"HealthSquare: *A Mobile Application for Health Planning*"

By

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Dissertation submitted in partial fulfillment of the requirements for the

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Universiti Teknologi PETRONAS

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CERTIFICATION OF APPROVAL

HealthSquare Mobile Application

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A project dissertation submitted to the

Computer and Information Sciences Programme

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Approved by,

_____

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UNIVERSITI TEKNOLOGI PETRONAS

BANDAR SERI ISKANDAR, PERAK

MAY 2015

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgments, and the original work contained herein have not been undertaken or done by unspecified sources or persons.

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(RUHI SYUMAIMI BINTI ROSLIN)

ABSTRACT

HealthSquare is a mobile application which runs on the Android operating system. The objective of this application is to develop a mobile application which provides a healthy lifestyle plan for the users and available 24 hours daily based on Malaysian context for users who have the highest tendency of overweight and obese weight status based on the Body Mass Index (BMI) calculation. This is due to the increasing number of overweight and obese people in Malaysia nowadays, which lead to diseases such as Cholesterol and Cardiovascular Diseases (CVD), Type 2 Diabetes Mellitus, Kidney disease, Liver Disease and some cancers including endometrial, breast and colon cancer. It happens because of improper food intake per day and lack or no physical activity involved per individual. In accordance to reduce the risk, they need to be reminded, especially on the food intake and physical activity. For this project, BMI status will be the determinant for user to choose the meal and fitness plan. A notification alert feature will be implemented per schedule as a reminder for the users. As for now, the focus of this project is an android based application. Therefore, this application is one of the efforts to reduce the number of obesity in Malaysia and also to provide a healthy lifestyle to the society. Rapid Application Development (RAD) methodology has been selected to be used for the project development phase. For the research methodology, the author used literature review, observation and questionnaire to obtain information relating to this project. The application enables users to calculate BMI, calculate daily caloric intake, proposed daily meal plan and fitness plan with subscription and provide health information to be revised and view by the user. In addition, to ensure the application is meeting the usability standard, the author has been decided to conduct a usability testing. Based on the testing, it shows that HealthSquare is a good application with a score of 73. It is considered as grade B in the usability standard. The application should be enhanced in the future by developing the application in another operating system such as iOS and window with an improved GUI. The author suggested to include GPS Tracking System and add more meal focusing on Malaysian cuisines. A monitoring program should be implemented for historical tracking. It shows that HealthSquare is a viable solution for planning a healthy lifestyle.

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INTRODUCTION

1.1 Background of Study

World Health Organization (2010) ranked Malaysia as sixth highest adult obesity rate in Asia. The obesity problem is caused by improper meals intake and lack of physical activities. People usually refer to their Body Mass Index (BMI) to measure their body fatness as calculating BMI is inexpensive and easy to perform. This is because BMI is calculated based on a person's weight and height only. BMI is a good indicator for individual to measure their weight status which are divided by four (4) categories; underweight, normal, overweight and obese. People with overweight and obese status are at higher risk in getting diseases such Cholesterol and Cardiovascular Diseases (CVD), Type 2 Diabetes Mellitus, Kidney disease, Liver Disease and some cancers including endometrial, breast and colon cancer.

As time passes, people start to concern about their health. They believed that prevention is better than cure. With the advancement of technology, a mobile application can be developed to overcome these problems. This is because smart phone has been our friend and we depend on it to manage things. In addition, people tend to forget their health routine because of other responsibilities. Sometimes, they do not even know about their current health status that might lead to unwanted diseases.

The purpose of this study is to help people manage their lifestyle to reduce the obesity rate in Malaysia. This prevention can be done in many ways; however, this study focus on developing a mobile application that allows users to plan their lifestyle which are food

intake and physical activity in order to stay healthy. For the sake of this study, the focus is all people, but the target group will be overweight or obese individual.

1.2 Problem Statement

Despite of concerns about their health, people tend to ignore and forget about their health condition because of other responsibilities or lack of motivations. They took it easy on health issues without thinking of its consequences. Sometimes, they were influenced by their lifestyle; food intake and physical activity. To fulfill the above general problem, specific problem of this particular project are:

- There are lack of information provided to the people on the Malaysian cuisines and local foods in order to manage their food intake daily. This condition led to improper food intake without concerning on the caloric intake per day.
- In addition, lack or no physical activity involved has led to weight problem especially for overweight and obese individual. With their overweight and obese status, they are at higher risk of getting diseases.

Thus, they required further assistance to manage their lifestyle in an easy way and healthy method. A mobile application that acts as health planning which is proposing caloric intake by providing meal plan and fitness plan based on BMI calculation with the presence of notification alert feature could remedy the situation.

1.3 Objectives

There are two (2) main objectives of this project:

- To develop a mobile application which provide a healthy lifestyle plan for the users and available 24 hours daily based on Malaysian context.
- To conduct usability testing.

1.4 Scope of Study

This project is aiming to develop a mobile application that will be focused on healthy lifestyle based on BMI status as a determinant. This application will be built on the Android platform specifically designed for android based gadgets. This application will provide a proposed solution on the caloric intake and fitness plan to the end users with the presence of a notification alert feature as a reminder. This application is intended to be used for all levels of users comprise of children, teenagers, adult and senior citizen, but the target group will be the overweight and obese individual.

1.5 Summary

Maintaining a healthy body weight is essential to good health. Body Mass Index (BMI) can act as indicator to measure body fatness of a person according to categories. Statistic shows that there is increasing number of obesity in Malaysia. This condition should be prevented as obesity can lead to many diseases by having an ideal body weight.

In order to have healthy communities, the author decided to develop a mobile application which can help the societies to have a healthy lifestyle. Food intake and physical activity play an important role to ensure a person's lifestyle. By having the right food and do adequate physical activity can help the society to maintain and improve their health.

Therefore, with the rapid usage of mobile applications nowadays, the author believes that this application can help the society to have a healthy lifestyle and increase their awareness on the important of having good health.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Body Mass Index (BMI) is referred to a value measured based a person's weight and height. The formula for BMI is weight in kilograms divided by height in meters squared. Based on the formula, the unit for BMI is kg/m^2. BMI is classified into four standard weight status categories which are underweight, normal weight, overweight and obese. The standard weight status categories and BMI ranges are shown in the following table.

Table 1: BMI and Weight Status

BMI	Weight Status
Below 18.5 kg/m^2	Underweight
18.5 – 24.9 kg/m^2	Normal weight
25.0 – 29.9 kg/m^2	Overweight
30.0 or greater	Obese

Based on the weight status we obtained from BMI calculation, BMI is identified as screening tool for weight categories that may lead to health problems (Centers for Disease Control and Prevention, 2014). There are many research has been conducted based on BMI especially for overweight and obese categories. In addition, obesity statistic

in Malaysia shows an increasing rate from day to day. World Health Organization (2010) ranked Malaysia as sixth highest adult obesity rate in Asia. At that time, sixty percent (60%) of Malaysian aged 18 and above, is categorized as overweight and obese. This situation has rung bell towards the Malaysian Ministry of Health. According to Must, Spadano, Coakley, Field, Colditz and Dietz (1999), obesity had been a main health concern for public as it is relates to chronic disease such as heart disease, stroke, diabetes, hypertension, elevated blood lipids, osteoarthritis and cancer. In addition, overweight and obesity can cause decreasing in level and amount of physical activity (Eck, Klesges, Hanson & Slawson, 1992).

During a press interview, Prof Dr. Mohd Ismail, the president of Malaysian Society for the study of obesity mentioned that

"Once you are obese, it will be a lifelong problem. However, we do not recognize that obesity is a disease! No one cares and think it is okay to be fat,"

(Edward, 2013)

Hence, this research is focus on the relationship of BMI with caloric intake and physical activity in order to improve our lifestyle.

2.2 BMI Background

2.2.1 BMI and Health Status

In general, our body mass depends on the calories we take daily. The higher the amount of calories we take, the higher our body mass is and vice versa. Caloric intake plays an important role for us to observe our weight, either it is increasing or decreasing. There are specific caloric intake for different group of people in order to maintain health and avoiding ourselves from health problems. BMI is a good indicator for us to measure our weight status.

There is an epidemic of obesity with an increasing number of overweight and obese adult (Ogden, Carroll & Kuczmarski, (2006). On the other hand, Wake,

Salmon, Waters, Wright and Hesketh (2002) mentioned that there is large number of overweight or obese children. This shows that obesity involves both adult and children. In addition, overweight or obesity may lead to negative impact to the child's health whether in short or long term. These children will experience limitation in their health, physical functioning, psychosocial well-being and family relationship. The impact is still the same for the overweight or obese adult. Yan et al. (2004) stated that overweight or obese adult has lower health perception, physical and social functioning and also mental well-wellbeing.

Compare to normal weight adult, underweight and obese adult are highly possible to have a chronic disease including hypertension, type 2 diabetes, coronary heart disease, asthma and cancers (Borkan, Hults & Glynn, 2006; Centers for Disease Control and Prevention, 2014). A research by Vortman and Eisner (2007) highlighted the relationship between body weight and asthma health status. People in obese category of BMI is said to have higher risk for daily or nearly daily asthma symptom than people in normal weight category of BMI.

2.2.2 BMI and physical activity

Physical activity is identified as important biologic determinant of overweight. By doing physical activity, there is positive impact on health which relates to bone health, cardiovascular disease and certain cancers (National Institute of Health, 1987). Physical activity can reduce obesity as mentioned by US Department of Health and Human Services (1996), there is a positive impact on growth and development for children and adolescences with the presence of physical activities. On the other hand, the avoidance of weight can and participation in regular physical activity can help to prevent ourselves from coronary heart disease (Li et al., 2006).

Furthermore, a research conducted by Weintein et al. (2004) proved that BMI is the independent determinant in the development of type 2 diabetes mellitus. Increase in physical activity led to decreasing level of diabetes risk by

controlling our BMI. Tuomilehto et al. (2001) mentioned that improvement in diet and physical activity can reduce the risk of diabetes even though the target weight loss is not achieve by the person.

Thus, strategies of dietary intakes and physical activity is required. Strong et.al (2005) mentioned that increasing the level of physical activity from moderate to vigorous intensity promotes a better health for youngster and one of the way in disease-prevention strategies. The communities should have effort to promote healthful dietary intakes and active lifestyle in children and adolescents.

2.4 Possible Solution

According to Gartner (2013), there is increasing in number of downloading mobile applications form all store worldwide as shown in Figure 1 below:

DOWNLOADS OF MOBILE APPS FROM ALL STORES WORLDWIDE 2010-2016 ACCORDING TO GARTNER						
	2011	2012	2013	2014	2015	2016
Free Downloads	22.1 billion	40.6 billion	73.3 billion	111.9 billion	189 billion	287.9 billion
Paid for Downloads	2.9 billion	5.0 billion	8.1 billion	11.9 billion	16.4 billion	21.7 billion
Total Downloads	24.9 billion	45.6 billion	81.4 billion	131.7 billion	205.4 billion	309.6 billion
Percentage free downloads	88.4%	89.0%	90.0%	91.0%	92.0%	93.0%

Figure 1: Downloads of Mobile Apps From All Stores Worldwide 2010-2016

Figure 2: Mobile Sites vs. Apps

Based on the figure 1, it shows that the development of mobile application is growing from various platform such as iOS and Android. This is because there is a huge number of mobile device produced in order to meet customers' demand and there is growing in usage of mobile applications nowadays. Increasing in number of mobile devices available in market creates a new opportunity for the mobile application's developers to introduce their product. Estimation of more than 250, 000 applications will be available in various store for different type of operating system (Wasserman, 2010).

According to Wasserman (2010), mobile applications are differ from traditional software applications in term of potential interaction with other applications, sensor handling, native and hybrid (mobile web) application, integration of hardware and software platforms, security, user interface and testing complexity. As such, mobile applications allow users to access large amount of information faster. Hence, the author choose android platform to develop HealthSquare.

2.3 Existing System

It is very difficult to find an existing application which had the same purpose of HealthSquare that helps in proposing a healthy lifestyle for the users based on the BMI calculation which integrates caloric intake and physical activity. But, there are other applications using BMI as their determinant in other aspect.

2.3.1 MyFitness Calculator Mobile Application

There are 250 mobile applications based on BMI calculation available on Google Play. But most of the applications act only as BMI calculator which calculates a person BMI and display weight status only. No other information are available. MyFitness Calculator is an application to measure daily fitness requirement based on calorie and nutrition intake. This application refer to TDEE Calculator which calculates the amount of calories burn in 24 hours including sleeping, working, exercising, playing and digesting food. There is BMI Calculator feature in this application but it only shows body weight status and act as reference material to the users whether to gain or lose weight.

Figure 3: Features of MyFitness Calculator

2.3.2 BMI & Daily Need Calculator by SELF Web Application

This application measures BMI and provide information on minimum daily nutrients need based on the physical activity inserted by the users. The total calories display is to maintain current weight only. Personal adjustment of calories is required in order to gain or lose weight to get ideal weight.
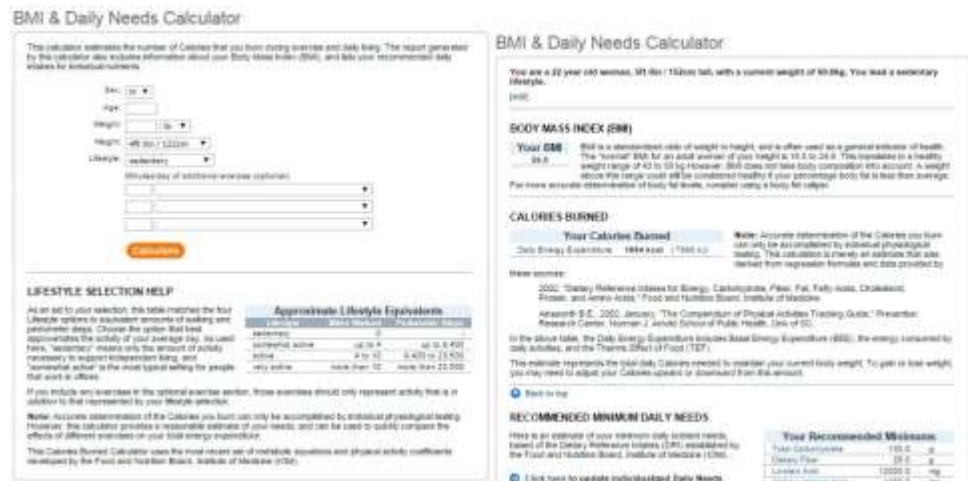

Figure 4: Features of BMI & Daily Need Calculator

2.3.2 Body Mass Index Mobile Application

Body Mass Index is a mobile application available on Google Play which calculates a person's BMI based upon factors like Gender, Age, Height and Weight. This application enables user to calculate BMI, weight goal, body fat percentage, ideal body weight and daily calorie needs with the presence of weight loss diet plan. This application only display the menu for losing weight especially for the western community. In addition, the main focus of this application is to provide users with information regarding to body weight in order achieve an ideal body weight.
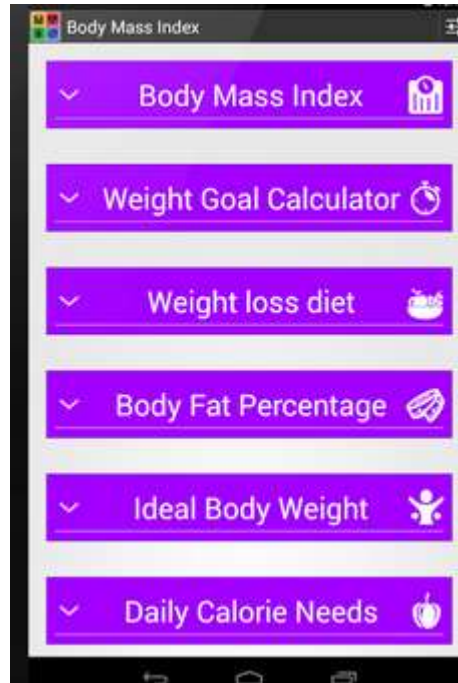
Figure 5: Features of Body Mass Index

2.5 Previous Work Comparison

Based on the existing systems discussed by the author earlier, the summary of all those three systems is provided in the table 2 below:

Table 2: Summary of Existing Application

Application	Developer	Description	Limitation
MyFitness Calculator	Abhinav Khanger (2014)	It provides information about daily fitness requirement based on calorie needs. It is depends on user whether to do maintenance, fat loss or bulking on their body.	The information provided is usually understandable by users who concern about their body such as body builder. For example, rep max may be a jargon word for normal people as they do not expose to the theory. In addition, The data of calories per day can be change

			according to users need and the result on ther weight might be different as they expected.
BMI & Daily Need Calculator	SELF (2014)	It provides information of BMI, calories and daily nutrient needed in order to maintain current body weight.	In order to gain or lose weight, users are required to adjust their calories upward and downward from current calories amount. No assistance is provided for the users to change their body weight.
Body Mass Index	Ezhil (2014)	It provides information for the users to get information about weight by calculating BMI, body fat percentage and daily calorie needs in order to reach the goal weight or ideal bodyweight as display in the application.	Despite of other weight plans, it only provides a weight loss diet plan. This only applicable to users who aim to lose weight and not the others. Furthermore, the meals suggested is based on western taste only.

2.6 Research Gap

Based on the above summary, it shows that there are gaps between those applications with HealthSquare. None of those application offered notification feature to the users in order to manage their lifestyle as intended by the author to implement it in HealthSquare. A notification can increase users' awareness on their health and lead to a healthy lifestyle. In addition, HealthSquare will provide a meal plan based on Malaysian taste, where users cannot found in other applications. Furthermore, Health Square will depends on BMI only in order to determine users' meal and physical activity for the purpose to obtain normal BMI. Users can also get external information through HealthSquare.

2.7 Summary

This chapter shows the critical analysis of BMI towards health status and physical activity of an individual. From the study, the author found that there is large number of people using mobile application in their everyday life. There is a wide number of health applications available on the market and there are gaps between the existing application and the new proposed application which is known as HealthSquare. Therefore, it can be concluded that HealthSquare is a totally new insight for managing healthy lifestyle especially for Malaysian users.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter consist of both methodologies for development and research used in this project. For development methodology, the author decided to use Rapid Application Development (RAD) method as this method is one of the System Development Lifecycle (SDLC) methodology. In accordance to collect data for this research, the author had conducted a survey in form of questionnaire and do observation for additional information.

3.2 Development Methodology

Rapid Application Development (RAD) is an approach to deliver a system in short time. Rapid means fast which enables faster development of this application and provides higher quality product. The main reason of using this methodology is because of limited time provided to complete this project. The author is given only 28 weeks to complete this project. In addition, the development of this application starts from a scratch where a good time management is required in order to ensure this project finish according to the plan.

Furthermore, this methodology is suitable to apply in this project because this methodology is specifically develop for a well-defined and narrow scope of study. In addition, the data for this project is uncomplicated and it is preferable to be used by a small group or an individual. In this project, the technology used is available freely on the market that helps the author to develop project faster.

By using RAD approaches, the author may put less effort on planning task and focus on the development of the application in favor of rapid prototyping. This condition will helps the author to develop an application which satisfy the need of end-users. This is because the author can make changes during the development process for improvement of the application. As RAD method is design for speed based on a task list and a work breakdown structure, this project is broken down into 4 phases which are requirement planning, prototyping, testing and deployment as per figure 6 below:
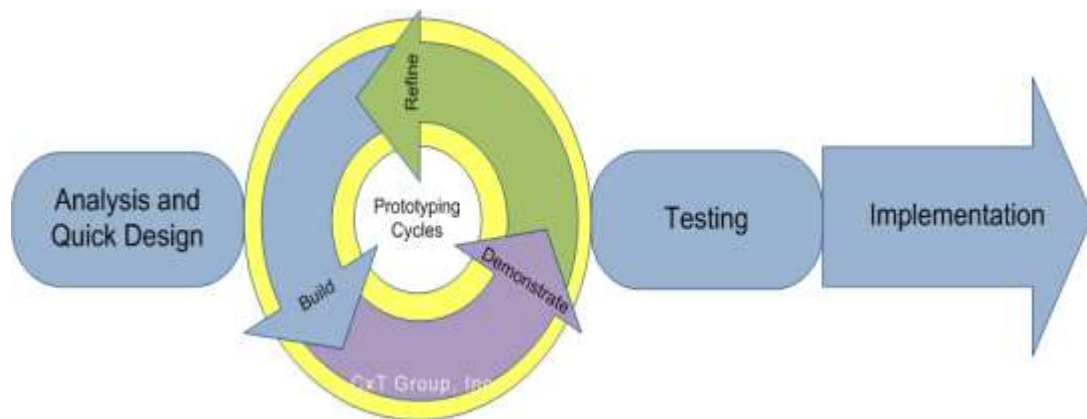

Figure 6: RAD Methodology

3.2.1 Analysis & Quick Design - Requirement planning

The author has been assigned to a supervisor during the third week of FYP1 based on the proposed topic. A Gantt chart and key milestone has been created to assist the author in the development of the project. In addition, both of this schedule chart will help the author to complete the project within the timeframe. Below is the key milestone for this project and the Gantt chart can be found in APPENDIX A.
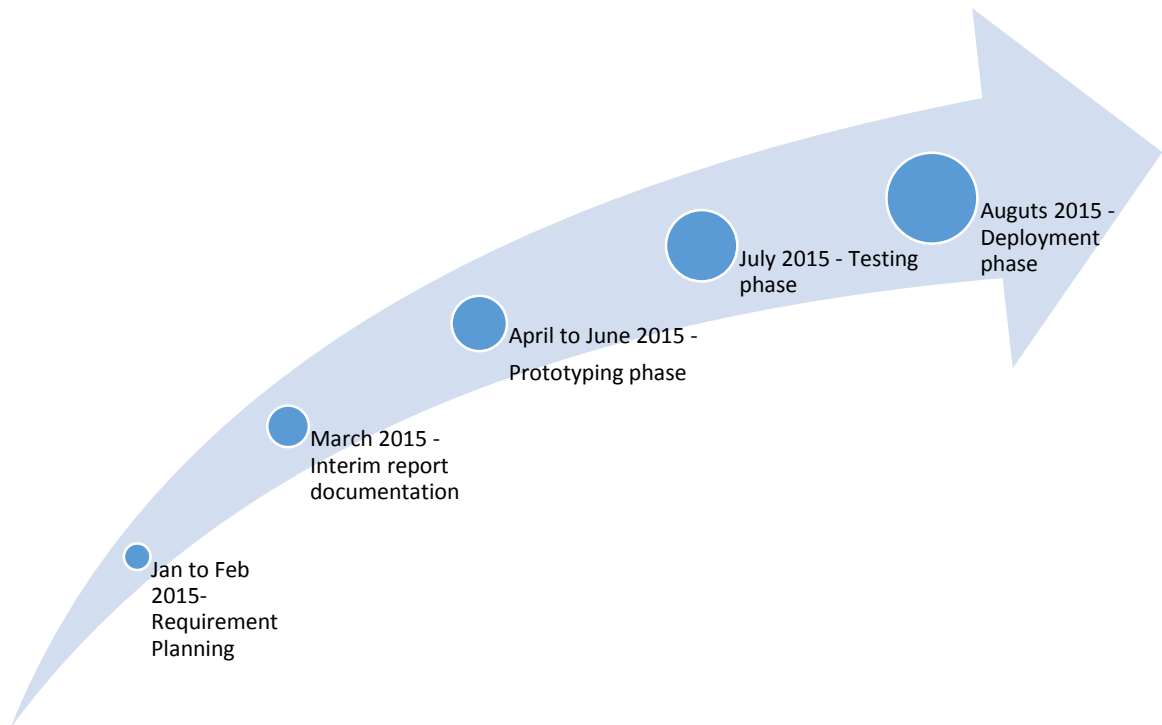
Figure 7: Key Milestone

During this planning phase, all the requirements of the product are identified. The author had done the preliminary research to obtain information relates to the topic by analyzing research papers and other reliable sources especially for the existing system and application. This is useful especially to identify either the current project is similar with existing ones, an improved version or a totally new approach to solve the problem. For data collection, the author used survey technique via questionnaire distribution and observation.

Table 3: Functional Requirements

No.	Functional Requirements
1	The application shall allow users to calculate BMI and get their current weight status and calorie needed in order to reach normal weight.
2	The application shall notify users on the meal and fitness plan according to the schedule.

3.2.2 Prototyping Phase

During this phase, a prototype will be develop to demonstrate and obtain users feedback and refining that result. The author need to design the application and model it using use case and activity diagram to show the functionality and flow of the application. This diagrams will helps the author to develop the product more easily by visualizing them. The prototype will be develop using MIT App Inventor 2.
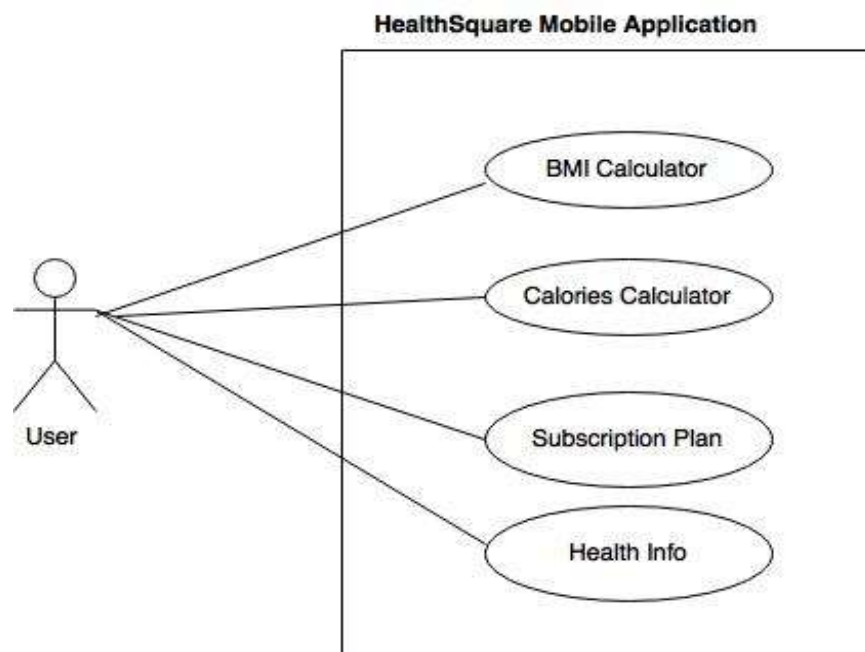

Figure 8: Use Case Diagram

17

Figure 8 above shows use case diagram when user triggers any of the features offered by HealthSquare. There are four main features offered in order to maintain their lifestyle. If a user trigger button BMI Calculator, user should enter gender, age, weight and height accordingly and the BMI and weight status will be appear. It is the same for Calories Calculator. The difference is user should choose his/her physical activity within a week to determine the caloric intake. The application will propose the caloric intake without physical activity, scientifically called as Basal Metabolic Rate (BMR) and the application also will proposed the caloric intake with physical activity, known as Total Daily Energy Expenditure (TDEE). If the user required a healthy lifestyle, Subscription Plan button should be trigger to subscribe meal and fitness plan and user will get notification based on the schedule. Health information is important for user to obtain knowledge regarding their weight and the consequences. The Health Info offers various type of health info based on related sites and user will be direct to the health site.
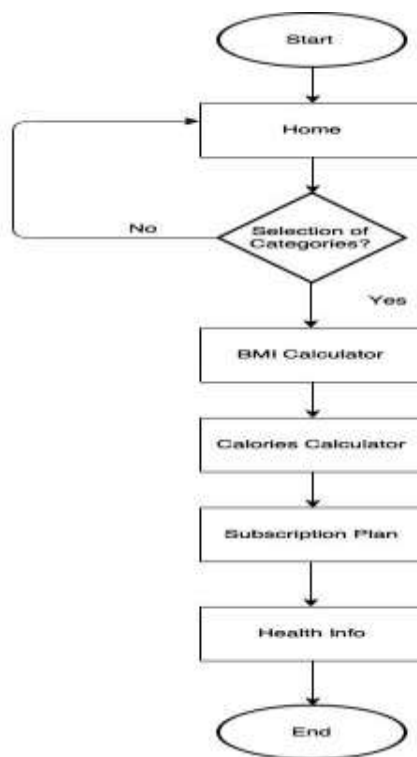

Figure 9: Flow Chart

Figure 8 above shows the interactions between the user and HealthSquare Mobile Application. User can start the flow by open the home screen of the app. The user can choose either to select categories that have the four features or going back to home screen.

3.2.3 Testing phase

The author has conducted a Usability Testing to get users feedback about the application. In addition, this feedback will help the author to do some improvement if required in the future.

3.2.4 Deployment/Implementation Phase

This is the last phase for RAD methodology. At the end of this course, after some improvement had been done to the prototype based after the Usability Testing session, the application will be ready to be used by end-users to manage their lifestyle.

3.3 Research Methodology

The author uses literature review, questionnaire and observation methods to gather data and information about BMI and its importance towards community based on their lifestyle. Based on the two approaches, the author will be able to provide solution in order to overcome related problems.

3.3.1 Questionnaire

The researcher used questionnaires to collect data. According to Vockel and Asher (1995), the questionnaire is defined as an instrument used to collect data in order to assist the researcher to generalize the findings from a sample of

responses to a population. Questionnaires were used to obtain factual data, attitudes and opinions in a structural framework from respondents.

In this project, the author will conduct two survey in different time. First survey has been conducted by distributing questionnaires to the local community to obtain public awareness on BMI and healthy lifestyle. The questionnaires was distributed among students of Universiti Teknologi PETRONAS. There are 20 respondents from different background and age, range between 21 to 25 years old.

Based on the questionnaires, the author able to obtain feedbacks from public about their lifestyle and weight status. In addition, the questionnaire provide solution for the author as most of the respondent thought that mobile application will assist them in planning their healthy lifestyle.

Next, second survey will be conducted after the implementation phase to obtain end-users feedbacks relate to the application based on the user experience. From this survey, the author can evaluate the application for improvement in the future.

3.3.2 Observation

Observation is either an activity of a living being, such as a human, consisting of receiving knowledge of the outside world through the sense, or the recording of data using scientific instruments. The author did the observation on the lifestyle of university students randomly. From the observation, the author able to observe their eating behavior and physical activity. Many of them prefer fast food meals and neglect to do any of physical activity with many excuses. In addition, most of them neglected their meal especially breakfast. This situation leads to other problem such as energy loss and gastric. Hence, the author comes out with the solution to provide healthy lifestyle planning to assist those people.

3.4 Tools

For this project, the author requires both hardware and software tools. For the hardware, the author need an android based smartphone and a personal laptop with the following minimum tecnical requirements:

a) System type: 32bit Operating System

b) Processor: Intel® Core™ i3

c) Memory (Random Access memory): 2.00 GB

For software tools, the laptop should be run in Window 7 operating system and requires access to web browser for developing the application at App Inventor 2 developer site by Massachusetts Institute of Technology (MIT). In short, this platform is called MIT App Inventor 2. The MIT App Invertor 2 is an open-source web application to create software application for the Android Operating System. This platform allows developer to drag and drop visual objects for interfaces of the application and it is a block-based programming tools to create an application that can run on Android devices. Lastly, the author requires Microsoft Office software for documentation.

3.5 Feasibility Study

The author has conducted a feasibility study to ensure the project's viability. The feasibility study is divided into 3 criteria as discussed in the next sub-section.

3.5.1 Operational

The author believes that this application will help the society to improve their lifestyle by using a mobile application as health plan and a reminder. This is because people nowadays own a smartphone that work closely with them in daily activities. Mobile application is usually used to get faster information and save time. The users may adapt to the application faster as they usually depend on the mobile applications and it is not a new thing for them as HealthSquare will be simple and easy to use.

3.5.2   Technical

Based on the analysis, the technology used by the author is widely used by most developers. In this project, the author used MIT App Inventor 2 as a platform to develop HealthSquare mobile application running in Android Operating System. Even though there are many application based on the BMI calculation but there are gaps between HealthSquare and other applications. The size of the project is narrow in scope and involves the author only as developer. It shows that this project is feasible to proceed.

3.5.3   Economical

Based on the cost estimation, the cost for this project will be cost benefit as the author requires small amount of money only in the development process. This is because the list of hardware mentioned above is fully own by the author. In addition, the software is available in the laptop including MIT App Invertor 2 developer site which is free to browse.

3.5.4 Schedule

The time allocate for this project is enough as the author applied RAD method in the development of this application and will be finished in time according to plan.

3.6 Summary

Overall, in this chapter, the author discussed about the development and research methodology used by the author in this project. The author used RAD method which comprises of 4 main phases; requirement planning, prototyping, testing and deployment. For the research methodology, the author has obtained information from the literature review. In addition, the author also used questionnaires to get feedback from the local community on the topic being discussed in this project. Observation was also done to

analyze the behavior of the community. The tools and feasibility study was described in details in this chapter for the development of HealthSquare.

CHAPTER 4

RESULT & DISCUSSION

4. 1 Introduction

In this chapter, the author will discussed further about data gathering and analysis based on the research that has been conducted based on different method. This section will present the usability testing and prototype of HealthSquare. At the end of this chapter, readers can see the benefits of having HealthSquare to manage a healthy lifestyle.

4.2 Result of Data Gathering

The author used questionnaire and observation method in order to generate information for the proposed application. This information is useful for the author to find meaningful information and analyses users' demand toward current technology.

4.2.1 Questionnaire

A set of questionnaire is distribute among local community to obtain their feedback on their lifestyle (APPENDIX B). The author managed to obtain feedback from 20 students comprises of 5 male and 15 female students. The respondents' age is between 21 to 25 years old only. From the questionnaires, the author managed to analyze their lifestyle and the result will be discussed below.
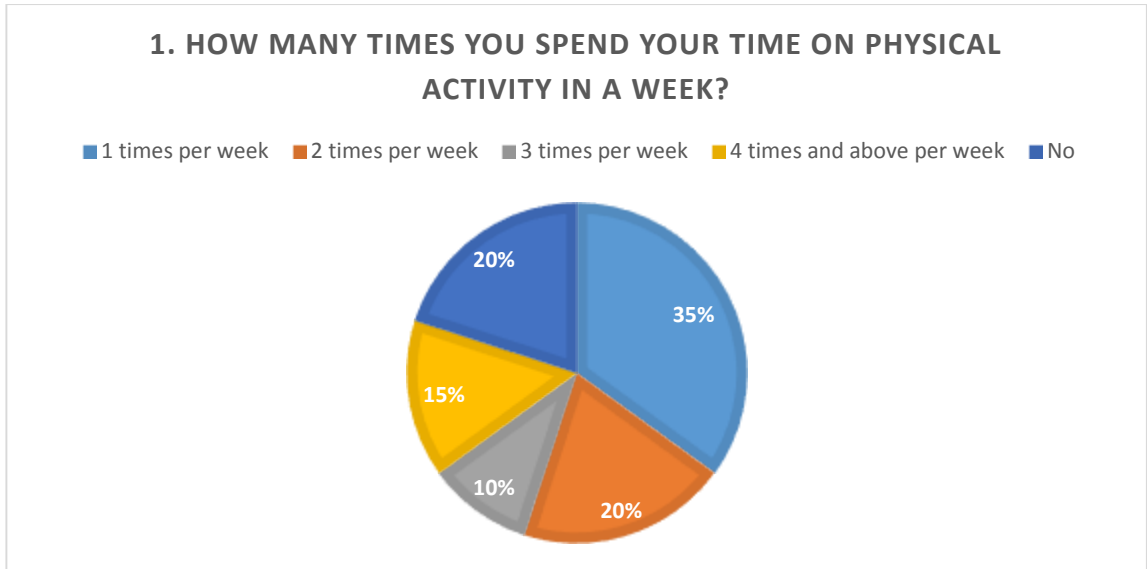
Figure 10: Question 1

For the first question, 35 % of respondent only did 1 times per week of physical activity followed by 20 % of respondent did involve in physical activity 2 times per week and no activity respectively. Meanwhile, only 10 % of respondent involve in physical activity 3 times per week and the rest 15 % did involve in physical activity 4 times and above per week. From the data, the author assumed that only small number of respondent did not involve in any physical activity.

2. HOW MANY MEALS YOU TAKE PER DAY?

■1 ■2 ■3 ■4 ■5 and above

0%
15%
40%
45%
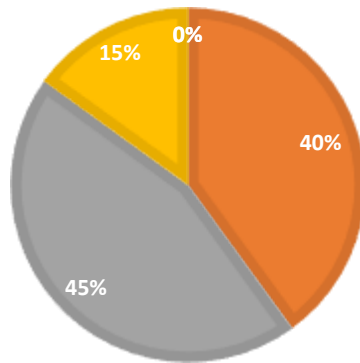
Figure 11: Question 2

For the second question, 45 % of the respondents did take 3 meals daily and 40 % of them did take only 2 meals per day only. Only 15 % of them eat 4 meals per day.

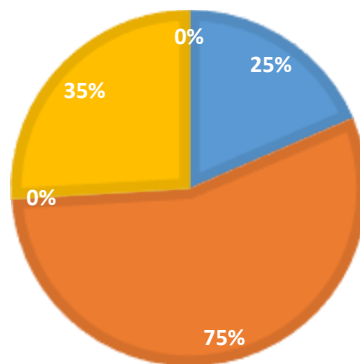## 3. WHICH MEAL IS IMPORTANT TO YOU?

■Breakfast ■Lunch ■Tea ■Dinner ■Supper

0%
25%
35%
0%
75%

Figure 12: Question 3

In order to relate with question number 2, the author did asked about the important meal to the respondents. Three quarter of respondents agreed that lunch is important for them instead of breakfast, only 5 % of them vote for it and the rest 7 % agreed that dinner is important for them. For this question, one respondent can choose more than one meal as their important meal. Theoretically, breakfast is the most important meal as breakfast can provide energy to the consumer. This shows that they did not apply correct meal intake or they did not aware of the condition.
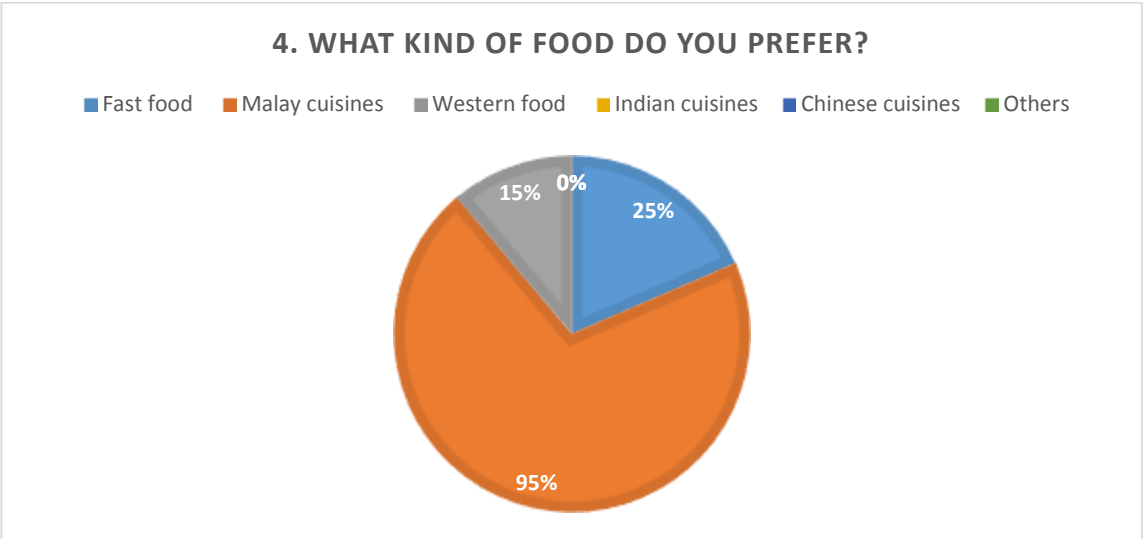
Figure 13: Question 4

For question 4, 95 % of the respondent agreed that they prefer Malay cuisine rather than other type of food. For this question, the respondent can choose more than one answer in order to obtain actual data. From this data, the author can see their meal preferences.
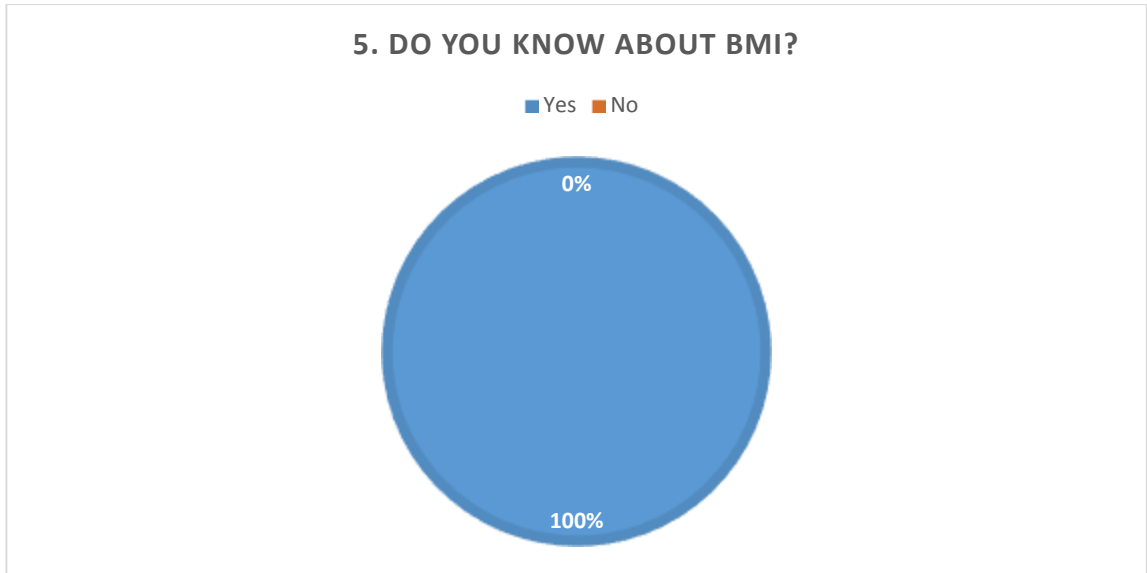
Figure 14: Question 5

Based on question 5, all the respondents know about BMI. This shows that the information of BMI is widely spread among the community as the calculation only required weight and height.
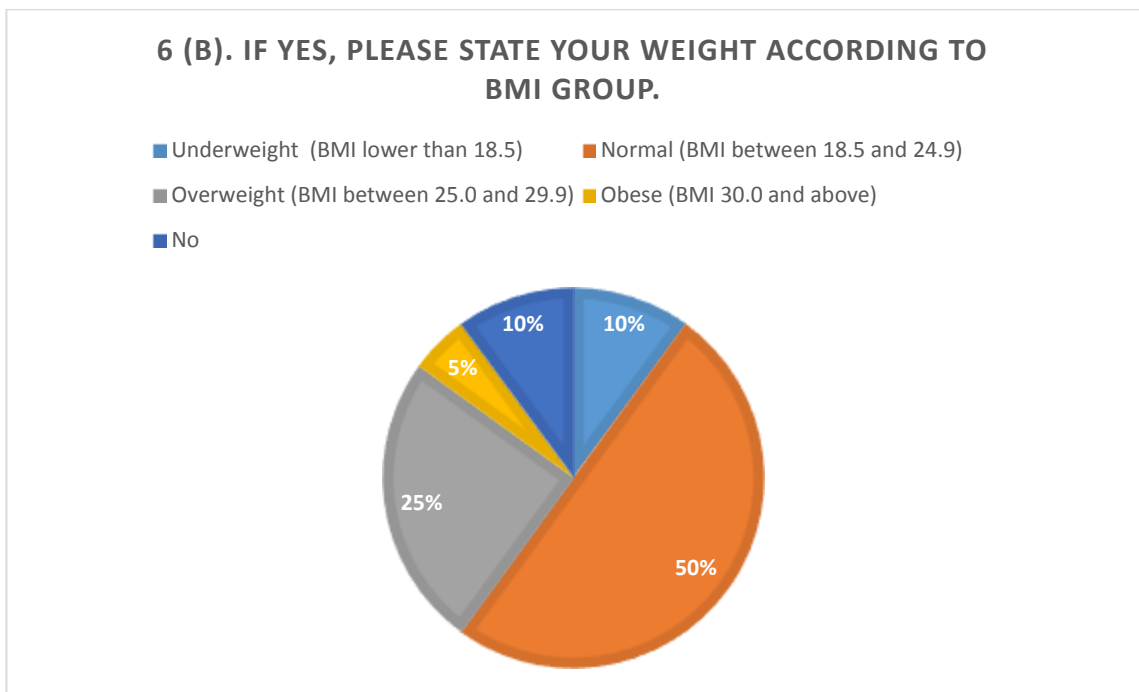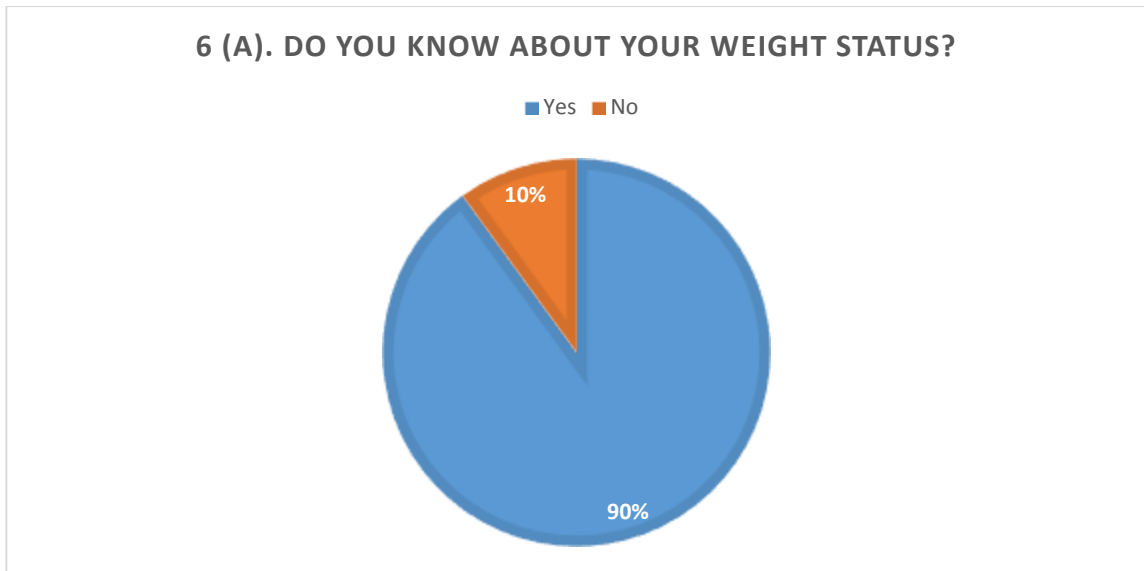
6 (A). DO YOU KNOW ABOUT YOUR WEIGHT STATUS?

■ Yes ■ No

10%

90%

6 (B). IF YES, PLEASE STATE YOUR WEIGHT ACCORDING TO BMI GROUP.

■ Underweight (BMI lower than 18.5)   ■ Normal (BMI between 18.5 and 24.9)
■ Overweight (BMI between 25.0 and 29.9) ■ Obese (BMI 30.0 and above)
■ No

10%   10%
5%
25%
50%

Figure 15: Question 6

Only 10 % of respondent did not aware of their weight status, whereas the other respondents aware about their weight status. 10 % of respondent are overweight, 50 % of respondents have normal BMI, 25 % are categorized as overweight and only 5 % are in the obese category. From the above data, it shows that there are all categories of BMI presence in the university environment. The author can conclude that a health assistance

is required in order to control their weight, for those in underweight, overweight and obese category.

7 (A). DO YOU OWN A SMARTPHONE?

Yes ■ No

0%

100%

7 (B). IF YES, WHAT IS THE TYPE OF YOUR SMARTPHONE?

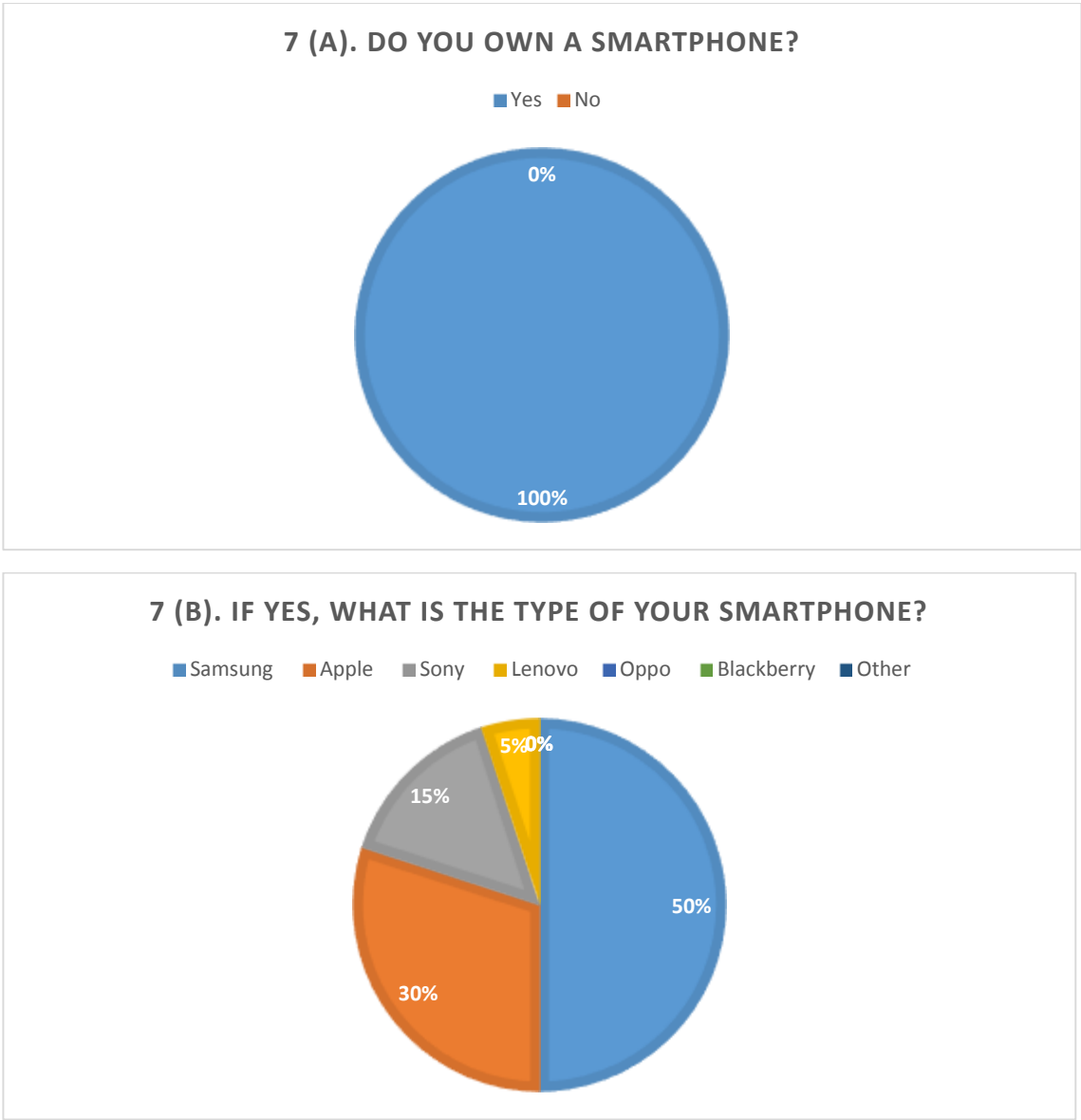Samsung ■ Apple ■ Sony ■ Lenovo ■ Oppo ■ Blackberry ■ Other

5% 0%

15%

50%

30%

Figure 16: Question 7

Based on question 7, all of the respondent have a smartphone and 70 % of them used Android based smartphone. Only 30 % of them using Apple smartphone which

running on iOS operating system. This shows that large number of users used smartphone that running on Android operating system which produced by different producer such as Samsung, Sony and Lenovo.
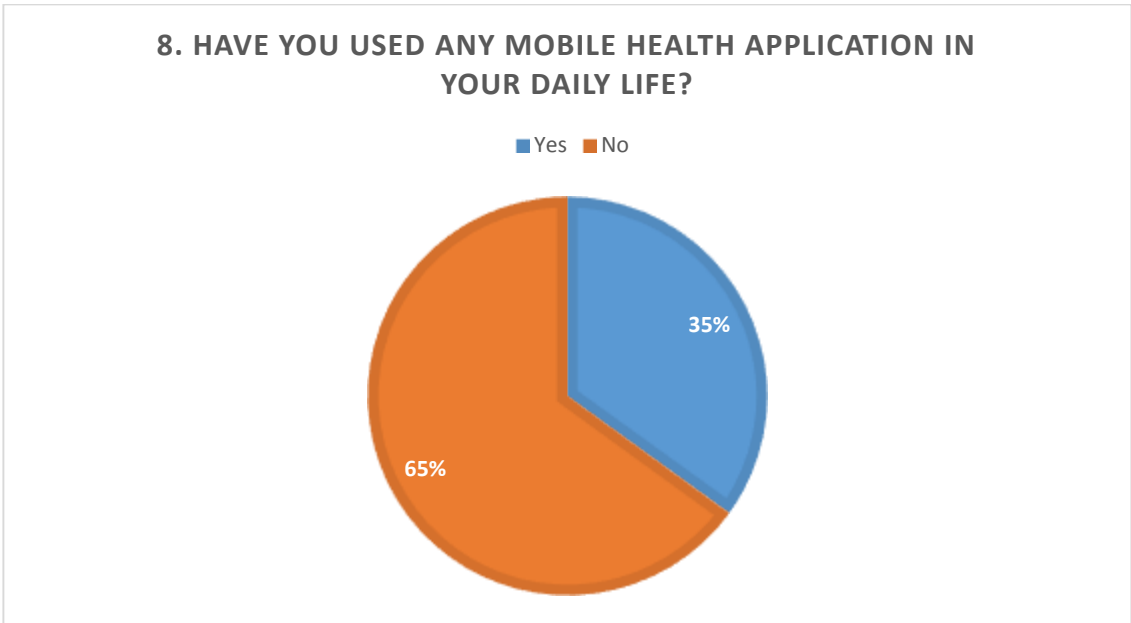

Figure 17: Question 8

65 % of respondent have experience in using mobile applications for their health. For this question, the author can get feedback on their demand features for new proposed application as per following question.

9. WHICH FEATURES IN THE PREVIOUS MOBILE APPS DO YOU LIKE THE MOST? IF YOU DID NOT USE IT BEFORE, PLEASE STATE WHICH FEATURES DO YOU PREFER.

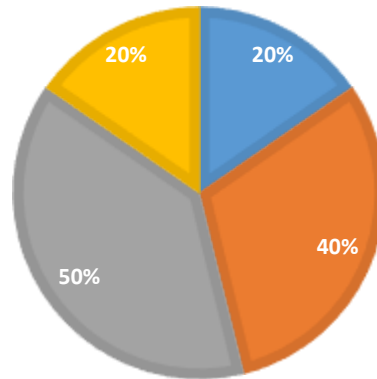■ Health tips   ■ Reminder   ■ Health Planning   ■ Other

Figure 18: Question 9

Half of the respondents agreed that health planning is important features for a health mobile application. For this question, the respondent can choose more than one answer in order to obtain actual data.
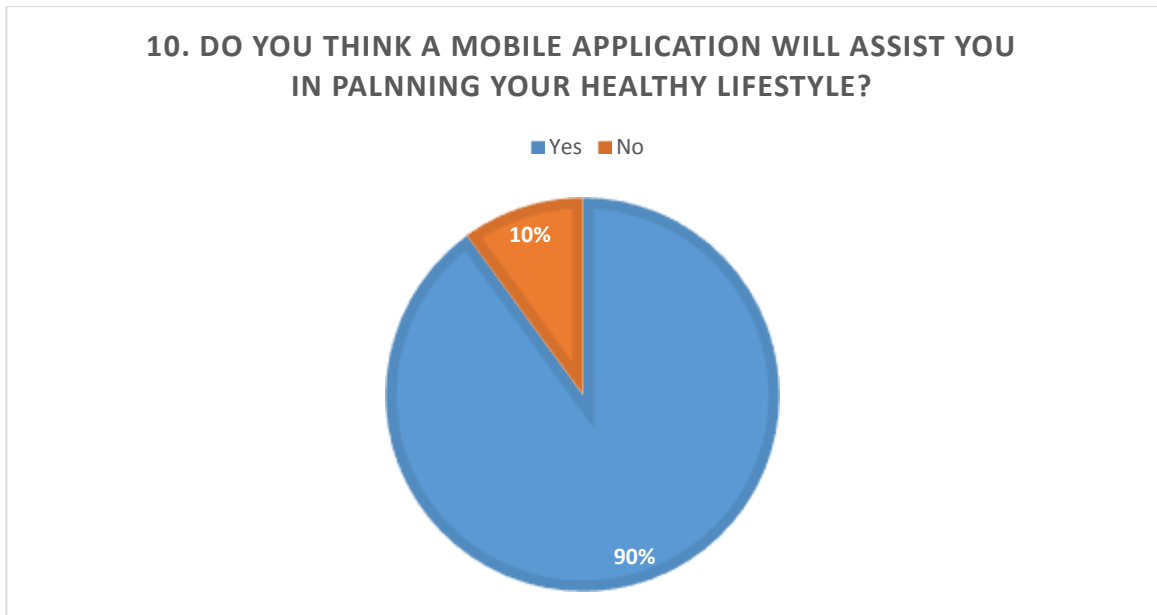
Figure 19: Question 10

Lastly, 90 % of respondents agreed that a mobile application can help them in managing their lifestyle. The author assumed that the respondents preferred a mobile application because they always have their smartphone with them and usually it acts as a planner. It is easy for them to get information in a place.

4.2.2 Observation

From the author's observation in university, there are a small number of students spend their time to do physical activity regularly. The main reason is because they usually give a lot of excuses such as assignment and project. In addition, the schedule of their study is not the same everyday which might demotivate them to do physical activity. The author has observed the eating habits of the students. Many of the students prefer fast food as their meal. This is because fast food restaurants offered fast services and open 24 hours daily. Furthermore, there is increasing number of fast food restaurant operated in this town.

From the observation, the author can conclude that there are imbalance between physical activity and meal intake consume by the local community.

4.3 Prototype

Figure 19 below shows the features of HealthSquare that can be navigate by user. From the home screen, the user can trigger button start to choose their categories. the user will be navigate to categories selection which provides the following features; BMI Calculator, Calories Calculator, Subscription Plan and Health Info. The user can subscribe meal and fitness plan for his/her daily reference.

Figure 20: Home screen and main screen of HealthSquare

Figures 19 above shows the interface design of the home screen and main menu screen. To be able to use the main function of this application, user need to trigger Start button. User will be navigated to the main menu screen with the selection of menu categories, either BMI Calculator, Calories Calculator, Subscription Plan or Health Info. If the user chooses BMI Calculator or Calories Calculator, user will require to input some
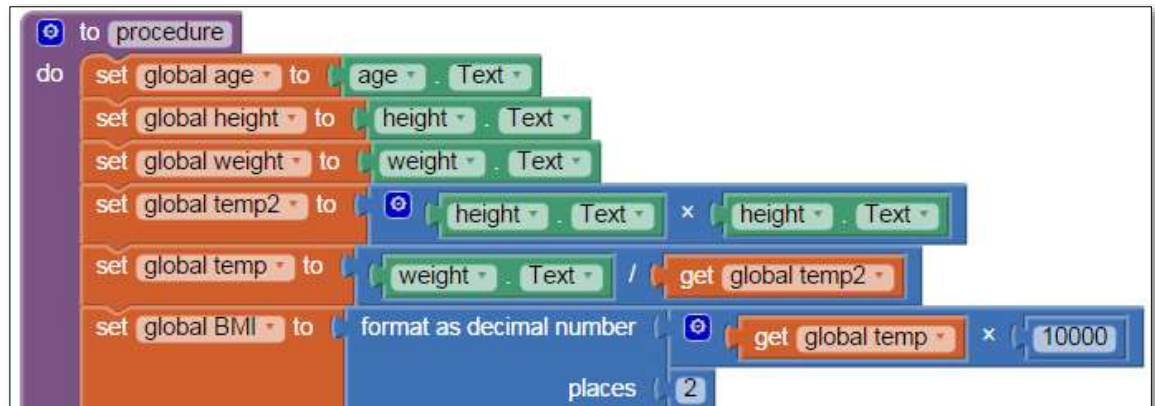
information in order to calculate the BMI and daily caloric intake. Based on the calculation, it will show the BMI, BMI status, the caloric intake before factoring in the physical activity known as Basal Metabolic Rate (BMR) and the caloric need after factoring in physical activity known as Total Daily Energy Expenditure (TDEE) as displayed in the below figure:

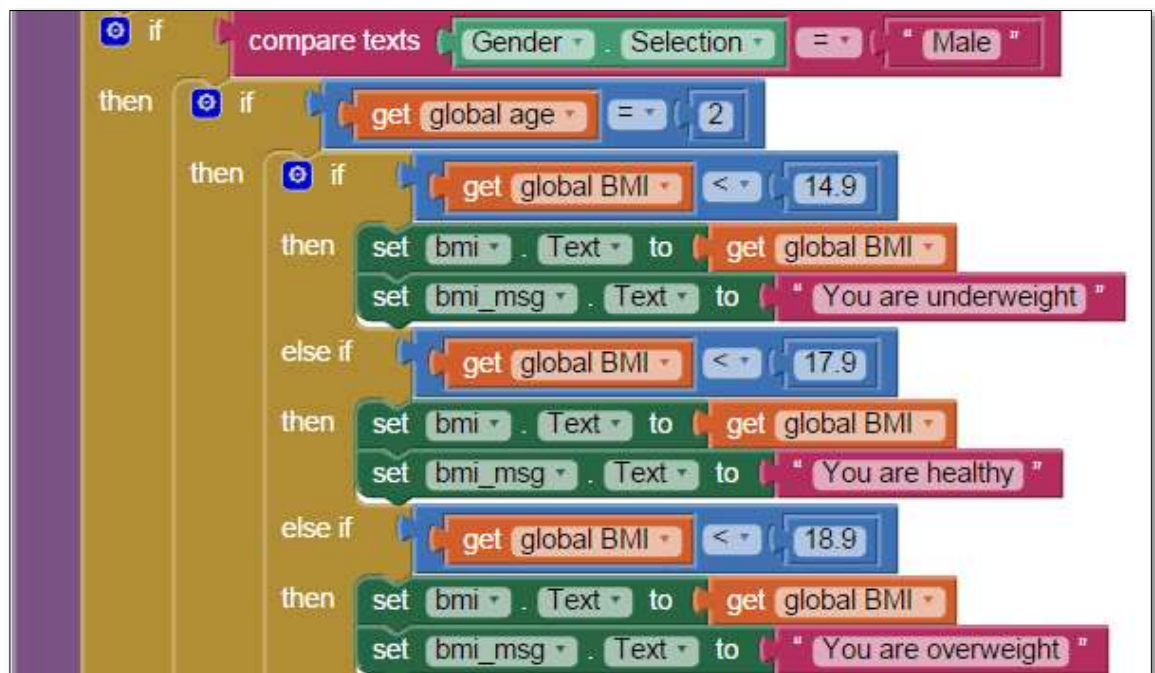Figure 21: BMI Calculator and Calories Calculator features

In order to obtain the above results, it requires the following formulas implemented in the programming block in MIT App Inventor 2:

$$\boxed{\text{BMI} = \text{weight in kg} / \text{height in m}^2}$$

Figure 22: BMI formula

Figure 23: BMI status

Because of the differences in age and gender, the status of each individual is different based on their age and gender shown in APPENDIX C.

$$\text{BMR for Men} = 66 + (6.23 \times \text{weight in pounds}) + (12.7 \times \text{height in inches}) - (6.8 \times \text{age})$$

Figure 24: BMR formula for men

$$\text{BMR for Women} = 655 + (4.35 \times \text{weight in pounds}) + (4.7 \times \text{height in inches}) - (4.7 \times \text{age})$$

Figure 25: BMR formula for women

$$\boxed{\text{TDEE} = \text{BMR} \times \text{physical activity}}$$

As the calculation of TDEE involves physical activity, the calculation will be done based on the physical activity involves.

- Sedentary; little or no exercise, desk job) = BMR × 1.2
- Lightly active; light exercise/sports 1-3 days/week) = BMR × 1.375
- Moderately active; light exercise/sports 3-5 days/week) = BMR × 1.55
- Very active; hard exercise/sports 6-7 days/week) = BMR × 1.725
- Very active; hard daily exercise/sports & physical job) = BMR × 1.9
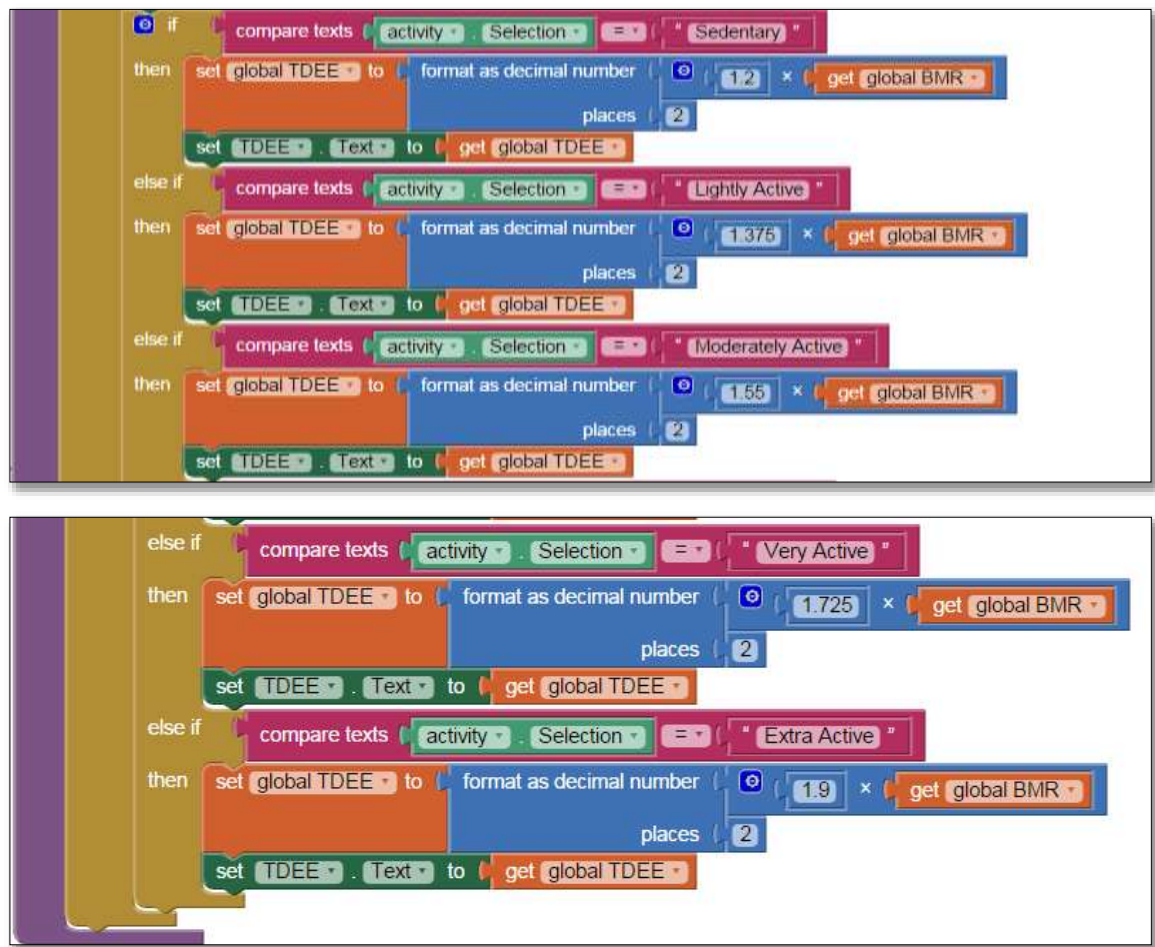
Figure 26: TDEE formula

As per below figure, it shows the meal plan for the user, mostly based on Malaysian cuisine. There are two plans available for the meal, which comprises of 1500kcal and a 1200kcal weight reduction plan. It also provides Subscribe button that acts as a reminder for the user, when they subscribed to the meal plan, to propose the meal time from breakfast to dinner daily. It will help users to reduce the tendency of forgetting the meal time.
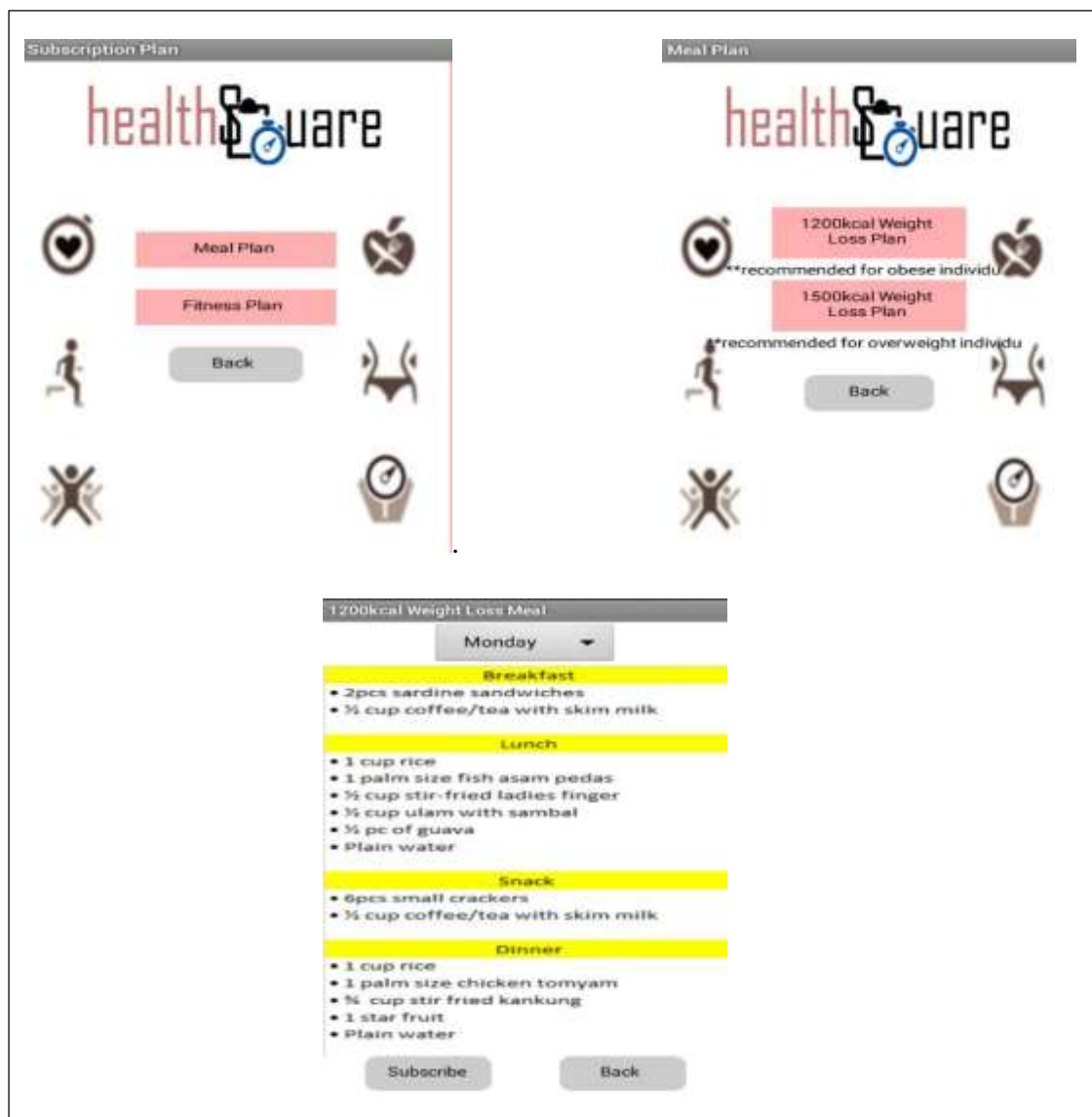
Figure 27: Meal Plan features

The list of meals was set up in a .PNG picture format at the back end process of this application. The full list of meal can be found in APPENDIX D.

Figure 28: List of meal plan

For the fitness plan, it will propose the daily activity required by the user with the presence of stopwatch to record the activity. The user is able to subscribe the plan too for

the reminder of his/her physical activity. For the Health Info feature, it provides information to the user by going direct to the site via an internet connection.

Figure 29: Fitness Plan features

Figure 30: Timer

Figure 31: Health info feature

Figure 32: Redirect to selected website

4.4 Usability Testing

      Usability testing was conducted to get feedbacks from the users of HealthSquare. This is because the feedbacks form the users are very vital for the future enhancement to improve the HealthSquare and usability in order to satisfy the users when using HealthSquare. The usability aspects of the software were measured based on the System Usability Scale (SUS) standard. Ten users are selected randomly which required to fill up a questionnaire after using the application and to answer each question by selecting based on point scale 5-1. The result obtained is shown below:

Table 4: Average of SUS score

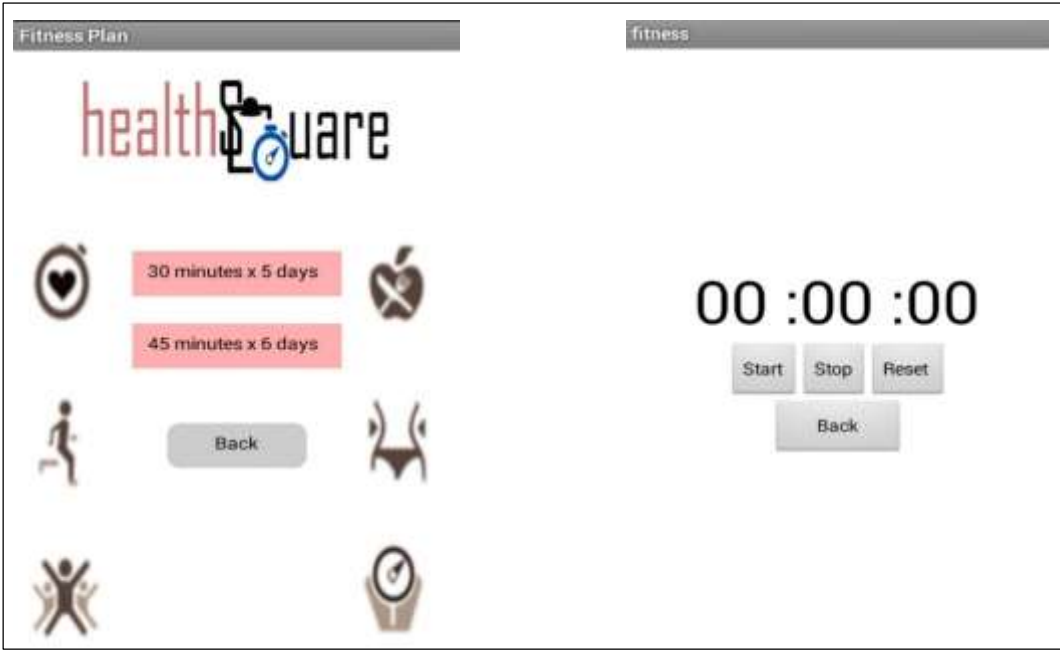| Factors to measure	Average
I think that I would like to use this application frequently:	8.25
I found the application unnecessarily complex:	1.50
I thought the application was easy to use:	9.25
I think that I would need the support of a technical person to be able to use this application:	9.5
I found the various functions in this application were well integrated:	5.00
I thought there was too much inconsistency in this application:	7.75
I would imagine that most people would learn to use this application very quickly:	6.75
I found the application very cumbersome to use:	9.00
I felt very confident using the application:	6.25
I needed to learn a lot of things before I could get going with this application:	9.75
	73 = Good
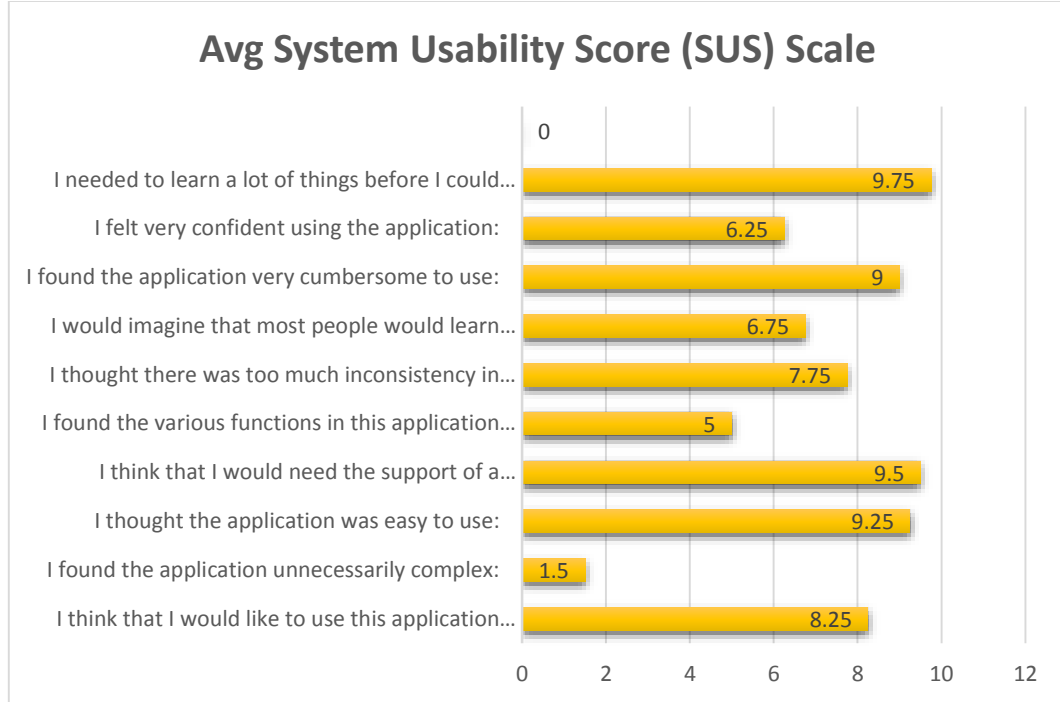
Figure 33: System Usability Score (SUS) Results

Figure 25 shows the average score for each of the question, from a total of ten users. The calculation to obtain average scores for odd-numbered (1, 3, 5, 7, and 9) questions differ from the average scores for the even-numbered (2, 4, 6, 8, and 10) questions. This is because question 1, 3, 5, 7 and 9 expect users to rate more towards the higher side of the scale (3 – 5) to achieve better usability rating, while question 2, 4, 6, 8 and 10 expect the opposites. Below are the formulas to obtain average scores based on the questionnaire outcome:

Table 5: Average SUS formula

Odd-numbered questions;

Average score = [No. of Users * (Scale Position – 1) * 2.5 / Total No. of Users

Even-numbered questions;

Average score = [No. of Users * (5 - Scale Position) * 2.5 / Total No. of Users

Therefore, the total score for System Usability Scale (SUS) of HealthSquare Mobile Application obtained from the ten (10) users is shown below:

Table 6: SUM of SUS average score

Sum of Average Score;

= 9.75 + 6.25 + 9.00 + 6.75 + 7.75 + 5.00 + 9.50 + 9.25+ 1.5 + 8.25

= 73, SUS Score obtained > 72 (Good)

Based on the SUS score, HeathSquare obtained score above 72 which is considered as good application with grade B in the usability standard. This has shown that development process have been done according to the usability aspects. The above average usability quality of this application has proven that it is applicable for all users which may find difficulties in using new implemented application.

4.5 Summary

This chapter briefly explained the results and discussion based on the research conducted by the author. Analyzing of data is conducted to study the lifestyle of local community. The data is obtain by using questionnaire and observation. The results were properly discussed and documented including a prototype and usability testing of HealthSquare.

CHAPTER 5
CONCLUSION

5.1 Introduction

Mobile applications is widely used nowadays in many area such as health, social networking and games. Increasing in number of obesity in Malaysian had create awareness to the author to develop a mobile application based on BMI of an individual. This project focuses on calories intake and physical activity of an individual in order to manage their lifestyle.

5.2 Achieved Objective

The author has identifies the two main objective of this project as describe below:

1) *To develop a mobile application which provide a healthy lifestyle plan for the users and available 24 hours daily based on Malaysian context.*
2) *To conduct usability testing. .*

The objectives of this project was achieved as the author is able to develop a health planning mobile application and has conducted the usability testing.

5.3 Future Work

This project can still be improved with adding more features to the application and not limit to BMI data only. The author plan to include GPS Tracking System to track location of the user while the physical activity is being conducted and add more meal plan, based on the Malaysian cuisines. The Graphical User Interface (GUI) of the application will be improved to attract more users and a recommendation feature should be add on, to provide user with extra information. For instance, the ideal weight for male and female user based on age and gender. In order to help users monitoring their weight, a monitoring program with database to store historic data should be implemented. Furthermore, different group of respondent should be approach in order to get more information and analyze their requirements. This project only covers the scope of Android OS users. In the future, it is possible to create a similar application for other operating system such as iOS and Windows.

5.4 Summary

Based on the final prototype of HealthSquare Mobile Application, it had undergone a tests which is usability testing. The application has been proven to be accepted by users which had shown in the usability testing result. The additional features of the application will be included in order to increase its commercial value. Based on all these criteria considered, the author hope that the project will achieve its main objectives and manage to help people to maintain their healthy lifestyle.

REFERENCES

Centers for Disease Control and Prevention. (2015, February 23). Healthy Weight – it's
    not a   diet, it's lifestyle: About BMI for Adults. Retrieved from
    http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/

HealthStatus. (n.d). Calories And Your Body Mass Index. Retrieved from
    http://www.healthstatus.com/health_blog/body-fat-calculator-2/calories-and-
    your-   body-mass-index/

Hubert, H. B., Snider, J., & Winkleby, M. A. (2005). Health status, health behaviors, and
    acculturation factors   associated with overweight and obesity in Latinos from a
    community and agricultural labor camp   survey. *Prev Med, 40*(6), 642-651.
    doi: 10.1016/j.ypmed.2004.09.001

Godin, G. Shephard, R. J. (1985). A Simple Method to Assess Exercise Behavior in the
    Community. In *Canadian Journal of Applied Sport Sciences* (Vol. 10, pp. 141–146)

Gordon-Larsen, P., McMurray, R. G., & Popkin, B. M. (1999). Adolescent physical
    activity and inactivity vary by ethnicity: The National Longitudinal Study of
    Adolescent Health. *The Journal of Pediatrics*, *135*(3), 301–306.
    http://doi.org/10.1016/S0022-3476(99)70124-1

Li, T. Y., Rana, J. S., Manson, J. E., Willett, W. C., Stampfer, M. J., Colditz, G. A., . . .
    Hu, F. B. (2006). Obesity as compared with physical activity in predicting risk of
    coronary heart disease in women. *Circulation, 113*(4), 499-506. doi:
    10.1161/CIRCULATIONAHA.105.574087

Sauro, J. (2011). Measuring Usability with the System Usability Scale (SUS). Retrieved

    from: http://www.measuringusability.com/sus

Strong, W. B., Malina, R. M., Blimkie, C. J., Daniels, S. R., Dishman, R. K., Gutin, B., .
    . . Trudeau, F. (2005).   Evidence based physical activity for school-age
    youth. *J Pediatr, 146*(6), 732-737. doi: 10.1016/j.jpeds.2005.01.055

Swami, V., & Tovee, M. J. (2005). Male physical attractiveness in Britain and Malaysia:
    A cross-cultural study.   *Body Image, 2*(4), 383-393. doi:
    10.1016/j.bodyim.2005.08.001

Swami, V., & Tovee, M. J. (2005). Female physical attractiveness in Britain and
    Malaysia: a cross-cultural   study. *Body Image, 2*(2), 115-128. doi:
    10.1016/j.bodyim.2005.02.002

Vortmann, M., & Eisner, M. D. (2008). BMI and health status among adults with
    asthma. *Obesity (Silver   Spring), 16*(1), 146-152. doi: 10.1038/oby.2007.7

Weinstein, A. R., Sesso, H. D., Lee, I. M., Cook, N. R., Manson, J. E., Buring, J. E., & Gaziano, J. M. (2004). Relationship of physical activity vs body mass index with type 2 diabetes in women. *JAMA : The Journal of the American Medical Association*, *292*(10), 1188–1194. http://doi.org/10.1001/jama.292.10.1188

Wake, M., Salmon, L., Waters, E., Wright, M., & Hesketh, K. (2002). Parent-reported health status of overweight and obese Australian primary school children: a cross-sectional population survey. *International Journal of Obesity and Related Metabolic Disorders : Journal of the International Association for the Study of Obesity*, *26*(5), 717–724. http://doi.org/10.1038/sj.ijo.0801974

Yan, L. L., Daviglus, M. L., Liu, K., Pirzada, A., Garside, D. B., Schiffer, L., … Greenland, P. (2004). BMI and health-related quality of life in adults 65 years and older. *Obesity Research*, *12*(1), 69–76. http://doi.org/10.1038/oby.2004.10

Task	Week																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Requirement Planning																												
Idenfication of problem	█																											
Define objective of the project		█																										
Preliminary research			█	█	█	█																						
Write up for Chapter 1: Introduction						█																						
Write up for Chapter 2: Literature Review							█																					
Plan for research methodology							█																					
Prototyping																												
Designing the application framework								█																				
Construct flowchart diagram & use case diagram								█																				
Write up for Chapter 3: Research Methodology									█																			
Write up for Chapter 4 and 5: Result & Discussion & Conclusion										█																		
submission of interim report											█																	
proposal defence												█	█															
Develop the application														█	█	█	█	█	█									
Testing																												
User testing																				█	█							
Improvement of the prototype																						█	█					
Pre-SEDEX																								█				
Deployment																												
Viva																									█	█	█	
Final dissertation submission																												█

APPENDIX B

HealthSquare Mobile Application Mini Survey

The purpose of this survey is to obtain feedback on the usage of mobile application in healthy lifestyle.

Age:

Occupation:

Gender:

1) How many times you spend your time on physical activity in a week?
   - o 1 times per week
   - o 2 times per week
   - o 3 times per week
   - o 4 times and above per week
   - o No
2) How many meals you take per day?
   - o 1
   - o 2
   - o 3
   - o 4
   - o 5 and above
3) Which meals is important to you?
   - o Breakfast
   - o Lunch
   - o Tea
   - o Dinner
   - o Supper
4) What kind of food do you prefer?
   - o Fast food
   - o Malay cuisine
   - o Chinese cuisine
   - o Indian Cuisine
   - o Western food
   - o Other:
5) Do you know about BMI?
   - o Yes
   - o No

6) Do you aware of your weight status? If yes please state your weight status according to BMI group.
   - o Yes
     - o Underweight (BMI lower than 18.5)
     - o Normal (BMI between 18.5 and 24.9)
     - o Overweight (BMI between 25.0 and 29.9)
     - o Obese (BMI greater than 30.0)
   - o No

7) Do you own a smartphone? If yes, what is the type of your smartphone?
   - o Yes
     - o Samsung
     - o Apple
     - o Sony
     - o Blackberry
     - o Oppo
     - o Lenovo
     - o Other :
   - o No

8) Have you used any mobile health application in your daily life?
   - o Yes
   - o No

9) Which features in the previous mobile apps do you like most?
   - o Health tips
   - o Reminder
   - o Health Planning
   - o Other:

10) Do you think a mobile app will assist you in planning your healthy lifestyle?
    - o Yes
    - o No

APPENDIX C

Age in years	BOYS			GIRLS		
	Under-weight if BMI is below	Over-weight if BMI is above	Obese if BMI is above	Under-weight if BMI is below	Over-weight if BMI is above	Obese if BMI is above
2	14.9	17.8	18.8	14.6	17.8	18.7
3	14.5	17.2	18.0	14.3	17.0	18.0
4	14.3	16.8	17.7	13.9	16.6	17.7
5	14.1	16.7	17.7	13.7	16.5	17.8
6	13.9	16.7	17.9	13.7	16.7	18.3
7	13.9	17.0	18.5	13.7	17.2	18.9
8	14.0	17.4	19.3	13.8	17.6	19.8
9	14.2	18.1	20.3	13.9	18.4	20.9
10	14.4	18.8	21.2	14.2	19.2	22.0
11	14.8	19.6	22.2	14.7	20.1	23.0
12	15.3	20.3	23.2	15.2	21.0	24.1
13	15.8	21.1	24.1	15.7	21.7	25.0
14	16.3	21.9	24.8	16.2	22.4	26.0
15	16.8	22.6	25.6	16.7	23.1	26.8
16	17.4	23.4	26.4	17.2	23.7	27.5
17	18.0	24.2	27.2	17.6	24.3	28.2
18	18.6	24.9	27.9	17.9	24.8	28.7

APPENDIX D

1200kcal				
	Breakfast	Lunch	Snack	Dinner
Monday	• 2pcs sardine sandwiches • ½ cup coffee/tea with skim milk	• 1 cup rice • 1 palm size fish asam pedas • ½ cup stir-fried ladies finger • ½ cup ulam with sambal • ½ pc of guava • Plain water	• 6pcs small crackers • ½ cup coffee/tea with skim milk	• 1 cup rice • 1 palm size chicken tomyam • ¾ cup stir fried kankung • 1 star fruit • Plain water
Tuesday	• 1 cup rice porridge • ½ cup coffee/tea with skim milk	• 1 cup spaghetti aglio olio with prawn and squid • 1 bowl salad with dressing • 1 pear • Plain water	• 3pcs cream crackers • ½ cup coffee/tea with skim milk	• 1 cup noodles • 1 palm size chicken soup + ¾ veggie • 1 slice papaya • Plain water
Wednesday	• 1 piece of thosai • ½ cup UHT fresh milk	• 1 cup rice • 1 palm size fish curry • ½ cup stir-fried mixed veggie • ½ cup ulam with sambal • 1 slice tembikai • Plain water	• 1 pc putu mayam • ½ cup coffee/tea with skim milk	• 2 small potato(mashed) • 1 palm size grilled chicken • ¾ cup salad with dressing • 8pcs grapes • Plain water
Thursday	• ½ cup oatmeal • ½ cup UHT fresh milk	• 1 cup chicken rice • 1 palm size grilled chicken • ½ cup soup • ½ cup salad with ketchup and sauce • 1 banana • Plain water	• 1 pc plain roll • ½ cup coffee/tea with skim milk	• 1 cup kway teow with chicken tomyam and ¾ cup vegie • 1 apple • Plain water

	Breakfast	Lunch	Snack	Dinner
Friday	• 2 slice of wholemeal bread with tuna • ½ cup coffee/tea with skim milk	• 1 cup baked macaroni with cheese • ½ cup salad with dressing • 2 plum • Plain water	• ½ cup tapioca • ½ cup coffee/tea with skim milk	• 1 cup rice • 1 palm size of chicken paprik • ¾ cup stir-fried khailan • 1 kiwi • Plain water

1500kcal				
	Breakfast	Lunch	Snack	Dinner
Monday	• 1 bowl of meehon soto with shredded chicken • ½ cup coffee/tea with skim milk	• 1 ½ cup rice • 1 ½ palm size ikan kembong with asam gravy • ½ cup stir-fried spinach • ½ cup ulam with sambal • 1 banana • Plain water	• 3pcs wholemeal crackers • ½ cup coffee/tea with skim milk	• 1 ½ cup rice • 1 palm size chicken stew • ¾ cup stir fried sawi • 1 slice papaya • Plain water
Tuesday	• 1 half boiled egg with ketchup/pepper • ½ cup coffee/tea with skim milk	• 1 ½ cup rice • 1 ½ palm size ikan kembong with sambal • ½ cup stir-fried kankung • ½ cup ulam with sambal • 1 slice watermelon • Plain water	• 6pcs small crackers • ½ cup coffee/tea with skim milk	• 1 ½ cup kway teow • 1 palm size chicken tomyam + ¾ cup veggie • 1 star fruit • Plain water
Wednesday	• 2 idli with sambal • ½ coffee/tea with skim milk	• 6 inch subway sandwich • 1 apple • Plain water	• 1pc plain roll • ½ cup coffee/tea with skim milk	• 1 ½ cup spaghetti • 1 palm size lean meat with bolognese gravy • ¾ cup salad • 1 kiwi

				• Plain water
Thursday	• ½ cup muesli • ½ cup UHT milk	• 1 ½ cup rice • 1 ½ palm size grilled fish • ½ cup vegie soup • ½ cup salad • 1 papaya • Plain water	• ½ cup topioca • ½ cup coffee/tea with skim milk	• 1pc of chapatti • 1 palm size tandoori chicken • ¾ cup salad • ½ guava • Plain water
Friday	• 2 slices andwich with tandoori chicken • ½ cup coffee/tea with skim milk	• 1 ½ cup chicken rice • 1 ½ palm size roasted chicken • ½ parkchoy • ½ cup soup • 1 papaya • Plain water	• 1 slice bread • ½ cup coffee/tea with skim milk	• 1 ½ cup wanton mee with prawn and soup • ¾ cup parkchoy • 1 orange • Plain water

System Usability Scale (SUS)

	1	2	3	4	5
I think that I would like to use this application frequently					
I found the application unnecessarily complex					
I thought the application was easy to use					
I think that I would need the support of a technical person to be able to use this application					
I found the various functions in this application were well integrated					
I thought there was too much inconsistency in this application					
I would imagine that most people would learn to use this application very quickly:					
I found the application very cumbersome to use					
I felt very confident using the application					
I needed to learn a lot of things before I could get going with this application					

APPENDIX F

Usability Testing Session