

Food Donation Application to Improve the Distribution and Verification Process Within Selangor: Feedback

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Abstract— Due to the rapid progression of smart applications and the Internet in our daily life, we have become more dependent on technology in solving issues. The recent white flag movement highlighted inequality in food distribution. This project was developed to solve these issues by providing a centralized platform for food donors and food recipients throughout the state of Selangor. This project also gives emphasis to cyber security features to ensure the safety of their users. The literature reviews of this project illustrate the factors affecting food distribution and how implementing a proper security system can help improve user experience. This project will be developed using programming languages and database on an Android platform, with the use of common gridles and packages to ensure that is compatible with most android devices. The research behind this project is conducted through questionnaires directed to a sample that are residents in Selangor regarding the idea of having a food donation application. It is found that most of the residents agree with the idea behind this project as well as the security aspect of the application. Taking all this into consideration, the application called “FeedBack” was developed to tackle this issue.

Keywords— food donation application, centralized platform, management system, donor management system.

I. INTRODUCTION

Food is something that provides important nutrients which in return provides us with the energy to carry out our daily activities as well as maintaining our overall body health. However, due to plenty of unforeseen situations such as the covid pandemic and the recent flash floods; a lot of people from low-income neighborhoods in Selangor have suffered unimaginable losses which includes the ability of purchasing food for their families. According to Malaysiakini, the massive flood cut off access to important highways and roads,

damaged electric substations, disrupted water treatment plants and affected port operations. While certain areas recovered quickly after the flash flood, certain areas like Taman Sri Muda and Shah Alam which are located close to the Klang River were stranded for days without food and water. Due to lack of communication between different bodies including the NGOs, donors, volunteers and the needy during this situation, the quantity of food donated to these affected families varied from one location to another. Certain locations received food over the required amount compared to areas that have a bigger and denser population. Hence, a lot of food wastage was due to excessive amounts of food in certain areas which can be distributed in other affected parts within Selangor. Therefore, a way was found to overcome this issue by developing and designing an application that acts as a communication link between all related parties from NGOs to the needy to help with the food distribution and verification process around the state of Selangor. Besides that, the proposed system can also help with food donation upon request made by variety homes such as nursing homes, disabilities centers, orphanages etc. and poor and struggling families that are constantly seeking food products that are located around Selangor. It has been reported that, around 2.91 million households in Malaysia fall under the b40 category and this number have been constantly increasing up to now due to the fact that the economy around the world is feeling the after effect of the coronavirus pandemic (Babulal, 2022). These affected families struggle to make ends meet since they do not possess the buying power to purchase nutritious food for themselves and their families. Furthermore, the application also fills the gap within the market as there is no food donation application that is developed and available for the needy to request any sort of food aid that is made to the public in the state of Selangor. Besides that, the development of this application also focuses more on user experience for all ages from the NGOs, the food donors and the needy by providing a smooth experience without confusing the user while they are navigating through the entire application (SeVa: A Food Donation App for Smart Living, 2022). Due to the recent spike of cybercrimes that

have been occurring globally, the application also comes with certain verification measures to ensure that all the private information of users will be safely stored and without having any unwanted login attempts or brute force attacks from hackers. In short, this application focuses on bridging the lack of communications from different bodies to help distribute food better within areas by avoiding food wastage and help the needy receive the adequate food donation without having any issues while having certain security features in place in order to protect user accounts from outside threats.

II. LITERATURE REVIEW

This literature review aims to provide an overview of the issues related to food waste and insecurity as well as mobile devices and cybercrime. Food waste and insecurity are two global concerns that have significant implications on the environment, society, and the economy. The COVID-19 pandemic has exacerbated the issue of food insecurity, with millions of people suffering from hunger around the world. The food industry and the production of food itself contribute significantly to greenhouse gas emissions, and food waste is responsible for 8-10% of anthropogenic emissions. Reducing food waste not only helps to address climate change but also has positive impacts on the community. Food donation is an effective way to reduce waste and improve the lives of those in need. However, food security is affected by various factors such as poverty, climate change, technology, and conflict between countries. Developing effective strategies to address food waste and insecurity is crucial to ensuring sustainable development.

Mobile devices have become an essential part of our daily lives, providing convenience and accessibility to various applications such as online banking, shopping, and media-related applications. However, the increased reliance on mobile devices has led to an increase in cybercrime related to accessing private and confidential information through phishing and spam messages. Mobile authentication plays a critical role in preventing unauthorized access to mobile devices. There are four common mobile authentication methods, including knowledge-based authentication, physiological biometric-based authentication, behavioral biometric-based authentication, and two-factor authentication. Two-factor authentication is becoming more popular as it provides an extra layer of protection by requiring users to provide multiple biometrics during the verification phase.

In recent years, technology has played a significant role in addressing both food waste and cybercrime. For instance, the use of Internet of things (IoT) and artificial intelligence (AI) has been successfully implemented in agriculture to improve crop production and reduce waste. However, there are challenges that need to be addressed, such as data leakage and knowledge theft associated with knowledge-based authentication, and the low sampling rate and reliability of sensors associated with behavioral biometric-based authentication.

In summary, the issues of food waste and insecurity, as well as mobile devices and cybercrime, are complex and require multifaceted solutions. Strategies that address poverty, climate change, and conflict are crucial to ensuring food security. Similarly, developing effective mobile authentication methods that leverage the latest technology is important to prevent unauthorized access to mobile devices and protect users' personal and confidential information.

Further research is needed to develop more sophisticated strategies to address these issues and ensure sustainable development.

III. METHODOLOGY

For this endeavor, technical research and software development methods were employed. The technical research conducted includes the front-end and back-end programming language, interactive development environment (IDE), database management system and operating system to be applied to Feedback system. Additionally, there are other software development approaches available that can be used in the interim. According to the requirements of the project, each methodology has benefits and drawbacks.

A. Technical Research

The proposed system will be an Android application. As a result, the researcher will conduct numerous technical studies in this section on appropriate frontend and backend programming languages, IDEs (Interactive Development Environments), libraries and tools, DBMSs (Database Management Systems), and operating systems which will be utilized throughout various development phases of the suggested food donation application. In this portion, the researcher will additionally carry out a thorough analysis of the two different programming languages and the Database Management System (DBMS). As a consequence, the researcher will be better able to comprehend this section and select a programming language and database management system (DBMS) that will work effectively for the complete system's development process, from conception to completion.

- **Frontend Programming Language:** For this web application, XML will be utilized as the frontend programming language. This is due to the fact that XML serves as the frontend of development, particularly in Android development, since its structure makes it simpler for software programmes to recognise and modify data (GeeksforGeeks, 2022). Besides that, XML within Android studio definitely offers plenty of benefits like programmers are able to use a visual editor where it creates XML files that can define the layout and appearance of the user interface elements. Additionally, XML offers compatibility, which renders it incredibly dependable and popular in the business for developing user interfaces that can function across various platforms and devices. The use of XML also increases programming efficiency because XML files do not need to be parsed each time an application loads them. As a whole, the developer opines that using XML through Android Studio definitely provides more pros than cons compared to other frontend programming languages within industry.
- **Backend Programming Language:** Java is chosen as the backend programming language for this web application. One of the reasons is that Java offers important security features that guard computers and other devices running Java programmes against harmful software like viruses and bloatware along with faulty programming. Moreover, Python was also definitely a viable candidate for backend programming language because of its versatility of the programming

language to use in all sorts of mobile development applications. After assessing the advantages and disadvantages of both Java and Python, it came down to choosing Java to build the backend of the proposed system because the developer believes that Java's framework is undoubtedly a game-changer, particularly when it pertains to the range of tools that can be applied in the system's early stages of development. Furthermore, the developer is also familiar and has good knowledge on Java programming language hence the development process of the proposed system can begin as soon as possible.

- **Interactive Development Environment (IDE):** The project shall be created with the selected version of Android Studio. It is a powerful and advanced interactive development environment platform that is designed to develop, test and package anything to do with android applications. Android studio also has few advantages such as code completion and refactoring which means that it intelligently completes code as you type making it such a game changer feature to have and every so often an entire line of code can be typed with no more than two three keystrokes. Other than that, Android studio has a Gradle build system which is almost similar to an Apache Ant system which many Java developers are aware of. This allows plenty of flexibility and plenty of customizable builds which allows developers to create an application which can then be uploaded to TestFlight, to build a demo version of an application (Mathur & Lobo, 2018). Furthermore, Android Studio features a special tool called Instant Run that enables developers to test minor code modifications without waiting for the application to be fully constructed. Hence, the developer has chosen Android studio as an IDE platform to develop the proposed system cons based on the reasoning that has been mentioned.
- **Database Management System:** Firebase will function as the database used to establish the suggested system. Firebase allows its users to develop their application in a much secure and time-consuming manner compared to other database management system in the market. However, Firebase offers a reliable built-in user management and authentication system, thereby making it simpler for programmers to integrate authorization and authentication for users into their own application. Besides that, Firebase is designed in a way that is very scalable and can handle a heavy amount of traffic application without requiring any manual configuration. MySQL database is also a strong contender in this case, but the researcher has chosen Firebase for the proposed system because of the advantages and use case in certain scenarios which make it a better candidate compared to MySQL Database.
- **Operating System:** In this portion, the developer has decided on Windows 10 as the main operating system due to the fact that the developer only possesses a laptop that runs windows 10 system. Windows 10 operating systems currently still receive security and firmware updates from Microsoft and a recent Lansweeper survey made in April this year, have

reported that Windows 10 is still the most popular operating system with a whopping 80.34 % usage (Brinkmann, 2022). The developer feels that it is very important to choose an operating system that you are familiar with since designing and developing a proposed system involves multiple programs which can be a long and tedious process if lack the knowledge on that specific operating system. Hence, the developer has decided to stick with Windows 10 to facilitate/setup both IDE and DBMS software to develop the proposed system since it offers stability and performance optimizations.

B. System Development Method

Software development methodology in short is a standard process that will be in play or involved when working on a project. It is a combination of development frameworks and practical realism that dates back to the early days of computing. This framework is used for organizing, planning, and controlling the process of developing an information system. Throughout the years, we have witnessed plenty of advancement, especially in the Information Technology (IT) industry. Due to this, there are a variety of software development methodologies that are popular and are still made available in this market such as agile development, scrum development, waterfall model, Rapid application development, etc. In this chapter, the researcher will analyze and compare two different software development methodologies, namely the Waterfall and Rapid application development methodology (RAD). The researcher is then able to finalize and decide on a software development methodology that suits the proposed system.

TABLE I. JUSTIFICATION ON SELECTED METHODOLOGY- RAPID APPLICATION METHODOLOGY

Parameters	Waterfall methodology	Rapid Application Methodology (RAD)
Ideal Size of the project	Very small and very large projects (KissFlow, 2022)	Small and medium-sized projects (KissFlow, 2022)
Ideal Project Type	On-premises and desktop applications (KissFlow, 2022)	Web-based and mobile applications (KissFlow, 2022)
Time	Follows a predetermined schedule, needs to start back at the beginning if significant changes emerge (KissFlow, 2022)	The project is unfinished until the client is satisfied (KissFlow, 2022)
Best time and approach to change	At the very beginning, not flexible to changes (GeeksforGeeks, 2022)	Anytime, flexible to changes (GeeksforGeeks, 2022)
Project Management style	Stick to the original plans and dates (GeeksforGeeks, 2022)	Very adaptive (GeeksforGeeks, 2022)

Implementati on of new technologies	There will be no changes once the specifications have been established (Chien, 2020)	New changes can be implemented at any time (Chien, 2020)
Updates and Versions	Planned and methodical (KissFlow, 2022)	Ad-hoc and quick (KissFlow, 2022)
Prototype	Delivered once the entire app is fully functional (Chien, 2020)	Working model delivered as soon as possible (Chien, 2020)

Both methodologies have their pros and cons, however, the most ideal and obvious option to develop the proposed system would be Rapid Application Development (RAD). RAD concept focuses on releasing a prototype as fast as possible to clients and end-users since they are actively participating in the development of the software application. The developer mainly emphasizes on user experience since the food donation application will cater for users of all ages where they will be given the opportunity to participate and provide quick feedback on the application. Besides that, RAD model also allows changes to be made on the proposed system at any stage of development which will be easier for the developer to make changes on the application after receiving feedback that has been gathered throughout any stages of development of the food donation application. The ideal type of project that uses the RAD model are mostly web-based and mobile applications. The food donation application will be made available on android devices which makes it suitable to implement RAD model concepts. Lastly, RAD model allows implementation of new technologies to be added into the food donation application at any given time which makes it easier to add important features to the application in the long run (Chien, 2020). After comparing both methodologies, the researcher felt that the RAD model definitely ticks all the boxes compared to the waterfall model and will be used during the development of the food donation application.

- *Requirement gathering and analysis:* Before initiating the development of the project, the waterfall model calls for an extensive documentation upfront by gathering any sort of information from clients or end-users regarding the end result and their expectation on that particular software or product. This is then followed by a detailed explanation of the requirements, which includes an analysis of the current situation and a targeted concept. While the analysis mainly focuses on the problem area, the targeted concept defines the functionality and properties that the software product must include in order to meet expectations from the clients or even the end users. The developer is allowed to document as much information as is required to take the right step to begin the development of the project while having everything mapped out. This phase plays a vital role since it lays the foundation for the other phases.
- *Design:* In this phase, the project developing team will review all the requirements from the clients or end users to incorporate a design that meets them. The project team will then identify the path needed to then deliver a particular solution and the relevant

specification. The design phase is usually split into parts: the logical design and the physical design phase. In the logical phase, the project teams will brainstorm and come out with theoretical solutions that have the potential to meet clients' objectives and expectations. Physical design in the other hand, focuses more on concrete specifications that the project team has to specify such as the hardware, software, architecture, data sources, and services that the team will be utilizing during the project.

- *Implementation:* The software architecture that is designed in the design phase is implemented in the implementation phase, which includes programming, troubleshooting, and module testing. In this implementation phase, the preferred programming language is then implemented in the software design. This might be the shortest phase since the entire design has already been completed in the design phase. The project team will follow the documentation from the previous two phases to develop the actual deliverables. The challenging and more complex software can be broken down and developed into smaller programs, checked within the framework of the module testing, and then integrated back into the overall product (Ionos, 2019).
- *Testing:* After the implementation phase is completed, the testing/verification phase is where the project team that is involved ensures that all the requirements that are given by the clients are met and whether it needs any sort of debugging. The project team also scans the deliverables thoroughly before it is integrated into the desired target environment. If there is a major problem found within the software product or there are certain requirements that are not met, the project has to go back to the requirement gathering and analysis phase. The project team can also carry out the beta version of the software product to selected end users. The user acceptance tests that have been developed in the analysis phase can be used to verify whether the software fulfils all the requirements set by the client.

IV. RESULT

A thorough analysis was utilized to select the ideal frontend and backend programming language, IDE, database management system, and operating system for the Feedback food donation application's technological components. For the creation of this mobile application, the RAD paradigm for system development is acceptable. It not only speeds up completion of the project but also lowers the chance of oversight and enhances how it is handled. The prototype of feedback will be addressed in the subsequent division.

A. Feedback Interface design

The content describes the features and functionalities of a mobile application designed to connect food donors with food recipients. Users can register as either a food donor or a food recipient and can log in to view food donation posts and listings generated in reverse chronological order on the home screen. Food donors can create and edit food donation posts and listings and can delete them as well. The application also includes a messaging feature that allows food recipients to contact food donors to coordinate

donations. Users can view food donation center posts and listings and see their credentials in the profile section, where they can also log out or change their password.

The figure shows two side-by-side mobile app screens. The left screen is the 'FEEDBACK' screen with a red header, a tagline 'Make a difference with every bite!', and fields for 'USER'S EMAIL' and 'USER'S PASSWORD'. It has 'LOGIN', 'Forgot Password?', and 'New Account' buttons. The right screen is the 'SIGN UP' screen with a similar red header and tagline, and fields for 'USER'S FULL NAME', 'USER'S AGE', 'USER'S PHONE NUMBER', 'Select your user type' (with a dropdown), 'USER'S EMAIL ADDRESS', and 'USER'S PASSWORD'. It has a 'REGISTER USER' button.

Fig. 1. Login screen interface design and registration screen interface design.

The figure shows two side-by-side mobile app screens. The left screen is the 'FEEDBACK' screen with a red header, a tagline 'Make a difference with every bite!', and fields for 'USER'S EMAIL ADDRESS' and 'RESET PASSWORD'. The right screen is the 'FOOD DONOR'S HOME' screen with a red header, a search bar, and a list of donation items with fields for 'IMAGE', 'DONATION TITLE', 'DONOR'S NAME', and 'DATE'. It has a red '+' button at the bottom right.

Fig. 2. Forgot password interface design and food donor's home screen design.

The figure shows two side-by-side mobile app screens. The left screen is the 'FOOD RECIPIENT'S HOME' screen with a red header, a search bar, and a list of donation items with fields for 'IMAGE', 'DONATION TITLE', 'DONOR'S NAME', and 'DATE'. It has a 'FOOD RECIPIENT USER' button at the bottom. The right screen is the 'UPLOAD IMAGE' screen with a red header and fields for 'Title', 'Description', 'Food Donor's Name', 'Select Delivery Rate per Kilometre', 'Select Halal and Non-Halal Option', 'Select Location Options', and 'Current Date of Post'. It has a 'SAVE' button at the bottom.

Fig. 3. Food recipient's home screen design and food donor's upload screen design.

The figure shows two side-by-side mobile app screens. The left screen is the 'FOOD DONOR'S LISTING' screen with a red header, a 'FOOD TITLE' field, an 'IMAGE' field, and a list of fields: 'DESCRIPTION', 'SELECTED DELIVERY RATE PER KILOMETRE', 'SELECTED HALAL/NON-HALAL OPTION', 'FOOD DONOR'S NAME', 'SELECTED LOCATION', and 'CURRENT DATE OF POST'. The right screen is the 'UPLOAD DATA' screen with a red header, an 'IMAGE' field, and fields for 'Food Donor's Name', 'Food Title', 'Description', and 'Location'. It has a 'SAVE' button at the bottom.

Fig. 4. Food Donor's listing and edit screen design

The figure shows two side-by-side mobile app screens for the chat feature. Both have a red header with 'USERNAME' and tabs for 'CHATS' and 'USERS'. The left screen is the 'FOOD RECIPIENT'S NAME' chat screen with a list of chat items. The right screen is the 'FOOD DONOR'S NAME' chat screen with a list of chat items. Both have a red bottom navigation bar with icons for home, search, chat, and profile.

Fig. 5. Chatting Feature Screen Design

The figure shows two side-by-side mobile app screens. The left screen is the 'FOOD DONATION ORGANIZATIONS' screen with a red header, a list of organizations with fields for 'IMAGE', 'FOOD DONATION ORGANIZATIONS', and 'LOCATION', and a red bottom navigation bar. The right screen is the 'FOOD DONATION ORGANIZATION' screen with a red header, a large 'IMAGE' field, 'LOCATION' and 'ABOUT US' fields, and a 'FOR MORE INFORMATION OR TO DONATE' button with a 'Donation Link'.

Fig. 6. Food donation center and listing screen design

The figure shows two side-by-side mobile app screens. The left screen is the 'FOOD TITLE' listing screen with a red header, an 'IMAGE' field, and fields for 'DESCRIPTION', 'SELECTED DELIVERY RATE PER KILOMETRE', 'SELECTED HALAL/NON-HALAL OPTION', 'FOOD DONOR'S NAME', 'SELECTED LOCATION', and 'CURRENT DATE OF POST'. The right screen is the 'ACCOUNT FEATURE' screen with a red header, a 'Welcome, USERNAME!' message, a user profile icon, and fields for 'EMAIL ADDRESS', 'FULL NAME', 'AGE', 'PHONE NUMBER', and 'USER TYPE'. It has 'LOGOUT' and 'RESET PASSWORD' buttons at the bottom.

Fig. 7. Food recipient's listing screen design and account feature screen design

V. CONCLUSION

As a conclusion, the Feedback food donation application was developed to solve the problem of food wastage by allowing users to donate unwanted food to those who need it. The application has features such as login and registration for security, posting and listing of food donations, viewing of food donation centre listings, and a chat feature for communication between users. While the implemented features were successful, there are limitations that could be improved in future releases such as the inclusion of a location picker, collaboration with delivery partners, and notification options for users. Overall, the application aims to provide a solution to food wastage and improve the distribution of food donations.

VI. ACKNOWLEDGEMENT

the authors would like to thank to all school of computing members who involved in this study. This

study was conducted for the purpose of food donation application project.

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