A Comprehensive Review on Food Guard

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Abstract -

Urban food hubs are a novel operational model for surplus food redistribution, and an increasingly implemented policy instrument to mitigate synergically food waste and food insecurity. However, there is still need to assess comprehensively their sustainability impacts across the environmental, social and economic dimensions. This study focuses on Milan, a frontrunner city in the implementation of innovative food policies, where urban food hubs aim to generate positive impacts in food waste reduction and food insecurity mitigation through a neighbour-based and quick redistribution model. Methodologically, the study performs a comprehensive, multi-dimensional (environmental, social and economic) sustainability evaluation using life cycle assessment, net economic benefit calculation and social sustainability indicators evaluation. Results show that one food hub offers annual net savings of 107 t of CO_2 equivalent and generates substantial environmental benefits across different environmental dimensions. Robustness checks and sensitivity analyses are carried out considering different degrees of displacement impacting the level of substitution of redistributed products.

Key Words: Urban Food Hubs, Surplus Food Redistribution, Food Waste Reduction, Sustainable Food Systems, Circular Economy.

1.INTRODUCTION

Food waste is a problem worldwide. Every day, restaurants, hotels, caterers and grocery stores throw away a lot of food that's still good to eat. At the time many people around the world are hungry and can't get enough nutritious food. This doesn't make sense. We need a way to get extra food to people who really need it.

2. Literature Survey

There has been a rise in interest in how to redistribute surplus food and manage food waste within just the last few years. Coupled with this rise in interest, has come an increase in research looking at both policy and technology solutions to decrease the amount of food wasted as well to increase the amount of food people at risk have access to.As part of many of these research efforts, digital redistribution platforms and mobile application have been the primary focus.

Many different systems have been created to connect food donors (e.g. restaurants, grocery stores, hotels) with registered charities and volunteers. Many of these systems also allow for the user to post information regarding surplus food they have available to be picked-up and to quickly coordinate with others about the pick-up of that food. Furthermore, some of these systems will incorporate features such location-based alerts, volunteer coordination, and provide instant communication between food donors and food recipients.

The other primary method includes creating regulatory and urban food centers. Food redistribution through organized redistributing schemes has already begun via local agencies and throughout urban areas with increased physical collection spaces and tracking/analytical tools, both physical and virtual. The aim of these food redistribution programs is to promote food security and reduce food waste for low-income populations. Studies indicate that local food distribution decreases the distance traveled in transportation, thus reducing the environmental damage caused by food waste (e.g., carbon footprint).

Research has been conducted and continues to explore the systems used to redistribute food as it pertains to the technical and operational aspects of these systems. Research has also been focused on increasing or optimizing the use of optimization algorithms, logistical strategies, and monitoring technology to improve food collection and distribution. In order to facilitate real-time collaboration between food donors, volunteers, and organizations that redistribute food, cloud data management, location services, and automated alerts are

essential.Despite the advancement of food redistribution systems, there are currently numerous solutions that face challenges with scalability, efficiency of coordination, and engagement of the end-users. Therefore, it is essential that there is a single point of connection between food donors, volunteers and organizations that will allow for reliable and easy to use connections in order to facilitate the redistribution of excess food. The proposed Food-Guard system will effectively redistribute excess food in a mobile-based platform to address these challenges.

2.1 Problem Statement

Food waste is a significant problem in a large part of the world, not only due to how much of the edible food we throw away, but because we don't have enough to eat. Every single day, restaurants, hotels, grocery stores and catering companies throw away tons of excess or unused food that would otherwise be edible and someone would benefit from eating. Many people are hungry and deprived of adequate and nutritious food.

One reason for the extent of this problem is the lack of an effective system to help food donors (such as restaurants, grocery stores, etc.) connect with organizations that can redistribute their excess food. There are many food donors who are willing to donate food, but when it comes to providing food, they have no way of communicating it to the volunteers or charitable organizations that can redistribute the food.

Because there is no coordinated means of communicating with one another, the donor ends up throwing the food away when he or she would have otherwise provided it to someone in need. In order to alleviate this situation, a technological solution is required in order to streamline food donations and ensure prompt redistribution of the food supplied to the donor.

The Food-Guard solution provides an electronic means of connecting food suppliers, volunteers and nonprofit organizations in order to make it easier for all parties involved in the donation process.

2.2 Objectives

Food-Guard's primary aim is to employ new technology to reduce food waste and improve food access by connecting food donors with volunteers and charities in order to hastily redistribute unused food.

The outlined objectives of Food-Guard are:

• To develop an online platform whereby restaurants and food providers may announce available unused food.

• To support the instantaneous communication of donors with NGOs and volunteers.

• To ensure the rapid collection and distribution of excess food prior to spoilage.

• To increase the awareness of the need to reduce food waste as well as educate others about food safety.

• To enhance the overall efficiency of food donation and redistribution.

Achieving these objectives will enable Food-Guard to assist in reducing food waste and providing assistance to those in need.

2.3 Proposed System

A Food-Guard mobile application is in development that will allow organizations to donate excess food, via volunteers to receive food by an organization to the community.

Food-Guard will notify food donors (restaurants, hotels & grocery stores) live when they have excess food available for donation. Once notified, Food-Guard will notify volunteers via the app of available excess food **donations. Volunteers may** accept the new donation, coordinate and perform delivery within the community.

The Food-Guard application will maintain a record of all community food donations, food collected and volunteer participation in food donation activities, thereby helping to maintain accountability and transparency for all users of the application.

The application helps provide a mechanism to quickly and efficiently communicate and coordinate food donations to needy families; rather than having excess food wasted.

2.4.1Key Features of Food-Guard

The Food-Guard system has a lot of things that help make giving away extra food easier. Food-Guard does a few things to help get extra food to people who need it.

• Food-Guard sends out alerts when restaurants have food that they want to give away.

• Food-Guard helps find volunteers to pick up food from restaurants and take it to people who need it.

• Food-Guard has a system for reviewing and rating restaurants that give away food.

• Food-Guard stores all of its information, in a kind of database called Firebase and Supabase.

2.4System Architecture

The proposed system architecture consists of multiple components including restaurants, NGOs, volunteers, and general users. Restaurants act as food donors who provide surplus food information through the mobile

application. NGOs and volunteers receive alerts and coordinate the collection process.

Diagram :

The Surplus & Safety Network is a system that helps connect people who have food organizations that help people and those who need food. This network uses a computer program that everyone can access. On one side of this system people like restaurant owners, hotel managers, grocery store owners, charity groups, shelters, community kitchens and regular people can use the system. They can use it on the internet or on their phones. The Surplus & Safety Network is, like a bridge that connects all these people and organizations together.
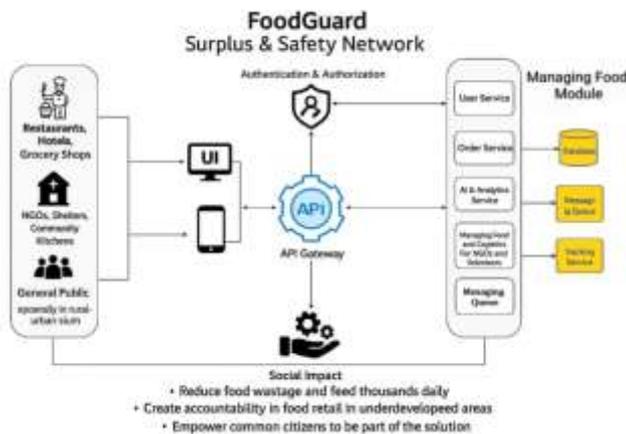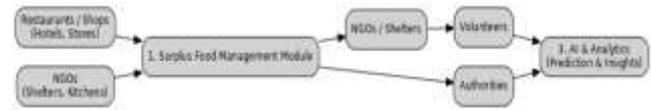

Fig -1: Figure

The diagram represents the **Level-0 Data Flow Diagram (DFD)** of the **Food-Guard – Surplus & Safety Network** system. It shows the high-level interaction between external entities and the central Food-Guard platform.

Surplus & Safety Network system, showing how surplus food moves through different components of the platform

2.5 Methodology

The Food Guard system's development is a systematic process involving the design, development and implementation of a computerized program. The purpose of this software is to be user-friendly for food donation and redistribution purposes.

During the first stage of the project, the people/organizations involved in the food redistribution process were identified as the primary stakeholders (restaurants, not for profit groups, volunteers, end user). The requirements of each of these stakeholders were analyzed to create a solution that addresses their needs.

During stage two, an architecture design for the system was developed to incorporate mobile apps, cloud storage and notification services; and to use the technology frameworks available via Firebase and Supabase to store data and manage interactions between users.

The final stage is to implement/testing out the application functionality and determine if it meets the criteria outlined above (in terms of connecting donors/volunteers together and ensuring the timely distribution of excess food).

2.6 Implementation

The Food-Guard solution utilizes a contemporary technology stack of mobile and cloud solutions that provides the Food-Guard platform with real-time communication and data management. The mobile app has been developed leveraging Android technology and provides an easy-to-navigate interface for donors, volunteers and NGOs.

Users can :

Restaurant and food provider users can easily enter information on the quantity, location, and time frame for food collections of surplus food that they have available in order to donate. The excess food information is maintained in a secure Cloud database and is accessible to applicable users in real time.

Firebase is used for managing notifications and real time updates within the Food-Guard system; and Supabase databases are used for storing and managing application data. This combination of technologies allows for the Food-Guard Platform to service multiple users at the

same time, while providing for optimum performance and reliability of the Food-Guard solution.

In summary, the Food-Guard System provides reliable and scalable solutions for the redistribution of surplus food product.

2.7 Results and Discussion

A significant contribution towards decreasing waste from food and increase efficiency with distribution of food has been demonstrated through technology in the Food-Guard platform. Through a centralized platform for communication between donors (restaurants/food providers), volunteers and NGOs are able to efficiently communicate about surplus food available for donation. Communicating quickly about surplus food will reduce time delays in the redistribution of food, and will allow food to be delivered to the intended recipient while it is still safe to eat.

The Food-Guard system also increases awareness of responsible management and promotes food donation to local charities by promoting more businesses to participate in food donation programs. By providing businesses with location-based notifications and real-time updates, better coordination between donors and volunteers can occur.

The Food-Guard system ultimately continues to contribute to decreasing food waste, support vulnerable populations and promote sustainable food management practices.

3. CONCLUSIONS

The Surplus & Safety Network platform is a way to stop food from going to waste. It helps people who do not have food to eat. This platform connects restaurants, hotels and grocery stores with people who need food. It also connects them with volunteers and organizations that help people in need.The platform has an app that makes it easy for people to find and get surplus food. It sends out alerts when there is food. It also uses GPS to help people find the food. Volunteers can use the app to sign up to help pick up and deliver the food.

The Surplus & Safety Network platform also helps keep people safe from food. It teaches food providers how to handle food. It also helps people know which restaurants and food providers are safe to use.

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