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Development of Mobile Application for Health and Fitness Guidance - FIT DAY

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Abstract: FIT DAY is an Android-based mobile application to guide people to do workouts and pay attention to their food calorie intakes to maintain their fitness. The main objective of the FIT DAY application is to boost potential users to be more health concerns. This application consists of five modules: Food Calories, Exercise, Body Mass Index (BMI), Step Counter, and Reminder. Most of the current health and fitness application focused on the workout part compared to the food calories part. Therefore, the Agile methodology supports the project's development through its five (5) phases. The development of FIT DAY application in Android Studio, and Firebase Database enables its implementation in an Android-based platform. Ten respondents aged between 18 to 40 years old participated in the user acceptance testing. Technology Acceptance Model (TAM) model utilized for user testing shows positive acceptance in the aspects of interface, content, and functional features of the FIT DAY application. Overall, this application enables users to track daily calories intake and acquire health and fitness methods.

Keywords: Food Calories, Exercise, Body Mass Index, Step Counter, Reminder

1. Introduction

Health and fitness play an important role in human life. In previous years, the elders have kept good care of health and fitness by eating healthy foods and ensuring themselves to form healthy living habits. Nowadays, most people love to eat supper and snacks. Based on the statistics given by the Ministry of Health in 2016, death is increasing significantly due to unhealthy eating habits where healthier lifestyle will reduce number of death naturally [1]. Many behaviors that lead an unhealthy lifestyle due to a lack of exercise and unhealthy diet habits.

Lack of exercise is one of the major causes of people becoming unhealthy. People are becoming less active because they are busy at work, especially office workers who often sit in front of the computer all day. They always neglected their health importance due to their tight schedule and no leisure time for exercise including joining a gym class. However, in case people exercise at home by spending 3 days a week can solve these problems [2]. Besides that, according to the news from the

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World Health Organization, there was more than 50% of Malaysian having health issues due to obesity where the prevalence of diabetes and hypertension has increased [3]. Given that, Malaysian are lack health awareness on food calories intake calories in their daily meals.

In these changing times, people are becoming more aware of the importance of fitness in their lives as mobile technology advances. All of this is thanks to easily downloading mobile apps that allow them to track their daily healthy habits. Health and fitness mobile applications provide users with a great personalized user experience to assist them maintain healthier lifestyles [4]. In similar applications, there is a lack of health and fitness concentrated on both food calories intake and exercise guidelines. These applications will be focused on workout where additional applications related to food calories is needed and normally shows food calories by long text only. Traditional application is boring where merging simple game will enhance users understanding towards food calories tremendously. Existing health and fitness applications involve many types of exercise but do not involve warm-up exercise preventing injuries by loosening their joints during exercise.

Thus, the idea of health and fitness application (FIT DAY) was born. Five modules are in the proposed application which are Food Calories, Exercise, Body Mass Index, Step Counter and Reminder. The objectives of this project are to design a health and fitness mobile application – FIT DAY! based on 2D approach, develop a FIT DAY! health and fitness mobile application on Android platform and to test the functionalities and user acceptance of the developed mobile application with the target users aged between 18 to 40 years old.

The rest of paper will be organized as follows. The related work of the project will be discussed in following section. In Section 3, the methodology used to develop this application will be covered in detail. Section 4 will discuss the result of the testing phase outcomes. Lastly, Section 5 will discuss the conclusion and future work of this project.

2. Related Work

This section discusses related work of the project, including mobile application facilitating healthy lifestyle and comparison of existing similar apps and the proposed app.

2.1 Mobile Application Facilitating Healthy Lifestyle

Physical exercise and well eating habits are very important for people who want to keep fit. If people want to maintain fitness, they need to carry out exercise regularly to reduce the occurrence of some diseases such as diabetes and cancer [5]. They should exercise at least 3 days a week to stay healthy [2]. To exercise correctly, the health and fitness coach is essential to guide people and they can use health and fitness application to obtain and follow the exercise guidance. At the same time, people should cautious and set the limit of their food calories intake. Sometimes people are lazy to maintain a healthy diet and physical activity willingly however they may be affected by external triggers. For instance, a reminder from the phone like text messaging prompted out to progress their exercise [6].

In this era of digital technology, people adopt mobile applications to complete some operations become a new trend. Persuasive applications today have been knowing popularly to focus on behavioral change. It is an interactive application that aims to change personal attitudes and behaviors [7]. Besides that, the persuasive applications capable of improving the quality of life as well as convince the user to vary their health behavior such as exercise. Generally, there are three types of health and fitness applications in the market: workout or exercise applications, nutrition applications, and activity tracking apps. Workout applications provide the user with various sets of exercise guidance while nutrition applications help users to monitor and track their food calories intake. Activity tracking application gives the tracking activity information such as step taken, calories burned, distance and speed run [8].

2.2 Comparison of Existing Application

There are many similar health and fitness mobile applications in the Google Play Store. In this section, the similar existing applications that chosen to test their functionality are Workout for Women [9], FITFIT [10] and My Fitness [11]. The comparison of existing applications and proposed application is tabulated and as presented in the following:

Table 1: Comparison of existing applications and proposed application

Characteristics	Workout for Women	FITFIT	My Fitness	FIT DAY (Proposed App)
Android platform	Yes	Yes	Yes	Yes
Login & Logout	No	Yes	No	Yes
Modules:				
-Food Calories	No	No	No	Yes
-Exercise	Yes	Yes	Yes	Yes
-Body Mass Index	Yes	Yes	No	Yes
-Step Counter	No	No	No	Yes
-Reminder	Yes	No	Yes	Yes
Strengths	Free to install	Free to install	Free to install	Free to install
	User friendly interface	Suitable for both men and women	Simple to use	User friendly interface
	Easy to use	Provide very detailed workout guidelines	Provide exercise guidance that straight to the point	Provide extra additional module
Weaknesses	More focus on workout plan merely	More focus on workout plan merely	More focus on workout plan merely	Consist of yoga workout plans only
	Too many advertisements	In-apps purchase	Too many advertisements	

Table 1 shows the comparison of existing applications and proposed application (FIT DAY mobile application). As a result, the proposed application offers a food calories module and step counter module that is not available among all three existing applications. All three existing applications are free to install but more focused on workout plans merely. Besides that, the user interface suddenly pops up advertising when the user is using these existing applications (Workout for Women app and My Fitness app). In addition, the My Fitness app and FIT FIT app lack body mass index measurement feature and reminder feature respectively to assist users to maintain their healthy lifestyle, whereas the proposed application only includes yoga workout plans.

3. Methodology

The Agile model approach [12] is used to develop FIT DAY application including the Brainstorm phase, Design phase, Development phase, Implementation and Testing phase, and Feedback phase.

3.1 Brainstorm Phase

In Brainstorm phase, it is a study of what is going to carry out in this project. After the idea of FIT DAY application came out and has been approved by the supervisor, the purpose to develop the application should be clarified. Its purpose is to resolve the problem of the existing applications and add some useful features to enhance performance. The target users of application are specified as people who aged 18 until 40 years old. At this phase, it is to identify what are the requirements to develop FIT DAY mobile application. The activities involved in this phase are identifying the problem statement,

objectives, scope and expected result of the application. Then, researching similar existing mobile applications and proposed mobile application to compare and analyze their strengths and weaknesses.

3.2 Design Phase

In Design phase, a use case diagram was designed for use in system analysis to identify, clarify and organize system requirements. Figure 1 is a use case diagram for FIT DAY mobile application.

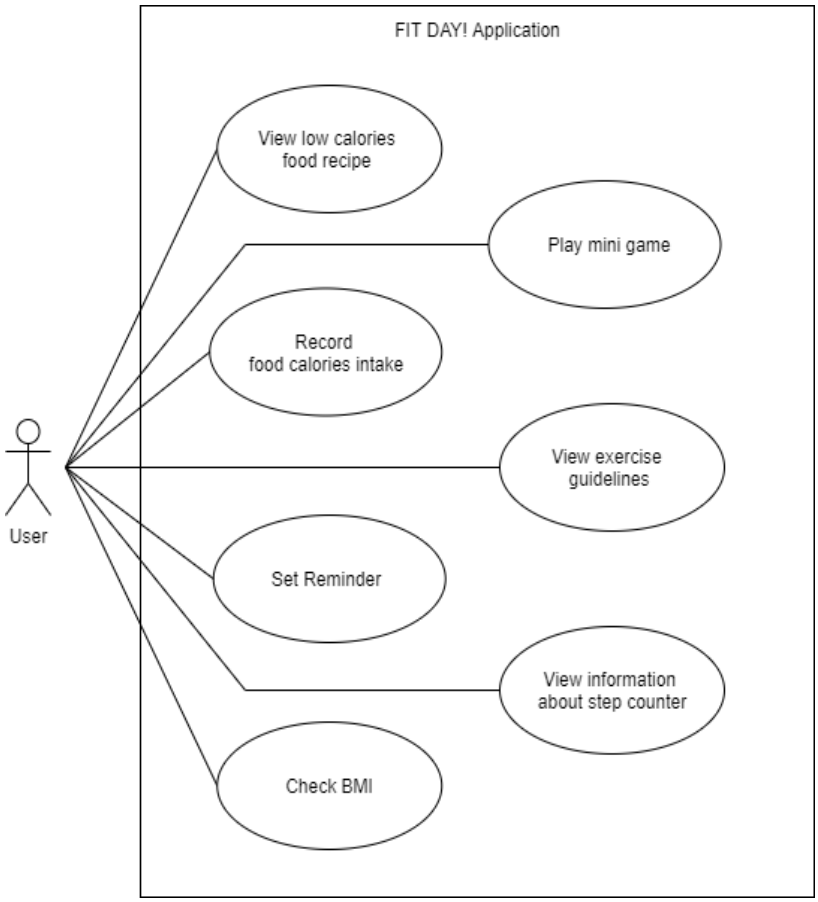


Figure 1: Use case diagram

Figure 1 shows the use case diagram of FIT DAY mobile application. Based on use case diagram, users can view low calories food recipes to produce food depend on following the procedure of low calories food recipes. Besides that, users can play a mini-game about food calories. The user can record food calories intake to prevent the user take the food over the daily calories limit. Users also can view exercise guidelines to practice exercise. Through this application, the user can set an exercise reminder to notice the user remember to practice exercise. Not only for this, FIT DAY application allows the user to view information about the step counter. Lastly, the user can check BMI by entering the information about gender, age, weight and height in this application.

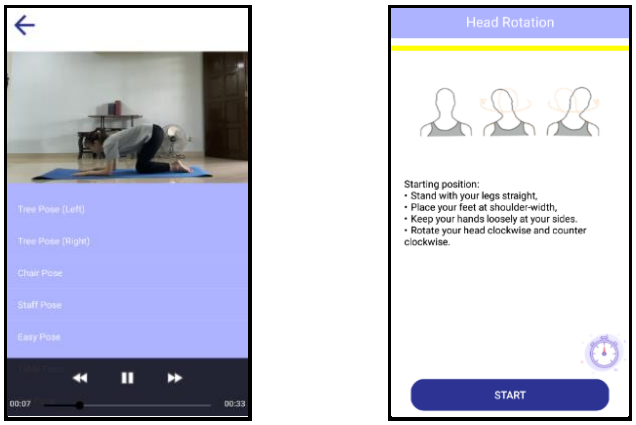
Furthermore, storyboard design of this mobile application done according to the scope and expected result defined in the brainstorm phase. Adobe XD is used to devise interfaces of the mobile application to the development process of the project run smoothly. Figures below show the interface design of FIT DAY mobile application.

Figure 2: Home interface

Figure 2 shows the home interface of FIT DAY mobile application. There are five modules including Food Calories module, Exercise module, BMI module, Step Counter module and Reminder module as well as the logout button. Figure 3 below shows some interfaces design of the food calories module while Figure 4 shows some exercise module's interfaces design. Figure 5 show the interface design of Step Counter module and Reminder module.

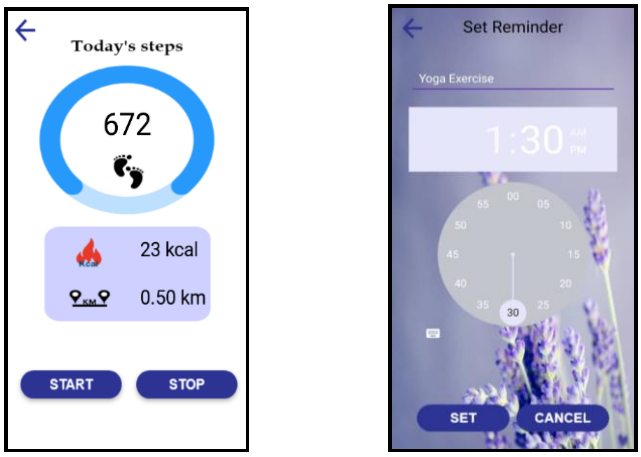
(a) **(b)**

Figure 3: (a)(b) Food Calories module



(a) **(b)**

Figure 4: (a)(b) Exercise module



(a) **(b)**

Figure 5: (a) Step Counter module (b) Reminder module

Except for interface design, the flowchart is readied to analyze, design, document or manage a workflow of this mobile application can be referenced in Appendix A. When the user launches the application, it will display the welcome page and later will show the sign in and sign up selection. Then, if users have already an account to log in, they can proceed to login into the homepage by entering their email and password. However, if users do not have an account to login, then it is required to register their own account by filling email, username, password and confirm password in sign up page. After the user login to the application, homepage will be displayed and there are five modules such as Food Calories module, Exercise module, BMI module, Step Counter module and Reminder module as well as logout button. If the user chooses Food Calories module, there are three sub-modules like Diet Calories, Calories Counter and Low Calories Recipe. In Diet Calories sub-module, the user can play the mini matching card game to obtain food calories info. Users can record food calories intake in Calories Counter sub-module while the user can view low food calories recipes in Low Calories Recipe sub-modules. Besides, if the user chooses Exercise module, there are three sub-modules like Warm-Up, Beginner and Advanced. Users can view exercise video guidelines from those sub-modules respectively. Additionally, there is a play button to show all exercises with a countdown timer. Users can challenge to complete all exercises within the countdown. If the user chooses BMI module, the user can check their Body Mass Index (BMI) by selecting their gender and entering their age, weight and height. Moreover, if the user chooses Step Counter module, the user able to view information about step counter such as step, distance and calories burned. Furthermore, if the user chooses Reminder module, the user can set tasks and remind time in order to notify and alert them.

Additionally, database design of the application for example Entity Relationship diagram (ERD) is designed by draw.io.

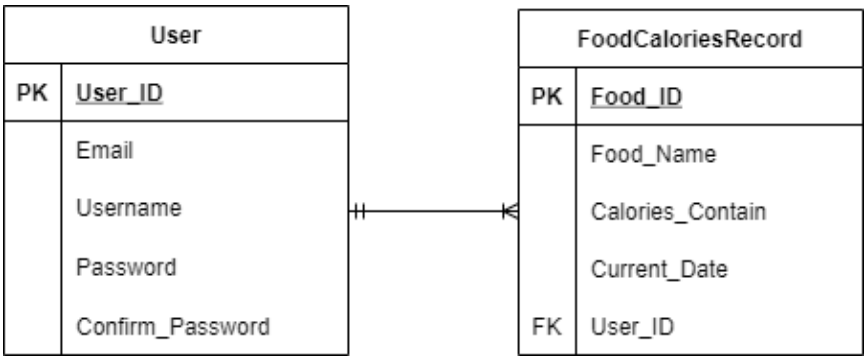


Figure 6: Entity relationship diagram

Figure 6 above show the Entity Relationship diagram of the application. In entities relationship, each user has many foods calories record.

3.3 Development Phase

In this stage, this mobile application was developed using Android Studio. An android application was made up of two kinds of programming language involves front-end and back-end. The Back-end programming language chosen was Java which easier to learn and can support the majority of platforms while front-end programming language use extensive mark-up language (XML) written. In this phase, the main features and content of this mobile application were developed as a prototype application. The software and hardware requirements for the developer to build this application as presented in the following:

Table 2: Software and Hardware Requirement for Developer

Requirement	Software/Hardware	Description
Software	Android Studio	To implement the application with Java and XML programming languages.
	Adobe Illustrator	To design graphics and logo used in the application interface.
	Adobe XD	To design interfaces of FIT DAY application.
	Adobe Premiere Pro	To edit exercise video tutorials of FIT DAY application.
Hardware	Laptop	8 GB RAM
	Android mobile	Minimum specification: Android version 5.1 and above

Table 2 shows the list of software and hardware requirements is required by the developer to design and develop the application.

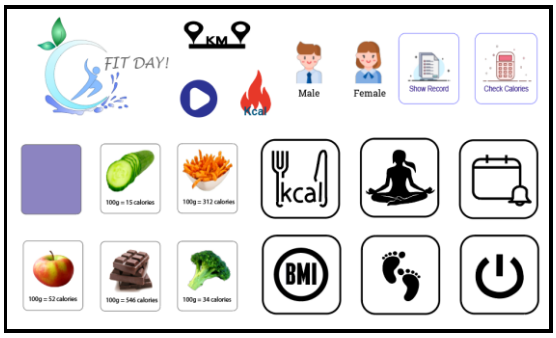


Figure 7: Graphics Assets

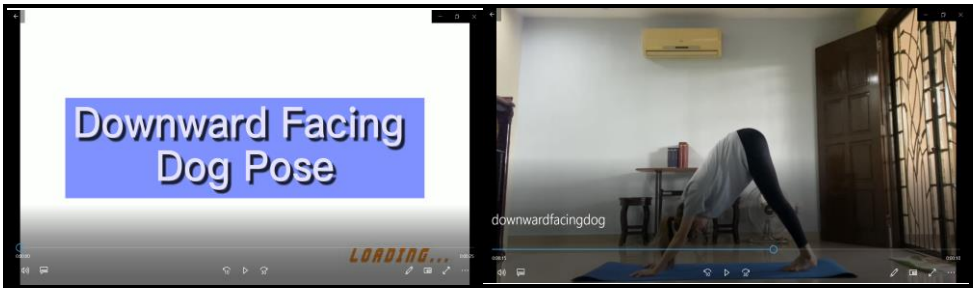


Figure 8: Video Assets

Figure 7 and Figure 8 above show examples of application assets implementation. The graphics assets were implemented by using Adobe Illustrator whereas the video assets were implemented by using Adobe Premiere Pro.

Figure 9: Firebase Realtime Database

Figure 9 shows the implementation of Firebase Realtime Database which used to store data of the mobile application. Furthermore, Figure 10 shows the code segment of add food calories record (calories counter sub-module). Figure 11 shows the code segment for reading food calories record from the real-time database (calories counter sub-module) whereas Figure 12 shows the code segment for deleting food calories record in the real-time database (calories counter sub-module). Figure 13 shows the code segment of Step Counter module.

```
String id = reference.push().getKey();
final Member member = new Member(id, foodname, calories, currentdate);

reference.child(userID).child("FoodCaloriesRecord").child(id).setValue(member).addOnSuccessListener(new OnSuccessListener<Void>() {
    @Override
    public void onSuccess(Void aVoid) {
        Toast.makeText(getApplicationContext(), text: member.getFoodname()+" is added", Toast.LENGTH_SHORT).show();
    }
});
```

Figure 10: Code Segment of Add Food Calories Record

```
private void readData() {
    // Read from the database

    reference.child(userID).child("FoodCaloriesRecord").addValueEventListener(new ValueEventListener() {
        @Override
        public void onDataChange(DataSnapshot dataSnapshot) {
            // This method is called once with the initial value and again
            // whenever data at this location is updated.
            list.clear();
            for(DataSnapshot snapshot :dataSnapshot.getChildren()){
                Member value = snapshot.getValue(Member.class);
                list.add(value);

            }
            adapter = new MemberAdapter( context: FoodCaloriesRecordListActivity.this, list);
            recyclerView.setAdapter(adapter);
            setClick();

        }
```

Figure 11: Code Segment of Read Food Calories Record

```
private void deleteFoodRecord(final Member member){

    reference.child(userID).child("FoodCaloriesRecord").child(member.getId()).removeValue(new DatabaseReference.CompletionListener() {
        @Override
        public void onComplete(@Nullable DatabaseError error, @NonNull DatabaseReference ref) {
            Toast.makeText(getApplicationContext(), text: "Removed : "+member.getFoodname(), Toast.LENGTH_SHORT).show();

        }
    });
}
```

Figure 12: Code Segment of Delete Food Calories Record

```
BtnStart.setOnClickListener((arg0) → {

        numSteps = 0;
        distance = (float)0;
        caloriesBurned = (int)0 ;
        sensorManager.registerListener( listener: StepCounterActivity.this, accel, SensorManager.SENSOR_DELAY_FASTEST);

});


BtnStop.setOnClickListener((arg0) → {

        sensorManager.unregisterListener(StepCounterActivity.this);

});
```

Figure 13: Code Segment of Step Counter

3.4 Implementation and Testing Phase

In this phase, the APK file of FIT DAY mobile application was built and generated in Android Studio. Figure 14 below show some parts of the process to generate an APK file of the app.

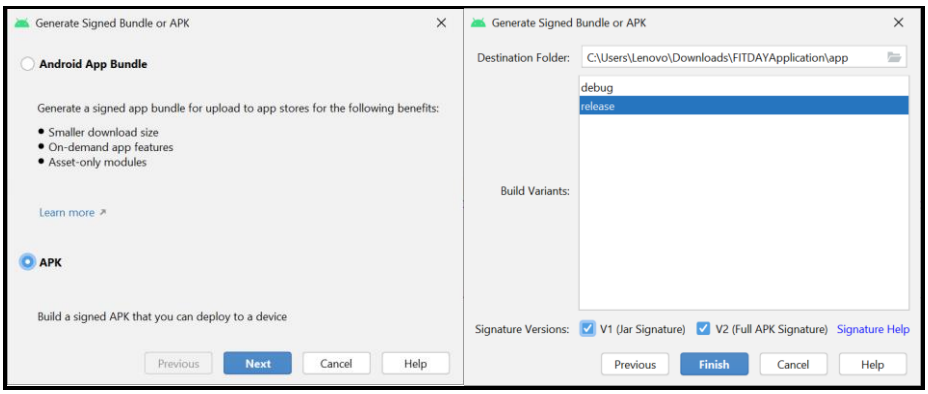


Figure 14: Process of generating APK file

After that, effective testing should be undertaken to uncover unnoticed bugs and problems after the design and development phase of the mobile application. There are many kinds of techniques that available for testing such as alpha testing, unit testing, module testing, black box testing and white box testing. This mobile application has tested through the methods of alpha testing. Hence, software bugs or errors have been discovered in the program code.

Alpha testing is a type of software testing method that used to identify bugs throughout the whole development process of the application. All modules functionality is main tested during alpha testing phase and can be referenced in Appendix B. The results of alpha testing discovered some bugs or errors in FIT DAY application. For instance, if the user accidentally clicks the Logout button, there is no

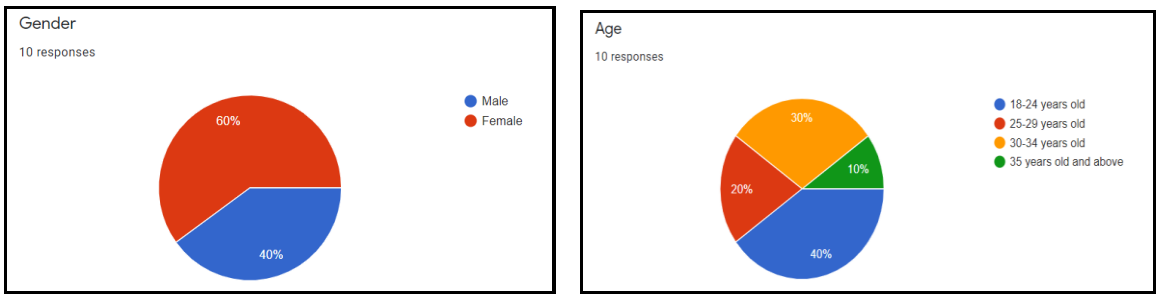
confirmation dialogue emerges to cancel it. In addition, there are no error messages to notify the user if the input information required is empty after clicking the Check button in the male bmi calculator interface or the female bmi calculator interface. According to the term "Help, diagnosis and recovery from errors" of Nielsen's ten usability principles, error messages exist is to inform users of inputs errors and provide clear information on how to recover from the error. Besides that, the lack of record date inserts into the database after click add button. Since the food calories intake is a daily record, hence it is crucial to have the record date displayed in the show record interface. Not only this, the problems were found that user requires a return to the home page with multiple clicks and exercise video tutorial lack of clear exercise instruction. Corrective action had taken to proper the errors found during alpha testing.

3.5 Feedback Phase

During the feedback phase, this mobile application should undergo beta testing with target users to analyze satisfaction and collect feedback. Google Form was created to collect target users' feedback on the aspect of interface, content, functionality, usability of the FIT DAY application. This is to verify whether the project objectives have been achieved.

4. Results and Discussion

After the alpha testing of the application completed, beta testing (user acceptance testing) was conducted with the participation of target users to collect and analyze feedback on the FIT DAY application. Technology Acceptance Model (TAM) is the evaluation model used to measure the user acceptance level where have two main components like perceived usefulness (PU) and perceived ease of use (PEOU). As a result, a set of questionnaires was created in Google Form and share with the target users to fill in later they test the application. In Google Form, four sections have five questions respectively which are Interface Testing, Content Testing, Functionality Testing and Usability Testing. There were 10 respondents aged 18 to 40 years old who took part in the questionnaire.



(a) **(b)**

Figure 15: (a) Gender (b) Age

Based on Figure 15 (a), there are 6 out of 10 respondents (60%) are female while the left of 4 respondents (40%) are male. Figure 15 (b) found that 40% of target users are aged from 18 to 24 years old and 30% of target users are aged from 30 to 34 years old. Besides that, there are few target users are aged from 25 to 29 years old and 35 years old above to participate in the beta testing which only has 20% and 10% respectively.

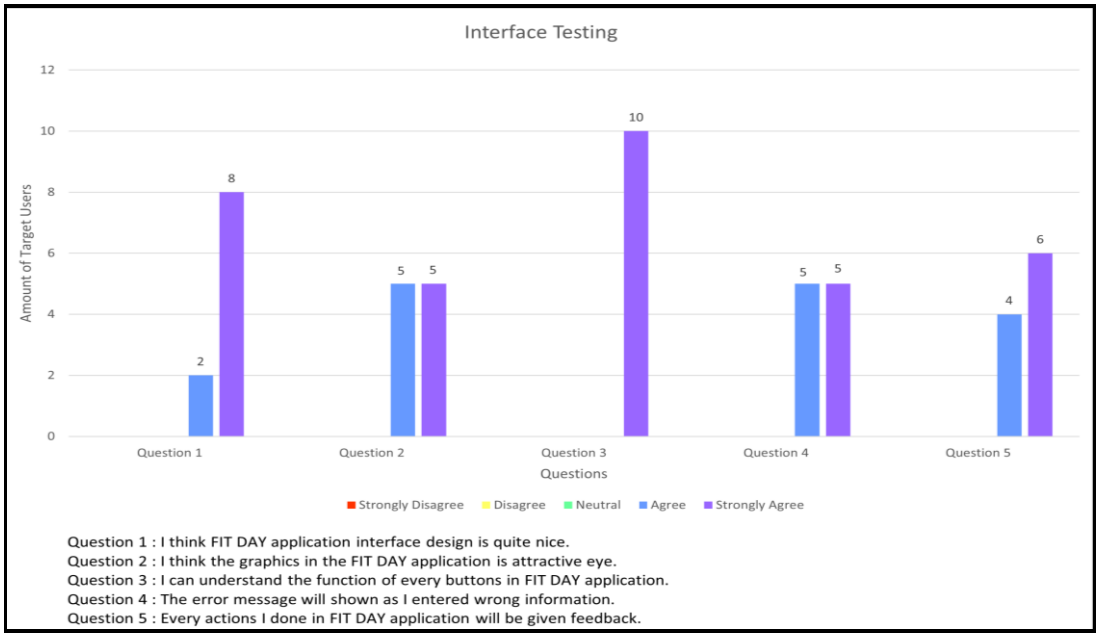


Figure 16: Interface Testing Analysis

Figure 16 above shows the graph result of interface testing analysis for FIT DAY application. In Question 1, two respondents are agreed and 8 respondents are strongly agreed that the FIT DAY application interface design is quite nice. As for Question 2 and Question 4, both have the same results where five respondents agreed and five respondents strongly agreed. They agreed on these statements which are "I think graphics in the FIT DAY application is the attractive eye" and "The error message will show as I entered the wrong information." Other than that, all the respondents have strongly agreed the function of every button in FIT DAY application can be understood. While Question 5, there are 6 respondents are strongly agreed and 4 respondents are agreed that every action they have done in FIT DAY application will be given feedback. In short, there is all positive response from 10 respondents in the part of interface testing. Hence, this interface testing analysis is concluded as target users satisfied the interface design of the application.

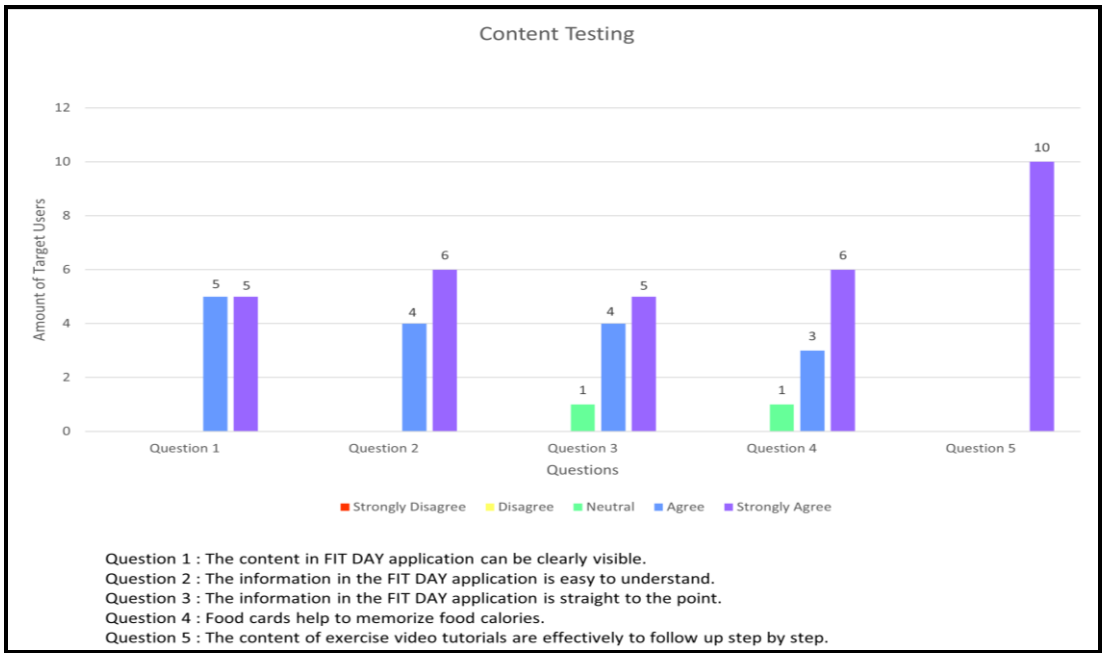


Figure 17: Content Testing Analysis

Figure 17 above shows the graph result of content testing analysis for FIT DAY application. Showing Question 1, half of the respondents agreed and half of the respondents strongly agreed the content in FIT DAY application can be clearly visible. Besides that, four respondents agreed and six respondents strongly agreed the information given in FIT DAY is easy to understand. However, five respondents answered “Strongly Agree”, 4 respondents answered “Agree” and one respondent answered “Neutral” in Question 3 "The information in the FIT DAY application is straight to the point". In Question 4, 6 respondents strongly agreed, 3 respondents agreed and 1 respondent stayed neutral in the statement of “Food cards helps to memorize food calories”. All respondents strongly agreed the content of exercise video tutorials is effectively follow up step by step. There were no respondents who give negative feedback on the content of the application. Therefore, it can be concluded that the content of the application has met the expectations of target users.

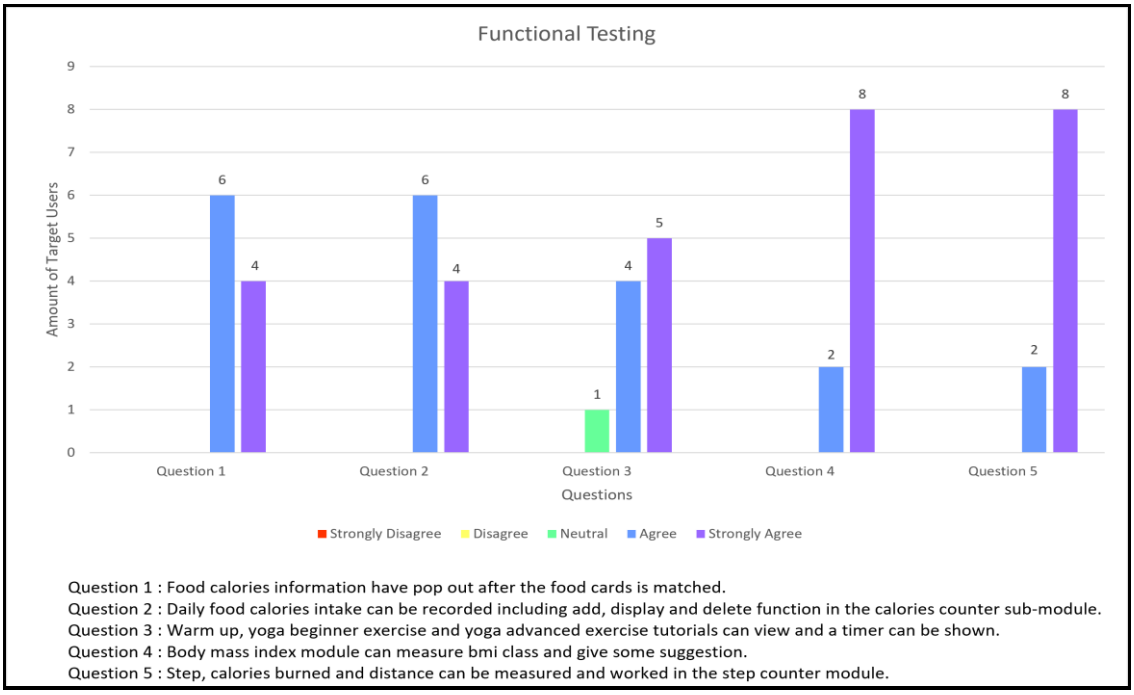


Figure 18: Functionality Testing Analysis

Figure 18 above shows the graph result of functionality testing analysis for FIT DAY application. There are 4 out of 10 respondents who strongly agreed and the left of 6 respondents have agreed the food calories information popped out after all food cards are matched. Not only this, 6 respondents answered “Agree” and 4 respondents answered “Strongly Agree” in Question 2 “Daily food calories intake can be recorded including add, display and delete function in the calories counter sub-module”. While Question 3, 5 respondents strongly agreed, 4 respondents agreed and 1 respondent stayed neutral in the statement of "Warm-up, yoga beginner exercise and yoga advanced exercise tutorials can view and a timer can be shown". Next is the Question 4 and Question 5 have the same results which are 8 respondents strongly agreed and 2 respondents agreed. They agreed the function of BMI module work well in measuring body mass index class and giving some suggestions. And also, they agreed with steps, calories burned and distance can be measured and worked in the Step Counter module. Since there is no negative response obtained from 10 respondents in the part of functional testing, therefore it can conclude FIT DAY application have performed well.

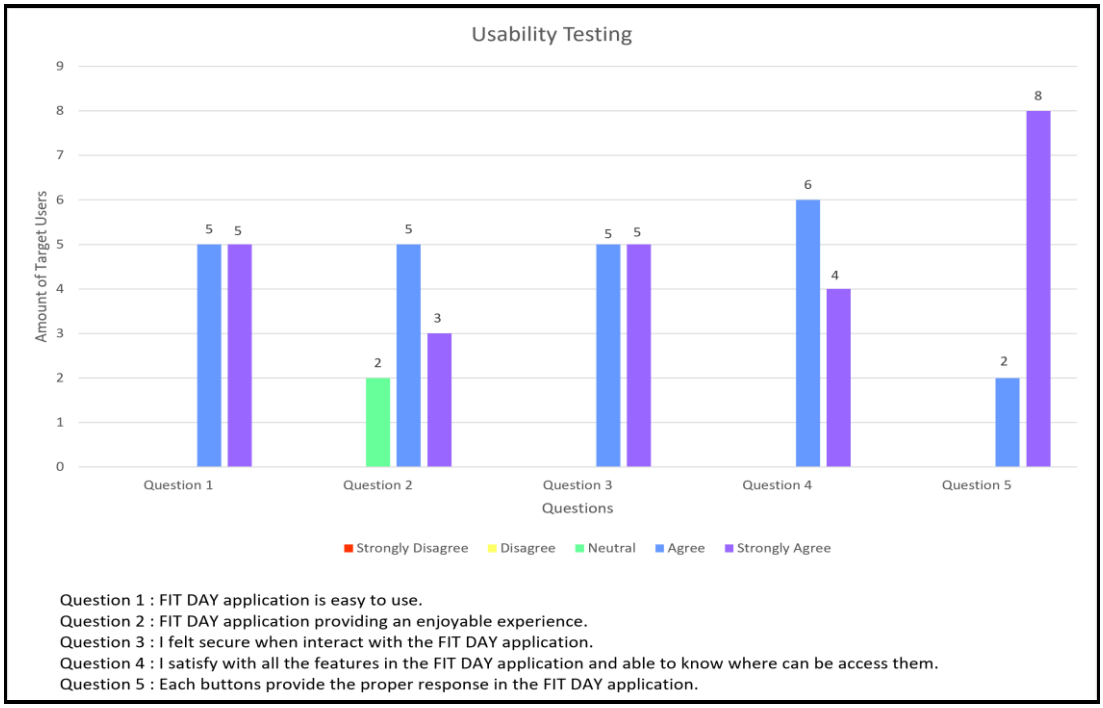


Figure 19: Usability Testing Analysis

Figure 19 above shows the graph result of usability testing analysis for FIT DAY application. Question 1 and Question 3, both have obtained the same results which are half of the respondents strongly agreed and half of the respondents agreed with those related statements. They agreed FIT DAY application is easy to use as well as they felt secure when interacting with the application. Furthermore, 3 respondents strongly agreed, 5 respondents agreed and 2 respondents stayed neutral regard to the statement of FIT DAY application providing an enjoyable experience. In Question 4, 6 respondents agreed and 4 respondents strongly agreed concerning all the features in the application is satisfied and able to know where can access them. All respondents agreed each button provide a proper response in the FIT DAY application which is 8 respondents strongly agreed and 2 respondents agreed. As there is no passive feedback in the usability testing analysis so that it can be concluded FIT DAY application is user friendly to target users.

Table 3: System Usability Scale

Question	Respondent										Score
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	
1	5	5	5	4	5	5	5	5	5	4	48
2	4	5	5	5	4	4	5	4	4	5	45
3	5	5	5	5	5	5	5	5	5	5	50
4	4	5	5	5	4	5	5	4	4	4	45
5	5	5	4	4	4	5	5	4	5	5	46
6	5	5	4	4	4	4	4	5	5	5	45
7	4	4	5	4	5	5	5	5	4	5	46
8	3	4	5	5	4	5	4	4	5	5	44
9	5	3	5	5	5	5	4	5	4	4	45
10	5	5	5	5	5	5	5	5	5	5	50
11	5	5	5	4	5	4	4	4	4	4	44
12	5	5	5	4	4	4	4	5	4	4	44
13	4	5	5	5	5	4	4	3	4	5	44
14	5	5	5	5	5	5	4	5	4	5	48
15	5	5	4	5	5	5	4	5	5	5	48

Table 3: (cont)

Question	Respondent										Score
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	
16	5	5	5	4	4	5	5	4	4	4	45
17	4	5	4	3	4	4	5	5	3	4	41
18	5	4	4	5	4	5	4	4	5	5	45
19	4	4	5	4	5	5	4	5	4	4	44
20	5	5	4	5	5	5	5	4	5	5	48
Total Score											915

$$System\ Usability\ Scale = \frac{Total\ Score}{Overall\ Total\ Score} \times 100\% \quad Equation\ 1$$
$$= \frac{915}{1000} \times 100\% = 91.5\%$$

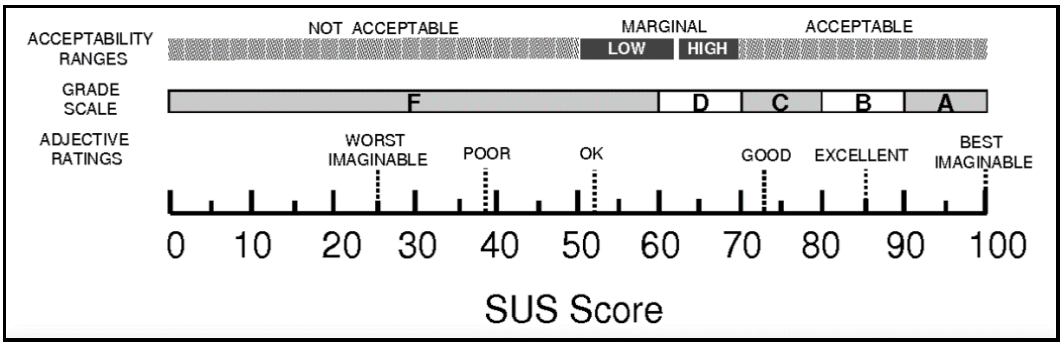


Figure 20: System Usability Scale

All beta testing results have been tabulated as seen in Table 3. The analysis of four testing sections from interface, content, functionality, and usability are processed by using the system usability scale algorithms [13] shows in Equation 1. Figure 20 shows the scale of system usability to determine the acceptability ranges. In a nutshell, overall percentage of application usability scale is 91.5% so it can prove the application is acceptable.

5. Conclusion

The development of FIT DAY mobile application was accomplished through the methodology of Agile model. Testing had conducted to collect and analyze feedback from target users. As a result, the application was satisfied and highly accepted by users with 91.5% overall percentage according to system usability scale. In terms of advantages, people save fitness guidance costs because of this application. Other than that, users can conduct workouts at home with select any adequate time. The most important benefit is individuals can meet their health goals by using this application. In conclusion, the project objectives have been achieved and some recommendations for future work to further improve the FIT DAY mobile application. The step counter module should replenish a feature that saves user's steps, calories burned and distance history as well as able to set a step goal to achieve. Besides that, a feature can be added that recommend specific food recipe and exercises to users according to their measured body mass index class. Lastly, it is recommended that to add a heart detection module in the application to allow the user to detect their heart rate frequently.

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Appendix A: Flowchart

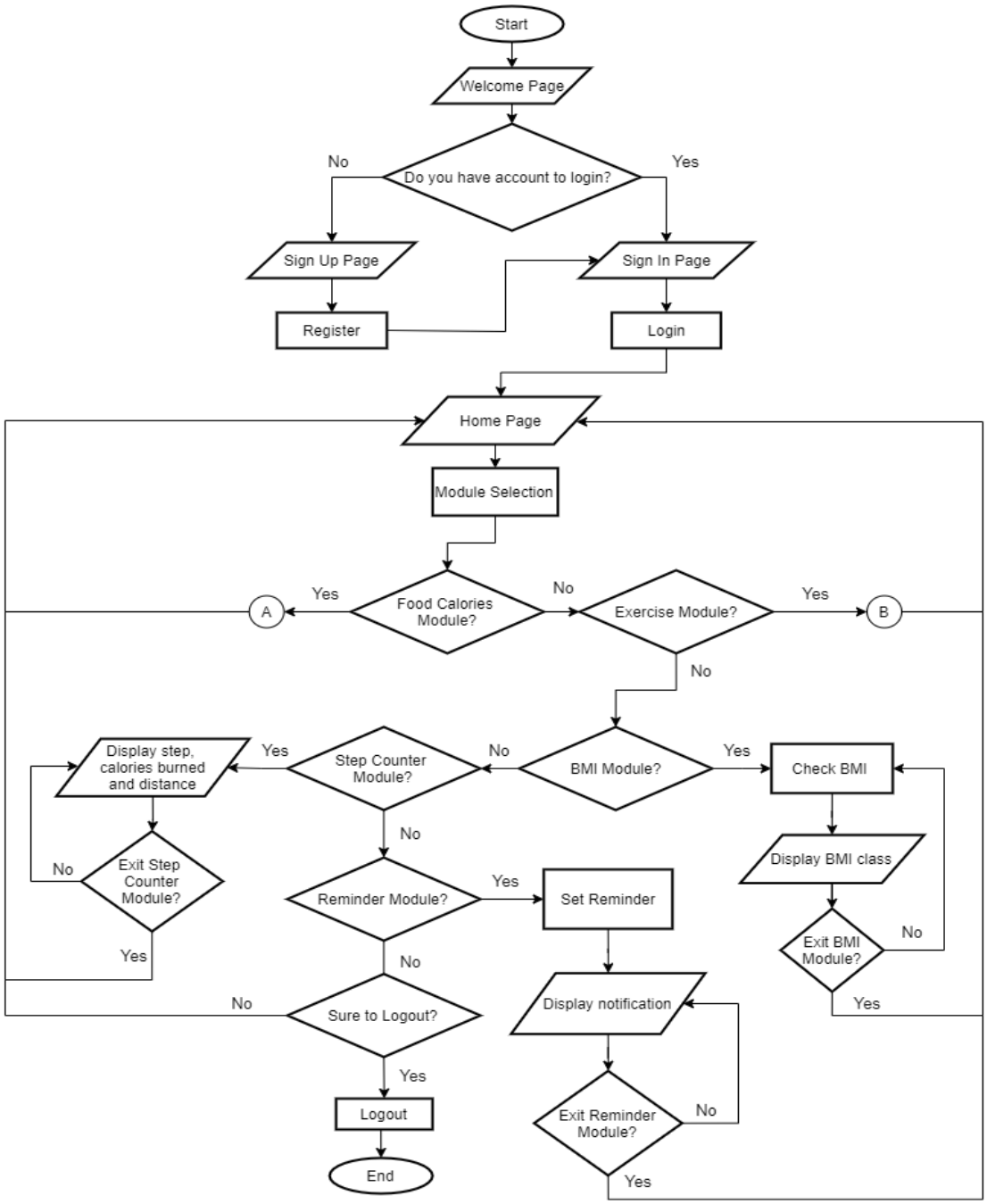

Figure 21: Flowchart

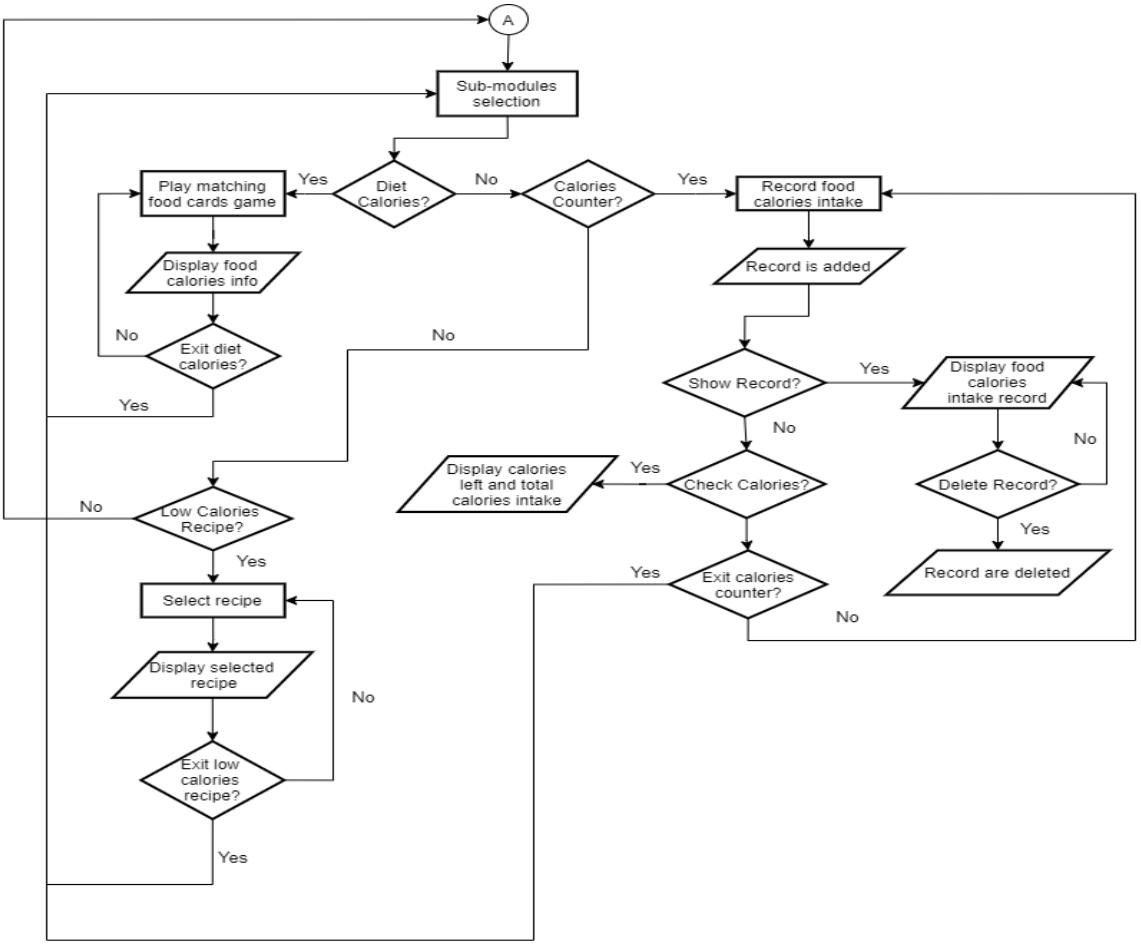

Figure 22: Flowchart (continue A)

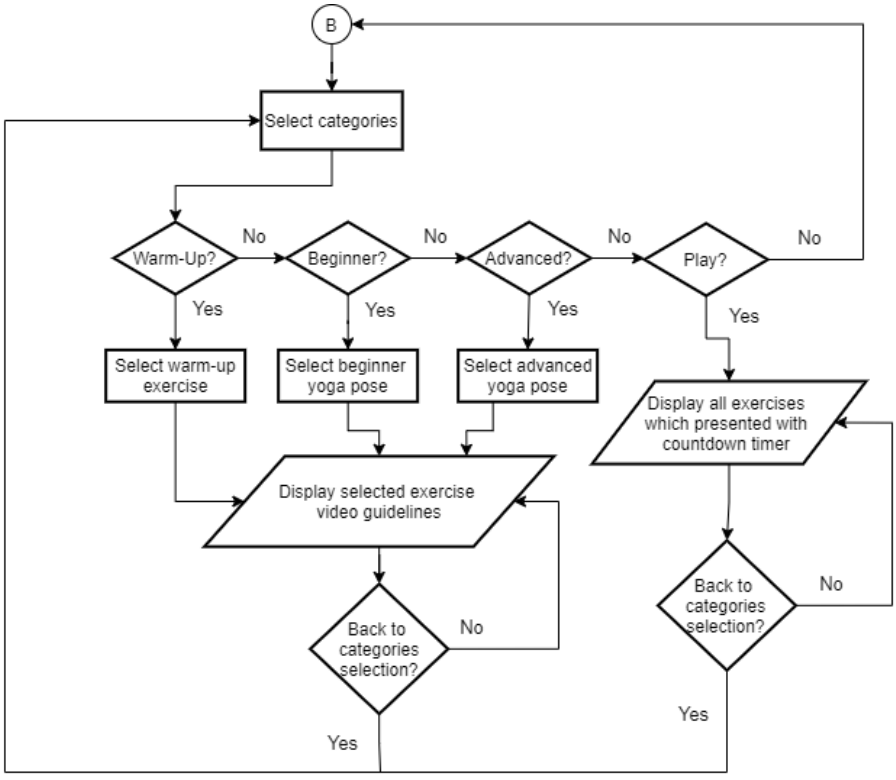

Figure 23: Flowchart (continue B)

Appendix B: Alpha Testing

Table 4: Alpha Testing

Modules	Test	Expected Result	Actual Result	Corrective Action
Sign In & Sign Up	Login Button	Login successfully and navigate to Home Interface.	Function well.	No need.
	Register Button	Register an account successfully.	Function well.	No need.
	Sign Up link	Navigate to register interface.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well.	No need.
	Wrong info inputs	Display error messages.	Function well.	No need.
Home Interface	Food Calories Module Icon	Navigate to food calories interface.	Function well.	No need.
	Exercise Module Icon	Navigate to exercise interface.	Function well.	No need.
	BMI Module Icon	Navigate to BMI interface.	Function well.	No need.
	Step Counter Module Icon	Navigate to step counter interface.	Function well.	No need.
	Reminder Module Icon	Navigate to set reminder interface.	Function well.	No need.
	Logout Button	Logout successfully and navigate to login interface.	Logout directly without confirmation dialog	Use dialog. builder() function.
Food Calories Module	Diet Calories Image Button	Navigate to diet calories interface.	Function well.	No need.
	Calories Counter Image Button	Navigate to calories counter interface.	Function well.	No need.
	Low Calories Recipe Image Button	Navigate to low calories recipe interface.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well.	No need.
Diet Calories Sub-Module	Low Calories Food Image Button	Navigate to low calories food interface.	Function well.	No need.
	High Calories Food Image Button	Navigate to high calories food interface.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well.	No need.
Low Calories Food Interface	Match Low Calories Food Cards	Food Calories Information appears in dialog after matching all food cards	Function well.	No need.
	Click "OK" button after read food calories information	Navigate to diet calories interface.	Function well.	No need.

Table 4: (cont)

Modules	Test	Expected Result	Actual Result	Corrective Action
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
High Calories Food Interface	Match High Calories Food Cards	Food Calories Information appears in dialog after matching all food cards	Function well.	No need.
	Click "OK" button after read food calories information	Navigate to diet calories interface.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Calories Counter Sub-Module	Food Type Spinner	Able to select food type.	Function well.	No need.
	Food Name Spinner	Able to select food name.	Function well.	No need.
	Add Button	Add food name and calories into database and display messages that food is successfully added.	Function well but lack of record date.	Get current date using Calendar class.
	Show Record Button	Navigate to show record interface.	Function well.	No need.
	Check Calories Button	Navigate to check calories interface.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Show Record Interface	Delete Button	Delete food calories record directly in interface and database.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Check Calories Interface	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Exercise Module	Warm-Up Image Button	Navigate to warm-up interface.	Function well.	No need.
	Beginner Image Button	Navigate to beginner interface.	Function well.	No need.

Table 4: (cont)

Modules	Test	Expected Result	Actual Result	Corrective Action
	Advanced Image Button	Navigate to advanced interface.	Function well.	No need.
	Play Button	Navigate to exercise timer interface.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well.	No need.
Warm-Up Interface	Warm-Up Exercise List Button	Each button in the list will display each warm-up exercise video tutorials respectively.	Function well but the video tutorial lack of clear exercise instruction.	Insert exercise instruction into the videos.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Beginner Interface	Beginner Exercise List Button	Each button in the list will display each yoga beginner exercise video tutorials respectively.	Function well but the video tutorial lack of clear exercise instruction.	Insert exercise instruction into the videos.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Advanced Interface	Advanced Exercise List Button	Each button in the list will display each yoga advanced exercise video tutorials respectively.	Function well but the video tutorial lack of clear exercise instruction.	Insert exercise instruction into the videos.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Exercise Timer Interface	Start Button	Navigate to get ready interface with count down timer 5 seconds and then turn into exercise countdown timer interface.	Function well.	No need.
	Done Button	Navigate to rest time interface.	Function well.	No need.
	Skip Button	Navigate to the next exercise timer interface.	Function well.	No need.
	Progress Bar	After done each exercise, the progress bar moves forward.	Function well.	No need.
	Count Down Timer	Countdown timer updates every second in interface.	Function well.	No need.
BMI Module	Male Button	Navigate to the male bmi calculator interface.	Function well.	No need.

Table 4: (cont)

Modules	Test	Expected Result	Actual Result	Corrective Action
	Female Button	Navigate to the female bmi calculator interface.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well.	No need.
Male BMI Calculator Interface	Check Button	Navigate to bmi result interface.	Navigate to bmi result interface after click Check button unless empty in text field.	Set error () method to show error message in EditText.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Female BMI Calculator Interface	Check Button	Navigate to the bmi result interface.	Navigate to bmi result interface after click Check button unless empty in text field.	Set error () method to show error message in EditText.
	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
BMI Result Interface	Back Button	Navigate to previous interface.	Function well but requires return to the home page with multiple clicks.	Add home button.
Step Counter Module	Start Button	Display steps, calories burned and distance in step counter interface.	Function well.	No need.
	Stop Button	Stop the updates of steps, calories burned and distance in Step Counter module.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well.	No need.
Reminder Module	Set Button	Reminder content and time set as notification.	Function well.	No need.
	Cancel Button	Cancel the reminder.	Function well.	No need.
	Back Button	Navigate to previous interface.	Function well.	No need.

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