My Recipe Book : A Web-based system for Organizing Recipes and Managing Menu

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***Abstract*— A long time ago, elder generations supposedly to use recipe books to store recipes. However, they did realize there were various obstacles regarding recipe books which possibility misplaced recipes were rose up. The concept of writing recipes on recipe books was not relevant or awful to use and will cause recipes messed up. In this era, the web search engine is recognizable to people, for instance, Google, Bing and Youtube and social media as the instrument for searching recipes. Although there is a variety of platform to convenient people, it still cannot handle the recipes properly due to human error and need a mechanism or tool to assist people to keep recipes in a place. People nowadays tend to choose an incomplex and effortless process for improving or fixing their lifestyles. Technologies is a paramount platform and mechanism to survive in a modern era like a Web-based system, Applications and Internet of Things (IoT). Technologies make everything is on our fingertips. Hence, the web-based system was developed to overcome those issues. The prototype named My Recipe Book. My Recipe Book provides various functions. My Recipe Book is a web-based system. The main aim of this study is to develop My Recipe Book and the sub-objectives were to identify the requirement for My Recipe Book, to design the interface of My Recipe Book, to develop My Recipe Book and to test the usability of My Recipe Book. This study conducted using Rapid Application Development (RAD). The results of the evaluation suggested My Recipe Book because it is easy to use and very useful. The respondents satisfied with the functions and interface of My Recipe Book. This study contributes to an understanding of the system requirements and user interface of a web-based system for managing recipes. It can be a future reference for developers and researchers in this field to develop similar websites or rising the ability to improve the website.**

Keywords— recipe books, recipe, My Recipe Book, web-based system, website

I. INTRODUCTION

The recipe book is a book of guidance describing how to prepare and cook various kinds of food by K Yanai et.al [1]. A long time ago, elder generations were used recipe books to place or store recipes. This concept has begun to grab numerous attention of people and they start writing their own recipes that they had learned from others or by themselves. The writing recipe book technique very efficient to memorize all the recipes. Furthermore, elder generations had skills to cook for their families without looking at the recipes. Nevertheless, recipe books had countless of issues which are not relevant and awful to use because it had misleading recipes, misplaced recipes and uncoordinated recipes. In this urban era, the web search engine favored people for instance Google, Bing, Youtube and social media to figure out recipes details. Although there is numerous variety of mechanisms to assist people, it still disables to facilitate and handle recipes properly and need appropriate tools or platforms to guide and According to previous research, websites on cooking recipes such as cooks.com and BBC food search has become popular [2]. These people used the website to obtain information regarding recipes. A huge reason why people prefer to choose the website because it is more accessible by using smartphones or personal computers either in grocery or in the kitchen. This shows that people were preferred as a platform that is effortless and simple. Therefore, a web-based system was introduced to assist them in managing the recipes coordinately. The prototype is called “My Recipe Book”. My Recipe Book is a web-based system that was provided with a variety of functions such as create recipes, view recipes, delete recipes and edit recipes. Not only that, but My Recipe Book was also supported to view recipes by selecting meal categories, origin food and adding calorie intake.

This study contributes to an understanding of the system requirements and user interface of a web-based system for managing recipes. It can be a future reference for developers and researchers in this field to develop similar websites or rising the ability to improve the website. The following section is explain about the background and related studies. Later, the section is describe the design and development of My Recipe Book. The subsequent section describes the usability evaluation of My Recipe Book and the last section in this paper was concluded study and a few lists of future works.

II. BACKGROUND AND RELATED STUDIES

This section describes and explains the background of My Recipe Book and related studies focusing on the expectation or prediction of the famous or popularity of online recipes [3]. The online recipe usually used for enhancing cooking skills and improving the quality of food. Therefore, thousands of recipes were provided to give various options to people. The online recipe is not only good for people who want to learn about cooking but also a relevant platform to be used parallel with technology trends nowadays. The online recipe was very familiar and popular among of housewife especially those have work. This online recipe was accessible and easy to use wherever they are.

People nowadays communicated with recipes online will be provided for hints about user food options and eating

behaviour. Kusmierczyk et al. and Trattner et al. measured details or data from the German community platform Kochbar.de and found trends either in monthly or weekly on online food recipe and nutritions details such as fat, proteins, carbohydrates, and calories [4, 5] and in other words of ingredient collaborations and investigation [6]. Similar trends were recognized by Wagner et al. [7] and West et al. [8]. West and colleagues also found associations between recipes also accessible through search engines and diet-related illness cases, which occurs in the results were explained recently by Said & Bellogin [9], De Coudhury et al. [10] and Abbar et al. [11] in the content of Allrecipes.com and social media respectively. Rokicki et al. [12] searched differences especially in nutritional values between user recipes that were created by different user groups and results.

Difference with previous study

The methodology that has been used for previous study were different with this study. This study were used Rapid Application Development methodology while previous study were use five methods which are Data selection and pre-processing, Evaluating popularity, Elements engineering, Comparative statistical analysis and Predictive modeling. It had used in four subsections which were data selection and pre-processing that explained how they implemented and processed the recipes from what they gathered, Analyzing popularity explained how they evaluated famous of the platforms, Feature engineering for implementing guidelines of the elements were investigated and, finally, Comparative statistical analysis and Predictive modeling that was presented of the statistical reaches that have been used to measure the comparison of model expectations. To keep the text and graphics files were separated, the text has been aligned and styled first.

1. Data selection and pre-processing

there were various of objectives of their analysis which were they use of recipes that were (1) main dishes (2) competed with nutritions details (3) compulsory things that they must had a photo of prepared meals. These two platforms were observed. Allrecipes.com 11, 194 recipes already met requirements or expectations while Kochbar.de the number was 81, 232 recipes. Figure 1 showed the frequency of which recipes with different categories were uploaded

For Allrecipes.com 11, 194 recipes met these requirements and Kochbar.de has 81, 232 recipes. They chose to focus and give attention on the main dishes because, as shown in Figure 1, the frequency for which recipes in different categories are uploaded were different based on the platform they had used. They provided extra analysis that will be used of the recipes in the platforms, included the expectation in this test and they highlighted this to the reader as appropriate.

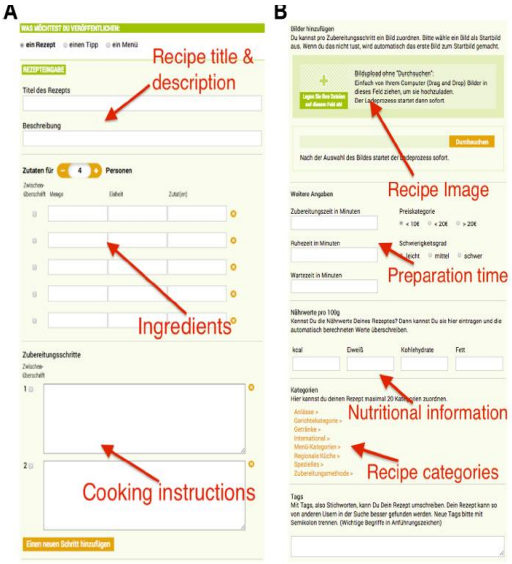

Figure 1: Plot (A) shown the top sections of the form with the ingredients and cooking instructions input widgets (B) presented the bottom section of the upload form, allowed the user to upload an image. This part was able the opportunity to authorize the recipe based on different classification, challenges and levels of costs.

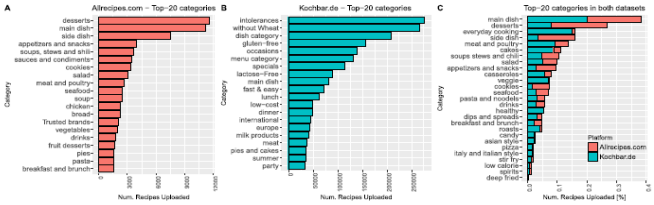

Figure 2: Plot (A) and (B) showed which of the classification in Allrecipes.com and Kochbar.de were the most famous were concerned with a total of recipes that uploaded to this classification. Plot (C) performed which of the classification investigated in both platforms were the ones with the many recipes uploaded. As a result, the 'main dish' classification was the many of the recipes in both platforms were uploaded.

2. Evaluating popularity

They chose the number of feedbacks and ratings for each recipe that was accessible for both platforms as the index of popularity among these platforms. this was very relevant to use and to evaluate or investigate the ratings and feedbacks that were applied to rely on certain recipes. for the Kochbar.de platform, it was rated a 5-stars rating and almost 99% while in Allrecipes.com not fascinated as Kochbar.de and most of the rating was evaluated between 4 or 5. They also found a total average number of feedbacks or ratings. for this section, they evaluated by calculating the mean and median of these online recipes based on each time slot such as a day, one week, one month and one year.

3. Elements engineering for recipe popularity prediction or expectation

The elements related to a recipe's description, performance, nutrition and healthiness, complexity and innovation. They also provided features captured aspects that related to the authoring user and the content encompassed the interaction of the platform. Despite the fact that many of

these features already applied in previous investigations, but it is the first time they have been tested together and have been examined in the context of predicting popularity in more complicated

4. Comparative statistical analysis

To make a comparison between the two communities they implemented standard descriptive statistics, for all elements on both platforms and used importance tests to develop differences. Due to the differences in the feature conduction, it was compulsory to conduct numerous experiments or tests. A Brown–Forsythe test for searching statistically same variance was utilized. The Brown–Forsythe test is used for group comparison based on median absolute deviations (MAD) and was more strong against outliers compared to the Leven's test, which used the mean. In the case of the same variance for theses feature conduction ($p < 0.05$), a Wilcoxon rank-sum was used. When the test rejected the same variance hypothesis, a two-sample Kolmogorov–Smirnov (KS) test was used.

5. Predictive modeling

Many experiments and tests were performed to evaluate the completeness and balanced platform. the purpose of this experiment The experiments was performed on complete and balanced datasets. this is to avoid the potential of missing data with the favor of R library Hmisc.q. To ensure stabilization, the majority of classes were selected randomly by implementing R's sample policy. the categories test itself was distributed with different categories by using R library Caret.r Besides a Random Forest (RF) classifier, Logistic Regression (LOG) and Naive Bayes (NB) were employed. RF and NB have been successfully used in the same 'before publication' popularity classification studies [13]. As an evaluation protocol, they used and chose five fold-cross validation and term of 'Accuracy' was used as the main performance metric. Furthermore, the variable importance for each feature set was described by implementing Caret's 'VarImp' feature, to capture the importance of the variables after the models have been established, as well as FSelector'ss InfoGain feature to find the Top-10 features before model construction. The equations were an exception to the prescribed specifications of this template. the user will need to determine whether or not the user equation should be typed using either the Times New Roman or the Symbol font (please no other font). To create the various level of equations, it may be needed to treat the equation as a graphic and inserted it into the text after the paper was styled.

III. METHODOLOGY OF STUDY

This study conducted using Rapid Application Development (RAD). Rapid Application Development (RAD) describes the process of software development that has good intensity on rapid prototyping and iterative delivery [14]. The RAD model is a good option for the waterfall development model which focuses more on planning and sequential design practices. RAD was introduced by James Martin's in 1991 and this method has been used many expert people because it capable methods of development that fall within the category of agile techniques of development [15]. Besides that, RAD also can reduce the risks, users' involvement in the creating process and testing. RAD process has 4 stages which are requirement planning phase, user design phase, rapid construction and user ability test. The progress of the phases show in Figure 3.

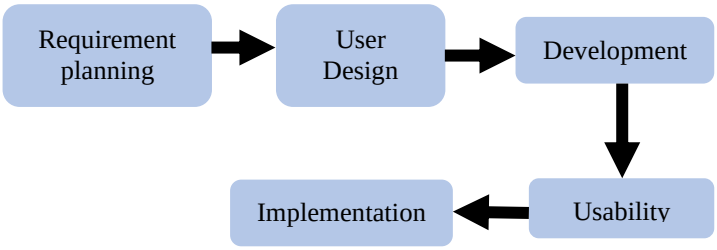

Figure 3 :The phases or stages in Rapid Application Development (RAD)

In the requirement planning phase, it was involved in the appointment date to meet the supervisor set up by the developer. After they met, they were discussed more details about the project title which is My Recipe Book. The developer collected the requirement from the supervisor and interviewed with the chef of the restaurant Planet Sandwich in Varsity Mall, UUM. Besides that, the developer used some literature used Google to find information about this project. The output of this phase was found in the requirement of My Recipe Book. At the end of this project, My Recipe Book should match the requirement stated by the supervisor and chef of Planet Sandwich. For example, My Recipe Book can create recipes, can view menus followed by meals categories, origin food and can add cooking tips. This phase was a combination of various elements in system planning and system analysis.

For the user design phase, the developer built and drew flow charts, use case diagrams and sequence diagrams to make the developing processes clearer. The developer made a change of user design phase by using Star UML software as a tool to build the diagrams. These models and diagrams were represented of the system process, input and output. By using these diagrams, the developer knew who was the user, how My Recipe flowed and the interactions of the requirements. These models and diagrams were helped the developer to view, understood the whole system and able recovered if My Recipe Book got errors or mistakes. After the models and diagram completed, the developer was designed the user interface of My Recipe Book.

In the development phase, the developer has created a prototype by using Hypertext Markup Language (HTML) together with Cascading Style Sheet (CSS) and supported with Hypertext Processor (PHP). This prototype had provided connection in database, button movement, page interaction, a complete interface and so on. The prototype of My Recipe Book has presented to the potential user. Some users able to give bad or good comments and feedbacks to improve My Recipe Book and became a good system. The developer improved the system and the user satisfied with My recipe book. The users were cleared and understood to use the My Recipe Book.

Lastly, the implementation phase. This phase was the last phase or part of Rapid Application Development that was used by this project. The implementation phase where

the finished or end product went launched to the user. My Recipe Book should be friendly to the user. My Recipe Book presented to users that fulfilled their needs and requirements. My Recipe Book should be no errors or mistakes and ran smoothly with the users.

IV. DESIGN AND DEVELOPMENT OF MY RECIPE BOOK

This part explains about the design and development of My Recipe Book followed the three phases of Rapid Application Development (RAD). On this part, it separates into two sections which are the requirements of My Recipe Book and the prototype development of My Recipe Book developed to demonstrate the collected requirements.

The Requirements of My Recipe Book. The developer collected the requirement from the supervisor and interviewed with the chef of the restaurant Planet Sandwich in Varsity Mall, UUM. For supervisor requirements, she was discussed about features of My Recipe Book and the design prototype of My Recipe Book and the chef was asked by developer a few open-ended questions mainly on the My Recipe Book [16]. The example of the questions are before this, you always use recipes. If this project will be developed, do you want to share your recipes? As soon as this project presented, what do you want to have in the system to make it easier for you to refer your recipe book? Their ideas were taped and the requirements were collected. The chef and the supervisor passionately committed during the development phase of My Recipe Book where the prototype was demonstrated to them to get their feedbacks and comments regarding on My Recipe Book.

Besides that, the developer analyzed using Google search engines by searching keyword such as “My Recipe Book”, “Recipe” and “Recipe Book” to find details about My Recipe Book such as similar websites or applications and related articles to get ideas on requirements and how My Recipe Book looks like. This information favors the developer to learn deeply and shown interest in My Recipe Book. As a result, the developer gathered all the requirements and documented the requirements of My Recipe Book. Table 1 lists the five vital requirements and the priority that were formed from gathered requirements. The requirements include login of My Recipe Book, manage creating the recipe, manage view recipe, manage menu and manage cooking tips.

Table 1: List of requirements of My Recipe Book

No	Requirement ID	Description	Priority
	MRB_01	**MANAGE USER INFORMATION**	
1.	MRB_01_01	Administrator be able to log in by using username and password	M
	MRB_02	**MANAGE CREATING RECIPE**	
2.	MRB_02_01	Administrator can add new recipe such as insert images, select categories, insert ingredients, descriptions and so on	M
	MRB_03	**MANAGE VIEW RECIPE**	
3.	MRB_03_01	Administrator can view recipes	M
4.	MRB_03_02	Administrator can update recipes	M
5.	MRB_03_03	Administrator can delete recipes	M
6.	MRB_03_04	Administrator and user can search recipes by using keywords or meal categories	M
	MRB_04	**MANAGE MENU**	
7.	MRB_04_01	Administrator can select categories meals such as breakfast, lunch, dinner, tea time, cookies, desserts, healthy foods, drinks and juices.	M
8.	MRB_04_02	Administrator can select origin food such as Malaysian, Chinese, Indian, Korean, Japanese, Arabian, Vietnamese and Western	M
9.	MRB_04_03	Administrator can view recipes	M
10.	MRB_04_04	Administrator can update recipes	M
11.	MRB_04_05	Administrator can delete recipes	
	MRB_05	**MANAGE COOKING TIPS**	
12.	MRB_05_01	Administrator can add cooking tips by inserting images and descriptions	M
13.	MRB_05_02	Administrator can view cooking tips	M
14.	MRB_05_03	Administrator can delete cooking tips	M
15.	MRB_05_04	Administrator can update cooking tips	M

The requirements collected in table 1 were converted into the computer system functionality. The next process is modeling or drawing the requirements of My Recipe Book using the proper or relevant modeling methods and tools. This section, the Unified Modelling Language (UML) was applied to illustrate of model requirements. Two diagrams used to figure the My Recipe Book which are use case diagram and class diagram. These diagrams were illustrated by using Star UML software. A use case diagram can

conclude the information of system's users (also known as actors) and their interactions with the system [17]. There are five main use case inside of My Recipe Book which manages user information, manage to create a recipe, manage view recipe, manage menu and manage cooking tips. To manage user information, it allows the administrator to "log in". Next, manage to create a recipe that allows the administrator to "add recipe". Other than that, manage view recipe allows the administrator to "view recipe", "delete recipe", "update recipe" and "search recipe". For the manage menu, the administrator allows to select "meal categories", "origin food" and "calorie" and for last use case, manage creating recipe allows the administrator to "add tips", "view tips", "update tips" and "delete tips".

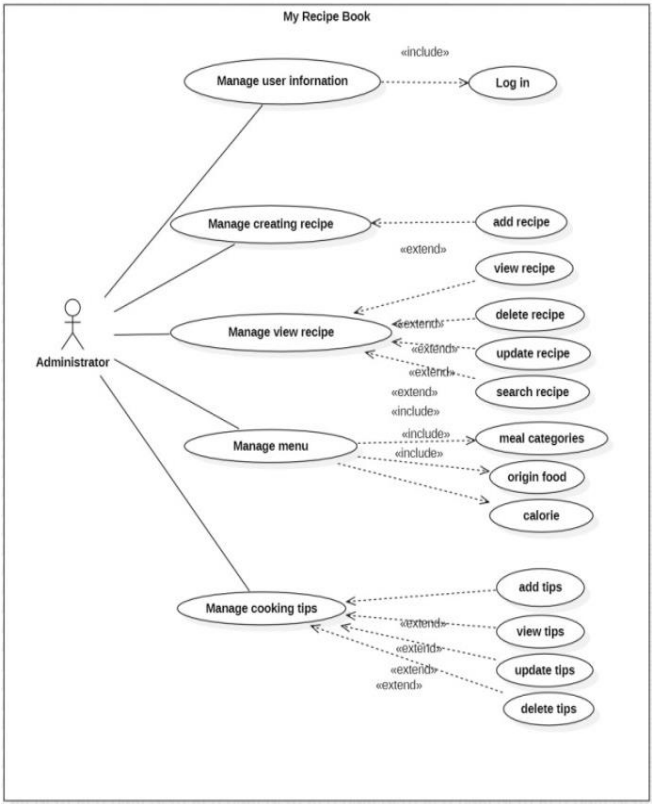

Figure 4: The use case diagram of My Recipe Book

The elements of My Recipe book were represented in class diagrams. The class diagram was used to represent the static view of an application. Class diagram is not only used for visualizing, describing, and documenting different aspects of a system but also for constructing executable code of the software application [18]. This class diagram in figure 4 shows the attributes and operation of the web-based system. There are five classes are creating user information, creating the recipe, view recipe, menu and cooking tips. This diagram was illustrated clearly the interaction between classes.

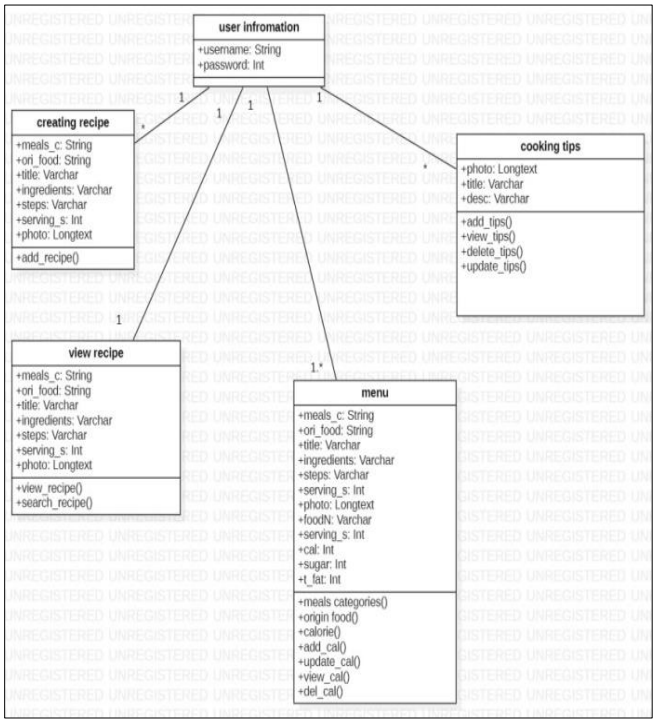

Figure 5: The class diagram of My Recipe Book

V. MY RECIPE BOOK PROTOTYPE DEVELOPMENT

A prototype of a web-based system that provided with a variety of functions such as create recipes, view recipes, delete recipes and edit recipes named My Recipe Book was developed. This prototype is a platform to represents the requirements that have been gathered before. A website prototype can be a sample or demonstration of what will be website look like. Further recommendations or feedbacks could be collected from the users based on their experiences using this prototype and this prototype improved to be a good system. Numerous programming languages that will be used, for instance, Hypertext Markup Language (HTML) together with Cascading Style Sheet (CSS) and supported with Hypertext Preprocessor (PHP). These languanges were performed in Xampp and Notepad++ as main instruments to develop My Recipe Book.

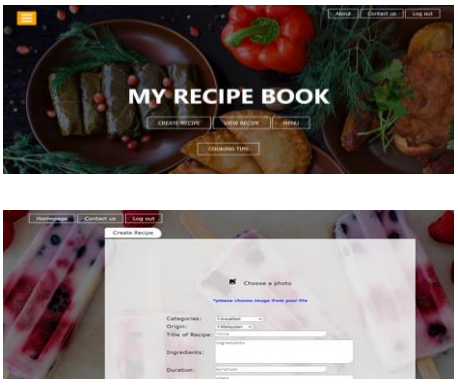

Figure 6: The interface for homepage (above) and creating recipe (below)

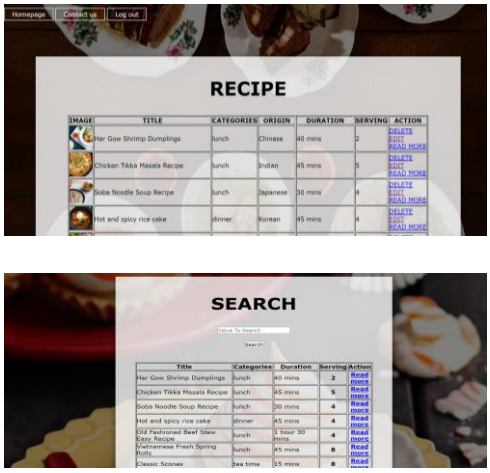

Figure 7: The interface for view recipe (above) and search recipe (below)

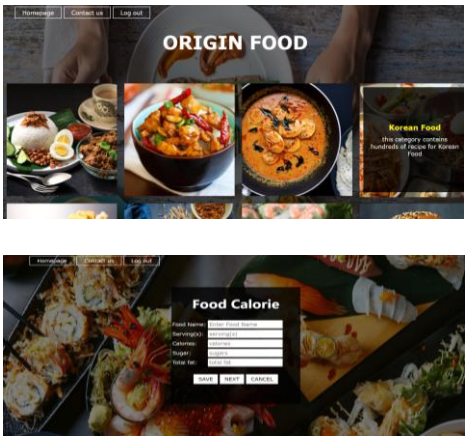

Figure 8: The interface for origin food (above) and calorie (below)

VI. EVALUATION OF MY RECIPE BOOK

The evaluation is a benchmark or measurement on how the system meets or achieved the needs and requirements of the user. Besides that, evaluation is a specific guideline to determine the success of a project.

A. The Evaluation Setting

There were 25 respondents were involved in this study. All the respondents were randomly selected from UUM students and other university students. Both genders were allowed to answer the post-task questionnaires. There were two instruments were used for the evaluation of My Recipe Book which are questionnaires and virtual instruments. The post-task questionnaire were consists of 30 items and separated into two sections which were section A and section B. In section A, it asked respondents demography and background Information while section B asked about evaluating My Recipe Book. There some procedures that should be followed by respondents in the evaluation for My Recipe Book such as the respondents had a laptop or smartphone that connected to the internet (1), the developer did demonstrate how to use the system (2), the developer took a photo of respondents as evidence for this evaluation session (3), the developer let the respondents tested the system or watched the video have prepared (4) and the respondents answered the questionnaire to evaluate the system (5)

B. The Respondents's Demographic and Background Information

Based on the analysis of the respondent's demographic and background information shows that 100% of respondents are female and 100% of respondents were aged at 21-25 group age. This is because the evaluation conducted to 25 respondents randomly selected from UUM and other university students. The respondents 100% from Malay race and 100% of respondents do not have any incomes because they currently study. This evaluation shows that 96% of respondents for degree education and 4% of respondents for other education. Furthermore, 72% of respondents have heard about My Recipe Book, 20% of respondents are have not heard about My Recipe Book and 8% of respondents are not sure. Besides that, 60% respondents have experience using similar websites, 36% have no experience using similar websites and 4% of respondents are not sure. Other than that, 80% of respondents liked using similar websites, 16% of respondents were not liked using a similar website and 4% of respondents are not sure.

C. The Usability of My Recipe Book

The study was distributed on the respondents' response or answer in the section B based on the post-task questionnaire given. This section evaluates the respondents' opinions and impressions of My Recipe Book. Table 2, 3, 4 and 5 were shown the average and frequency of the responses. Most of the respondents' gave rate between four and five of the post-task scales four the aspects of the usability. Some respondents' were rated neutral and a few respondents were rated disagree.

Table 2: The Respondents' responses on My Recipe Book system design

Post-task questionnaire	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
I like the interface of My Recipe Book.	0.00	0.00	0.00	0.28	0.72	4.71
I was easily to navigate all pages in My Recipe Book.	0.00	0.00	0.00	0.44	0.56	4.58
My Recipe Book have navigation or button that linked correctly.	0.00	0.00	0.04	0.44	0.52	4.50
My Recipe Book have suitable background, fonts and colors.	0.00	0.04	0.00	0.44	0.52	4.42
My Recipe was not too much with unnecessary things.	0.00	0.08	0.08	0.40	0.44	4.21
I liked the graphic of My Recipe Book.	0.00	0.00	0.00	0.40	0.60	4.58
My Recipe Book have suitable button and navigation.	0.00	0.00	0.04	0.48	0.48	4.42

Table 3: The Respondents' responses on usefulness of My Recipe Book

Post-task questionnaire	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
My Recipe Book saves my time when I use it.	0.00	0.00	0.40	0.56	0.40	4.38
My Recipe Book meets my needs.	0.00	0.04	0.12	0.56	0.28	4.08
My Recipe Book is useful in overall.	0.00	0.00	0.12	0.48	0.40	4.29

Table 4: The Respondents' responses on ease of My Recipe Book

Post-task questionnaire	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
My Recipe Book is easy to use.	0.00	0.00	0.00	0.48	0.52	4.54
My Recipe Book is user friendly.	0.00	0.00	0.08	0.48	0.44	4.38
My Recipe Book is flexible.	0.00	0.00	0.08	0.56	0.36	4.29
My Recipe Book is easy to learn how to use it.	0.00	0.00	0.00	0.44	0.56	4.58
I can easily remember how to use it.	0.00	0.00	0.00	0.44	0.56	4.58
I can recover from mistakes quickly and easily when using My Recipe Book.	0.00	0.00	0.12	0.48	0.40	4.29

Table 5: The Respondents' responses on satisfaction of My Recipe Book

Post-task questionnaire	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
I am satisfied with My Recipe Book.	0.00	0.00	0.00	0.56	0.44	4.46
I would recommend My Recipe Book to my friend.	0.00	0.00	0.00	0.52	0.48	4.50
My Recipe Book works the way I want it to work.	0.00	0.00	0.04	0.44	0.53	4.50
My Recipe Book is wonderful and pleasant to use.	0.00	0.00	0.00	0.60	0.40	4.42

The feedbacks and results of the evaluation proposed that My Recipe Book is very useful and easy to use. From responses of respondents about specific featured that provided by My Recipe book shows that it easy to navigate all pages, navigation or button that linked correctly, suitable background, fonts, colors and suitable button and navigation. In term of usefulness, they were agreed that My Recipe Book can save time, meets their needs and useful overall. Besides that, they were reported that My Recipe Book user friendly, easy to learn how to use, easily remember how to use it and they can recover from mistakes. Overall, the respondents agreed that they were satisfied with elements and features inside the website that ease them to create, view, update and delete recipes.

VII. CONCLUSION AND FUTURE WORKS

This paper has explained the design and development of My Recipe Book. Numerous aspects or perspectives that can be determined or investigated. In the future, we plan to boost the functionality of My Recipe Book by providing supports towards My Recipe Book collaborative with shopping lists. This collaboration will ease housewife especially those working. Shopping lists have the main function such as groceries. This list able to help them to plan what to buy and can manage their expense. The shopping list was favored to buy groceries via online transactions. Other than that, we also want to develop My Recipe Book in Mobile application which can be accessed everywhere. This application also will provide a system with visual recognition of food ingredients. Any ingredients can be captured by the user by using a smartphone and the system will show some recommendation recipes based on the ingredients. This is an innovation consumption of technology trends nowadays such as the Internet of Things (IoT) and real-time. This development may need details such as color histogram and consume too many times but it gives many experiences to explore more about technology

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