Chapter in Book

Design and Development of a Web-Based Food Bank Management System

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Abstract: *The food bank program has been widely introduced as a Corporate Social Responsibility (CSR) in many organizations, especially Non-Government Organizations (NGOs), to fight food poverty. Some organizations still use the manual process to manage food donations, which can lead to difficulty in keeping track of their food inventory records. It is challenging for the donor to know the food or items that are critically needed, and most of the time, they will donate anything they feel essential. Therefore, to mitigate the problems, this web-based system is developed to manage the food inventory in a better way. This project aims to provide a feature where food donors can pledge food donations directly through the system. This system is developed by using the modified waterfall model to achieve the project aim. This paper highlighted the requirements identification, design, and development phases. The system is tested based on its functionality. In future works, it is suggested to include the notification to notify the administrator and staff whenever the campaign reaches the target and to alert the administrator and staff about the food inventory when it reaches a certain quantity or expiry date.*

Keywords: web-based system; food bank; inventory.

1. INTRODUCTION

A food bank is a non-profit effort to collect and distribute food for charities with their targeted people, those facing food poverty issues. Over 800 million people are underfed, and 50 million face critical global hunger levels (World Food Programme, 2022). Thus to enhance food security, many organizations launch their food bank campaign and distribute food to the underprivileged to fight hunger. Some organizations collect raw foods such as flour, sugar, vegetables, and cans of food. Then they will prepare and cook the food themselves before distributing it. May et al. (2020) stated that food supplies are often irregular, and there have been reports of excess of some foods and shortage of others, which caused food waste.

In the recent research on the food bank, many innovation practices are being introduced, after the Covid-19 pandemic, specifically. For instance, in Albania, a new system has been introduced to distribute food based on requests for specific food (Capodistrias et al., 2021). The objective of this paper is to develop a web-based system which means for managing the food inventory of the food bank organizer. This system would be able to reduce the imbalance of inventory; excessive supply in one item and undersupply in another. This system also can assist the organizer in identifying their current food stock; thus, they can avoid any food waste.

2. RELATED WORK

This section discusses the existing system among three food bank organizations for managing food donations.

2.1 Helping Harvest

Helping Harvest focus more both on food donors and fund donors. Fund donors can donate by mail or online transfer. This system uses PayPal as an online payment gateway to make an online fund transfer. The food donors who have lived within the area of the Helping Harvest building can drop off the donated food at the location details given on the website. Figure 1 shows the way to donate food to this organization.

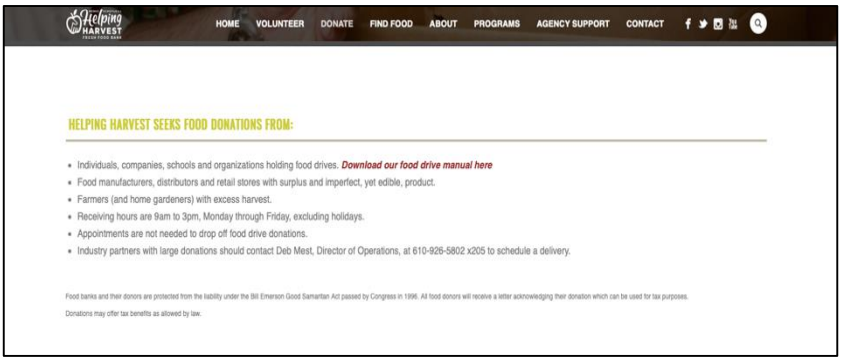

Figure 1: Helping Harvest website.

2.2 Kechara Soup Kitchen

Kechara Soup Kitchen's goal is to provide Malaysia's homeless and urban poor with primary medical care and support. The fund donors need to donate the money, whether by manual transfer or logging in to the website of their bank account and make an online fund transfer to the bank details stated on this website. The food donors need to reach through email or contact with the phone number stated on the website, as shown in Figure 2.

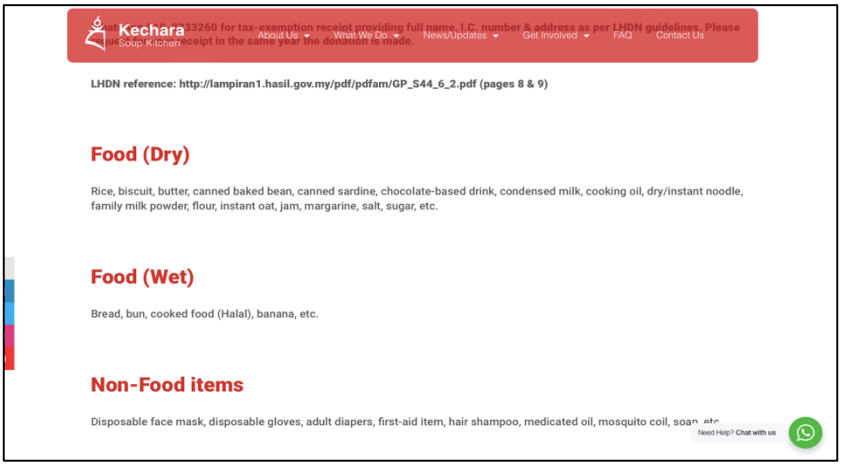

Figure 2: Kechara Soup Kitchen website.

2.3 The Lost Food Project

The Lost Food Project is a pioneering food bank in Malaysia. It has a website where the main objective of this system is to find fund donors and volunteers for their mission. This website has an

online payment gateway system for donors who wants to donate money—food donors who want to donate food need to contact them through email. Even though many organizations have become their partners by supplying food such as fruits, vegetables, dry food, and canned food, The Lost Food Project still accepts donations from individual donors, as shown in Figure 3.

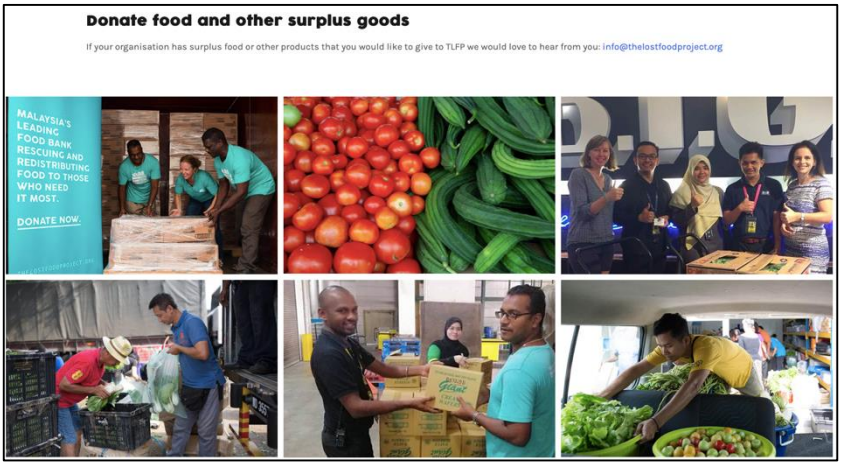

Figure 3: The Lost Food Project website.

2.4 Comparison of Related Works

Based on the review of the related works above, it can be concluded that all of these organizations have a website to spread information about their charity works and allow the donors to contribute funds through the website. However, none of the reviewed websites allows the donors to get information about the food bank's inventory via the website. Donors need to personally contact the organizations to get to know the details of the food or products critically needed.

3. METHODOLOGY

This project uses the Waterfall approach, starting from the requirements identification phase until the development and testing. Figure 4 below shows the summary of the applied research methodology approach.

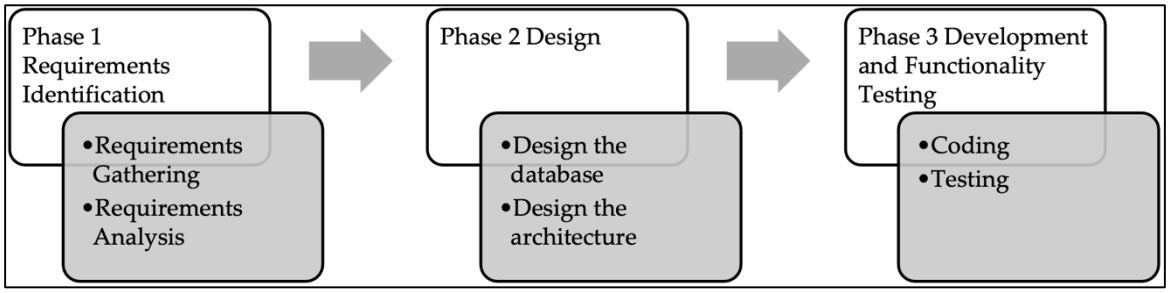

Figure 4: Research Methodology.

3.1 Phase 1: Requirements Identification

This phase is crucial to understand the stakeholders' needs and ensuring all the requirements are implemented. It started with the elicitation of the requirements from the stakeholder by conducting the

interview session. Then the requirements were analyzed and represented in a use case diagram to assist the developer in visualizing the functions that will be developed.

3.2 Phase 2: Design

In the design phase, the primary artefacts are the system architecture and database design. These artefacts were designed using the Unified Modeling Language (UML) tool that is StarUML and used MySQL as a database platform.

3.3 Phase 3: Development and Testing

This phase mainly focused on the project's development, and all functionalities were tested to ensure the system was working. This project uses the PHP language with the Laravel Framework.

4. FINDINGS AND DISCUSSION

This section presents the findings of the research based on the applied research methodology described in the previous section. For the first phase, the requirements identification, an interview with stakeholders was conducted. The interview results indicated that the stakeholders preferred the web-based platform since it is easier for them to access and manage the information. After the interview results were analyzed, it was modelled using the use case diagram shown in Figure 5 below. Twelve use cases and three actors are involved: admin, staff, and donors. Admin and staff have equal access to the system, except that only the admin can create an account for staff. Donors can view the required food to be donated, and they are allowed to donate food and view campaigns that the organizations conduct.

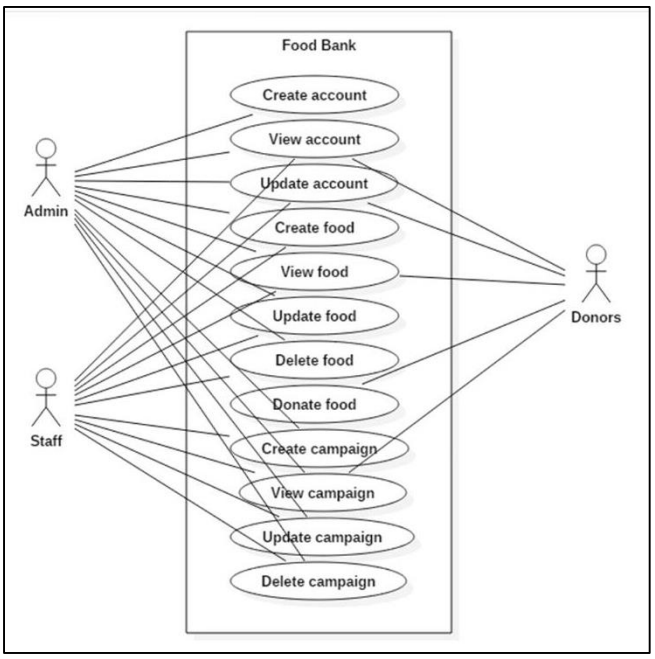

Figure 5: Use Case Diagram.

In the design phase, the entity relationship diagram was constructed. Seven tables are required to depict the database design, which will store all information in the system. This diagram is crucial since the system is developed based on the designed database.

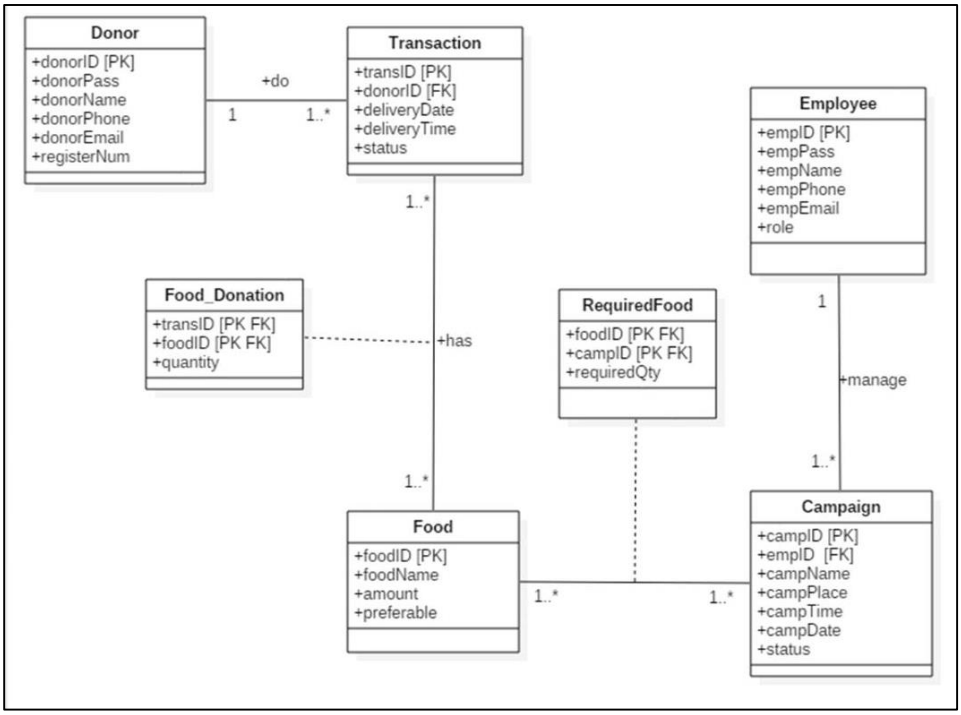

Figure 6: Entity Relationship Diagram.

In the last phase, the system is developed based on the artefacts in phases one and two by using the Laravel framework. All functions are successfully developed and represented in the prototype, as shown in Figures 7, 8,9, and 10 below. Based on Figure 7, system administrators and staff are allowed to create a charity campaign which requires food donations. They can insert the campaign's name, venue, and date, select the types of food and required quantity and click submit.

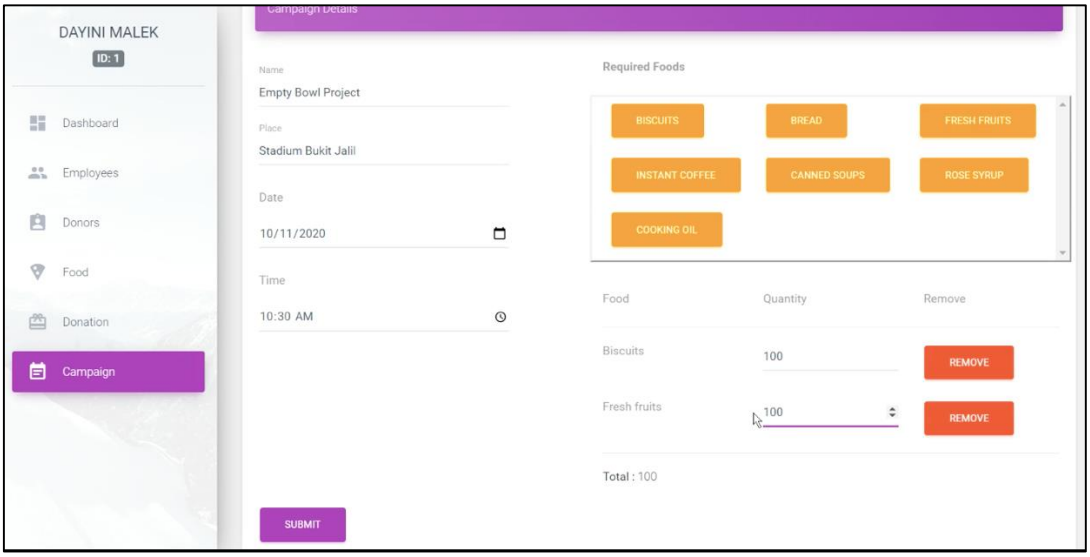

Figure 7: Admin creates the campaign.

Then, the system administrator and staff can view the active campaign list and the food donation status, whether it is already sufficient or not, as shown in Figure 8. If all items are sufficient, they can close the campaign.

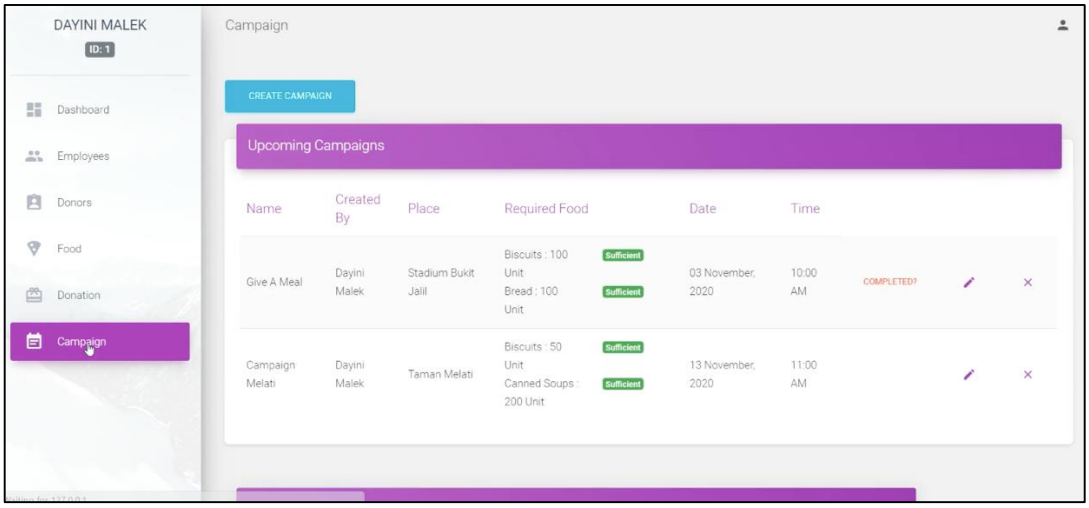

Figure 8: The list of upcoming campaigns with the food status.

The other feature provided in the system is the food inventory, as shown in Figure 9. System administrators and staff can view each item's current quantity, which helps them plan their campaign. For instance, if there are many biscuits in their inventory, they might consider not including them as the required food in their campaign.

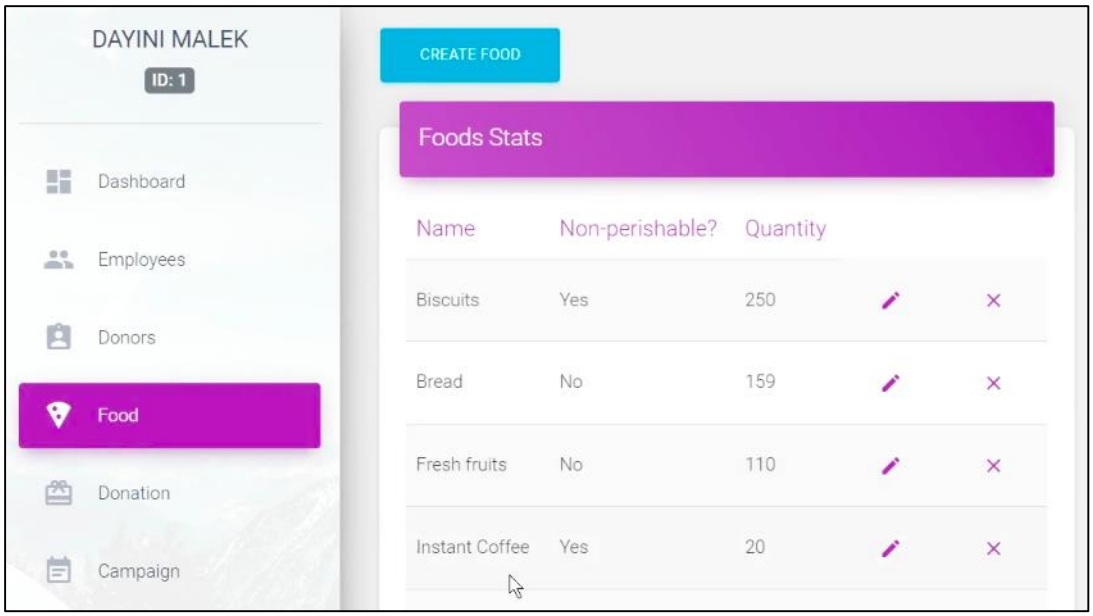

Figure 9: Food inventory.

The donors can view the active campaign, which still requires a donation, and the donor can click on the campaign title to insert their donation information. As shown in Figure 10, the required foods are highlighted, and the quantity is displayed to indicate that these foods are needed to be donated. The donor can insert the quantity they want to donate and submit the information. This feature will update the food inventory and let the administrator and staff know the current donation status.

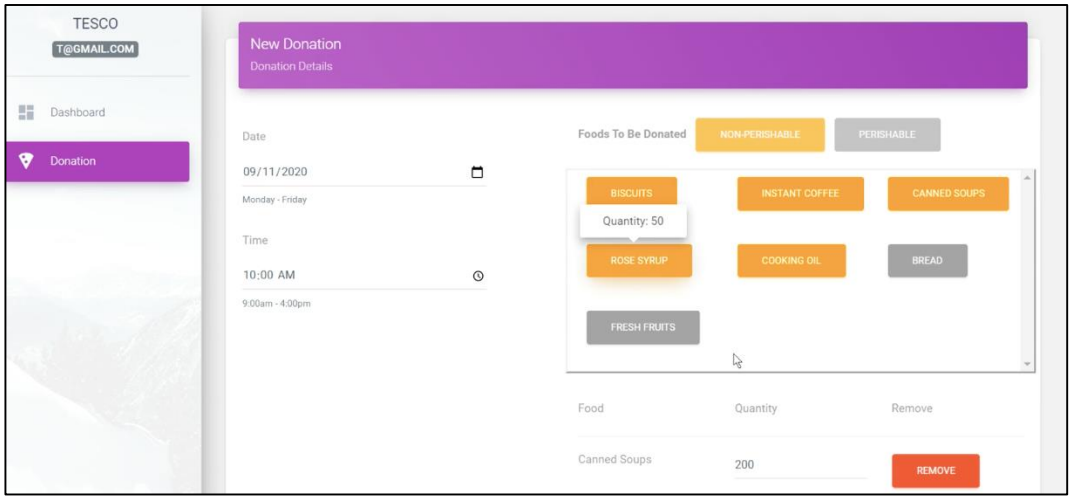

Figure 10: Donor submit donation information.

After creating the prototype, all the functionalities were tested to ensure all functions worked to solve the problems. Table 1 below shows the testing results. All use cases passed the testing.

Table 1. Functionality testing results.

Use Case	Functionality testing results
Create account	Pass
View account	Pass
Update account	Pass
Create food	Pass
View food	Pass
Update food	Pass
Delete food	Pass
Donate food	Pass
Create campaign	Pass
View campaign	Pass
Update campaign	Pass
Delete campaign	Pass

5. CONCLUSION

This paper described a study on the food bank web-based system design and development. It has three phases: requirements identification, design, development and functionality testing. All of the research objectives are achieved. However, there are some limitations identified. In future works, it is suggested to include the notification to notify the administrator and staff whenever the campaign reaches the target. The notification also can be generated to alert the administrator and staff about the food inventory when it reaches a certain quantity or expiry date.

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