Food Recipe Mobile Application for Allergist

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Article Info	ABSTRACT
	People who develop allergy reactions often have limited access to certain foods. The technology of smart and mobile applications has emerged as important tools for people who have difficulties managing their food diet, especially those with serious illnesses and health risks. Providing a variety of options for these people in using a suitable mobile application for their diet management will be highly beneficial. This paper reports the research works on the food diet mobile application that can be customized according to some peoples' needs and limitations. Based on the Waterfall model of System Development Life Cycle (SDLC), the mobile application has been developed for the Android platform by using the Android Studio software development tool. The application interfaces and usability testing results were presented in this paper to show the effectiveness of the food recipe mobile application. The usability results showed that the majority of users found that the mobile application was easy and convenient to be used. This paper presents the fundamental design and development methodology of a mobile application that can assist people with strict dietary and allergies problems to find suitable recipes.

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1. Introduction

As time goes by, human evolution becomes more diverse from different types of races, religions, and geographical backgrounds. This diversity which is related to foods plays a big role in affecting the people's types of diets and diseases [1]-[3]. Food plays an essential role in our daily life as one of basic the necessities in life. The food industries and technologies also evolve according to this diet diversity. This diet diversity also known as the dietary variety, often be the indicator of factoring health and disease issues [4], [5]. Some of us have allergies issues that are affecting our diet type. Statistics show that there are approximately 32 million people in the United States have food allergies. This is an alarming issue as serious allergic reactions can ultimately cause death. Roughly, an average of 1-10% population in every region worldwide have food allergies. The low percentage in numbers might be one of the reasons why they are being overlooked. However, in the past decades, the number of people suffering from food allergy shown an increasing pattern.

Nowadays, technology has become more advanced. One of the industries that follow this evolution is the telecommunication industry. Everyone owns a smartphone with the ability to go online and use different apps for different purposes. Therefore, people have many accesses to a large number of food recipes that can be accessed through a mobile application or from websites. However, there are some people that have been prescribed with strict diet having trouble finding a proper recipe due to limited availability. They must change and search for other alternatives to

replace the original ingredients that they are restricted to [6], [7]. Thus, this research aims to provide a high-quality food recipes suggestion platform through the Android-based mobile application for this group of people as mentioned.

2. Literature Review

Food consumption is the main factor affecting our health [8]. We need to consume food based balanced diet so that the body absorbs the vitamins and nutrients. However, there are cases where someone has food quality and preference. They are often called picky eaters. First, we must be clear about picky and non-picky eaters A study by [9] helps us understand more about picky and non-picky. There are some peoples that simply hate the texture, appearance or taste of certain ingredients can be called picky eaters. Normally the non-picky eater has no problems consuming any food ingredients if it is edible. Unfortunately, there is a third category known as sensitive eater under the non-picky eater. This sensitive eater does not be picky about food. However, they are often because of allergies reactions to some ingredients. In other cases, this sensitive eater has their own diet type such as vegetarian that does not consume meats. Factors such as beliefs and religious prevent them from eating any source of meat [10], [11]. There are many diets category such as gluten-free, pescatarian etc. Figure 1 shows the relationship between food consumed and how it is affecting health.
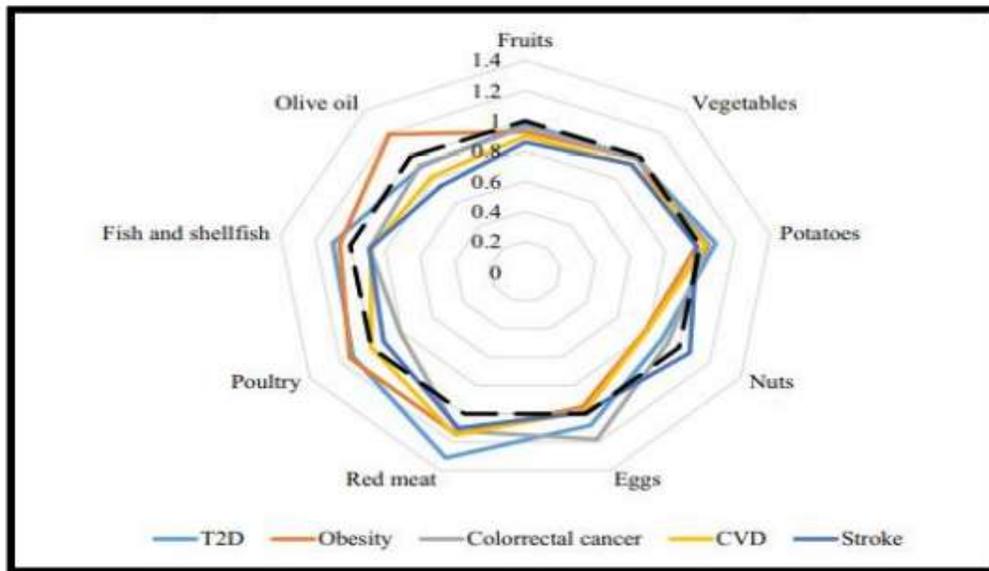

Figure 1. Relationship of Food and Health

Mobile phones have become more important in this past decade. Analyst done by International Journal of Applied Research and Studies (iJARS) shows that 97% of the students use smartphones [12]. A large number of the students are using mobile phones operating on Android operating system. Applications for smartphones have become more popular as the user of smartphones increases. Research by [13] shows that the growing advancement of mobile application illustrates positive impacts on many economic sectors such as education, marketing and business.

A study by [14] in 2017 shows that there are distinct differences in mobile applications development for android and iOS. Factors such as performance and architecture to develop the mobile application might be causing these differences. However, Android application developments shows more popularity. The development environments such as platform, syncing and language favors Android developments as its development is more open. As the official integrated development environment (IDE) for android, Android Studio is a famous development tool that is used in the area. One of the important features is networking libraries in Android Studio is Retrofit. Retrofit is one the networking libraries that are easy to use in Android development. Retrofit can

simply change API http into a Java interface. This networking library is essential to support request and response interaction between applications and web API [15].

3. Methodology

This section explains the methodology of the research including the SDLC and the system architecture.

3.1. Software Development Life Cycle (SDLC)

Figure 2 presents the SDLC of this research that adapts five important phases of the operational framework, including planning, design, implementation, testing and documentation. This operational framework provides an overview of development process guidelines. This guideline is important to help and ensure the development process is planned and done systematically.
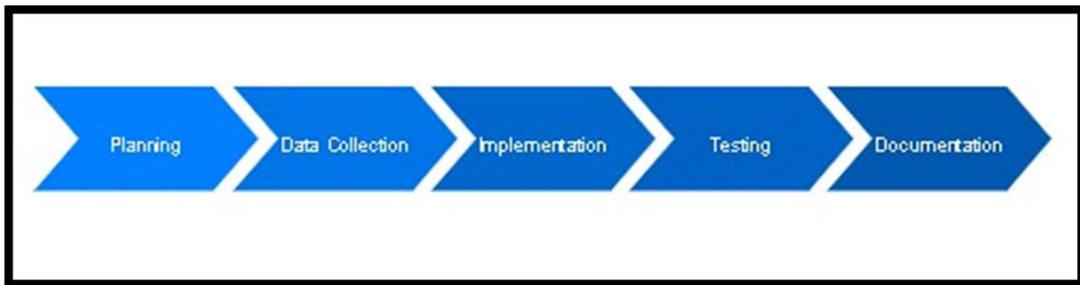

Figure 2. Operational Framework

The planning part is to study the feasibility of the mobile application development followed with data collection to identify the requirements of the system and the food allergies suitable recipes. Based the system architecture identified in the planning phase, implementation and testing were conducted followed with the system documentation.

3.2 System Architecture

Figure 3 shows the application system architecture. When the user accesses the application, it will navigate to search recipes by diet categories. The application then sends get request to the Spoonacular Food Application Programming Interface (API).
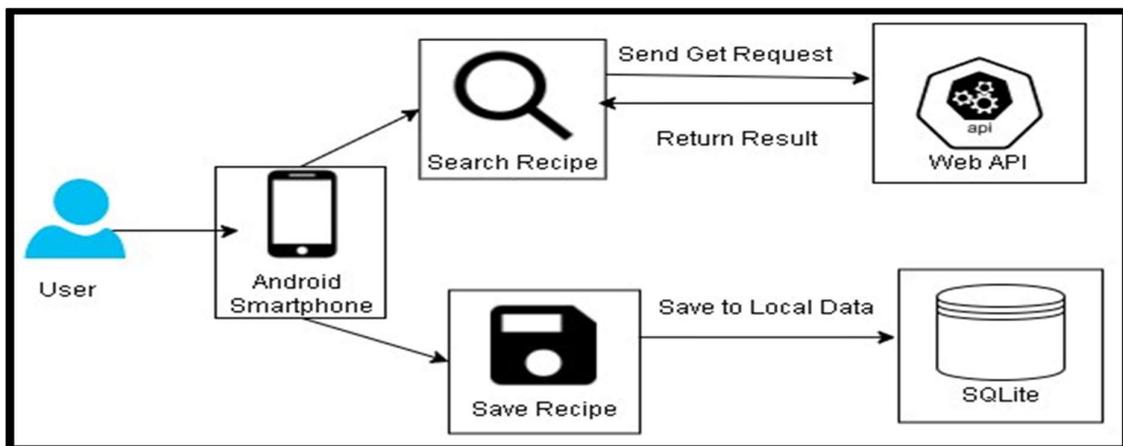
Figure 3. System Architecture

The API provides access to over 360,000 recipes and 80,000 food products. One of the important factors this API was chosen to implement in this project is because it contains the data that is used to search recipes based on diet type. It provides many diet types that can be included in this application. Furthermore, the Spoonacular API provides free 150 request access per day for the user to use. Once the request has been submitted to the API, it will respond and returns the result to the user. The application also includes allows users to store any new recipes required.

4. Result and Discussion
This section describes the developed food recipe mobile application, and the usability testing results. The flowchart and the Graphical User Interfaces (GUIs) of the mobile application are described in the following sub-sections.

4.1 The flowchart of food recipe mobile application
As seen in Figure 4, the food recipe mobile application provides Main Menu for users to select the options either *Recipe List*, *Favorites* or *Food Joke*. The *Recipe List* menu will display variety of suitable recipes based on the user search that can be queried according to the food type, ingredients or title.
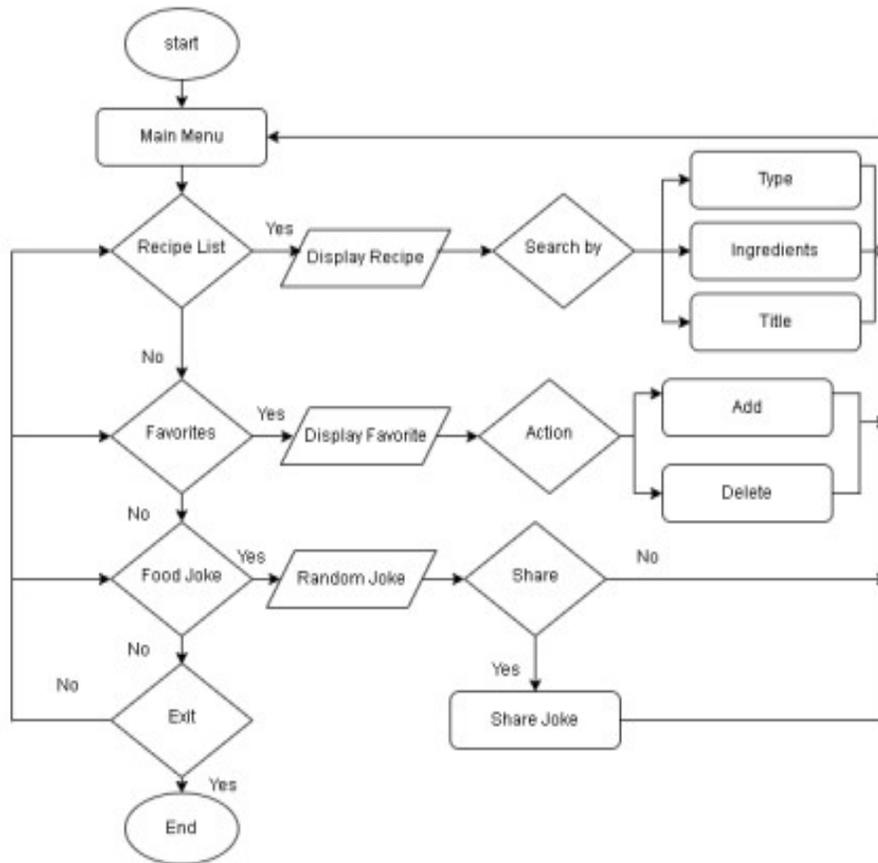

Figure 4 The Flowchart of the Application

The GUIs for users to select the suitable recipe and its details can be depicted in Figure 5 while Figure 6 presents the descriptions of each ingredient of the selected recipe. Then, the user can add the selected recipe into the favourite list as shown in Figure 7.
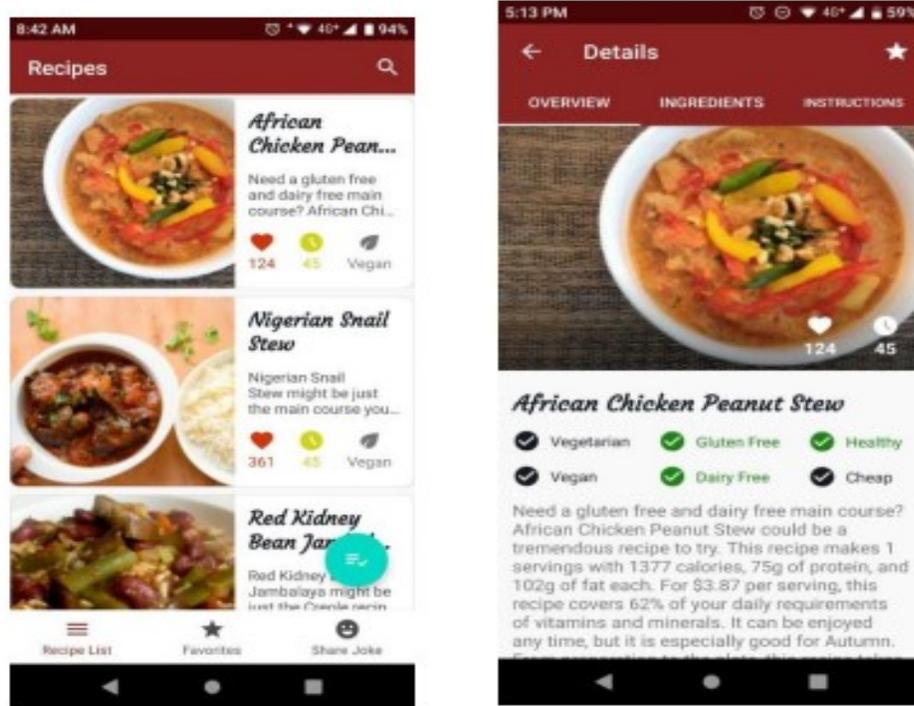

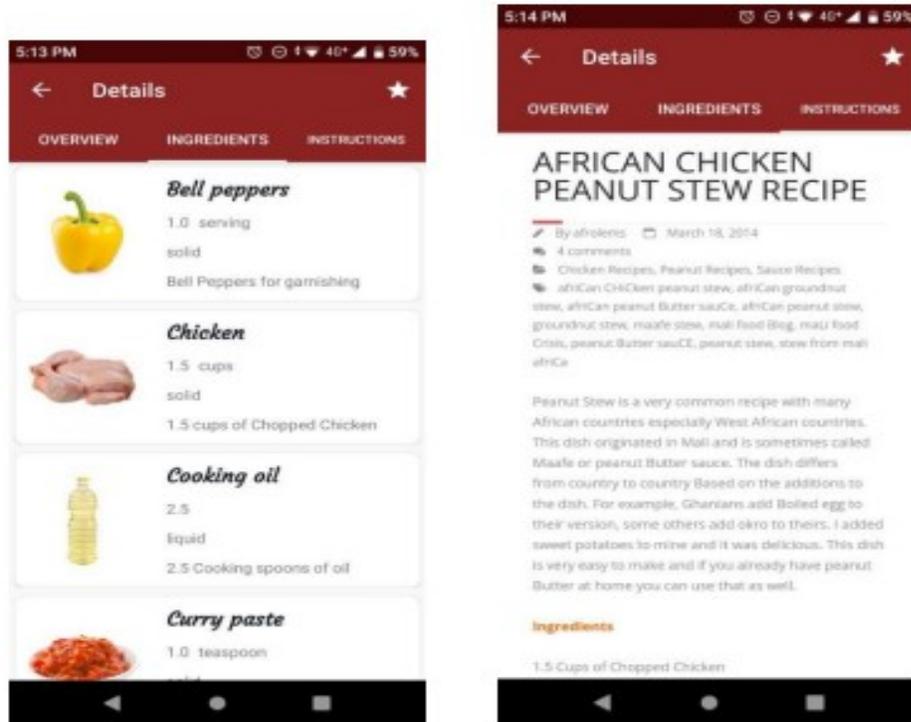Figure 5 Menu for Allergy Recipes and Details

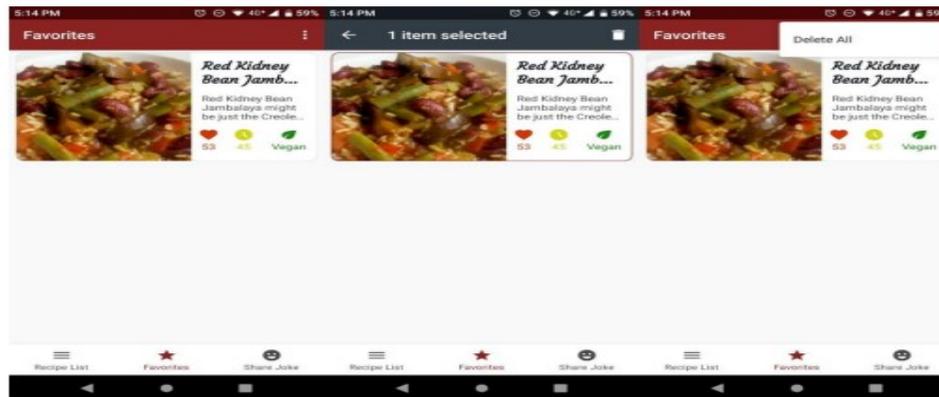Figure 6 Menu list of ingredients and its details on allergies

Figure 7 Menu of Recipe Favorite

4.2 Usability Testing

This testing was conducted to determine whether the application practicable in accordance with users' usability. This test was also performed to identify any issues or bugs. The users were given to use and share their perceptions on the functionalities of food recipe mobile application by giving 5 rating scales on the basic items as listed in Table 1 and the results are given in Table 2.

Table 1 Rating Scale

Rate	Perception level
1	Strongly Disagree
2	Disagree

3	Neutral
4	Agree
5	Strongly Agree

Table 2 The Results

	Item	Result (in percent %)
1.	List of recipes	100
2.	Save recipes	100
3.	Search by diet type	100
4.	Performance	93.3
5.	Acceptance	86.7

Based on table 2, the application achieved 100% results of users' usability in showing the list of recipes, saved recipes and search recipes according to the diet type. In contrast, the overall application performance achieved the result of 93.3% and application acceptance is at 86.7%. These values indicate that the application meets and achieved the purpose of assisting those people with allergies and restricted diet, but it can be further improved so that it can run smoothly without error.

5. Conclusion

Health is one of the important aspects of life. There are many reasons why some people follow a certain diet type. Some just simply wanted to cut weight and others because of religious beliefs. However, there are also some health issues caused by certain food products causing allergic reactions and health issues. The Food Recipe Mobile Application for Allergists introduced in this study has been tested and successfully implements API connection to utilize cloud data provided by the web. The application also performs well in Android environment. Based on the results, the application is received positively by the user and has proven to assist people that have strict diet types by providing many functions and information suitable for them. The app achieved a high percentage (above 80%) in the usability testing being performed on it. The research can be further improved in terms of adding taste and flavor analysis graphs or statistics that may improve the recipe details and adding food nutritional values to help the user keep track of their nutrition needs.

Conflict of Interest
The authors declare no conflict of interest in the subject matter or materials discussed in this manuscript.

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	Shahirah Mohamed Hatim is currently an academia at the Faculty of Computer and Mathematical Sciences Universiti Perak Branch Tapah Campus, Perak, Malaysia.	Design and supervising the research work and drafting article.
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