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A Development of Personal Coaching Mobile Application: Coach Me

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Abstract: With number of closing gymnasiums increasing exponentially, it entails the steady decline of unemployment in the fitness industry particularly amongst the fitness coaches or instructors. Thus, personal trainers and coaches do not have a dedicated platform during the pandemic to train students from home due to the COVID-19 Pandemic. Hence, this project aims to design, develop, and test a personal coaching mobile application called Coach Me by using the incremental prototyping as the software methodology to tackle these problems. The mobile application will be built using Flutter, a Dart framework, Node.js runtime environment and MySQL database. The significance of this project is that the mobile application boosts the camaraderie between trainers and their students even with the physical limitation of not being able to enter a gym providing a platform for both parties to connect. Albeit if the pandemic has reached its endpoint, the mobile application will not lose its traction and continue to thrive as it will drive coaches and students who are not able to attend a physical class in using the mobile application as a platform to professionally connect and re-watch video lessons. The results show the many of the test plan's actual outcome of each module were successful. The mobile application can be further improved by implementing a real-time peer-to-peer chatting functionality.

Keywords: Personal Coaching, Mobile Application, Flutter, Health, Fitness

1. Introduction

The year of 2020 has left many of us in a dismal tone and will be remembered as one of the worst global health crises in modern times going down in history, the COVID-19 pandemic [1]. According to a Worldwide Trade Group for the health and fitness sector, the fitness industry employed 3 million part-time and full-time personnel prior to the pandemic. However, with the steady incline of people being infected, more than 480, 000 jobs are getting destroyed per month all around the world. While other small companies might pivot to establish their own online commerce and takeout orders, health clubs and their staffs of personal trainers as well as fitness instructors has no such option. A professional fitness coach or instructor can be defined as a person who aid participants in exercise programs, evaluate various fitness components, instruct exercises to improve the participants heath, and help participants

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with specific conditions [2]. With number of closing gymnasiums increasing exponentially, it entails the steady decline of unemployment in the fitness industry particularly amongst the fitness coaches or instructors.

Prior to the pandemic, coaches will teach a myriad of classes in their local gym depending on their skills and certifications. These classes typically last anywhere between an hour to 3 hours. Any people who are interested in joining their classes are then enrolled with a certain amount of fee in order to become a student of the class. A class is then divided into lessons where multiple students enrolled in the class will be coached simultaneously. For instance, the first lesson of a Yoga Class is warming up. Moreover, private sessions are also held in which the students are coached and given consultations one-to-one by the instructors. Importantly, the objective of their fitness programs aims to provide a social situation in which participants, supervised by licensed group fitness instructors, benefits socially and emotionally [3]. Case in point, physical classes is held within a local gym whereby students are coached by a certified or a skillful instructor.

Ergo, the aftermath forces most fitness coaches to resort to online classes by utilizing digital platforms such as WhatsApp, Zoom and Skype. Physical classes are substituted with online conference calls, while private sessions between a coach and a student are strictly forbidden, they are replaced with private chats which constricts the effectiveness of a consultation session as the coach cannot provide an accurate feedback and advice due the limited functionality of a private chat. The up-bringing atmosphere of conducting a class within a gym where music, fitness partners are no longer accessible. The effect of social distancing allotment on overall physical activity is an important stimulus of health, especially if social distancing is prolonged [4]. Thus, it implies that fitness centres will not be opening anytime soon.

Henceforth, a Personal Coaching Mobile Application (Coach Me) is proposed to connect fitness coaches and their students in a digital platform further cementing the effectiveness of a fitness class. The overview of the app is that personal coaches can upload, store their pre-recorded lessons in a class where students can enroll with a certain amount of fee based on the coach to then watch the pre-recorded lessons and follow along with their coaches. A private one-to-one session between a coach and a student can also be conducted. Students can then view their progress in class and consult with their coach to help clarify misunderstanding regarding a specific topic or asking for a few tips and tricks which they may not know due to their impeding progress. Albeit if the pandemic has reached its endpoint, the mobile application will not lose its traction and continue to thrive as it will drive coaches and students who are not able to attend a physical class in using the mobile application as a platform to professionally connect and re-watch video lessons.

This article is organized into five sections. The first part is an introduction describing the context of the project. The second section describes the literature review. In the third section, the methodology is explained. The implementation and testing of this system are described in the fourth section. In the last section, a conclusion with some instructions for future employment is given.

2. Related Work - Literature Review

The design of the mobile application leans towards coaches and their students. The proposed mobile application is targeted for everyone that wants to stay in shape by hiring a personal trainer in connecting coaches to their students by joining classes with pre-recorded video lessons by their coaches where students can watch and follow at their own pace. There are four primary features which make up the backbone of the mobile application, namely, Sign Up and Log In account, coaching feature, learning from pre-recorded lessons and personal session scheduling. The key characteristics were compared and analysed. It is the specifications of the systems were found. Table 1 shows the resulting comparison between the 3 existing systems.

Table 1: Comparison of The Existing Systems

Features	Openfit [5]	Nike Training Club [6]	Peloton[7]	Coach Me
Platform	iOS, Android, Web	iOS, Android	iOS, Android, Web.	
Log in and Sign up	Users are required to sign up and log in			
Class Scheduling	No class scheduling is available.			A private one to one session or a class can be conducted by the coach.
Pre-recorded classes	Held by the company's hired personal coacher			A personal coach can a apply to be in the application
Personal one to one coaching	Not available			Users can arrange a personal one-to-one session by choosing an open date and time from the coach's schedule.
Coach Background	Student cannot view or check the background and certification of the personal coaches.			Students can view the coach's certification and background within minute detail.
Workout Plans	Goal focused nutrition plan.	Fitness based workout Plan	No workout plans available.	

3. Methodology

There are 7 phases in total namely, planning, analysis, design, user evaluation, implementation and testing. The goal of using a prototyping methodology is to explore, experiment and evolve. A prototyping development approach aids in building and refine, a product to meet end-user expectations [8]. Thus, the process of iterating the design, system prototyping, and user evaluation is key to assure user satisfaction. The prototyping process encourages the methodical development of applications by

breaking down complex problems into several complete yet simpler parts [9]. Table 2 shows the system development workflow of Coach Me mobile application.

Table 2: System Development Workflow

Phase	Task	Output
Planning	• Identify the Objectives, Problems and Scope. • Identify the Software Requirements.	• Proposal. • Gantt Chart.
Requirement Analysis	• Data Collection. • Information Analysis. • Identify Specific Programs and Programming Language. • Create UML (use case diagram), Class Diagram and RTM.	• The functional and non-functional requirements of the system. • UML Diagrams • Class diagram • Requirements Traceability Matrix (RTM) • To-be model (Swimlane diagram)
Design	• Design User Interface of The System. • Design Application Programming Interface of The System. • Design the Flow of Backend to Frontend.	• System architecture • Database design (schema and data dictionaries) • User interface design
Prototyping System	• Creating prototype for Sign Up and Log In component. • Creating prototype for Coach component. • Creating prototype for Student component. • Creating prototype for Administrator component. • Integrate all of the component into one prototype.	• Figma mock-up high fidelity prototype.
User Evaluation	• System is presented to the client for an evaluation.	• Test cases

	• Collect suggestion and feedback. • Analyse Suggestion and feedback.	
Design II	• Design user interface of the system. • Design application programming interface of the system. • Design the flow of backend to frontend.	• The refined wireframe sketch of the system.
Prototyping System II	• Refine prototype for Sign Up and Log In component. • Refine prototype for Coach component. • Refine prototype for Student component. • Refine prototype for Administrator component. • Refine all of the component into one prototype.	• Refined Figma mock-up high fidelity prototype.
User Evaluation II	• System is presented to the client for an evaluation. • Collect suggestion and feedback. • Analyse Suggestion and feedback.	• Test cases
Implementation	• Implementing Sign Up and Log In component. • Implementing prototype for Coach component. • Implementing prototype for Student component. • Implementing prototype for Administrator component. • Integrate all of the component into one whole system.	• Flutter front-end. • Node.js back-end. • Firebase server.
Testing	• Unit Testing. • User Acceptance Testing.	• Test cases

There are total of nine phases from the prototype model. Each phase has its own task and output that need to produce during the entire project development. The table further shows the phases, tasks within a phase, and the output of the task in a concise manner.

Table 1: Modules, Function and User for Coach Me Mobile Application

System Module	Function	User
Sign Up and Log In module	This module is responsible for routing the users to dedicated pages when authenticated.	Administrator, Coach and Student
Coaching module	This module is responsible for the coach user to manage their class, revenues and payments, lessons and pre-recorded videos.	Coach
Learning module	This module is responsible for the student user to enroll or unenroll from classes, lessons, watch pre-recorded videos and make payments.	Student
Scheduling module	To manage a personal one-to-one session between the coach and student user.	Coach, Student
Administrator module	To produce reports and handle account deletions.	Administrator

To show the relationship between requirements and artifacts, requirement traceability matrix is used. Attached in **Appendix A** is the requirement traceability matrix the Coach Me mobile application.

Functional requirement is defined as capturing the expected behaviour of the system such as certain task to perform, services or the functions that are required for the system to perform [10]. Non-functional requirements describe how should the system perform said task or the performance, reliability, security and also the portability of the system [11]. Such requirements are key to designing a good system as it decides the alternative design, and characteristic selection of a system. Table 4 describes the functional requirements for each module.

Table 4: Functional Requirements Specification for Coach Me Mobile Application

No.	System Module	Functionality
1.	Sign Up and Log In module	• The system should allow the users to sign up by filling up their first name, last name, username, password, role, email, phone number and address. • The system should allow the users to log in with the correct username and password. • The system should allow the users to reset their password through their email in case if the users forget their password.

		• The system should show a message if the username or password is incorrect. • The system should allow the users that are signed into logout.
2.	Coaching module	• The system is able to show the coach user their account information. • The system is able to show the coach user which students are enrolled in which class. • The system should allow the coach user to create classes. • The system should allow the coach user to create lessons within each created class. • The system should allow the coach user to upload pre-recorded videos within each created lesson. • The system should allow the coach user to accept or decline a private one to one session request from a student user. • The system is to ensure the coach user receives appropriate payment when the student user enrolls in their class.
3.	Learning module	• The system is able to show the student user their account information. • The system is able to show the student user their enrolled classes. • The system should show the student user their available lessons • The system should allow the student user to watch pre-recorded videos within a lesson. • The system should allow the student user to make payments during class enrolment. • The system should allow the student user to request a personal one-to-one session with a coach based on the availability of the coach.
4.	Scheduling module	• The system should allow the coach user to manage their available date and time for a personal one to one session • The system should allow the student user to pick available date and time for a personal coaching session.

		• The system should not show the date and time that has passed. • The student user cannot pick a date and time that has passed.
5.	Administrator module	• The system should allow the administrator to approve student and coach user account deletion. • The system should generate monthly report for the coach rating. • The system should generate monthly report on the most popular categories. • The system should generate a monthly report for the number of engaged students. • The system should not allow the student and coach user to view the monthly reports.

The non-functional requirement can be defined simply as the constraints on the system design to ensure the effectiveness of the system. Table 5 shows the non-functional requirements of the Coach Me mobile application.

Table 5: Non-functional Requirements Specification for Coach Me Mobile Application

No.	Requirements	Description
1.	Operational	• The mobile application is only for the Android operating system. • The update of the mobile application should be easily rolled out. • The application should be user-friendly.
2.	Performance	• The time to load the mobile application should not be more than 3000 milliseconds.
3.	Security	• The user password should be encrypted before storing in database.

3.1 Analysis

A use case diagram can be defined as the primary depiction of the user's interaction where by the base use case is the user's expected behavior. Figure 1 shows the use case diagram that represents the overall activity of the Coach Me Mobile Application.

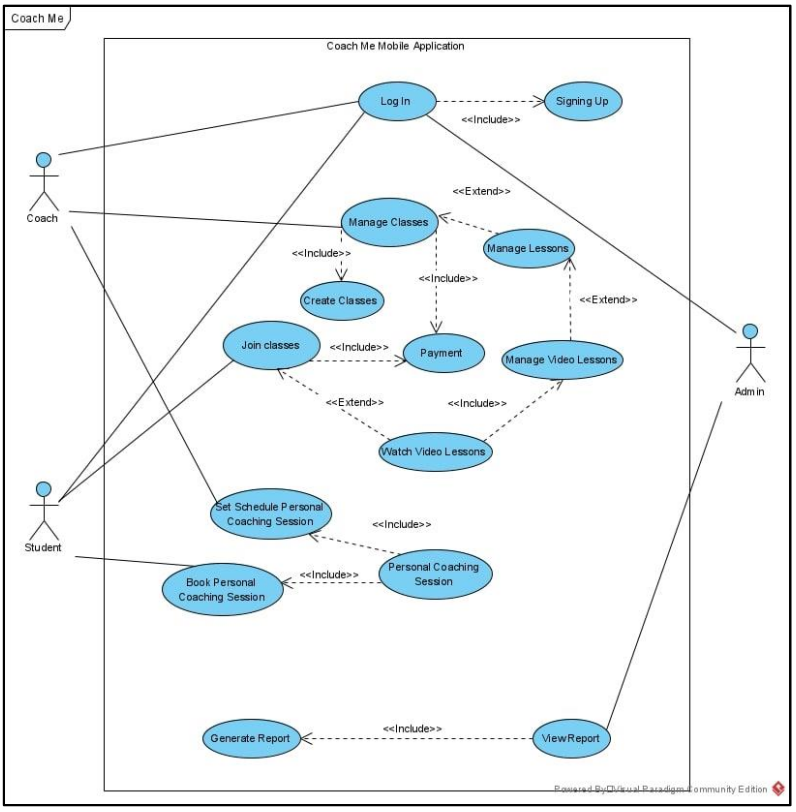


Figure 1: Use Case Diagram of Proposed System

To be model depicts how the system should behave as a proposed system. Moreover, the to-be model describes basic user and their actions. Figure 2 show the to-be model of the mobile application in UML Swimlane diagram.

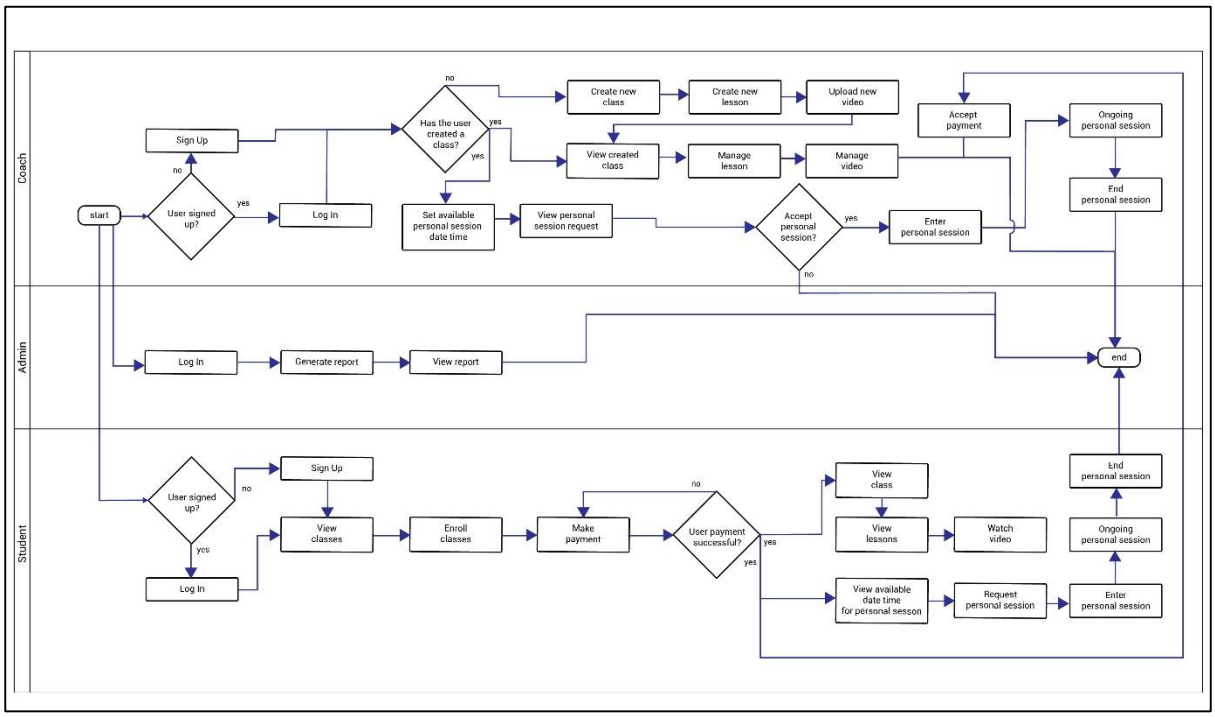
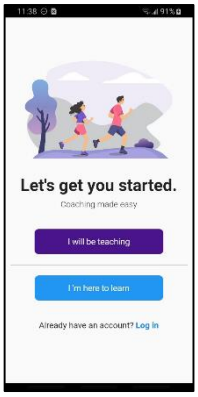
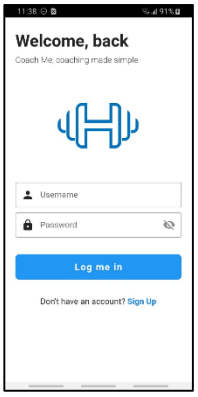


Figure 2: To-Be Model of Coach Me Mobile Application

3.3 User Interface Design

The mobile application user interfaced consist of a few parts. The log up and sign up, student home page, coach home page and also booking schedule. Figure 3 and 4 shows the sign up and log in user interface respectively. Upon loggin in, the student user will be brought to the student main page as show in figure 5. Figure 6 displays the coach main page when the coach user is authenticated.





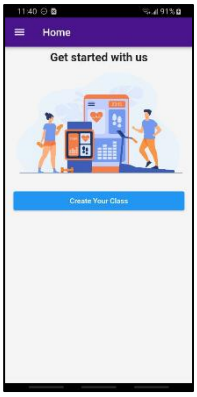


Figure 3: Sign Up **Figure 4: Log In** **Figure 5: Student Main Page** **Figure 6: Coach Main Page**

3.4 Database Schema

In order to design a normalized database, the database schema is needed. The schema for the database is listed as below:-

i. **student**(user_id, username, name, email, telephone, user_type, age, bank_account)
ii. **coach**(user_id, username, name, email, telephone, user_type, age, field, certificate, bank_account)
iii. **admin**(user_id, username, name, email, telephone, user_type, age, admin_level)
iv. **category**(category_id, name, class_id (FK))
v. **class**(class_id, title, description, category_id (FK), coach_user_id, datetime_creation)
vi. **lesson**(lesson_id, title, description, class_id (FK))
vii. **video**(video_id, lesson_id (FK), title, mime, size, resolution)
viii. **teach**(teach_id, coach_user_id (FK), class_id (FK))
ix. **enroll**(enroll_id, class_id (FK), student_user_id (FK), datetime_enrolled)
x. **payment**(payment_id, class_id (FK), coach_user_id (FK), student_user_id (FK), coach_bank_account (FK))
xi. **receipt**(receipt_id, receipt, date_creation, payment_id (FK))
xii. **personal_session**(personal_session_id, title, class_id (FK), coach_user_id (FK), student_user_id (FK), date_time)
xiii. **session_status**(session_status_id, personal_session_id (FK), status)
xiv. **report**(report_id, report_type, scale, report_date_time)

4. Result and Discussion

The section discusses and present the results of the testing carried out on the produced mobile application. Overall, the results of this system's test cases suggest that it has been successfully developed and tested.

4.1 Test Cases

There test cases were produced as shown in **Appendix B.** There are no failed test cases in the overall test case findings for the produced mobile application. The Table shows the results of 6 system modules with a total of 33 test cases. The test cases for all of the system modules passes. The entire test case outcome is provided in Table 6.

Table 6: Overall Result Test Cases

Test Case Module	Number Of Test Cases	Total Passed Test Cases	Total Failed Test Cases
TC_100 (Sign up submodule)	4	4(100%)	0
TC_200 (Log in submodule)	3	3(100%)	0
TC_300 (Learning module)	8	8(100%)	0
TC_400 (Coaching module)	8	8(100%)	0
TC_500 (Scheduling module)	6	6(100%)	0
TC_600 (Administrator module)	4	4 (100%)	0

4.2 User Acceptance Test

Users can assist developers in identifying defects by performing this testing. The questionnaire given had a total of 30 participants. The results produced are analysed using column charts. Most respondents strongly agree that the mobile application is easy to understand, has suitable content layout and interface design as show in Figure 7.

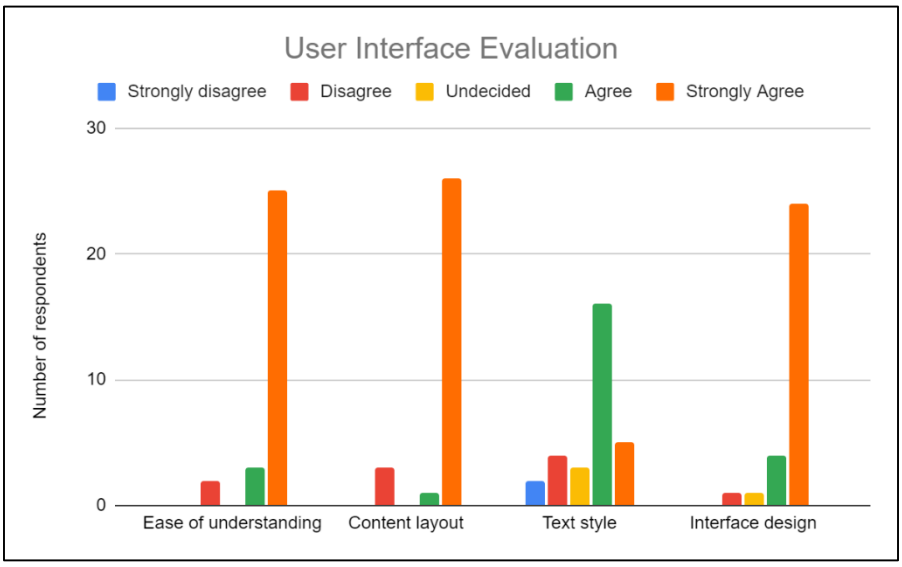


Figure 7: Result of application user interface evaluation

While majority of the respondent agree that the mobile application has suitable text style. In the chart for the application features, most respondents strongly agree with the design and features provided the developed application as shown in Figure 8.

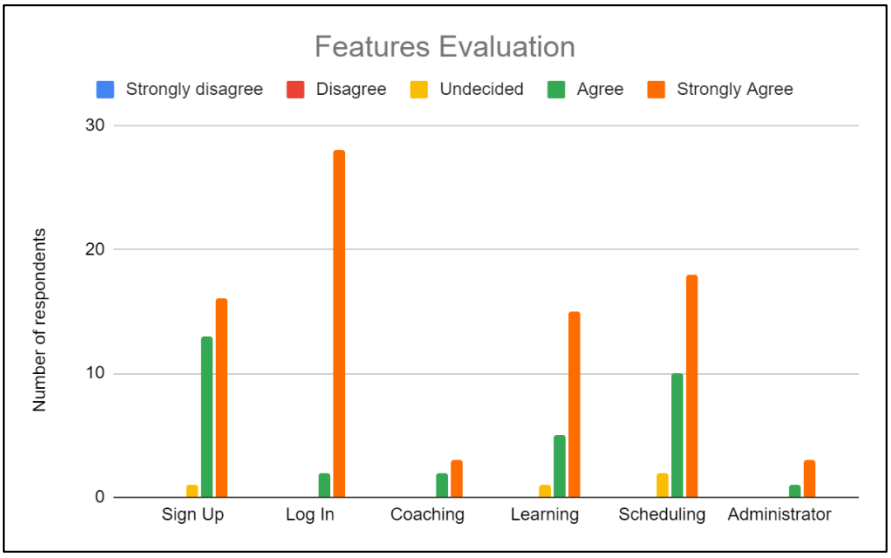


Figure 8: Result of application features evaluation

5. Conclusion

The conclude, The Coach Me Mobile application is developed based on the project planning. The mobile application will aid personal coaches and thier students to connect in a digital platform. Eventhough at any point of time in the future if the pandemic has reached its endpoint, the mobile application will not lose its traction and continue to thrive as it will drive coaches and students who are not able to attend a physical class in using the mobile application as a platform to professionally connect. It will also boost the camaraderie between trainers and their students even with the physical limitation of not being able to enter a gym. The methodology used in developing the system is incremental prototyping system. Based on the systems model, the system has also been developed in accordance with the architectural design, UML diagrams and also system analysis. Microservice system architecture is utilized to decouple the front-end from the server and database by using Flutter and Node.js respectively. However, only one student and one coach is allowed for a session, there is no group session. The mobile application developed hopes to lessen the number of unemployed personal trainers by providing a platform for said personal trainers and students to connect which in turn drives the traction within the health and fitness industry.

Although the system has achieved its objective, there are still several improvements to be made to further increase the functionality by implementing real-time peer-to-peer chatting submodule and using load balancers for system scalability. Moreover, reminders to watch classes and push notification of the coaches creates a new class or upload a new video could also be added in the future to further boost he functionality of the mobile application.

Acknowledgement

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Appendix A

Requirement	Software Requirement Specification	Description
Log In and Sign Up SRS_REQ_100	SRS_REQ_101	Students sign up by completing sign up form.
	SRS_REQ_102	Student presses Sign Up button.
	SRS_REQ_103	System verify Sign Up form.
	SRS_REQ_104	System verifies username and password
	SRS_REQ_105	System shows message(s) when Sign Up form is incomplete.
	SRS_REQ_106	System redirect student homepage if verification is complete.
	SRS_REQ_107	Coach signs up by completing sign up form
	SRS_REQ_108	Coach presses Sign Up button
	SRS_REQ_109	System verify Sign Up form
	SRS_REQ_110	System verifies username and password
	SRS_REQ_111	System shows message(s) when Sign Up form is incomplete
	SRS_REQ_112	System redirect coach homepage if verification is complete.
	SRS_REQ_113	Users enter username and password to log in.
	SRS_REQ_114	User presses Log In button
	SRS_REQ_115	System verifies username and password
	SRS_REQ_116	System will redirect user to appropriate homepage
Learning SRS_REQ_200	SRS_REQ_201	System displays enrolled classes.
	SRS_REQ_202	Student browses coaches.
	SRS_REQ_203	Student taps coaches to see more on profile.
	SRS_REQ_204	System displays coach certification and classes.
	SRS_REQ_205	Student browses available classes.
	SRS_REQ_206	Student presses more info button.
	SRS_REQ_207	System displays information on class.
	SRS_REQ_208	Student presses Enroll button.
	SRS_REQ_209	Student is redirected to payment confirmation page.
	SRS_REQ_210	Student is redirected to payment gateway page.
	SRS_REQ_211	Upon successful payment, student is welcomed to class page.

	SRS_REQ_212	Student browses lessons within class.
	SRS_REQ_212	Student presses Watch This lesson to play video.
Coaching SRS_REQ_300	SRS_REQ_301	System displays coach classes.
	SRS_REQ_302	Coach creates class by filling up create class form.
	SRS_REQ_303	Coach creates lessons by filling up lesson form.
	SRS_REQ_304	Coach Upload video in the lesson.
	SRS_REQ_305	Upon student enrollment, coach receives payment.
	SRS_REQ_306	Coach can view students in a class by pressing view student button.
	SRS_REQ_307	Coach Update Class information by pressing Update Class button.
	SRS_REQ_308	System Updates Class Information.
	SRS_REQ_309	Coach Update lesson information by pression update lesson Button.
	SRS_REQ_310	System updates lesson information.
	SRS_REQ_311	Coach presses delete lesson button.
	SRS_REQ_312	System drops lesson from database records.
	SRS_REQ_313	Coach presses delete class button.
	SRS_REQ_314	System drops class from database records.
Scheduling SRS_REQ_400	SRS_REQ_401	Coach presses set available session button.
	SRS_REQ_402	system shows time and date for a personal session in a class.
	SRS_REQ_403	Student picks time and date for personal session in class.
	SRS_REQ_404	Coach presses confirm button.
	SRS_REQ_405	Coach receive notification for the requested session.
Administrator SRS_REQ_500	SRS_REQ_501	Administrator chooses reporting tab.
	SRS_REQ_502	System generates report for highest rated coach.
	SRS_REQ_503	System generates report for most enrolled class.
	SRS_REQ_504	System generates report for personal sessions per week/ month.
	SRS_REQ_505	Administrator presses button print report.
	SRS_REQ_506	System generates report in pdf format.

Appendix B

No.	Test cases	Description
TC_100		
1.	TC_100_001	Verify when user enters nothing in the sign-up form upon taping the sign-up button, an error message will be shown.
2.	TC_100_002	Verify if users enter existing records in sign up form, the system will display an error message.
3.	TC_100_003	Verify when user enters invalid characters in the sign-up form, the system will show an error message.
4.	TC_100_004	Verify upon successfully completing the sign-up form and the sign-up button is tapped, the user's records will be created, and the correct route shall be directed.
TC_200		
1.	TC_200_001	Verify when user enters null details in the log in form then tapping the log in button, an error message will be shown
2.	TC _200_002	Verify when the user enters incorrect credentials then tapping the log in button, an error message will be shown
3.	TC_200_003	Verify when the user enters correct credentials then tapping the log in button, the user will be redirected to the correct route
TC_300		
1.	TC_300_001	Verify that students enrolled classes are shown
2.	TC_300_002	Verify student is directed to class landing route when the class card is tapped
3.	TC_300_003	Verify student is directed to coach profile route when the coach card is tapped.
4.	TC_300_004	Verify student can view their profile when the account button is tapped.
5.	TC_300_005	Verify student can change their password if and only if they entered their previous password.
6.	TC_300_006	Verify student can edit their profile upon tapping edit profile button
7.	TC_300_007	Verify student can request to close their account upon long pressing the close account button
8.	TC_300_008	Verify student will be directed to the payment route upon tapping the enrol button.

TC_400		
1.	TC_400_001	Verify an error message will be shown if the coach does not fill up the entire create class form upon tapping the create class button
2.	TC_400_002	Verify coach can view the details of created class.
3.	TC_400_003	Verify an error message will be shown if coach does not fill in the edit class form upon tapping the confirm edit class button.
4.	TC_400_004	Verify an error message will be shown if coach does not fill in the edit lesson form upon tapping the confirm edit lesson button.
5.	TC_400_005	Verify an error message will be shown if the coach does not fill up the entire create lesson form upon tapping the create lesson button
6.	TC_400_006	Verify both enrolled students and coach of the class can view all the video lessons upon tapping the play button icon.
7.	TC_400_007	Verify upon coach tapping the delete class button, the class records will be destroyed in the database
8.	TC_400_008	Verify upon coach tapping the delete lesson button, the lesson records will be destroyed in the database
TC_500		
1.	TC_500_001	Verify coach is directed to session set page when the set session button is tapped
2.	TC_500_002	Verify coach is not able to pick past date as a session
3.	TC_500_003	Verify student is directed to book session page when the book button is tapped.
4.	TC_500_004	Verify student cannot book another session after the booked session has passed or rejected
5.	TC_500_005	Verify coach can view the requested bookings by student
6.	TC_500_006	Verify when coach accepts a student, all bookings of related class will be rejected and rescheduled.
TC_600		
1.	TC_600_001	Verify Report of highest number of categories in format of pdf is shown when the button generate report is pressed.
2.	TC_600_002	Verify Report of rated class in picked month in format of pdf is shown when the button generate report is pressed.

3.	TC_600_003	Verify Report of rated coach in picked month in format of pdf is shown when the button generate report is pressed.
4.	TC_600_004	Verify administrator can permanently delete an account if the account has requested to being close.

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