Web based application for fitness consultancy

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A dissertation submitted for the Degree of Master of Information Technology

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Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge, it does not contain any material published or written by another person, except as acknowledged in the text.

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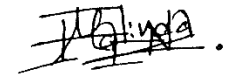

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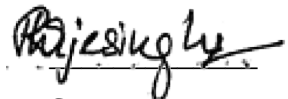

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Preface

The main idea behind the web-based fitness consultancy application is to provide efficient customer service who come to health club Fitness Company. To develop the project, I visited the Health Club Fitness center to collect the required data. This report is based on my practical knowledge of the company and my web development skills.

The main reason to choose the above topic is to develop an information system to manage the day to day activities of both client-side and consultant side of fitness center efficiently and give wider publicity about the Health Club Fitness center. When developing exercise programs and diet plans, many problems are faced by consultants. They have to memorize many exercises and diets, as well as a consultant should send instructions to do gym exercises and how to take a diet. I saw the drawback of that function and I move to solve the problem using a web system.

When using the proposed system, gym managers, and consultants can easily manage the main functions of the gym. The main target audience is gym managers, fitness consultants, and clients. This report shows how the proposed system creates an exercise and diet plan, and advertising articles, register new clients using the system to the fitness center.

The project was inspired by my interest in web development technologies. The intention was to make things easier by computerizing and automating the manual system. Then the issues were identified and a solution was designed.

I would like to show my gratitude to all who have supported me in all the ways to study this for my master's degree project. And I'd like to express my heartfelt appreciation to my supervisor Ms. M.W.A.C.R. Wijesinghe, Senior Lecturer at the University of Colombo School of computing, who made a tremendous sacrifice to make this a success and for her meticulous care, kindness, and generosity. More importantly, that valuable advice and criticism help to project more successfully. Her comments and suggestions have been a key determinative inspiration for the present study.

I would like to get this chance to show my deepest sense of thankfulness to the Health Club Fitness center and its consultants and manager who were giving me priceless support to complete this master's project work.

I show my heartfelt thankfulness to my loving mother who gave me advice, care, and respected support to make this project successful.

Abstract

Health club Fitness was established in 2018 to improve the health and fitness of the community. The main purpose of a fitness consultancy application is to deliver efficient exercise programs and diet plans to clients, manage the activities of the gymnasium, help fitness consultants manage their operations, and give wider publicity about the Health Club Fitness center and its article series.

The Health club fitness center uses a manual system to register clients and collect client details to prepare workout programs and diet plans. It offers different membership packages. But it’s not properly advertised and payment details are written in a book. When making an exercise and diet plan, there is a possibility of mistakes when calculating BMI and 1RM manually. The Fitness center has no unique platform to share workout programs, diet plans, and the consultant's knowledge.

Information technology is a fast-growing aspect. There, each company translates its manual system into an automated system. The motivation for developing this system was to allow users to work with the system easily, avoiding the vulnerabilities of the manual system.

The system includes customer and consultant registration and management, exercise program and diet planning, BMI and 1RM efficient calculation, making an appointment with a consultant, uploading fitness-related articles to the website, report generation, and Initial payment handling. Those can recognize as functional requirements.

When designing the system, UML diagrams are used to show the system along with its main actors, roles, actions, artifacts or classes, to well understand, alter, maintain, or document information about the system. Wireframe interfaces are designed using draw.io software. The proposed system is developed as a web-based system. Therefore, the system is designed in responsive technologies like bootstrap. The Application structure is a client-server architecture. Backend language is PHP Front-end design using HTML, JS, and CSS. MYSQL is used to develop a database. The waterfall development process is used as a Software development methodology. A test case is used to verify a specific feature or functionality of the application. The IEEE testing standard follows to testing the application. The information technology sector is rising day by day. In each sector, online service is very important. This project helps the Health Club Fitness center’s clients and consultants who

work at the gym. It can be hoped that it will play a major role in the future development of the organization. According to the above facts, the system is an acceptable solution to manage the essential day-to-day activities in the Health club fitness center.

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List of Acronym

1RM	-	One-Repetition Maximum
API	-	Application Programming Interface
BMI	-	Body Mass Index
CAD	-	Computer-Aided Design
CMS	-	Content Management System
CSS	-	Cascading Style Sheets
DB	-	Database
GUI	-	Graphical User Interface
GVC	-	Global Value Chain
HTML	-	Hypertext Markup Language
IDE	-	Integrated Development Environment
IEEE	-	The Institute of Electrical and Electronics Engineers
JS	-	Java Script
LKR	-	Sri Lankan Rupee
MVC	-	Model View Controller
NIC	-	National Identity Card
OS	-	Operating System
PHP	-	Hypertext Preprocessor
SMS	-	Short Message Service
SQL	-	Structured Query Language
TDD	-	Test-Driven Development
UI/UX	-	User Interface / User Experience
UML	-	Unified Modeling Language
WAMP	-	Apache, MySQL, PHP, Perl, Python. Web Server.
XML	-	Extensible Markup Language

Chapter 1 – Introduction

1.1 Project Overview

"Health club fitness" is a gym and physical fitness center. The company's main services are handling gymnasium, online coaching, physical coaching, and preparing diet plans for clients. Fitness consultancy application is used to help managers and consultants in fitness centers to manage specific areas of their own company. One of the main functions is to reduce paperwork in the fitness center. Fitness consultancy application has features to manage exercise and diet programs, generate decision-making reports. A fitness consultancy application is a software tool to manage day-to-day gym or fitness center operations. The system keeps member information in a relational database, manages fitness center’s members, makes exercise programs, makes diet plans, and calculates functional measurements like BMI and 1RM. A fitness consultancy system can use for organizations that have different fitness-focused goals. To perform a higher-level task in the fitness center application, it can integrate many other useful components. As an example, social media marketing components to develop brand awareness, email component to continue a relationship with clients, payment gateways, etc. When developing a web-based system, responsive components increase user experience. Android applications also can use to reach the client like a web-based system. But it has pros and cons. In the proposed system, the appointments can be managed. Membership management is the common function of many gym management software solutions. It is one of the essential functions of the gym. There are many gym membership management software tools. But fitness and consultancy software provide specific features to make exercise programs and diet plans and manage day-to-day fitness center activities.

1.2 Motivation

The main purposes of the "Health Club Fitness Center" are to deliver efficient exercise programs and diet plans to clients, manage the activities of the gymnasium, help fitness consultants manage their operations, and give wider publicity about the Health Club Fitness Center and its article series. Currently, the data recording process is done manually on papers at the facility. Sometimes papers are misplaced, making it difficult to find a history

of a client's details. In the process, papers are required. One of the goals is to reduce paperwork and costs. The consultant should prepare an exercise program and diet plan for the client. When preparing the above factors, body mass index and one-repetition maximum should be calculated. When calculating it manually, it may be mistaken and time-consuming. As a result, when that computation is automated. Then accuracy will be high and no more time-consuming for the above functions. The Health Club Fitness center needs wider publicity to attract clients. Therefore, the fitness center publishes articles, quotes, videos, and pictures.

After developing the system, managers can easily record the above details on the system and publish article series on the website. It will help to increase income. It will be important for the Health Club Fitness center to demonstrate the quality of its services. Gym management software delivers various kinds of tools to managers and consultants. Then no need to spend more money on various solutions to accomplish the business's day-to-day needs. Fitness center management software can provide multiple features like an integrated one. Back-office tools such as exercise program, diet plan management component to handle day-to-day operations. Many of the above operations can perform in a single fitness center platform. If members can pay online, the online payments method portal can be integrated into the system after discussing with local or international banks. Rather than having employees spend their time preparing exercise programs and diet plans using paper, members can work out more time at the gym because the programs are displayed on the dashboard after entering the data. It's effective to send exercise programs and diet plans to members through the system instead of writing exercise programs and diet plans in the paper.

1.3 Problem

The main goals of the Health club fitness are to deliver efficient exercise programs and diet plans to clients, manage the activities of the gymnasium, help fitness consultants to manage their operations, and give wider publicity about the Health Club Fitness center and its article series.

The clients register for the gym with having different goals. As an example, some clients need to build a body, therefore they look for a good diet plan, a good training program, and good guidance to achieve their goals. Some clients need to weight loss or gain. Some clients

come with different injuries or improper posture, they come to correct those issues. Because doctors suggest to work out to solve them. Some clients have non-communicable diseases such as diabetes, cholesterol, cancer, etc. They come up to be healthier. Currently, the Health club fitness center uses a manual system to register clients and collect client details to prepare workout programs and diet plans.

When bringing client details manually using paper, sometimes it may be misplaced. Because of that, the consultant needs to collect the details again. Health club fitness centers offer different membership packages. But it's not properly advertised. Usually, a consultant says it when registering a client.

The Health club fitness center does all payment transactions manually and payment details are written in a book and issues membership cards. Therefore, the speed of operations is quite slow. Consultants need to make an exercise and diet plan. As support, BMI and 1RM calculators use to make exercise and diet plans. But all BMI and 1RM calculations are carried out manually. There is a possibility of mistakes when making plans and calculations are done manually. As well as in the manual system, backing up files is not possible.

Currently, the fitness center uses social media, email platforms to share their knowledge and exercise program and diet plans. But there is no unique platform to share workout programs, diet plans, and the consultant's knowledge. When providing a program to the client, the consultant needs previous programs to make a new program. Because of the manual system, consultants should take effect to find old programs. Because it has not the proper way to store old programs. This fitness center currently shares its fitness articles on social media. But some clients are not using social media. Therefore, it's required a proper way to publish articles on the internet to access people all over the world. They only use social media to promote their services. Therefore, they expect to implement a proper marketing platform to show their factors. An email is an important tool of corporate communication since it is quick, inexpensive, accessible, and simple to copy. There is a strong need for the fitness center to send an email to a client or consultant.

1.4 Objectives

The main purposes of the "fitness consultancy application" are to deliver effective exercise programs and diet plans to clients, manage the activities of the gymnasium, help fitness consultants to manage their operations, and give wider publicity about the Health Club

Fitness center and its article series. Consultants, managers, and clients are the stakeholders of the system.

When a client joins a fitness center, clients should be able to access fitness material easily. Fitness consultants are trained their members to achieve their fitness objectives. Make personalized fitness programs, teach members to prevent injuries, create diet plans, provide nutritional advice, assessing the fitness levels of clients are examples of duties of fitness consultants. The proposed system is used to make customized exercise programs, customized diet plans, explain to clients how to prevent injuries, and give fitness advice. As well, the fitness center provides important fitness-related articles for clients to read. As well as marketing is also done through the website. Therefore, considering the above essential requirements, the following are identified as project objectives.

1. Accelerate day-to-day work by reducing the paperwork of the fitness center.
2. To save and store a backup of previous registrations by facilitating the client registration process.
3. Effectively collect details about the client's medical history, fitness goals, day-to-day activities, food consumption.
4. Make it easier to contact fitness consultants when clients need more details or assistant for the exercise program.
5. Make it easier to contact fitness consultants when clients need more details or assistant with a diet plan.
6. To increase the accuracy when calculating and checking body mass index (BMI). The results of a BMI measurement can give an idea about whether a person has the correct weight for their height.
7. Evaluate the effectiveness of training programs by using accurately calculating 1RM.
8. Ability to store and retrieve all details to view each other's contact details and use them when needed.
9. Give wider publicity about the Health Club Fitness center and its article and advertisements.
10. Effectively manage membership payments.
11. Should be able to send an email when needed to develop customer relationships.

1.5 Scope of the study

The planned fitness consulting system is developed to manage the day-to-day activities of both the client-side and gym consultant side. Consultants use this system to send documents to clients. This is a business-to-consumer process. The company business model is membership-based selling services. The end users are members of the gym. Then the system should maintain client and consultant communication. The system develops according to the client-server web base model. Because consultants and clients could be able to access it anytime anywhere.

Fitness consultant is expert in the physical fitness and health field. A fitness consultant is a person who provides expert advice professionally regarding someone's physical fitness and health. Fitness consulting is a broad topic. It can include advising gym facilities, price ranges, and skillful consultant teams. As well as it can show how to accomplish their fitness goals. Usually, fitness consultants work at the gym.

Gym members may have special needs like obesity, pregnancy, injuries, and diabetes, or high blood pressure. In the Health Club Fitness center, one of the main issues is no proper way to deliver the exercise program to the client. As well as no database of clients and client's history. Following functions hope to be developed.

1. Client registration: Register by giving details about the client's personal, medical history, day-to-day activities, food consumption.
2. View/edit client details: Consultants can view all the client details in the system to examine the client's details to gymnasium functions.
3. Remove client: Consultants can remove client records when necessary by selecting the specific client.
4. Register consultants: The manager can register consultants to the system by giving the consultant's details. The administrator creates a user name and password for consultants.
5. Create exercise program: When creating the exercise program, the consultant uses client details. If the client is new, the system must show the client's medical history, goals, day-to-day activities, food consumption to assist to make an exercise program. If the client is not a new one, the system should show the previous exercise program to make new ones. Generate BMI (body mass index): BMI value assists in creating an exercise program and diet plan.
6. Create a Diet plan: done using the BMI value and exercise program.
7. Generate 1RM (max weight can lift at one repetition of exercise) calculator: a calculated value for assisting to create an exercise program. The consultant should input the max

weight (kg) of the client can lift for a single repetition and input how many repetitions for lift.

8. Contact Consultants: In addition to existing consultants, different consultants who work outside the fitness center are also shown to contact the client. (Chiropractor, osteopathic physician, physiatrist, orthopedist, sports medicine doctor, bariatrician)
9. To show the client's history: When creating the exercise program, the consultant needs to look at previous exercise programs and diet plans of the client. Therefore, the system should show it when making exercise programs and diet plans.
10. Publish fitness articles: The fitness article series will be published on the website. The system administrator will add a fitness article image with a detailed description.
11. Coaching plans: The manager can add different types of coaching plans. The details of coaching plans can be viewed by all the users who visit the website. The manager should provide price, type, services, and related factors about the coaching plan. The manager can remove a particular coaching plan. When required.
12. Report generation: In addition to Exercise plans and diet plans, several reports will be generated to assist the business.

1.6 Structure of the dissertation

This illustrates the progress of implementation-based development keep-going.

Chapter 01 contains an introduction and overview of the project which emphasizes the problem area, why motivated to do this project, what are the objectives and scope of the project. As well as feasibility study shows how beneficial/practical an information system will be to an organization.

Chapter 02 describes the background and similar systems review finished according to this area. Requirement analysis of the proposed system shows how the current system works and what it does. Producing a model of what the new system will need. Producing a description of the system specifying the business requirements and priorities.

Chapter 03 Software design shows the specification of a software artifact intended to accomplish aims, using a set of primitive modules and subject to constraints.

Chapter 04 shows the methodology and the technologies which are used and a detailed report of the design. It has an analysis of the system and shows what are the implementation technique and details of the system.

Chapter 05 test the system and evaluates the module and components used in the implementation and the different kinds of results obtained with the proposed system.

To end, Chapter 06 shows the conclusion and future developments for the fitness and consultancy application.

Chapter 2 – Background

2.1 Introduction

A review of the study field is described in the background study. And this chapter provides a review of similar systems, related technologies, and related design strategies which are similar to or appear to be similar to the "web-based application for fitness consultancy" that is being developed. It focuses on other prominent research and development works, technologies that are explored or adapted, and models or concepts explored. The product is a fitness consultancy application that provides multiple functions for clients, consultants, and managers. The project, “Web-based application for fitness consultancy” is a business product. A review of similar systems is shown below.

2.2 Requirement Analysis

The manual system enables a client to get an exercise and diet program from a consultant or manager. Managers and consultants can view clients’ data and exercise and diet programs using books. It has many issues. Because all data were recorded manually. The proposed system needs the following requirements.

2.2.1 Functional Requirements

A functional requirement specifies a system or component's function, where a function is defined as a definition of behavior between inputs and outputs. The manual system supports three types of actors. They are managers, consultants, and clients. Figure 2.1 shows the high-level use case diagram of the manual system. Functional requirements of the manual process contain, registering the client to the fitness center, taking initial and monthly payments from the client, finding out the clients medical history, writing exercise program and diet plan according to the client goals, calculating BMI and 1RM manually on paper, publish fitness related articles and advertisement series on Facebook and Instagram, maintain inquire box to take client’s feedback about fitness center and its staff.

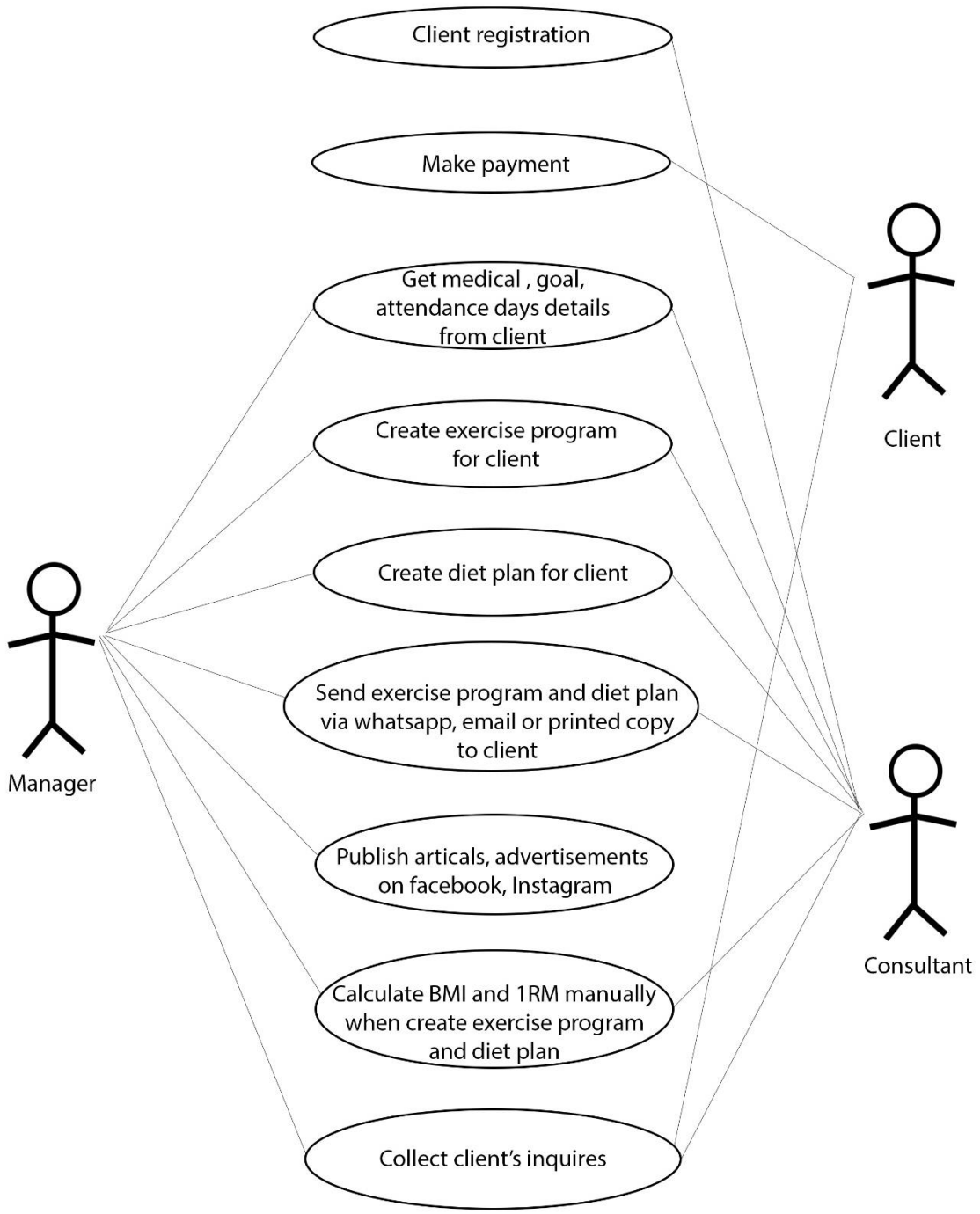

Figure 2.1 High level use case diagram (manual system)

- Registration

  Initially, when a client comes to the fitness center, the consultant or manager guides the procedure of the fitness center and explains which packages are offered. It has an online coaching package, personal training package, annual package, couple package, and family package. The consultant or manager notes down the details of the client. A consultant uses the client name, mobile number, date of registration, name of the

package and signature of the client, signature of the consultant or manager to register the client.

- Make payment

  When registering a new client, the client should pay a registration fee. Registration payment makes only once when initially registering with the fitness center. With the registration fee, the Client should pay a monthly membership fee after selecting the membership package. The Fitness center uses another book to write down the payment details. Only cash payments are allowed when paying at the fitness center premises.

- Get client's medical, goals, attendance date details

  When the client did the registration payment and monthly payment, the consultant asks for the client and write down the following details. Personal details of the client (name, age, date of birth, address, email, mobile number, national identity card number). Medical history (Injuries, non-infectious diseases, surgery details, mussel's pains). Fitness goal (weight gain, weight loss, bodybuilding, strength training, athlete training, keep off from diabetics, cholesterol). Attendance days (how many days a client can visit the fitness center).

- Create exercise program

  Exercise programs are depended on the client's fitness goal, health condition, and frequency. Some clients are beginners, some clients are intermediates and some clients are advanced. Therefore, a consultant or manager needs to create a fully customized exercise program. On the first day, the consultant provides a basic exercise program to the client. After eligibility of that exercise program to the client, the consultant creates the next exercise program for the next one, two, or three months.

- Creating diet plan

  A diet plan is depended on the client's fitness goal and health condition. Some clients are trying to lose weight, some clients are trying to gain weight, some clients are trying to maintain weight and be healthy. Therefore, a consultant or manager needs to create a fully customized diet plan.

- Send exercise program and diet plan

  The exercise program and diet plan are sent using email or WhatsApp. As well as some programs are handover after creating the exercise or diet plan using paper. Many of the clients use WhatsApp or email to share documents. Some people don't use these technologies. That's the reason the fitness center prepares exercise and diet plans in the paper.

- Publish articles and advertisements

  The marketing manager of the fitness center creates articles and marketing materials. Marketing materials include fitness center membership packages and advertisements. As well as paid social media promotions are made by the manager. Fitness center shares their fitness articles on social media. Manager or consultant upload the images or videos to Health club fitness center Facebook page and Instagram profile. The fitness center only uses social media to promote its services and product. Therefore, the fitness center needs to touch all global users. Then the fitness center looks for publishing articles and advertisements on the website.

- Calculate BMI and 1RM

  Body mass index value assists in creating an exercise program and diet plan. Body Mass Index is calculated via an individual's height and weight. The BMI formula is as follows, BMI = kg/m^2 the kg is an individual's weight in kilograms. The m^2 is body height in meters squared. When a BMI of 25 or above is overweight, it is not good, the healthy range of the BMI is 18.5 to 24.9. So usually above BMI calculation is applies to adults 18-65 years old.

  One rep maximum value help in creating an exercise program. 1RM can calculate using the following formulas. For an individual's upper body, should discovery the heaviest weight gym member can lift 4-6 times and set it into the following equation. (4.6RM * 1.1307) + 0.6998. As an example, when the client can perform 5 reps of 60kg weight, when it inserts into the above formula, (60 * 1.1307) + 0.6998, the client can lift 68.5kg. The lower body formula is a little bit different. Using those formula, (4-6RM * 1.09703) + 14.2546. 1RM training can be able to select the correct capacity and intensity when the training at to suit client fitness goals. Therefore, all the above calculations are done using paper.

- Inquires

  Fitness center has no proper way to show membership packages to clients. The staff presents the packages verbally. It has an online coaching package, personal training package, annual package, couple package, and family package. Sometimes clients ask repeatedly about membership packages.

2.2.2 Non-functional Requirements

Non-functional requirements define system properties and constraints. It is discussed under the following three categories.

2.2.2.1 Product Requirements

A product requirement defines the requirements of a proposed system, including the product's efficiency, reliability, portability, and usability requirements.

2.2.2.1.1 Efficiency requirements

Performance requirements are shown under efficiency requirements.

2.2.2.1.1.1 Performance requirements

Within enough response time, the program should load and be usable. When a user interacts with the program, the interface should be updated. To avoid redundant data and enhance efficiency, the database should be normalized. The system should be interactive, with as few delays as possible. As a result, there are no immediate delays in the system's action response. In the case of opening windows forms, displaying error messages, and saving settings or sessions, the delay should be minimal. In the case of opening databases, sorting questions, and evaluating, there are no delays, and the operation is completed very soon.

2.2.2.1.2 Reliability requirements

The system would run 24*7 without a failure. The probability of unavailability depends on the server of the website. If the server work without any failure the Availability of the system is 100%.

2.2.2.1.3 Portability requirements

Users should be able to access the system from a variety of operating systems, such as Microsoft Windows, macOS, and Android. Users should be able to access the system using a variety of web browsers, including Microsoft Edge, Mozilla Firefox, and Google Chrome.

2.2.2.1.4 Usability requirements

Interface requirements are shown under usability requirements.

2.2.2.1.4.1 Interface requirements

The user interface should able to be navigated using a mouse or other pointing device. The interface between the program and hardware should consist of the user interface, the mouse, and the keyboard. The system should able easy to use by non-experienced users.

User interfaces - The system navigation bar should be related to the fitness center theme color. All button colors should be blue color. Website Home page cover should have multiple images related to the fitness center. The screen layout should be responsive to both desktop and mobile.

2.2.2.2 Organizational Requirements

The categories related to organizational requirements are given below with details.

2.2.2.2.1 Delivery requirements

The system should be deployed within six months. The system should be completed within the allocated budget. Should deliver the entire application as soon as ready and test it in a working environment. The main deliverables are web application, database schema. Before delivering the product user acceptance testing should not fail.

2.2.2.2.2 Implementation requirements

To implement the system in the fitness center, should use a parallel deployment process. For a set amount of time, the old and new systems should operate in parallel. If the new system is successful, the old system can be decommissioned and the new system can be continued.

2.2.2.2.3 Standards requirements

The system should deliver according to IEEE Standard. All databases should have a standardized user interface that adheres to the Z39.50 standard. Each module should be documented separately. A more extensive discussion of the procedures, data structures, and algorithms should also be presented. Each source code file should include comments to help the reader and maintainer understand the code.

2.2.2.3 External requirements

The categories related to external requirements are given below with details.

2.2.2.3.1 Interoperability requirements

No, any hardware must connect to the system to do functions. The system may run on different types of devices such as smartphones, personal computers, and tablets. The system does not share information with other systems.

2.2.2.3.2 Ethical requirements

The system shall not disclose personal information. Follow professional standards when developing the system. Specifications for software will be well documented, satisfy the user requirements, and have suitable approvals. Do Adequate testing, debugging, and reviewing of software and deliver related documents.

2.2.2.3.3 Legislative requirements

The categories related to legislative requirements are given below with details.

2.2.2.3.3.1 Safety requirements

To protect the system against external attacks or failures, recovery features should be built-in to the system. The system validates data when inserted into the system. Keep all development software up-to-date. Use parameterized queries in the database to prevent SQL injections. The system should provide the least errors to users of the system. It should ensure that system protects the user information such as passwords. Should not deliver complete exception details. The system should provide only relevant information to the user. Validation of user information should be done on both the browser side and server side. The user should use complex passwords when login into the system. Use website security tools to test the system security.

2.2.2.3.3.2 Privacy requirements

The system shall not disclose personal information and sensitive information to unauthorized users or the public. The information is not collected for any advertising programs. The system collects data of users to create exercise programs and diet plans.

2.3 Review of Similar Systems

Most fitness management systems face detail gathering problems. To make an exercise program, a consultant needs lots of details about the client. Most systems do not include those features. The system should store old program records to help make new ones. And there are no calculators integrated with the system. As well as when making an exercise

program, the consultant may forget some exercise names. Many of the systems do not provide those features. Below are some gym management systems.

- My PT Hub (My PT Hub, 2021) – My PT Hub is a gym management system that connects trainers and clients online. Fitness professionals, personal trainers, nutritionists can use this system. The system can use on android and iOS platforms. The system has built-in templates to manage training programs. As well as nutrition plans also for each member of the fitness center.it has an online scheduling function to meet with a client. The client has access to update their appointment schedules. The managers can customize their system as they wish. Trainers can monitor clients' activities and clients can share their experiences with clients. In addition, custom forms, barcode scanning, push notifications, recurring bookings, video tutorials, and client notes are available with the system. Following technologies are used to develop this product. The mobile app is developed by Apache Cordova and AngularJS. It is an ionic framework for easy native development. As well as AngularJS was also used to develop the My PT Hub application. The interfaces of My PT Hub are referring in Appendix B (Figure B.1 and Figure B.2)

- Gym Master (GymMaster, 2021) – Gym Master is a web-based fitness center membership management system. It has an administrative task management feature, scheduling and billing components, membership management features. As well as automated advertising, point of sale system, door access controls, online bookings have been integrated with the system. The door access control feature is used to manage user access physically to the gym. Manage can restrict time to maintain a visitor log. The system can send notifications as email or SMS. The interfaces of Gym Master are referring in Appendix B (Figure B.3 and Figure B.4)

- An iOS application with Firebase for gym membership management (iOS gym membership management system, 2019) – this system also has a booking fitness class, view own trainer profile to communicate. The manager can update the client's payment detail on the client's profile page. As well as the client can pay the membership fee via a payment gateway. The system has a feature to direct debits and sign up with a personal trainer and make an appointment to talk with staff. The system sets goals to achieve for clients. The main goal of the system is to motivate users to come to the gym regularly.

Then they can achieve the system-provided goals. They can earn badges. The achievements can share on social media. System prompt notifications to motivate members to do workouts. When clients do exercise with the team. They can set their friendly team. Following technologies are used to develop this product. Firebase is used as a systems back-end database, System architecture is model–view–controller (MVC), all coding is implemented in Xcode IDE. This is a native environment for iOS development. Cocoa Touch frameworks, the system is erected with 'swift' programming language. Cocoa Pods are used to reuse the libraries. The interfaces of an iOS application with firebase for gym membership management are referring in Appendix B (Figure B.5)

- Guiding training in gym application for beginners based on android mobile (Guiding Training in Gym Application for Beginner Based on Android Mobile, 2016) – the Goal of this system is to optimize the workout and diet program mechanism among beginners in the fitness center. The system provides a detailed explanation of exercises. Provide diet program with suitable to exercise program. Following technologies are used to develop this product. Android, Android Studio, SQLite, Java, XML, adobe CorelDraw to design the interfaces. The interfaces of guiding training in gym application for beginner based on android mobile is referring in Appendix B (Figure B.6 and Figure B.7)

Table 2.1 shows the comparison of alternative designs. The four systems mentioned above are compared with the proposed system.

Table 2.1 comparison of alternative designs

Criteria	My PT Hub	Gym Master	iOS membership management system	Guiding training application	Proposed system
Login and registration	Yes	Yes	Yes	Yes	Yes
Obtain all the fitness-related details of a client	No	No	No	No	Yes
Manage payment	No	Yes	Yes	No	Yes
Manage appointments	Yes	Yes	No	No	Yes

Create an exercise program and diet plan	Yes	No	No	Yes	Yes
Manage client	Yes	Yes	Yes	No	Yes
Search clients	No	Yes	Yes	No	Yes
Manage consultant	No	No	Yes	No	Yes
Calculate BMI and 1RM	No	No	No	Yes	Yes
Separate dashboards for users	Yes	No	Yes	No	Yes
Manage web posts	No	No	No	No	Yes
Send an email	No	Yes	No	No	Yes
Generate static reports	Yes	Yes	No	No	Yes
Generate dynamic reports	No	No	No	Yes	Yes
Web or mobile	Mobile	Web	Mobile	Mobile	Yes
Responsiveness	No	Yes	No	No	Yes

2.4 Related Technologies

This section shows the related technologies used to develop related systems. The consideration of related systems helps to develop a good system. There were many related used technologies in past. Web development technologies are occasionally changing very faster. When developing a system, it is essential to care about trends, techniques, and methods that are popular. When building a web application, it usually takes attention to performance enhancement. The technologies of similar systems are shown below.

- HTML (HTML, 2021) – HTML is Hypertext Markup Language. This language is used to show designed documents in a web browser. CSS and JavaScript have added technologies to HTML. Web browsers take HTML files from the server and show them in a browser. HTML shows the arrangement of a web page.
- CSS (CSS - Tutorials point, 2021) - CSS mean Cascading Style Sheets. CSS is used to make web pages smart. The appearance of a web page can handle using CSS. Using CSS, developers can easily manage fonts, colors, layout, and responsiveness.
- JS (JavaScript - Overview - Tutorials point, 2021)- JavaScript used as a portion of website development. Implementations do in client-side. It makes dynamic web pages. JS has object-oriented capabilities. Photo slideshows, animated graphics, autocomplete text suggestions, interactive forms are implemented using JS.

- Python (Python. Executive Summary, 2021) – Python is a high-level language. It has dynamic semantics and advanced data structures. Python is good for rapid application development. Python can use application components. Python decreases maintenance costs because it can learn easily, readability is high. Python modules can easily reuse. It supports modules and packages. Many platforms have python interpreters and libraries. Then source Code can run without changing the platform. And the code can be freely distributed.
- (Web Development, 2021) Server-side web applications can develop using python. Usually, web systems develop according to frameworks. Python is usually not used in web browsers. PYJS projects can execute using JS and python. Python is executed on the server-side.
- Bootstrap (Bootstrap Beginners Guide, 2021) - The bootstrap framework is an important tool to develop the front-end. Bootstrap has HTML, CSS, and JavaScript reusable codes. Bootstrap is used as a front-end development framework. Front-end designers use this to develop responsive websites quickly. It has grid system components. A grid can show as columns and rows. Images can be resized based on device display size. Example components are progress bars, navigation bars, thumbnails, and dropdowns.
- WordPress (WordPress, 2021) – WordPress is a content management system. It is open-source. Without knowledge of programming, this tool is used to easily manage significant parts of a website. PHP and MySQL databases are used to write WordPress. E-commerce websites, E-learning websites, and Business websites are some of examples WordPress.
- Angular.js (AngularJS, 2021) – AngularJS is used for web development, it is a well structural framework. Mainly HTML template language is used to develop the system. It is an extended HTML version. AngularJS has a feature to redact the gap between documents centric HTML. AngularJS clarifies the browser novel syntax over make call directives.
- MongoDB (MongoDB from WhatIs.com, 2021) – MongoDB is NoSQL type database. It is document-oriented and works with high-volume data. MongoDB creates collections and documents to store data. It has key-value pairs, it is a basic unit of data in MongoDB. MongoDB can work with various forms of data. Most big data applications use MongoDB to efficiently store and retrieve data. Load balancing, ad-hoc queries, server-side JavaScript execution are some of the features of MongoDB.

- MySQL (MySQL 2021) – MySQL is open-source database management system. It means MySQL can store data in well-structured tables. A picture gallery, a simple shopping list, and business network data are examples of the database. MySQL Server is used to grant access, process data, and store. DBMS does one of the main roles in software development. Users can create suitable table-type databases. The tables can connect. In a relational database, large data does not place in one table. Because of the table structure placed in a physical file, the file accessing speed goes high. When programming with MySQL and another language it is very flexible to programming. Because it has objects like databases, tables, views, rows, and columns. Relationships can implement within two tables. This database applies rules, it can create a well-made database, and the application certainly does not see unreliable, duplicate, out-of-date, or lost data.

2.5 Related Design Strategies

There are several design strategies used to design systems. MVC architecture is commonly used software architecture in web development. Creational, behavioral, structural design patterns are also used to develop the system. There are two benefits of design patterns. Using design patterns easily resolves problems using a verified way. Design patterns allow making cohesive units with minimal coupling. It allows users to understand the system and maintenance easily. It discrete the inconsistency of the system requirements. Because of the design patterns, designers can communicate more efficiently. Developers can easily recognize the design of the design pattern when they mention the name of the design pattern.

(iOS gym membership management system, 2019) "An iOS application with firebase for a gym membership management system" is used a singleton design pattern. Singleton is a type of creational design pattern. The singleton design pattern is used when just one instance of a class must be returned, regardless of how many times the application requests it. As proposed by Apple, this pattern was used to contain all Firebase functionality. One of the benefits of using a creational is that it removes code duplication. Deprived of the mutual case, whenever the application needs to make the finished objectives, it is a necessity to request the code block in its total.

2.5.1 MVC architecture

Model-View-Controller (MVC) is a design pattern that splits an application into three primary logical components. Thus as per to distinct inner pictures of data from methods that data is visible or got from a client. Though initially developed for desktop development, MVC has been adopted as an architecture for web developments. As well as in all main programming languages. Good design of architecture is crucial. MVC design patterns can leverage patterns and frameworks. MVC help to make an app in different aspects of app logic, giving loose coupling. As well as this dividing help to handle difficulty when developing the applications. Then it gives access to a particular side of the implementation at once. Test applications make easy. This motivates users to use TDD. MVC design pattern's separation of business logic from presentation outcomes in the following benefits. Enhanced Maintainability. Because the View layer and Model layer are decoupled, can change the user interface without touching the business rules and vice-versa. The impact of changes is, therefore, minimized model reusability. It can create multiple views of the same model. For example, if an application needs to support different client device types (for example, mobile phones and tablets), it can create new views specific to each technology and reuse the same model. Development roles can be separated letting diverse members of the development team to attention on their area of expertise. Web Page designers can be responsible for the View layer and work independently from developers who can concentrate on implementing the Controller and Model layers.

2.5.2 Client-server architecture

The client-server approach is a distributed application structure that divides duties or workloads between resource or service providers, known as servers, and service requester, known as clients. The Client-Server paradigm uses a centralized system that stores all data in a single location. Cost-effectiveness necessitates lower maintenance costs, and data recovery is possible. The capacities of the Client and the Servers can be modified independently.

2.5 Summary

This chapter includes the requirement analysis and background of similar systems. Some requirement gathering methods are used to gather requirements. Sampling documents, research about tasks, site visits, observations of the work premises, opinion poll, and

interviews with the manager, consultant, and client. Requirement analysis of the manual system has been collected dividing it into functional and non-functional requirements. Use the internet to learn about similar systems that meet the selected criteria. The “Review of similar systems” topic covered a brief explanation of the similar systems and how it works. “Related technologies” topic shows what are the technologies used in that system. “Related design strategies” topic covered what are the strategies of the above systems are used.

Chapter 3 – Design

3.1 Introduction

This chapter explains the design of the proposed fitness and consultancy system and defines methodologies and techniques used to develop the proposed system. UML diagram is used to show the component's behavior of the system. UML assists in organizing, planning, and visualization of a program. It is a common notation used by software engineers. UML is a powerful and effective modeling language that can be used to describe not just object-oriented software engineering, but also application structure and behavior, as well as business processes. System architecture describes a system's structure, behavior, and additional viewpoints. As well as a design chapter shows the coding languages, frameworks, development tools, application development architecture, design techniques, and UML diagrams use to design the proposed system. A detailed description of the modules is discussed in the design chapter. The interface of the system is designed and demonstrated in the design section to show how the system flow.

3.2 System Architecture

Suitable system development Technologies should define by checking the domain and requirement for the system. The excellence of products depends on selecting suitable tools and technology. The presence of extra technical thoughts can be understood, meanwhile the proposed system of fitness consultancy application. Development time, performance, efficiency, functionality, Usability, Flexibility of the system should be well-thought-out in developing the system. To satisfy functional and non-functional requirements, it is right to recognize suitable technological methodologies.

3.2.1 Coding Language

PHP Language (PHP Introduction, 2021) - PHP is Hypertext Preprocessor. It is an open-source language. PHP codes are executed on the webserver and results show to the browser as plain HTML. PHP is free. JavaScript, CSS, HTML, PHP is the code snips include in the PHP file. PHP can do CRUD operations. As well as PHP can develop dynamic page content. PHP can work with HTML forms. User-access control can do using PHP. Figure 3.1 shows how PHP works.

Figure 3.1 How PHP works

3.2.2 Frameworks

Client-server architecture – this has a centralized server to request and receive a message from the client. The client-side device provides an interface to call the server and show the results the server returns. The server provides a clear interface to the user and the user does not need to know about the facts of the system. Client computers mean laptop, desktop, tablet pc, smartphones. Servers have large CPUs. They are extra powerful machines. When clients have special day-to-day operations, the server does it routinely. Figure 3.2 shows the client-server model of a web application. It is platform-independent because it need only a web browser.

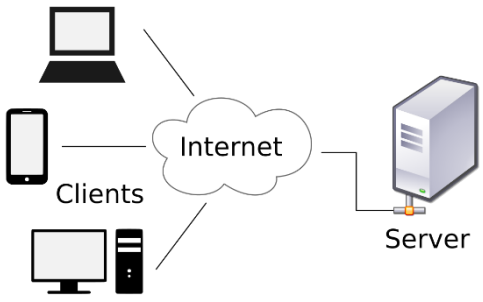

Figure 3.2 Client Server model

Bootstrap framework (Ouellette, 2021) – Bootstrap use front-end developers to manage the web front-end. It has large reusable codes written in JavaScript, CSS, and HTML. Using this framework developers & designers can speedily develop completely responsive web pages. It contained predefined grids. It can put custom breakpoints to every column. There are XM, S, M, L, and XL breaks. Images can resize according to the device screen size.

Bootstrap contains Dropdowns, Progress bars, Thumbnails, Navigation bars to easily manage web pages.

3.2.3 Development tools

- Sublime – Sublime text is used as IDE to project. Because of its simplicity, speed, ironic plugin ecosystem, the sublime text is popular. It has a developer-friendly environment. As well as it has syntax checker features.
- WAMP server – WAMP means Windows, Apache, MySQL, and PHP. WAMP server is a software stack. WAMP server creates a virtual server on PC. Mainly WAMP server is used as windows web development environment. Users can develop web systems using PHP, Apache2, and MySQL. Using PhpMyAdmin DB and tables can create manually without coding.
- MySQL – MySQL is one of the systems for relational database management. It is built on structured query language. MySQL can work on Linux, UNIX, and Windows operating systems. Most web developers use MySQL to connect DB with the web app. Therefore it can use in extensive type applications. MySQL server is the core of MySQL. Database instructions are handled from it. The client-server model is the base model of MySQL. MySQL server has many libraries embedded into it. Therefore the system can work as easily in a networked environment.
- PHPMyAdmin – this is open-source software. It can execute SQL statements. To implement the process, it needs web browser developer tools. It provides various debugging methods. When the problems come to the system, It can handle them.

3.2.4 Application Development Architecture

Client-server architecture – this has a centralized server to request and receive a message from the client. The client-side device provides an interface to call the server and show the results the server returns. The server provides a clear interface to the user and the user does not need to know about the facts of the system. Client computers mean laptop, desktop, tablet pc, smartphones. Servers have large CPUs. They are extra powerful machines. When clients have special day-to-day operations, the server does it routinely. It is platform-independent because it need only a web browser. Figure 3.3 shows the client-server architecture.

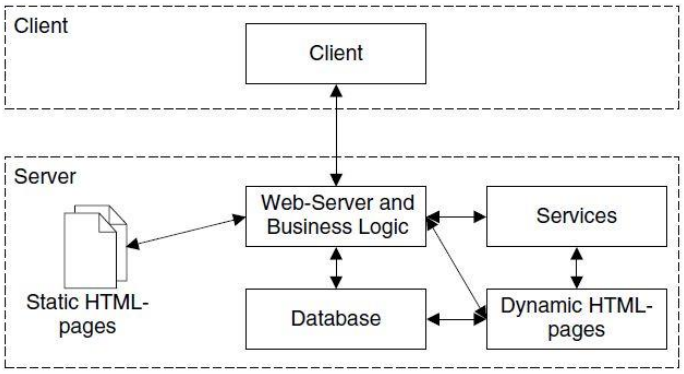

Figure 3.3 Client server architecture

3.2.5 Design Technique

There are several design methodologies are available. Level-oriented design, data flow-oriented design, data structure-oriented design, object-oriented design is some of them. To design the proposed system object-oriented design technique is chosen. Because it has a reusable facility, recursive facility, design benefits facility, maintainable facility. The unified modeling language is now the standard modeling language for object-oriented modeling. Object models in unified modeling language are simple to understand for developers. Diagrams also make it simple for developers to write code. Use case diagrams, class diagrams, sequence diagrams are used to design the proposed systems.

3.3 UML diagrams

The main purpose of the UML diagram is to show a well understandable, maintainable, or documentable system. It uses actions, roles, actors, artifacts, and classes.

(Diagrams, 2021) Draw.io software is open source which used to design UML diagrams and charts. Draw.io can create a custom layout or automatic layout. It has many shapes and elements. It has a Drag-and-drop feature. It makes a diagram or chart look good.

3.3.1 Use case diagram

Use case diagrams use to show the user's interaction with the proposed system. The simplest way to illustrate the user's interaction is to use a case diagram. And it can show the specifications of use cases. If there are many users available to the system, the use case can

represent it easily and can show numerous ways that they interact with the system. For easiness, the use case diagrams were depicted in modules in accord with the actors of the system. Figure 3.4 shows the high-level view of the use case diagram.

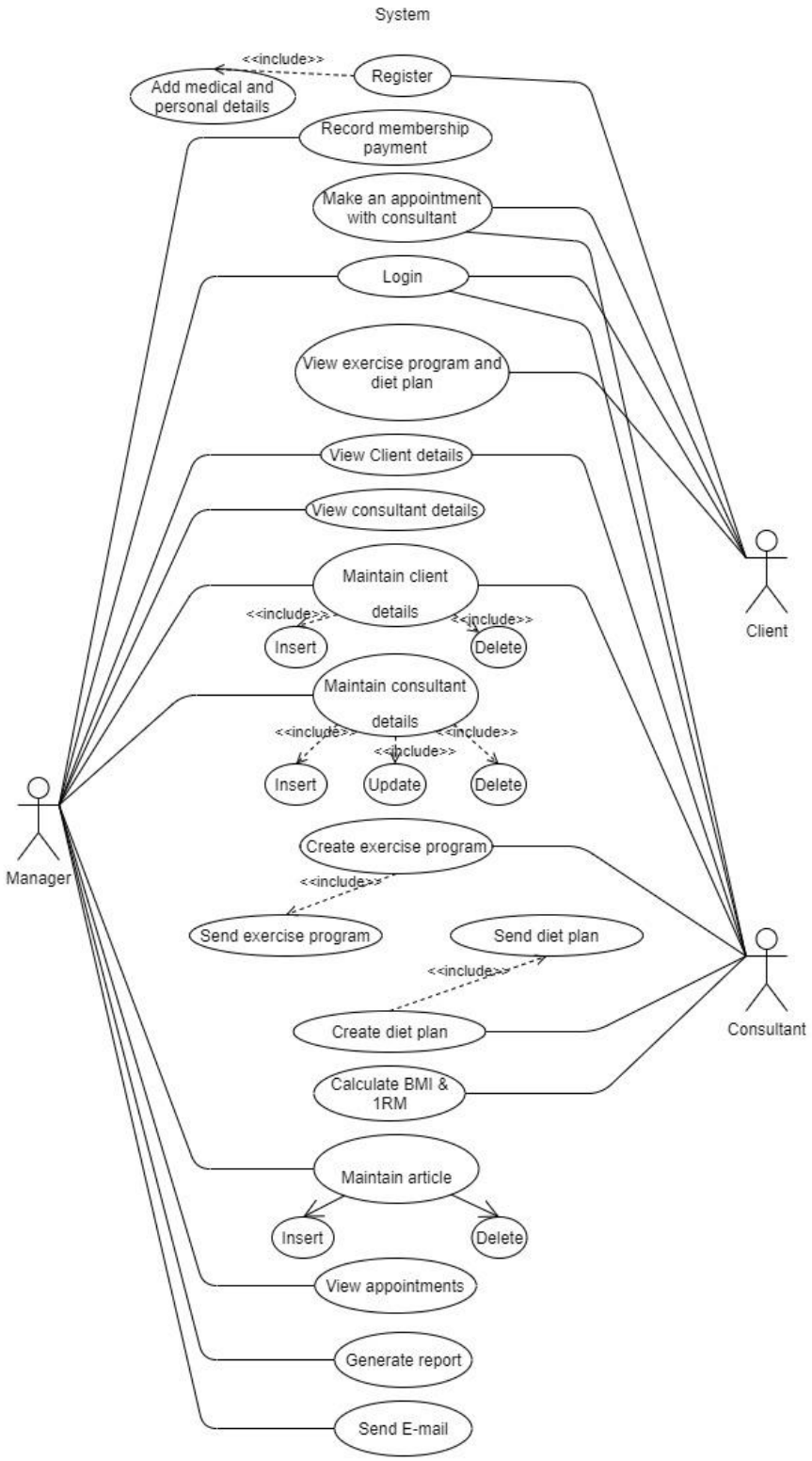

Figure 3.4 High-level use case diagram (Proposed system)

3.3.2 Extended use case narratives

The extended use case narratives are referring in Appendix C.

3.3.3 Class diagram

The class diagram shows what type of objects are found in the system and show what kinds of relationships exist between them. It represents attributes, services of class, and constraints. It can connect among objects. Figure 3.5 shows the class diagram of the fitness consultancy application.

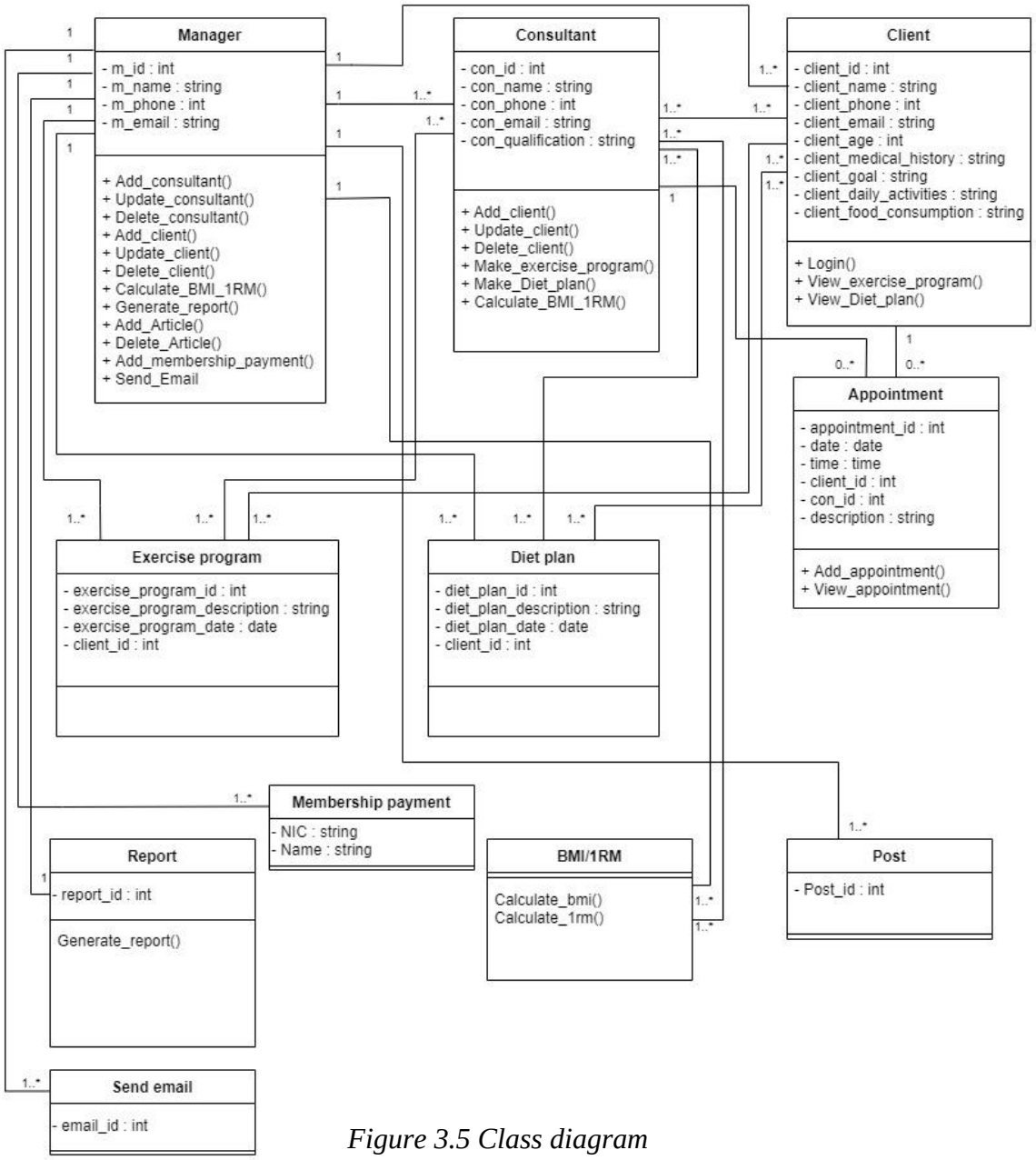

Figure 3.5 Class diagram

3.3.4 Sequence diagrams

The sequence diagram shows how system objects are organized in a time sequence. And shows how objects engage in scenarios. And show messages exchanged order. And objects transmit the functionality of the scenario. The sequence diagrams are referring in Appendix C.

3.3.5 ER diagram

ER model describes the interrelated factors of awareness in a particular domain. ER model shows particular relationship's entity types and how does it work among others. ER diagrams support to clarification of the logical structure of databases. ER model assists in scientifically analyzing data to generate a well-made DB. The ER Model shows entities and the relationships among them. Figure 3.6 shows the entity-relationship diagram of the fitness consultancy application.

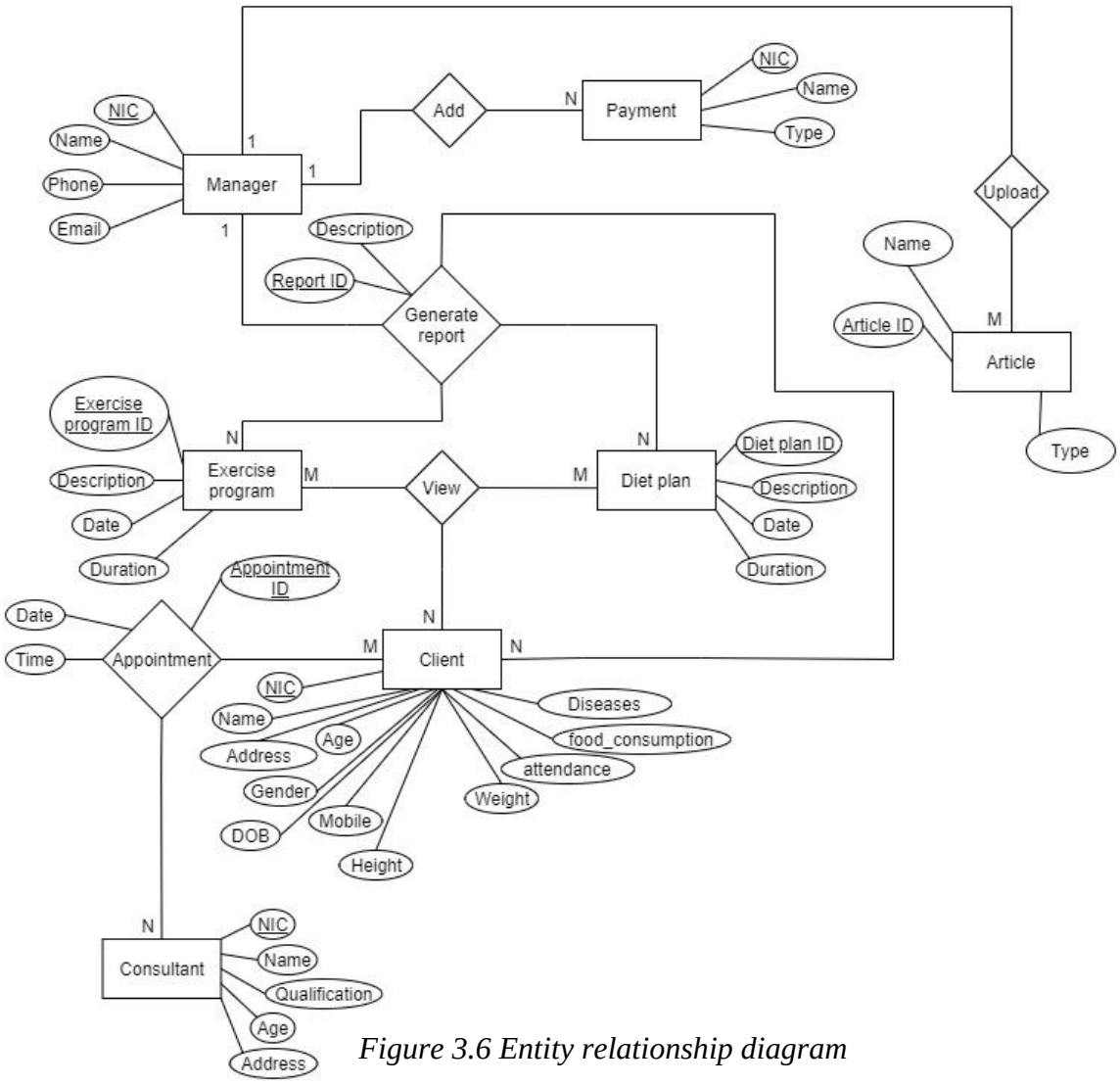

Figure 3.6 Entity relationship diagram

3.4 User interface

This section shows the main user interfaces that have been designed. It represents the structure of the system interface. The user interface is the way through which a user interacts with the system.

3.4.1 Login

To identification and authentication, the user, the login page is used in web development. When login username and password should use to log into the system. It controls unauthorized access to confidential data. The system has three users. Different users have different dashboards after login. When a login fails (for example, the username and password do not match a user account), the user is denied access. Figure 3.7 shows the client login page.

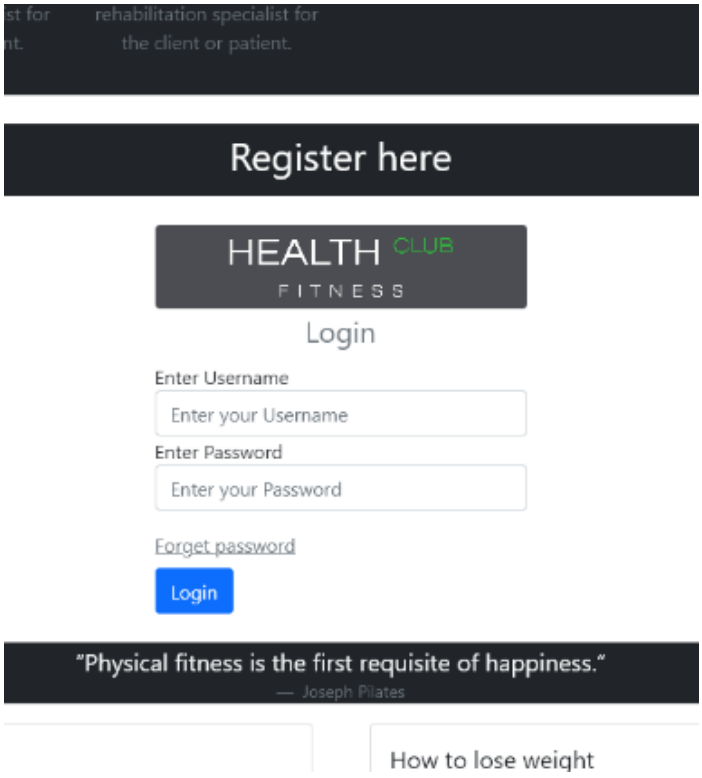

Figure 3.7 Login interface

3.4.2 Client profile

User details are shown in the table. Lest sideshow attributes and the right side show values. It can easily recognize by the user. As well as use bootstrap grid use to show specific functions of the system. Figure 3.8 shows the designed client UI. The client can view the exercise program and diet plan and make an appointment. The client can select the specific consultant, date, time to make an appointment.

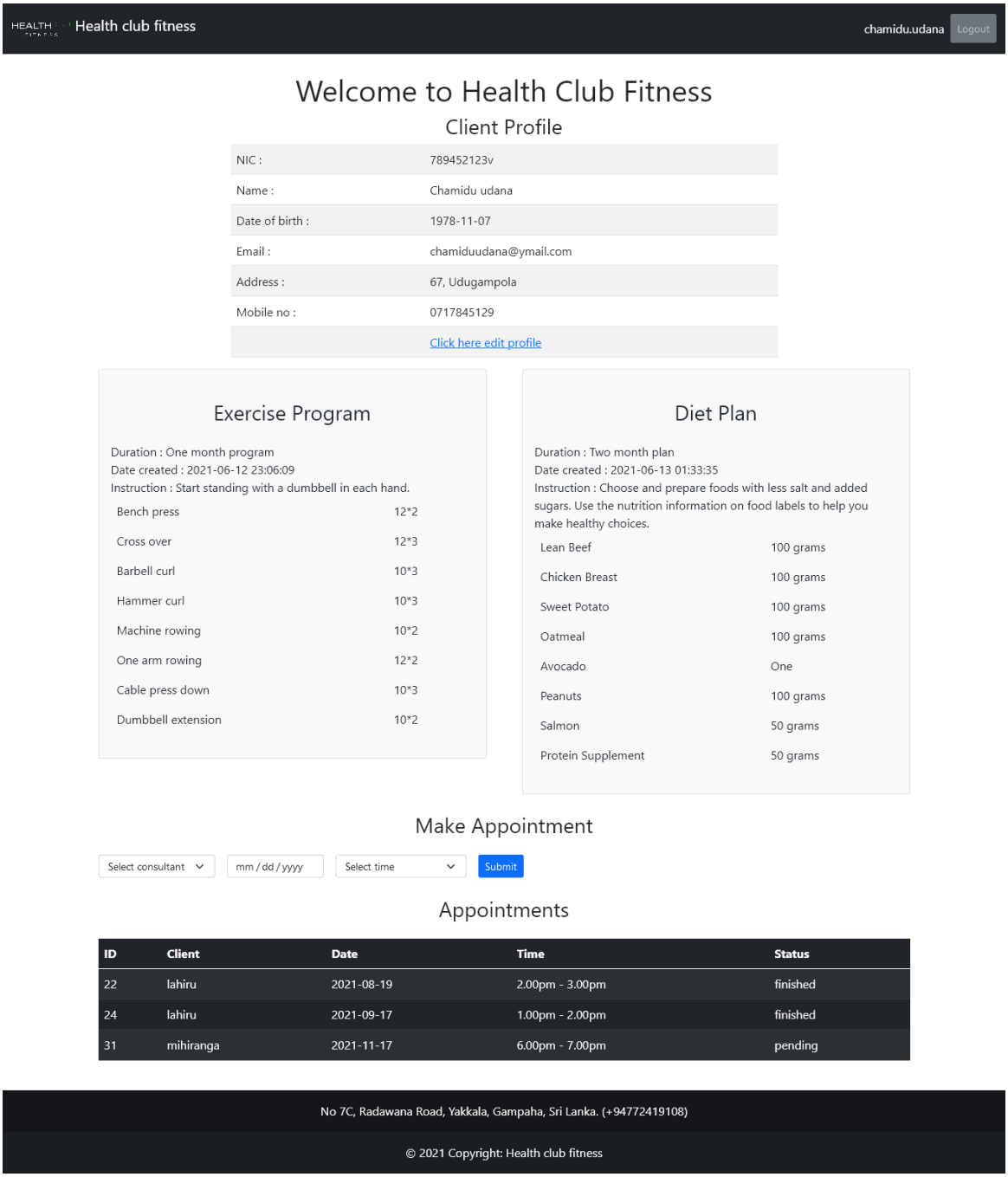

Figure 3.8 Client interface

3.4.3 View client details

JavaScript data table used to show client details. It helps to search for specific clients easily. Specific action buttons are shown in different colors. Users can log out on every page. Then no need to go specific page to log out. Figure 3.9 shows the designed interface of the view client details function. Client details can view only by consultant and manager.

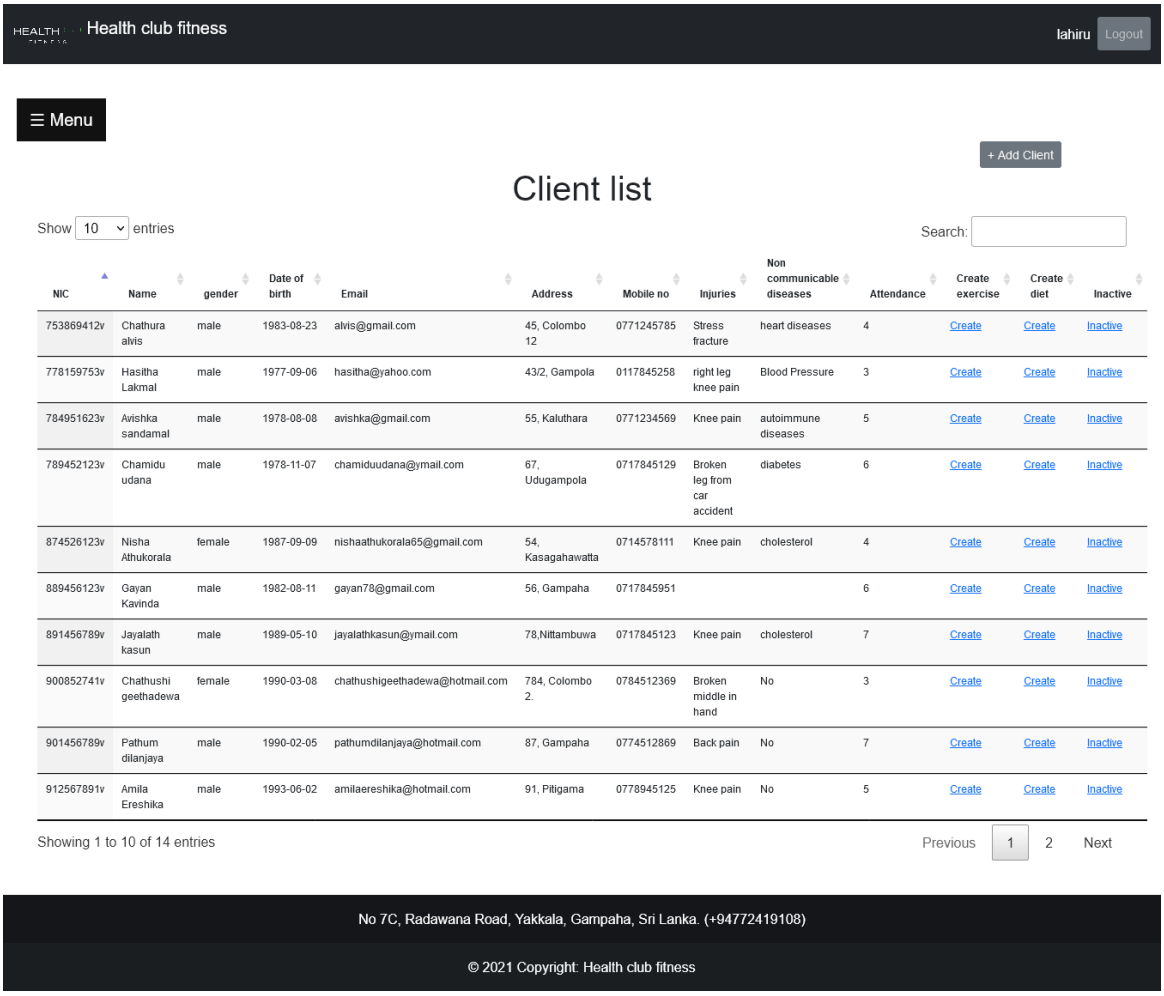

Figure 3.9 View client details interface

3.4.4 Create an exercise program

Figure 3.10 shows the designed interface of make exercise program function. An exercise program can create only by the consultant. The buttons are created according to the UI/UX principles. Use the HTML option list to find predefined exercises and duration. The consultant can select relevant exercises using the drop-down menu. When clicking the

"view the last exercise program" button, the system shows the last exercise program of the client. As well as 1RM calculation can perform in this section.

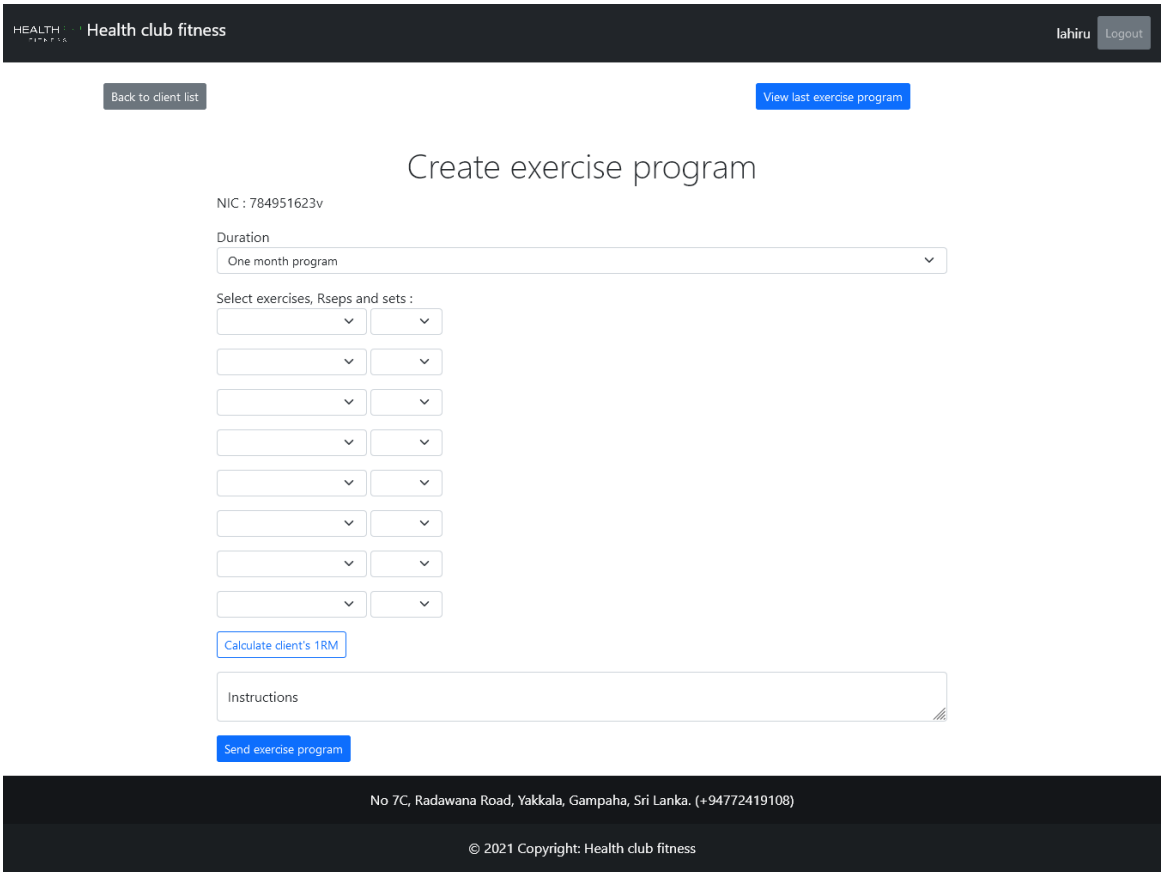

Figure 3.10 Create exercise program interface

3.4.5 Create a diet plan

Figure 3.11 shows the designed interface of the create diet plan. A Diet plan can create only by a manager or consultant. The consultant can select relevant foods using the drop-down menu. When clicking the "view last diet plan" button, the system shows the last diet plan of the client. As well as BMI calculator calculate clients BMI automatically. The buttons are created according to the UI/UX principles. Use HTML option list to find predefined foods and duration.

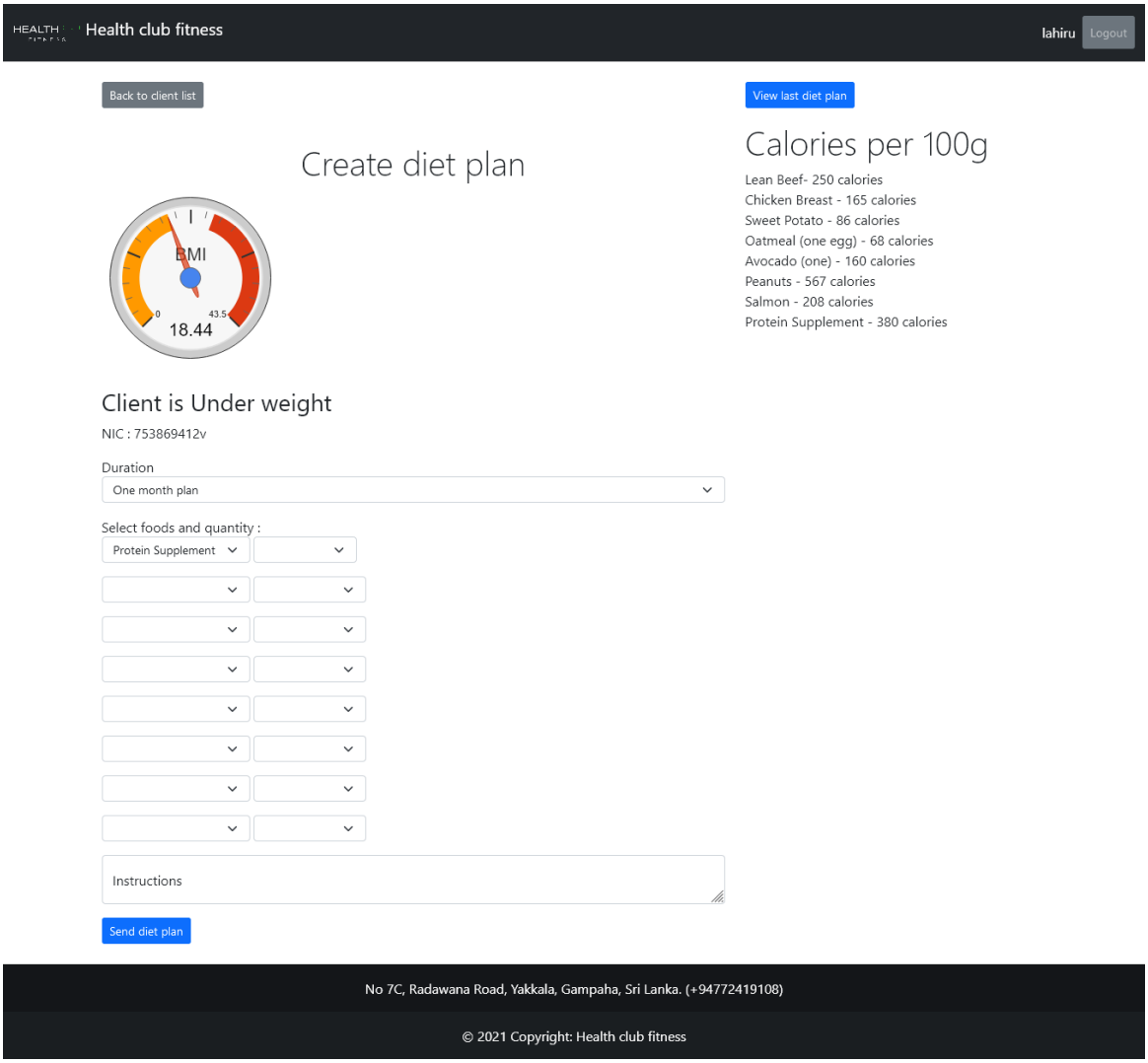

Figure 3.11 Create diet plan interface

3.4.6 Make an appointment with a consultant

Figure 3.12 shows the designed interface of the "makes an appointment with the consultant". System display consultant, date, and time to select by the client. To select the date, use HTML form data type, and to select the time use HTML time components. The user is restricted to selecting previous dates of the calendar. The client can see the appointment status of the appointments.

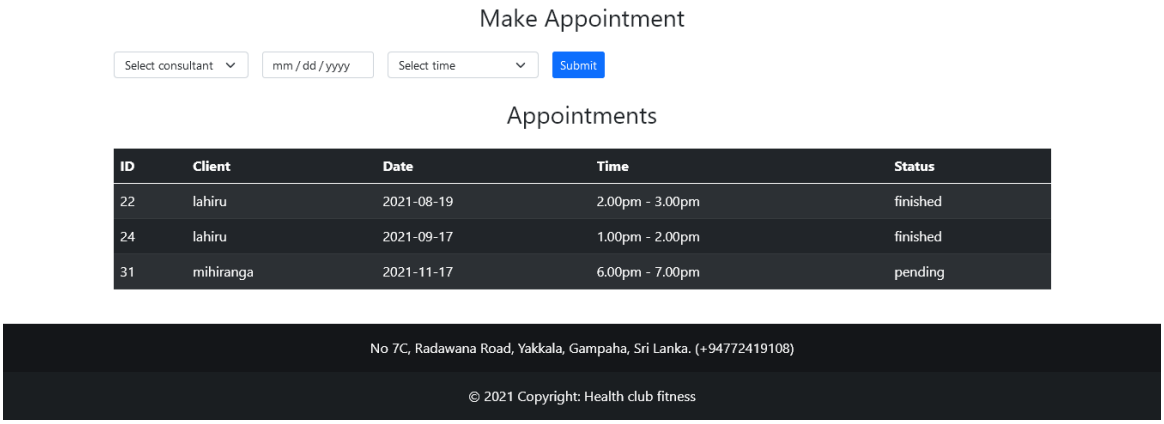

Figure 3.12 Make an appointment with consultant interface

3.4.7 Personal training appointment list

Figure 3.13 shows the designed interface of the personal training appointment list. It has three categories (pending, accepted, and all appointments). The consultant can accept or reject the client's appointment. All appointment details are shown in the JavaScript data table. Specific action buttons are shown in different colors.

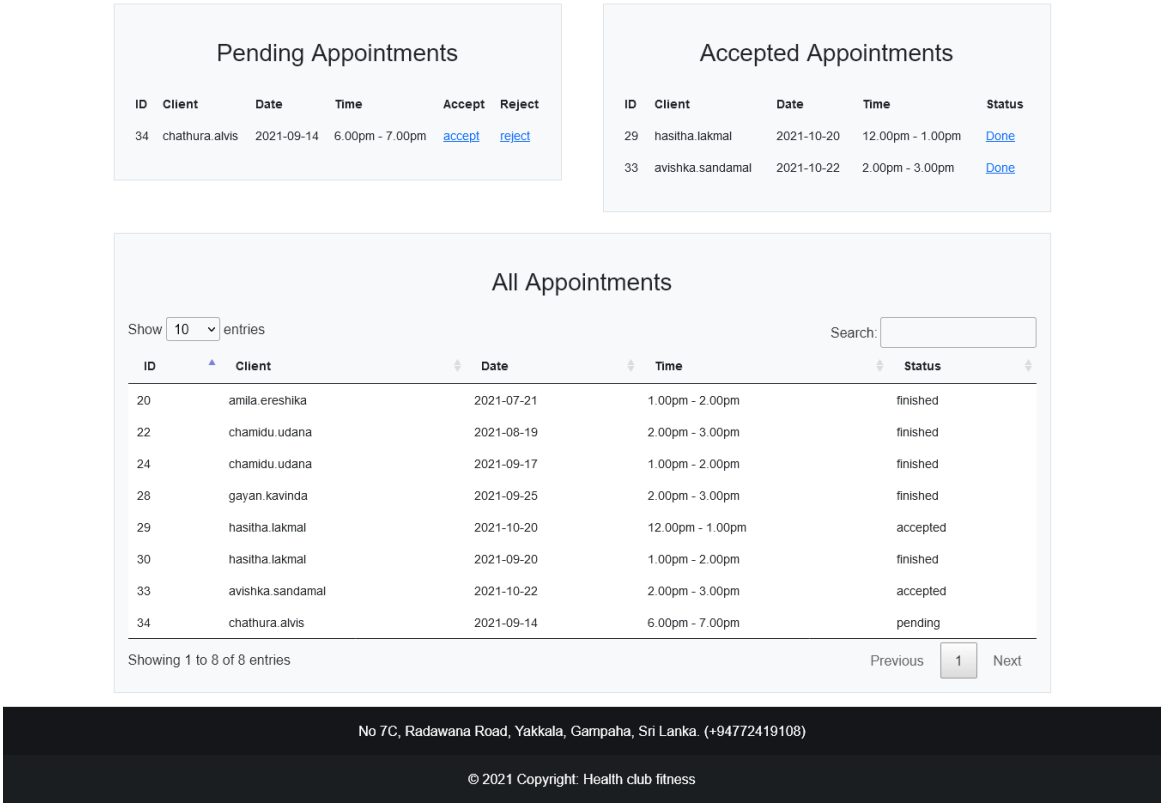

Figure 3.13 Personal training appointment list interface

3.4.8 Maintain article

Figure 3.14 shows the designed interface function of "maintain article". There are two types of article categories (article and advertisement). Only the manager can upload and delete the article. When uploading the article to the database, the uploaded article list is shown below the upload section. The article list is shown using a JavaScript data table. Specific action buttons are shown in different colors.

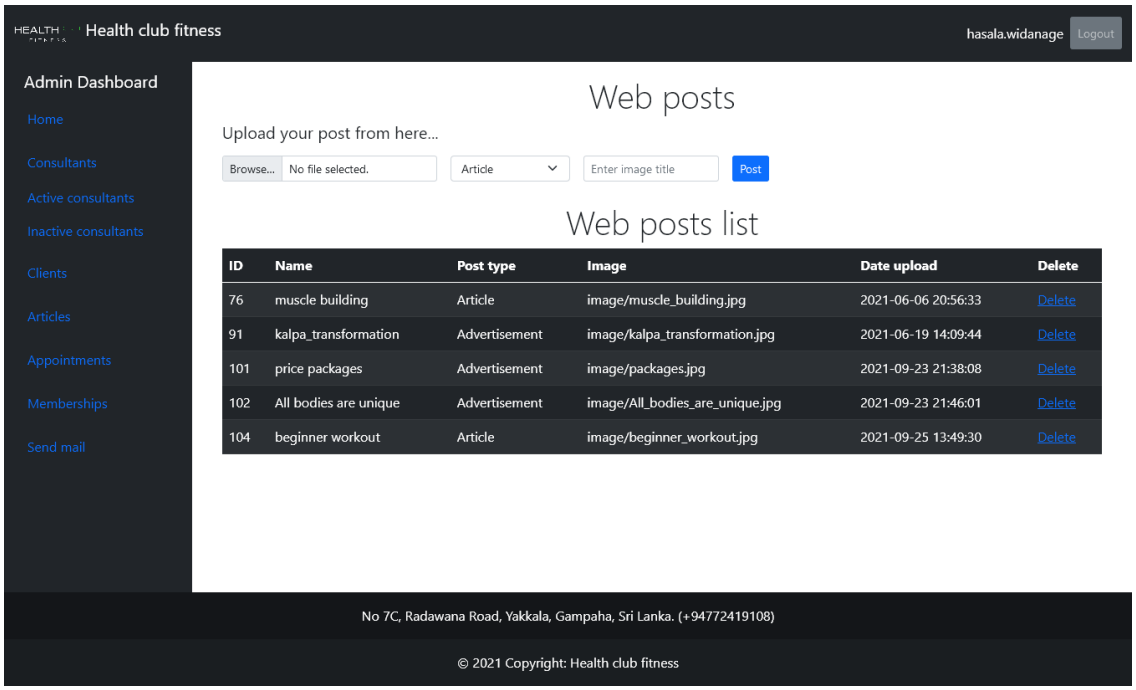

Figure 3.14 Maintain article interface

3.4.9 Manager profile

Figure 3.15 shows the designed interface of "manager Profile". The manager manages client, manage consultant, manage articles, generate static and dynamic reports, send an email, add membership fees, and view appointment details are the functions of manager can do. Some functions are shown in the bootstrap side menu bar. When the user clicks the link inside the menu, sends the user to the relevant page. Static reports can download using one click.

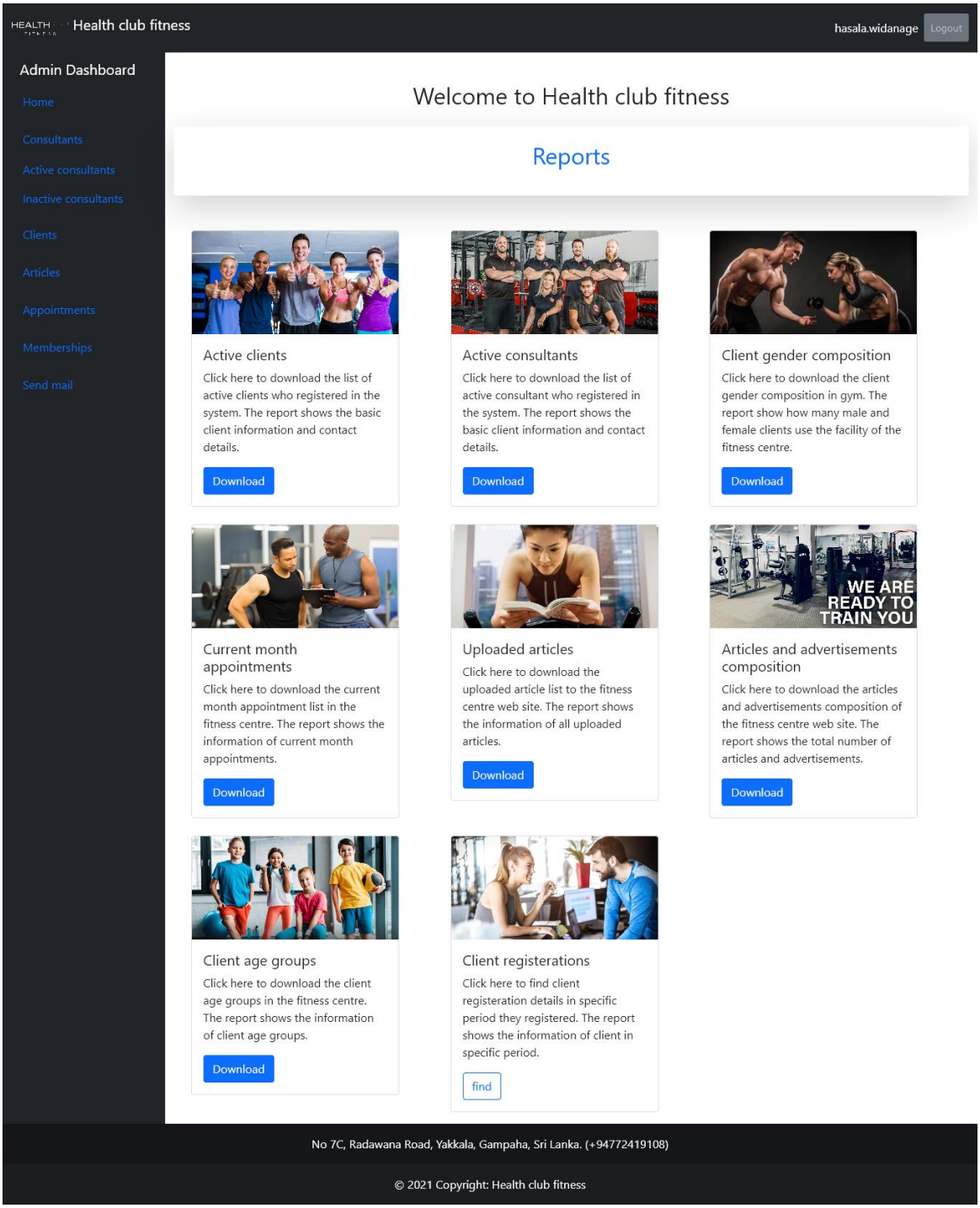

Figure 3.15 Manager Profile interface

3.4.10 Add membership Payment

Registration payment makes only once when the client initially registers with the fitness center. Without adding the membership payment, the client cannot register to the system.

Figure 3.16 shows the interface for adding the membership payment. Admin should enter NIC, name, and payment type.

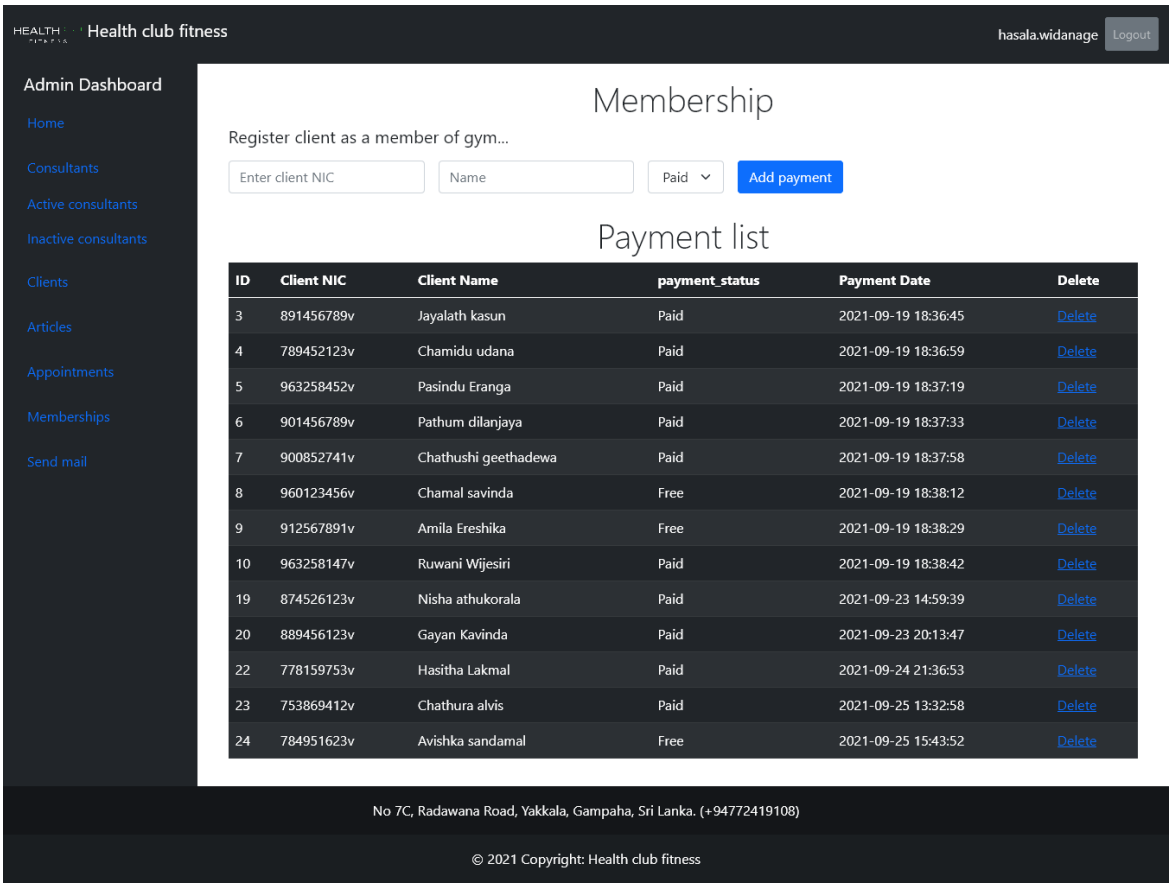

Figure 3.16 Membership payment interface

3.4.11 Send an email

An email is an important tool of corporate communication since it is quick, inexpensive, accessible, and simple to copy. Following figure 3.17 shows the interface of sending an email. Admin should enter the relevant email address, subject, and message to send the email. The buttons and input fields are developed according to the UI/UX principles.

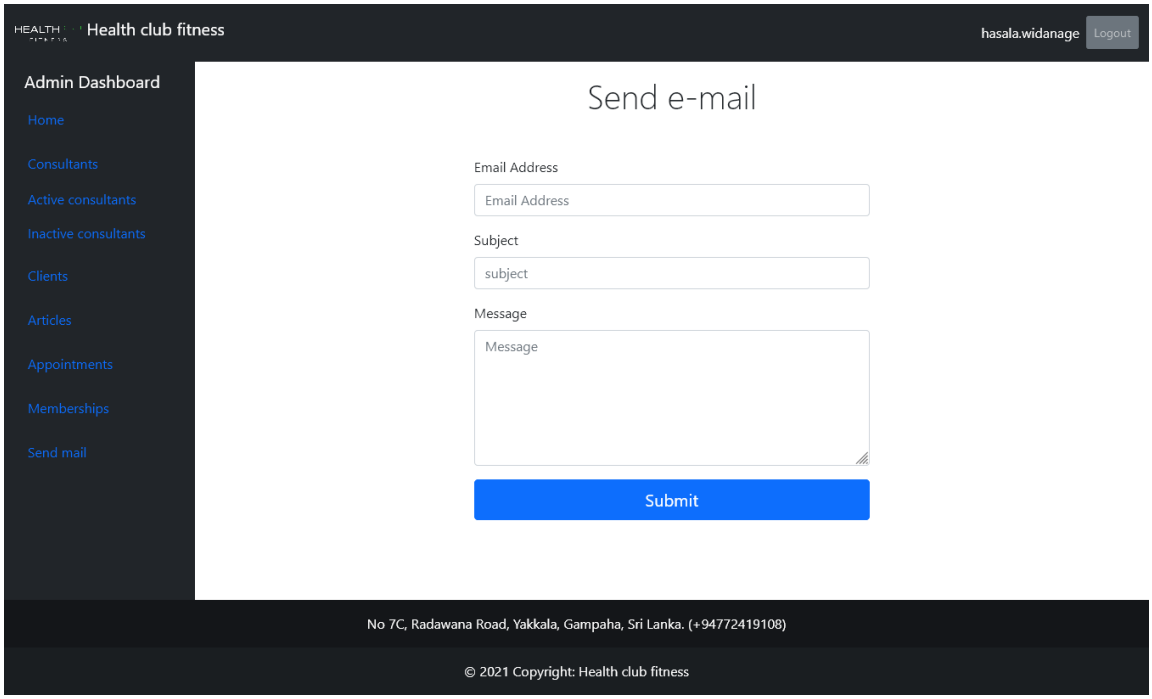

Figure 3.17 Interface of send an email

3.5 Summary

This chapter includes the design architecture of the system. This shows which coding language is used to develop the system. And show what are the frameworks, development tools, and application development architecture and design techniques. After research about the technologies selected the most appropriate tools and techniques. User interfaces are designed according to the user interface and user experience principles. The user login page is designed and developed for three users (manager, consultant, and client). When the user login, the system check user has already existed in related database tables. The above three users have the same dashboards with different features. Bootstrap framework is used to design colorful and attractive interfaces. Use Case diagrams are designed to show what the system needs to do. A Class diagram is designed to show the relationships between objects. Sequence diagrams are designed to show what way the objects interrelate over time. An entity-relationship model is designed to describe the interrelated factors of the system. The system is developing according to the above designs.

Chapter 4 – Implementation

4.1 Implementation Details

This section shows the implementation details up to what has been done so far. The implementation sector clarifies the software development process of the current system. As well as it shows the development environments and why those environments are used to develop the system, advantages of selection of that environments. The module structure represents the structure of the system. It shows how modules interact with one another. Some of the implement codes are explained in the code explanation section. It has the details of how the code is implemented and what are the user interfaces. It demonstrates how to implement the code in the selected environment, what languages and frameworks are used.

4.2 Software development process

The web-based application for fitness consultancy systems is developed according to the waterfall development process. The Waterfall Development process is a rigid linear model comprised of sequential phases (requirements analysis, software design, implement the solution, testing, and maintenance of the software) each focusing on a particular goal. Before the following phase should begin, each phase must be completed completely. The overall development is easy in waterfall development.

The waterfall model is basic and easy to understand, and it highly utilized methodology. The waterfall model saves a large amount of time by processing and completing all steps at the same time. Each phase does have its own set of deliverables and evaluation process. Under this form of the software process, the requirements are well understood and well defined. It also performs well enough for smaller-scale projects. By doing the testing that corresponds to the defined scenarios in the previous functional definition easily.

4.3 Implementation environment

The development environment is set up on the local computer. Users and clients cannot see whatever is done in the development environment except the developer show them. The following shows the hardware and software information of the development environment.

Hardware information

- Processor: Intel(R) Core(TM) i7-6500U CPU @ 2.50GHz (4 CPUs), ~2.6GHz
- Memory: 8192MB RAM
- HDD: 1TB
- Display Devices: Intel(R) HD Graphics 520 (Dedicated Memory: 128 MB), AMD Radeon R5 M335 (Dedicated Memory: 4087 MB)

Software information

- Operating System: Windows 10 Pro 64-bit (10.0, Build 19041)
- DirectX Version: DirectX 12
- Sublime text version: 3.2.2
- Web browser: Firefox version – 80.0.1 (64-bit)
- Local server: WAMP server 3.1.9

- (Wojciakowski, 2021) Windows operating system is used as a development environment. There is much software that can assist in programming. Microsoft Windows is compatible with different development tools like the WAMP server, sublime text, and visual studio code. Java, Python, and other emulators porting tools or cross-platform languages and most new programs are released for all OSes. But Windows is still the most important OS that gets the first beta working, bug fixes, and more attention. Windows is also more optimized to run on hardware compared to Linux.
- (Sublime Text - the sophisticated text editor for code, markup, and prose, 2021) Sublime text is used as IDE to project. Because of its simplicity, speed, ironic plugin ecosystem, the sublime text is popular. It has a developer-friendly environment. As well as it has syntax checker features. Syntax description information automatically provides a project-wide index for each class, method, and function. Make ten changes at the same time. Various choices allow the user to modify any code lines at once. Simply rename variables and a faster file manipulator. Command place can save rarely used functionality, like updating the syntax, indentation settings, and sorting. With typing a few keys, the user can easily search the factors, then no need to navigate menus and remember the shortcut keys.
- (Firefox Developer Tools MDN, 2021) Firefox web browser is used to debug the program. Firefox has developer tools. It is a web development toolset. HTML, JavaScript, CSS codes can be debugged and examined using Firefox. View and edit page content and layout. Firefox page inspector show numerous features of the page including animations, box model, and grid layouts. Firefox has a network monitor, web

console, JavaScript debugger, responsive design method, debugging the browser. The developer tools are attached to a web page or app.

- (Finley, 2021) Certain frontend designs are done with the assistance of GitHub. Developers GitHub uses as a code hosting platform. GitHub is used for version control. As well as collaboration. GitHub is a code repository hosting company. GitHub has many features related to coding. GitHub provides web-based GUI, command-line tool, access control, teamwork features.

- Stack overflow is used to solve some coding issues. There are an extensive diversity of tutorials, guides, books, etc. available for that type of thing. Using stack overflow users can ask and answer problems. It has a membership facility and an active participation facility. Users can vote answers and the answers can move up and down using voting. Then the user can find the suitable answer from the answer pool.

Client Environment should have the following Minimum Hardware and Software needs to use the proposed system.

For desktop users,

- Intel Core I3 Processor
- 8 GB RAM
- 500 MB HDD
- Network access and card support 100Mbps
- Windows 10 OS latest version 64bit
- The latest version of Firefox
- The latest version of Chrome

For mobile users,

- OS: Android 5.0.1 (Lollipop) or above
- Chipset: Qualcomm APQ8064T Snapdragon 600
- CPU: Quad-core 1.9 GHz Krait 300
- Internal memory: 16GB
- RAM: 2 GB
- Network: Wi-Fi, GSM, HSPA, LTE

4.4 Module structure

The modules are units of implementation. Modules represent the structure of the system. As well as elements set of itself, as it stands in software and hardware. It is the root of modules. And this demonstrates how bigger modules decomposed into minor modules. As well as shows inherit by an instance of relations between modules. The units can identify as UI of modules, resources, procedures. The proposed domain name is www.healthclubfitness.com. There are several pages after the root page. The pages are performing different types of functionalities. Most of the modules are connected to the MYSQL database. The module uses several data entered by users and consultants. Figure 4.1 shows the module structure.

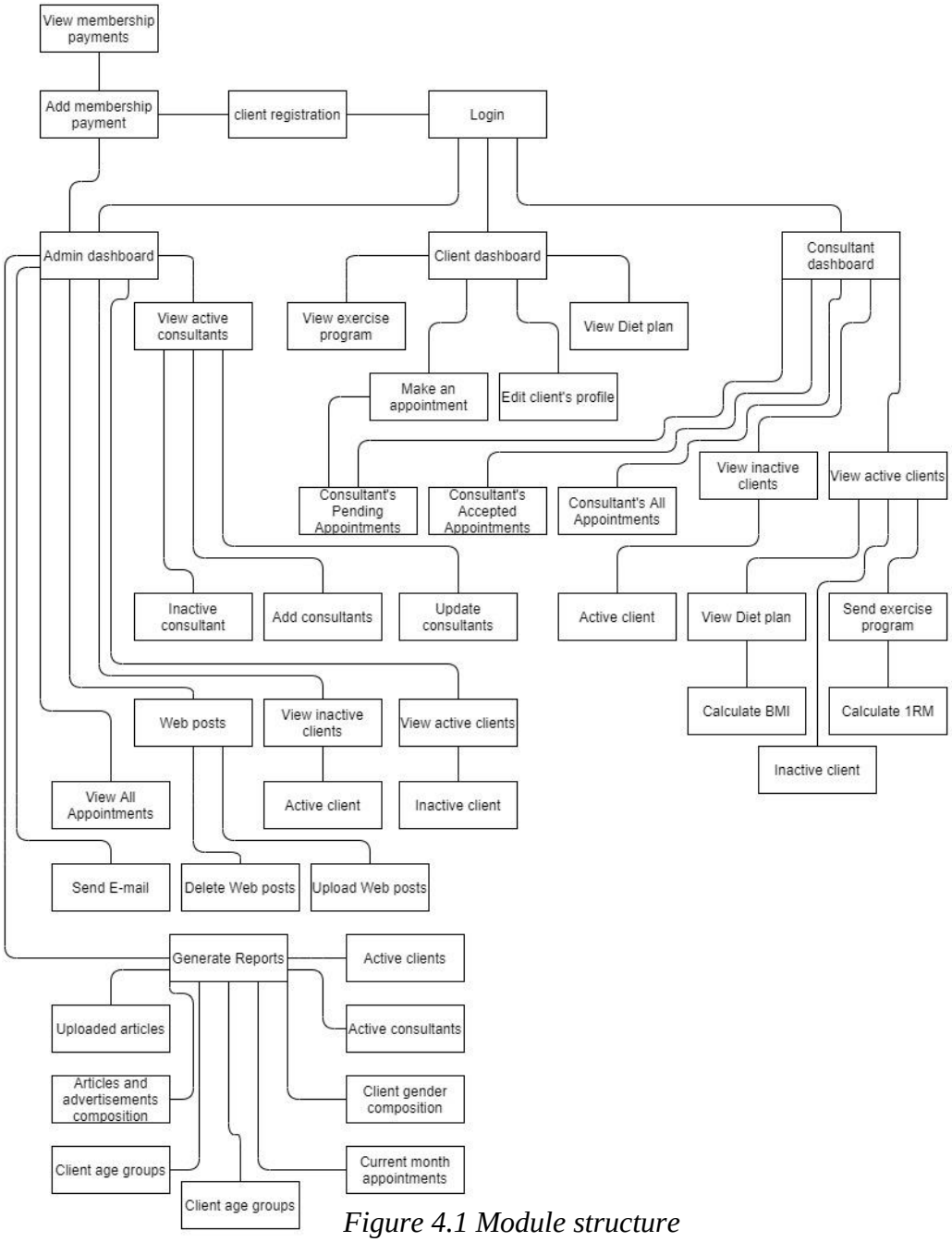

Figure 4.1 Module structure

4.5 Code explanations

Currently, the system is under development. The system is developed in a windows environment. PHP and SQL are used as back-end languages. The frontend is designed using HTML, CSS, and JavaScript. Bootstrap is used to design frontend attractively. As an IDE, sublime text 3 is used to code the system. Some development issues have come when developing the modules. There was solve browsing the internet. The following shows several developed modules and descriptions of them.

- Login – Manager, consultant, the client can be logged in to the fitness center system. Before login consultant, the client should already be registered. The system displays the login page. The user should enter the username and password click the login button if the username and password are matched user retrieve it to their dashboard. The login page is designed to respond to mobile phones also. When the user browses the fitness center web using mobile, the user can see as follow. Bootstrap is used to design the login with responsiveness to mobile devices. The HTML form element is used to create interactive controls for web-based forms to accept data from the user. Extensive diversity of types of input data and control widgets are available, depending on device and user.

  PHP is used to develop the backend of the system. In the login form, the system gets login information from the user. When entering the username and password correctly, the first login page connected to the client, manager, consultant database. Add a select query to search and check correct username and password is available in the client, manager, and consultant database. If username and password are matched, the user retrieves them to their dashboard. If the username and password do not match, it shows an error message. Id user forgot the password and when the user click “forgot password”, the system shows the “forgot_password.php” page. Figure 4.2 shows the PHP login form code.

```
<form action="" method = "post">

  <div class="form-group">
  <img src="image/logo/HealthClubLogo2.jpg" width="310" height="70" class="rounded" alt="...">
  </div>


  <legend class="text-secondary text-center">Login</legend>

    <div class="form-group">
        <label for="inputUserName" class="control-label">Enter Username</label>
        <div class="col-md">
          <input type="text" class="form-control form-control-md" id="username" placeholder="Enter your U
        </div>
    </div>

    <div class="form-group">
        <label for="inputPassword" class="control-label">Enter Password</label>
        <div class="col-md">
          <input type="password" class="form-control form-control-md" id="password" placeholder="Enter yo
        </div>
    </div>

    <p style="color:red;"> <?php echo $message; ?> </p>

    <div class="form-group">
        <div class="col-md">
          <a href="forget_password.php" class="link-secondary">Forget password</a>
        </div>
    </div>

    <div class="mt-2 col-md-12"></div> <!-- Margin between divs -->

    <div class="form-group">
        <div class="col-md">
          <button type="submit" value="submit" name = "submit" class="btn btn-primary">Login</button>
        </div>
    </div>

</form>
```

Figure 4.2 PHP login form

- Client register - The client can register at the fitness center using a web browser. Client input username number. If a username number does not exist in the system, the client can input relevant details into the system. The client clicks the submit button of the form and proceeds with the task. First should establish the connection between web page and database. The hostname is localhost, the username is the root, password no given, and the database name is HealthClubDB. And next, should create a connection, after creating the connection, should check the connection. After establishing the connection should provide the user inputs to the connection PHP file. First name, last name, gender, date of birth, address, mobile no, email, weight, height, injuries, no spread diseases, attend a date, daily food consumption, password, and confirm password. Next, create an SQL query to insert data into the database. Figure 4.5 shows the registration form database connection. Aster successfully inserts data to database, user retrieve to user dashboard. Figure 4.6 shows the password validation of the registration form. Figure 4.3 registration form desktop view and figure 4.4 registration form mobile view.

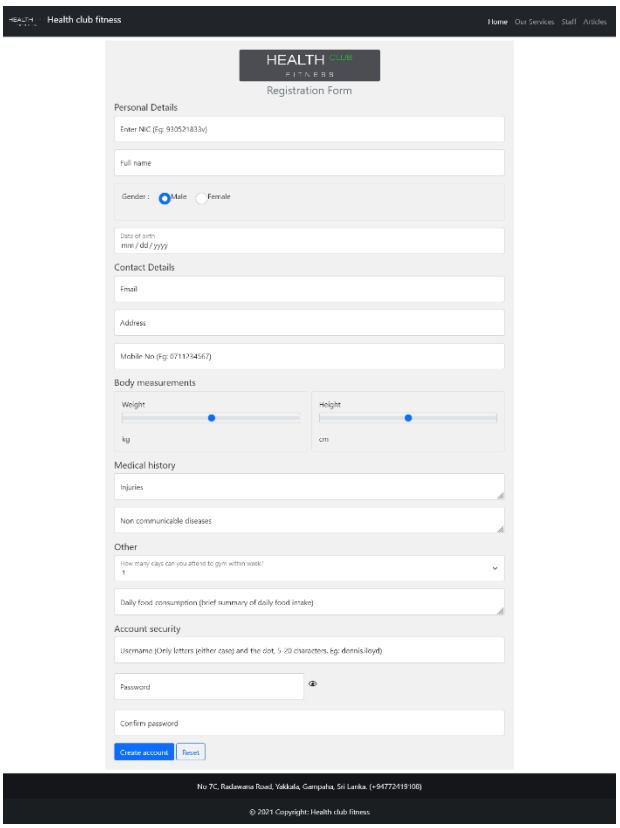

Figure 4.3 Registration form in desktop view

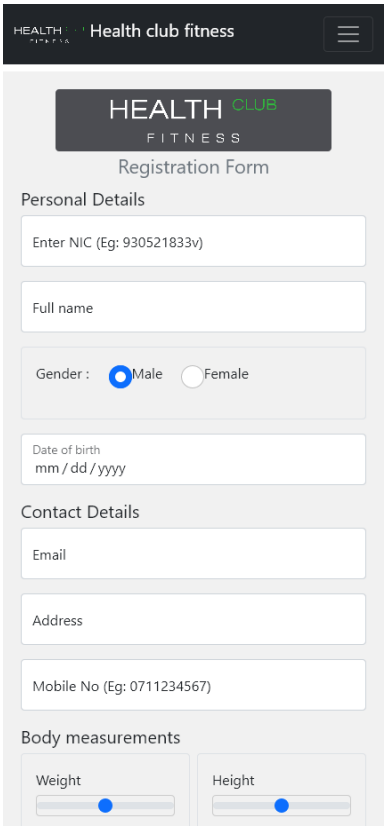

Figure 4.4 Registration form in mobile view

wamp64 > www > HealthClubFitnessCentre > client_registrationform.php > ...

```php
//get gate from form

if(isset($_POST['submit']))
{
  $nic = $_POST["nic"];
  $name = $_POST["name"];
  $gender = $_POST["gender"];
  $dob = $_POST["dob"];
  $email = $_POST["email"];
  $address = $_POST["address"];
  $mobile_no = $_POST["mobile_no"];
  $weight = $_POST["weight"];
  $height = $_POST["height"];
  $injuries = $_POST["injuries"];
  $non_spread_diseases = $_POST["non_spread_diseases"];
  $attendance = $_POST["attendance"];
  $food_consumption = $_POST["food_consumption"];
  $client_username = $_POST["client_username"];
  $password = $_POST["password"];
  $role = $_POST["role"];


  //save data in client table
  $sql = "INSERT INTO client (nic,name,gender,dob,email,address,mobile_no,weight,height,injuries,non_spread_diseases,at

  $query = mysqli_query($conn, $sql);

  if($query){
    //Give access to lagin
    $sql2 = "INSERT INTO login (nic,username,password,role) VALUES('$nic','$client_username','$password','$role')";
    $result = mysqli_query($conn, $sql2);

    header('location: registration_success.php');
  }
  else{
    //if error
    $message = " user already exists ! Registration Failed. Please Try again !";
    echo "<script type='text/javascript'>alert('$message');</script>";
  }
```

Figure 4.5 Registration form database connection

```
<!-- check password and confirmPassword is same -->
<script type="text/javascript">
    function validateForm() {
        var password = document.getElementById("password").value;
        var confirmPassword = document.getElementById("confirm_password").value;
        if (password != confirmPassword) {
            alert("Passwords do not match.");
            return false;
        }
        return true;
    }
</script>
```

Figure 4.6 Password validation

- Check username and password are in the database – this PHP code segment is used to check the user is a valid user when login in. It confirms that the data that the system getting is correct and valid to store or process. Get username and password from SQL database and check its variables. If condition used to show two conditions. When username and password match, the user can log in to the user's dashboard, if not error message is shown to the user. The error message show as "the username or password is incorrect". Figure 4.7 shows the source code to check username and password are in the database.

```
session_start();

    $message="";
    $role="";

    if (isset($_POST['submit'])){
        $username = $_POST['username'];
        $password = $_POST['password'];

        $query = "SELECT * FROM login WHERE username='$username' AND password='$password' AND deletion_indicator is NULL";
        $result = mysqli_query($conn,$query);

        if (mysqli_num_rows($result) > 0)
        {
          while($row = mysqli_fetch_assoc($result))
          {
              if($row["role"] == "admin")
              {
                $_SESSION['AdminUser'] = $row["username"];
                header('Location: admin_dashboard.php');
```

Figure 4.7 Check username and password are in the database

- Generate the Body mass index of the client - BMI value support in creating a diet plan. Therefore it automatically generates when consultants come to create an exercise program. Body Mass Index is calculated via an individual's height and weight. The BMI formula is as follows,

  BMI = kg/m^2 the kg is an individual's weight in kilograms. The m^2 is body height in meters squared. When a BMI of 25 or above is overweight, it is not good, the healthy

range of the BMI is 18.5 to 24.9. So usually above BMI calculation is applies to adults 18-65 years old. The output is shown as a gauge. Then the consultant easily identifies the BMI. Figure 4.8 shows the code snippet of the BMI calculation.

```
<?php
$w= $weight['weight'];
$h= $height['height'];

$bmi = number_format((float)($w/($h*$h))*10000,2, '.', '');

if ($bmi <= 18.5) {
$output = "Under weight";
}
else if ($bmi > 18.5 AND $bmi<=24.9 ) {
$output = "Normal weight";
}
else if ($bmi > 24.9 AND $bmi<=29.9) {
$output = "Over weight";
}
else if ($bmi > 30.0) {
$output = "Obese weight";
}

?>

<script type="text/javascript">
    google.charts.load('current', {'packages':['gauge']});
    google.charts.setOnLoadCallback(drawGauge);

    var gaugeOptions = {min: 0, max: 43.5,
      yellowFrom: 0, yellowTo: 18.5,
      redFrom: 25, redTo: 43.5,
      minorTicks: 5

};
    var gauge;

    function drawGauge() {
      gaugeData = new google.visualization.DataTable();
      gaugeData.addColumn('number', 'BMI');

      gaugeData.addRows(3);
      gaugeData.setCell(0, 0,<?php echo $bmi; ?>);


      gauge = new google.visualization.Gauge(document.getElementById('gauge_div'));
      gauge.draw(gaugeData, gaugeOptions);
    }

  </script>
```

Figure 4.8 BMI calculation code snippet

- Calculate 1RM of the client - Max's weight can lift at one repetition of exercise by a person. A calculated value for assisting to create an exercise program. The consultant should input the max weight (kg) of the client can lift for a single repetition and input how many repetitions for lift. 1RM can calculate using the following formulas. For an individual's upper body, should discovery the heaviest weight gym member can lift 4-6 times and set it into the following equation. (4.6RM X 1.1307) + 0.6998. As an example, when the client can perform 5 reps of 60kg weight, so when to insert into the above

formula, (60 x 1.1307) + 0.6998, the client can lift 68.5kg. The lower body formula is a little bit different. Using that formula, (4-6RM x 1.09703) + 14.2546. 1RM training can be able to select the correct capacity and intensity when the training at to suit client fitness goals. Figure 4.9 shows the 1RM calculation code snippet.

```
<script type="text/javascript">
    function CalculationForm() {
        var weight = document.getElementById("weight").value;
        var reps = document.getElementById("reps").value;

        oneRepMax = Math.round((100 * weight) / (101.3 - (2.67123 * reps)));

        document.getElementById("result").innerHTML = oneRepMax ;
    }
</script>
```

Figure 4.9 1RM calculation code snippet

- Display client availability - When the manager check statistic of the client registration. The manager can view the total registered client of the fitness center. As well as counting the active member information. FPDF is used to show the above information as a PDF document. Following Figure 4.10 shows a client availability code snippet.

```
/* Instanciation of inherited class */
$pdf = new PDF();
$pdf->AliasNbPages();
$pdf->AddPage();
$pdf->SetFont('Times','',12);


$pdf->SetFont('Arial','',7);
$pdf->SetDrawColor(180,180,255);


$query=mysqli_query($con,"SELECT nic,name,gender,dob,email,address,mobile_no FROM client
WHERE deletion_indicator IS NULL ORDER BY name");
while($data=mysqli_fetch_array($query)){
    $pdf->Cell(20,5,$data['nic'],'LR',0);
    $pdf->Cell(30,5,$data['name'],'LR',0);
    $pdf->Cell(20,5,$data['gender'],'LR',0);
    $pdf->Cell(20,5,$data['dob'],'LR',0);
    $pdf->Cell(45,5,$data['email'],'LR',0);
    $pdf->Cell(40,5,$data['address'],'LR',0);
    $pdf->Cell(20,5,$data['mobile_no'],'LR',1);
}


$pdf->SetFont('Arial','I',10);
$date =  date("F j, Y");
$pdf->Cell(40,30,'Report date: '.$date);


$pdf->Output('D','Active client list.pdf');

?>
```

Figure 4.10 Check client availability code snippet

4.6 Summary

The implementation chapter shows system development details according to the user requirements. It explains major codes and module structures and shows the interaction between modules of the system. And show hardware and software implementation environment. As well as illustrate the development tools used and platform dependence.

When developing an information technology-based solution to fitness center operations, There are identified methods to develop the system. To the web solution, PHP is recognized as the best solution for developing the system.

Chapter 5 – Testing and Evaluation

5.1 Introduction

The testing and evaluation chapter shows the software testing information of the fitness consultancy system and, shows related testing types of other related applications. System testing improves quality by ensuring that the functionality of an application works as planned or as specified. Fitness consultancy application was tested several ways to find the software bugs. A bug is an error, flaw, failure, or fault in the application that causes it to make an unfitting or unexpected result, or to perform in unintended ways. Appendices D shows the test cases which are planned to demonstrate what the defects of the system are. Validating and verifying processes were done to find out business requirements and technical requirements which are suitable to the system. Testing is important to deliver a high-quality product to a client. As well as testing the system can lower the maintenance cost, increase the accuracy of the system, increase consistency and reliability, increase customer satisfaction, business reputation will high. The tests are done using artificial and actual data. Fitness consultancy application is demonstrated to the customer and the system was shown to the customer how it is worked according to the desired requirement. Figure 5.1 shows the overall user evaluation feedback of three actors of the system.

5.2 Related testing types

When running the business process online, the business is necessary to make a website that is easily accessible, more informative, and user-friendly. Therefore when checking the above features, the website should be tested correctly. Before the website goes live, the entire website should be checked before using the end-users.

- Functionality testing ensures that all functional requirements inside a web application are operational and free of technological errors. It can cover hyperlinks (outgoing links, internal links, anchor Links) are working smoothly or not, testing forms in all the pages (checks form validation work as developer expected, checking default parameters, forms are optimally formatted for good readability), validating forms in HTML or CSS (check syntax errors, readable color schemas, standard compliance), a testing database for the security (check database integrity) and so on.

- Usability testing is used to measure HCI characteristics of the system and find weaknesses of the system to correct. HCI measure how easy to learn the system. The website navigation should be easy. When using the system subjective user satisfaction is measured using the feedback form. Checked the provided information are clear and understand.
- Web server-side and application-side interface testing is prepared by confirming the system communications are working correctly. Checked the compatibility of the server with the web frontend and the database. Interface testing checked the interactions among executed servers and handle errors correctly.
- Compatibility tests ensure the website shows properly through various devices such as a mobile, laptop. The same website in different browsers will display differently.
- Performance testing is used to ensure web site works under loads. Web-based app response times at various connection speeds. When doing web load testing the site show how to manage numerous real-time user requests. As well as large data input from users. And should manage a concurrent connection to DB and full load in exact page. Web stress testing is done by giving stress to a website and checking how to react to that stress and check how to recover it.
- Usually, stress tests are done in login, sign-up pages, and input fields.
- (Web Application Testing Complete Guide, 2021) Security Testing is the most essential part of the website when storing sensitive client data. Unauthorized access should test to protect sensitive data on web pages. Without authorized user privileges restricted files should not be downloaded for unauthorized persons. As well as log-in sessions should kill when long inactivity of the user.

5.3 Test cases and results of the testing

Test Cases are a series of actions. It uses to verify the functionality of the fitness and consultancy system. The developed application follows the IEEE testing standard to do testing. Following the test cases have test descriptions, test data, precondition, and test status developed for specific test scenarios to verify developed functions are working properly. The Test Case contains specific variables and conditions, it can compare expected and actual results to check whether an application is functioning as per the requirements of the consumer. When doing Unit Testing Separate individual portions of the proposed system, as well as check whether every portion is accurate or not. A black box testing strategy is

used to test the following test cases. The test cases and results of the testing are referring in Appendix D.

5.4 User evaluation

The usability evaluation section shows how system users can learn and use the web system to obtain users' goals. Usability Evaluation shows how satisfied users are with the functionality of the system. Usability is about the effectiveness, efficiency, and overall satisfaction of users who use the system.

Mainly web-based fitness consultancy application is used by three types of users. The first user is a manager of the Health Club Fitness. The second user is the consultant of the Health Club Fitness. The third users are the clients of the Health Club Fitness. User evaluation was done using face-to-face interviewing with a user. It was done remotely. Remote testing was used to research the usage of users by screen-sharing applications like "Any desk" in their environment. The tests were around 15–30 minutes long and guided 3-5 operations. Before interviewing, the user had used the system for 15 minutes. The user evaluation forms are referring in Appendix D.

User interface review questions are a questionnaire that aims to discover the parts of development in terms of a user interface of a product based on user opinions. The questionnaire has been given to the administrator and all consultants, clients who use the system. The user overall acceptance criteria form is referring in Appendix D.

After analyzing the whole outcomes of different user responses, it can classify user satisfaction levels, according to the user experience of the system. Use an average satisfaction level for each question to plot the chart. The user evaluation template form refers to Appendix D. Figure 5.1 shows the overall user evaluation feedback results.

Satisfactory level as follows,

5 - Very much satisfactory
4 - Satisfactory
3 - Neural
2 - Unsatisfactory
1 - Very much Unsatisfactory

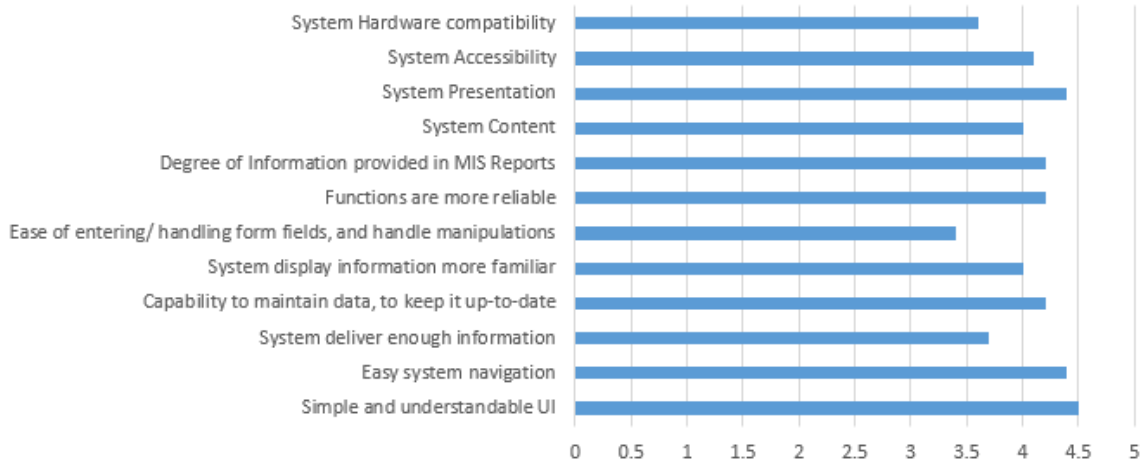

Figure 5.1 Overall user evaluation feedback

The degree of information provided in MIS reports referring in appendices A.

5.5 Summary

When evaluating the system, testing of the system functionalities was done by the main users of the web-based fitness consultancy application. The test cases were created and tested against the web system. All the functionalities of the web-based fitness consultancy application working properly as expected according to the results of the test cases. The manager, consultant, and client of the system can perform their tasks efficiently through the developed system. As well, according to the grades taken by the user feedback forms, the overall system user experience and their requirements with the system are well completed.

Chapter 6 – Conclusion

6.1 Introduction

The conclusion chapter shows the archived objectives and future development of fitness and consultancy application. As well as the chapter shows the further development of the system to advance the system functionality of the consultancy processes.

6.2 Conclusion

The Information Technology sector is developing day by day. In each sector, online service is very important. This project helps Health club Fitness center's clients and consultants who work at the gym.

The main purpose of a fitness consultancy application is to deliver efficient exercise programs and diet plans to clients, manage the activities of the gymnasium, help fitness consultants manage their operations, and give wider publicity about the Health Club Fitness center and its article series.

Because the client is coming to the fitness center with a different goal. There is much paperwork to do when clients start to attend the fitness center. The developed system overcome the most of problems the fitness center is being faced.

This system was developed to facilitate registering early and fast online before clients start to work out at the gym. It helps to manager and consultant to get a fully detailed image of the client.

The manager, consultant, and client can log in to the system. Before login to the system, the consultant and client should register to the system. Using their username and password, users can log in to their dashboard. It is easy to manage clients who registered to the system. Also, consultants. Client management is an essential factor for the fitness center. The developed system can active and inactive clients.

When making exercise programs, it depends on the client's fitness goal, health condition, and frequency. Some clients are beginners, some clients are intermediates and some clients are expertise. Because of that consultants should create a fully customized exercise program. Creating an exercise program is an essential thing in the fitness center, at the first-day consultant gives a basic exercise program to the client. After eligibility of that exercise

program to the client, consultants create the next exam program for the next one or two or three months. The developed system has the facility to make it the easier way. Many exercises details are integrated with the system, the consultant can make exercise programs easily and quickly using the developed system. 1RM calculated value is assisting to create an exercise program for a consultant.

When the consultant decides to create a diet plan, the BMI value is automatically calculated and generated on a particular diet plan page. It is very useful for a consultant to make a diet plan for a particular client's weight. The developed system has the facility to make it an easier way. Many healthy food details are integrated with the system, the consultant can make a diet plan easily and quickly using the developed system.

As well as its help consultant to send essential programs and give instructions to the client. That fitness center staff can reduce time and easily submit exercise programs and diet plans. This system allows a client to set an appointment with a consultant. It saves the time, cost, and energy of the customer to go to the gym to meet a consultant and get more instructions about exercise programs or diet plans. Now, the client can use this system anyplace they are, regardless of time.

According to the above facts, the system is an acceptable solution to manage the essential day-to-day activities in the Health club fitness center.

6.3 Further Work

Exercise programs and diet plans are essential parts of the fitness center. When making an exercise program, it needs to suggest relevant exercises considering the client's injuries. And when making a diet plan, it needs to suggest relevant foods considering the client's fitness goals and current weight. Therefore above sections needs to enhance moreover. When implementing the system, because of limited time and changing the requirements frequently, the system is delayed to implement. Therefore main functionalities are developed by giving priority. The system does not send notifications to the client's mobile phone when the consultant creates an exercise. It has to be developed.

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Appendices A - Management Reports

A.1 Introduction

This section shows the management information system of the web-based application for fitness consultancy. Management information systems support fitness center management to assess the performance of the organization and let for rapid decision making. Health club fitness management needs information to make effective decisions. Management information systems make it possible. Management information systems facilitate communication between clients and consultants in the Health club fitness organization. Managers and consultants in the organization can simply access the necessary information for day-to-day operations. Management information systems record all business transactions like client registration, new consultant recruitment details, advertisement details, fitness articles details, payment details, age groups, and gender composition in the Health club fitness center and provide meaningful output to make a decision.

A.2 Description of MIS report modules

A.2.1 Active client module

Initially, many clients come to the fitness center, then the consultant or manager tells about the details of the fitness center and what the packages they offer are. Now the system provides advertisement online coaching packages, personal training packages, annual packages, couple packages, family packages likewise. Then no need to discuss it with the client.

The client can input relevant details and register to the fitness center's system, the manager can see the list of client details. Because managers should be able to manage clients. And should be able to easily contact them. Figure A.1 shows the list of clients who registered in the system. In this case, all data are referred to using the NIC number. The page show NIC, name, date of birth, email, address, mobile no.

The manager should be able to see the list and number of clients. It is important to contact the client when needed. The report generates as a pdf.

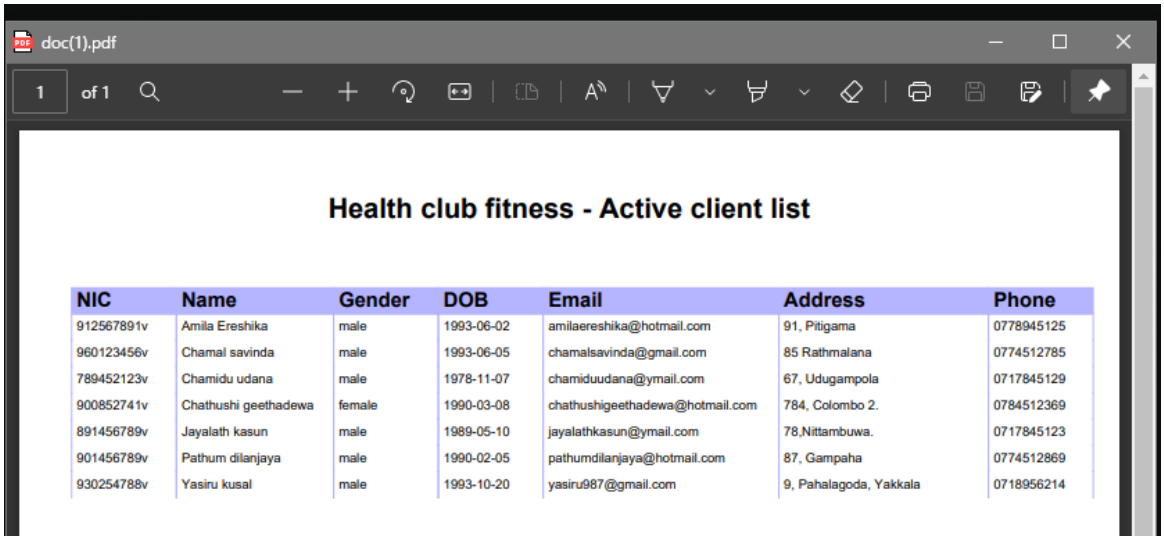


Figure A.1 List of active clients

A.2.2 Active consultant module

Health club fitness center maintains consultant details. After interviewing with the consultant, the manager input all details into the system. Web-based fitness and consultancy, applications keep current working and left consultant details. Managers have the privilege to remove consultants. The attributes of the consultant's data are NIC, name, email, address, mobile no, date of birth, qualification, experience. After the manager adds a consultant to the system, the manager may need to check active consultants, as well as the manager, may need to contact them. Therefore report is generated to show active consultants and their contact details. Following figure A.2 shows the list of active consultants and their contact details.

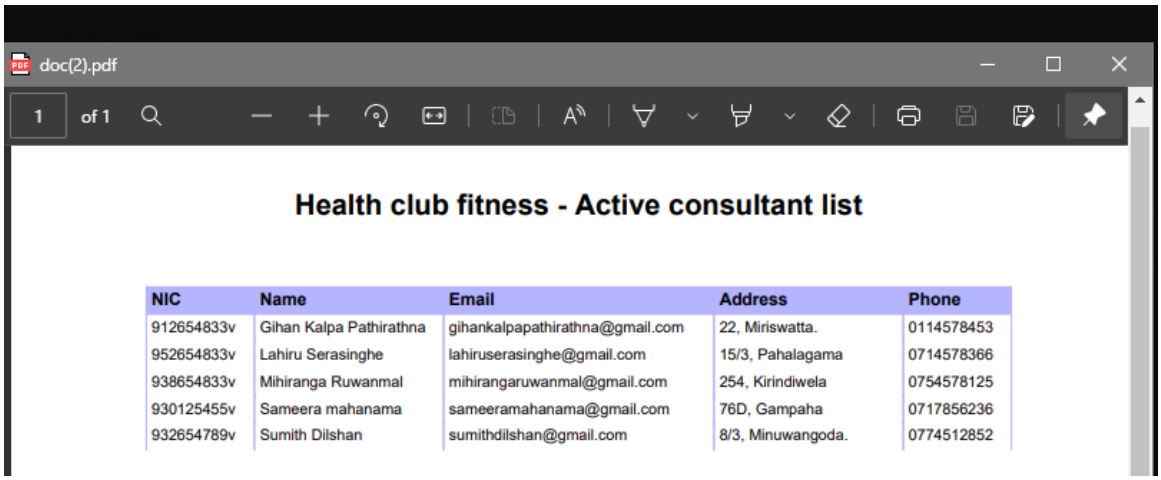


Figure A.2 list of active consultants

A.2.3 Client's gender composition

Health club fitness has both male and female clients. The exercise programs are different from gender by gender. Then some fitness center equipment also changes according to gender. Sometimes management may need to buy more equipment according to gender composition. As an example, most female clients focus on their lower body exercises like hamstring curl, Glute Bridge, walking lunge, Box jump. Then they need exercise equipment like a Glute machine, Stationary bike, Pull up assist. When the manager clicks the client gender composition button, automatically download the report as a pdf file format. Following figure A.3 shows the gender composition of the fitness center.

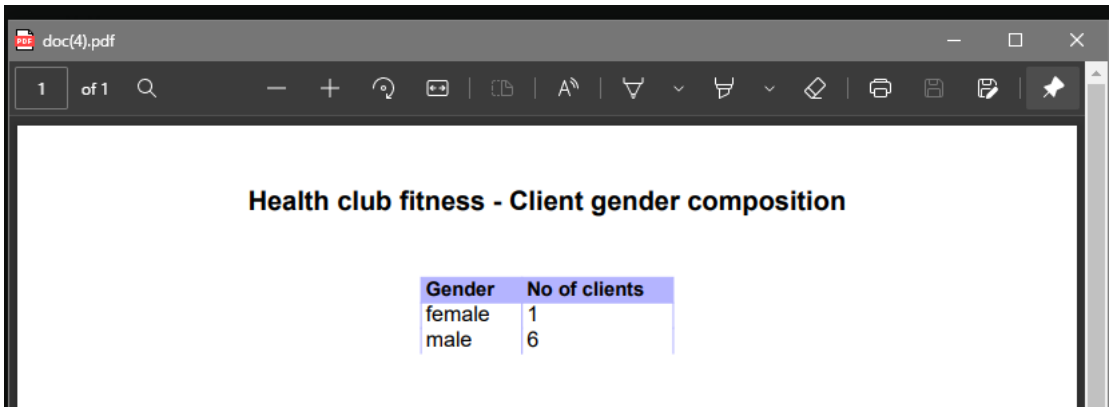


Figure A.3 Client's gender composition

A.2.4 Uploaded article and advertisements module

The manager can upload two types of posts to the web. One for advertising purposes and another one for community knowledge. When a new client visits the Health Club Fitness website. The client can read the advertisement before registering at the fitness center. It is useful to provide knowledge about packages, offers, and other marketing materials. Usually, before registering at the fitness center, the client always calls the fitness center, therefore all contact details (address, mobile number, Facebook link, Instagram link, Twitter link) are shown in pages and advertisement materials. One of the requirements is requested to develop in the system, is to check how many articles and advertisements uploaded to the website and the title list of articles.

As a summary manager can view the summary report on the report page. The report shows two types of posts and a total of a specific type of posts upload. Following figure A.4 shows

the article and advertisements composition. Figure A.5 shows the uploaded article and advertisements list.

Figure A.4 article and advertisements composition

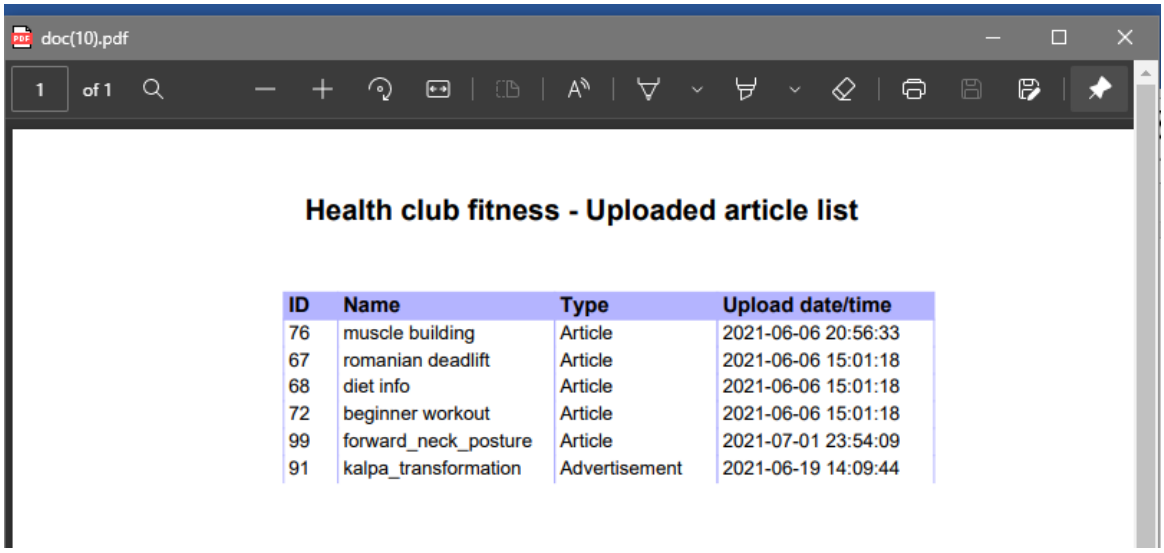


Figure A.5 uploaded article and advertisements list

A.2.5 Client age group

Fitness center management can view the age group and gender composition of the clients. The age group categories are below 20, 21-30, 31-40, 41-50, 51-60, and above 60. These are useful information for management to get knowledge about their clients. As an example, a male client's composition is higher than the female client's composition in the fitness sector. In the Health Club Fitness center also same, in the Health Club Fitness center, most of the fitness equipment is most suitable for a male. When increasing the number of female clients in the fitness center, management may be needed to buy more equipment suitable for female clients. Therefore the report shows age and gender composition in the fitness center as a line chart. Figure A.6 shows the client's age groups.

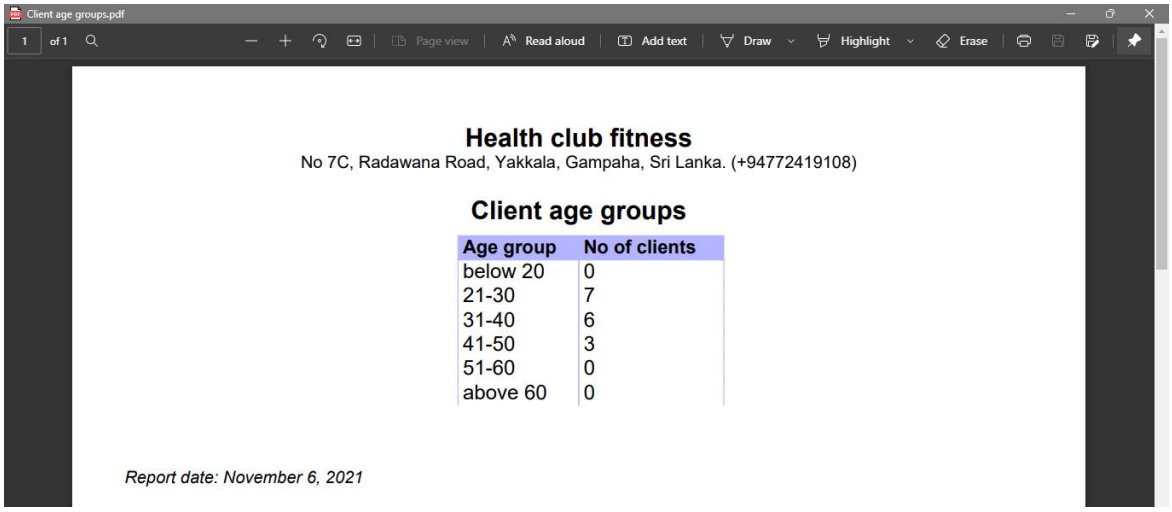


Figure A.6 Client's age groups

A.2.6 Current month appointments

When the client makes an appointment with a consultant, the Client enters the date, time, and consultant name. The request saves in the database and the manager should be able to view it as a report. It is useful to find the current month's appointment and its details. Then the manager can find how many appointments are accepted, rejected, and pending in the current month. As well as a manager can see a combination of consultant and client of the month. It is useful to find who the most popular consultant is in the current month. Following figure A.7 shows the current month appointment list.

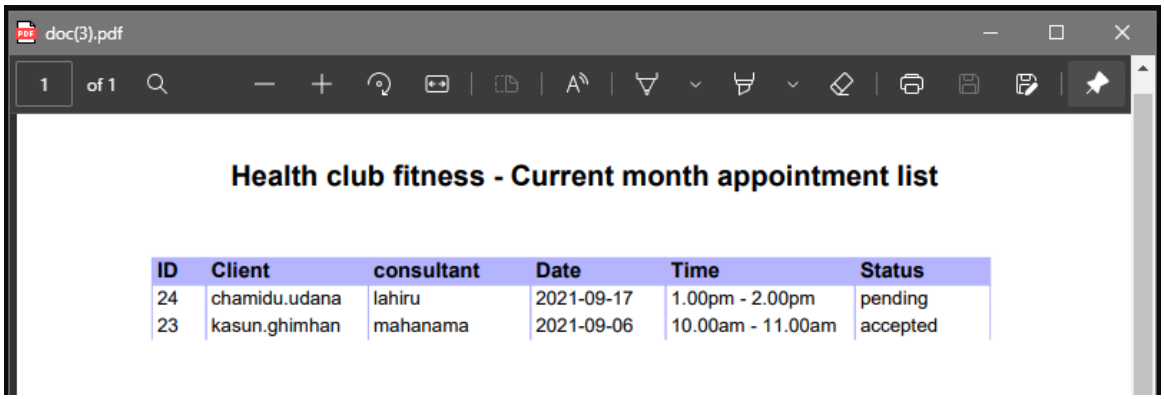


Figure A.7 Current month appointment list

A.2.7 Client registrations

The manager may need to find out, how many clients registered in a specific period. Following figure A.8 shows the dynamic report of client registrations. The manager should insert the start and end date into the system. When processing it, results are shown in the same window. Then the manager can download the report as follows.

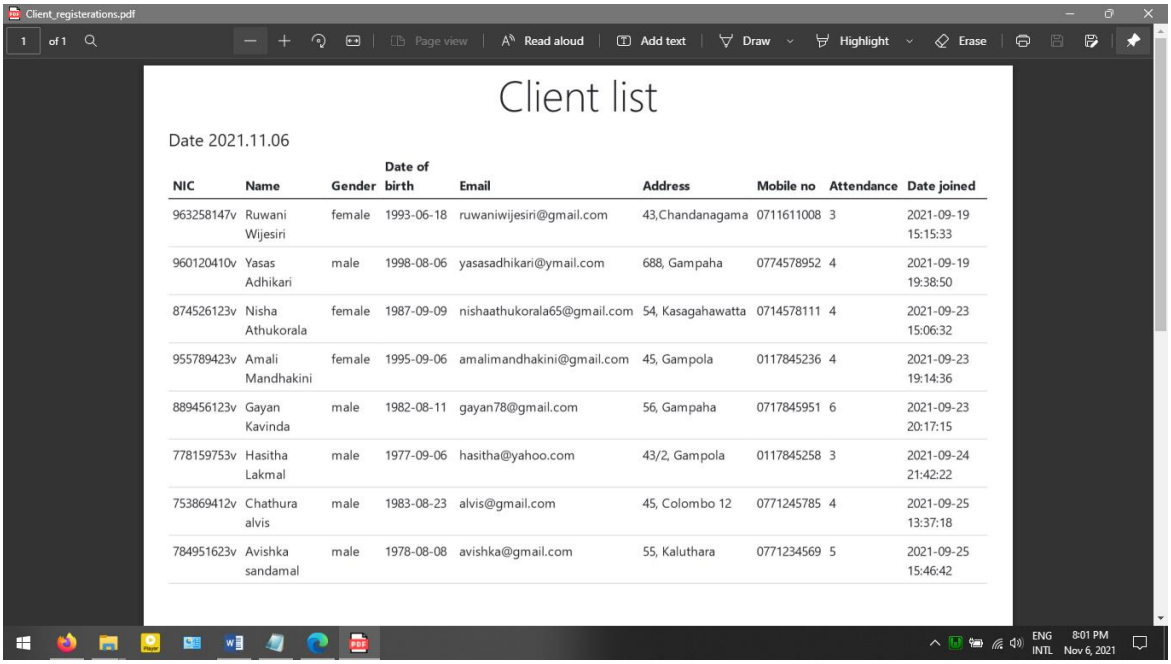


Figure A.8 Dynamic report of client registrations

Appendices B - Similar system screenshots

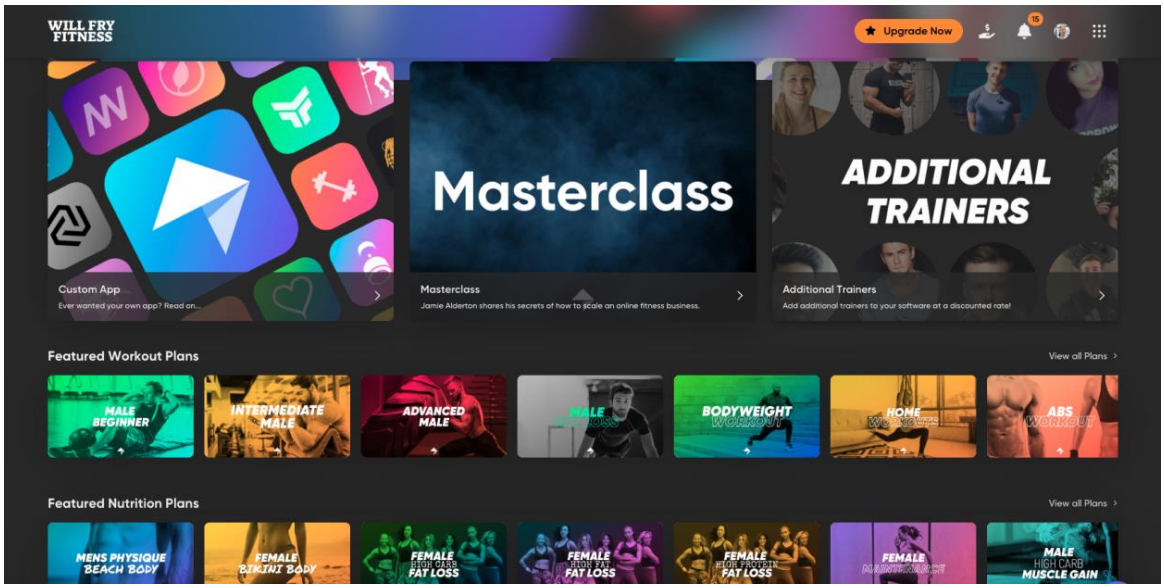


Figure B.1 Main interface of My PT Hub

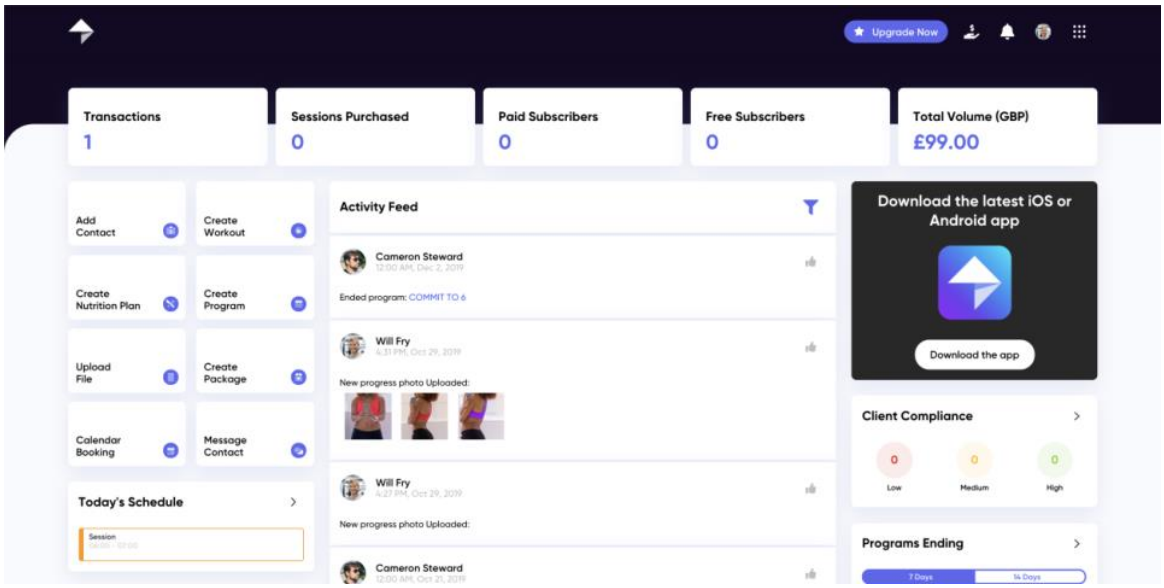


Figure B.2 Transactions interface of My PT Hub

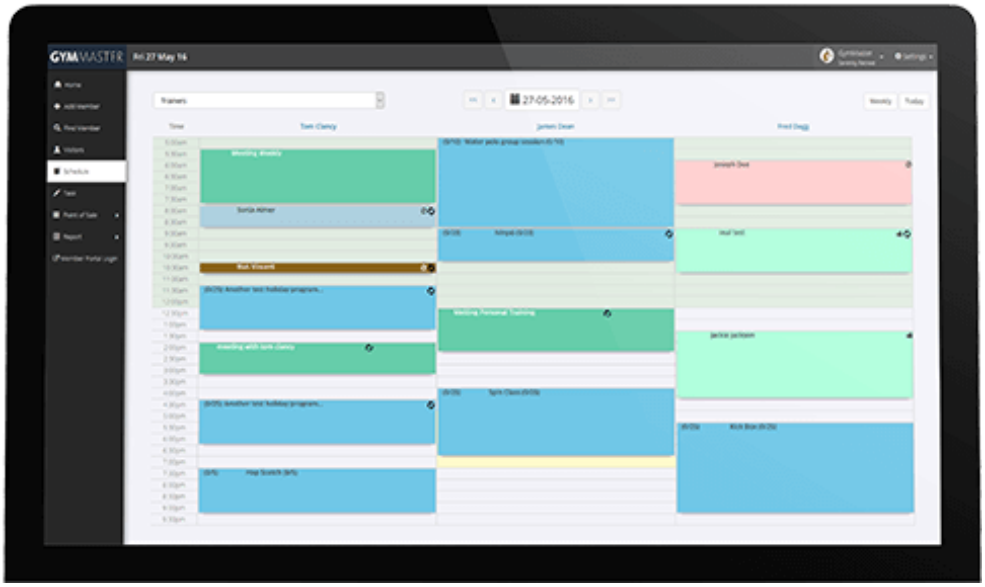


Figure B.3 Online Booking interface of Gym Master

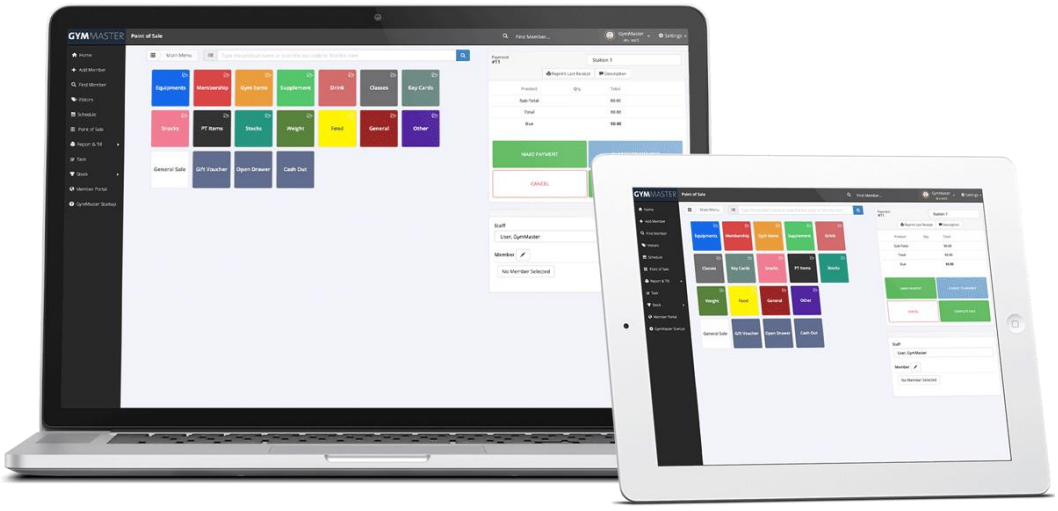


Figure B.4 Point of sales interface of Gym Master

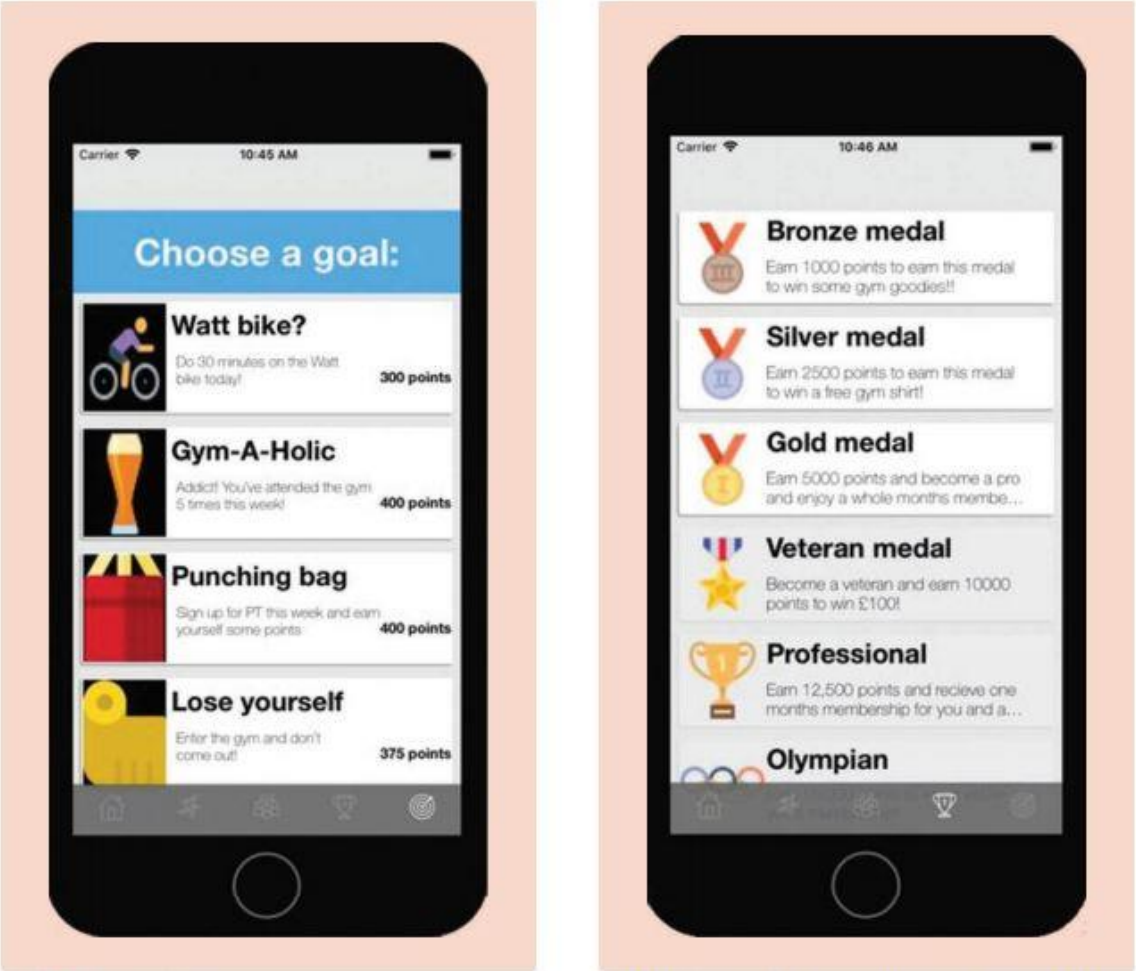


Figure B.5 The GVC and achievements view controller interface of gym membership management system

Figure B.6 Main page and animation video training interface of gym membership management system

Figure B.7 Set notification alert and notification display interface of gym membership management system

Appendices C - Use Cases and Sequence diagrams

C.1 Extended Use Case narratives

C.1.1 Register

Table C.1 shows the client registration of the use case narrative.

Table C.1 Client registration

Use-Case Name:	Register client	Use-Case Type Business Requirements: The Fitness center has no proper way to register client
Use-Case ID:	01	
Priority:	High	
Source:	Client table	
Primary Business Actor:	Client	
Other Participating Actors:		
Other Interested stakeholders:	Manager, consultant	
Description:	The client can register to fitness center system	
Preconditions:		
Trigger:		
A typical course of flow:	System display list of tasks that can be proceeded with client Client input NIC number. If NIC number does not exist in the system, The client can input relevant details into the system. The client proceeds with the task.	
Alternative flow:	If a NIC number exists in the system, the client cannot register to the system.	
Postconditions:	When successfully registered, the client logged into the system.	

	When not registered successfully, a display error message to the client.

C.1.2 Make an appointment with a consultant

Table C.2 shows the use case narrative of making an appointment with a consultant.

Table C.2 Make an appointment with a consultant

Use-Case Name:	Make an appointment with a consultant	Use-Case Type Business Requirements: The client has no proper way to make an appointment
Use-Case ID:	02	
Priority:	Medium	
Source:	Appointment form, appointment table, client and consultant table	
Primary Business Actor:	Client	
Other Participating Actors:	Consultant	
Other Interested stakeholders:	Manager	
Description:	The client can make an appointment with a consultant	
Preconditions:	Client should register	
Trigger:		
A typical course of flow:	System display list of tasks that can be proceeded with client The client selects the consultant The client selects the relevant task and inserts details. The client proceeds with the task	
Alternative flow:		
Postconditions:	Go to a client profile page	

C.1.3 Login

Table C.3 shows the use case narrative of login.

Table C.3 Login

Use-Case Name:	Login	Use-Case Type Business Requirements: Manager, consultant, client have no proper way to enter to system
Use-Case ID:	03	
Priority:	High	
Source:	Client table	
Primary Business Actor:	Client, Manager, consultant	
Other Participating Actors:		
Other Interested stakeholders:		
Description:	Manager, consultant, the client can be logged in to fitness center system	
Preconditions:	The manager, consultant, the client should already be registered	
Trigger:		
A typical course of flow:	The system displays the login page. The user should enter the username and password Click login button If username and password are matched, the system proceeds with the task	
Alternative flow:	If the username and password do not match, the user cannot log in to the system	
Postconditions:	When successfully logged in, display dashboard to the user When does not log in successfully, a display error message to the user	

C.1.4 View client details

Table C.4 shows the use case narrative to view client details.

Table C.4 View client details

Use-Case Name:	View client details	Use-Case Type Business Requirements: Manager or consultant, have no proper way to view client details
Use-Case ID:	04	
Priority:	High	
Source:	Client table	
Primary Business Actor:	Manager	
Other Participating Actors:	Consultant	
Other Interested stakeholders:		
Description:	The manager or consultant can view client details	
Preconditions:	The manager or consultant should already be registered and logged in. The client should already be registered to the system	
Trigger:		
A typical course of flow:	The manager or consultant selects the relevant task. The manager or consultant proceed with the task The system shows the list of results	
Alternative flow:		
Postconditions:	The system shows the list of clients	

C.1.5 View consultant details

Table C.5 shows use case narrative to view consultant details.

Table C.5 View consultant details

Use-Case Name:	View consultant details	Use-Case Type Business Requirements: The manager has no proper way to view consultant details
Use-Case ID:	05	
Priority:	High	
Source:	Consultant table	
Primary Business Actor:	Manager	
Other Participating Actors:		
Other Interested stakeholders:		
Description:	Manager can view consultant details	

Preconditions:	The manager should log in. A consultant should already be registered to the system
Trigger:	
A typical course of flow:	The manager selects the relevant task. The manager proceeds with the task The system shows the list of results
Alternative flow:	
Postconditions:	The system shows the list of consultants

C.1.6 Maintain client details

Table C.6 shows the use case narrative to maintain client details.

Table C.6 Maintain client details

Use-Case Name:	Maintain client details	Use-Case Type Business Requirements: Manager and consultant have no proper way to maintain client details
Use-Case ID:	06	
Priority:	High	
Source:	Client table	
Primary Business Actor:	Manager	
Other Participating Actors:	Consultant	
Other Interested stakeholders:	Client	
Description:	The manager or consultant can update, delete details of the client	
Preconditions:	Client should register	
Trigger:		
A typical course of flow:	System display list of tasks that can be proceeded with the client (insert, update or delete) The manager or consultant selects the relevant task. The manager or consultant proceed with the task	
Alternative flow:		
Postconditions:	When update, show updated profile. When delete, show client list.	

C.1.7 Maintain consultant's details

Table C.7 shows the use case narrative to maintain consultant details.

Table C.7 Maintain consultant's details

Use-Case Name:	Maintain consultant details	Use-Case Type Business Requirements: The manager has no proper way to manage consultant details
Use-Case ID:	07	
Priority:	High	
Source:	Consultant table	
Primary Business Actor:	Manager	
Other Participating Actors:		
Other Interested stakeholders:	Consultant	
Description:	The manager can insert, update, delete details of the consultant	
Preconditions:	Consultant should register	
Trigger:		
A typical course of events:	System display list of tasks that can be proceeded with a consultant (insert, update or delete) The manager selects the relevant task. The manager proceeds with the task	
Alternative course:	System display confirmation message according to the task.	
Post conditions:		

C.1.8 Create exercise program

Table C.8 shows the use case narrative to create an exercise program.

Table C.8 Create an exercise program

Use-Case Name:	Create exercise program	Use-Case Type Business Requirements:
Use-Case ID:	08	

Priority:	High	Consultants have no proper way to create an exercise program
Source:	Exercise program tables	
Primary Business Actor:	Consultant	
Other Participating Actors:		
Other Interested stakeholders:	Client	
Description:	The consultant can create, send an exercise program	
Preconditions:	The client should submit the questioner when registering. The manager or consultant should see the history of the client's exercise program	
Trigger:		
A typical course of events:	System display exercise program history Consultant select the relevant client details and task The Consultant proceed with the task	
Alternative course:		
Postconditions:	When sending exercise program, show client updated profile	

C.1.9 Create a diet plan

Table C.9 shows the use case narrative to create a diet plan.

Table C.9 Create a diet plan

Use-Case Name:	Create diet plan	Use-Case Type Business Requirements: Consultants have no proper way to create a diet plan
Use-Case ID:	09	
Priority:	High	
Source:	Diet plan tablets	
Primary Business Actor:	Consultant	
Other Participating Actors:		
Other Interested stakeholders:	Client	
Description:	The consultant can create, send a diet plan	

Preconditions:	The client should submit the questioner when registering. The consultant should see the history of the client diet plan
Trigger:	
A typical course of events:	System display client registration history and diet plan history Consultant select the relevant client details and task The consultant proceed with the task
Alternative course:	
Postconditions:	When sent the diet plan, show it in the client's profile

C.1.10 Calculate BMI and 1RM

Table C.10 shows use a case narrative to calculate BMI and 1RM.

Table C.10 Calculate BMI and 1RM

Use-Case Name:	Calculate BMI and 1RM	Use-Case Type Business Requirements: Consultants have no proper way to calculate BMI and 1RM
Use-Case ID:	10	
Priority:	Medium	
Source:	Exercise program and diet plan table	
Primary Business Actor:	Consultant	
Other Participating Actors:		
Other Interested stakeholders:	Client	
Description:	The consultant can calculate BMI and 1RM when creating a client exercise program and diet plan	
Preconditions:	The client should submit the questioner when registering. The consultant should see the history of the client's exercise program and diet plan	
Trigger:		

The typical course of events:	The system displays the BMI and 1RM calculators next to the exercise program and diet plan editor interface. Consultant input relevant details After the result comes, the consultant uses it to make the exercise program necessary.
Alternative course:	
Postconditions:	It shows result

C.1.11 Maintain fitness articles

Table C.11 shows the use case narrative to maintain fitness articles.

Table C.11 Maintain fitness articles

Use-Case Name:	Maintain fitness articles	Use-Case Type Business Requirements: The manager has no proper way to publish fitness articles
Use-Case ID:	11	
Priority:	Medium	
Source:	Articles table	
Primary Business Actor:	Manager	
Other Participating Actors:		
Other Interested stakeholders:	All fitness community	
Description:	Managers can insert and delete articles on the website. Only publish the article as an image (jpg file)	
Preconditions:	Article image should be predesigned The manager should log in	
Trigger:		
A typical course of events:	The system displays a window to upload an image. The manager selects the task The manager proceeds with the task	
Alternative course:		
Postconditions:	Go to the article page.	

C.1.12 Generate report

Table C.12 shows the use case narrative to generate the report.

Table C.12 Generate report

Use-Case Name:	Generate report	Use-Case Type Business Requirements: The manager has no proper way to generate reports to make a decision
Use-Case ID:	12	
Priority:	Medium	
Source:	Client table, consultant table, web post table, appointment table.	
Primary Business Actor:	Manager	
Other Participating Actors:		
Other Interested stakeholders:		
Description:	Managers can be able to generate a report about active clients, active consultants, client gender composition, current month appointments, uploaded articles, articles and advertisements composition, client age groups, and client registrations.	
Preconditions:	Client, consultant, appointment tables should have records. The manager should log in	
Trigger:	The manager decides to check details of all clients, consultants, appointments	
A typical course of events:	System display list of tasks that can proceed with reports. There are static and dynamic reports. Static reports can download using a single click. Different criteria should be set to download dynamic reports. The manager selects the relevant task The manager proceeds with the task	
Alternative course:		
Postconditions:	Download the report.	

C.1.13 Add membership payment

Table C.13 shows the use case narrative to add membership payment.

Table C.13 Add membership payment

Use-Case Name:	Add membership payment	Use-Case Type Business Requirements: The manager has no proper way to add membership payment
Use-Case ID:	13	
Priority:	Medium	
Source:	Payment table	
Primary Business Actor:	Manager	
Other Participating Actors:	Client	
Other Interested stakeholders:		
Description:	Managers can be able to add membership payment details when the client pays it.	
Preconditions:	The manager should log in.	
Trigger:	The manager decides to record membership payment details to the system	
A typical course of events:	The system displays the form to add membership payment. Giving NIC, name, payment details The manager proceeds with the task	
Alternative course:		
Postconditions:	It shows the last payment at the top of the list.	

C.1.14 Send email

Table C.14 shows the use case narrative to send e-mail.

Table C.14 Send an E-mail

Use-Case Name:	Send Email	Use-Case Type Business Requirements: The manager has no proper way to send e-
Use-Case ID:	14	
Priority:	Medium	
Source:	Client and consultants table	

		mail through the system
Primary Business Actor:	Manager	
Other Participating Actors:	Client, consultant	
Other Interested stakeholders:		
Description:	Managers can be able to send e-mail to clients or consultants	
Preconditions:	The manager should log in.	
Trigger:	The manager decides to send e-mail through the system	
A typical course of events:	The system displays the form to send an e-mail with relevant fields	
Alternative course:		
Postconditions:	It shows “sending success message”	

C.2 Sequence diagrams

C.2.1 Login

Figure C.1 shows the sequence diagram for login. The system should validate the user by checking the database.

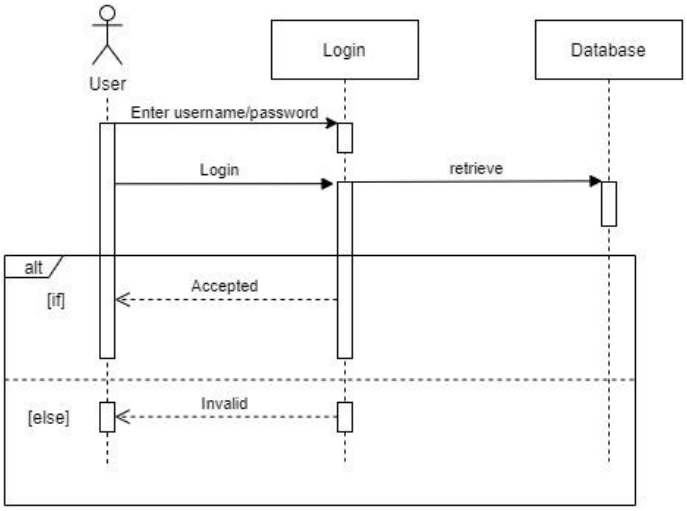


Figure C.1 Sequence diagram for login

C.2.2 Register

Figure C.2 shows the sequence diagram for the register. The registration page checks the validity of user-entered data. And save it in the database.

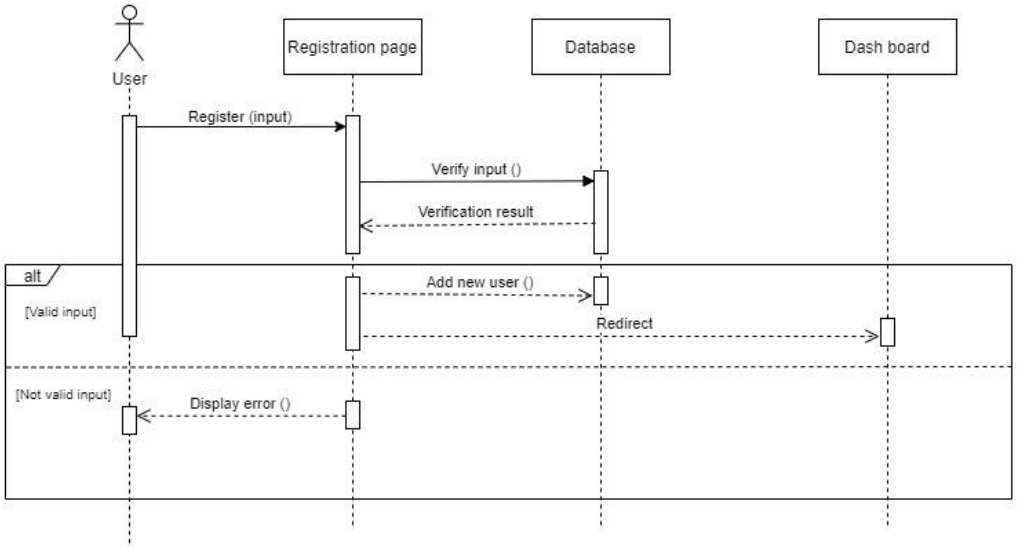


Figure C.2 Sequence diagram for register

C.2.3 Make an exercise program

Figure C.3 shows the sequence diagram to make an exercise program. If the client is in a data database, the consultant can make an exercise program for the client.

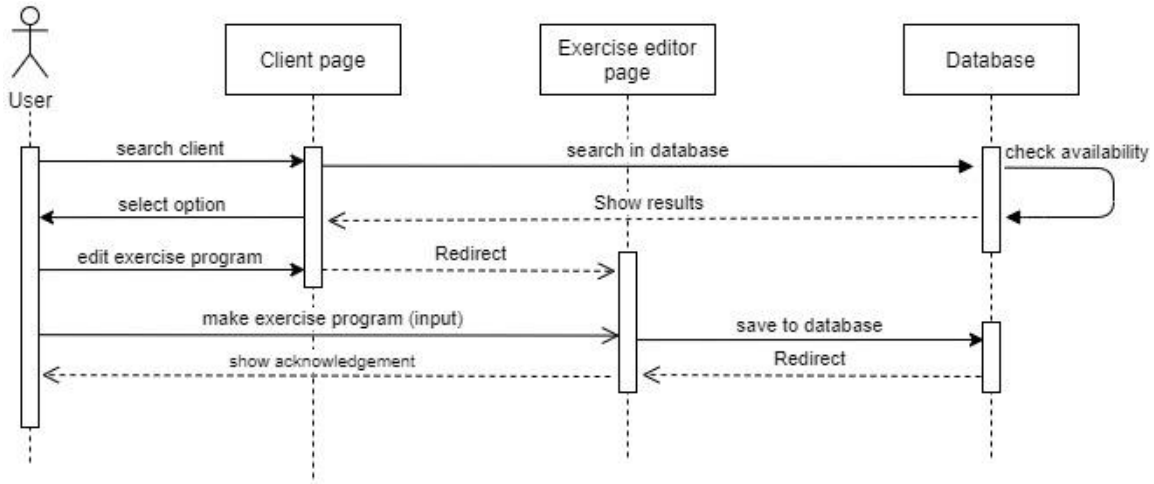


Figure C.3 Sequence diagram for make exercise program

C.2.4 Make a diet plan

Figure C.4 shows the sequence diagram for a make diet plan. If the client is in the data database, the consultant can make a diet plan for the client.

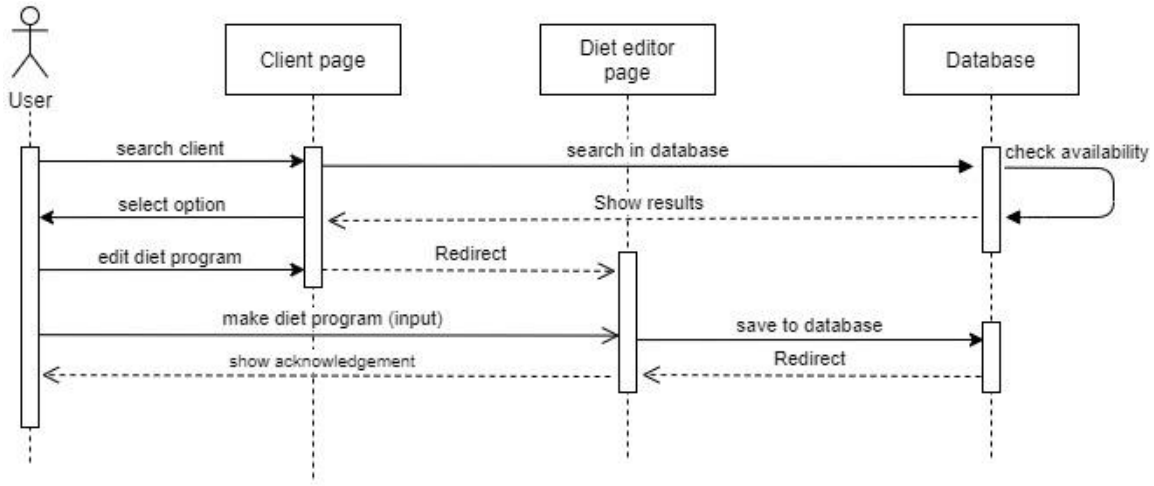


Figure C.4 Sequence diagram for make diet plan

C.2.5 Delete client

Figure C.5 shows the sequence diagram for deleting the client. The manager and consultant both have the authority to delete the client. After deleting the client, retrieve it to the client list page.

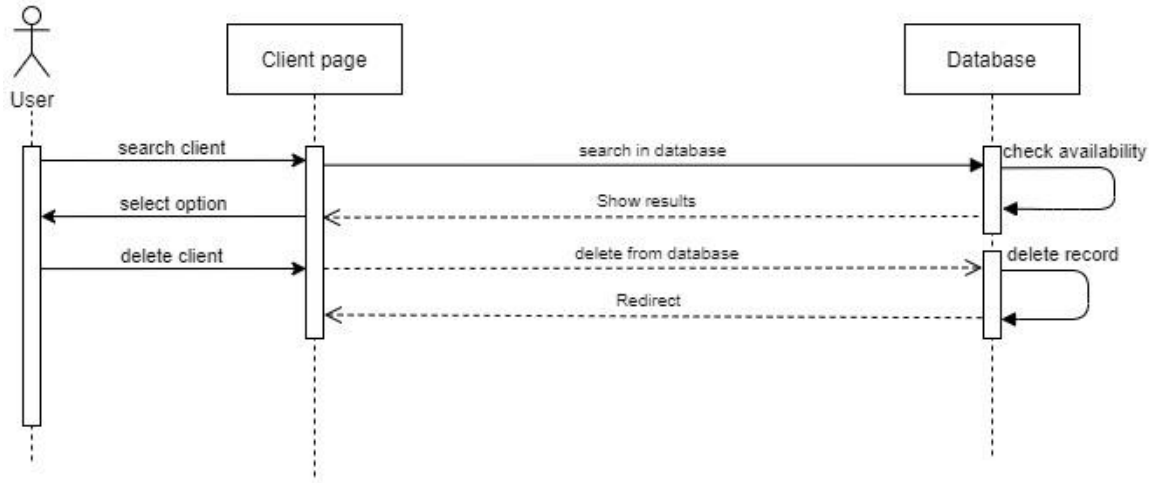


Figure C.5 Sequence diagram for delete client

C.2.6 Delete consultant

Figure C.6 shows the sequence diagram for the deleted consultant. The manager has the authority to delete the consultant. After deleting the consultant, retrieve it to the consultant list page.

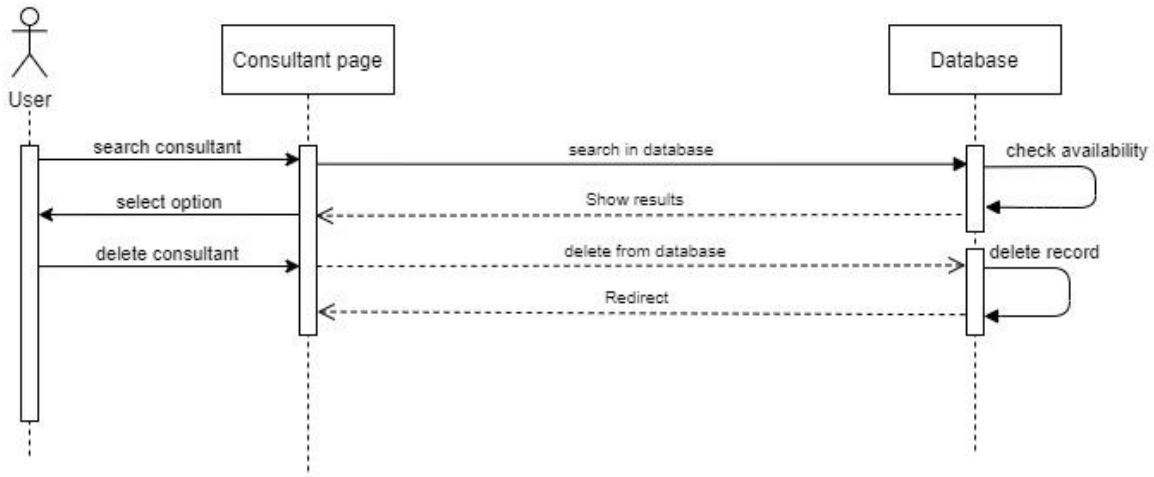


Figure C.6 Sequence diagram for delete consultant

C.2.7 Add an article

Figure C.7 shows the sequence diagram for adding the article. When the manager adds the article, the image of the article save in the database and shown on the article page.

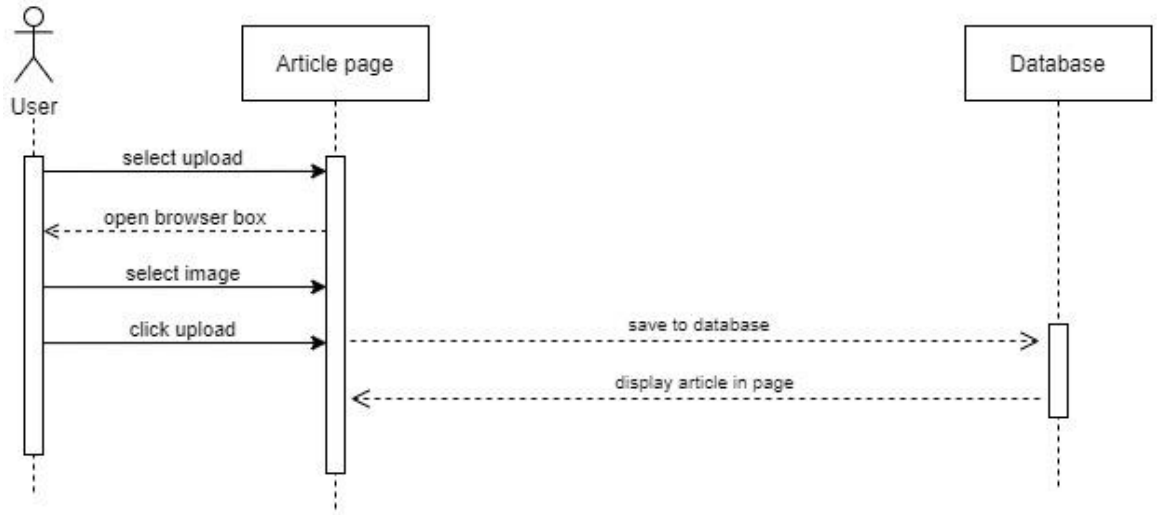


Figure C.7 Sequence diagram for add article

C.2.8 Delete article

Figure C.8 shows the sequence diagram for the deleted article. When the manager deletes an article, the image of the article is deleted from the database and retrieved to the article page.

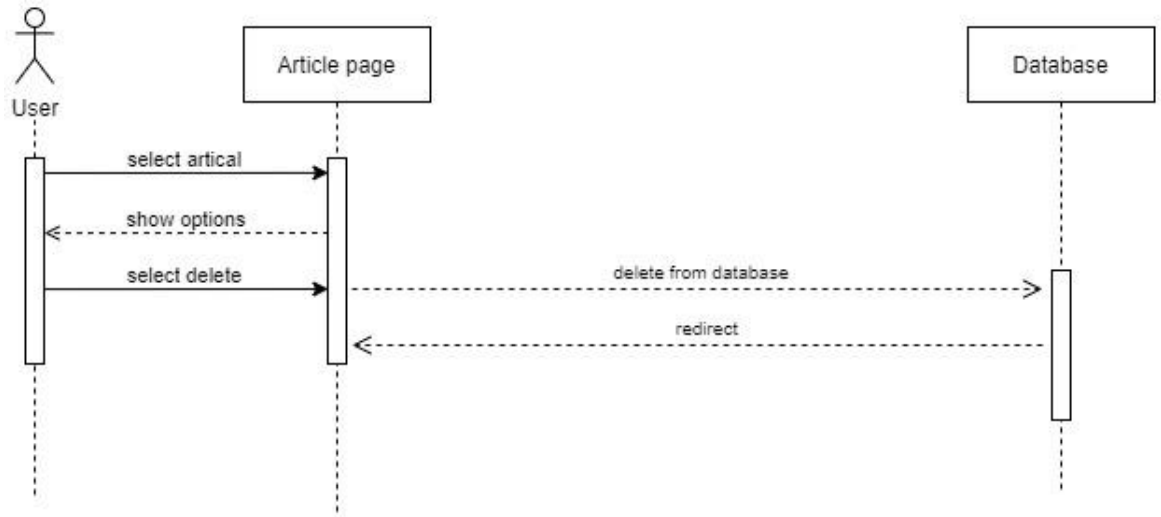


Figure C.8 Sequence diagram for delete article

C.2.9 Generate report

Figure C.9 shows the sequence diagram for generating the report. When the manager goes to the report page, the system display list of tasks that can be proceeded with reports using different criteria. When generating the report, the user retrieves to result in section.

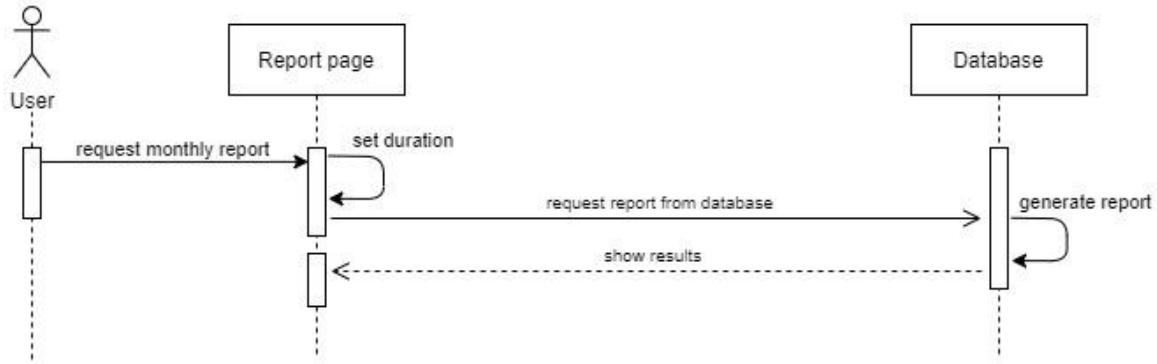


Figure C.9 Sequence diagram for generate report

C.2.10 Make an appointment with a consultant

Figure C.10 shows the sequence diagram for making an appointment with a consultant. The client should enter the date, time, and consultant name and perform the task. The request save in the database and the consultant can view it.

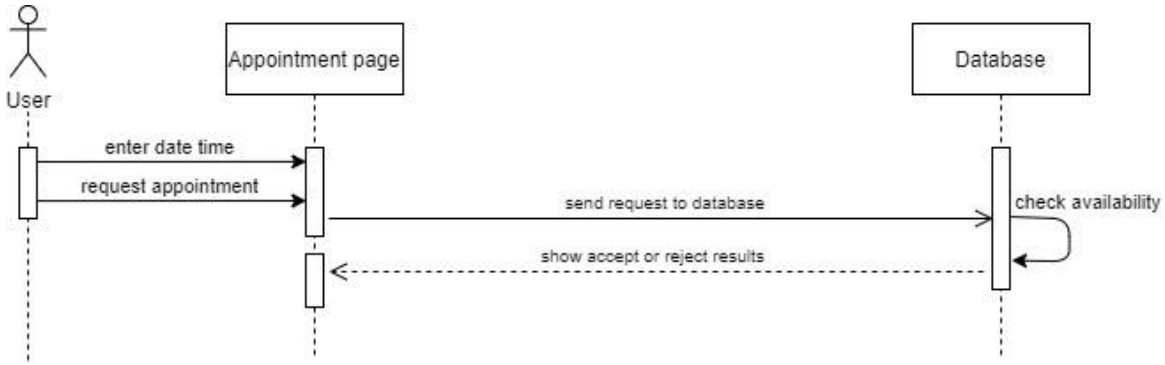


Figure C.10 Sequence diagram for make appointment

Appendices D – Test cases and User evaluation

D.1 Test cases and results of the testing

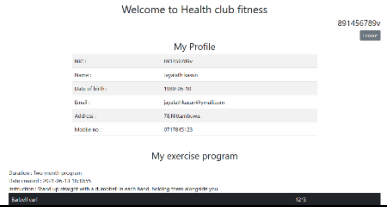
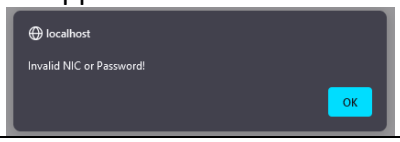
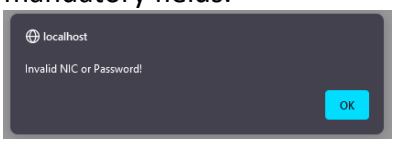
D.1.1 Client login test case

Page name: home.php

Pre-condition: the client should registrar

Table D.1 shows the test case of the client login.

Table D.1 Client login test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Client login with valid data	Client username = 930254788v Password = 456123	Client should login into an application 	As expected	Pass
2	Client login with invalid data	Client username = hgwats788v Password = ghywsntd	Client should not login into an application 	As expected	Pass
3	Required fields in client login interface and check the required fields by not filling any data	N/a	It should show a “please fill out this field” text on mandatory fields. 	As expected	Pass

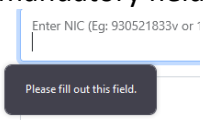
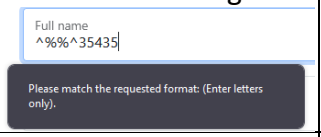
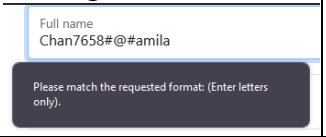
D.1.2 Client registration test case

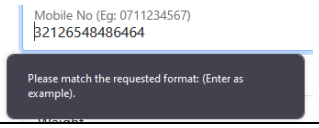
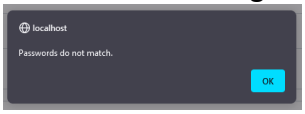
Page name: client_registrationform.php

Pre-condition:

Table D.2 shows the test case of the client registration form.

Table D.2 Client registration test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Client's NIC input	NIC = 963521455v	It should not show any validation message. Prompt to next field.	As expected	Pass
2	Client's NIC forget to input	NIC =	It should show a "please fill out this field" text on mandatory fields. 	As expected	Pass
3	Client's full name	Full name = gayan kavinda	Without any error prompt to next field.	As expected	Pass
4	Client's full name with invalid data	Full name = ^%%^35435	Show "please enter character" message. 	Field allowed special characters	Fail
5	Client's date of birth with valid data	Date of birth = 1993/10/20	Without any error prompt to next field.	As expected	Pass
6	Client's date of birth with invalid data	Date of birth = 1993-10-20	Cannot input invalid data.	As expected	Pass
7	Client's email with valid data	Email = gayank@gmail.com	Without any error prompt to next field.	As expected	Pass
8	Client's email with invalid data	Email = gayankgmail.com	Show "please enter invalid email" message. 	As expected	Pass
9	Client's address with valid data	Address = 42, Gampaha	Without any error prompt to next field.	As expected	Pass
10	Client's mobile number with valid data	Mobile number = 0714587878	Without any error prompt to next field.	As expected	Pass

11	Client's mobile number with invalid data	Mobile number = ght4587878	Show "please enter invalid mobile number" message. 	As expected	Pass
12	Client's weight with valid data	Weight = 70	Without any error prompt to next field.	As expected	Pass
13	Client's height with valid data	Height = 180	Without any error prompt to next field.	As expected	Pass
14	Client's injuries with valid data	Injuries = neck pain, knee pain	Without any error prompt to next field.	As expected	Pass
15	Client's non-communicable diseases with valid data	Non-communicable diseases = hypertension, diabetes mellitus	Without any error prompt to next field.	As expected	Pass
16	Client's attendance with valid data	Attendance = 4	Without any error prompt to next field.	As expected	Pass
17	Client's food consumption with valid data	Food consumption = lean meats and poultry, fish, eggs, tofu.	Without any error prompt to next field.	As expected	Pass
18	Client's user name with valid data	User name = vihanga23	Without any error prompt to next field.	As expected	Pass
19	Client's password and confirms password with valid data	Password =123458 Confirm password = 123458	Without any error prompt registration_success.php page	As expected	Pass
20	Client's password and confirms password with invalid data	Password =1jhgsff Confirm password = 123458	Show "passwords do not match." Message. 	As expected	Pass

2 1	Registration form interface button	N/a	Should check input data with the database and go to the registration_success.php page.	As expected	Pass

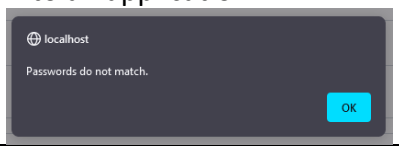
D.1.3 Consultant login test case

Page name: staff.php

Pre-condition: consultant should registrar

Table D.3 shows the test case of the consultant login.

Table D.3 Consultant login test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Consultant's login with valid data	Consultant username = chathura75 Password = 456123	Consultant should login into an application	As expected	Pass
2	Consultant's login with invalid data	Consultant username = hgwats788v Password = ghywsntd	Consultant should not login into an application 	As expected	Pass
3	Consultant's login interface button	N/a	When the button click, check input data with the database and login into the system.	As expected	Pass
4	Required fields in consultant's login interface and check the required fields by not filling any data	N/a	It should show a "please fill out this field" text on mandatory fields.	As expected	Pass

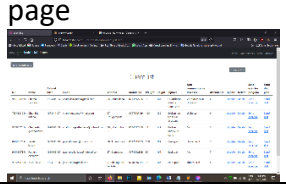
D.1.4 View client's details test case

Page name: client_list.php

Pre-condition: consultant or manager should log in

Table D.4 shows the test case of the client login.

Table D.4 View client's details test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Client list	Click the client list button on another page	Show list of clients in client_list.php page 	As expected	Pass

D.1.5 View consultant's details test case

Page name: consultant_list.php

Pre-condition: a manager should log in

Table D.5 shows the test case of the consultant's details.

Table D.5 View consultant's details test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Consultant list	Click the consultant list button on another page	Show list of a button in consultant_list.php page 	As expected	Pass

D.1.6 Update client's details test case

Page name: client_update.php

Pre-condition: client should login

Table D.6 shows the test case of the update of the client details.

Table D.6 Update client's details test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail

1	Client update Interface button	Click the client update button on the client dashboard page.	Go to the client_update.php page	As expected	Pass
2	Client's all data retrieved to client update page	N/a	Show client's data with editable form fields	As expected	Pass
3	Client's full name	Full name = gayan kavinda	Without any error prompt to next field.	As expected	Pass
4	Client's full name with invalid data	Full name = ^%%^35435	Show "please enter character" message.	As expected	Fail
5	Client's date of birth with valid data	Date of birth = 1993-10-20	Without any error prompt to next field.	As expected	Pass
6	Client's date of birth with invalid data	Date of birth = ^$%84	Show "please enter valid character" message.0	As expected	Pass
7	Client's email with valid data	Email = gayank@gmail.com	Without any error prompt to next field.	As expected	Pass
8	Client's email with invalid data	Email = gayankgmail.com	Show "please enter invalid email" message.	As expected	Pass
9	Client's address with valid data	Address = 42, Gampaha	Without any error prompt to next field.	As expected	Pass
10	Client's mobile number with valid data	Mobile number = 0714587878	Without any error prompt to next field.	As expected	Pass
11	Client's mobile number with invalid data	Mobile number = ght4587878	Show "please enter invalid mobile number" message.	As expected	Pass
12	Client's weight with valid data	Weight = 70	Without any error prompt to next field.	As expected	Pass
13	Client's height with valid data	Height = 180	Without any error prompt to next field.	As expected	Pass
14	Client's injuries with valid data	Injuries = neck pain, knee pain	Without any error prompt to next field.	As expected	Pass

15	Client's non-communicable diseases with valid data	Non-communicable diseases = hypertension, diabetes mellitus	Without any error prompt to next field.	As expected	Pass
16	Client's attendance with valid data	Attendance = 4	Without any error prompt to next field.	As expected	Pass
17	Client's food consumption with valid data	Food consumption = lean meats and poultry, fish, eggs, tofu.	Without any error prompt to next field.	As expected	Pass
18	Client's user name with valid data	User name = vihanga23	Without any error prompt to next field.	As expected	Pass
19	Client's password and confirms password with valid data	Password =123458 Confirm password = 123458	Without any error prompt client_dashboard.php page	As expected	Pass
20	Client's password and confirms password with invalid data	Password =1jhgsff Confirm password = 123458	Show "passwords do not match." Message.	As expected	Pass
21	Update form interface button	N/a	When the button click, check update data in the database and go to the client_dashboard.php page.	As expected	Pass

D.1.7 Delete client test case

Page name: client_list.php

Pre-condition: manager or consultant should log in

Table D.7 shows the test case of the consultant delete.

Table D.7 Delete client test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Make active user inactive	N/a	Should block the client access to	As expected	Pass

			the system. Decrease one from client availability. And increase one from the left client.		
2	Make inactive user active	N/a	Should unblock the client accessibility of the system. Increase one from client availability decrease one from the left client.	As expected	Pass

D.1.8 Add consultant test case

Page name: consultant_add.php

Pre-condition: a manager should log in

Table D.8 shows the test case of the add consultant.

Table D.8 Add consultant test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Consultant registration with valid data	Nic = 985654855v Name = chathura silva Username = chathura Email = chathura@hotmail.com Address = 452, panadura Mobile no = 0771245789 Date of birth = 1998-09-08 Qualification = diploma in instructing exercise and fitness. (Kelaniya University) Experience = Muay Thai boxing player (up to now), Muay Thai fighting instructor in	Should check input data with database and go to consultant_list.php page	As expected	Pass

		Muay Thai fighter association. (6 years) Password = 351354			
2	Consultant registration with invalid data	Nic = noname5454 Name = no_name24 Username = name5468 Email =gdkh.gmail.com Address =354 ankubura Mobile no = 765hd@ Date of birth = 1998-09-08 Qualification = fighter association Experience = fighter union Password = jhgf3546	If fields are empty, should show a “please fill out this field” text on mandatory fields. If fields have wrong messages 	As expected	Pass

D.1.9 Delete consultant test case

Page name: consultant_list.php

Pre-condition: a manager should log in

Table D.9 shows the test case of the delete the consultant.

Table D.9 Delete consultant test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Delete consultant from system	Click delete button in consultant_list.php Page	Remove consultant from consultant list and add delete indicator to consultant table in the database	As expected	Pass

D.1.10 Create exercise program test case

Page name: send_exercise.php

Pre-condition: manager or consultant should log in and select the relevant client

Table D.10 shows the test case of the create an exercise program.

Table D.10 Create exercise program test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Create an exercise program with valid data	Duration selection exercises reps and sets select using option field. Duration = one month program Exercise 1 = bench press Reps and sets 1 = 12*3 Exercise 2 = cross over Reps and sets 2 = 10*3 Exercise 3 = hammer curl Reps and sets 3 = 10*2 Exercise 4 = machine rowing Reps and sets 4 = 8*2 Exercise 5 = one arm rowing Reps and sets 5 = 10*2 Exercise 6 = cable press down Reps and sets 6 = 12*3 Exercise 7 = barbell curl Reps and sets 7 = 8*2 Exercise 8 = dumbbell extension Reps and sets 8 = 12*3 Instructions = follow these cardiovascular exercises. Brisk walking, running, jogging or jogging in place, burpees.	Should create exercise program and save e details in a database	As expected	Pass

D.1.11 Create diet plan test case

Page name: send_diet.php

Pre-condition: manager or consultant should log in and select the relevant client

Table D.11 shows the test case of the create diet plan.

Table D.11 Create diet plan test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Create a diet plan with valid data	Duration selection, foods, and the quantity selected using the options field. Duration = two month program Food 1 = lean beef Quantity 1 = 50 grams Food 2 = chicken breast Quantity 2 = 50 grams Food 3 = sweet potato Quantity 3 = 50 grams Food 4 = oatmeal Quantity 4 = 100 grams Food 5 = avocado Quantity 5 = 100 grams Food 6 = peanuts Quantity 6 = 100 grams Food 7 = salmon Quantity 7 = 100 grams Food 8 = protein supplement Quantity 8 = 20 grams	Should create a diet plan and save e details in a database	As expected	Pass

		Instructions = a usually suggested protein quantity is 1, 2 scoops (25 to 50 grams) for each day. Typically after workouts.			

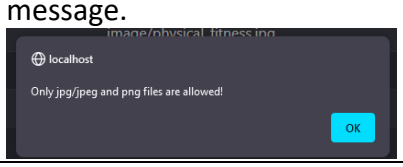
D.1.12 Upload article test case

Page name: article_upload.php

Pre-condition: a manager should log in

Table D.12 shows the test case of the uploaded article.

Table D.12 Upload article test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Upload article with valid data	Select file = image/ diet_info.jpg Enter image title = diet info	Should show uploaded file in the article list and article_display.php and save data in a database	As expected	Pass
2	Upload article with invalid data	Select file = image/ nothing.pdf Enter image title = nothing@#5	Should show “Only jpg/jpeg and png files are allowed!” message. 	As expected	Pass

D.1.13 Delete article test case

Page name: article_upload.php

Pre-condition: a manager should log in

Table D.13 shows the test case of the delete an article.

Table D.13 Delete article test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Delete article from system	N/A	Should delete record from article list and database	As expected	Pass

D.1.14 Calculate BMI test case

Page name: send_diet.php

Pre-condition: manager or consultant should log in

Table D.14 shows the test case of the BMI calculation.

Table D.14 Calculate BMI test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Calculate BMI	Automatically get from a client table	Should show the current BMI value  Client is Over weight	As expected	Pass

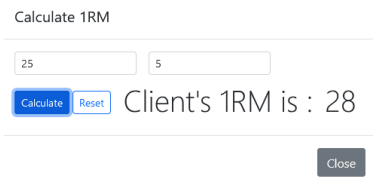
D.1.15 Calculate 1RM test case

Page name: send_exercise.php

Pre-condition: manager or consultant should log in

Table D.15 shows the test case of the 1RM calculation.

Table D.15 Calculate 1RM test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Calculate 1RM with valid data	Weight = 25 Reps = 5	Should show the current 1RM value. 	As expected	Pass
2	Calculate 1RM with invalid data	Weight = 2w Reps = 5$	User cannot type other characters, only number	As expected	Pass

D.1.16 Report generate test case

Page name: report.php

Pre-condition: a manager should log in

Table D.16 shows the test case of the report.

Table D.16 Report generate test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Active clients report of the system	Automatically take from a client table	Should show the active clients	As expected	Pass
2	Active consultant report of the system	Automatically take from consultant table	Should show the active consultants	As expected	Pass
3	Client gender composition report of the system	Automatically take from clients table	Should show the active male and female clients composition	As expected	Pass
4	Current month appointment report	Automatically take from the appointment table	Should show all appointment details of the current month	As expected	Pass
5	Uploaded articles report	Automatically take from article table	Should show the all uploaded article list	As expected	Pass
6	Articles and advertisements composition report	Automatically take from article table	Should show the total count of uploaded articles and advertisements	As expected	Pass
7	Client age groups report	Automatically take from clients table	Should show the age groups and No of clients of the relevant category	As expected	Pass
8	Dynamic client registrations report	Start date = 09/01/2021 End date = 11/01/2021	Should show the registered clients of a given period	As expected	Pass

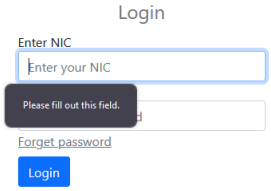
D.1.17 Verify client cannot access the inner link once the logout test case

Page name:

Pre-condition: client should logout

Table D.17 shows the test case of the verify the client cannot access the inner link once logout from the system.

Table D.17 Verify client cannot access the inner link once log out from the system test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Attempt to access the inner link after logout	Client_dashboard.php	Users should not allow accessing the link instead should redirect to the login 	As expected	Pass

D.1.18 Add membership payment test case

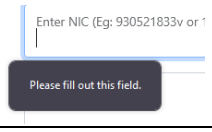
Page name: membership_fee.php

Pre-condition: a manager should log in

Table D.18 shows the test case of add membership payment.

Table D.18 Add membership payment test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Add membership payment with valid data	NIC = 930521833v Enter name = Pawan	Should show NIC, name in the payment list and save data in a database	As expected	Pass
2	Add membership payment with invalid data	NIC = 93sggs0533v Enter name = P$6awan	If fields are empty, should show a “please fill out this field” text on mandatory fields. Prevent incorrect data typing.	As expected	Pass

D.1.19 Send an Email test case

Page name: email_send.php

Pre-condition: a manager should log in

Table D.19 shows the test case of sending an email.

Table D.19 Send an email test case

Id	Test description	Test input data	Expected output	Actual output	Pass/fail
1	Send an email with valid data	Email = nihsn@gmail.com Subject = diet plan Message = take low fat foods to lose weight	Should show “email was sent message”	As expected	Pass
2	Send an email with invalid data	Email = ni4n@g3il.com Subject = 4456g Message = 87$#b	If fields are empty, should show a “please fill out this field” text on mandatory fields. Prevent incorrect data typing.	As expected	Pass

D.2 User evaluation

Following table D.20 shows the system evaluation by the manager

Table D.20 system evaluation by manager

No	Requirement	Pass/Fail	remark
1	Login	Pass	-
2	Show dashboard with manager’s details	Pass	-
3	View client details	Pass	-
4	Delete client	Pass	-
5	Add consultant	Pass	-

6	View consultant details	Pass	-
7	Delete consultant	Pass	-
9	Create exercise program	Pass	-
10	Create diet plan	Pass	-
11	View client's last exercise program	Pass	-
12	View client's last diet plan	Pass	-
13	Calculate BMI and 1RM	Pass	-
14	View article list	Pass	-
15	Add article	Pass	-
16	Delete article	Pass	-
17	View client availability report	Pass	-
18	View consultant availability report	Pass	-
19	View issued exercise program and diet plan composition	Pass	-
20	View uploaded article and advertisements volume	Pass	-
21	View client age groups	Pass	-
22	Logout	Pass	-

Following the table, D.21 show the system evaluation by the consultant

Table D.21 system evaluation by a consultant

No	Requirement	Pass/Fail	remark
1	Login	Pass	-
2	Show dashboard with consultant's details	Pass	-
3	View client details	Pass	-
4	View client's last exercise program	Pass	-
5	View client's last diet plan	Pass	-
6	Delete client	Pass	-
7	Create exercise program	Pass	-
9	Create diet plan	Pass	-
10	Calculate BMI and 1RM	Pass	-
11	Logout	Pass	-

Following table D.22 shows the system evaluation by the client

Table D.22 system evaluation by client

No	Requirement	Pass/Fail	remark
1	Login	Pass	-
2	Show dashboard with client's details	Pass	-
3	View client's exercise program	Pass	-
4	View client's diet plan	Pass	-
5	Logout	Pass	-

UI review questions are a questionnaire that aims to find the parts of development in terms of the UI of the product based on user opinions. The questionnaire has been given to the administrator and all consultants, clients who use the system. Following D.23 table shows the User Evaluation questionnaire.

Table D.23 Overall acceptance criteria

User Evaluation Form **Web-based application for fitness consultancy**						
Date:		**Name:**			**Title role:**	
* Please put “X” in a suitable column and fill it with short answers.						
No	**Question**	**Very much satisfactory**	**Satisfactory**	**Neural**	**Unsatisfactory**	**Very much Unsatisfactory**
1	Simple and understandable UI					
2	Easy system navigation					
3	The system delivers enough information					
4	Capability to maintain data, to keep it up-to-date					
5	System display information more familiar					
6	Ease of entering/ handling form fields, and handle manipulations					
7	Functions are more reliable					
8	Degree of Information provided in MIS Reports					
9	System Content					
10	System Presentation					
11	System Accessibility					

12	System Hardware compatibility					
Any other comments:						