simple and provides deep user involvement in system development.

4.1 Analysis Phase

This system's analysis was done in two different approaches, including by firsthand observation and literature research. Communities that distribute food were included in direct observation. For many years, the social group has worked to provide food to people who are at risk of starvation in the city. Despite all communities having the same overall objective, they all operate in unique ways. In order to construct a system that all of these social networks may use, analysis is done to find a model. In order to undertake the literature study, numerous types of similar applications that already exist in India were examined. One programme we looked at was gifood.id, which operates in Vietnam. The only difference between this application and the one that is being developed is that both have the same goal. The analysis's findings are used to construct the application's business process model. This system has four different sorts of users: application managers, community managers, donors, and volunteers. All transactions from each community, contributors, and volunteer are under the control and management of the application manager. Community managers control how food donated by donors is distributed and inform contributors of the results. For food distribution, donors must submit an application. The application for volunteers only helps with the food distribution procedure because not all towns have volunteers [22][23].

4.2 Design

This stage involves creating an interface for the features that were decided upon in the stage before. The outcomes of this design will be applied in the subsequent phase to create prototype applications. The application's user interface was created with whimsical tools. To make it simpler to use for average person, Any local language can be chosen as the user interface instruction language [24][25].

Fig 4.2 Design of application

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Fig 4.2 Design of application

4.3 User Evaluation

In the prototype process, user evaluation is a component of testing. The users of the prototyping product provide feedback. It is crucial since it ensures that the system won't encounter usability problems. The phase, which was completed in three cycles, includes improved features that may be applied to contributors, volunteers, and the food community. During this stage, the system will be put through a user acceptability test template. We had three community managers, four volunteers, and three contributors. Cycles of development are performed until all errors are fixed [26].

4.4 Advantages over previous research

-In an earlier mobile application namely the FoodX applocation, users had to use multiple platforms namely the mobile and the web platform, this research has worked upon simplifying the user experience via limiting the use of only one platform which is the mobile platform to increase convenience [27].

- There was no way to determine whether the food request has been completed or not, this created problem if the consumable food has already been taken by some NGO or any individual.

-Now registered NGO's gets notified based on the distance from the food source if and food doner provides food.

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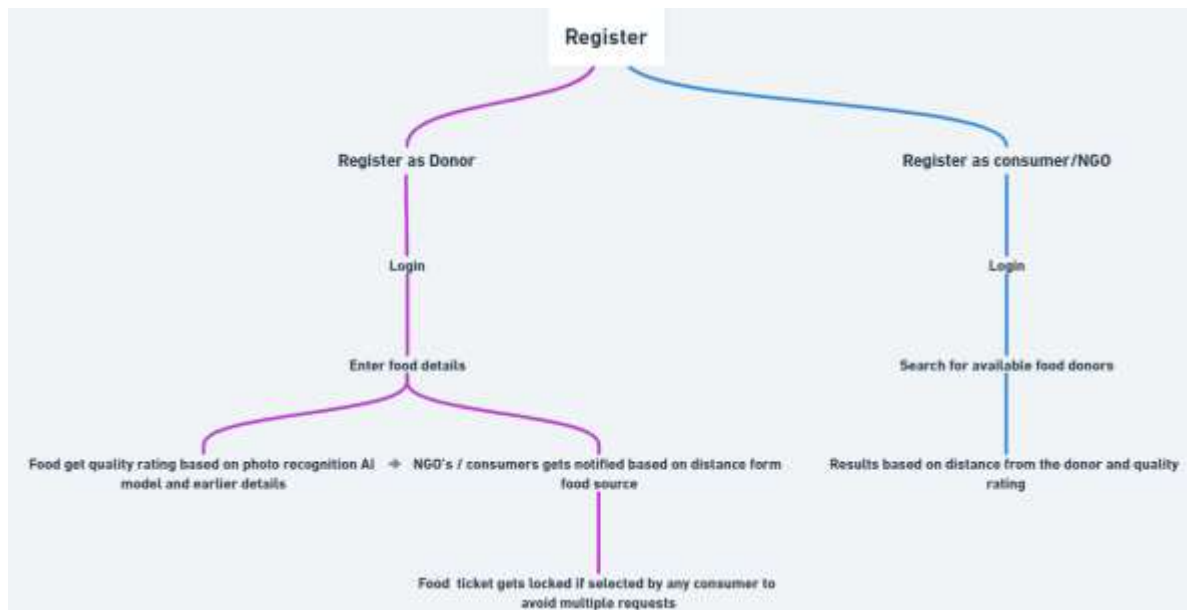
4. Implementation

Fig 5.1: Application Flowchart

5.1 Algorithms Used:

Dijkstra's Algorithm is used to implement the feature which sends notification from the food donor to the consumers or NGO's. Here is the code snippet of the implementation [28].

```
data class Graph<T>(
    val vertices: Set<T>,
    val edges: Map<T, Set<T>>,
    val weights: Map<Pair<T, T>, Int>
)

fun <T> dijkstra(graph: Graph<T>, start: T): Map<T, T?> {
    val S: MutableSet<T> = mutableSetOf()

    val delta = graph.vertices.map { it to Int.MAX_VALUE }.toMap().toMutableMap()
    delta[start] = 0

    val previous: MutableMap<T, T?> = graph.vertices.map { it to null }.toMap().toMutableMap()

    while (S != graph.vertices) {
        val v: T = delta
            .filter { !S.contains(it.key) }
            .minBy { it.value }!!
            .key

        graph.edges.getValue(v).minus(S).forEach { neighbor ->
            val newPath = delta.getValue(v) + graph.weights.getValue(Pair(v, neighbor))

            if (newPath < delta.getValue(neighbor)) {
                delta[neighbor] = newPath
                previous[neighbor] = v
            }
```

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```
        }

        S.add(v)
    }

    return previous.toMap()
}

fun <T> shortestPath(shortestPathTree: Map<T, T?>, start: T, end: T): List<T> {
    fun pathTo(start: T, end: T): List<T> {
        if (shortestPathTree[end] == null) return listOf(end)
        return listOf(pathTo(start, shortestPathTree[end]!!), listOf(end)).flatten()
    }

    return pathTo(start, end)
}
```

Step 1: Develop the Mobile Application

The first step is to develop a mobile application that can connect food waste generators (e.g., restaurants, hotels, etc.) with potential beneficiaries (e.g., food banks, shelters, etc.). The application should allow food waste generators to list their available food items, specify the quantity, and provide details about the pick-up location and time. On the other hand, the beneficiaries should be able to search for available food items and request them through the application. The mobile application should also have a user-friendly interface and be compatible with both Android and iOS platforms.

Step 2: Identify Potential Food Waste Generators and Beneficiaries

Once the mobile application is ready, the next step is to identify potential food waste generators and beneficiaries. You can start by reaching out to local restaurants, hotels, supermarkets, and other food businesses that generate a significant amount of food waste. You can also connect with local food banks, shelters, and other charitable organizations that can benefit from the food waste distribution program.

Step 3: Onboard Food Waste Generators and Beneficiaries

Once you have identified potential food waste generators and beneficiaries, the next step is to onboard them onto the mobile application. You can conduct awareness campaigns and provide training to the food waste generators on how to list their available food items on the application. Similarly, you can provide training to the beneficiaries on how to search for available food items and request them through the application.

Step 4: Monitor the Food Waste Distribution Program

To ensure the success of the food waste distribution program, you need to monitor its progress regularly. You can track the number of food waste generators and beneficiaries onboarded onto the application, the number of food items listed and distributed, and the overall impact of the program. You can also collect feedback from the participants and use it to improve the program further.

Step 5: Promote the Food Waste Distribution Program

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To ensure the sustainability of the food waste distribution program, you need to promote it through various channels. You can use social media platforms, local newspapers, and other communication channels to spread awareness about the program and its benefits. You can also collaborate with local governments, non-profit organizations, and other stakeholders to promote the program.

The system was built up until this point. The project integrates GPS and GIS using the Geotag. Moreover, hotspots are integrated utilising the Geotag location, Google Maps Direction API, and Google Maps Engine API. The system was tested using unit testing, integration testing, and systems testing [29][30][31].

 The various technologies that can be used are as follows:

1. SQLite
2. Android
3. Kotlin
4. XML

6. CONCLUSION

Even though all the requirements have been satisfied and the application is connected to those who have spare food, charitable organisations, and hungry people, some enhancements are still required. To ensure that the donated food is safe, we need to collaborate with professionals who are knowledgeable about food safety. We also need to collaborate with regional governments and other Organisations that address humanitarian challenges. We can incorporate gamification techniques into the system to motivate donors and volunteers.
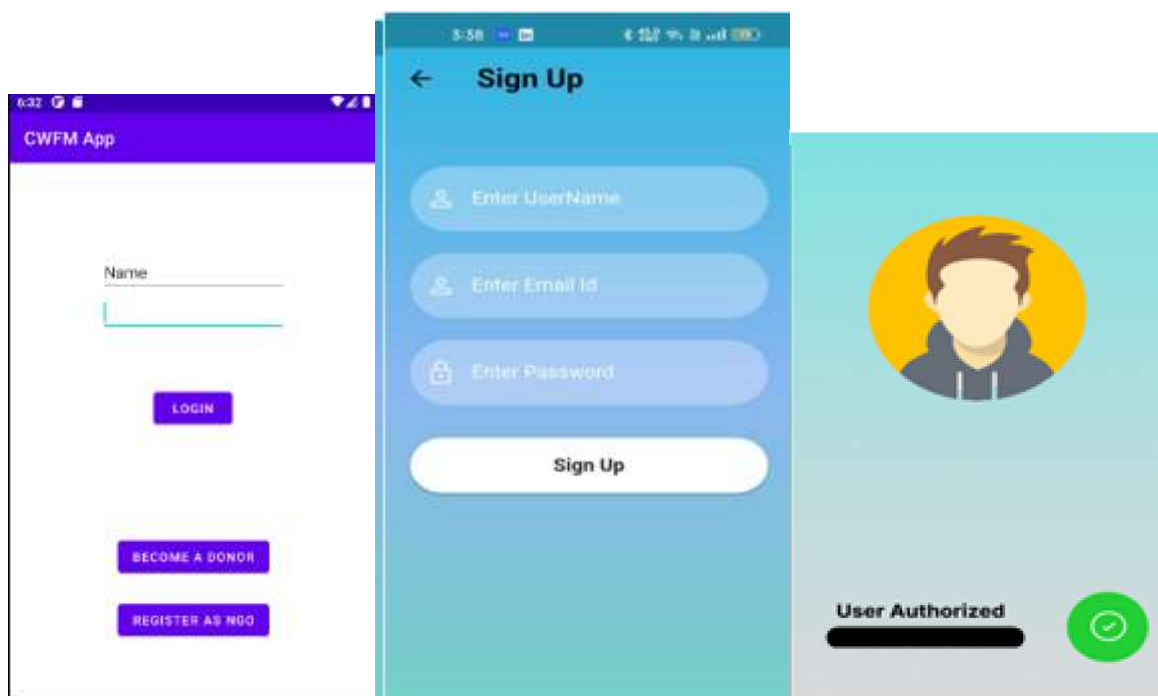
Result Screens:

FIg 6.1:   Fig: 6.2   Fig: 6.3

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