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BSc Computer Science and Related Subjects

CM3070 PROJECT
FINAL PROJECT REPORT

<TrainToFit>

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CHAPTER 1: INTRODUCTION

The project idea is chosen from Interaction Design, aiming to introduce novices to strength. According to the American heart Association, strength training is physical activity designed to improve muscular strength and fitness by exercising a specific muscle or muscle group against external resistance, including free-weights, weight machines or your own body weight [1]. It not only makes us stronger and fitter, but also strengthens our bones and protects our muscle mass. Furthermore, it enhances our quality of life and improve our ability to do everyday activity.

As the project focuses on the novices, novice linear progression happens to be a good choice. It is a program supporting novices to begin a fitness program safely and maximize gains. The core concept is the basic barbell movements, and the whole program usually uses two workouts and alternate back and forth every workout. Moreover, in terms of linear it means adding weight to the bar from the previous session linearly.

The motivation of the project includes the fact that the Covid-19 pandemic has significantly impacted people's daily lives. To avoid being infected by the virus, individuals are not only required to follow social restrictions measures such as social distancing measures and lockdown, but also forced to spend more time at home. The public's ability to exercise and participate in outdoor sports are drastically reduced, leading to a potential of weight gain. In fact, a survey has shown that nearly one-third of Singaporeans have gained weight during the pandemic [2]. Exercise has been recommended and encouraged a lot during this period, and previous studies have also shown that it can improve the immune system by increasing the number of immune cells and boosting the body's defences against the virus [3]. Hence, publishing an application supporting novices to strength training at this point is likely to receive greater attention and support.

The aim of this project is to develop a mobile application which has been planned to call **TrainToFit** to support a novice linear progression for amateur strength of fitness training. It will support novices in learning specific fitness programme, tracking their training schedules and providing resources to support learning.

The deliverables of the project are shown as follows:

- Customisation of novices training plan
- Records of workout and schedule tracking
- Countdown for rest session
- Advice on future workout plan
- Tracking of strength increase and body change
- Resources to learning support

After two months of dedication and hard work, a fully functional iOS app capable of achieve listed deliverables has been implemented. It works as expected, yet there are still some improvements to be made. The future version of the TrainToFit app is expecting to be improved in both accessibility and usability aspects. The main anticipated features include the Android and the website versions to be implemented, better and safer user account management, choices of other version of novices training plans, and calculation of daily calorie intake.

CHAPTER 2: LITERATURE REVIEW

Strength is the basis of athletic ability. The training not only helps us get stronger, but also benefits our psychological well-being. A 2017 study done in men and women, ages 30-45, has shown improvement in psychological health, as measured by a questionnaire after 12 weeks of resistance training [4]. There are also many studies that demonstrate that strength training is beneficial to those diagnosed with depressive disorders. In one study on adults greater than 60 years old, 10 weeks of a supervised progressive resistance training program three times a week was shown to improve depression, as well as improve bodily pain, vitality, and social functioning [4]. Therefore, making such application encourages the society to gain strength at the same time stay healthy mentally and physically.

The novice linear progression is a program when weight on the bar increases, linearly, every workout for each lift [5]. The workouts are designed with only few lift types, and the trainees are expected to do those lifts in a cycle. In other words, the only difference over time is the weight on the bar. The program has been proved to be useful by several real experiences sharing as well as its core concept behind. Articles have explained that people do not get big and strong by lifting weights; they get big and strong by recovering from lifting weights [6]. In fact, the Stress Recovery Adaption cycle tells that when we create an intentional training stress, sufficient to disrupt our normal physiological state, and then allow for sufficient recovery from that stress our bodies adapt and get stronger. This process is specific to the stress we put on our body [5]. Moreover, articles have argued that training the same exercises regularly allows the body to adapt and thus grow stronger, while training a large variety of exercises equates to doing the same workouts with little to no adaption [7]. Hence, the novice linear progression works because of its simplicity as well as the knowledge of human gain stress.

One example of experience sharing is a video posted by Starting Strength recording the progress of a young man training with the linear program. Within 7 weeks, He has

improved the squat from 75 lbs to 235 lbs, press from 53 lbs to 92.5 lbs, bench from 55 lbs to 127.5 lbs, and deadlift from 95 lbs to 265 lbs. He has also mentioned that he used to have back pain due to a car accident, but after one-month training, his strength increased significantly and the back pain problem never bothered him anymore [8].

A basic novice linear progression relies heavily on sets of five repetitions, meaning that for example, a sign of "Squat: 3 x 5" stands for "doing squats for three sets of five repetitions". This is because experience and evidence of thousands of lifters has proved that the optimal rep range for general strength tends to revolve around sets of five repetitions. Even if there are any changes to the program, the repetition range should be three to six [9].

One similar project is Starting Strength Official. It is a mobile application available on multiple platforms: Apple Store, Google Play and Amazon. While there are few ratings (only 17) on the Amazon [10], the app has achieved an almost full star rating (4.8 out of 5) on two other platforms. Many of their satisfied users have mentioned from the reviews about the detailed instructional videos and thorough explanations which have truly helped them during the whole training programme. The instructions are complete and easy to follow, especially for those who just kickstarted the strength training. They have also pointed out that the automatic calculation of the next workout weight, plate recommendation as well as the tracking functions are beneficial. However, others feel it not worth the money as it does not provide enough lifting positions and adjustments (such as altering warm-up weight or adding other exercises) are not flexible enough either. The app might be great only for pure linear Starting Strength routine [11] [12].

Another similar project is StrongLifts, which is also a mobile application for both iPhone and Android. Same as the app Starting Strength Official, it has also been highly satisfied by its users, with 4.9 out of 5-star rating on both Apple Store and Google Play. One interesting fact about this app is that it can sync with Apple Health, which can be considered as bonus points for all iPhone users. Furthermore, the workouts can be

customized. Users are allowed to add extra exercises, or create an entire new workout plan and save it to be reused next time. In addition, many users have mentioned in the reviews that clear and simple layout design avoids them getting confused. In fact, the application is designed user-friendly and users get to use it quickly. Some have also mentioned about the great part that the application does all the work of planning and tracking, allowing them to focus only on the exercises and receive the best fitness result. Nevertheless, there are some suggestions given by the users. One example is that users can get to know the whole program well if the future workout plan is shown on the calendar [13] [14].

This project aims to build a mobile based app instead of web based, which is supported by a study aiming to examine whether the use of exercise apps for the mobile devices is associated with increased levels of exercise and improved health outcomes. The result has turned out that nearly three-quarters of current app users reported being more active compared to under half of non-users and past users. They are more likely to exercise during their leisure time, compared to those who do not use exercise apps, essentially fulfilling the role that many of these apps were designed to accomplish. It has also concluded that exercise apps can be viewed as intervention delivery systems consisting of features that help users overcome specific barriers [15].

In terms of techniques and research methodologies, the project is planned to use **XCode13.4.1** with the language **Swift5**. For the database management system, **Firebase** real-time database comes to be a good choice. Compared to local database which stores data on local storage, real-time database allows the application to approach cross-platform data within real time. **Firebase Authentication** will be mainly used for managing user accounts, and **Firestore** will be storing data including personal information, workout plans and histories. **Firebase Storage**, on the other hand, will be focusing on image storage.

Also, to create a better app interface, the prototyping is planned to be improved by interviews. This is because TrainToFit app is user-centric, the primary research such as interviews help better understand what potential future customers truly need in terms of strength training. The target respondents will be novices of strength training, but I will also be willing to listen to advices from those who are intermediate or advanced lifters as they might have better ideas to novices from their point of view. The respondents will share what they wish to see in TrainToFit app and by looking through the prototyping, they will provide feedback including the parts they feel satisfied and unsatisfied. Furthermore, the agile methodology is chosen to be implemented in this project since breaking the whole big project into small separate phases makes it easier to manage each task and continuous improvement at every stage.

CHAPTER 3:PROJECT DESIGN

This project is within the domain of time and strength training. Introducing strength to users and helping them get stronger as quickly and efficiently as possible is the main goal of this application. Our target users are novices who, by definition, can recover from an intense workout stress and realise a strength increase by the next workout 48-72 hours later. They can be those who have never been in any strength training before, or those who have not been training for a long time. They can also be those who came back from injuries or illnesses or surgeries, or those who may have experience with weight training but have not trained specifically with linear progression. In the previous project proposal, it was planned to do in web-based. But after advanced research which includes the fact that the mobile app does positively increase their behaviours in workouts. Therefore, the plan has been changed to do in mobile app version.

Although there are three phases to the novice linear progression, it is not wise to look at the training plan as a whole to determine the appropriate phase is appropriate to you most. It is instead critical to track each lift and adjust each lift individually based on users' progress with that lift as strength is built by increases in stress rather than components of the fitness programme. In order to introduce the most important features that are relevant to our target audience, the application will stick to the phase one version first, leaving the choices of other version as future improvement. The two workouts of the phase one version to the novice linear progression are shown below, where "3x5" indicates "three sets of five repetitions" and "1x5" stands for "one set of five repetitions" [9].

Workout A	**Workout B**
Squat: 3x5	Squat: 3x5
Press: 3x5	Bench Pres: 3x5
Deadlift: 1x5	Deadlift: 1x5

According to Strength Level, the following table shows how much weight male and female novices can lift respectively based on different barbell exercises [16]. Noted that the barbell weight includes the weight of the bar which a standard one is 45 pounds. Although novices are recommended to start lifting with an empty bar, our potential users include those who have training experience and thus, the users have the discretion to flexibly choose their training regime. That is, the recommended weight values are shown as default, and users are allowed to change the figures while customising a training plan in the app.

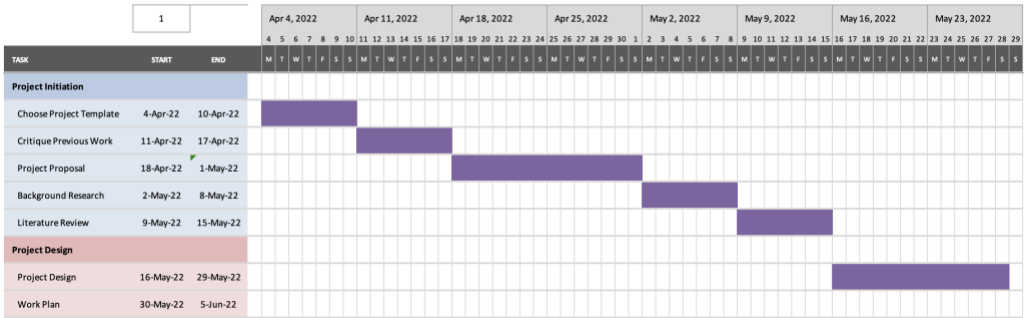
	Male Novice (lb)	Female Novice (lb)
Squat	206	107
(Overhead) Press	99	48
Deadlift	246	132
Bench Press	154	69

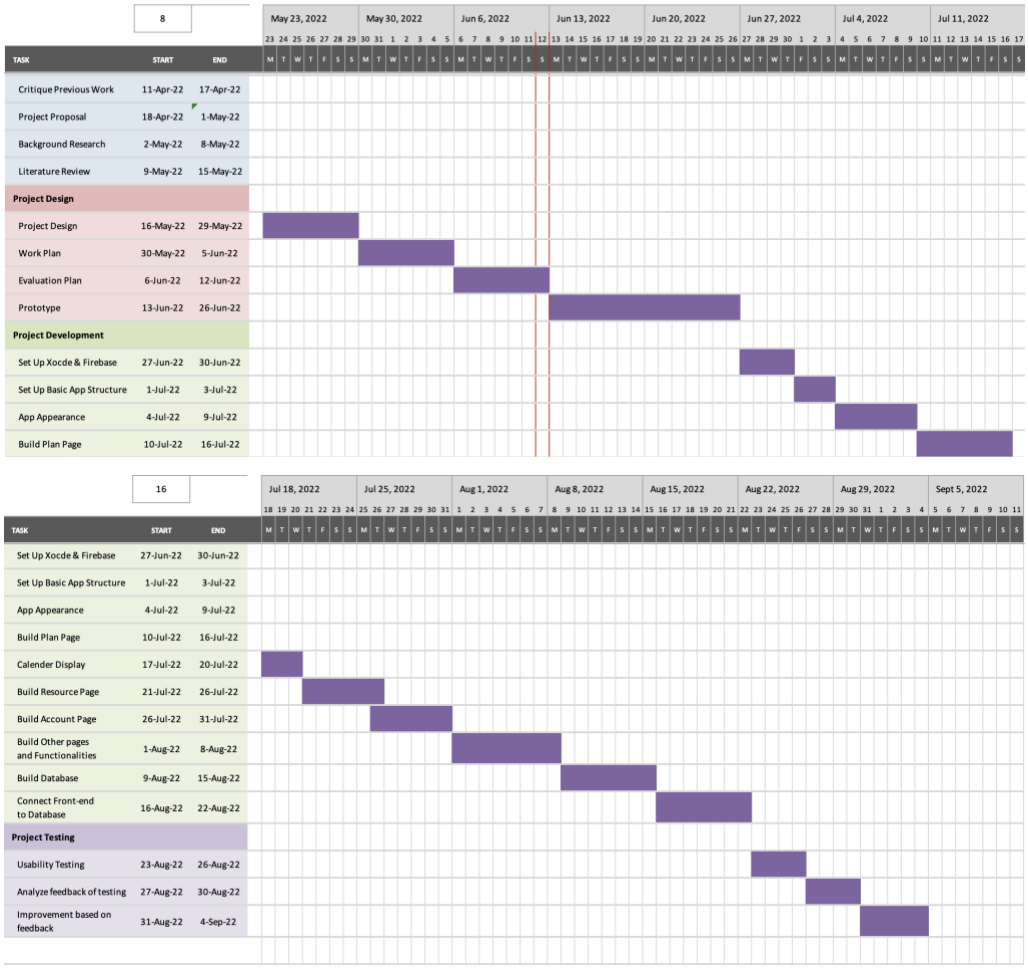
In terms of the incremental weights to be added each session, articles have suggested that for upper body exercises such as press and bench press, an ideal increment is 2, 2.5 or 5 lb. For lower body exercises, the trainees are encouraged to increase 10 lbs each session initially [17] [18]. Since novices might be confused with different incremental weights of different barbel movements, as they might have no idea which increments of specific barbel movement should be altered, the TrainToFit app will be built with one incremental weight first. That is, all barbel movements will increase/decrease with the same amount of increments. Noted that the app is not a life coach who can determine your condition and alter the training plan directly. It however will adjust the training plan accordingly to the user feedback. That is, the app will follow the increments from the research, but it will not employ the increments every time. Instead, feedback is required to do after every workout. Users can tell the app how they felt about the exercise, and the app will determine whether to increase or remain the weight based on their feedbacks. Moreover, since there are many videos on YouTube platform that teaches novices how to do different lifts correctly, the application plans to provide those hyperlinks to novices rather

than making our own videos. With those considerations and arguments, the user case diagram of the app is shown below [figure 1].

In terms of database, there is some changes made from primary project report. Since Firebase uses NoSQL database structure, a new data model diagram is drawn and shown as [figure 2]. Different from SQL table structure, the structure in Firebase is all about collections and documents. Hence, a collection called “Accounts” is planned to be the starting point, and user accounts are stored inside this collection as documents. One document represents one user account, with document ID as user ID from Firebase Authentication. Inside this user document, a collection called “Plans” is created to store plans this user has created ever. Each plan is stored as a document inside “Plans” collection, with plan details such as plan name, start date and current weight. There is another collection stored in every single plan document called “Histories”. This is the place recording workout histories, each document inside representing a workout history. The document stores data including weights of different barbel movements and their status (that is, whether the user has completed all sets of that movement). This type of data structure organises data well, which is more appropriate to TrainToFit app because it contains several data types and thus, can be easily categorised by with collection-and-document relationship.

The below is the working plan in Gantt Chart which has been built and followed:

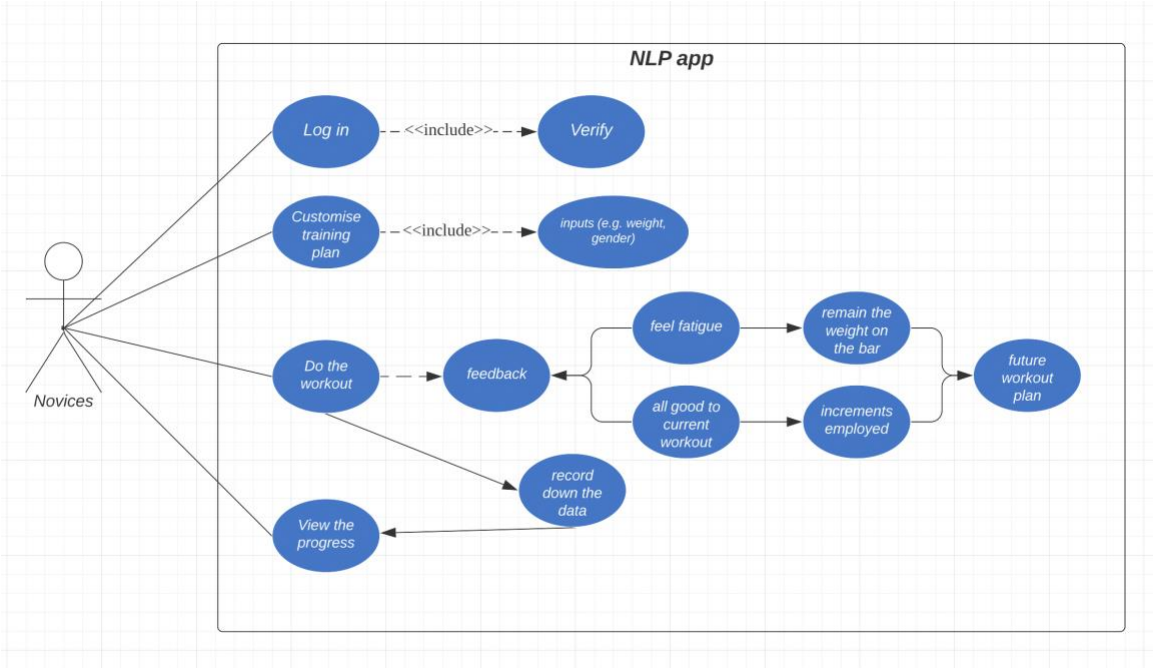




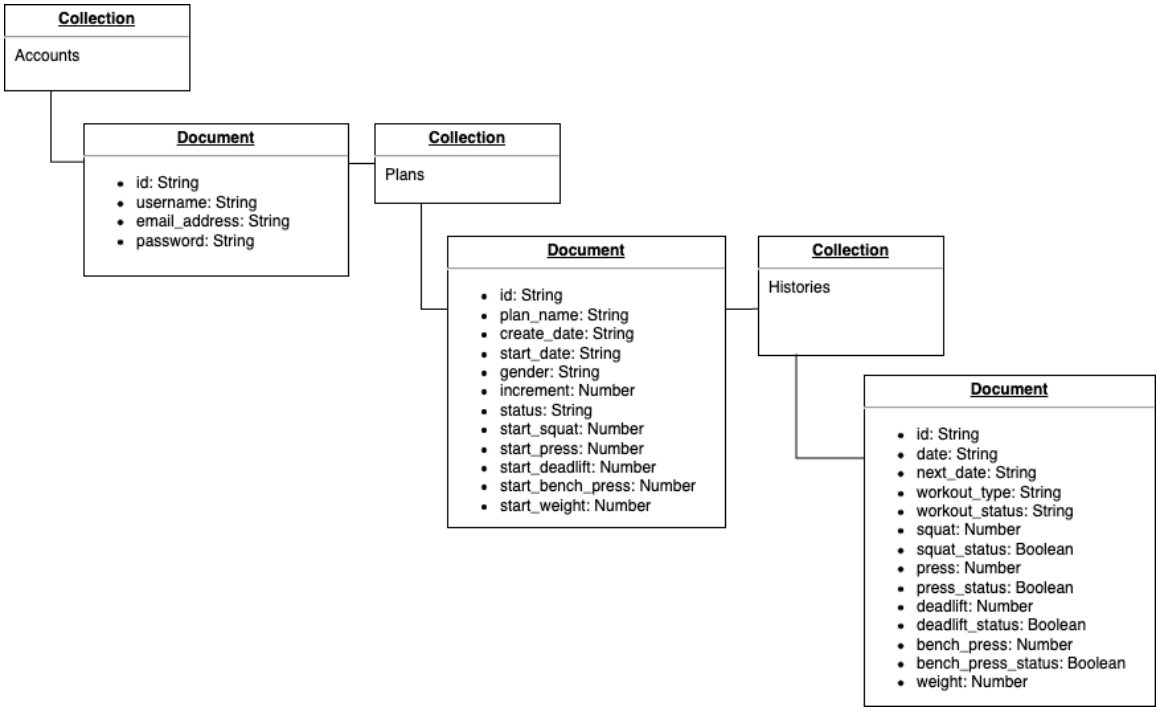
TASK	START	END
Critique Previous Work	11-Apr-22	17-Apr-22
Project Proposal	18-Apr-22	1-May-22
Background Research	2-May-22	8-May-22
Literature Review	9-May-22	15-May-22
Project Design		
Project Design	16-May-22	29-May-22
Work Plan	30-May-22	5-Jun-22
Evaluation Plan	6-Jun-22	12-Jun-22
Prototype	13-Jun-22	26-Jun-22
Project Development		
Set Up Xocde & Firebase	27-Jun-22	30-Jun-22
Set Up Basic App Structure	1-Jul-22	3-Jul-22
App Appearance	4-Jul-22	9-Jul-22
Build Plan Page	10-Jul-22	16-Jul-22

TASK	START	END
Set Up Xocde & Firebase	27-Jun-22	30-Jun-22
Set Up Basic App Structure	1-Jul-22	3-Jul-22
App Appearance	4-Jul-22	9-Jul-22
Build Plan Page	10-Jul-22	16-Jul-22
Calender Display	17-Jul-22	20-Jul-22
Build Resource Page	21-Jul-22	26-Jul-22
Build Account Page	26-Jul-22	31-Jul-22
Build Other pages and Functionalities	1-Aug-22	8-Aug-22
Build Database	9-Aug-22	15-Aug-22
Connect Front-end to Database	16-Aug-22	22-Aug-22
Project Testing		
Usability Testing	23-Aug-22	26-Aug-22
Analyze feedback of testing	27-Aug-22	30-Aug-22
Improvement based on feedback	31-Aug-22	4-Sep-22

In terms of evaluation, Jakob Nielsen 10 heuristics will be applied to the prototype of the app to evaluate its usability. Following the work plan shown above, the testing and evaluation for each distinguish task will be implemented to ensure no error will be brought to the next phase. The iterative cycle makes the development makes it easier to control, since if today there is an error happened, it is clear to know that the error is related to the current task instead of previous ones. When the whole system, both front-end and back-end, has completed, it will be tested with real users. Afterwards, the app will be improved based on feedbacks from them.



[figure 1 – user case diagram]



[figure 2 – NoSQL data model diagram]

CHAPTER 4:IMPLEMENTATION

Reference to app code repository: https://github.com/dananamua/TRAINTOFIT

The implementation of the app application has followed strictly to the feature prototype which had been made in advance. As planned, the application is created in XCode13.4.1 and language Swift5. There are also four packages which help support different functions of the application: “Firebase” stores and sync data between users in real-time, “Charts” shows users their trends of workout plan with beautiful line graphs, “TinyConstraints” makes better layout, and “YouTubeiOSPlayerHelper” allows the connection with YouTube videos [19-22]. Icons used in the app is either from the system or from a platform called Flaticon which allows to download icons for free[23]. Moreover, the storyboard feature is used since it shows all views together at runtime without having to run the app. The entry point is set at the “Login” view which will appear after the lunch screen is completed. Furthermore, the navigation controller is implemented and the “Home” view is set as its root view controller. The “Settings”, “My Plan”, “Calendar” and “My Progress” views are connected with the root view controller by using segues, allowing users to switch between those views from the “Home” view and return back by pressing the back button in the navigation bar or using a left-edge swipe gesture.

As the “Login” view is the storyboard entry point, there is a button which brings new users to “Register” view. The “FirebaseAuth” and “FirebaseStorage” are imported in the “Register” view controller. The former allows users to sign up/ sign in the app with email and password, and the later stores and sync data in NoSQL structure. Noted that there are multiple places in this app that requires inputs from users and some of them have specific requirements. For example, password length for user account registration cannot be less than 6 chars. Hence, error messages are designed in every single needed view to support users completing the task. After the new user is successfully signed up using Firebase Authentication *createUser* method, their username as well as email address will be also stored in a document in Firestore database. This way, we can retrieve more data to show

in other views based on which user account is currently signing in. In the "Login" view, email address and password are checked with Firebase Authentication *signIn* method.

The "My Plan" view has two main elements: a table view and a button. The former displays row of vertically scrolling content in a single column, each cell showing a plan this user has created before with its plan name, created date and plan status. This has completed by retrieving data from Firestore, appending them into lists in *viewWillAppear* method, and from UITableViewDataSource, displaying plans based on the lists. The "Plan Details" view is shown when the user selects any plan in the table view. The detailed data of selected plan will be retrieved based on its index. There are two buttons inside the "Plan Details" view: one is the edit button which shifts to the "Edit Plan" that allows users to update the information. Another is the complete button which simply complete the plan immediately. The status of that plan will become "Completed" and its complete button in the "Plan Details" view will no longer be clickable. The view will be returned back to the "My Plan" view, with updated version of plan lists. Besides, the button in the bottom of the "My Plan" view allows users to create a new plan. It will shift to the "Create Plan" view, where users give inputs and the data will be stored in cloud database. There are some rules (such as plan name cannot include '/') to different text fields which error message will appear to remind user. Noted that once a new plan is created, all other plans' status will automatically change to "Completed" as only one ongoing plan is allowed. This is because the user is assumed to follow one plan at a time, and the system can get the correct plan by checking the plan status.

In terms of calendar, a UICollectionView is used since its layout is customizable. The *CalendarViewController* class mainly focuses on the layout of the "Calendar" view as well as triggered events from the user (i.e. the reaction when user selects a specific date cell in the calendar), while the *CalendarHelper* class is more on date calculations and string-date conversion. Noted that the way of displaying different months of the view is by checking the weekday of the first day of that specific month, and adding blanks in the front if needed. The Sunday is set as the first column of the collection view, and thus, if

the first day of the month is Tuesday, two blanks will be added in the totalSquares list. The "Day Details" view will be shown when user clicks on any date cell in the calendar. The selected date will be used to check whether there is any history document in Firestore database that matches the date. If yes, data such as squat weight and status will be retrieved and showed in the view. If the selected date happens to be the upcoming workout date, the "Start the Workout now!" button will appear and be clickable to bring the user to "Workout" view. Noted that the instructional videos are chosen to be those from Starting Strength channel [24]. The "YouTubeiOSPlayerHelper" package are used to embed YouTube videos in TRAINTOFIT application. Moreover, number of sets is represented in UIImageView and its image shows the repeition of that set. Each set is clickable and the image will change to check image when the user clicks on it, which helps to record users progress during this workout. After the user clicks on the "Complete the workout" button, the status of every set will be sent to the "Feedback" view. This is because the next workout will be based on the set status as well as user feedback. Hence, by combining two information, the next workout information will be created and stored in a new document inside "Histories" collection in Firestore.

The "progress" view uses "Charts" and "TinyConstraints" packages to draw line graphs. There is a selector made of a button as well as a table view, allowing the user to select which data he/she would like to see. Data types stored in a list include squat, press, deadlift, bench press and weight. Once the user has picked his/her choice, all weight values of that data type and their dates in "Histories" collection of current ongoing plan will be collected. They then will be presented in line graphs. In terms of the "Settings" view, the user is allowed to edit their personal information. Both Firebase Authentication and FireStore will be updated once the user presses "Save Changes" button. The user is also allowed to deactivate the account in this view. A pop-up message will appear to confirm user's behaviour. Once the deactivation is confirmed, data about this user account will be deleted from both Firebase Authentication and FireStore. Furthermore, the "Help Centre" view is for user to write messages to TrainToFit support operation. Further implementation will be considered as future work.

CHAPTER 5:EVALUATION

The interview is conducted one-by-one as the aim of the primary research is to get to know more on user's side and it is believed that interviewing with a single stakeholder at a time is the best way to achieve it even it also means more time to be spent. There is total 30 stakeholders interviewed, with 25 of them being novices in reality and 5 of them being intermediate or advanced lifters. The below shows the interview result of 25 novices:

- All of them have no experiences using Starting Strength or StrongLifts apps.
- If they are starting a strength training plan, 84% of them are interested in an app which is able to plan workouts for them. 8% prefer using website versions and the rest 8% prefer finding a strength coach.
- All of them prefer the workout plan to be customizable, with recommendations such as starting weight since they have no ideas where to start.
- All of them prefer instructional videos than word descriptions.
- 52% of them have mentioned that it is important for them to rest in between different barbell exercises.
- 56% of them have mentioned that button layouts in the home view can be improved as there is blank space at the right bottom of the view.
- In terms of strength progress, 80% of them prefer graphs while others prefer tables.

There are also 5 intermediate or advanced lifters interviewed and the below lists down what they have advised to the app:

- 80% of them have experiences using training apps.
- They have advised that the rest session between different barbell exercises should be 1 minute.
- 40% of them have mentioned that they might use TrainToFit app if it can also calculate a recommended daily calorie intake, as they believe that strength training is not only about barbell exercises but also food intake.

Taking those ideas from interviews into consideration, there are some changes made and hence, the final version of the application is not same as the prototyping layout shown in advance. The changes include altering the countdown in the workout view from 3 minutes to 1 minute, and restructuring the layout of the buttons in the home view from two rows and two columns to one three rows and one single column.

In terms of the testing, it has been broken into several test cases in order to test every single part of TrainToFit. All test cases are tested with iPhone11 as test iOS simulator. The following table displays each test record and its result:

Testing Views	**Description**	**Inputs**	**Test Result**
Login View	While launching the application, the login view appears after splash screen	NA	Success
	Register view appears after clicking on "Create an Account" button	NA	Success
	Successful login with registered account. Home view appears afterwards, with correct username as well as profile image (if there is any) shown.	**Email address:** testValid@gmail.com **Password:** test123	Success
	Unsuccessful login with error messages shown. Scenarios include: • Empty fields • Not registered email address • Invalid password	**Email address:** testInvalid@gmail.com / testValid@gmail.com **Password:** test123/ test456	Success
Register View	Successful creation on new account. Back to Login view.	**Username:** Valid User **Email address:** testValid@gmail.com	Success

		Password: test123 **Confirm Password:** test123	
	Unsuccessful creation on new registration with error messages shown. Scenarios include: • Empty fields • Password length less than 6 chars • Password field does not match with Confirm Password field • Invalid Email address format	**Username:** Invalid User **Email address:** testInvalidgmail.com **Password:** test/test123 **Confirm Password**: test/test456	Success
Home View	Successful click listeners: • My Progress view appears after clicking on My Progress button. • My Plan view appears after clicking on My Plan button, with a list of plans created from current user. • Calendar view appears after clicking on My Calendar button. It shows the current month. • Settings view appears after clicking on Settings icon. • Login view appears after clicking on Logout icon.	NA	Success

	Successful uploading/ updating profile from choosing image from the Photo library.	Image from Photos library	Success
My Plan View	Plan Details view appears after clicking on any plan cell from the list, with correct plan details of that chosen plan.	NA	Success
	Create Plan view appears after clicking on Create New Plan button.	NA	Success
Plan Details View	Edit Plan view appears after clicking on Edit button. This is only allowed to those with plan status being "Ongoing". The Edit button is not enabled to plans which the status is "Completed".	NA	Success
	Successfully complete the chosen plan by pressing on Complete the Plan button. This is only allowed to those with plan status being "Ongoing". The Complete the Plan button is not enabled to plans which the status is "Completed". The plan status stored in Firebase is changed to "Completed". Return to My Plan view. Updated version appears as the status label of that plan turns red and turns to "Completed".	NA	Success
	Successful creation of a new plan, with valid inputs. Data is created and	**Plan name:** planA **Gender:** "Male" option	Success

Create Plan View	stored in Firebase. Return to Home view.	**Starting Date:** Aug 30, 2022 **Current Weight/ Starting Squat/ Starting Press/ Starting Deadlift/ Starting Bench Press/ Increment:** 5	
	Unsuccessful plan creation. Scenarios include: • Empty fields • Plan name includes "/" • Starting date as Sunday • Weight, Squat, Press, Deadlift, Bench Press, Increment fields not a number	**Plan name:** plan/A **Gender:** "Male" option **Starting Date:** Aug 30, 2022 **Current Weight/ Starting Squat/ Starting Press/ Starting Deadlift/ Starting Bench Press/ Increment:** it's4.5	Success
Edit Plan View	Successful edition on selected plan with valid inputs. Data stored in Firebase is updated. Return to My Plan view.	**Plan name:** planA-1 **Gender:** "Male" option **Starting Date:** Aug 30, 2022 **Current Weight/ Starting Squat/ Starting Press/ Starting Deadlift/ Starting Bench Press/ Increment:** 5	Success

	Unsuccessful plan edition. Scenarios include: • Empty fields • Plan name includes "/" • Starting date as Sunday • Weight, Squat, Press, Deadlift, Bench Press, Increment fields not a number	**Plan name:** planA/1 **Gender:** "Male" option **Starting Date:** Aug 30, 2022 **Current Weight/ Starting Squat/ Starting Press/ Starting Deadlift/ Starting Bench Press/ Increment:** It's4.5	Success
Calendar View	Day Details view appears after clicking on any date cell in the calendar. The content displays correctly based on the selected date.	NA	Success
	The calendar shows the previous month when tapping on back button next to the label of month and year.	NA	Success
	The calendar shows the upcoming month when tapping on forward button next to the label of month and year.	NA	Success
Day Details View	Workout view appears after clicking on Start the Workout NOW button. This is only allowed to upcoming workout date.	NA	Success
Workout View	Instructional Video view appears after clicking on the video icon, with YouTube video about selected barbell exercise.	NA	Success

	Feedback view appears after clicking on Complete the Workout button.	NA	Success
	Countdown timer works by pressing Countdown button.	NA	Success
	Five icon turns to Check icon when tapping on it. Once tapped, it cannot turn back to Five icon by pressing it again.	NA	Success
Instructional View	Video is able to work as how it works on YouTube platform.	NA	Success
Feedback View	Successful submission with each question answered. Data about current workout history is updated and next workout history is created in Firebase. Return to Home view.	**Icons:** Smile Face one **Weight:** 148.5	Success
	Unsuccessful feedback submission. Scenarios include: • Empty fields • Weight field not a number	**Icons:** not tapping on any one **Weight:** It's148.5	Success
My Progress View	The graph is shown after selecting a data category from the scroll list.	NA	Success
Settings View	Successful edit on personal information after tapping on Save Changes button. Back to Home view.	**Email address:** testValid2@gmail.com **Password:** test456 **Confirm Password:** test456	Success

Settings View	Unsuccessful save on editing personal information, with error messages shown. Scenarios include: • Password length less than 6 chars • Password field does not match Confirm Password field • Invalid Email address format	**Email address:** testInvalid2gmail.com **Password:** test/test123 **Confirm Password**: test/test456	Success
	Help Centre view appears after clicking on Help Centre button	NA	Success
	Successful account deactivation: tapping on "Deactivate Account" button and then "Delete" option when the confirmation box appears. Return to Login view. Account and related data are deleted from the Firebase.	NA	Success
	Unsuccessful account termination: tapping on "Deactivate Account" button and then "Cancel" option when the confirmation box appears. The confirmation box dismisses.	NA	Success
Help Centre View	Successful sent with issue description after clicking on Submit button. The Help Centre Received View appears afterwards.	"Hi there, I have an issue…"	Success
	Unsuccessful sent due to empty description, with error message shown.	""	Success

Help Centre Received View	Successful click listener. The Home view appears after clicking on Back to Home page button.	NA	Success

All test cases did pass but there are still some possible improvements. The following features will be addressed in the next release (but surely after submission date 5/9/2022):

- Enquires from users can be solved well from TrainToFit operation team.
- Solutions of users forgetting their passwords can be implemented.
- Incremental weights of different barbel movements can be separated.
- Daily calorie intake can be implemented.

CHAPTER 6:CONCLUSION

The project TrainToFit is a mobile application that supports Novice Linear Progression for fitness training. The main target audience of this project is novice, which the application is expected to make users start up the plan with ease, follow the planned workouts and see significant growth in strength in a short term. It was eventually achieved as proposed. There are many problems encountered while working on this project but fortunately, most of them have been overcame.

Test users of this application reflected that it is easy to use and the functions are well integrated. Layout is well-organised, with the size of buttons and other clickable elements is proper enough to interact. The parts where supporting videos are included in the workout view and the next workout is created automatically based on the workout status as well as feedback makes the application more beginner friendly. TrainToFit app turned out to be what it was intended to be in terms of aims, objectives, and functionalities apart from a few functions that are not fully functional yet but it did not impact the application from being what it is said to be capable of. Furthermore, when the application hits the markret, it is expecting a higher probability of users as the plan is customisable and those who are not novices to strength training but would like to track their progress with a mobile application might be interested to TrainToFit app.

This project was considered complex since it contained many views and although prototyping had been well implemented in advance, there were some point of time the situation which the views were completed yet could not be tested whether they were running correctly due to other uncompleted views was encountered. So it was decided to build those fundamental views (including Login, Home, Calendar, Progress, Plan, Settings views) first, make them connected and then turned to the implementation of other extended views. The plan views and its connections were the first, since in that way the plan information could be stored in cloud Firestore, allowing to show workout information on the Calendar. The Calendar view and its related views (including

Workout and Feedback views) were then implemented, followed by the Progress view as it needed workout histories. The settings view came to the last part to be working on, and at the end the application worked as expected. It has been realised that before starting to produce an application there should certainly have more researches done in terms of architecture so that such issues would not be faced and the focus could be more on the improvement of the application rather than spending time on sorting this out.

In the future, the improvements are expecting to be focused in terms of better accessibility and usability for all kinds of users who are using TrainToFit application, keep on updating the project to fit it in the real world, make it competitive with other applications of the same field as well, make it available for Android users, and create a website while some people also prefer to work on their computer.

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