Malaysian Weight Loss Mobile Application with Inner Body Analysis

By

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Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Technology (Hons)
(Business Information Systems)

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Computer & Information Science Department
Universiti Teknology PETRONAS
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BACHELOR OF TECHNOLOGY (Hons)
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Approved by,

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TRONOH, PERAK
September 2012

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 acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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ERNI SYUHADA BT LIHAN

ABSTRACT

OH! MY WEIGHT (OMW) is a mobile application using Android Operating System that aimed to help user especially Malaysians and its citizen to analyze their inner body condition and weight loss guidelines. It works by giving useful advices on fitness and nutrition aspects based on users' particular body state and condition. It has six main functionalities which are; capture the user personal information, calculate user Body Mass Index (BMI), provide inner body analysis, count daily calorie need by user, a fitness planner and also a nutrition counter for user daily calorie intake. User body state and information will be analyzed either via; user BMI or their Bioelectrical Impedance Analysis (BIA) information like their *visceral fat level, body fat %, muscle mass, water mass, bone mass and physical age*. Besides that, this application aimed to solve Malaysia's dishes consumer problem of having limited list of Malaysia food choice in current existing application. The author is inspired by the potential of android that is continually conquering the market of smart phone users. This application will be free and available for installation at the android market once completed. Lastly, this is one of the efforts to support government mission in promoting a healthy life style among Malaysia citizens.

ACKNOWLEDGEMENTS

First, I praise to the Almighty God for giving me the strength and His blessing to complete this project within the given time frame. I also would like to specially thank my supervisor, Dr Jafreezal Jaafar for his willingness and understanding while supervising me throughout these two semester period of the project completion. My grateful appreciation to all the interviewees for their time spent and cooperation given during the project. They have given me many useful insight and information that help me complete this project accordingly. Last but not least, my utmost thanks to my parents and friends for their constant support and motivation they gave me while completing this project.

Thank you.

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ABBREVIATIONS AND NOMENCLATURES

BMI	Body Mass Index
BIA	Bioelectrical Impedance Analysis
WHO	World Health Organization
BMR	Basic Metabolic Rate
OMW	Oh MY Weight
OS	Operating System
SDK	Software Development Kit
LWM	London Weight Management

CHAPTER 1
INTRODUCTION

1.1 Project Background

Malaysia is a dynamic country and is stable in both its economical and political condition. However this pleasant, satisfying state has also created setbacks of its own. Back in 60 years ago, people are starving because they can hardly get any food but today, people are sick and dying because they are consuming excessive food. In 2008 at least 2.6 million of people died each year as the result of being either overweight or obese. (World Health Organization, 2008)

Malaysia citizens are also included in the calculation. In Malaysia alone, more than 1.4 billion adults, 20 years old and older were overweight and more than 200 million men and 300 million women were obese. (The New Straits Times, 2012)

Overweight and obesity will not only harm individual health, but also affect their social interaction with the society. These people are usually shy, have high stress level and have low self-esteem. Such weight problems will affect their performance, lower their confidence level and hinder their ability to interact with other people. Not only that, they tend to have lower stamina level comparing to average normal weight people.

In order to cater this problem, Malaysia government has tried many solutions such as; conducting several health related campaign, establish a help-line to connect people of health problem with the health, introducing new social policies and many more. Among the efforts that have been done in order to inculcate these overweight problems are; the constant awareness forums and campaign run by many private sector like Nestle and My Weight and the My Health Programme (a helpline initiated by Malaysian Pharmaceutical Society to help educate Malaysian with these problems). However, these efforts' only

leave temporarily effects to these people. It is because these efforts are not capable of monitoring each individual body condition personally at all times. Moreover, available slimming and health treatments, also the weight loss and nutrition supplements are very costly and it is find out to be time consuming.

Relating to this issue, the author intended to create a mobile application using Android OS, named "OH MY Weight". This application is designed to help people especially Malaysian citizens with their weight loss activity. This application can be used by people of ages 22 to 60 years old, male or female, which wanted to lose some weight. This application will have six functions which are:-

I. Capture user personal information
II. Calculate user BMI
III. Analyze user inner body condition
IV. Calculate daily calorie need by user
V. Provide timely fitness plan for user
VI. Calculate daily calorie intake by user based on the food consumed

This application works by utilizing specific input of user body condition, analyze it and then generating a set of tips on nutrition and fitness that can be used by user as guidance. There will be two methods of input; one is by using the user Body Mass Index (BMI) calculation and another one is by using the information generates from a scientific body mass balance that uses Bioelectrical Impedance Analysis (BIA) technology. When using this application, it is optional for user to use either one of the input methods, depending on the user preference and the information availability.

Information needed for BMI calculation is easier to be obtained by user as it only involve their weight and height measurement. While another method which is the BIA analysis, requires user to get several additional information. The user needs to use a scientific body mass balance in order to get the measurement of their Body Fat %, Visceral Fat %, Water Mass, Physique Rating (ratio of muscle mass and body fat %), Bone Mass and their

Physical Age, and then include this information together with their weight and height measurement into the application. Based on the analysis and calculation of either any of these methods, the application will generate their daily calorie need, a set of fitness and nutrition plan for the user as their guidance for weight loss.

Furthermore, the author decides to create a mobile application solution because the existing web-based applications are semi-portable and it required expensive subscription fees. Plus, comparing to the personal computer or laptop, people tend to carry their mobile more frequently. Besides that, the author also chooses to use Android Operating System for the product development. This is because Android OS is an open source and the author is also familiar with the language used by this operating system which is java. Not only that, the main reason why the author uses Android as the product based is because it is currently conquers the smart phone market. Android application can be easily download and accessible by everyone at all time through the online Android market.

1.2 Problem Statement

1.2.1 Problem Identification

There are already many android applications available on the market right now. There are My Fitness Pal, Calorie Counter, MyDiet Coach and many more applications for weight loss. These applications are working nicely and accordingly. However throughout several studies and researches, the author finds out that the existing applications are lacking two important elements, which are;

1. **All the weight related-applications depends solely on user BMI calculation to analyze or measure user inner body condition**

BMI calculation is widely used to measure human body condition, however the calculation is too general and the measurement is only relevant for healthy

individuals. There are many cases about "***skinny fat***" people. These people are slim and skinny; however they posses excessive fat at certain part/ compartment of their body especially on their stomach or thigh. Even people with similar BMI might have different level of fatness. Hence we can conclude that BMI calculation alone will not give sufficient description about ones' particular body condition. This calculation should be complement by other type of measurement that is able to give us more specific and personalized information about user inner body state and form. With a more personalized detailed input about user body condition, more specific recommendation can be generate to help guide the user with their weight loss activity.

2. **The existing applications provide limited list of food from Malaysia dishes in their food calorie database. The food preference focused on Western-type dishes**

With limited list of Malaysian food available in the food calorie database, it has been troublesome for the user; Malaysian or people who are currently enjoying Malaysian dishes, to cautiously monitor the amount of calorie intake they consumed in their nutrition daily. This will definitely disrupt their effort to supervise the total amount of calorie intake by each of them per meal, leaving the application function to be useless.

3. **Others**

Based on the market reviews, some of the available applications are hard to navigate and costly. People who are still new to technology or android apps can hardly navigate these applications in a correct manner. Hence reduce their motivation them to fully utilize the application functionality.

Realistically only minority of the population has enough money to pay for a personal coach. The web-based software is semi-portable and costly, hence making a mobile application to be a good solution. With this new application, not only the user can use it free, but they also can use it anytime, anywhere and without the need of internet connection.

1.2.2 Significance of Project

The significance of the project comes in the fact that they address and provide solution for the issues that have been addressed earlier. There are;

1. **It implements two methods of input**

As mentioned earlier BMI calculation alone cannot fully addressed user personal needs and condition. Hence providing BIA analysis as another option for user to get more specific analysis on their body condition is very significant. With this, users will has wider choice on what type of analysis they wished to have.

2. **Lots of Malaysian and its citizens used the application**

By listing and including more Malaysia dishes in the food calorie database, now Malaysian user especially can finally use the calorie counter application efficiently. They can widen the choice of food that they can and cannot consumed rather than giving up calculating the calorie consumed or giving up the meal, this will surely help them to manage their meal more effectively and properly.

3. **Free, can be used anywhere, anytime and does not need internet connection**

This application will be available in Android market, and can be downloaded by user without any cost. It will not have any updating or sharing functionality, hence user can use it without any internet connection. Once the user has already owned the application, it will be on their smart phone. Hence they can easily use the application anywhere, at anytime they wish. Everything is on their fingertips.

4. **Good monitoring system**

With the help of the application, user can monitor their body condition from time to time. They can measure and access their body condition directly. They will not have to search everything on the internet from time to time as everything will be listed accordingly in the application. They can directly learn

about their inner body condition and know what they can do about it. Besides that, the application will focus on both the fitness and nutrition part of human body requirement. Thus user can monitor and take action in both parts instead of just focusing on one of the two important part of weight loss.

1.3 Objectives and Scope of Study

1.3.1 Objectives

1. To examine factors affecting human weight and investigate existing related method available to solve weight loss problems in order to attain a firmer grasp on the language and its structure

2. To identify the element and functions that should be included in the weight loss application and the type of food consumed by Malaysian and its citizen

3. To design and develop and Android application that will help to guide people to lose weight and at the same time get better understanding on their inner body condition

4. To test the usefulness of the application with the targeted users

1.3.2 Scope of Study and Limitations

Weight loss is a very broad and general topic to be catered specifically; hence further research will be done in order to properly address the best solution for each individual relating to weight loss. The type of fitness and activity needed to be done by them to burn their calorie, the type of dishes and meal that best suits these groups of people will also be identify with the help of related and trusted organization. The findings will determine the best function and features to be included in this application.

However, some countries may apply different type of approaches and activities with regard to weight loss. For example, in term of the fitness activities done and the meals consumed. For this application, the author will design the application to best suit the style and environment of Malaysian.

1.4 Relevancy of Project

The relevancy of the project depends on whether or not the project address the issue mentioned earlier and whether it will impact the community as planned. It should use relevant tools and elements to ensure continuously relevancy. To achieve it highest purpose, people should consider how this application may impact people and how much it will change these people perspective on health-related matters. It will not only encourage people to get to know their body condition better, but it will also provide a guideline for the user to follow in order to be at their best state. Furthermore this effort can also give confidence to the Malaysian dishes fans to enjoy their food accordingly while at the same time monitor the amount of calorie consumed by them per meal. It will generally promote healthy lifestyle to everyone.

Moreover, we can avoid or reduce any overweight related diseases that had been actively harmed the people. With this not only the medical cost can be cut down, but our nation will also produce healthy generation gradually. This project may not immediately affect the nation entirely; however the idea of how important it is for everyone to know their inner body condition can help to increase people awareness on this matter.

Most importantly to ensure everyone can use this application effectively, the presence of the scientific body mass balance in public places is a must. The government should install this scientific body mass balance so that people without the body mass balance can also access their BIA analysis easily. Last but not least, in term of technology, the used of smart phones are very crucial in this project. Android was chosen because it holds largest

market share among smart phones user. It is open source software and the development product is easily accessible to anyone at the Android market.

1.5 Feasibility of Project

The project is estimated to be completed in eight months time. The first four months will be allocated solely for the research purposes. The researches include all the findings from survey, interviews, reading, previous articles, similar applications and many more. All information will be analyzed accordingly in order to get better understanding of the project matters.

The second part of the project focuses on the project features and design. All the element properties, position and the arrangement will be designed accordingly to better suits the target people preference. All these are expected to be done in at least four weeks time. The third stage is the development stage which requires 3 months period. The author uses App Inventor software and Samsung Galaxy Ace smart phone for the project development. The project prototype is currently been continuously develop and improve and is soon to be released for testing to selected users. The testing stage is held to further examine and improvise the product based on users' comments and recommendation.

CHAPTER 2
LITERATURE REVIEW

In order to fully understand the topic related to the project, thorough researches on the topic matters is very important. Information from reliable source and expert should be considered when starting and continuing the project.

2.1 Overweight problems and Malaysia efforts to solve it

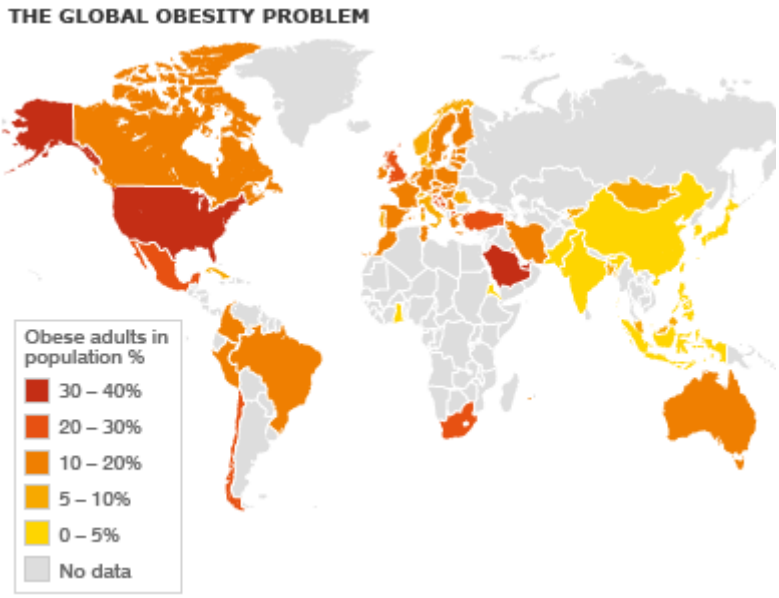


Figure 2.1(a): Global Obesity Population (WHO, 2006)

Above figure showed the global population of obese people in 2006. According to World Health Organization (WHO, 2012), overweight refers to people with a BMI greater than or equal to 25, while obesity refers to people with BMI greater than or equal to 30. People with these problems are exposed to health-related diseases like hypertension, stroke and cardiovascular disease. The main causes of overweight are over intake of food, lack of physical fitness activity and passive lifestyle. (Ministry of Health Malaysia, 2003)

This statement is supported by Dr Tee E Siong (2010), the President of the Nutrition Society of Malaysia (NSM) which suggested that this problem

may happened because of the combination of unhealthy eating habit, nutrition with high calorie and fat intake and the poor involvement with physical activity like sports or heavy duty work.

New Straits Times (2012) stated that there are about 43% of adults, 20% of teenagers and 26% of primary school children are either overweight or obese. Obesity and overweight problems are caused by the energy imbalance between calories consume and calories burn. It is either the increase intake of food that is high in fat, salt and sugar yet lack of vitamin and minerals, the decline of participation in physical activity like running, walking and exercising or the mix of both factors. (WHO, 2012) This has shown that the overweight and obesity problem becoming more severe by time. This is the result from the poor eating habit and lack of physical activities lifestyle that has been practice by the people.

The government strategy for obesity prevention in Malaysia is through covered shares responsibility between the government, the food industry, private agencies, the media and the community themselves. Basically the government provides support for public education and awareness campaign and at the same time conducts research on the obesity matters like prevention and treatment method. The industries and agencies will further encourage healthy lifestyle to the community through their social responsibility activities. One the effort that has been done by Malaysian Pharmaceutical Society is "My Weight and the My Health". It is a help-line which established one to one connection between people of health problem with the professional. While, the individual is constantly reminded to live a healthy lifestyle through balanced diet and proper fitness activities. (10^{th} Malaysia Plan, 2011)

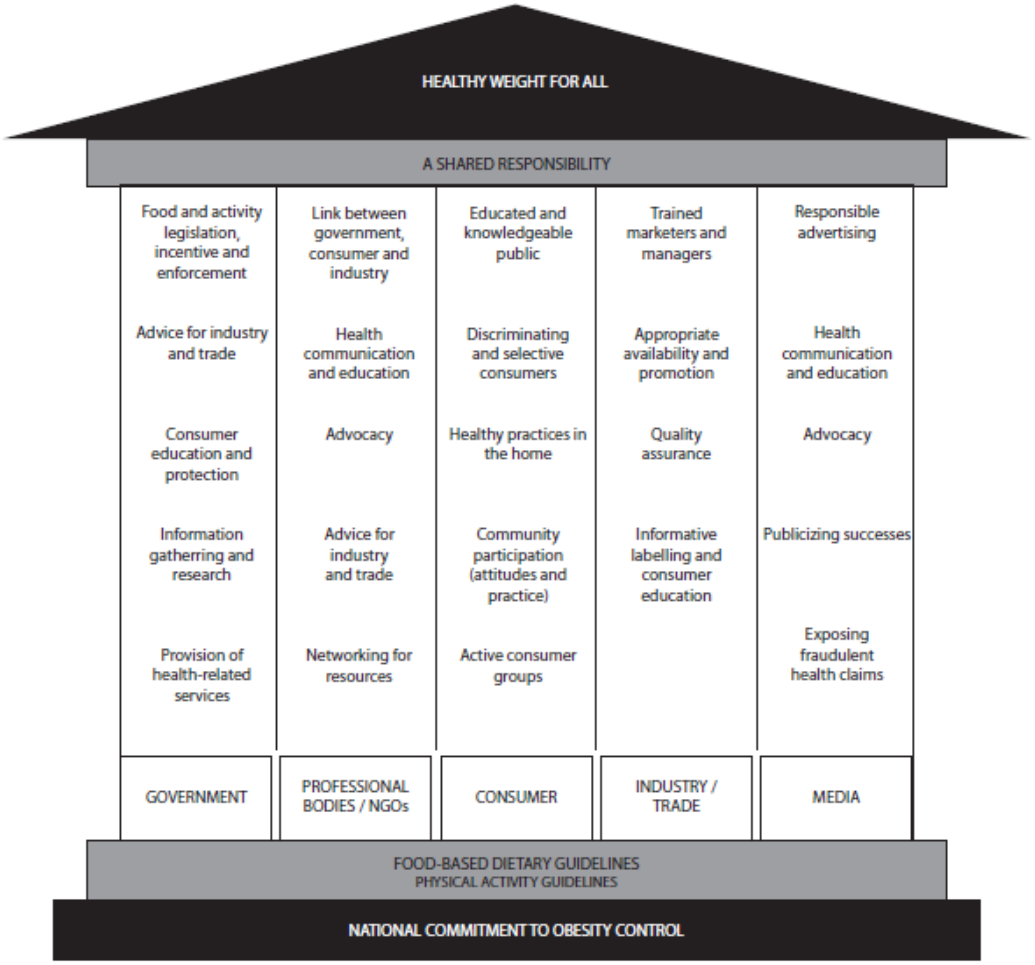


Figure 2.1(b): Healthy Weight for All Structures (10th Malaysia Plan, 2011)

However, these efforts are not capable of monitoring each individual personally at all times. It might increase the awareness but may not be working if there is no closer monitoring system that helps to remind them. With the establishment of this project, the user will be able to monitor their body condition at all time and at any where they are. Even though, there are numerous slimming product and treatment available, they are very costly and it is find out to be time consuming.

2.2 Body Mass Index (BMI) and Bioelectrical Impedance Analysis (BIA)

Both Body Mass Index (BMI) and Bioelectrical Impedance Analysis (BIA) will be used as the input for the application to measure the user weight

and body composition. BMI is widely use as a measurement tools for population average weight, while BIA provides more accurate information about body weight and its composition.

Body Mass Index is a consistent prediction of individual relative body fat with respect to their height and weight.

$$BMI = \frac{\text{(Weight in kilograms)}}{\text{(Height in meters) X (Height in meters)}}$$

Figure 2.2(a): BMI Formula

BMI provides the most practical population-level calculation for both genders and all ages, however it is only estimation rather than the exact value of a person's weight due to different level of fatness among individuals. (Freedieting.com, 2012) One of the biggest drawbacks of BMI mentioned by National Weight Control Registry is that it is unable to differentiate between muscle-fat ratio which causes confusion when measuring the BMI for an athlete with high muscle composition or measuring an old man with low muscle mass in their body. (National Weight Control Registry, 2008)

BIA on the other hand is also a tool to measure an individual body fat composition. There are more than 1500 papers written about BIA that are found in the English medical literature between 1990 and 2003. BIA measurement is more suitable for adult as children has inter-individual different in growth velocity and puberty related changes. Also different ethnic group has different average BIA measurement as they have different body shape and are affected to different life environment. (Clinical Nutrition Part I, 2004)

BIA is a method of predicting the percentage of the body fat by releasing a safe and small electrical current pass through your body. It is commonly used in the bathroom scales and handheld devices that measure fat

together with other element in body composition. BIA has proven to provide useful information in examine individual body condition. (Clinical Nutrition Part II, 2004) Below are the composition of human body, there are visceral protein, water and bone mineral.

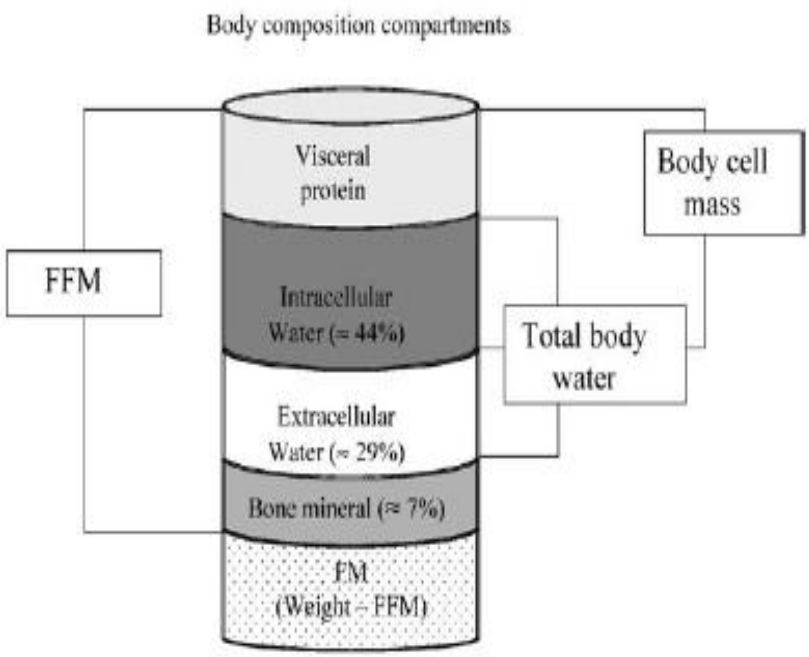


Figure 2.2(b) Schematic diagram of fat-free mass (FFM), total body water (TBW), intracellular water (ICW), extracellular water (ECW) and body cell mass (BCM). (Clinical Nutrition Part II, 2004)

BIA measures the speed of the current passes through the body. Water is a good conductor of electricity, the faster the current travel, the lower body fat you are estimated to have. (Elsevier.com, 2012) Below are among the body weight balance that uses BIA method to measures visceral fat, body fat, water composition and muscle mass:- HoMedics Healthstation SC540, Propert 3042, Soehnle Body Balance Shape F4 63161 and Tanita UM-016 (B).

Figure 2.2(c) Tanita Scientific Body Mass Balance

This body composition monitor provides measurement for Body Fat %, Body Water %, Muscle Mass, Daily Caloric Intake (DCI), Metabolic Age and Visceral Fat Rating. (Tanita.com, 2012)

Choice.com is a customer reviews website that gathers all the information required by customer when buying or selecting a product. It stated that there are more accurate ways of measuring body fat, like underwater weighing and X-ray absorptiometry, but most of the ways is not very practical to be used as it needed specialized item and expertise for those matters. (Choice.com, 2010)

Furthermore, Human Kinetics also a fitness website stated that BIA is a reliable tool to measure the body fat percentage. (Human Kinetic, 2012) BMI is a great tool in measuring a person fat composition as it only requires two elements which is the weight and the height of a person. The information can easily be access by anyone. However as mentioned previously, BMI does not provide a critical or accurate information about once body condition. Same people with the same weight may have different level of fatness due to different element composition presence in their body. On the other hand provides more accurate measurement than the BMI. It calculates the composition of fat, bone, muscle and water presence in the individual body. However in order to get the BIA measurement, user requires a special body mass balance that uses BIA technology to calculate it for them. Hence the information is slightly hard to be access by user.

2.3 Daily Calorie Need

In order to lose weight, a person should not consume more calorie than needed by their body and the average calorie needed by an individual is 1500 calories per day. However, everyone bodies have different need and rate of metabolism hence the have different calorie need. To calculate the calorie needed, Basic Metabolic Rate (BMR) must be calculated first. BMR is the amount of energy that the body needs to function properly. This function includes breathing, walking and many more. We use 60% of our calorie for this bodily function. For example for 10 minutes walking, we will burn 150 calories. (Freedieting.com, 2012)

The user must know exactly the amount of calorie their body need per day so that they can control the amount of calorie consumed by them during meal and at the same time burn the excessive calorie in their body by physical activity. Based on ADA (American Dietetic Association, 2005) Mifflin – St Jeor Formula has been proven to be the most accurate formula for daily calorie need calculation. Below is the Mifflin – St Jeor Formula:-

Men

10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) + 5

Women

10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) - 161.

Figure 2.3: Mifflin- St Jeor Formula for Daily Calorie Need

2.4 Mobile Computing & Android

Nowadays, almost everyone owned at least one mobile phone for communication purposes. The first mobile phone generation was built with just a basic feature which is the voice call. However as the world grow; mobile phones are equipped with much more functionality like Short Message System

(SMS), MP3 player, games and internet. People used their mobile for almost everything. With the present of smart phone, the mobile phone functionality is further expands to wider range. With the ability to share pictures, video and other features, mobile phone is the most portable tool as people bring it everywhere they go.

Figure 2.4(a): Android Logo

Android is the operating software (OS) for mobile devices like smart phones and tablet. It is develop by Google Inc. and used java language. It is currently uses in numerous mobile device manufactured by HTC, Samsung, Motorola and many more. According to the Senior Vice President of Mobile at Google Inc., Andy Rubin, the number of mobile that use android OS has reached over 300 million devices worldwide by February 2012 with 850 million activations per day. As of the third quarter of 2011, Android's market share was estimated to be over 52.5% coming out at the lead in the mobile device market beating its main rival Apple Inc. with its iOS platform of mobile devices (Gartner, 2012).

This is why Android was chosen as the preferred platform of choice for the current implementation of the application. Currently, there have been a number of version releases of the Android platform with the current version being Android 4.0 (Ice Cream Sandwich). It has a lot of users, it monopoly most of the software market and it is also an open source. Hence the development process can be done with more reference compare to choosing other type of software. Android device also comes with shape and varies sizes, it is very flexible to use and it allows user to enjoy numerous numbers of

application in the android market. Below are the different capabilities of each android version;

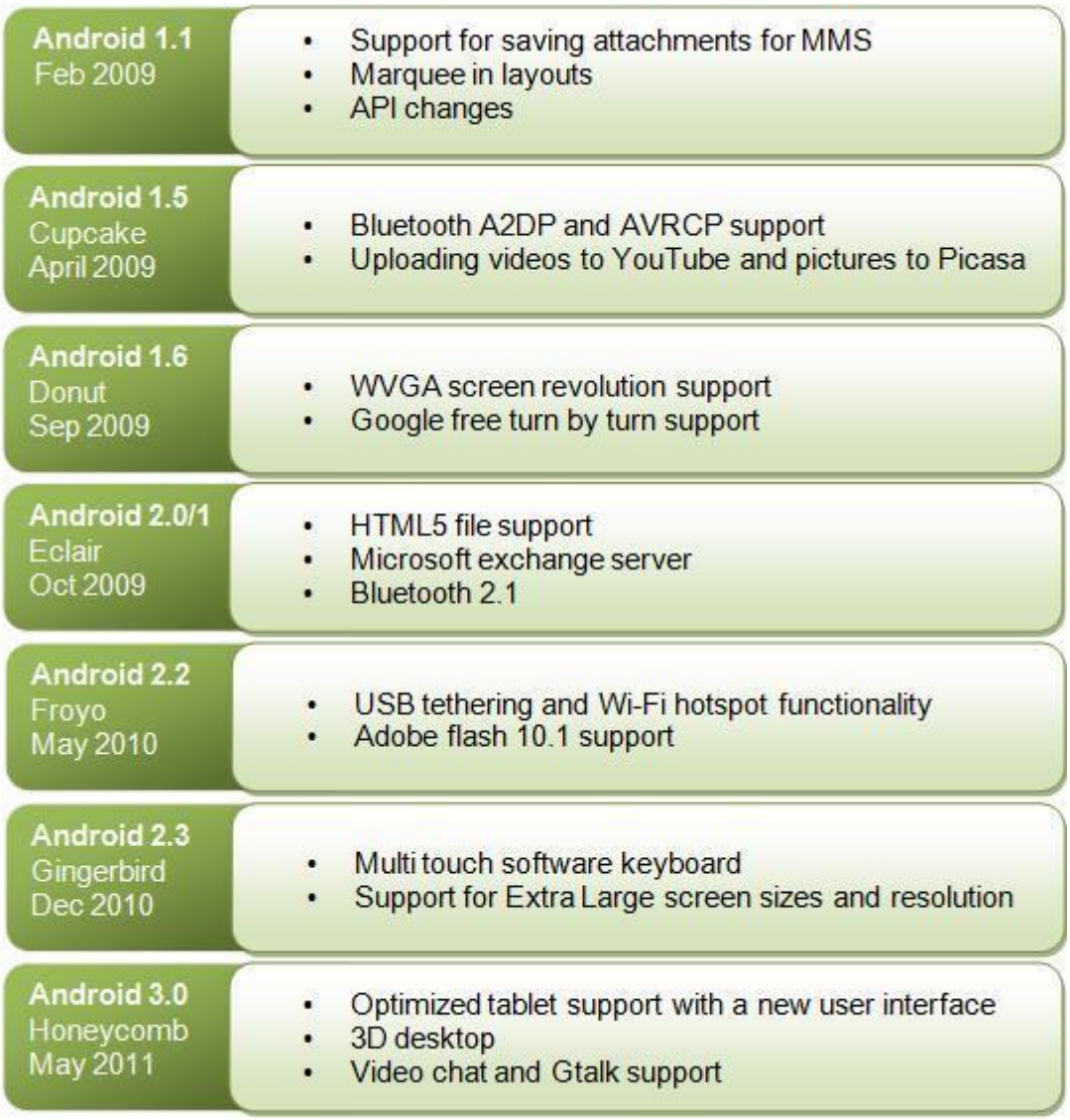


Figure 2.4(b): Android versions with different capability (Engineersgarage.com, 2011)

Based on the figure above, the author will used Android 2.3 due to its capability which suited this application functionality. The application development will be performed using App Inventor an experimental program that is originally owned by Google but is now maintained by Massachusetts Institute of Technology.

PCWorld, 2011 stated that within 12 months android has able to monopoly up to 25.5 % users of the OS market. With a very short period, they

manage and continue to penetrate the market. Hence android is a very demandable product right now, most people have it and many soon going to own it. Anyone can access and use it for their personal benefits. Based on below figure we can see Android OS is the biggest shareholder of the smart phone market.

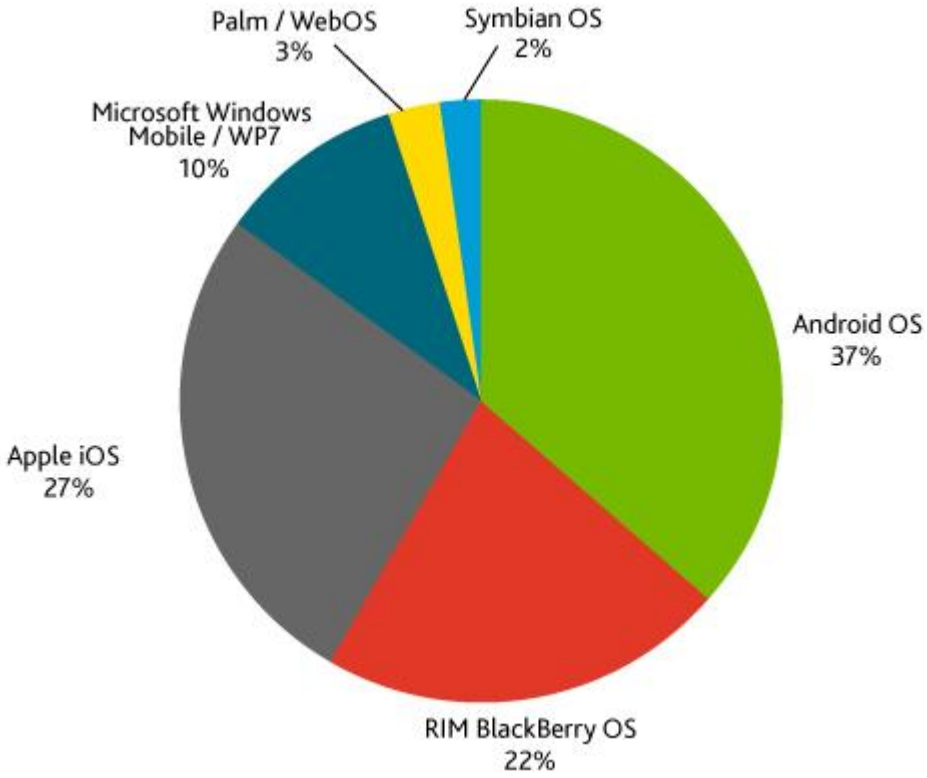


Figure 2.4(c) Smart Phone Share (Nielsen, 2011)

2.5 Existing Weight Loss Application

Due to the rapid development of the technology, of course there are already many applications available to solve weight loss problem. Some are of web-based application and some are of mobile application Examples of web-based applications are as below:-

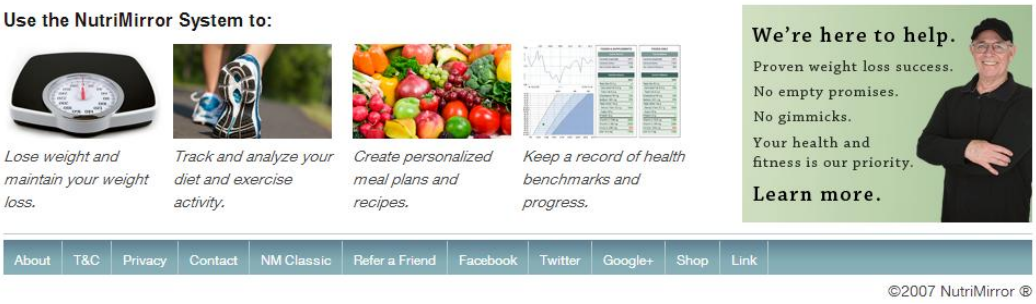


Figure 2.5(a): NutriMirror.com

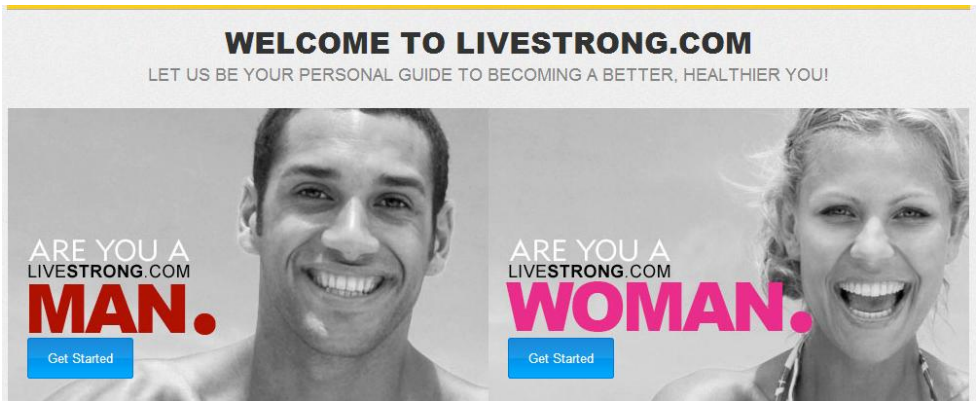


Figure 2.5(b): LifeStrong.com

These web-based applications are highly interactive and interesting. It has greater capacity and is easier to use by the user. However, most of the applications require high subscription fees and full internet connection. But most importantly, the web-based application is not portable. Hence it is hard for user to bring it to anywhere and use it anytime they want too. This is why the author prefers to do a mobile application.

Moreover due to the fact that android has been commercially launched since 2008, there is already android developer community that has started developing numerous of android application since. There are over 800 applications available in the android market, solely for Health & Fitness categories. Among the example of these applications are the Multi Reps, Diet Coach Pro, MyFitnessPal and Calorie Counter. The author has made comparison between these applications. They are selected because they have the most similarity with this project product. Below are the summary of the writer analysis of each product based on the user reviews available on Android Market website. (Google Play, 2011)

NO	NAME	DESCRIPTION	USER CRITICS
1	Multi Reps	Provides up to 10 different type of customizable exercise Provides a time tracker	Only focus on fitness Does not detect speed Does not measure body condition
2	Diet Coach	Uses attractive motivational photo and tips Focus on both fitness and nutrition	Solely motivation Only for women Hard to navigate
3	Calorie Counter	Has large food calorie database Acts as diet journal Includes calorie counter	Limited list of Malaysia meal
4	MyFitnessPal	Has the largest food database Has a barcode scanner	Hard to navigate Limited list of Malaysia meal Requires internet connection

Table 2.5: Summary of Existing Application Advantage and Critic (Google Play, 2011)

Figure 2.5(c): Multi Rep Application

Figure 2.5(d): Diet Coach Application

Figure 2.5(e): Calorie Counter Application

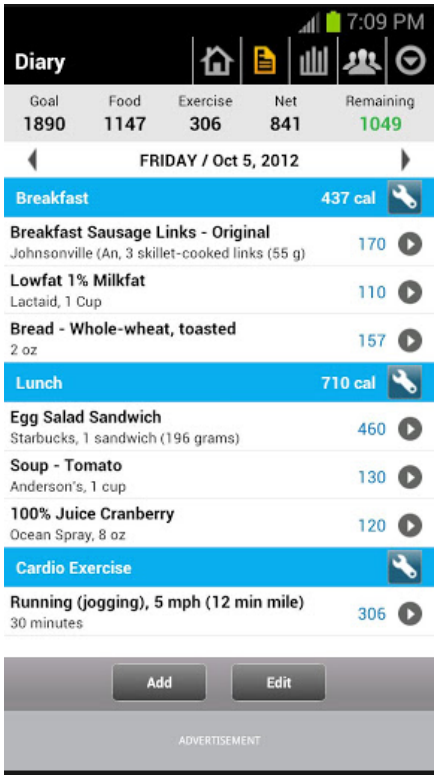


Figure 2.5(f): MyFitnesspal Application

Source: Google Play, 2011

CHAPTER 3
METHODOLOGY

3.1 Research Methodology

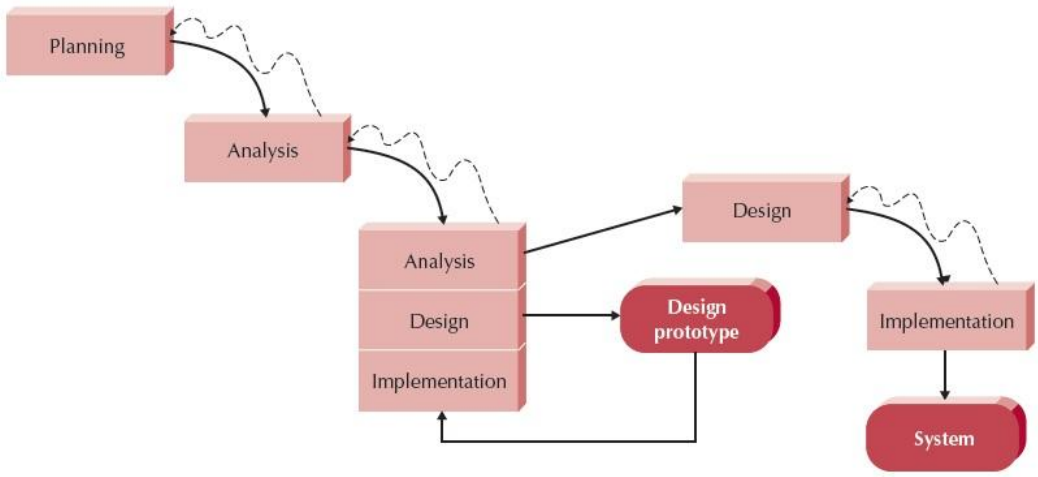


Figure 3.1: Prototyping Methodology

The author used the prototyping methodology as the research methodology. This methodology is chosen because this project deals with the analysis of much information. There will be many variables as it will be dealing with many different individuals. Hence, it is not easy to decide and finalize the exact requirement or specification for the application. The author needs to design the application so that the user can easily navigate the system. For example; whether she needs to list out all the fitness activities or should she group it in few levels.

Using this methodology, the author continuously modifies the existing flow, specification and component designed in the application from time to time. The author presents the prototype earlier so that the users can give their feedback and comments. It allows rapid movement for the product's development and at the same time allows the user to get the feel of the exact functionality of the application. Last but not least, by using this method the author managed to reduce the risk of failure as the product is going to get constant improvement and modification.

1. Planning Phase:

During the planning phase, the author assembles as much as necessary information related to weight loss; its cause and effect, existing methods available to solve the problem, previous research related to it and etc. The author also conducts few interviews and survey with the professionals and public in order to get more specific and personalized comment regarding this matter. Research is done in order to list out all the criteria related to this topic. Latest technology available to solve this problem is also being explored in this phase, in order to see what technology or solution is best to cater this problem. The author list out the plan and the limitation of the project in term of the flow of the project and the resources she has.

2. Analysis Phase:

In the analysis phase, the author analyzed all the data and statistic she has and compares it with existing method and theory. Then, the author list out all the important key and fact about this matter and draw out a brief conclusion about what should the application have and should not have.

3. **Analysis – Design – Implementation – Prototyping Phase**:

Next the author carried out further analysis based on the survey and interview she has conducted to further recognized the best approach that the application can used. She compares the finding with existing research and theories. Based on this analysis, the author shortlisted the key element, specification and functionality of the application and implements it in the application design. With this the prototype is build and currently still in development. Meanwhile developing, the author prepared a rough design of the prototype for user testing. The user will test the prototype and voice out their comment and recommendation. By this, the flaw and weakness of the application can be identified in the early stage.

4. Design Phase

Based on their suggestion, the author will again redesign the application. All the improvisation will be considered and a new design will be

established by the author. This new design will be more complete and user-friendly than the earlier design.

5. Implementation Phase

Then, the initial prototype will be modified based on the second design and it will be tested again by the targeted people. If the prototype still needs much improvement, the redesign – implementation process will take place all over again. If not, the prototype will be polished and become the final product of the project. Its capability to help the user in losing weight will be marked and monitored by the author.

3.2 Project Activities

a) Survey

An online survey was conducted to analyze the awareness and the basic requirements of the application in order to become an effective solution for weight loss problem. The online surveys were sent randomly to 35 Malaysian students, aged 21-25, from multi-races. The author carried out the survey on students because students especially the final year students have many free times and are more conscious about their health. This opinion is based on the author observation within her 4 years of studies in UTP. The results of the survey will be display in next chapter. The survey question is included in the appendices.

b) Personal Observation

Based on the author personal observation, most people bring their mobile phone everywhere they go. Some people even left their purse at their house but they rarely will leave home without their mobile phone. Even in the restaurant, office, coffee house and even library, we can see people scrolling up and down their phone. Some are busy texting, playing games, watch movies, reading magazines and many more. Smart phones have enable people

to do so many things using their phone. Besides, the author is also one of the smart phone users. She has experienced using smart phone for more than one year. Throughout her experience, android application has made many people life easier. Not only it provide entertainment, but it also have other important function like checking police summon, organize the study timetable, provide useful tools like flash light, language translator and many more.

Furthermore, the author has also tried to undergo two famous weight treatment processes carried out by Herbalife and London Weight Management (LWM). Through her observation, she found out that Herbalife is using both the BIA analysis and the BMI calculation in their body measurement. While LWM focuses on the lifestyle and the body physical (visible) condition. The author managed to get health consultation from both companies consultant in order to get better understanding of the health approach that she should use for the application.

Last but not least, the author also tries to use the existing android apps available in the market. She has tries the Calorie Counter, Waist apps and My Diet Coach. She managed to get the user experience and will try to implement the knowledge in the application design and development. All the weaknesses and strength of the applications are documented and will be further elaborate in the result section.

c) Interviews

The author also managed to interview 3 individuals which are directly involved with weight loss issue. They are;

a) Nur Liyana Bt Naharuddin, 27
   A dietician in Hospital Universiti Kebangsaan Malaysia (HUKM)

b) Dominic Well, 31
   A free blogger and a consultant working with a nutrition company, he has long experience dealing with health and nutrition issues

c) Siti Nurul Afiqah Mohd Bakri, (Nurul) 22

An independent distributor of Herbalife product that acted as a personal coach to few Herbalife's customers

d) Nurul Farihah Bt Mohd Zulkeple,(Farihah) 21

A student who are concern with her weight and constantly tries many methods to solve weight loss problem

The interviews are conducted in order to get the interviewees' comment on the idea of the application. Through these interviews, the author shortlisted the criteria to be considered from three different perspective, one is from a dietician, one is from a personal coach and the other is from the potential user.

3.3 Tools and Equipment Used

a) **Mobile Device**

The mobile device that is going to be used during the development and testing of the system includes is only smart phones. The author will particularly uses Samsung Galaxy Ace running on Android 2.3.5.

b) **Software**

The author used the App Inventor application for the system development and used the Adobe Photoshop to enhance the features of the development. App Inventor is chosen due to peers recommendation and the familiarity of the author with its language, which is java.

3.4 Gantt Chart

Final Year Project Part I

Activity	1	2	3	4	5	6	7	8	9	10	11	12
Selection of Project Topic & Supervisor												
Submission of Proposal to research cluster												
Submission of Extended Proposal												
Research Class												
First Interview for Research Purpose												
Proposal Defense												
Submission of Interim Report												

Table 3.4(a): Final Year Project I Gantt Chart

Final Year Project Part II

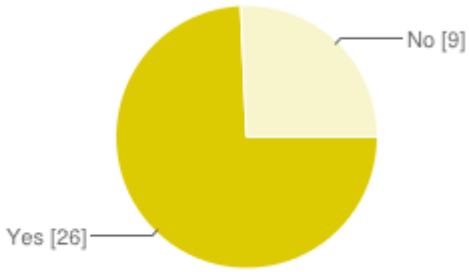
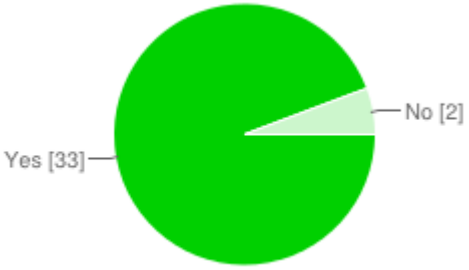
Activity	1	2	3	4	5	6	7	8	9	10	11	12	13
Survey & Interviews													
System Design & Modification													
Software Research and Tutorial													
Prototype Development													
Submission of Progress Report													
Pre-EDX													
Submission of Dissertation													
Viva Presentation													
Submission of Technical Report													

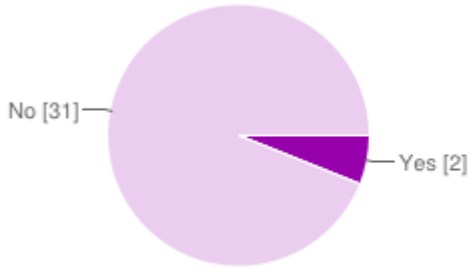
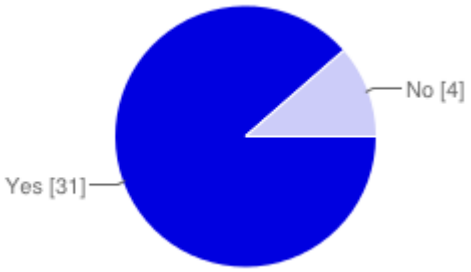
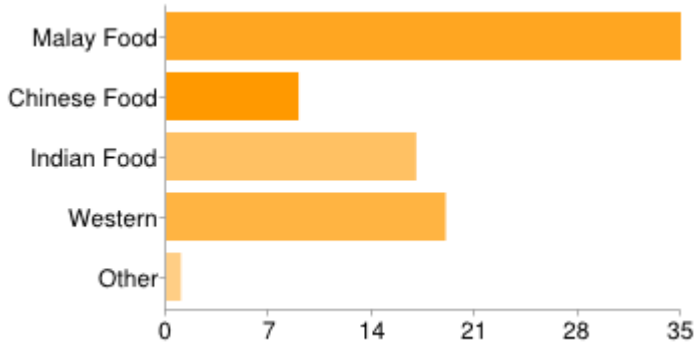
Table 3.4(b): Final Year Project II Gantt Chart

CHAPTER 4
RESULTS AND FINDINGS

4.1 Project Activities

a) Survey Result

Result	Assumption
 Out of 35 students, 26 students (74%) owned smart phone. While 9 students (26%) do not owned it.	Smartphone is vastly used by students and people from ages 18 to 50.
 Out of 35 students, 33 students (94%) are aware of Android applications. While 9 (6%) do not.	Most people are aware of the android applications.
Among the disadvantages of android applications that are most mentioned by these students are; a) Nothing b) Some are costly c) High battery consumption Among the advantages of android applications that are most mentioned by these students are; a) High mobility, can be carried any where b) Ease daily activity via varies functionality c) Wide market, many choices	Android applications have several disadvantages however the advantages outweigh its weaknesses.

d) Free e) Easily accessible	
Among the applications that have been used by these students are; a) JetFit b) BMI Calculator c) Calorie Tracker d) MyFitness Pal	There are people who utilized the existing applications to monitor their health or body condition.
 Out of 35 students, 31 students (89%) agree there are limited list of food for Malaysia dishes in existing application. While 2 students (6%) disagree. The other 2 students (6%) are not sure.	The students and people are aware of the limited choices of Malaysia food in existing application food database.
 Out of 35 students, 31 students (89%) agree that Malaysia food should be prioritized in the food calorie list too. While 4 students (11%) disagree.	Most students agree that Malaysia dishes should be prioritized in the applications too.
 According to the students, these are among the most frequent	The result shows that the most consumed food by these people are 1. Malay food 2. Western food 3. Indian food 4. Chinese food

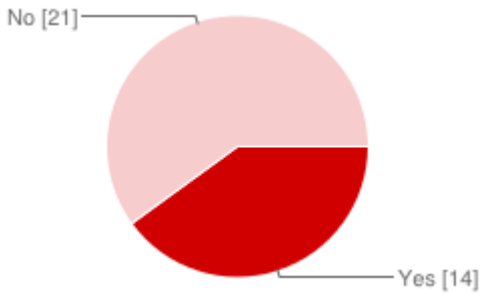
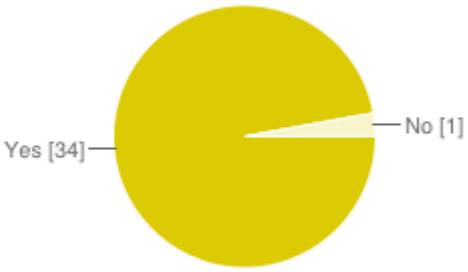
type of dishes that are consumed by the Malaysians and its citizen. Malay food 100%, Chinese food 26%, Indian food 49%, Western food 54% and others 3%.	5. Others
24 students thought BMI calculation does not provide sufficient detail of their body condition as they required further clarification and explanation of their body condition. 8 students thought BMI calculation provides sufficient information of their body condition, while another 3 students are not sure.	Most students agree that BMI Calculation does not provide sufficient information for their body condition.
 14 students are aware of the Bioelectrical Impedance Analysis, while 21 students did not.	More than half are not aware of BIA Analysis.
 97% of the students support the development of this application, while 1 student did not.	More than 90% supports this application development.
29 students agree that government should install the sienctific body mass balance in order to help increase reachness to the BIA analysis and at the same time increase the health awareness within community. 1 student disagree and another 4 students are not sure due to the cost that the government must bear and other related elements.	Most students agree that government should also take part in order to nurture the health awareness in the society by installing the scientific body mass balance in public spaces,

Table 4.1(a): Survey Result & Analysis

b) Personal Observation

People behavior

- Bring their mobile phone everywhere they go
- Android applications provide many functionality and help to human daily activity

Slimming or Health Treatment (Herbalife & London Weight Management)

- Focused on different type of body composition
  Herbalife → inner body condition and nutrition
  London Weight Management → body shape and physical treatment
- However both companies use two approaches for the weight loss programs which is through fitness and nutrition plan

c) Interviews

The details of the interviews are as below;

Interviewees	Issues Mentioned
Mrs. Liyana	• She stressed on the important of balance lifestyle in term of physical activity and food consumed • One-sided effort is not a healthy life balance • People should monitor their calorie intake in order to avoid food-related diseases
Mr. Dom Well	• He stressed the benefit of BIA analysis over BMI calculation "Just because someone is slim, doesn't mean the inside of their body isn't fat. It is common that people have a low BMI but a high body fat count; this is known as "SKINNY FAT". • He emphasized the effect of abnormal body fat %, metabolic age, total water % and etc to human body It include the effects on our health and our daily lifestyle • He strongly support the application development

	He is actually planning of the same thing but with monetary return
Miss Nurul	• She emphasized that every individuals body have different needs; hence constant and personal monitoring is advisable • She revealed the used of the BIA analysis in monitoring the customers inner body condition (body fat, water, muscle mass, physique rating, BMR, metabolic age, bone mass & visceral fats)
Miss Farihah	• She explained her needs while trying to lose weight and reveal the inadequacy of existing application and method available nowadays Involve what kind of approaches are suitable for weight loss program, what kind of interface works for her and what is lacking with current application • She voiced out the need of Malaysian own food calorie database She explained the difficulties she has when calculating the calorie intake while trying to enjoy Malaysian delight

Table 4.1(c): Interviews Result and Analysis

4.2 Findings

Below is the flowchart of the system. It is designed based on the consideration taken after the survey, observation, interviews and prototype development. After inputting their personal information of age, gender, weight, height and daily fitness level, the user can choose from two options; whether they wanted to do body analysis or whether to get weight loss method. If they choose BODY ANALYSIS, they will have three options, which are; BMI CALCULATION, DAILY CALORIE COUNT and INNER BODY ANALYSIS. While if they choose WEIGHT LOSS GUIDE, they will have two options, which are; FITNESS PLAN and NUTRITION CALORIE COUNTER.

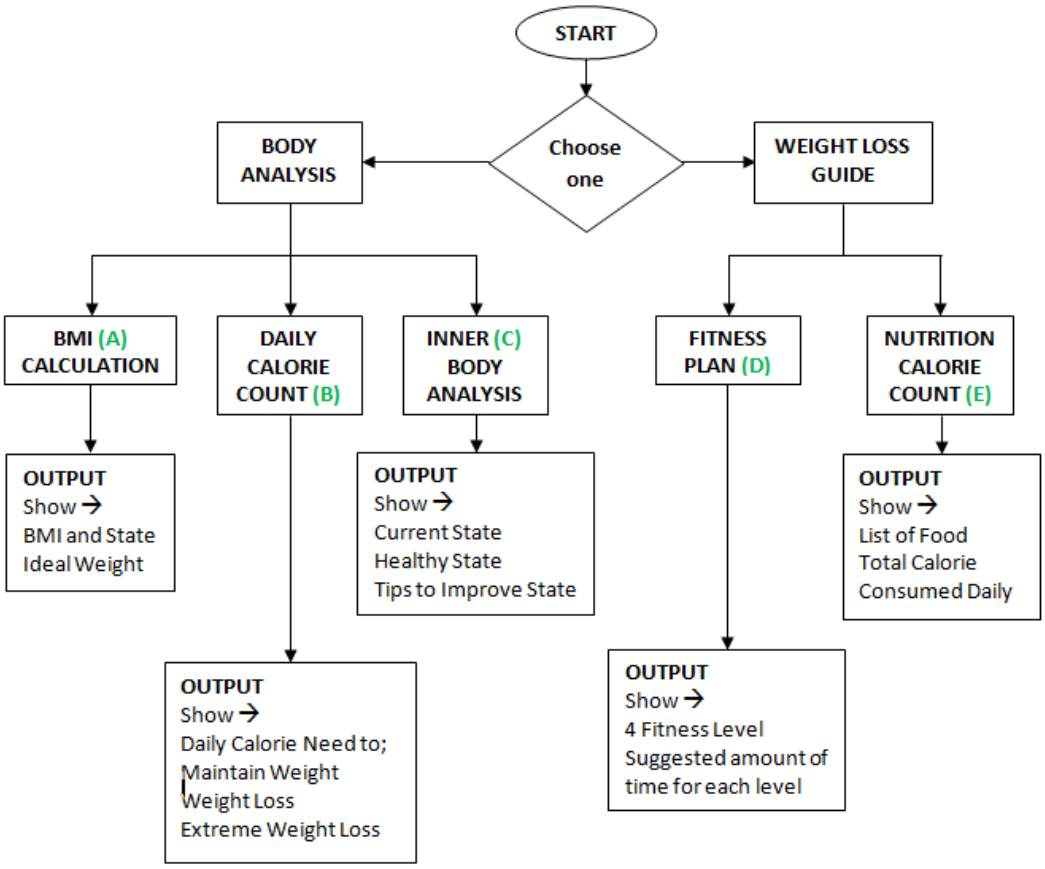


Figure 4.2(a): System Flowchart

The inner body analysis is analyzed based on the BIA information input by user. For fitness plan, different level of physical activity will be display together with the amount of time that is suggested for the user to carry out the fitness activity. The duration depends on the amount of calorie needed to be burn by the user.

While the nutrition calorie counter will provide a list of dishes, especially Malaysia originated dishes. The application will measure the total calorie intake by user by adding the calorie they consumed during breakfast, lunch, hi-tea, dinner, supper and others (if applicable). Based on the total calorie, the user can estimate how much additional calorie that they should consumed or how much excess calorie should they burn on that particular day.

All the elements of A, B, C, D and E will be measured based on below formula;

<table>
<tr><th>ELEMENT</th><th>DESCRIPTION</th><th>SOURCE</th></tr>
<tr><td rowspan="2">A</td><td><u>BMI Calculation</u>

A) BMI Calculation

BMI = weight (kg) / [height (m)]^2

B) BMI State

<table><tr><th>BMI</th><th>Weight State</th></tr><tr><td>Below 18.5</td><td>Underweight</td></tr><tr><td>18.5 to 24.9</td><td>Normal</td></tr><tr><td>25 to 29.9</td><td>Overweight</td></tr><tr><td>30 and Above</td><td>Obese</td></tr></table>Figure 4.2(b): BMI State Classification</td><td>www.cdc.gov</td></tr>
<tr><td>C) Ideal Weight (IW)

<table><tr><td>Male</td><td>IW = [height (m)]^2 x 20.1 to [height (m)]^2 x 24.9</td></tr><tr><td>Female</td><td>IW = [height (m)]^2 x 18.7 to [height (m)]^2 x 23.8</td></tr></table>Figure 4.2(c): Ideal Weight Formula</td><td>Brian Mac, 2011</td></tr>
<tr><td>B</td><td><u>Daily Calorie Needed</u>

A) Calorie Needed to Maintain Weight (MW)

<table><tr><td>Male</td><td>10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) + 5</td></tr><tr><td>Female</td><td>10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) - 161.</td></tr></table>Figure 4.2(d): Formula to Measure Calorie Needed to Maintain Weight

B) Calorie Needed to Lose Weight
Weight = MW x 0.8

C) Calorie Needed to Extreme Weight Loss
Weight = MW x 0.65</td><td>Kevin Zahri, 2010</td></tr>
</table>

<table>
<tr><td>C</td><td><u>Inner Body Analysis</u>

(Refer appendix, for chart analysis)</td><td>www.herbalvitality.info</td></tr>
<tr><td>D</td><td><u>Fitness Plan</u>

<table><tr><th rowspan="2">Fitness Level</th><th colspan="2">Calorie burned per hour</th></tr><tr><th>Male</th><th>Female</th></tr><tr><td>Light Activity
E.g: Cleaning house, play golf</td><td>300</td><td>400</td></tr><tr><td>Moderate Activity
E.g: Walking, Dancing, Cycling</td><td>460</td><td>370</td></tr><tr><td>Strenuous Activity
E.g: Jogging, Swimming</td><td>730</td><td>580</td></tr><tr><td>Very Strenuous Activity
E.g: Running, etc</td><td>920</td><td>740</td></tr></table>Figure 4.2(e): Calorie Burned for Various Activities</td><td>American Heart Association, 2010</td></tr>
<tr><td>E</td><td><u>Nutrition Calorie Count</u>
(Refer appendix, for food calorie list)</td><td>Kevin Zahri, 2010</td></tr>
</table>

Table 4.2 Table of Formula and Calculation

4.3 Prototype

Throughout the development process of the project, several iterations of the application have been designed to investigate the best possible options to address the problems mentioned earlier. Depending on the deep of the research and the analysis of the research, few modifications are done, one by one. Below are the lists of prototypes designed throughout the project period:

4.3.1 Prototype 1

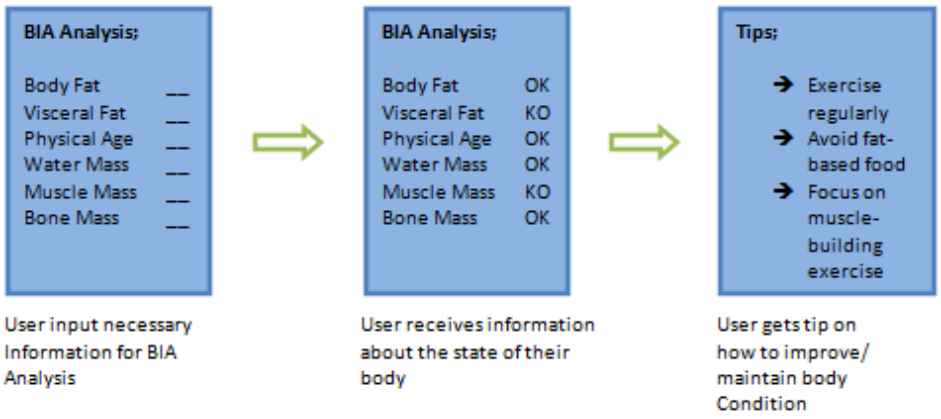
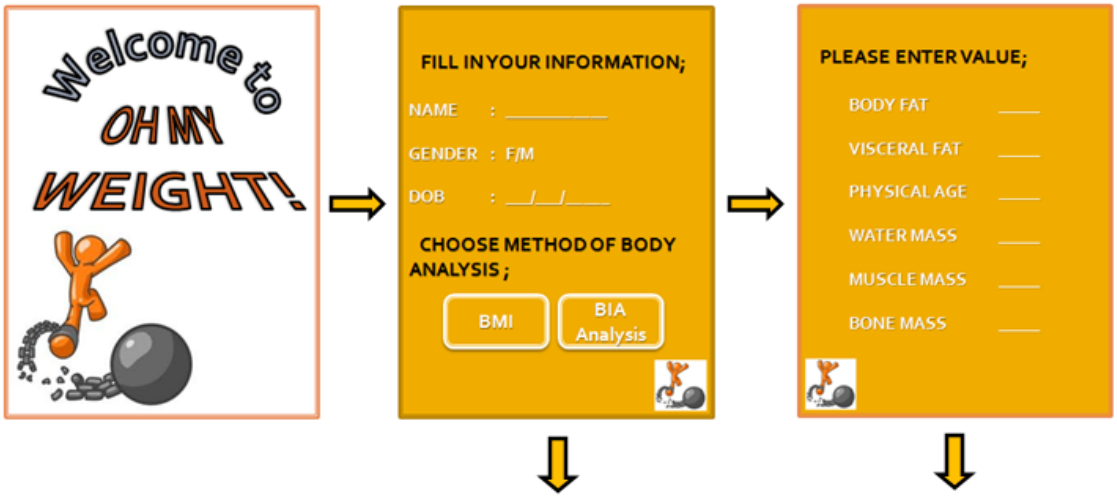


Figure 4.3.1: Prototype 1

The initial development for Prototype 1 of the application focused solely in the BIA Analysis. Only one type of input is available for user. User will fill in necessary input and they will get brief information about their inner body condition and several tips on how to either maintain or normalize their body conidition. This prototype is very simple and understandable for user to navigate. However the prototype is also lack of information and barely achieve its target. Plus, the application may not be useful for user without the presence of the BIA information. Hence to solve this problem, another choice of input which is BMI calculation, is include in the second prototype.

4.3.2 Prototype 2




FILL IN YOUR INFORMATION;
WEIGHT : _____ kg
HEIGHT : _____ cm
Clear
Calc
BMI : _____
You are : _____
BMI ANALYSIS
BODY FAT
The ideal amount is X.
Your state is ____.
Focus on ____.
VISCERAL FAT
The ideal amount is X.
Your state is ____.
Focus on ____.
PHYSICAL AGE
Lower/Higher physical age than your current age indicate better/lower ____
CALORIE POSSES :
_____
CALORIE NEEDED :
_____
CALORIE TO BE BURN :
_____
BMI ANALYSIS
WATER MASS
The ideal amount is X.
Your state is ____.
Focus on ____.
MUSCLE MASS
The ideal amount is X.
Your state is ____.
Focus on ____.
BONE MASS
The ideal amount is X.
Your state is ____.
Focus on ____.
FITNESS LEVEL
TIME
(minute/day)
EASY
(walking, clean up the room, etc)
MEDIUM
(jogging, taking stairs, etc)
HARD
(running, dancing, etc)
HARDER
(swimming, cycling, badminton, etc)
CHOOSE TIPS;
FITNESS
NUTRITION
NUTRITION PLAN
BREAKFAST
|Group A| Group B| Group C| None|
LUNCH
|Group A| Group B| Group C| None|
HI TEA
|Group A| Group B| Group C| None|
DINNER
|Group A| Group B| Group C| None|
SUPPER
|Group A| Group B| Group C| None|

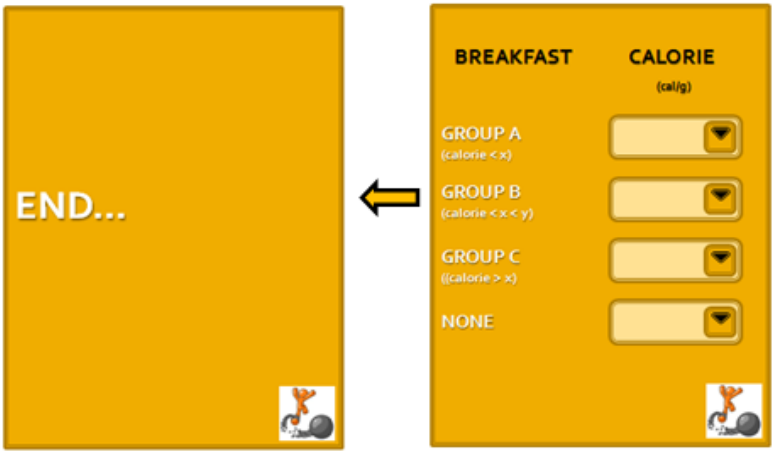


Figure 4.3.2: Prototype 2

Development of the second iteration of the application provides two type of input for user to choose based on their preference and information availability. It includes several processes like BMI calculation, calorie count and classfication of food's calories. These formulas are obtained from the existing research and is used to increase the accuracy of the application. The author focused on two approaches to solve the weight problems; there are fitness and nutrition. For fitness section, the author calculate excess calories present in the user body and estimate how much time required for them to carry out several fitness activity to burn these calories. While for the nutrition section, the application measure the amount of calorie needed by user and suggested several selection of food for the user for 5 meal courses which is the breakfast, lunch, hi-tea, dinner and supper. Most importantly, the meal options focused on Malaysian delights.

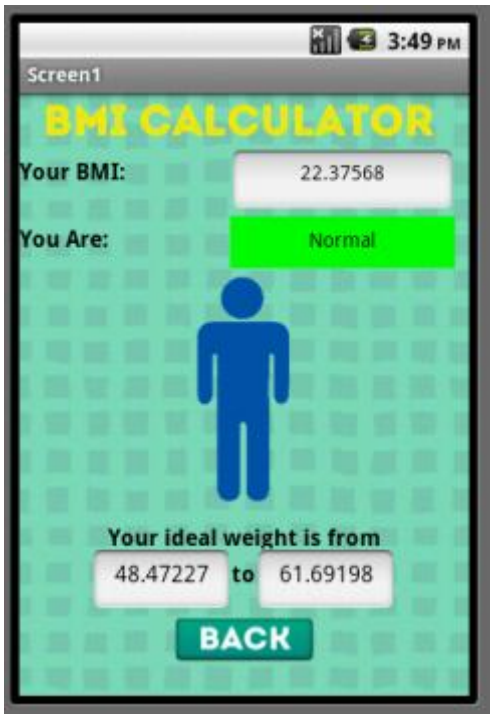
However due to technical limitation like the storage capacity and loading speed of the App Inventor, the prototype need to be redesign again. Few elements needed to be replace to ensure that the product can work smoothly.

4.3.3 Final Prototype

After continuous redesign and development process, below are the final prototype's snapshots and functionality;

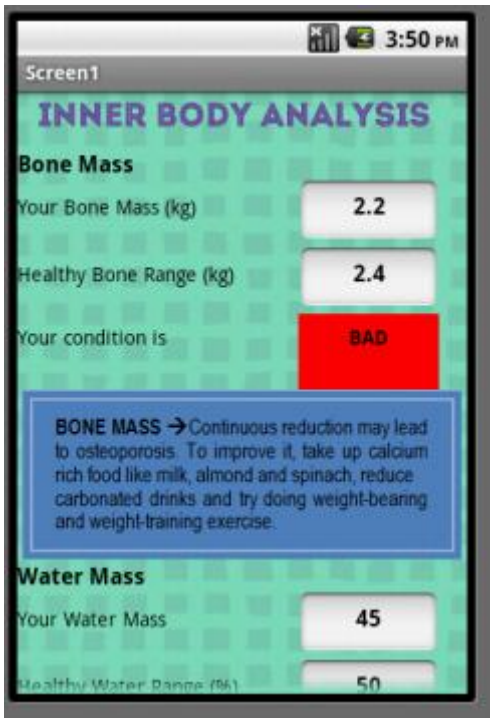
1. Capture user information

2. Calculate user BMI

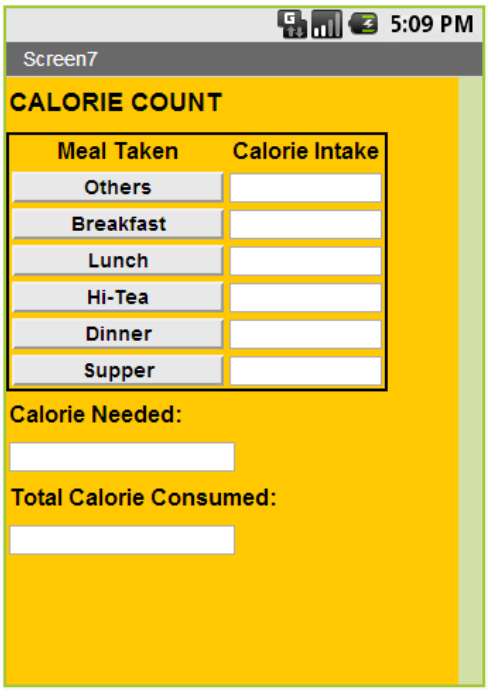


3. Calculate daily calorie needed by user

4. Provide user inner body analysis based on BIA information



5. Calculate daily calorie intake base food consumed



6. Generate duration of different level of fitness activities needed to be done by user to burn extra calorie in their body

As the result of redesigned the second prototype, the author managed to create a much simpler navigation process for the application user. The new prototype is more understandable and smaller in size; hence the application is more compatible for various devices. This prototype now has five main

functionalities which are; calculate user BMI, calculate daily calorie need by user, analyze user inner body condition, generate fitness timely plan and calculate daily calorie intake by user based on the food they consumed. This prototype has been chosen as the final implementation of the application as it caters the objectives to guide user with their weight loss activities while at the same time providing inner body analysis of their body.

4.3.4 Evaluation through prototype testing

All three prototypes were tested out by 10 participants in determining the following criteria in the implementation of the application;

1. The application is easy to navigate
2. The application has sufficient information
3. The application runs smoothly
4. The application is useful for user

On whether or not application will managed to help them with their problem. These questions were asked in order to find out the capability of the application in allowing ease of simplifying the weight loss effort; the questionnaire is utilized and further clarified to measure participant satisfaction on the application functionality.

4.3.5 Result of Prototype Testing

	Prototype 1		**Prototype 2**		**Prototype 3**	
	Yes	No	Yes	No	Yes	No
Ease of Navigation	10	0	2	8	8	2
Sufficient Information	0	10	7	3	8	2
Operation Smoothness	9	1	3	7	7	3
Application Usefulness	0	10	8	2	9	1
Total	19	21	20	20	32	8

Table 4.3.5: Result of Prototype Testing

4.4 Discussion

After successfully gathering the data on all three prototypes in each respective criterion, several conclusions can be made on the application. As shown in the table below, we can conclude that Prototype 1 is very easy to navigate and has the smoothest operation among the three prototypes. However, it provide insufficient information, hence is not helpful for user. This is due to the fact that it only covers the BIA analysis.

Whereas, we can see the second prototype provides sufficient information and is helpful to the user. But it is also lacking because it is hard to navigate and does not have a smooth operation. This may be due to its excessive information provided and the advance of the application functionality. This kind of problem may hinder the application ability to allow user to fully utilize its usage.

Last but not least, the third prototype is easy to navigate, provides sufficient information and has been very helpful to user with the weight loss activities. The operation may not be 100% smooth but it is still considered acceptable due to the fact that it is a new application for them. The smoothness will gradually increase once they are familiar with the product. It gets the highest Yes. Hence, based on the result we can see that Prototype 3 is successfully addressing all the problems that were mentioned earlier. It introduces BIA Analysis to the android world as one of the new method to be considered for health checking application.

Plus, it also priorities Malaysian delight to help Malaysians and its citizen to carefully monitor their calorie intake while enjoying any meal they wish to consume. However, the prototype is still open for any upgrade and modification as the development is having yet to be completed. Upon the completion of the prototype, it will be release for testing and further update will be reported from time to time

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

The objectives that were previously stated in the objectives are:

1. To examine factors affecting human weight and investigate existing related method available to solve weight loss problems to attain a firmer grasp on the language and its structure
2. To identify the element and functions that should be included in the weight loss application and the type of food consumed by Malaysian and its citizen
3. To design and develop and Android application that will help to guide people to lose weight and at the same time get better understanding on their inner body condition
4. To test the usefulness of the application with the targeted users

Based on the objectives, set of interviews, survey and observation were done in order to further clarify the statement mentioned in existing research made by professional in their eras. Using the help from health consultants from various backgrounds and UTP students' clarification, a more structured and details prototype has been designed and partially developed. Elements and functionality relevant to the product development has been recognized and yet to be implement in the application.

Accordingly, two objectives have been addressed in FYP I and the extension of these have been continued in the beginning of FYP 2. This allowed for a more accurate view on what should be included within the final product of the application. The development of Prototype 3, is already near to its completion. So far, the final prototype provides the best features and design for the application function. The project development is a bit behind in time and seems to have limited time. However, necessary action will be taken so that the product completion will be ready in time.

To conclude, the writer aims to help the user by creating an application that will be able to solve existing application problem and replace the usage of manual coaching system. Within the time frame given, the writer has discovers the effectiveness of BIA technology compare to BMI usefulness in measuring body weight. (a body weight scale that is able to calculate a person physical age, muscle, water and fat condition) and more secret of health, in order to provide better, most effective way to serve these weight conscious individuals. With more personalized information of the body, hopefully the people students especially will give more thought about their body condition. It will allow the user to get all the information they need in a single application.

Plus, the product is expected to solve all the Malaysian limited food listing problem over time. Furthermore, the writer aim to seek for government and educational sectors help in providing the special body mass balance in the campus itself. This will note only increase the students' awareness with regards to their help but will also help them to avoid spending too much money on such other costly treatment. In the next phase of the project the writer aims to develop ad design the best application that suits the user preference.

The project has achieved the following:-

1. Showing another alternative for public to get more personalized information of their body condition
2. Allows users especially Malaysian, to properly calculate their daily calorie intake through the new food calorie database
3. Creating an application that will act as a personal monitoring tools for user and at the same time guide their weight loss activities
4. Eliminate traditional inner body analysis method (refer appendix)
5. Increase awareness of individual inner body condition

Technically, it is recommended for this project information and functionality to be updated from time to time to ensure more effective tips and

solution for users. The author planned to improve the application interface to increase its attractiveness. While socially, the government, private agencies and higher learning institution shall install similar scientific weight in public places like shopping malls and recreation areas, so that the public and the students can have better access to the BIA information and at the same time increase the nation awareness about their health and lifestyle.

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APPENDICES

A) Pre-development Survey

OH! MY-WEIGHT

Hi everyone! I'm intending to create an android application that specializes in giving a set of guidance in term of fitness and nutrition, to users with weight problem. This new application, named OH! MY-Weight aims to improve two major "empty spaces" of the existing applications. Firstly, I would like to include as many as possible type of Malaysian dishes in the food calories database of this new application. Secondly, I would like to use information from a scientific body mass balance as an input to this application, to help me come out with a more personalized advice for each of the users. This set of question is asked in order to help me to further understand this matter. Your cooperation to help me answer all of these questions are much highly appreciated. Thanks :)

Age *

- 16 - 20
- 21 - 25
- 26 - 40
- 41 - 60
- 60 and older

Nationality *

- Malaysian
- Other:

Race *

- Malay
- Indian
- Chinese
- Other:

Owns a smartphone? *

- Yes
- No

Aware of mobile application like Android Apps? *

- Yes
- No

What is/are its disadvantage/s?

What is/are its advantage/s?

Have you ever used any android apps that helps user with weight loss problem? If yes, name it.

Are the food calorie databases of these applications providing sufficient list of Malaysia's dishes?

- Yes
- No

Is it important for these applications to include variety list of food that suits Malaysians appetite in the food calories list too? *

- Yes
- No

Which of these are among the most frequent type of dishes consumed by Malaysians and its citizen? *

- Malay Food
- Chinese Food
- Indian Food
- Western
- Other:

Do you think Body Mass Index (BMI) provides enough information about your body condition? Why? *

Are you aware of Bioelectrical Impedance Analysis (BIA) Technology? This technology is used in several scientific body mass balance to calculate human visceral fat, muscle mass, water composition, physical age and etc. *

- Yes

- No

Would you like it, if we created a mobile application that can provides more detailed and personalized health advice to you? *

- Yes
- No

All existing applications used BMI as the source of information to analyze users' body condition. Should we use information from BIA technology too, in order to get more personalized information about the user body condition? Is it useful? Why? *

Should the government installs several body mass balance with BIA technology in most public places? Is it applicable and will it be useful for the citizens? Why? *

Submit

B) Pre-development Interview Questions and Answers with Mr Dominic Wells

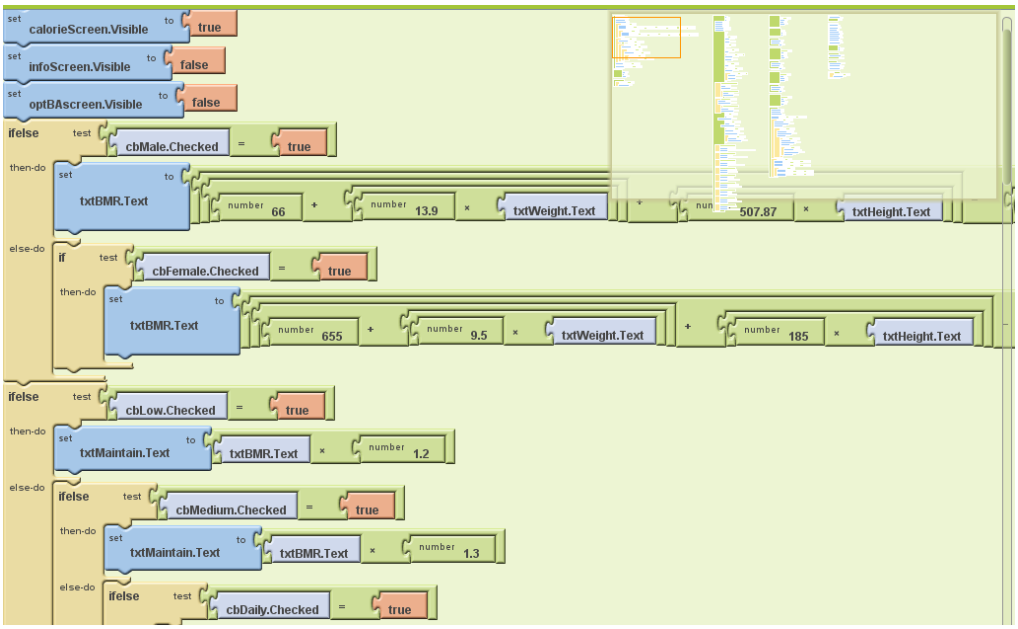
Date	Questions and Answers
12/10/12	Questions generated based on his writing in his blog:- 1. Why do you think BMI calculation is not very useful compare to inner body analysis? BMI is not very useful compared to inner analysis for several reasons. a.) because BMI is just a "range" and does not measure fat vs muscle. Somebody with a lot of fat and somebody with a lot of muscle could weigh the same, and have the same BMI, but one is healthy and one is not. b.) people have different size bones, which affects BMI. c.) the most important thing is visceral fat, body water %, body fat %, so BMI is just a basic level guide and doesn't give much information. 2. What are the important guidelines for user that wanted to lose some weight and what is the best way to lose the weight? The best way to lose weight really depends on a person's body condition, this is why we don't sell health product in shops, because everybody is different, however, the best way to lose weight is to have correct nutrition, and to avoid too many carbohydrates and sugars. If your body has good "fuel" it will work properly. People don't put bad oil or petrol into their car, but they put bad fuel into their body, so of course they become fat. 3. In your opinion, what are the functions that are important to be included in the application? The functions needed. They can input their data and then the app will tell them if they are in the normal range, and what they can do to improve. This is the key thing. 4. Why do you think such application is needed in the market now? I think it is needed because for example; Herbalife distributors can take someone's result and give them the data, then let them research the results by themselves in their own time, less pressure. Also, many people may not understand their results if they use the scales by themselves or if the distributor does not explain them clearly, so this allows them to measure the results by themselves and another useful function would be a progress chart. If the person tries to improve their

	results, and enters the data a second time, it can show them how much they have improved, this would be very important when customers need to see progress and motivation to continue.

C) Post – Development Questionnaires

	Prototype 1		Prototype 2		Prototype 3	
	Yes	No	Yes	No	Yes	No
I can navigate it easily						
It provides sufficient information						
The application operates smoothly						
This application helps						

D) Part of the development algorithm



E) Bioelectrical Impedance Analysis

1. Body Fat serves to store energy and protect internal organs. Too low/too high is bad.

MALE			
	20 - 40	**40 - 60**	**>60**
Excellent	14.5 – 18.0	19.0 – 22.0	21.5 – 24.0
Healthy	18.0 – 21.5	22.0 – 25.0	24.0 – 27.0
Medium	21.5 – 25.0	25.0 – 28.0	27.0 – 31.0
Obese	>25.0	>28.0	>31.0
FEMALE			
	20 - 40	**40 - 60**	**>60**
Excellent	19.5 – 23.0	25.0 – 28.0	27.5 – 32.0
Healthy	23.0 – 26.0	28.0 – 32.0	32.0 – 37.0
Medium	26.0 – 30.5	32.0 – 35.0	37.0 – 39.0
Obese	>30.5	>35.0	>39.0

2. Visceral Fat surrounds vital organ. Too much of this fat may lead to disease like high cholesterol, heart disease and diabetes. Less is better.

   1 – 4 Excellent
   5 – 8 Medium
   9 – 12 Bad
   >13 Excess (Danger)

3. Muscle mass can increase through work out. Increase muscle means increase body's energy requirement and consumption. More muscle, more calories burned, lessen chance of weight gain.

Gender	Age	Low (–)	Normal (0)	High (+)	Very High (++)
Female	**18-39**	< 24.3	24.3 - 30.3	30.4 - 35.3	≧ 35.4
	40-59	< 24.1	24.1 - 30.1	30.2 - 35.1	≧ 35.2
	60-80	< 23.9	23.9 - 29.9	30.0 - 34.9	≧ 35.0
Male	**18-39**	< 33.3	33.3 - 39.3	39.4 - 44.0	≧ 44.1
	40-59	< 33.1	33.1 - 39.1	39.2 - 43.8	≧ 43.9
	60-80	< 32.9	32.9 - 38.9	39.0 - 43.6	≧ 43.7

4. Physical age is calculated base the ratio of body weight, body fat % and muscle. It shows how old your body is. Lower that your real weight is better.

5. Bone Mass

Gender	Weight (kg)	Healthy Bone Range (kg)
Male	<65	2.65
	65 – 95	3.29
	>95	3.69
Female	<50	1.95
	50 – 75	2.40
	>75	2.95

6. Body Water

   Healthy Range:

Male	60 – 65%
Female	50 – 55%

7. Physique Rating refers to the ratio of body fat & muscle mass in your body.

Physique Rate	State	Details
1	**Hidden Obese**	**Small Frame Obese** You seemed to have healthy body type based on physical appearance however you have high body fat % and low muscle mass
2	**Obese**	**Medium Frame Obese** You have high body fat % and moderate muscle mass
3	**Solidly Built**	**Large Frame Obese** You have both high body fat % and high muscle mass
4	**Under Exercise**	**Low Muscle & Average Body Fat %** You have average body fat % and less than average muscle mass
5	**Standard**	**Average Muscle & Average Body Fat %** You have average body fat % and muscle mass
6	**Standard Muscular**	**High Muscle & Average Body Fat % (Athlete)** You have average body fat % and higher than normal muscle mass
7	**Thin**	**Low Muscle & Low Fat** You have lower than normal body fat % and muscle mass
8	**Thin & Muscular**	**Thin & Muscular (Athlete)** You have lower than normal body fat % and have adequate muscle mass
9	**Very Muscular**	**Very Muscular (Athlete)** You have lower than normal body fat % and have above average muscle mass

F) Part of the food calorie database

TIME	NAME	SERVING QUANTITY	CALORIE AMOUNT
Breakfast/ HiTea	1. Nasi Lemak		
	2. Roti Canai	1 piece	301.5
	3. Omelette	1 piece	68.5
	4. Sandwich		
	a. Sardine	1 piece	80.2
	b. Egg		
	5. Mushroom Soup		
	6. Nestum	½ cup	165.0
	7. (Cereal with milk)		
	a. Honey Star (125 ml)	½ cup	282.15
	b. Koko Krunch (80 ml)	½ cup	289.95
	c. Corn Flakes		
	8. Telur Goreng		
Lunch/ Dinner/ Supper	1. Nasi Putih		
	2. Dishes		
	a. Beef, Rendang		
	b. Fried Chicken	1 piece (110g)	255.2
	c. BBQ Chicken	1 piece (110g)	161.6
	d. Tomyam (Chicken)	1 bowl (400g)	204.6
	e. Sambal Chicken	1 bowl (250g)	860.7
	f. Korma Chicken	1 bowl (250g)	523.38
Drinks	1. Milk		
	a. Milk (goat)	1 glass (240g)	165.44
	b. Milk (cow)	1 glass (240g)	150.5
	2. Nescafe	1 packet(20g)	88.7
	3. Horlicks	1 packet(32g)	94.8
	4. Milo	1 glass(32g)	110.45
	5. Juice		
	a. Orange	1 glass(240g)	100
	b. Watermelon	1 glass(240g)	122.18
	c. Apple	1 glass(240g)	118.50
Others	1. Satay (chicken)	1 skewer	139.68
	2. Kebab (chicken)	1 serving (173g)	180.12
	3. Cendol	1 cup	600.6
	4. Ice cream (Chocolate)	1 scoop(65g)	77.4
	5. Chocolate		
	a. Toblerone	1 bar (50g)	263
	b. Mars	1 bar(62.5g)	284.7
	c. Cadbury Dairy Milk	1 bar(26g)	132