DIGITAL FITNESS DIARY FOR HEALTHY LIFESTYLE

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ABSTRACT

The deliverable of the project is a fitness app called *Digital Fitness Diary for Healthy Lifestyle* which will offers three main modules for the users to use. Firstly, the users can perform exercise anywhere they like by using the Exercise section where it contains different types of workouts as well as exercises that can support and aid them to practice a healthy lifestyle. Other than that, the core technology that is involved in the app is GPS because it is highly essential when it comes to location tracking of people globally and accurately (Bajaj, Ranaweera and Agrawal, 2002).

However, healthy lifestyle cannot be practiced perfectly by only exercise because the role of diet is also extremely crucial. The users will be able to keep track of what they have eaten and then consume appropriate diet by looking at the statistics regarding their bodies in the Food section. Lastly, the users can keep an eye on the daily water intake because sufficient amount of water intake is necessary for human body as well. They could also control the intake of other beverages such as coffee and beer by using the app so that their bodies can withstand just enough amount of intake.

Primarily, all these functions mentioned above aim to help the users to stay away from nasty diseases so that they could enjoy a healthy lifestyle with their beloved one. In order to have a clearer picture regarding fitness apps, there are five fitness apps that have been reviewed in this project namely Runtastic Running & Fitness, Google Fit, Fitbit, 7 Minute Workout, as well as Calories Counter – MyFitnessPal. Hence, Iterative & Incremental life cycle model is adopted in this project to realize the deliverable. Few rounds of requirements, design and implementation phases will be gone through while more features will also be added into the app until the project is completed.

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LIST OF ABBREVIATIONS

AVD	Android Virtual Device
BMI	Body Mass Index
FYP	Final Year Project
GPS	Global Positioning System
HICT	High Intensity Circuit Training
SDLC	System Development Life Cycle
SQL	Structured Query Language
JSON	JavaScript Object Notation
URL	Uniform Resource Locater
RAD	Rapid Application Development
SDK	Software Development Kit
IDE	Integrated Development Environment
API	Application Programming Interface
UI	User Interface
QR	Quick Response

CHAPTER 1: INTRODUCTION

1.1 Problem Statement and Motivation

A frustrating characteristic of fitness is that the results cannot be seen immediately as they must spend months and years to achieve the ultimate results (Rejeski and Kenney, 1989). So, one of the concerning problems in the society nowadays is that they have a poor tracking ability (Boreham et al., 2004) where it is difficult to keep track of their exercise statistics such as calories, distance travelled, speed, as well as steps taken. It is virtually impossible to keep track of all these statistics conveniently due to several reasons such as lack of measuring tools and self-perseverance to carry out the exercise consistently which will make them to give up eventually. Some of them also find it extremely hard to be motivated and keep exercising constantly due to the fact that exercising is totally voluntary based (Rejeski and Kenney, 1989). Other than that, people also must not forget about diet plays an important part in achieving a healthy lifestyle yet it is also a tough task when it comes to keep track of their diets in terms of what they consume and how much they consume every day. Hence, all these problems mentioned above lead to the development of this project. By developing this fitness app called *Digital Fitness Diary for Healthy Lifestyle*, peoples could keep track of their fitness level daily through the app by monitoring the statistics of the exercises that they have completed previously and then adjust the routines accordingly, in which the app will plays as an assistant role in the users' daily life while delivering information such as health articles, nutrients consumed, social network feed, and so on.

The app will store the users' data and then process as well as display for each of them accordingly because of the differentiation in users' skill and fitness level as well as each and every one of them has different needs (Higgins, 2016). Besides, due to the poor tracking ability of people in diet and exercise statistics where it may leads to some undesired consequences, there is an urgent need in assisting the people to improve some of the inappropriate dietary habits (Boreham et al., 2004) and exercise frequency gradually by providing statistics or reminding them through the reminder feature. Moreover, the inclusion of friend leaderboard feature in the project also intends to raise the awareness of people about exercising more in order to minimize the risk of disease

(United States Department of Health and Human Services, 1996) and eliminate the mindset about the inability to keep track of the exercise statistics consistently by allowing the user to challenge their friends in terms of exercise as well as food and then compete for higher scores or ranking.

1.2 Project Scope

After mentioning the problems above, the deliverable of the project is a fitness mobile application called *Digital Fitness Diary for Healthy Lifestyle* in which the users can use the app to keep track of their exercise, food, and water statistics such as calories, distance travelled, nutrients consumed, volume of water intake, and so forth. Meanwhile, tons of information will be available in the mobile application so that the users can be provided with useful as well as helpful tips and tricks about health to make their life healthier than before. There are more details for modules and features involved in this project as shown below:

1. Exercise Module

   This module contains several features in which it can be divided into 2 parts which are indoor and outdoor exercise. Outdoor exercise part can aid the users to carry out the workout consistently through the use of GPS technology and smartphone sensors such as gyroscope and accelerometer. They will be able to view the statistics as well as the map in real time while they are doing exercise so they can have a better idea about the performance, body conditions, and current location. Meanwhile, the indoor exercise part allows the users to do exercise routines which can be done indoor while keeping track of the duration as well as number of routine sets that they have completed.

2. Food Module

   This module allows the users to create meal with existing foods stored in the database and then log the meals that they have consumed according to the type of meal such as breakfast, lunch, and dinner in order to keep track of the nutrition intake whereas the amount of calories will also be logged along with the meals so that they will be able to get a clear idea regarding how much that they have ate in

their daily meals. Besides, users can create custom food item and enter the necessary information in case they could not find certain foods in the database. It is also possible for the users to create and save their food recipes in the app perhaps due to the fact that they wish to share the recipes with their friends.

3. Water Module

   This module allows the users to log the daily water intake because water is vital for a healthy lifestyle. Nevertheless, there is also another feature in this module which can assist the users while consuming other beverages by keeping track of the amount of intake daily and display the data in graphical form.

4. Reminder Feature

   This feature enables the users to create reminder from exercise, food, water, and others so that they could be reminded to do certain tasks or routines on specific time and date.

5. Social Network Feature

   This feature allows the app users to connect to each other by providing a platform for them to share their pictures, thoughts, and updates with their friends because long term use of social media site benefit their fitness routine (Frimming, Polsgrove and Bower, 2011) which can motivate the users to practice healthy lifestyle. Similar to some of the popular social network, the users can also view the other users' profile, like and comment on the posts whenever they want.

6. Leaderboard Feature

   This feature allows the users to challenge their friends in terms of exercise and food where they could compete for higher ranking or scores when they have completed some tasks. Likewise, leaderboard will also be shown to the users where they can view all of the scores and rankings of their friends.

7. Diary Feature

   This feature allows the users to view all of the statistics in one single screen. Statistics will be displayed in organized view like table form as well as graph view so that the users could understand the data more. It can also be filtered by selected date in case the users wish to view specific date. As a result, users could keep track of the statistics and activities in a screen without the need to switch to other screens.

1.3 Project Objectives

The project objectives are fairly straightforward, the first objective is that the users will be able to keep track of their current exercise, food, and water statistics through continuous usage of the app, this means that the all data about their health, will be logged and saved into the database for further process and then display to the users when it is needed. The users can have a better idea about their lifestyle since they can keep track and view the stored data in organized form. There are 3 main modules in the app, which are Water, Exercise, as well as Food module that aim to support and aid the users to practice a healthy lifestyle because each section log and provides different kind of information to the users. Likewise, the second objective is to help the users to practice consistent exercise routines as well as keep their diet right for every meal according to the result analyzed from the data stored in the database by motivating them through extrinsic motivation. Apparently, that will be a huge problem if people eat whatever they want and consume excess calories every day yet they do not carry out sufficient amount of exercise, obesity as well as other chronic diseases are coming for them sooner or later. The truth is human eats only as much as the body needs and should feel satisfied instead of stuffed at the end of a meal (Robinson, Segal Ph.D. and Segal, 2017). Basically the users can also create reminders in order to remind them to do certain tasks which are quite handy if they are worried of forgetting routines that need to be done.

Eventually, the major problem that will be addressed through this project is the lack of information and motivation. People often do not provided with ample amount of information so that they could always stick with the latest health information and get a clear sense of direction in terms of what needs to be done as well as how to accomplish it.

For instance, the users can complete a set of exercise through steps by steps instructions as shown in Figure 1.1 which demonstrates the indoor exercise section in the app. Furthermore, they also feel that exercise is boring and lack of fun as well. Thus one of the objectives of this project is to supply functions and information such as health articles that is more than enough for the users to practice a healthy lifestyle by providing them a functional mobile application to handle the tasks. Additionally, the concept of gamification like leaderboard will also be added into the app to increase the extrinsic motivation and diminish the boredom of the users so that they will be motivated to practice healthy lifestyle consistently by using the app. For clarification, behavior that is driven by external rewards called extrinsic motivation can be raised through the in game achievements (Cherry, 2016). Perhaps after implementing the features mentioned above, the users will be motivated and excited to practice a healthy lifestyle day in day out. As a matter of fact, health and quality life indeed can be improved by including appropriate amounts of physical activity in daily lives (United States Department of Health and Human Services, 1996).

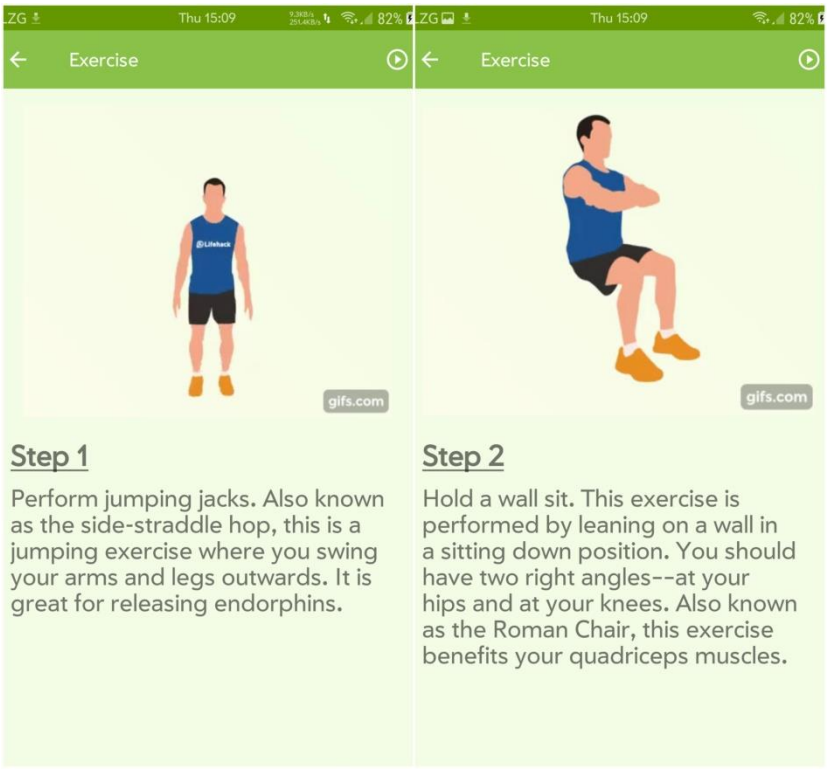


Figure 1.1 Step by step instructions of an exercise routine

1.4 Impact, Significance, and Contribution

The fitness app that is going to be developed will be able to keep track of the users' data such as meals, recipes, statistics, and so on after the continuous usage of the app. There is a dedicated section that displays all kinds of statistics in organized form to the users whenever they wish to view the details regarding their progress. On the other hand, modern people nowadays also do not fully aware of the crisis that they are facing, which is the occurrence of the chronic diseases. The app will be able to remind the users about some things that must not do or vice versa after they create reminders. Speaking of the users' lifestyle, the final deliverable of this project is to motivate and encourage the users so that they could practice a healthy lifestyle through the built-in social network platform as well as the concept of gamification such as leaderboard so that they will not think that exercise is meaningless when there is no more intrinsic motivation.

1.5 Background Information

People often overlook the importance of keeping their fitness at average level or above in this modern society. Obesity as well as other diseases are creeping in without any major alert because people are always busying with their works and lives, all they would care is the money that they earn and people that they love. All these diseases must be envisaged as the developments of the diseases are not inevitable and they are largely preventable through lifestyle change (World Health Organization, 2000). Even if they notice the jeopardy that they are facing, they do not have enough spare time or motivation to keep them away from the risk of dying from horrible diseases. Therefore, fitness app is the solution for this problem because the personal item that is relatively close to the modern people is smartphone and the mobile applications installed inside it.

Apparently, dozens of hours have been spent by people daily on using the mobile app and it is the clear advantage of this solution. It is portable, which means that they could just install the fitness app on the phone and they could literally go anywhere to carry out the exercises. As far as the feature is concerned, there are various functions in the fitness app such as the ability to setup fitness goals, record distance travelled daily, daily burned calories, and hydration level in which all these are essentials for the humans and can be found in basically all of the conventional fitness apps. While some of the apps

are free to download from the app market and contain no in-app purchases, there are the other popular apps which require the users to pay in order to unlock premium contents for acceptable costs.

All kinds of features are available to the users with just several touches so that they can try out different apps just to find out the app that satisfies them. Additionally, some people also prefer to use the low-cost and wide-availability of the fitness-tracker devices (de Zambotti et al., 2015) along with the companion fitness apps and they are much more reliable in terms of result. The reason behind this is the fitness apps and the correlated sensors in the smartphone do not sensitive enough to detect the pattern of movement for instance due to the fact that the some of the sensors are not meant for fitness initially. Meanwhile, it is much more reliable when it comes to wearable trackers as they are designed to track all pattern of movements and all types of body conditions such as heart rate.

Apart from that, the concept of gamification has also been vastly applied in mobile applications because it has emerges as one of the most popular strategies in recent years. Basically, the idea of gamification is the usage of game design elements in nongame contexts where it is meant to increase initiation and retention of desired behaviors (Lister et al., 2014). Users will be motivated by game-like rewards in which they would sustain the desired behaviors voluntarily due to the strong incentives. In another term, the implementation of gamification in mobile applications often appeals to human desires for reward, self-expression, achievement, competition, as well as status (Abrosimova, 2017).

CHAPTER 2: LITERATURE REVIEW

2.1 Runtastic Running & Fitness

This app was developed by Runtastic, it is a running tracker that turns the phone into GPS tracker so that the users can track their runs and see their progress while completing their fitness goals. The main screen of the app features a dashboard-like monitor which displays the values that are related to running such as duration, distance, pace, speed, heart rate, dehydration, calories, elevation, clock, and steps. The users will be able to keep track of the values and the location as they are running or jogging at the preset routes on the map.

The map allows them to know where they are and where they should go subsequently in real time without leaving the app (Sousa et al., 2012). Apart from that, there are history and statistics section which keep track of all of the necessary information in an organized view. What the users have done and the values that are extracted from the finished exercise will be displayed here so that the users can have an idea about their performance. Meanwhile, there is also a leaderboard section in the app which allows the users to compete with their friends in terms of running sessions. By doing so the users will not feel boring while doing exercise as this feature motivates the users to step up their game and boost their fitness level.

Runtastic also features a function called Routes which basically let the users to find, create, save, and flag their favorite routes. The users can customize and share their favorite routes each time they find a new routes when they wish to. Besides, Interval Training & Coaching feature helps the users to avoid burnout and boredom as these two problems are very common for those who love to exercise. Runtastic also allows the users to select the training plan according to the preset categories such as weight loss, beginner, 10k run, half marathon, marathon, and bikini body prep. The users can carry out the exercises or workouts according to the training plan that they selected.

Last but not least, there is a feature called Story Running which plays the story in audio form while the users is exercising, they could enjoy and fully immerse in the interesting stories that provided by Runtastic in the Story Running menu. Listen to the story while the users is exercising or working out is great because it get rid of the boredom and kills time while they are doing the same thing repeatedly for a certain

amount of duration. On the contrary, the limitation of the app is that it contains way too many advance statistics which may not be understood by the users who are new to the app or the users who simply do not care much about these statistics.

The limitation can be solved by introducing the beginner mode and expert mode to the users so that they can choose on their own depends on the experience or knowledge as they use the app for longer time. Not only that, the users will also have to pay in order to access premium features which is a standard act for most of the popular app yet extraordinary amounts of money will also have to be spent by the users so that they can access some of the lessons or tutorials in the app. Hence, this might lead to the discouragement of the users to use the app consistently or even change to another app. Unfortunately, some of the users are not willing to spend that kind of money for some intangible goods. Hence, the limitation can be resolved by adding more free contents into the app to attract even more users.

2.2 Google Fit

Google Fit was developed by Google and can be used by the users to track any activity as they walk, run, or cycle throughout the day. Timeline about the users' activities are shown at the main menu along with the values that are related to exercise such as minutes spent, kilometers travelled, calories, and steps taken. All these values will allow the users to know clearly about current progress of the fitness goal and their performance as well. As far as fitness goal is concerned, the users can create their own goals or pick the preset goals such as take 10000 steps, active for 30minutes, and run 3 times every week.

The app will then keep track of the progress of the fitness goal twenty four seven to ensure that the users can reach the goal at a specific point. Meanwhile, the app integrates location technology like GPS, which allows the users to track their location and travel routes in real time by walking, running, cycle, or other activities (Keung et al., 2013). While the users are travelling, the stopwatch will be displayed along with audio narration and some information like distance travelled, calories burned, average speed, and steps taken in a little window so that they could know their current progress without leaving the current screen. They could also view or editthe activity reports afterwards if they wish to know more details about the previous exercise sessions.

Furthermore, weight can be entered by the users on a regular basis to keep track of their weight once they have completed the exercise session. By comparing the weights entered previously, the users will feel motivated if their weights have decreased or increased compared to last time. Moreover, Google also introduced Android Wear as a companion accessory for the users to keep track of their exercise loads in a much convenient way, that is to say, they can wear the watch on the wrist instead of holding their phone in hand. The watch will synchronize all collected data to the phone and vice versa so that the users could record their exercise data and switch to different devices without interruptions.

On the other hand, the limitations of Google Fit are the lack of information as well as features. This is because the app does not have the necessary information about the exercise such as hydration level. Also, the app itself is fairly lightweight and minimalistic because it is focusing on the tracking of the users and providing basic as

well as comprehensive information to the users. So the app does not have many features compared to Runtastic. Thus, the solution to the limitations is the inclusion of more information to the app such as analysis report to analyze the exercise patterns and behaviors of the users (Gowin et al. 223-230). Likewise, more features such as diet plan can be added into the app so that it can be used in various situations.

2.3 Fitbit

Fitbit, Inc. designed the app to work with Fitbit activity trackers and smart scales as all of them are standalone devices just like Android Wear, which aims to keep track of all of the exercises and activities that the users carried out. In the newly designed Fitbit dashboard, there is a graphical calories chart displayed along with several options that available for users to pick from, which are exercise, weight, water, and food. First and foremost, the users will be able to see the calories burned for the specific day when they clicked into the graphical chart. It is worth noting that the calories will be recorded in the app up to one year.

They can also setup a calories burned goal, which is the goal that the amount of burned calories must be reached before the specific day. Meanwhile at the exercise section, the users can track their location while they are running, cycling, or hiking through Google Maps yet they could also log their exercise manually. The other useful feature in the app is the availability of the graphical chart on the top section of the app, in which the calories burned, distance past 30 days in km, duration past 30 days in minutes, BMI past 30 days, body fat, and the calendar will be displayed to the users so that they can get to know their current progress or exercise loads. Furthermore, exercising without drinking water is clearly a dangerous action, therefore the users can log their water intake per day and can also view the volume of water intake for the specific day.

If the users would like to keep track of the weight, they will be able to log their weights in the weight section and then view it in a much organized view. They can view the weight loss in week, month, or year, which is a useful feature when it comes to summarization, users would feel motivate when they see what they have achieved in the past. Last but not least, users who wish to restrict their meals would find the Food section useful because it allow the users to keep track of the calories that they consumed and compare the calories in and calories out. By doing this, the users can monitor the calories that they consumed constantly and restrict their eaten foods for every meal in the hope of preventing disease as well as promote health (West et al.
e72).

Besides, the users can step up their game in the Challenges section as this section contains various preset challenges and adventures for the users to push their fitness level

higher. As for the limitations of the app, the users should be alerted when they consume way too much calories or the consumed calories exceed the threshold. Not only that, the water and weight section should also warn the users when they could not reach the target value so that they are aware of it and work hard on it in order to reach the target next time. Last but not least, the number of adventures and challenges in the Challenges section should be increased in order to motivate the users to do exercise daily.

2.4 7 Minute Workout

As the app name suggests, the users only have to complete a 7 minute workout (12 exercises) for each cycle in order to maximize the result with minimal investment (Reynolds, 2013) because this 7 minute workout is scientifically proven to assist weight loss and improve cardiovascular function. The users can also choose to perform the workout for 2 to 3 times depending on the time they have. What makes the workout effective is that the content inside the app is developed based on HICT (high intensity circuit training), which is the most effective as well as safest way to be healthy. Not only that, the latest update for the app supports Google Fit integration, which might improve the user experience and synchronization of data between the apps.

The moment when the users launch the app, they will be shown with the Workout tab that contains different types of workouts such as classic workout, abs workout, leg workout, and butt workout. Each workout emphasizes on training the body parts with the simplest exercise within 7 minutes. Just in case the users do not know how to perform the exercises, there is an instruction page which provides the users with clear instructions along with animated character to show them the exact way to perform the workout. By showing the steps of the exercises to the users through animation and text elements, confusions can be avoided and less time will be consumed before the users can get their hands dirty with the workout.

Once the users have decided to go with their desired workout, the training will start immediately. 10 seconds will be given to them as the animated character will perform the tutorial about the particular exercise on the screen, the users will then be given 30 seconds to perform the exercise subsequently. However, they also have the ability to pause the workout if they are disturbed or wished to take a break due to exhaustion. Voice guidance will also be provided along with the workout so that the users will be able to do the exercises without looking at the screen because it is definitely unpleasant to hold the phone while they are carrying out the workout as their hands may be sweaty.

Apart from that, there is also another tab called Calendar which consists of a calendar view, statistics about the duration and repetitions of the exercises for the specific duration of time, weight as well as BMI. Users are allowed to input the weight for everyday so that they can keep track of the weight loss from the beginning. Nevertheless, there are also a few limitations in this app which might affect the overall user experience. First and foremost, the inability to setup fitness goals might be a drawback for the app as the users cannot define their own goals which may result in the loss of self-motivation. The suggestion to this limitation is the introduction of self-defined fitness goals, thus the users can actually keep track of the progress and achieve the goals by working diligently.

Eventually, the app and the content itself is pretty simple to use and easy to understand, some power users may find that the exercise data recorded in the app is less significant due to the representation of statistics in a fairly simple form. Therefore, more advance statistics such as heart rate should be introduced into the app in order to allow the users to keep track of their own body conditions in real time.

2.5 Calorie Counter – MyFitnessPal

Calorie Counter – MyFitnessPal is an app that is designed for the users who mainly wish to lost weight or become healthy through controlling the diet. Unlike the conventional fitness apps, the difference between this app and the other apps is that the users will be able to log the foods that they have consumed along with the calculated amount of calories from the foods as there are over 6 million foods in the database including local items and cuisines. This app is perfect for the peoples who do not really like the exhaustion after exercising because there is no any dedicated feature in the app to track the ongoing exercises, all they have to do is paying extra attention about the nutrients that they have consumed in the daily meals.

As soon as the users start the app, tons of articles about health and fitness will be shown up in the news feed style home page, most of the articles were created by the official blog which aim to educate the users about some tips and tricks to maintain a good health. Interestingly, there is also a small section that reminds the users about the remaining calories. Moreover, the users can navigate to different sections easily from the button that is placed at the bottom right of the screen. Similar to the other social media platform, the users have the ability to update their status and share the progress photo with their friends so that they will probably be motivated to carry out their diet plan or exercise.

Meanwhile, there is also a section dedicated to water logging as water is the most important element in maintaining a good health. The users only have to enter the amount of water and then the changes are saved in the app. It is worth mentioning that the unit for each measurement is changeable, which means that the users can change to the units that they like. As the app is focusing mainly on controlling diet, the Meals section offers plenty of useful features to achieve the goals. The users can log the foods that they consumed throughout the day into few meal categories, which are breakfast, lunch, dinner, and snacks. By doing so they can keep track of the calories precisely while they are consuming the foods.

Calories Counter – MyFitnessPal allows the users to search for a food that they consumed and match with the food data in the database in order to provide an accurate result to the users. Likewise, they can also create the food data themselves just in case there is no relevant result regarding the food that they have searched for. Meals and recipes that are often consumed by the users can also be created just to make logging faster and effective. Various nutrition facts can also be entered optionally into the app because not every meal in the world has the same amount of nutrition. Apart from that, the app is also quite usable for the users who like to do more exercises while keeping track of their meals and should be able to raise the awareness of the users regarding food intake and weight management (Coughlin et al., 2015).

However, the interface and the feature are quite limited as the users can only allow them to log the name as well as the other information about the exercise. Not only that, this section also allows the users to create self-defined exercise or search from the list of the exercises. As far as user motivation is concerned, the app allows the users to create nutrition and fitness goals as well as keep track of daily calories intake in day view. Besides, there is also a graph to show the progress for specific duration of time. Similar to the fitness apps, weight can also be recorded and there is an option to upload progress photo as well. By doing so, the users can probably compare the photos to determine the changes in terms of physical appearance.

Eventually, some other sections in the app such as water and exercise section are very simple in terms of function and this may one of the limitations in this app. The data recorded in each of the section should be more as such simple form of data simply does not achieve the purpose. Thus, the developer should introduce more features and functions into the other sections to improve the usability of the app yet the only exception is the meal section as this section is already robust and useful. Lastly, the articles about health and fitness at the home page can also be added from different sources instead of official blog only because this will greatly reduce the sharing and flow of information.

2.6 Gamification and Extrinsic Motivation in Health and Fitness Apps

The term "gamification" can be defined as the application of typical elements of game playing such as competition, point scoring and so on to the non-game context. The concept of "gamification" can be applied to multiple areas so that people will be motivated to achieve their goals. Nevertheless, the success behind this concept do not solely relies on the high interaction between the users and game, it is also because of the rewards mechanism. The users will be rewarded with something in exchange for the users' incentives to achieve the task, thus the use of this tactic has been implemented in different types of apps and it proves that it has emerged as a popular strategy to be used in influencing behaviors (Lister et al., 2014).

Gamification has been used in large percentage of health and fitness apps for few years now and the results have showed that it has become immensely popular (Payne, Moxley and MacDonald, 2015). A bunch of apps in the Apple App Store contain at least some components of gamification in order to motivate the users to use the app consistently. When it comes to motivation, extrinsic reward such as achievements is definitely a significant contributing factor where it can be used to affect subsequent behavior (Rejeski and Kenney, 1989). Actions that are undertaken as the means to an end which is valued far more than the activities themselves provide extrinsic motivation (Whitehead, 1993). Therefore, it is vital that the users must be motivated not only through intrinsic motivation such as love of sports but also extrinsic motivation so that the objectives of the fitness apps can be achieved.

Consequently, the concept of gamification will be utilized in this project as one of the elements to motivate the users. The leaderboard feature mentioned in the project scope is expected to sustain the users' incentives to carry out the exercise routines as well as maintain healthy lifestyle through competing for higher ranking or nicknames as a way to acknowledge their efforts. Undoubtedly, the reason to adopt gamification is rather simple, it is because of not every people in the world is well-motivated to do something unless there is some rewards await them where it could be tiny rewards but the effects are unexpectedly good in terms of motivation to complete the task.

2.7 The Role of Social Media on Motivating People to Exercise More

Social influence from anonymous online peers was more successful than promotional messages for improving physical activity (Zhang et al., 2015). According to the research done in the journal Preventive Medicine Reports, can indeed affects the exercise habits of people. The study carried out the research by divided the group of peoples into 2 groups, which were peer groups as well as health-buddies groups. Peer groups received promotional messages such as motivational exercise videos and graphics containing fitness tips and advice whereas healthy-buddies groups were exposed to social networks with other peers.

Notes regarding fitness achievements and progress were exchanged regularly by the peer's group members who were anonymous to each other. For instance, one would be notified through email when other people signed up for yoga. Nonetheless, the effects were not impressive enough as people lost their motivation after some times. On the contrary, substantial growth was observed in the health-buddies groups as the members were connected in the peer networks. As a result, positive behaviors in exercising can be encouraged by connecting the user with one another in social networks.

CHAPTER 3: SYSTEM DESIGN AND OVERVIEW

3.1 System Design

3.1.1 Flowchart

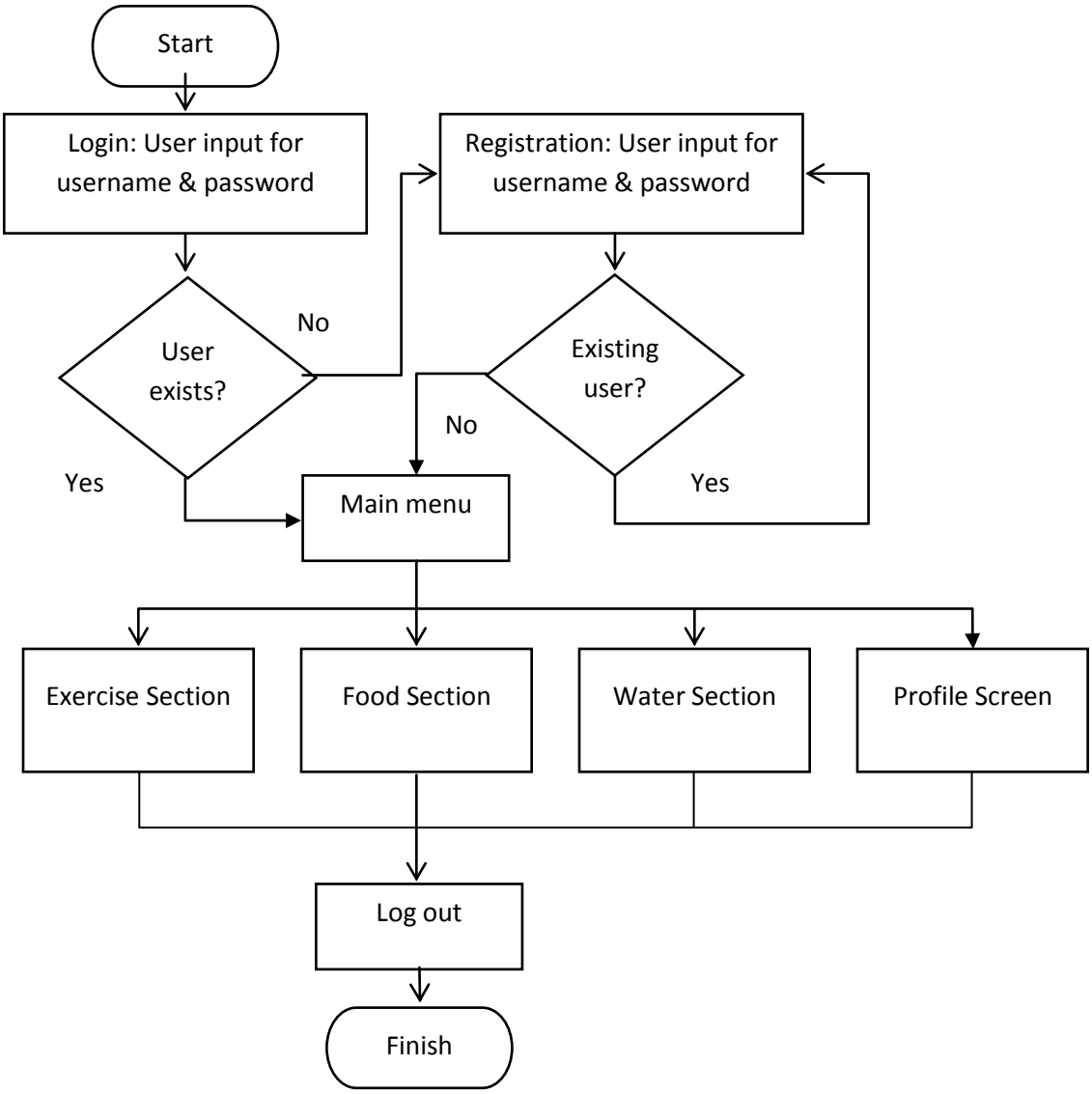


Figure 3.1: Flowchart of the system with all modules

When the users start the app initially, they will be prompted with the login screen and asked them to login before they can proceed to the main menu of the app. However, they can also register new accounts at the registration screen if they are not the existing users. After performing either one of the actions, they will be redirected to the main menu

with different modules such as Profile, Exercise, Food, as well as Water section. The complete flow of the system can be referred to Figure 3.1 that is being shown above.

3.1.2 Design Block Diagram

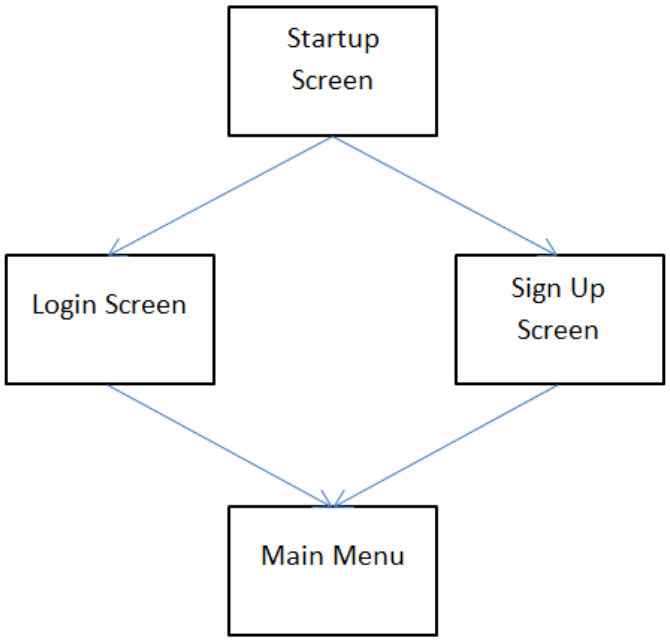


Figure 3.2: Startup screen block diagram

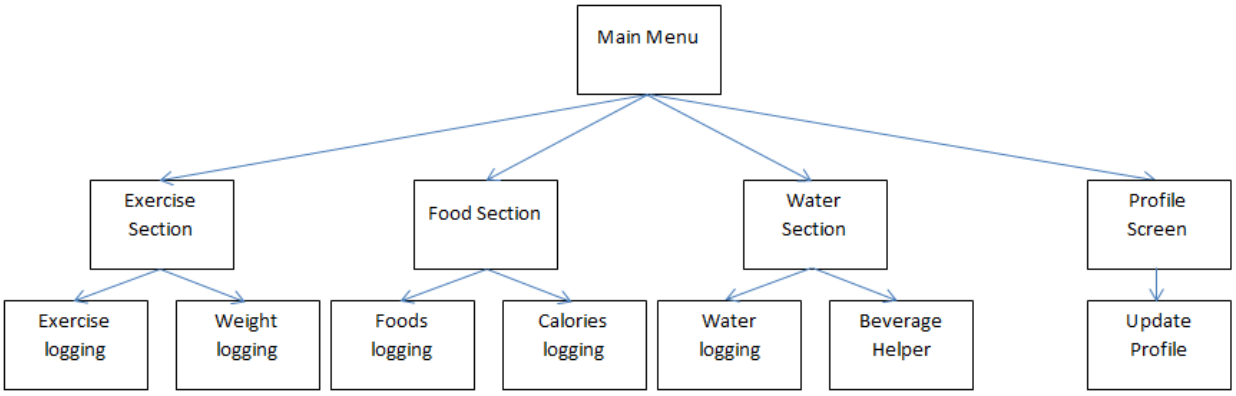


Figure 3.3: Main menu block diagram

Figure 3.2 shown above is the startup screen block diagram which consists of login screen as well as sign up screen. The registered users can proceed to the main menu

after logging in through the login screen whereas the new users can create new accounts and then only they can gain access to the other modules in the app. Then, Figure 3.3 shown above is the main menu block diagram which depicts the major three modules in the app as different directories and ready for selection from the users. Before the users proceed to the other modules, they can also take a look at the main menu as various health information will be displayed to them which kind of similar to Facebook's newsfeed. Subsequently, they can carry out various exercises such as biking and jogging in the Exercise section while monitoring the statistics closely by utilizing Google Maps as well as the other tools embedded in the function. Not only that, the users can also log their weight as soon as they finish the exercise so that they could keep track of the progress as the time goes by. The next module is also possible for the users who wish to log the foods that they consumed through the Food section by logging the nutrition facts and calories consistently. Last but not least, the Water section allows the users to log the daily water intake in order to keep the appropriate amount of water intake per day. There is another function in this section called Beverage Helper which also allows the users to log other beverages such as beer and coffee because the harmful effects might damage the human body as these beverages are being consumed excessively.

3.1.3 Database Design

The project uses Firebase for Android in which it is a NoSQL database. Unlike conventional SQL database, it does not have any table or record. Data is stored as JSON objects and nodes with associated keys exist in JSON structure so that it can be used to identify data uniquely. For the usage of this project, there are 17 directories in the database as shown in Figure 3.4 below:

Figure 3.4 Database structure

3.1.4 Data Dictionary

Table 3.1 Food Composition Table

Entity name	Attributes	Description	Data Type
Food_Composition	ash	Ash (Nutrients)	String
	available_carbs	Available carbohydrates, by difference (Nutrients)	
	b1	Thiamin (Nutrients)	
	b2	Riboflavin (Nutrients)	
	b3	Niacin (Nutrients)	
	calcium	Calcium (Nutrients)	
	carotenes	Carotenes (Nutrients)	
	category	Categories of the food	
	energy	Energy (Nutrients)	
	fat	Fat (Nutrients)	
	fibre	Fibre (Nutrients)	
	food_id	Unique identifier of the food item	
	food_name	Name of the food	
	gram_edible_portion	Edible portion per gram	
	iron	Iron (Nutrients)	
	phosphorus	Phosphorus (Nutrients)	
	potassium	Potassium (Nutrients)	
	protein	Protein (Nutrients)	
	re	Re (Nutrients)	
	sodium	Sodium (Nutrients)	
	vitamin_a	Vitamin A (Nutrients)	
	vitamin_c	Vitamin C (Nutrients)	
	water	Water (Nutrients)	

Table 3.2: Food List Table

Entity Name	Attributes	Description	Data Type
Food_List	food_id	Unique identifier of the food item	String
	food_name	Name of the food	

Table 3.3 Liquid Table

Entity Name	Attributes	Description	Data Type
Liquid	amount	Amount of the beverage or water intake	String
	beverage_id	Unique identifier of the beverage item	
	beverage_name	Name of the beverage name	
	date	Date created	
	time	Time created	

Table 3.4 Meal Table

Entity Name	Attributes	Description	Data Type
Meal	food_list_url	URL that links to the food list table	String
	meal_desc	Description of the meal	
	meal_image	Image URL that links to the meal image	
	meal_remarks	Remarks of the meal	
	meal_type	Type of the meal	
	date	Date created	
	time	Time created	

Table 3.5 Post Like Table

Entity Name	Attributes	Description	Data Type
Post_Like	user_id	Unique identifier of the user	String

Table 3.6 Recipe Table

Entity Name	Attributes	Description	Data Type
Recipe	recipe_desc	Description of the recipe	String
	recipe_image	Image URL that links to the recipe image	
	recipe_remarks	Remarks of the recipe	
	recipe_name	Name of the recipe	
	date	Date created	
	time	Time created	

Table 3.7 Recipe Steps Ingredients Table

Entity Name	Attributes	Description	Data Type
Recipe_Steps_Ingredients	ingredients	Ingredients of the recipe	String
	steps	Steps of the recipe	

Table 3.8 Route Table

Entity Name	Attributes	Description	Data Type
Route	latitude	Latitude on the map	String
	longitude	Longitude on the map	

Table 3.9 User Account Table

Entity Name	Attributes	Description	Data Type
User_Account	email	Email of the user	String
	username	Username of the user	

Table 3.10 User Beverage Table

Entity Name	Attributes	Description	Data Type
User_Beverage	beverage_desc	Description of the beverage	String
	beverage_name	Name of the beverage	
	beverage_image_url	Image URL that links to the beverage image	
	meal_remarks	Remarks of the beverage	
	beverage_category	Categories of the beverage	
	date	Date created	
	time	Time created	

Table 3.11 User Comment Table

Entity Name	Attributes	Description	Data Type
User_Comment	post_comment	Comment of the user	String
	user_id	Unique identifier of the user	
	date	Date created	
	time	Time created	

Table 3.12 User Food Composition Table

Entity Name	Attributes	Description	Data Type
User_Food_Composition	nutrients	Name of the nutrients	String
	nutrients_value	Value of the nutrients	

Table 3.13 User Friend Table

Entity Name	Attributes	Description	Data Type
User_Friend	is_friend	Whether the user is friend with other user	String
	user_id	Unique identifier of the user	
	is_sender	Whether the user is the friend request sender	

Table 3.14 User Log Table

Entity Name	Attributes	Description	Data Type
User_Log	activity_type	Type of the activity	String
	cycle	Number of cycle of the exercise routine	
	date	Date created	
	time	Time created	
	time_elapsed	Time elapsed of the exercise	
	points	Points earned	
	name	Name of the activity performed by the user	

Table 3.15 User Post Table

Entity Name	Attributes	Description	Data Type
User_Post	post_content	Content of the post	String
	date	Date created	
	time	Time created	
	user_id	Unique identifier of the user	

Table 3.16 User Profile Table

Entity Name	Attributes	Description	Data Type
User_Profile	email	Email of the user	String
	first_name	First name of the user	
	last_name	Last name of the user	
	gender	Gender of the user	
	height	Height of the user	
	weight	Weight of the user	
	username	Username of the user	

Table 3.17 User Reminder Table

Entity Name	Attributes	Description	Data Type
User_Reminder	calendar	Value of the calendar in long format	String
	date	Date created	
	time	Time created	
	reminder_desc	Description of the reminder	
	reminder_id	Unique identifier of the reminder item	
	reminder_img_url	Image URL that links to the reminder image	
	reminder_name	Name of the reminder	
	reminder_type	Type of the reminder	
	reminder_on	On off status of the reminder	boolean

3.1.5 Interface Design

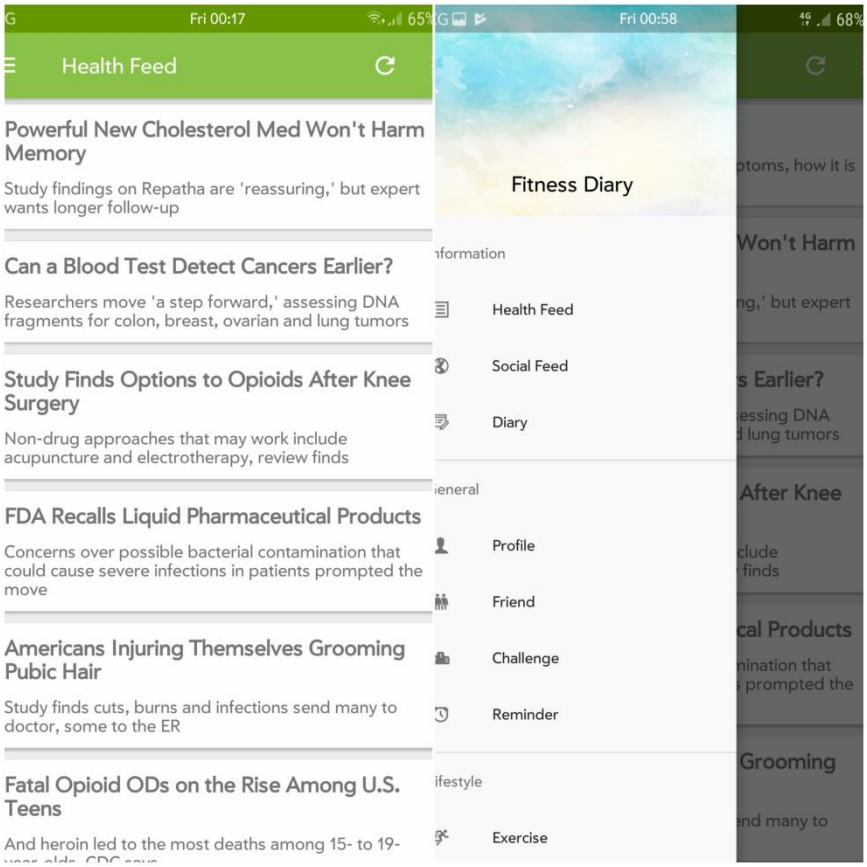


Figure 3.5: Main menu screen

Figure 3.5 shows the main screen of the app called Health Feed where articles or tip and tricks about health will be displayed here. When the users click on any one of the article, they will be redirected to another screen to view the article in browser view. Besides, the users can navigate from the health feed to the other modules such as Social Feed, Diary, Profile, Friend, Challenge, Reminder, Exercise, Food, and Water through navigation bar which could be pulled out by sliding from left edge to the right. Also, if they wish to log out of the app they could do so by selecting the option in the popup menu at the top right of the screen.

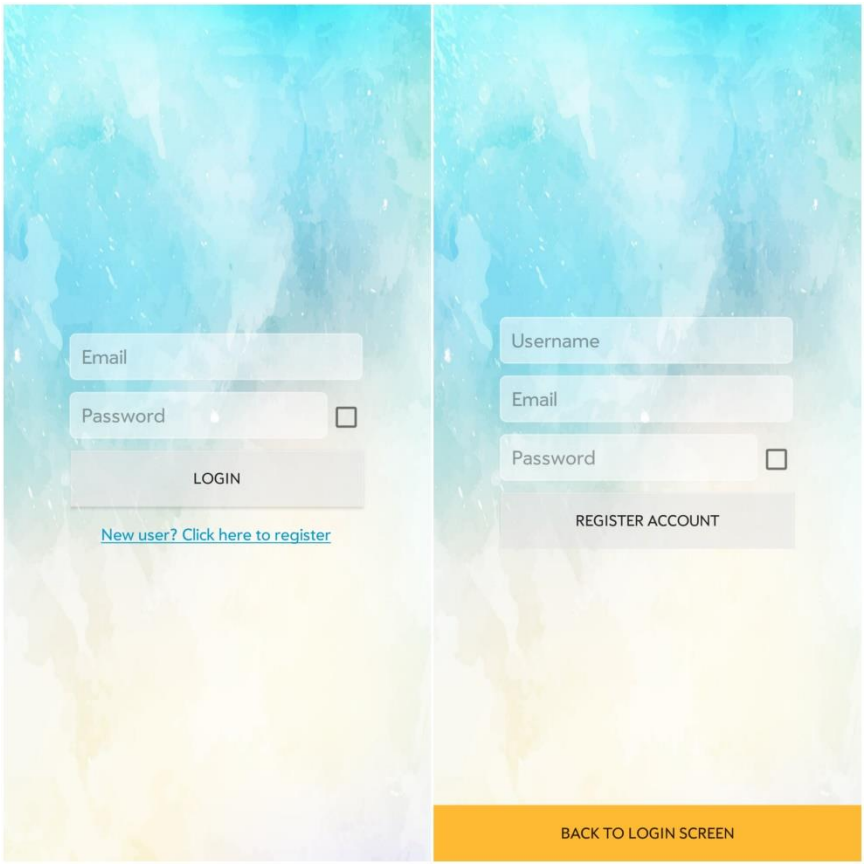


Figure 3.6: Login and register section

Figure 3.6 shows the login and register screen of the app where the users will be able to register a new account if they are new users otherwise they could login to their account by proceeding to the login screen. Users are required to enter their username, email as well as password if they wish to create a new account. Meanwhile, existing users only have to enter email and password in order to login to their account. There is a check box available in each of the screen which serves the purpose of showing the password in text form instead of password form.

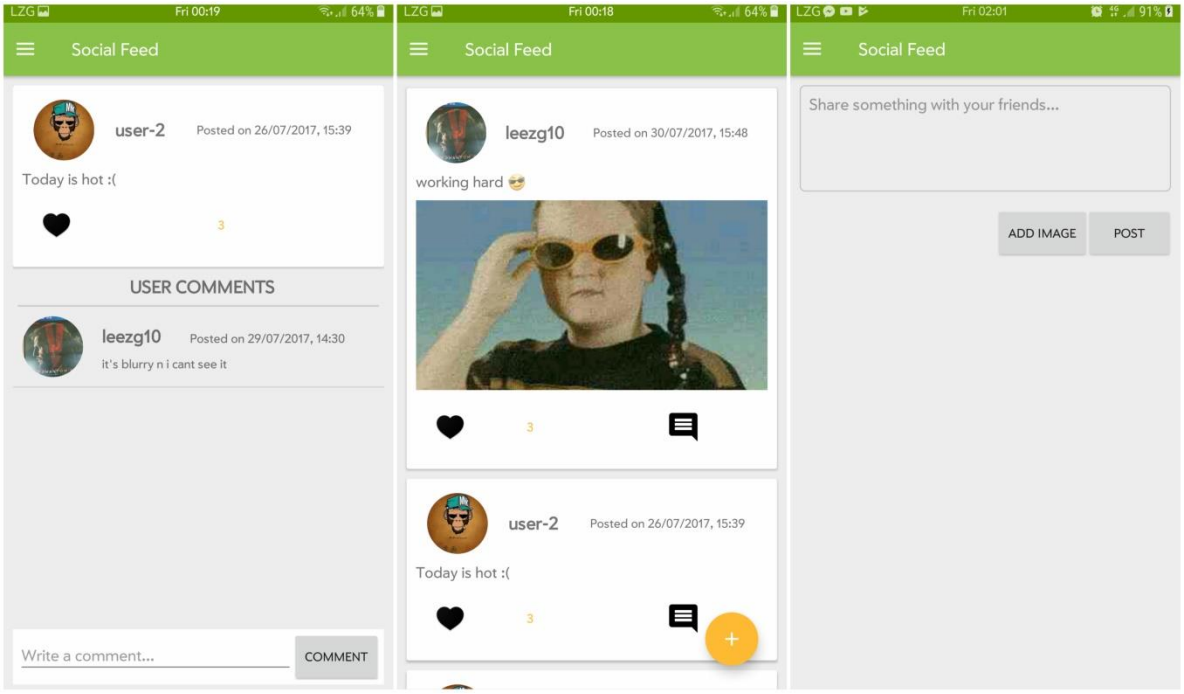


Figure 3.7 Social feed, view posts, create post and comment section

Figure 3.7 shows the social feed of the app where it is similar to social networking platform in which the users will be able to view the other users' post. Similarly, they can create new post by clicking at the button at the bottom right corner when they would like to share their status with their friends as refer to the screenshot in the middle. Moreover, they could also like and comment on the posts that they like by clicking the respective icons. After clicking on the icons, they are redirected to a new screen where the posts and comments will be shown. Points will be rewarded to the users after their posts have been liked other users in order to encourage them to share their recent status. Finally, they can view the other users' profile by clicking on the profile image or username of the particular user.

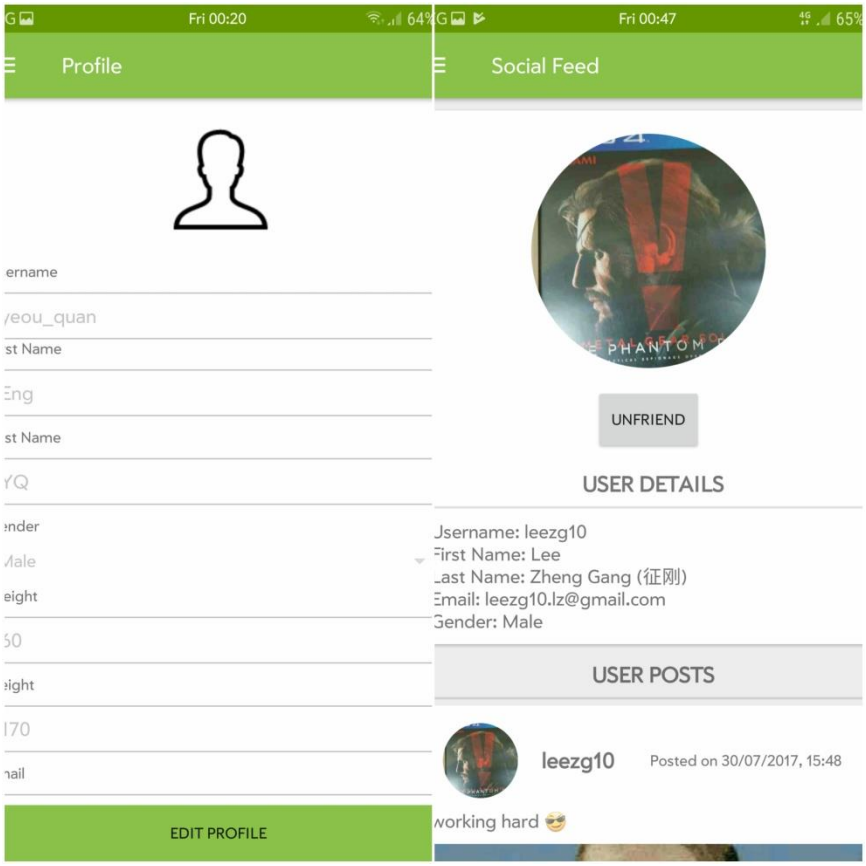


Figure 3.8: Profile section

Figure 3.8 shows the profile section where the user can view the other users' profile as refer to the screenshot at the right. User details such as email and name are available to the user so that they get to know more about the particular user. There is also a button which allow the users to add or unfriend the particular user in case they wish to interact more with the user. At the meantime, the particular user's posts are also available down under the user post section and can be viewed by other users. Apart from that, the screenshot at the right is current user's profile where they can edit it when they feel like some details need to be updated.

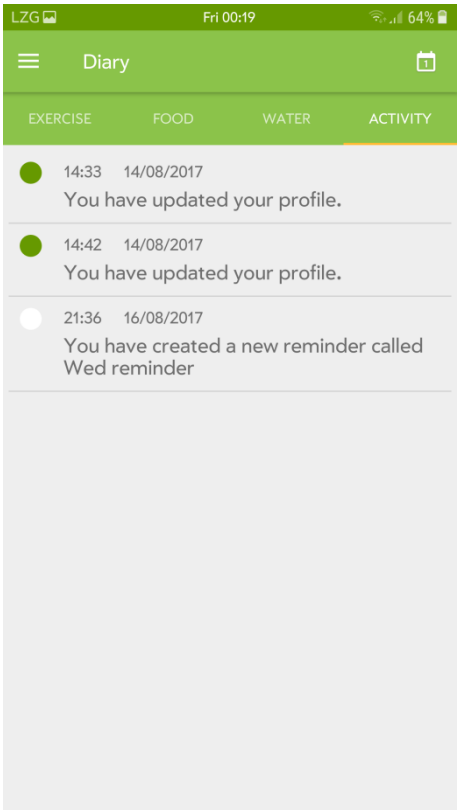


Figure 3.9: Diary section

Figure 3.9 shows the Diary screen in the app and there are 4 tabs in this screen in which each of them displays different information. After the users have completed the exercises, the Exercise tab will shows statistics about the exercises such as steps taken, distance travelled, and speed. Similarly, Food tab shows statistics about the food or meal such as energy, vitamins, available carbohydrates, and so forth. The Water tab also displays the amount of water or beverage intake by the users so that they could keep track of their hydration level as well as health. Certainly, the data will be displayed in organized view through the use of table and graph. Eventually, the Activity tab enables the users to keep track of their activities in the app through logging it when they perform certain actions so that they could have better idea about their behaviors. It is also worth noting that there is a calendar icon on the top right corner of the app in which the users could filter the statistics based on the selected date in case they want to view only the statistics on particular date.

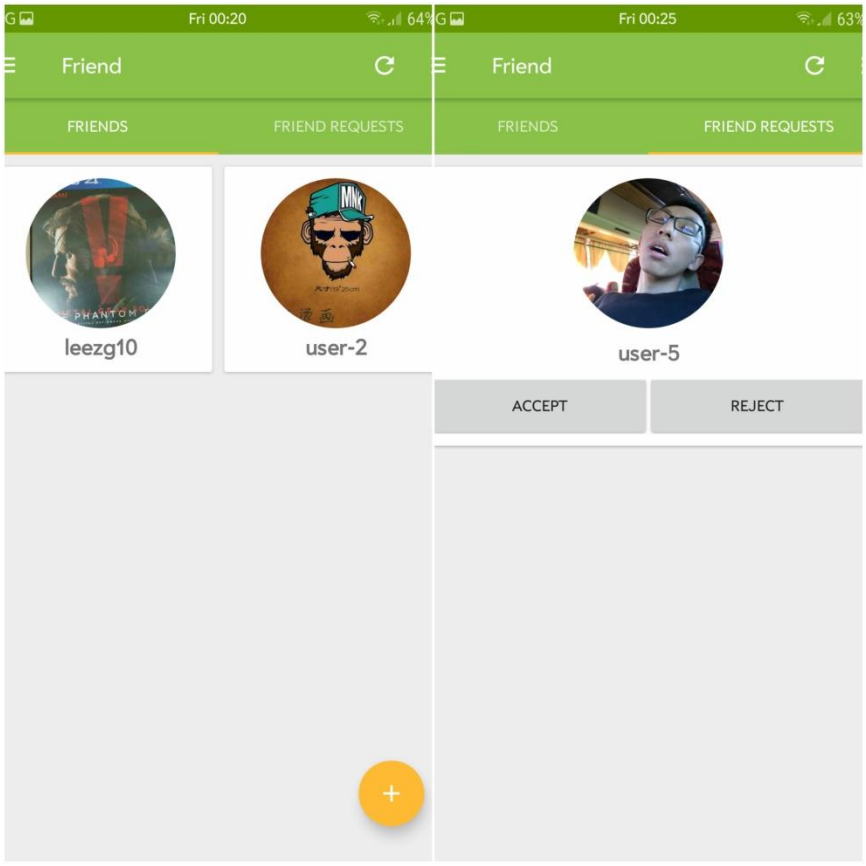


Figure 3.10: Friend list and friend request section

Figure 3.10 shows the friend section in the app where it contains friend list as well as friend request section. Users can view their friends in a list and could also browse the list of other users after clicking on the button at the bottom right corner of the app as refer to the screenshot at the left. Not only that, they could also respond to the friend requests from other users by clicking on accept or reject button as refer to the screenshot at the right.

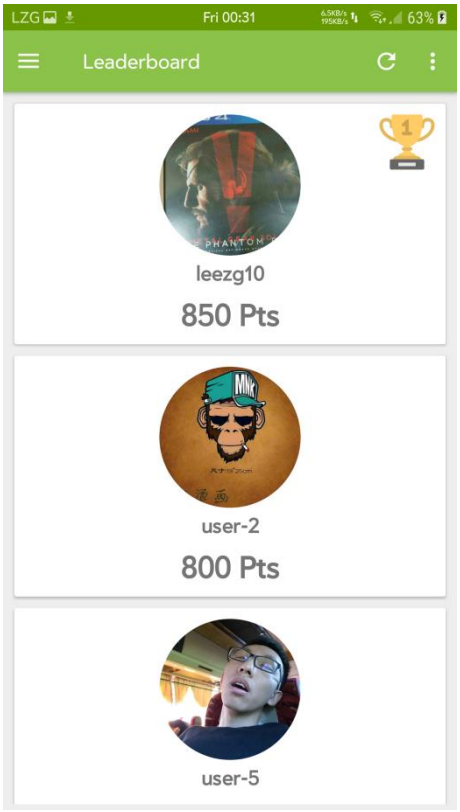


Figure 3.11: Leaderboard section

Figure 3.11 shows the leaderboard section in the app in which the users can view the leaderboard and their ranks among other users in terms of accumulated points while points can be earned after completing an exercise session in the app. This feature aims to motivate the users to practice a healthy lifestyle by doing more exercises to gain points in order to compete among other users in the leaderboard.

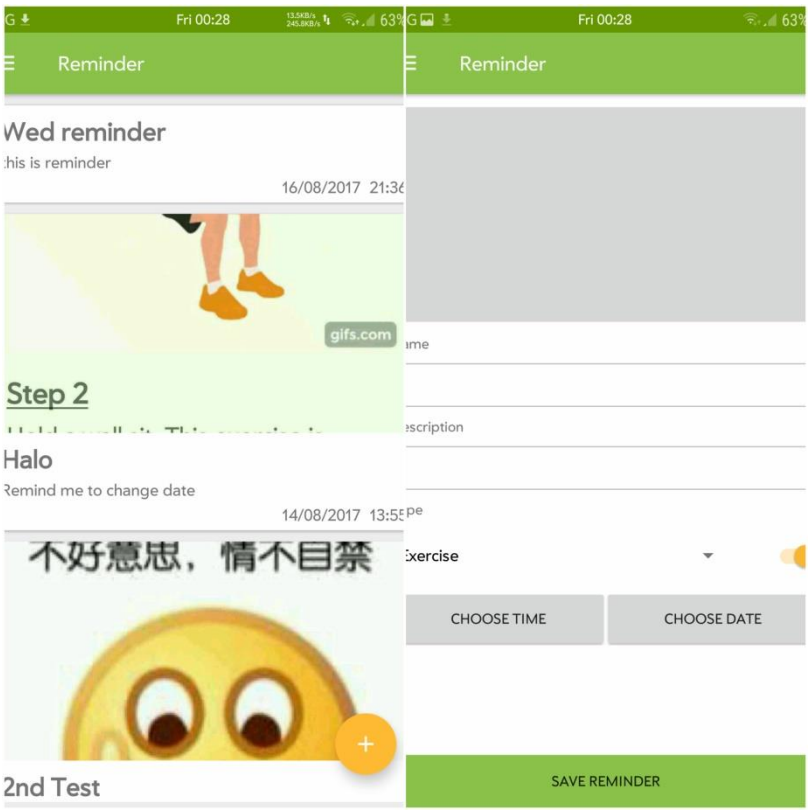


Figure 3.12: Reminder section

Figure 3.12 shows the reminder section of the app where the users can create reminders to remind themselves to perform certain tasks when the specified date and time has passed. They can also view the list of reminders that they have created previously as refer to the screenshot at the left. Meanwhile, the users have to enter some details such as name, description, type or image when they are creating the reminder. In case the users just wanted to create a reminder purely instead of reminding them on time, they could also turn off the reminder and save it. Undoubtedly, date and time are also required to be provided by the user so that the reminder could go off on the desired time.

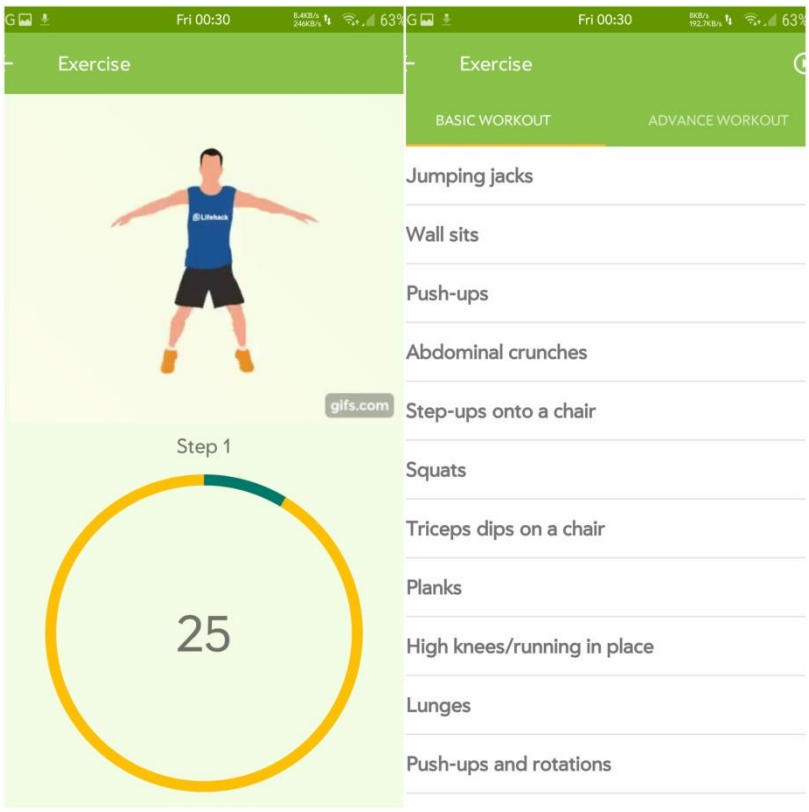


Figure 3.13: Indoor exercise section

Figure 3.13 shows the indoor exercise section of the app where the users can perform the exercise indoor by following the on screen instructions. The exercise routines will be displayed in a list while the users can view the details after clicking on any one of the item on the list. If the users have mastered all of the basic routines, they can try out the advance routines in which it is more difficult as well as challenging. After they have started the exercise, there is a timer which times each individual exercise so that they know when to stop. Eventually, points will be rewarded to the users after they have completed the routines so that they can compete with other users in the leaderboard section.

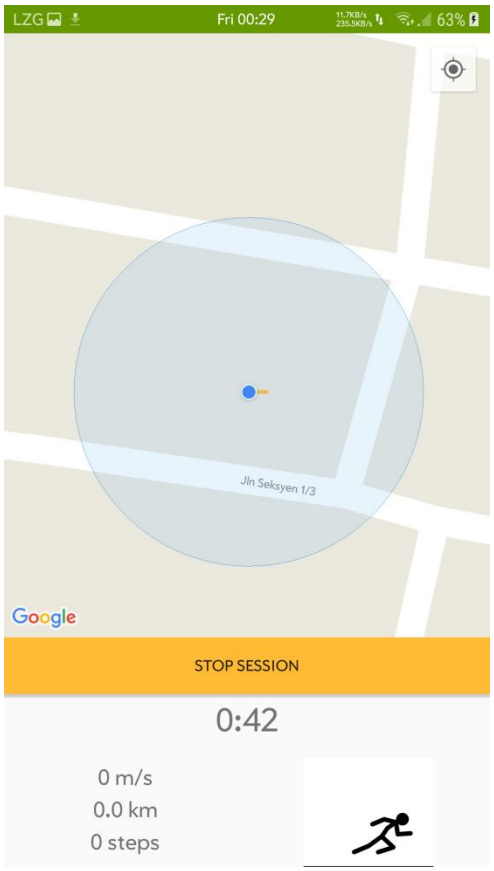


Figure 3.14: Outdoor exercise section

Figure 3.14 shows the outdoor exercise section of the app in which the users could perform exercise outdoor. List of common options such as running, hiking, biking, and walking are available to the users so that they can select their desired activity and carry out exercise outdoor. A real time map will be displayed on the major part of the screen where the user's location will be shown. Not only that, the route that the users travelled is shown on the map and will also be stored into the database for other usage. Statistics like duration, speed, distance travelled, steps taken, as well as the current motion of the users will also be shown at the bottom half of the screen. They can stop the session when they are finished with their activity and the session will be stored into the database subsequently. Eventually, points will be rewarded to the users after they have completed the exercise so that they can compete with other users in the leaderboard section.

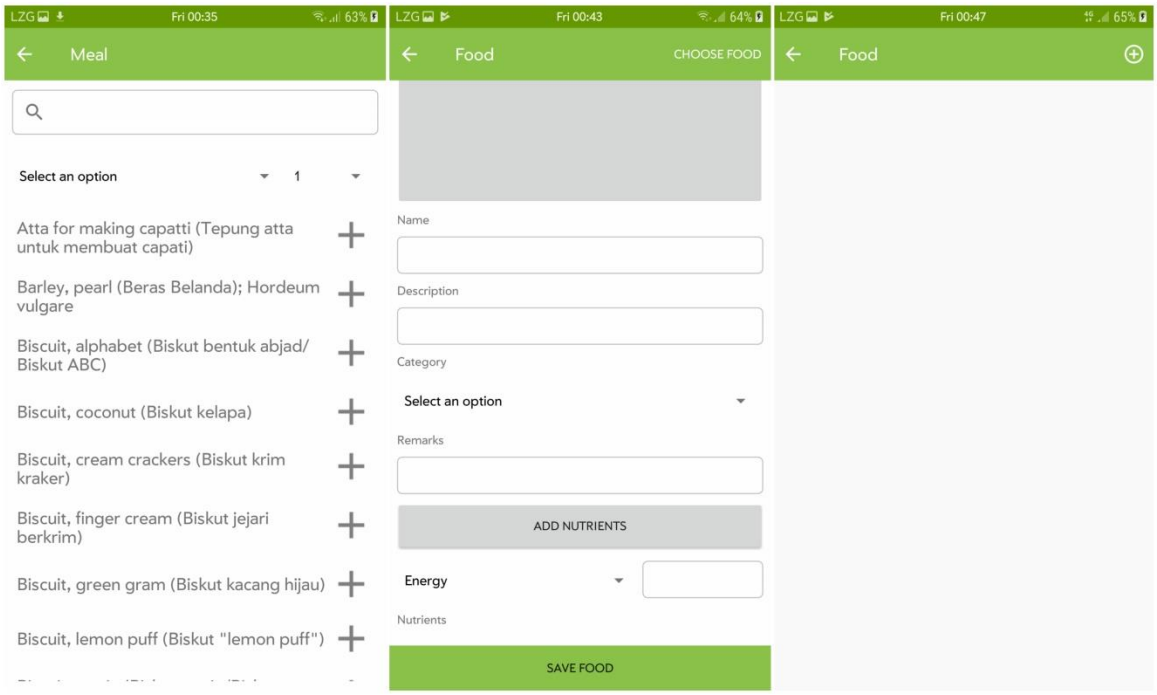


Figure 3.15: Food section

Figure 3.15 shows the Food section in the app where the users can create new foods by entering details required in the section. Fields such as name, description, nutrients value, and remarks are provided to the users. Likewise, they could also choose an existing food found in the food database and load the predefined data into their newly created food as refer to the screenshot at the left. Users can search the food database for their desired foods instead of scrolling through the whole lists. Nutrition facts such as energy, vitamins, water, and calcium will be displayed along with other details in table form so that they can have a better idea about the food compositions. After they have created new foods, list of foods created by them previously can be viewed or selected as refer to the screenshot at the right.

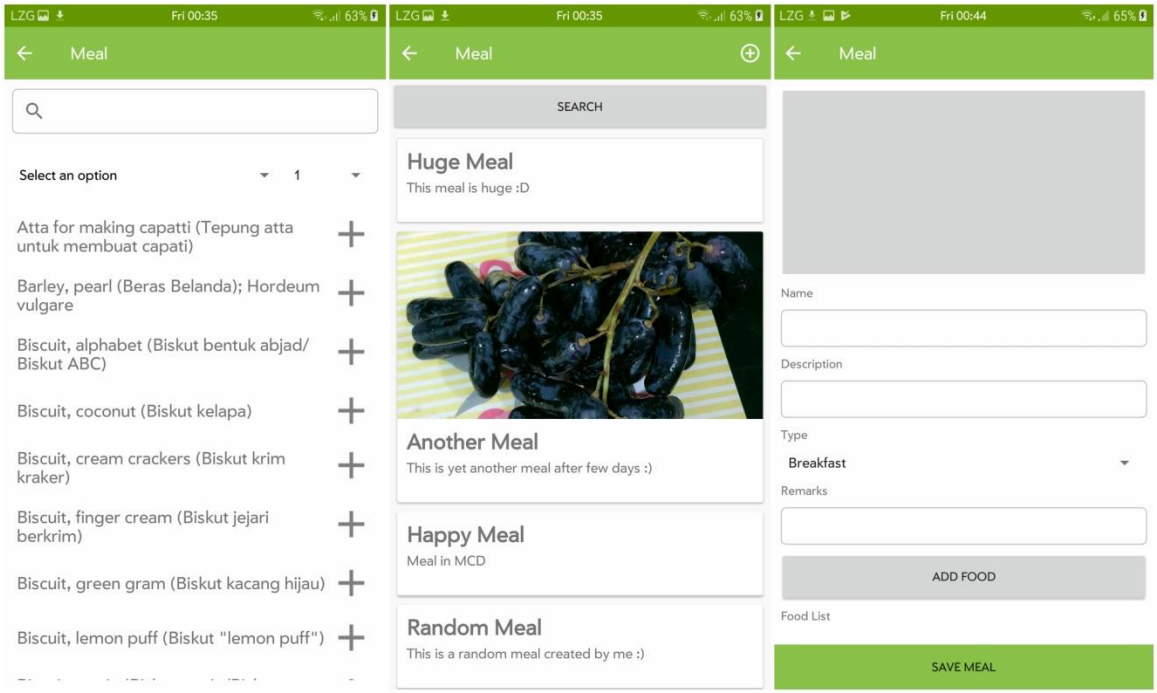


Figure 3.16: Meal section

Figure 3.16 shows the meal section in the app where the users can create new meals by entering details required in the section. Fields such as name, description, type, remarks are provided to the users. Likewise, they could also add foods found in the food database and load the food into their newly created meal as refer to the screenshot at the right. Users can search the food database for their desired foods instead of scrolling through the whole lists. Nutrition facts such as energy, vitamins, water, and calcium will be displayed along with other details in table form so that they can have a better idea about the food compositions. After they have created new meals, list of meals created by them previously can be viewed or selected as refer to the screenshot at the middle.

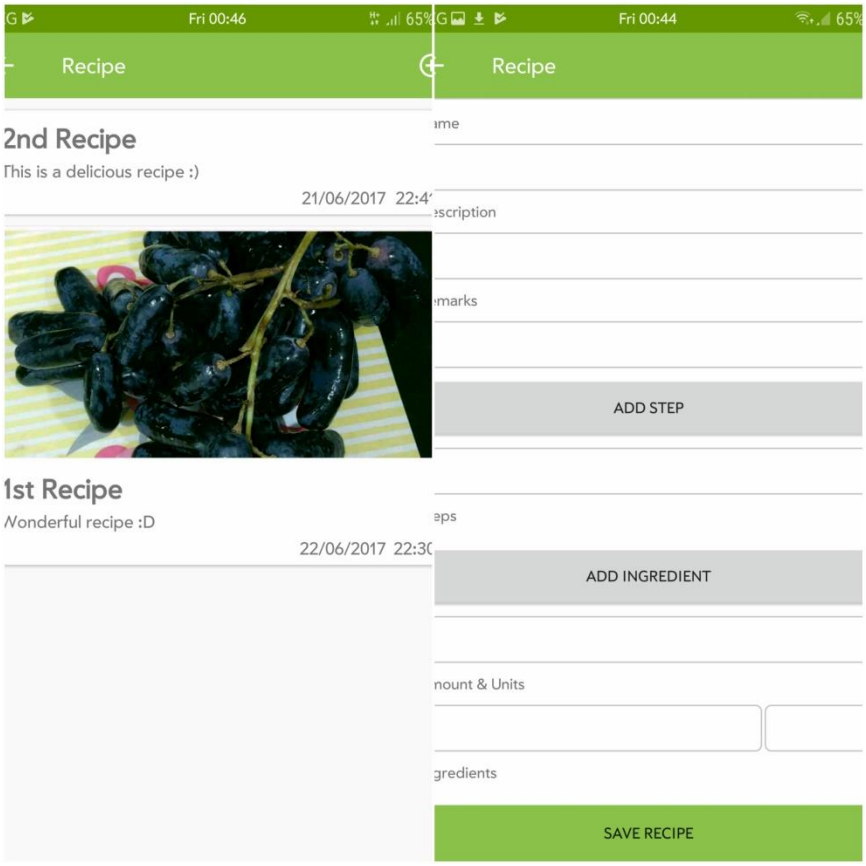


Figure 3.17: Recipe section

Figure 3.17 shows the recipe section in the app where the users can create new recipes by entering details required in the section. Fields such as name, description, type, remarks, steps, ingredients, as well as respective units are also provided to the users. By doing so, the users could store their recipe steps and ingredients and then view it later on when it is needed. After they have created new recipes, list of recipes created by them previously can be viewed or selected as refer to the screenshot at the left.

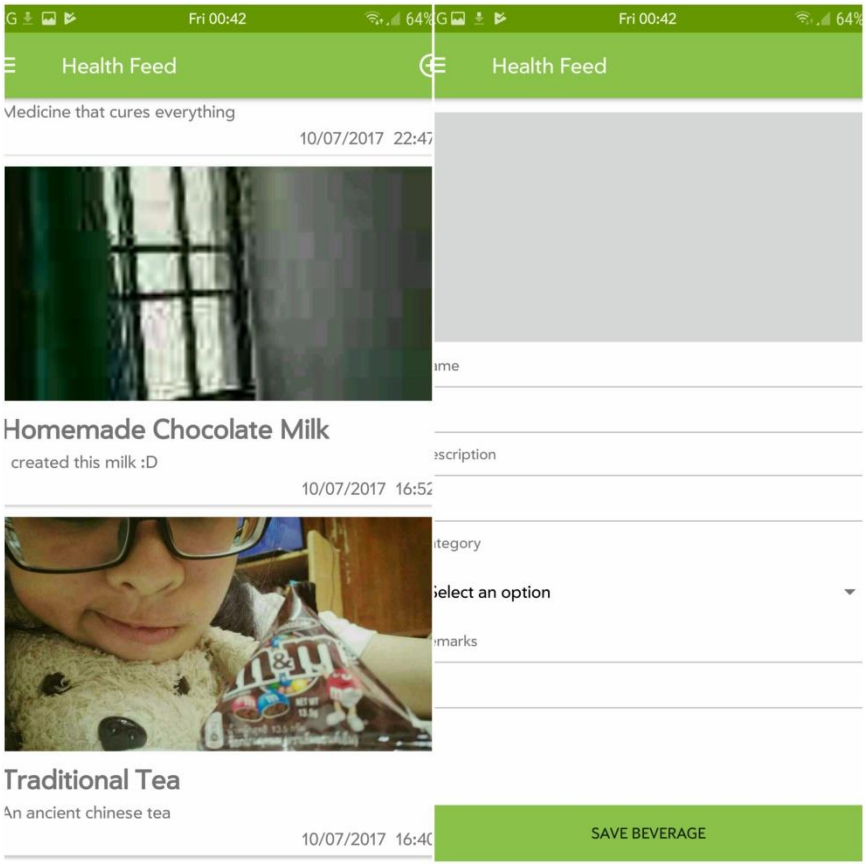


Figure 3.18: Water section

Figure 3.18 shows the recipe section in the app where the users can create new beverages by entering details required in the section. Fields such as name, description, category, and remarks are also provided to the users. After they have created new beverages, list of beverages created by them previously can be viewed or selected as refer to the screenshot at the left. Other than the intakes of beverage amount, the users could also enter the amount of water intakes into the field in the beverage list and store it into the database in order to keep track of their water intakes.

CHAPTER 4: PROPOSED METHOD / APPROACH

4.1 Methodology

4.1.1 Waterfall Methodology

Waterfall method is a popular methodology among the traditional software methods while it consists of several sequential phases as shown in Figure 4.1 below:

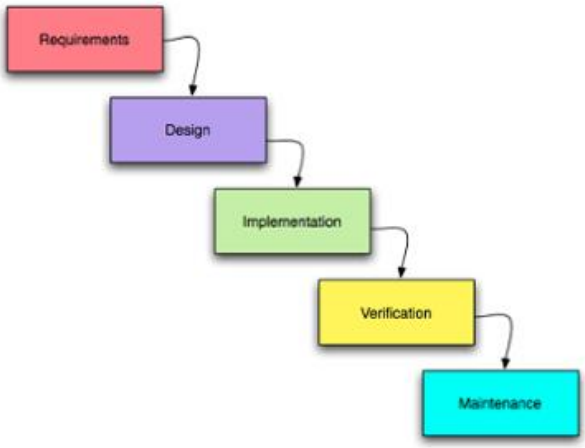


Figure 4.1 Waterfall method

Each phase must be completed before moving on to the next phase to ensure all of the goals can be accomplished. Nonetheless, the process cannot be reverted because all works are done in linear flow with specified sequence. In terms of advantages, waterfall method is easy to understand and functional for most of the projects due to the fact that it is rigid in nature. Unlike some of the methodologies which consume a lot of time, waterfall method saves plenty amount of time because there is only a one way process. However, this method does not allow for editing in testing phase and makes the works to become more difficult for the developers. It is also impossible to determine the outcome of the project as prototypes or models are not required during the course of the project development.

4.1.2 Rapid Application Development

Rapid Application Development is a condensed development process that produces a high quality system with low investment costs (Hubbell, 2017). The investment costs for the system are low because RAD allows for quick adjustment during the system development process. Furthermore, this method can be divided into four phases, which are requirements planning, user design, construction as well as cutover as shown in Figure 4.2 below. RAD is mainly designed to engage the user in the system development process while highlighting the participation of an active user. Interestingly, the user design and construction phases will be repeated until the clients agree that all of the requirements are met. As far as advantages are concerned, the developers will help the clients in taking quick reviews so that they can provide their valuable feedbacks to the developers as feedbacks from the clients are always encouraged in order to make improvements.

Figure 4.2 Rapid application development

4.1.3 Iterative and Incremental Methodology

This methodology enables the breakdown of the development life cycle which will then become smaller and manageable modules for the project (ISTQB Exam Certification, 2017). Subsequently, every module will go through the requirements, design, implementation, as well as testing phases so that the quality for each of the

module can be assured. More features and functions will be added into the module incrementally as the module passes through each cycle and the module will be integrated or further improved until the project is completed. There are several pros for this methodology, the first advantage is the time to generate working software is considerably short and relatively early in the SDLC because some phases in the life cycle have to be passed through for several times until the project is completed. Other than that, it is also easier to test and debug during each cycle as the module have been broken down into smaller pieces which will results in shorter development time perhaps. Besides, the risks are easier to be managed due to the nature of this methodology as the risks are identified and coped early during each cycle. As far as alteration is concerned, this model also makes the possibility of scopes or requirements alteration less costly due to its flexible nature.

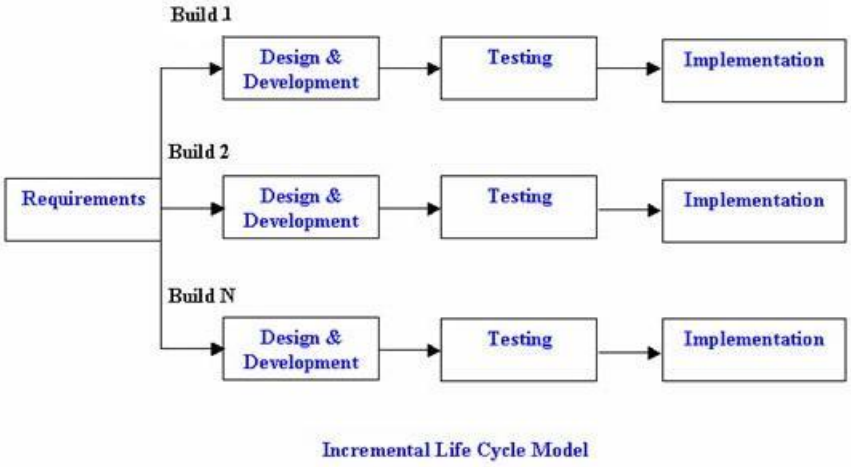


Figure 4.3: Iterative and incremental methodology

4.1.4 Selection of Development Methodology

Upon consideration of the methodologies discussed above, iterative and incremental methodology will be selected to develop this project because the scope of this project is fairly large. The system can be broken down into few modules so that the development process can be less complex as compared to the whole system. The short duration of the project is also one of the reasons to select this method as it is flexible in nature which allows the change of requirements throughout the development process

possible. Subsequently, after going through few cycles of design and development, testing, as well as implementation process, more features will be added into the project incrementally and the final build is going to be the deliverable of the project called *Digital Fitness Diary for Healthy Lifestyle* mobile application.

4.2 Development Tools

The project scope mentioned above has stated that the deliverable of this project will be a fitness mobile application that enables the users to practice a healthy lifestyle. Thus, this section will discuss about the system requirements that are essential to the deliverable. The tools that are going to be used in this project will be discussed below:

1. **Android Studio**

   The deliverable will be compiled by using Android Studio. The main reason is rather simple, simple navigation built on top of a minimal user interface which allows greater efficiency while developing this project. Besides, the software development kit (SDK) that is vital in developing mobile application is also provided in the software so that developers will not have to look for it elsewhere. It is also quite stable as compared to other IDE such as Eclipse because the hardware requirements to run Android Studio is considerably low so it will not always crash or unresponsive. Likewise, the features and functions contain in Android Studio are also more than enough for the current level of project development because it is a professional software that is used by millions of Android developers worldwide.

2. **Android Virtual Device & Smartphone**

   Also known as Android Emulator and a smartphone will be used as the devices to test the mobile app thoroughly throughout the project development process.

3. **Firebase**

   Firebase is a platform that is developed by Google that supports IOS, Android, Unity, web, and C++ to allow the developers to develop applications with great integration as well interoperability among different platforms. Plenty of products

such as real time database, crash reporting, Google analytics, cloud messaging, and many more are offered by Firebase. Nonetheless, the main function used in this project is real time database only because it can store and sync data in the NoSQL database. One of the pro of the database is that it will automatically receive updates with newest data when the app is connected to the internet. However, data stored in the real time database is synced across all clients in real time and remains available when the app goes offline. Data is stored in JSON format while the connected clients will share the same database regardless of platform.

4. Google Maps API

One of the modules in the project uses Google Maps API as a tool to build up the functionality of the module. This API enables the developers to display maps in Android, IOS, as well as websites through a randomly generated API key. It also offers plenty of features to the developers in order to meet their development needs. After implementing Google Maps API, the devices location can be determined by using built-in GPS and configurations in the applications code.

5. Google Maps Directions API

This API is a service that calculates directions between locations while it enables the users to search for directions for several modes of transportation, including transit, driving, walking, or cycling (Google Developers, 2017).

6. Google Fit APIs

Google Fit is an open ecosystem that allows developers to upload fitness data to a central repository where users can access their data from different services and apps in one location (Google Developers, 2017). There are 4 APIs that are used in this project such as Sensors API, Recording API, History API, and Sessions API which will be elaborated next. First and foremost, Sensors API allows the developers to access to raw sensor data streams from sensors available on the Android device as well as companion devices. The Recording API provides

automated storage of fitness data by using subscriptions in which it stores the subscribed data type in background without consuming much battery. In order to manipulate the stored fitness data, History API is called to perform operations such as insert, delete, and read the data. Last but not least, Sessions API allows the developers to store the fitness data with session metadata while session is the duration in which the users carry out a specific fitness activity.

4.3 Requirement Specifications

4.3.1 Functional Requirements

1. The system must be able to track the location of the users while they are exercising.
2. The system must be able to show the user some useful information.
3. The system must be able to log and store data persistently in the database for further usage.
4. The system must be able to perform accurate calculation when it comes to statistics calculation such as calories and nutrients values.
5. The system must be able to remind the users to complete certain tasks that have been created as reminder by them previously.

4.3.2 Non-Functional Requirements

1. The system shall have high accuracy when it comes to location reporting by using GPS.
2. The system shall have high reliability and persistency in terms of data storing.
3. The system shall have fast response time when there is an input received from the users.
4. The system shall have high usability in terms of useful functions and features.
5. The system shall have high robustness when the app is up and running where it will not crash randomly.

4.4 System Performance Verification Plan

1. The app is tested thoroughly by inputting a bunch of dummy data as records to ensure that the app is stable enough to fulfill the objectives.

2. Ensure that the application's interface design is user-friendly by navigating from section to the others without going through complex navigation and each of the UI component in the app should has clear label and function.

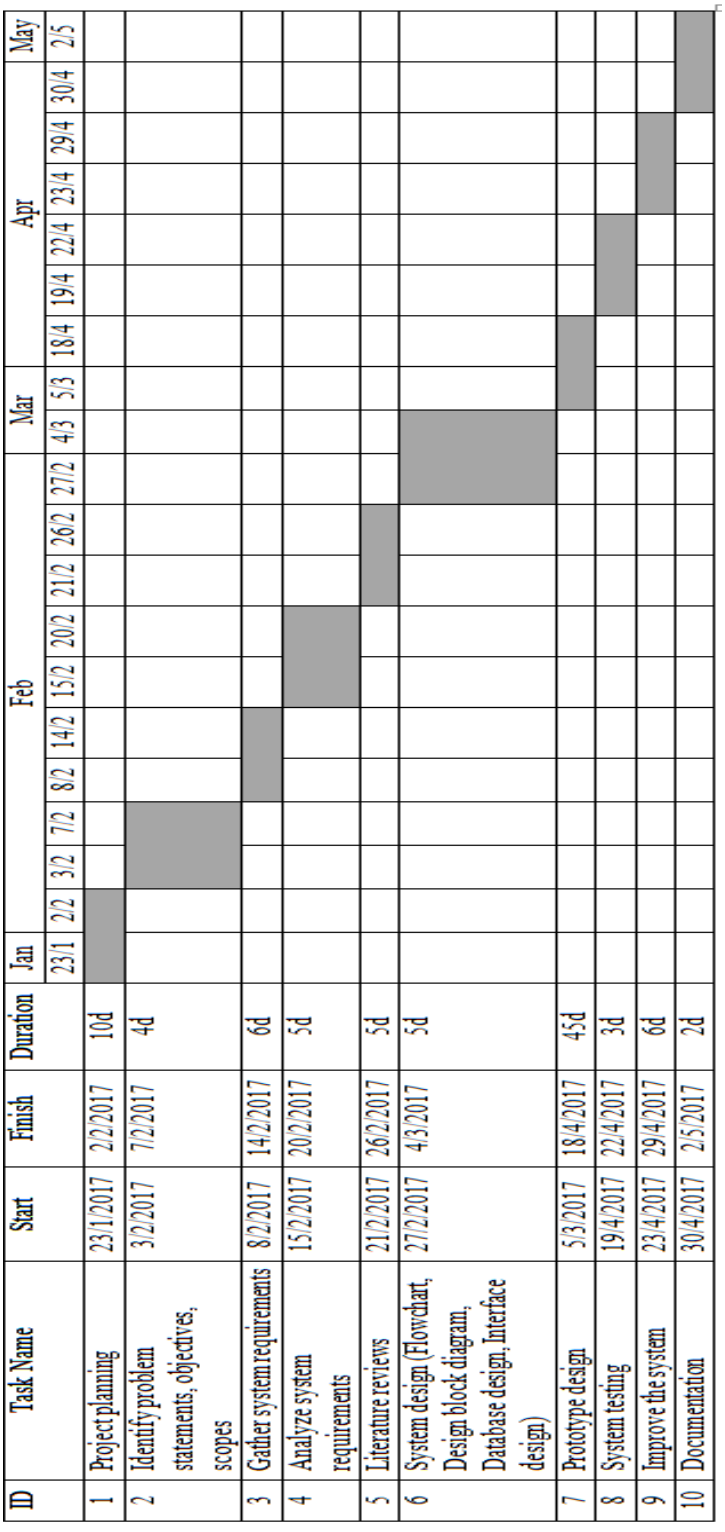
3. The app will be tested at outdoor area to ensure that GPS technology embedded in the app could track the location of the smartphone.

4.5 Implementation Issues and Challenges

There were several implementation issues and challenges encountered in the project which slowed down the progress and the current technical skills were insufficient in overcoming the problems. First and foremost, due to the fact that the app requires server side configuration in order to retrieve and store the information into the database, it was difficult to configure the server without some basic knowledge about the steps and procedures. After searching the internet for the solution, the issues were resolved eventually yet it results in the investment of more precious time while configuring.

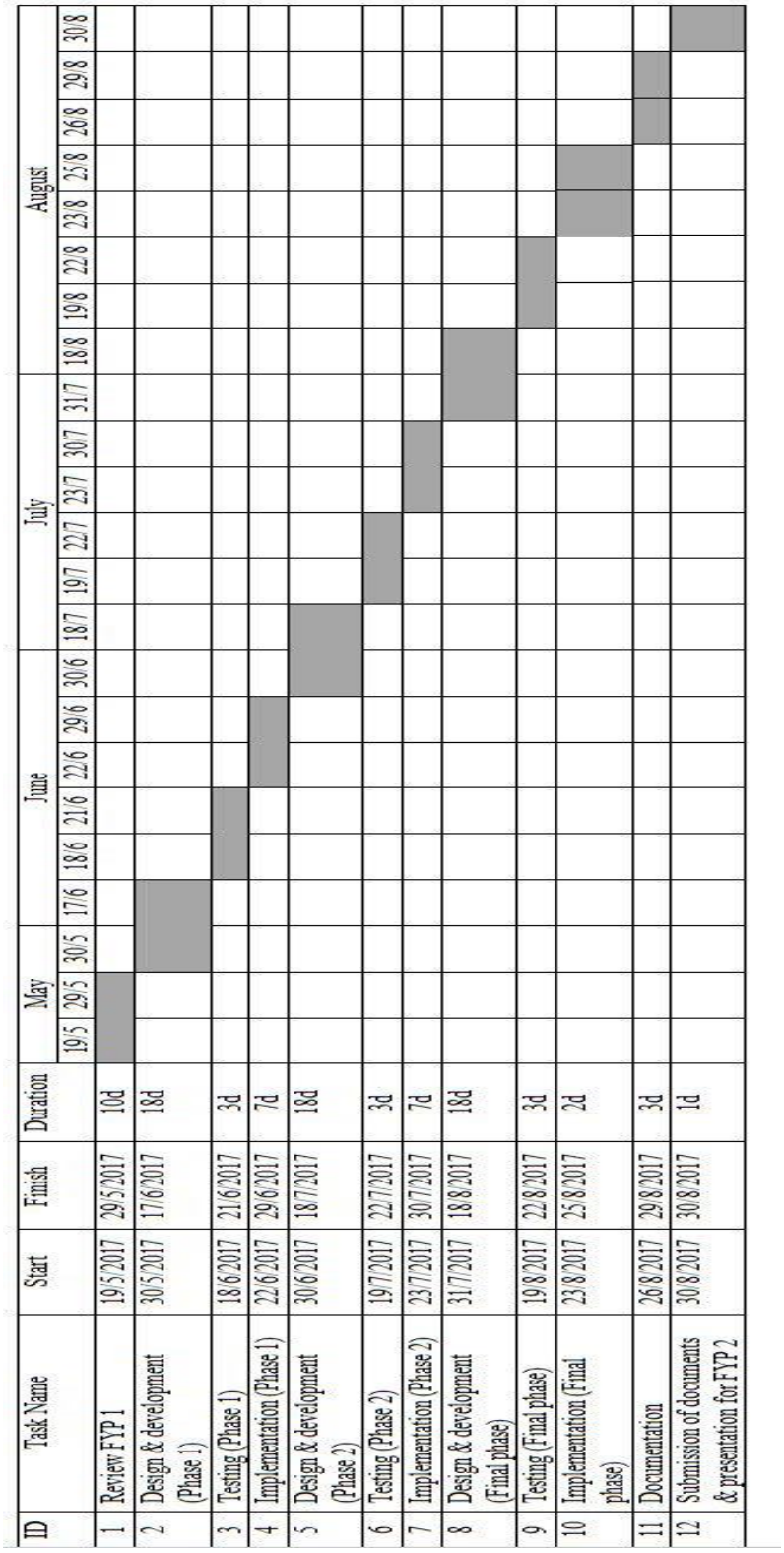
On the other hand, there are some modules in the app which involve complex Android coding when it comes to the core functions such as location reporting. This function requires some APIs that were quite an uncharted territory due to the fact that this is not included in the course's syllabus. Furthermore, the animations contain in the app make the task even harder because the animation effects were difficult to achieve with the limited knowledge and experience yet those effects could makes the app looks attractive to the user as well. Nevertheless, after some trial and errors were done, the challenges have been resolved eventually.

4.6 Timeline



ID	Task Name	Start	Finish	Duration
1	Project planning	23/1/2017	2/2/2017	10d
2	Identify problem statements, objectives, scopes	3/2/2017	7/2/2017	4d
3	Gather system requirements	8/2/2017	14/2/2017	6d
4	Analyze system requirements	15/2/2017	20/2/2017	5d
5	Literature reviews	21/2/2017	26/2/2017	5d
6	System design (Flowchart, Design block diagram, Database design, Interface design)	27/2/2017	4/3/2017	5d
7	Prototype design	5/3/2017	18/4/2017	45d
8	System testing	19/4/2017	22/4/2017	3d
9	Improve the system	23/4/2017	29/4/2017	6d
10	Documentation	30/4/2017	2/5/2017	2d

Figure 4.4 Gantt chart for FYP 1



ID	Task Name	Start	Finish	Duration
1	Review FYP 1	19/5/2017	29/5/2017	10d
2	Design & development (Phase 1)	30/5/2017	17/6/2017	18d
3	Testing (Phase 1)	18/6/2017	21/6/2017	3d
4	Implementation (Phase 1)	22/6/2017	29/6/2017	7d
5	Design & development (Phase 2)	30/6/2017	18/7/2017	18d
6	Testing (Phase 2)	19/7/2017	22/7/2017	3d
7	Implementation (Phase 2)	23/7/2017	30/7/2017	7d
8	Design & development (Final phase)	31/7/2017	18/8/2017	18d
9	Testing (Final phase)	19/8/2017	22/8/2017	3d
10	Implementation (Final phase)	23/8/2017	25/8/2017	2d
11	Documentation	26/8/2017	29/8/2017	3d
12	Submission of documents & presentation for FYP 2	30/8/2017	30/8/2017	1d

Figure 4.5 Gantt chart for FYP 2

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Verification Testing Plan

The tables below will show the features and functions of *Digital Fitness Diary for Healthy Lifestyle* whereas the aspects as well as expected output will also be shown in the tables. Meanwhile, actual output will only be shown in implementation testing and debugging section.

5.1.1 Exercise Module

Aspect	Expected Output	Actual Output
Indoor exercise section:		
Steps by steps exercise instructions	The user will be able to swipe from left to right to view the instructions.	
Popup dialog	The user will be able to start the exercise routine or cancel the action through the dialog.	
Points reward	Points will be rewarded to the user when they completed an exercise session.	
Session	The exercise session details will be stored into the database.	
Outdoor exercise section:		
GPS location tracking	The user's location will be tracked while doing exercise.	
Statistics panel	Statistics such as duration, distance travelled, steps taken, and speed will be shown.	

Route	Route travelled by the user will be stored into the database when the session ends.	
Points reward	Points will be rewarded to the user when they completed an exercise session.	
Session	The exercise session details will be stored into the database.	

5.1.2 Food Module

Aspect	Expected Output	Actual Output
<u>Food section, Meal section, Recipe section:</u>		
Create, edit, and delete record	The user will be able to create new record, edit and delete it later on.	
Display of records	The records created by the user should be displayed in a list.	

5.1.3 Water Module

Aspect	Expected Output	Actual Output
Create, edit, and delete record	The user will be able to create new record, edit and delete it later on.	
Display of records	The records created by the user should be displayed in a list.	

5.1.4 Reminder Feature

Aspect	Expected Output	Actual Output
Create and edit reminder	The user will be able to create new reminder and edit it later on.	
Goes off on time	The reminder will goes off on the specified time and date.	
Display of records	The records created by the user should be displayed in a list.	

5.1.5 Social Networking Feature

Aspect	Expected Output	Actual Output
Post new status	The user will be able to post new status.	
Add new friend	The user will be able to add new friends.	
Like and comment on the post	The user will be able to like and comment on the other users' posts.	
View user profile	The user will able to view the other users' profiles.	
Points reward	Points will be rewarded to the user when other users like their posts.	

5.1.6 Leaderboard Feature

Aspect	Expected Output	Actual Output
Leaderboard	User will be able to view the leaderboard and their ranks among other users.	

5.1.7 Diary Feature

Aspect	Expected Output	Actual Output
Graph view	The user will be able to view the statistics in graph view.	
Filter based on date	The user will be able to perform filter and view the statistics for specified date.	
Overall statistics view	The user will be able to view the statistics regarding exercise, food, and water module.	

5.2 Implementation Testing and Debugging

The app will gone through the verification testing plan defined above in order to identify bugs as well as to ensure that the app is well-developed while meeting the project objectives.

5.2.1 Exercise Module

Aspect	Expected Output	Actual Output
<u>Indoor exercise section:</u>		
Steps by steps exercise instructions	The user will be able to swipe from left to right to view the instructions.	Steps by steps instructions are shown in the layout called ViewPager which allows the user to swipe horizontally.

Popup dialog	The user will be able to choose the cycle of the exercise routine or cancel the action through the dialog.	Popup dialog is shown when the user presses the button and user can choose to start the exercise with selected cycles as well as cancel the action.
Points reward	Points will be rewarded to the user when they completed an exercise session.	Points are added to the user's score in the database when they completed an exercise session.
Session	The exercise session details will be stored into the database.	The session data is stored into the database.
<u>Outdoor exercise section:</u>		
GPS location tracking	The user's location will be tracked while doing exercise.	The user's location can be identified by GPS yet the accuracy depends on the GPS signal.
Statistics panel	Statistics such as duration, distance travelled, steps taken, and speed will be shown.	Some statistics such as speed and distance travelled could not be displayed due to the integration of Google Fit API with the app is not well-integrated.
Route	Route travelled by the user will be stored into the database when the session ends.	The route shown on map is sometimes inaccurate due to the inaccuracy of GPS signal.
Points reward	Points will be rewarded to the user when they completed an exercise session.	Points are added to the user's score in the database when they completed an exercise session.

Session	The exercise session details will be stored into the database.	The session data is stored into the database.

5.2.2 Food Module

Aspect	Expected Output	Actual Output
<u>Food section, Meal section, Recipe section:</u>		
Create, edit, and delete record	The user will be able to create new record, edit and delete it later on.	New record can be created, edited and deleted. Some fields will prompt errors when the user left the fields empty.
Display of records	The records created by the user should be displayed in a list.	Image, title, date, time as well as description are displayed at each row with RecyclerView.

5.2.3 Water Module

Aspect	Expected Output	Actual Output
Create, edit, and delete record	The user will be able to create new record, edit and delete it later on.	New record can be created, edited and deleted. Some fields will prompt errors when the user left the fields empty.
Display of records	The records created by the user should be displayed in a list.	Image, title, date, time as well as description are displayed at each row with RecyclerView.

5.2.4 Reminder Feature

Aspect	Expected Output	Actual Output
Create and edit reminder	The user will be able to create new reminder and edit it later on.	New record can be created, edited and deleted. Errors will prompt when title, date, time are left empty.
Goes off on time	The reminder will be goes off on the specified time and date.	The reminder goes off on the specified time but the battery drains heavily before the reminder goes off due to poorly designed codes integrated with AlarmManager.
Display of records	The records created by the user should be displayed in a list.	Image, title, date, time as well as description are displayed at each row with RecyclerView.

5.2.5 Social Networking Feature

Aspect	Expected Output	Actual Output
Post new status	The user will be able to post new status.	New statuses can be posted by the user.
Add new friend	The user will be able to add new friends.	New friends can be added by the user.
Like and comment on the post	The user will be able to like and comment on the other users' posts.	Like and comment is possible for the user to perform on the posts.
View user profile	The user will able to view the other users' profiles.	Other users' profile can be viewed by the user.
Points reward	Points will be rewarded to the user when other users like their posts.	Points added to the user's points when their posts have been liked by the others.

5.2.6 Challenge Feature

Aspect	Expected Output	Actual Output
Leaderboard	User will be able to view the leaderboard and their ranks among other users.	Leaderboard can be displayed to the user but the list can only displays all users instead of user's friends due to some Firebase query issues.

5.2.7 Diary Feature

Aspect	Expected Output	Actual Output
Graph view	The user will be able to view the statistics in graph view.	The graph can only show the data to some extent due to the limited knowledge in coding.
Filter based on date	The user will be able to perform filter and view the statistics for specified date.	The data can be filtered according to selected date.
Overall statistics view	The user will be able to view the statistics regarding exercise, food, and water module.	The statistics can be viewed according to their own field.

CHAPTER 6: CONCLUSION

6.1 Project Overview

As a matter of fact, some of the modern citizens nowadays have no clues about how to exercise properly and find it difficult to keep track of their exercise progress due to various reasons such as lack of information as well as knowledge. It is also worth mentioning that they have a job too, as if it is not stressful enough to balance their works and healthy lives. Apparently, loss of motivation is also one of the major problems that people often give up on doing exercise consistently. That means people will feel boring as they cannot be motivated anymore unless there is something motivational which re-motivate them to put in more efforts. With that being said, only peoples who somewhat determine and diligent can keep their head up in order to stay healthy without needing the assistance of a fitness app.

Therefore, the deliverable of this project called *Digital Fitness Diary for Healthy Lifestyle* is going to address all these problems mentioned above by introducing a few functions that can aid the users while they are exercising so that they have nothing to worry about from now on. First and foremost, the users can carry out different exercises while keeping track of the real time statistics such as location, distance travelled, and time elapsed in the Exercise section. After all this have been done, the users can view the amount of calories and weight in an organized view so that they could compare the changes side by side. For the sake of motivation, leaderboard will also be added in as an element of gamification where the users' can compete with each other in terms of points earned as well as ranks.

The project also contains the Food section module where it allows the users to log the meals that they consume daily along with the nutrition facts that are pre-defined in the database. The benefit that they get is the ability to keep track of the nutrients as well as calories effortlessly because it is not easy to determine the exact amount of those stats without searching for it online. Last but not least, the Water section module is a part where the users are required to log their daily water intake so that they will have a clear idea about the hydration level in their body. The other function contains in this module is beverage helper which aims to aid the users to take appropriate amount of beverage such

as beer and coffee before the harmful effect has been done on their body. As far as methodology is concerned, the iterative and incremental model will be used as the methodology to develop this project due to the characteristics that are beneficial for this project such as shorter time required creating working software which can minimize the overall project duration to 103 days as shown in Figure 4.5.

6.2 Objective Achieved

This mobile application allows the users to keep track of the statistics through Exercise, Food, and Water module. Subsequently, data will also be displayed in organized view in which the data is represented in graph view as well as table form. Apart from that, this app can also encourage the users to practice a healthy lifestyle consistently by presenting the statistics to them when it is needed so that they can take control of their daily routines. Not only that, they can be motivated extrinsically through elements of gamification like leaderboard and points reward. Moreover, the issue regarding lack of information can also be addressed through the health articles provided in the app in which they can gain more information about health. Last but not least, some other features such as social networking as well as reminder are also meant to aid the users to achieve a healthy lifestyle voluntarily.

6.3 Future Improvements

The project can be improved through these ideas in the future:

1. QR code scanning feature in Food module which could allow the users to scan the nutrition labels on the products and obtain the nutrition facts immediately.
2. Virtual personal trainer which could assist the users in practicing a healthy lifestyle through intelligent voice narration.
3. Message function which could allow the users to chat with their friends.
4. More social network sites could be integrated into the app in order to improve the connectivity between users from different platforms.

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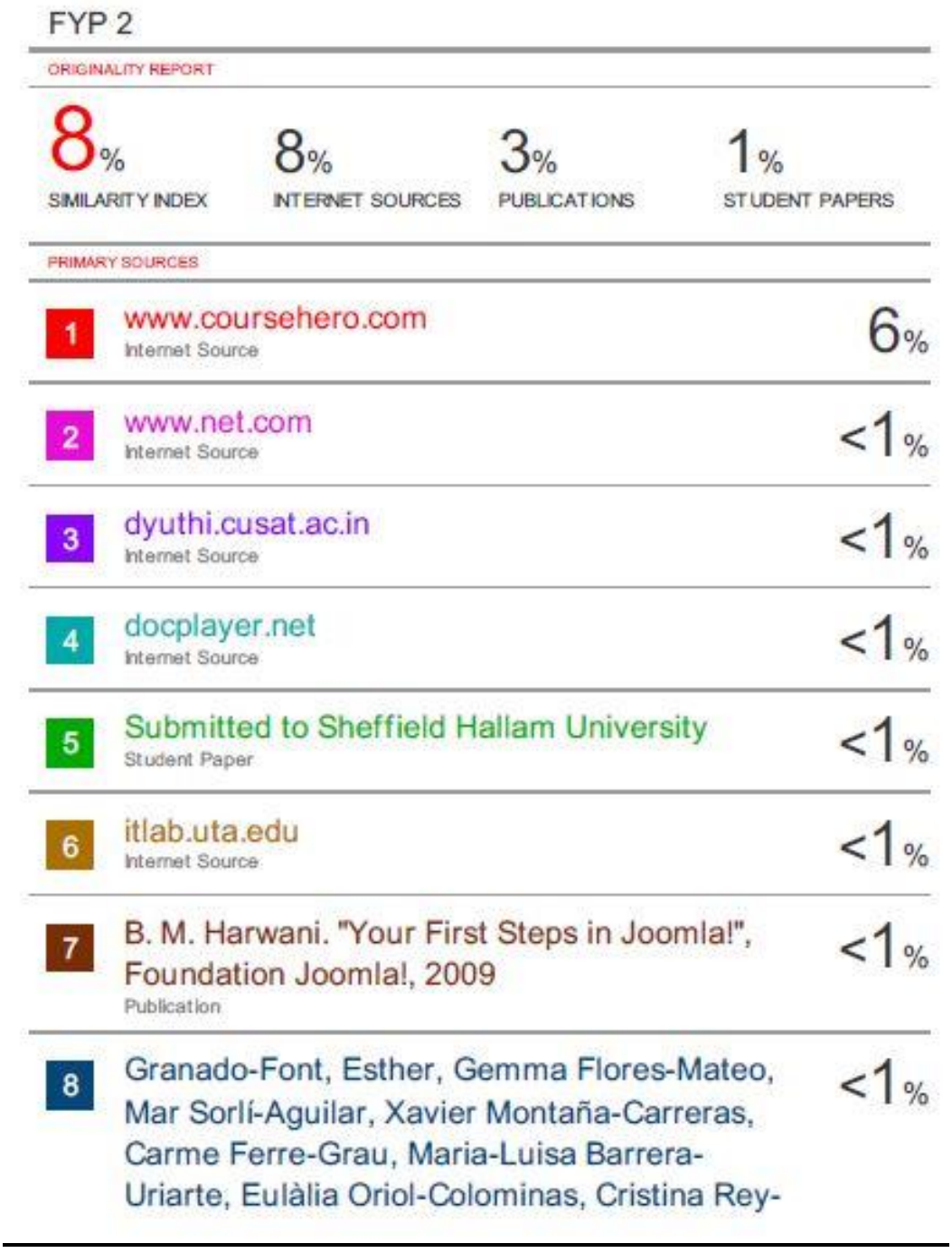
APPENDIX A: TURNITIN PLAGIARISM CHECKING

A-1 Turnitin Originality Report



FYP 2

ORIGINALITY REPORT

8%	8%	3%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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7	B. M. Harwani. "Your First Steps in Joomla!", Foundation Joomla!, 2009 Publication	<1%
8	Granado-Font, Esther, Gemma Flores-Mateo, Mar Sorlí-Aguilar, Xavier Montaña-Carreras, Carme Ferre-Grau, Maria-Luisa Barrera-Uriarte, Eulàlia Oriol-Colominas, Cristina Rey-	<1%

Figure A-1: Turnitin Originality Report (Page 1)

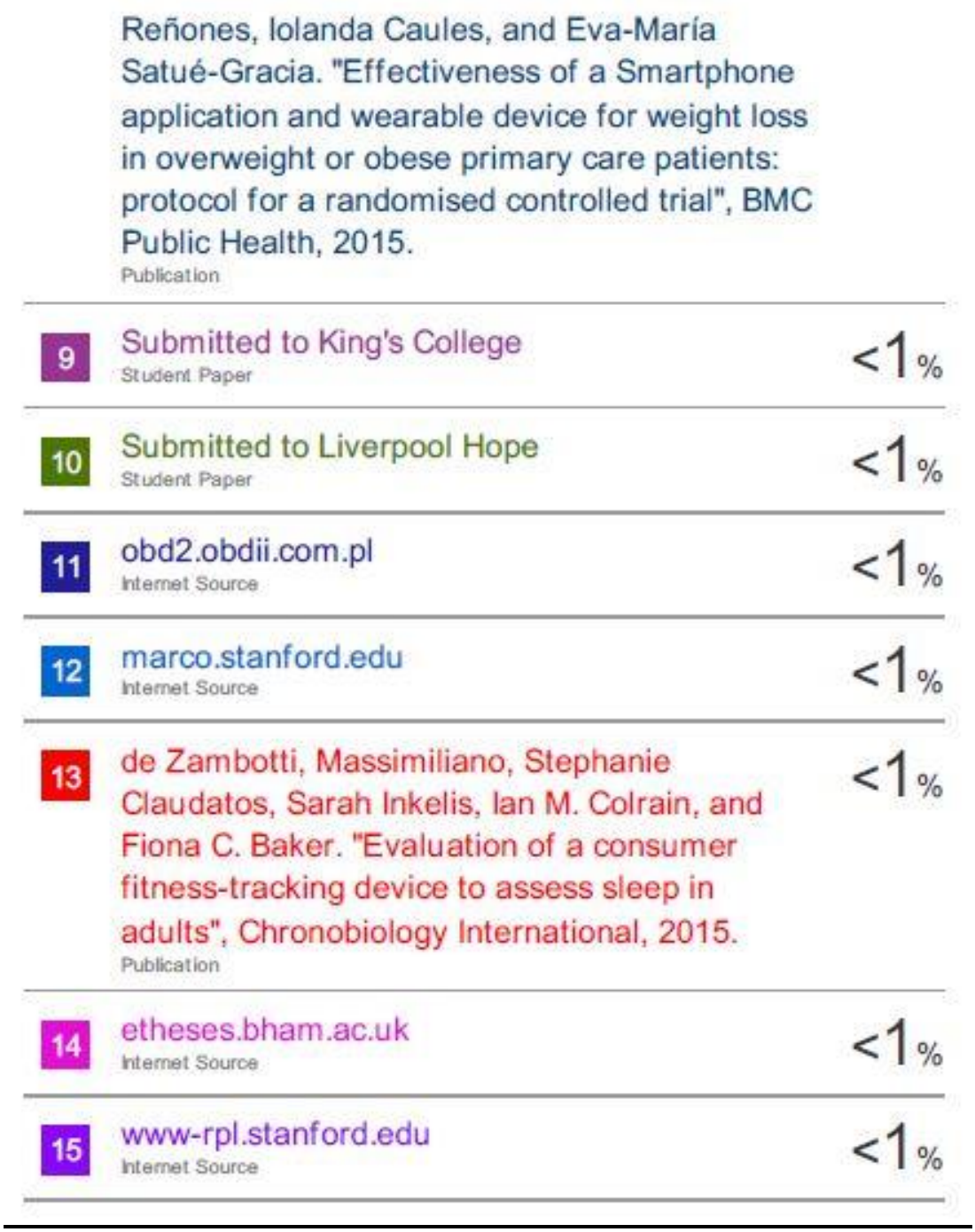

Figure A-2: Turnitin Originality Report (Page 2)

Figure A-2: Turnitin Originality Report (Page 3)

APPENDIX B: BIWEEKLY REPORT

Final Year Project 2: Biweekly Report

Trimester, Year: Year 3, Semester 3	**Study week no.: 2**
Student Name & ID: Lee Zheng Gang 1305751	
Supervisor: Dr. Ramesh Kumar Ayyasamy	
Project Title: Digital Fitness Diary for Healthy Lifestyle	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Completed the layout design of the app.

2. WORK TO BE DONE

Complete other modules.

3. PROBLEMS ENCOUNTERED

Complex and confusing Android coding.

4. SELF EVALUATION OF THE PROGRESS

More works need to be done.

_____ _____

Supervisor's signature Student's signature

Final Year Project 2: Biweekly Report

Trimester, Year: Year 3, Semester 3	**Study week no.: 4**
Student Name & ID: Lee Zheng Gang 1305751	
Supervisor: Dr. Ramesh Kumar Ayyasamy	
Project Title: Digital Fitness Diary for Healthy Lifestyle	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Completed minor part in one of the module.

2. WORK TO BE DONE

Complete other modules.

3. PROBLEMS ENCOUNTERED

Complex and confusing Android coding.

4. SELF EVALUATION OF THE PROGRESS

More works need to be done.

_____ _____

Supervisor's signature Student's signature

Final Year Project 2: Biweekly Report

Trimester, Year: Year 3, Semester 3	**Study week no.: 6**
Student Name & ID: Lee Zheng Gang 1305751	
Supervisor: Dr. Ramesh Kumar Ayyasamy	
Project Title: Digital Fitness Diary for Healthy Lifestyle	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Completed one module.

2. WORK TO BE DONE

Complete other modules.

3. PROBLEMS ENCOUNTERED

Complex and confusing Android coding.

4. SELF EVALUATION OF THE PROGRESS

More works need to be done.

_____ _____

Supervisor's signature Student's signature

Final Year Project 2: Biweekly Report

Trimester, Year: Year 3, Semester 3	**Study week no.: 8**
Student Name & ID: Lee Zheng Gang 1305751	
Supervisor: Dr. Ramesh Kumar Ayyasamy	
Project Title: Digital Fitness Diary for Healthy Lifestyle	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Completed minor part in the second module.

2. WORK TO BE DONE

Complete other modules.

3. PROBLEMS ENCOUNTERED

Complex and confusing Android coding.

4. SELF EVALUATION OF THE PROGRESS

More works need to be done.

_____ _____

Supervisor's signature Student's signature

Final Year Project 2: Biweekly Report

Trimester, Year: Year 3, Semester 3	**Study week no.: 10**
Student Name & ID: Lee Zheng Gang 1305751	
Supervisor: Dr. Ramesh Kumar Ayyasamy	
Project Title: Digital Fitness Diary for Healthy Lifestyle	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Completed the second module.

2. WORK TO BE DONE

Complete other modules.

3. PROBLEMS ENCOUNTERED

Complex and confusing Android coding.

4. SELF EVALUATION OF THE PROGRESS

More works need to be done.

_____ _____

Supervisor's signature Student's signature

Final Year Project 2: Biweekly Report

Trimester, Year: Year 3, Semester 3	**Study week no.: 12**
Student Name & ID: Lee Zheng Gang 1305751	
Supervisor: Dr. Ramesh Kumar Ayyasamy	
Project Title: Digital Fitness Diary for Healthy Lifestyle	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Completed the third module.

2. WORK TO BE DONE

Complete other modules.

3. PROBLEMS ENCOUNTERED

Complex and confusing Android coding.

4. SELF EVALUATION OF THE PROGRESS

More works need to be done.

_____ _____

Supervisor's signature Student's signature

Final Year Project 2: Biweekly Report

Trimester, Year: Year 3, Semester 3	**Study week no.: 14**
Student Name & ID: Lee Zheng Gang 1305751	
Supervisor: Dr. Ramesh Kumar Ayyasamy	
Project Title: Digital Fitness Diary for Healthy Lifestyle	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Completed all planned modules and features

2. WORK TO BE DONE

Complete the documentation.

3. PROBLEMS ENCOUNTERED

Unclear about the FYP format.

4. SELF EVALUATION OF THE PROGRESS

Pretty good, tasks were done on time.

_____ _____

Supervisor's signature Student's signature