Web-Based Smart Gym Management System

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This project report has been submitted in fulfilment of the requirements for the degree of **Bachelor of Science in Software Engineering**

Department of Software Engineering Faculty

of Science and Information Technology

Supervisor Approval Form

Fall 2025	B.Sc. In SWE	Campus: DSC

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This thesis titled on **Smart Gym Management System** submitted by **B.M. Nafees Iqbal (ID: 221-35-1062)** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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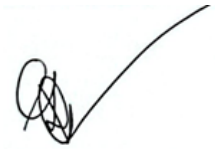

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Position : **Lecturer (Senior Scale)**

Date : 20 October 2025

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Date : 20 October 2025

Smart Gym Management System

B.M. Nafees Iqbal

Project submitted in fulfillment of the requirements
for the award of the degree of
Bachelor of Science/Master of Science

Department of Software Engineering

DAFFODIL INTERNATIONAL UNIVERSITY

OCTOBER 2025

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DEDICATION

I therefore declare that I have done this project under the oversight of "**Mr. Md. Rajib Mia**", **"Lecturer (Senior Scale)"**, Department of Software Engineering, Daffodil International University. Also declare that neither entire record nor any portion of this record has been submitted somewhere else for my degree.

ABSTRACT

The Smart Gym Management System is an online system that will facilitate and streamline the day to day running of fitness centers. Gyms usually use manual means of managing members, trainers, appointments, payments, supplements, and workout plans which create inefficiency, mistakes and reduced personalization. This system will solve these challenges by offering a centralized, automated, and user-friendly solution to all the stakeholders. The platform offers four specific user roles, including Member, Trainer, Manager, and Admin, which have a set of personalized features including membership and appointment management, purchasing of supplements, requests of workout and diet plans, managing leaves, and reporting based on data. The system was developed with React.js, Node.js, Express.js, and MongoDB to achieve scalability, security, and a seamless performance of the system. JWT and Google OAuth are used to implement secure authentication, and such additional modules as notifications, analytics and inventory management are added to increase the overall functionality. The Smart Gym Management System will focus on enhancing the operational efficiency, transparency, and user experience by incorporating a combination of modern development practices and digital tools and tools, eventually assisting the gyms in offering a more professional and structured service experience.

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CHAPTER 1

INTRODUCTION

1.1 Background

The booming fitness sector in the recent past has resulted in a rise in the demands of organized training, personalized guidance and effective service delivery in the gyms and fitness centers. Due to the increased attention that more individuals pay to a healthier lifestyle, gyms have to deal with more members, different membership schemes, individual workout plans, and training schedules. Nevertheless, most of the small and medium-sized gyms continue using manual solutions like paper logs, spreadsheets, and handwritten records to manage everyday activities. These archaic ways usually lead to lack of data consistency, lack of communication, inability to trace payments and problems in maintaining correct data of the members and trainers. The absence of a centralized system eventually has an implication on the efficiency of the running of the gym as well as the experience of the members. Here, the necessity of a new and computerized managerial platform has been growing. A web-based Gym Management System provides an organized solution in which key functionality is integrated, which includes membership management, appointment management, supplement management, workout and diet plan management, and administrative controls are all available in a system that is user friendly. Digital workflows and cloud-based data management can help the gym to greatly cut on the number of manual works, reduce mistakes, and provide a more professional service experience. The Smart Gym Management System is created to overcome all these issues by offering a flexible platform to serve the members, trainers, managers, and administrators, with a better coordination process, enhanced transparency, and more efficient fitness space.

1.1.1 Context and Relevance

With the current fast and health-aware community, the role of fitness centers in a person's life has become a necessity since people require organized workouts, individual training, and enhanced physical and psychological health. The operational duties of gyms also rise as the number of people joining the gym is on the rise. The managers are required to

handle individualized workouts and appointments, trainers are to control the supplements and memberships, and administrators are to control the staff, payments, reports, and the overall performance. Although this workload has increased, still most gyms, especially small and mid-sized gyms rely on manual records to keep records including use sheets like notebooks, spreadsheets or even informal logs. Such out-of-date practices usually cause inefficiencies, poor communication, loss of data and low transparency to the staff as well as members. With the increasing demands to professional and organized fitness services, the topicality of the digital system in the gym management has never been more crucial than ever. Centralizing information on a web-based platform does not only increase the accuracy of information but also makes it more accessible and provides better service overall. It facilitates real-time functionality, minimizes bureaucracy, increases user interaction, and keeps gyms in line with the digital transformation that is sweeping most industries. In this respect, The Smart Gym Management System can be referred to as a relevant and adequate solution, which is set to upgrade the gym activity and address the demands of the current fitness community.

1.1.2 Problem Identification

Despite the rapid growth in the fitness industry, most of the gyms have been using traditional and manual means of operating their daily operations, and this has posed a great challenge to their operations. It is not easy to have accurate and organized records using manual registers, paper-based attendance sheets, and scattered spread sheets. Billing can be a sham because the staff and the members will be confused. Trainers have challenges managing various appointments, creating different workout or meal plans, and maintaining a searchable history of the member progress. The absence of an integrated communication system, on the other hand, often makes members fail to get updates regarding their plans, schedules, or the status of their subscriptions in time. Such isolated processes are also a problem to the managers and administrators who may not be able to manage the supplement inventories, staff duties, leaves and membership renewals with no centralized system. The lack of real-life information and automatic workflows cause delays, mistakes, and inefficiencies, which eventually influence the quality of services and customer satisfaction. The shortcomings of these manual systems become even more evident as the gyms become bigger and more complex. The above scenario has clearly brought out the need to have a single, digital solution that can be used to streamline

operations and increase its accuracy and offer seamless experience to all of the stakeholders.

1.1.3 Purpose and Justification

The main aim of the Smart Gym Management System is to present a modernized, structured, and automated system that can substitute the scattered manual system that is in place in most of the fitness centers. The system will help to enhance the overall efficiency and reliability of workout and meal plan requests, supplement inventory, and management, appointment scheduling, and membership handling by centralizing key processes and tasks that the gym will undertake on its behalf.<|human|>The goal of the system is to improve the overall efficiency and reliability of the gym by centralizing key processes and tasks that the gym will perform on its behalf, including membership handling, appointments, supplement inventory, and workout and meal plans. It offers a well organised platform on which members, trainers, managers and administrators are able to execute their duties at a single platform without any difficulties. This does not only improve transparency and communication but also assists in ensuring that the records are accurate and up-to-date in all the areas of operation. The reason why this kind of system needs to be developed is that it can result in the enhancement of the user experience and the working process of the fitness centers to a considerable degree. In the case of gyms that are not technologically equipped or those that lack the financial means to spend on costly commercial applications, a convenient web-based platform is more realistic and cost-efficient. With the help of modern technologies, safe authentication processes, and flexible database structure, the system will guarantee its ability to be used in the long term and be flexible. It minimizes manual errors, helps to save time, and promotes the enhancement of sound decisions: data-driven insights and reporting tools, help to make the right choice. In conclusion, the Smart Gym Management System is warranted as a required move towards the digital revolution in the fitness sector, and the ability of the gyms to provide more professional, efficient, and personalized services to their members.

1.1.4 Scope

The Smart Gym Management System has an extensive scope and involves creating a full web-based solution which has the capacity of overseeing the critical operations of a modern-day gym. The system will accommodate four different user entities namely Member, Trainer, Manager, and Admin with a set of responsibilities and access rights. Under this, the platform manages the following basic functions: member management, appointment booking, supplement order, workout and diet request, announcements, notices, payment details, refunding, leavership and administrative reporting. The system is supposed to ensure communication is streamlined, automated repetitive processes and offer a user-friendly interface to all stakeholders. To achieve scalability and usability, the project uses modern web technology, secure authentication protocols like JWT and Google OAuth, and A database on the cloud to provide an efficient and a smooth operation of the project. Although the system is quite extensive in terms of the number of processes related to the gym, there are still some aspects that are not included in the existing system. These are the creation of a special mobile app, the integration of wearable fitness gadgets, further AI-powered workouts suggestions, biometric attendance solutions, and offline desktop apps. They are known to be potential improvements of the expansion in the future but are not added to the initial implementation. Having the scope clearly determine the things that are included and excluded makes the scope ensure that the project is feasible, focused and in line with the intended objectives and leaving room into the possibility to grow and improve in the future.

1.2 Project Planning and Initiation

The first step of the Smart Gym Management System planning and initiation is the beginning of the whole development lifecycle. This stage will entail determining the vision of the project, the requirements of the operations of the modern gyms and the key features that will be necessary to provide an effective and realistic solution. Under the initiation stage, the main emphasis is on the evaluation of the prevailing challenges of the gyms that continue to rely on manual systems, as well as the expectations that various users, including members, trainers, managers, and administrators, had. On the basis of these understandings, a vivid project plan is developed, which describes the main functionalities of the system, the technologies it will need, the risks it would face, and how it would be developed.

The stage of planning also makes certain that the development activities are organized in the systematic manner and based on the repetitive course of development and constant improvement. The agile attitude of the project embraces the concept of regular updates, feedback with the users, and the ability to change requirements. In order to have a system that is not only feasible but also worthwhile, careful feasibility study is done in various levels which involve examining the project to determine its feasibility, cost-effectiveness, and technical implementability.

Feasibility Study (Step-by-Step)

1. Technical Feasibility

Technically, the project is very possible since it will use proven and popular technologies like React.js to build the front and Node.js using Express.js to build the back end. MongoDB Atlas is a cloud-based NoSQL database that delivers scalability, reliability, and has the simplicity of being integrated with the current applications. Secure access and management of the users is guaranteed by authentication systems such as JWT and Google OAuth. The technical implementation is viable and well-supported since all the necessary development tools (including GitHub, Postman, and cloud deployment platforms (Vercel/Render)) are easily accessible.

2. Operational Feasibility

The system is operationally in line with the day-to-day operations of gyms. It provides automation to critical business processes including membership management, appointment booking, plan orders, inventory management and administrative reporting, thus, eliminating manual effort and human error to a minimum. The site is user-friendly and easy to navigate; hence, various groups of users can easily customize the site without necessarily possessing a lot of technical expertise. This makes the system operationally viable as well as ensures that members and staff of the gym can comfortably use the system.

3. Economic Feasibility

The project can also be done economically since the construction is based on the open-source technologies which do not attract the high licensing costs. Time, effort and basic hosting services are the main issues of cost of development. Given that the system enhances efficiency and minimizes reliance on manual labor, it carries long-term economic gains to the owners of the gyms. The system can help indirectly to achieve revenue and operational savings by reducing administrative errors, improving the workflow, and increasing member satisfaction.

4. Schedule Feasibility

The timeline of development has been designed in an organized way to guarantee that development will be completed on time. The following phases are used to partition the project requirement: analysis, UI/UX, backend and database configuration, frontend integration, feature implementation, testing, and deployment. The schedule is realistic and therefore attainable as each phase takes a reasonable amount of time to do the task according to its complexity. Access to flexibilities of making adjustments is also available in the iterative development model.

5. Legal and Security Feasibility

It follows the common web application security principles, such as encryption of authentication, secure session management, and role authorization. As personal information and payments are involved in the data manipulations, adherence to appropriate safety protocols will guarantee the adherence to the overall data protection standards. The system is legally and ethically accountable by having a secure storage of information and controlled access. To conclude, the planning and initiation phase of the project provides the foundation of the Smart Gym Management System since it assesses the fact that the system is technically feasible, operationally effective, economical, schedule friendly, and secure. The feasibility study also proves that the project is viable and worthy to proceed with the next phase of design and development.

Target User Profile and Tentative Elicitation Process

1.3.1 Target User

Member

Trainer

Manager

Admin

1.3.2 User profile

Table 1: User Profile for Member

User Class	Note on Characteristics
Type of user	Member
Age range	16 to 60 years
Frequency of use	Regular (3–7 times per week depending on membership)
Mandatory	Yes (must register to use system features)
Computer experience	Basic to Intermediate
Education	General education level or above
goal	To manage appointments, view plans, track membership, buy supplements
Language skills	Basic English Comprehension
Number of users	Unlimited (depends on gym size and subscribed members)
Training	None required (simple UI)
Others system use	Web browsers (Chrome, Edge, Firefox) on mobile or desktop
Way of working	Independent browsing and accessing personal gym data

Table 2: User Profile for Trainer

User Class	**Note on Characteristics**
Type of User	Trainer
Age Range	20 – 50 years
Frequency of Use	Daily (for appointments, schedules, plan requests)
Mandatory	Yes
Computer Experience	Intermediate
Education	Professional fitness training certification or related
Goal	To manage appointments, create workout/meal plans, track member progress.
Language Skills	Good English comprehension
Number of Users	Limited (depends on trainer count in the gym)
Training	Minimal system training may be required
Other System Use	Web browsers (Chrome, Edge, Firefox)
Way of Working	Works with scheduled appointments and member plan requests

Table 3: User Profile for Manager

User Class	**Note on Characteristics**
Type of User	Manager
Age Range	25 – 55 years
Frequency of Use	Daily (for operational monitoring)
Mandatory	Yes
Computer Experience	Intermediate to Advanced
Education	Business/management background preferred
Goal	To manage supplements, membership packages, leave requests, and operations
Language Skills	Good English proficiency
Number of Users	Very limited (1–3 users typically)
Training	Slight system training required
Other System Use	Web browsers (Chrome, Edge, Firefox)
Way of Working	Oversees gym operations and coordinates staff activities

Table 3: User Profile for Admin

User Class	**Note on Characteristics**
Type of User	Admin (Superuser)
Age Range	25 – 60 years
Frequency of Use	As needed (system-wide control)
Mandatory	Yes
Computer Experience	Advanced
Education	Technical/management background
Goal	To manage all modules, access full reports, control system settings
Language Skills	Good English proficiency
Number of Users	Usually 1 (Gym Owner or System Admin)
Training	Basic overview of system required
Other System Use	Web browsers (Chrome, Edge, Firefox)
Way of Working	System-wide monitoring & controlling

1.3.3 Elicitation Process

In order to create the right and feasible user requirements in the Smart Gym Management System, some structured elicitation process was adhered to. The primary aim was to get to know the requirements of the gym members, trainers, managers, and administrators and convert the requirements into explicit system features. This process was aimed at defining the day-to-day issues concerning the gym activities and how a computerized system can make their work easier, automatic.

Methods Used:

Interviews: Interviewed employees of the gym, trainers, and front-desk workers informally to learn key features like management of membership, plan requests, appointment scheduling and tracking of supplements.

Observation: Witnessed the daily operations within a gym and the manner in which attendance is taken, how trainers make their time schedules, and the trainers who administer the supplements and renewing of the membership. This assisted in determining inefficiencies of the current manual system.

Questionnaires: Gathered feedback via brief surveys to get to know their expectations of the interface and accessibility, as well as the desired features of the system, including notifications, dashboards, and payment tracking.

Document Review: Examined available manual files like attendance lists, membership list, trainer shifts, and supplement files to know the kind of information that is being captured and the ways of digitizing it efficiently.

Project Block Diagram

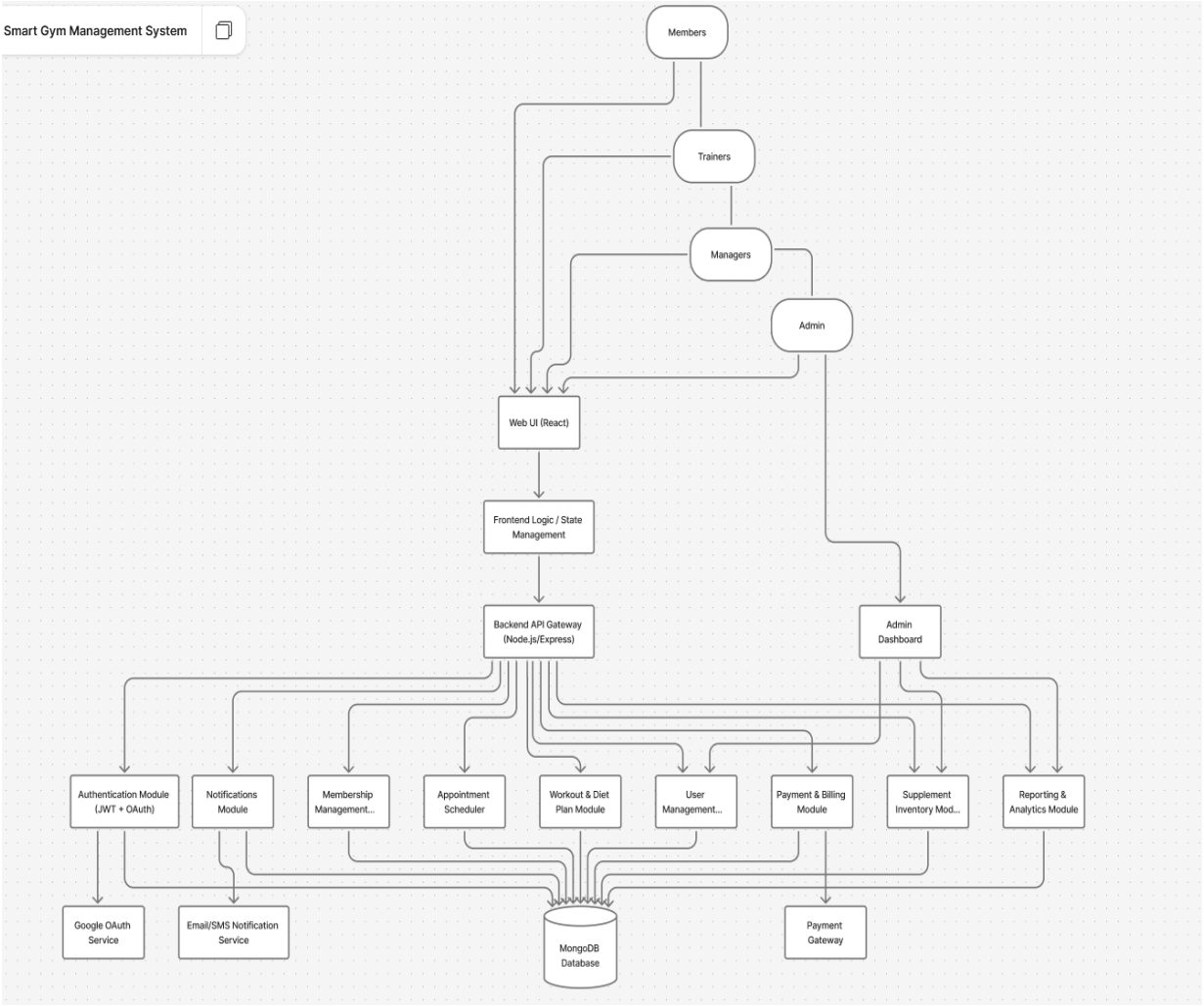


Figure 1: System Block Diagram

The block diagram of the Smart Gym Management System gives a general picture of the interaction of the key parts of the system with each other. It demonstrates exchange of information between the four user roles, including Member, Trainer, Manager, and Admin, and the basic modules of the application, including membership management, appointments scheduling, supplement handling, plan requests, authentication and reporting. Another key aspect in the diagram is the relationship of the frontend interface, backend server with the MongoDB database, where the data is processed and stored by the system. The block diagram can also be used to visualize these interactions thus explaining the entire structure of the system and how various modules interlock to enable the efficient and smooth running of the gym.

1.5 System Requirements

1.5.1 Hardware Requirements

Server:

Processor: Dual-core processor (2.0 GHz and more)

RAM: 4 GB minimum

Hard Display: 100 GB of free space to house the system and store data.

Network: Fast internet network to facilitate data exchange and communication.

Client (End-user Devices):

Desktop/Laptop Windows 7 or newer, macOS, or Linux-based platform.

Hardware: Android 5.0 or more, iOS 12 or more.

1.5.2 Software Requirements

Component	Requirement
Operating System	Windows 10 or later, macOS, Linux
Frontend	React.js, Tailwind CSS, TypeScript
Framework	Next.js
Backend	Node.js
Code Editor	MS Visual Studio Code
Database	PostgreSQL
Web Browser	Google Chrome, Mozilla Firefox, Safari
Web Server	Localhost

1.5.3 Constraints and Dependencies

Type	Description
Hardware Constraints	The processing speed, the memory, and the storage capacity of the computer on which the local server is running are the factors that determine the performance of the system. The cheap hardware can lead to slow response time to multiple demands.
Software Constraints	The system will need a local server environment like the MS Visual Studio code and PostgreSQL to be configured. In case of outdated versions compatibility problems might occur.
Browser Dependency	The system is compatible with the latest browsers such as Google Chrome and Microsoft Edge. Outdated browsers could also have display or functionality problems.
Network Constraints	The system is not accessible outside since it is a localized system unless deployed on an online web server. Any problem with the network set up can cause the users to have no access to the application..
Security Limitations	Basic security features like validation of the session and validation of the form are used. Nevertheless, the scope of this project does not include the full-scale protection (e.g., encryption by means of the use of theSSL protocol, sophisticated authentication).
Data Dependency	The system is based heavily on the use of PostgreSQL database. Any failure, corruption, and incorrect configuration of a database linkage will interfere with the booking and data retrieving procedures.
Scalability Limitation	The existing one targets small to medium-sized gyms. Additional load balancing and optimization would be needed in case of a larger-scale implementation.
Maintenance Dependency	The System updates, back-ups, and bug fixings require access and technical expertise on the part of the administrators on database management.

1.6 Project Scheduling

The Smart Gym Management System has a six phase timeline, broken down into phases. All phases are concerned with the particular activity that leads to the project completion. The schedule provides a good flow between the requirement analysis and deployment so that there is sufficient design, implementation, testing, and refining time.

Phase No.	**Project Phase**	**Major Activities**	**Estimated Duration (Week)**	**Time Period (Week)**
1	Requirement Analysis	Gather requirements, develop user needs, existing workflow analysis, complete scope.	1 week	Week 1
2	UI/UX Design	Create wireframes, page layouts, userflow, finalize visual design.	1 week	Week 2
3	Backend Setup & DB Design	Set up node js server, designing of database schema, api structure.	2 weeks	Week 3–4
4	Frontend Integration	Develop React pages, allow UI and backend APIs, implement components.	2 weeks	Week 5–6
5	Authentication & Roles	Implement JWT + Google OAuth Create role based access control. Create session handling.	1 week	Week 7
6	Feature Development	Build all core modules: Appointments, supplements, plans, payments, reporting.	3 weeks	Week 8–10
7	Testing & Bug Fixes	Carry out functional tests, bug fix, refinement, UAT.	1 week	Week 11
8	Deployment &	Prepare documentation, optimize the performance of the database, connect it to the frontend and deploy it.	1 week	Week 12

1.7 Summary

Chapter 1 was a general background of the Smart Gym Management System as it gave the background, reasoning, and the aim of the project. It showed the increasing need of the digital solutions within the framework of the modern fitness centers, where manual operations are able to cause inefficiencies, lack of communication, and challenges in the management of day-to-day activities. The chapter highlighted the reasons why an automated, web-based system is necessary to enhance the experience of members, the productivity of the staff, and the accuracy of the operations through the problem identification and justification.

The project initiation process was also introduced in the chapter, with the feasibility study being detailed in evaluation of technical, operational, economic, schedule and security of the system. It was made clear who the target users were and what their profiles entailed and as a result, the design of the system is up-to-date with the actual needs of the members, trainers, managers, and administrators. The elicitation process also addressed the way requirements were collected in a systematic manner through interviews and observations, surveys and review of documents. The description of the block diagram provided a high level overview as to the interaction between the system components, and the description of the system requirements presented the hardware, software, and constraints required. Lastly, the project scheduling section gave me a codified schedule of how every development stage would be done.

On the whole, Chapter 1 preconditions the whole project as it defines the problem space, establishes the requirements and prepares a clear roadmap to follow. It makes sure that the following chapters will have well-order and logically linked development procedure.

CHAPTER 2

DESIGN AND IMPLEMENTATION

2.1 Introduction

Chapter 2 is devoted to the aspects of design and implementation of Smart Gym Management System. This chapter proceeds after determining the project requirements, feasibility and planning in Chapter 1 and passes on to the technical structure which determines the manner of how the system is built. It gives the description of both functional and non-functional requirements and then the design items in the form of detailed design items developed via the UML modeling techniques. Such designs act as the blueprint to the system architecture which gives an outline of how various parts will interact and the way in which user operations will be addressed in the system.

It also defines the concepts of object-oriented design applied in the development of the design as it involves the development of the use case diagrams, use case descriptions, activity diagrams, sequence diagrams, class diagrams, and the ER diagram. These are all useful diagrams that assist in visualizing the workflows, user behaviors, flow of data, and the general structure of the entire system. Moreover, this chapter also has references to the coding implementation, which is described as the real code segments, which are systematized and kept in the Appendix A. Chapter 2 provides sequences of both design and implementation options, thus guaranteeing a successful shift between the theoretical planning stage and the actual software development.

2.2 Functional Requirements

The Smart Gym Management System will consist of a functional requirement set, which stipulates the operations and behaviors that will be conducted by the system in order to serve its users. These requirements will guarantee that all the user roles, such as Member, Trainer, Manager and Admin, can effectively perform their duties in the platform. The functional requirements include user authentication, membership and appointment management, supplement handling, plan requests, leave management, payment tracking and administrative reporting. The system should have a smooth and responsive interface that can allow the user to interact with the system without complexity and delays.The key functional requirements identified to make it clear and complete have been listed as follows:

FR01	User Login / Authentication
Description	The system enables its users (Member, Trainer, Manager, Admin) to log in with valid credentials. Google OAuth secure login is also supported by the system. Wrong credentials will produce a message of error.
Stakeholder	Member, Trainer, Manager, Admin

FR02	Role-Based Dashboard
Description	On authentication, the system shows the default dashboard depending on the role of a user. The features available to each role are limited to those that are allowed by this role.
Stakeholder	Member, Trainer, Manager, Admin

FR03	Manage Member Profile
Description	Through the profile page, members are able to review and update their personal details, membership details, and health related preferences.
Stakeholder	Member

FR04	Book Appointment with Trainer
Description	Members are able to make a booking with trainers that are available by choosing date, time, and type of session. The system records the booking and informs the trainer.
Stakeholder	Member, Trainer

FR05	Manage Appointments (Trainer)
Description	Trainers are able to see, verify, re-book or cancel appointments that members have made. Accordingly, the system changes the appointment status.
Stakeholder	Trainer

FR06	Request Workout & Diet Plans
Description	Personal workout or diet plans can be requested by the members. The requests are sent to trainers who upload personalised plans to the members.
Stakeholder	Member, Trainer

FR07	Supplement Management (Add/Edit/Delete)
Description	Managers are able to add additional supplements, revise stock records, change product records (name, category, price) or remove old items in the inventory.
Stakeholder	Manager

FR08	Subscription & Membership Management
Description	The members are allowed to subscribe to membership packages and renew subscriptions and also see the validity. Managers/Admin will be able to update membership plans and follow payment status.
Stakeholder	Member, Manager, Admin

FR09	Supplement Purchase / Cart / Checkout
Description	The members will be able to browse supplements, add items to the cart, and make a checkout. Orders are registered and inventory updated by the system.
Stakeholder	Member, Manager

FR10	Manage Employee Accounts
Description	Admin has the opportunity to add, edit or delete Trainer and Manager accounts. User role permission can also be updated by the admin where necessary.
Stakeholder	Admin

FR11	Leave Request Management
Description	The system allows Trainers and Managers to submit their leave requests. Admin has an opportunity to accept or decline the request and change the scheduling.
Stakeholder	Trainer, Manager, Admin

FR12	Announcements & Notifications
Description	Admin has the capability to make announcements that all the users can see. The system also generates appointment, plan approvals, membership renewal and order confirmations notifications.
Stakeholder	Member, Trainer, Manager, Admin

FR13	Reporting & Analytics
Description	Admin is able to produce membership, appointment, revenue and supplement sales and activity of the trainer reports. Managers are able to see constrained operational reports.
Stakeholder	Manager, Admin

FR14	Payment & Refund Handling
Description	The members are able to see the payment history, outstanding dues, and the status of the refunds. Timesheet/Manager can make payment records and refunds.
Stakeholder	Member, Manager, Admin

FR15	Workout & Diet Plan Upload (Trainer)
Description	Members are allowed to download or see their personalized workout or diet plans uploaded by their trainers on their dashboard.
Stakeholder	Trainer, Member

2.3 Non-Functional Requirements

The non-functional requirements outline the quality parameters and operation levels that the Smart Gym Management System should pass as a way of ensuring smooth, secure, and efficient implementation. Non-functional requirements, unlike the functional requirements, which are statements of what the system should perform, are concerned with the best way the system should perform. All these requirements will guarantee that the system will be fast, dependable, scalable, secure and easy to use by every stakeholder, including the members, trainers, managers and administrators. They also aid in sustaining the system to withstand load, safeguard user data, enhance long-term maintainability, and accessibility.

NFR01	Performance
Description	The system should be fast in responding to the user request so that navigation through it is easy and that data is readily accessed. Normal network conditions under normal circumstances should take 3 seconds to load any pages. Even allowing simultaneous use by multiple customers at the same time, appointment booking, supplement viewing, and dashboard loading should have no apparent delay.
Stakeholder	Member, Trainer, Manager, Admin

NFR02	Reliability
Description	The system should be available on a regular basis and should not have unforeseen malfunctions. The rate of reliability of all the necessary functions in the system of the login, appointment scheduling, and membership maintenance should also be high. The system must be able to absorb errors and come back to its feet in case of simple interruptions.
Stakeholder	Member, Trainer, Manager, Admin

NFR03	Availability
Description	The system must be 24/7 and it must have very little down time. Planned maintenance must be allocated at the low-activity time. Deployment (e.g., Vencel/ Render + MongoDB Atlas) is done in the cloud, which guarantees a high uptime and constant accessibility of all users.
Stakeholder	Member, Trainer, Manager, Admin

NFR04	Security
Description	The system needs to be secure in terms of data management via encrypted communication (HTTPS), powerful authentication (JWT + Google OAuth), and access control. Sensitive data like passwords, membership records, and records on payment should not be obtained by unintended persons.
Stakeholder	Admin, Manager, Trainer, Member

NFR05	Scalability
Description	The system should be capable of accommodating more users, appointments, payments and supplement transactions without compromising on the performance. Cloud infrastructure is used to enable scaling with increases in gym membership.
Stakeholder	Admin, Manager

NFR06	Usability
Description	The interface must have an easy to learn, responsive and intuitive interface which would allow users with low technical skills to navigate the system easily. There should be uniformity in the U1 components and they must be compatible with mobile and desktop browsers.
Stakeholder	Member, Trainer, Manager

NFR07	Maintainability

Description	The codebase must be designed in a modular way (MVC and reusable components) in order to be able to effectively add updates, fix bugs, and features. GitHub version control guarantees the ability to work collaboratively and maintain easily.
Stakeholder	Admin, Developer Team

NFR08	Portability
Description	The system must have a good performance with various operating systems such as windows, Mac OS, Android, and iOS using any modern web browser. No platform-specific installation will be needed.
Stakeholder	All user roles

NFR09	Data Integrity
Description	Any data stored should be current, consistent and accurate. The real-time changes cannot be conflicting and duplicate in terms of membership status, appointments, supplement inventory, and payment records.
Stakeholder	Admin, Manager, Trainer

NFR10	Backup & Recovery

Description	It needs to have automated data backup procedures on a timely basis through cloud backup systems. The system should back up the data with minimal loss in case of failure of the server.
Stakeholder	Admin

Object-oriented System design using UML

2.4.1 Use Case Diagram

Figure 2: Use case Diagram

2.4.2 Case Description

Case Description-01: Login

Case Description-02: Request Workout Plan

Use Case	Login	
Goal	Member books an appointment with a trainer for a selected date and time.	
Preconditions	Member is logged in and trainer schedule is available.	
Success End Condition	Appointment is successfully booked and stored in the system.	
Failed End Condition	Appointment booking fails due to time slot unavailability or invalid input.	
Primary Actors: Secondary Actors:	Member Trainer, Appointment Management System	
Trigger	Member submits appointment booking request.	
Description / Main Success Scenario	Step	Action
	1	Member navigates to the appointment booking page.
	2	Member selects trainer, date, and time slot.
	3	System checks availability of the selected time slot.
	4	System saves the appointment details.
	5	Member receives confirmation notification.
Alternative Flows	Step	Branching Action
	1	Selected time slot is unavailable.
	2	System shows "Slot Not Available" message and suggests alternatives.
Quality Requirements	Step	Requirement
	1	Appointment booking must be processed within 3 seconds.
	2	Notification should be delivered instantly after booking.

Case Description-02: Request Workout Plan

Use Case	Request Workout Plan	
Goal	Member requests a personalized workout plan from a trainer.	
Preconditions	Member is logged in and has an active membership.	
Success End Condition	Trainer receives the request and plan is successfully submitted into the system.	
Failed End Condition	Request fails due to missing information or system error.	
Primary Actors: Secondary Actors:	Member Trainer, Plan Management System	
Trigger	Member clicks “Request Workout Plan” and submits details.	
Description / Main Success Scenario	Step	Action
	1	Member navigates to the workout plan request page.
	2	Member enters fitness goals and any specific requirements.
	3	System validates the request data.
	4	System forwards the request to the assigned trainer.
	5	Member receives confirmation that request has been sent.
Alternative Flows	Step	Branching Action
	1	Required information missing.
	2	System shows “Incomplete Request” message and prompts user to fill required fields.
Quality Requirements	Step	Requirement
	1	System must forward the request to trainer instantly.

Case Description-03: Purchase Supplements

Use Case	Purchase Supplements	
Goal	Member purchases supplements from the gym's online supplement store.	
Preconditions	Member is logged in and supplements are available in inventory.	
Success End Condition	Order is successfully placed and saved in the system. Inventory quantity is updated.	
Failed End Condition	Purchase fails due to out-of-stock items or payment errors.	
Primary Actors: Secondary Actors:	Member Manager, Inventory System, Payment System	
Trigger	Member adds supplements to the cart and clicks "Purchase."	
Description / Main Success Scenario	Step	Action
	1	Member browses the supplement list.
	2	Member selects a product and adds it to the cart.
	3	Member proceeds to checkout and confirms order.
	4	System verifies inventory availability.
	5	System processes payment (manual or logged).
	6	System saves order details and updates inventory.
	7	Member receives order confirmation notification.
Alternative Flows	Step	Branching Action
	1	Item is out of stock.
	2	System displays "Out of Stock" message and prevents checkout.
	3	Payment fails.
	4	System shows "Payment Unsuccessful" and cancels purchase.
Quality Requirements	Step	Requirement
	1	Inventory must update instantly after purchase.
	2	Order confirmation must be delivered to the member within 2 seconds.
	3	System must ensure safe handling of payment data.

Case Description-04: Manage Supplement Inventory

Use Case	Manage Supplement Inventory	
Goal	Manager updates supplement products by adding new items, editing details, or removing outdated stock.	
Preconditions	Manager is logged in and has inventory management permissions.	
Success End Condition	Supplement list is successfully updated in the system.	
Failed End Condition	Update fails due to missing data, invalid input, or system error.	
Primary Actors: Secondary Actors:	Manager Inventory System, Admin (overview)	
Trigger	Manager selects “Manage Supplements” from dashboard.	
Description / Main Success Scenario	Step	Action
	1	Manager navigates to the supplement inventory page.
	2	Manager selects add, edit, or delete option.
	3	Manager enters or updates supplement details (name, price, category, stock).
	4	System validates the data.
	5	System updates the inventory database.
	6	Manager receives success confirmation.
Alternative Flows	Step	Branching Action
	1	Required field is missing.
	2	System displays “Incomplete Information” message.
	3	Invalid price or stock format.
	4	System shows input validation error.
Quality Requirements	Step	Requirement
	1	Inventory updates must reflect instantly throughout the system
	2	All stock operations must be logged for audit.
	3	Only authorized managers can change inventory.

Case Description-05: Upload Workout Plan

Use Case	Upload Workout Plan	
Goal	Trainer uploads a personalized workout plan for a specific member.	
Preconditions	Trainer is logged in and has received a workout plan request from a member.	
Success End Condition	Workout plan is successfully uploaded and becomes accessible to the member.	
Failed End Condition	Upload fails due to missing file, unsupported format, or system error.	
Primary Actors: Secondary Actors:	Trainer Member, Plan Management System	
Trigger	Trainer clicks “Upload Workout Plan” after completing the plan.	
Description / Main Success Scenario	Step	Action
	1	Trainer navigates to the workout plan request section.
	2	Trainer selects the member’s pending request.
	3	Trainer uploads the workout plan file or document.
	4	System validates file type and size.
	5	System saves the plan in the database and links it to the member.
	6	Member receives a notification that the plan is available.
Alternative Flows	Step	Branching Action
	1	Unsupported file format.
	2	System displays “Invalid File Type” message
	3	File size too large.
	4	System displays “File exceeds maximum size limit.
Quality Requirements	Step	Requirement
	1	Status update must complete within 2 seconds.
	2	Files must be scanned for security before storage.

Case Description-06: Manage Users (Admin)

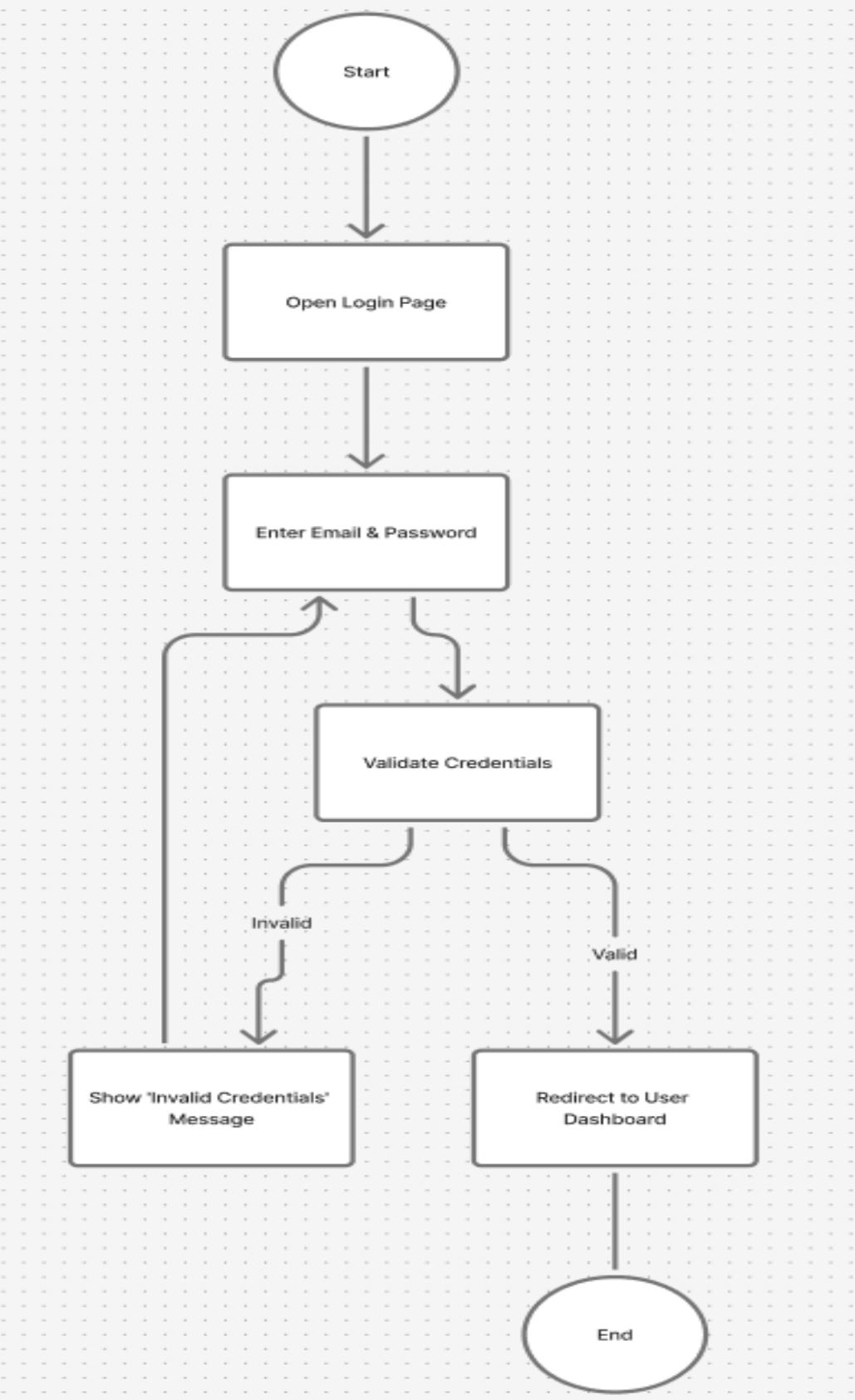
Use Case	Manage Users (Add / Edit / Delete)	
Goal	Admin manages system users by creating new accounts, updating details, or removing users such as trainers or managers.	
Preconditions	Admin is logged in with full system access.	
Success End Condition	User account is successfully added, updated, or deleted in the system.	
Failed End Condition	Operation fails due to missing information, duplicate email, or system error.	
Primary Actors: Secondary Actors:	Admin User Management System	
Trigger	Admin selects “Manage Users” from the dashboard.	
Description / Main Success Scenario	Step	Action
	1	Admin opens the Manage Users page.
	2	Admin selects Add, Edit, or Delete option.
	3	Admin enters or updates user details (name, email, role, password).
	4	System validates input data.
	5	System updates user account details in the database.
	6	Admin receives success confirmation.
Alternative Flows	Step	Branching Action
	1	Email already exists.
	2	System shows “Email Already Registered” message.
	3	Required field missing.
	4	System displays “Incomplete Information” message.
Quality Requirements	Step	Requirement
	1	Only admins can access user management operations
	2	All changes must be saved and updated instantly.

Case Description-07: Membership Renewal

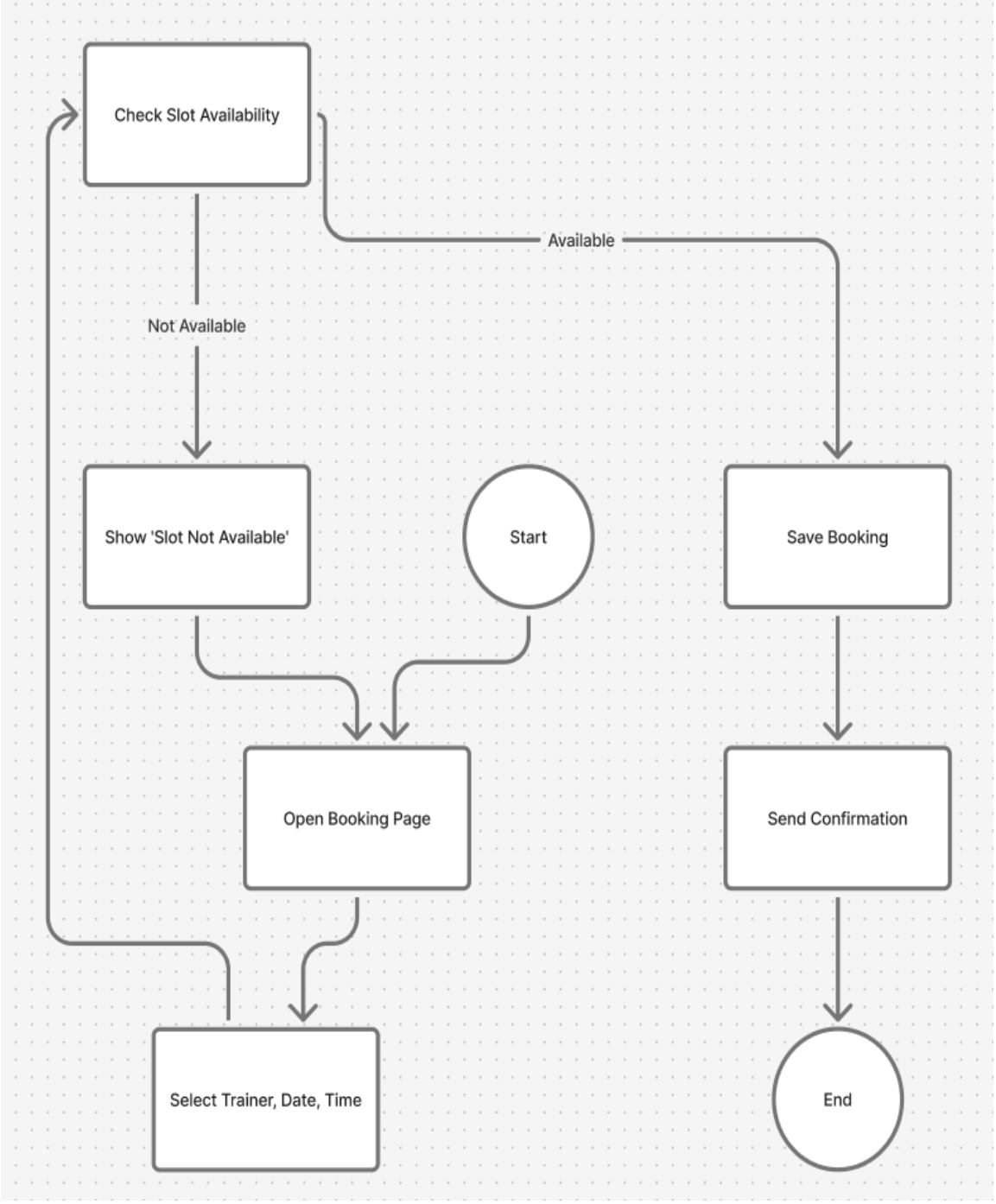
Use Case	Membership Renewal	
Goal	Member renews their gym membership by selecting a package and completing payment.	
Preconditions	Member is logged in and has an existing membership nearing expiration.	
Success End Condition	Membership is renewed successfully and new validity dates are updated.	
Failed End Condition	Renewal fails due to invalid payment, package selection error, or system issue.	
Primary Actors: Secondary Actors:	Member Manager, Payment System, Membership Management System	
Trigger	Member clicks "Renew Membership" from their dashboard.	
Description / Main Success Scenario	Step	Action
	1	Member navigates to the membership renewal section.
	2	Member selects a preferred membership package.
	3	Member reviews package details and confirms renewal.
	4	System verifies payment or logs manual payment status.
	5	System updates membership validity dates in the database.
	6	Member receives renewal confirmation notification.
Alternative Flows	Step	Branching Action
	1	Payment unsuccessful.
	2	System displays "Payment Failed" message and cancels renewal.
	3	Invalid package selected.
	4	System shows "Invalid Selection" and asks user to try again.
Quality Requirements	Step	Requirement
	1	Membership renewal should process within 5 seconds.
	2	Renewal confirmation must be delivered immediately.
	3	System must store renewal history for future reference.

2.4.3 Activity Diagram

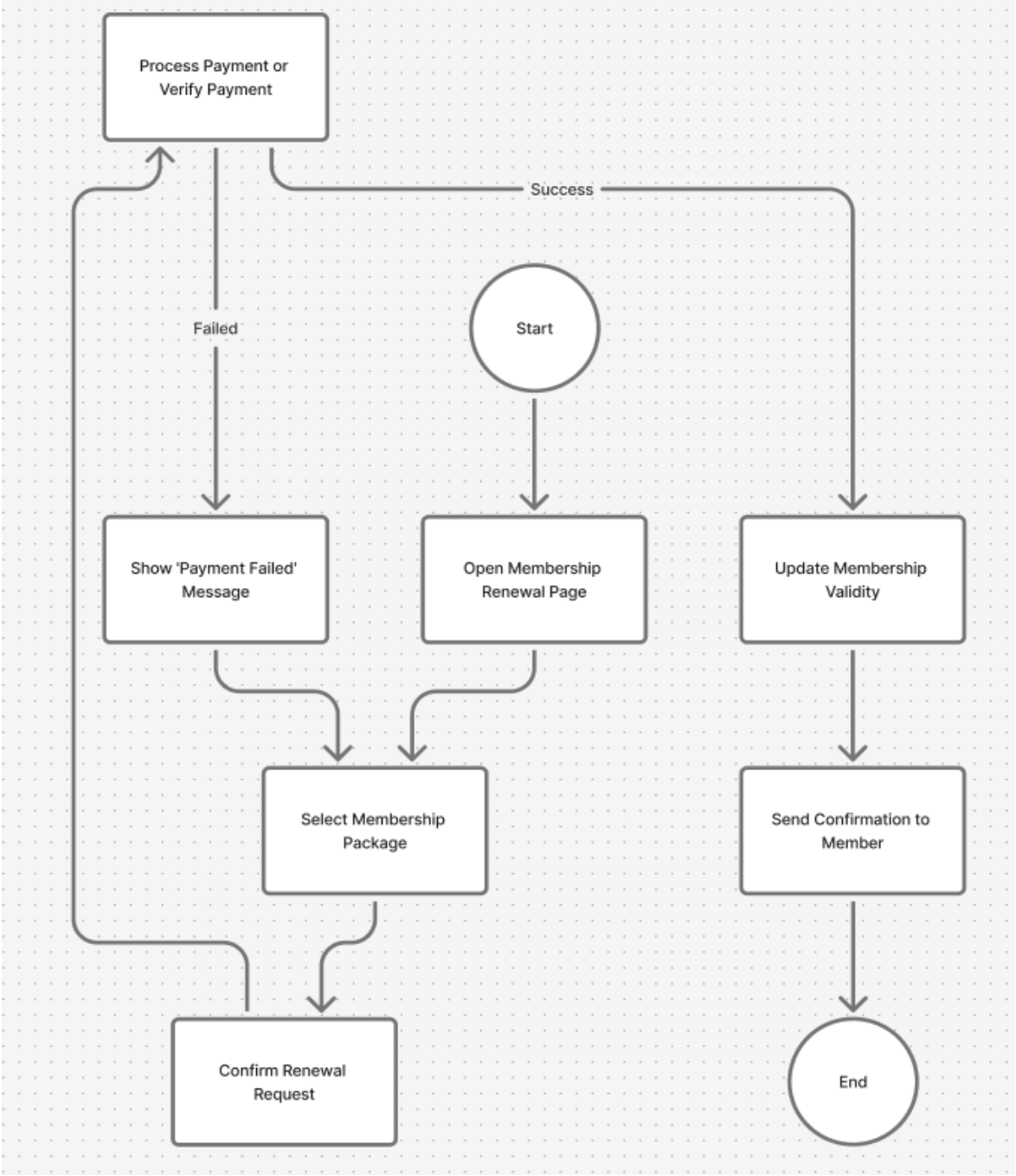
Activity Diagram 1: Login



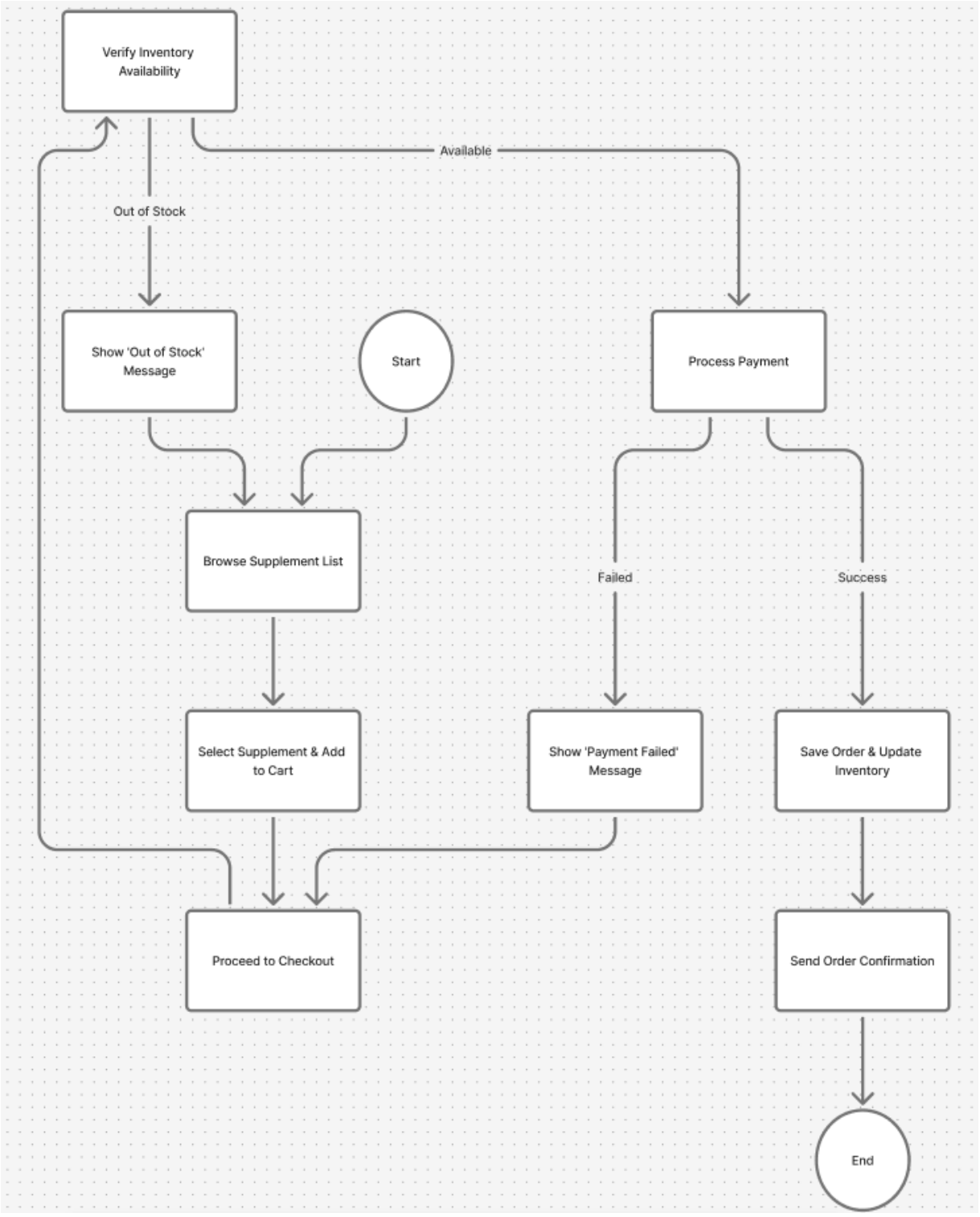
Activity Diagram 2: Book Appointment



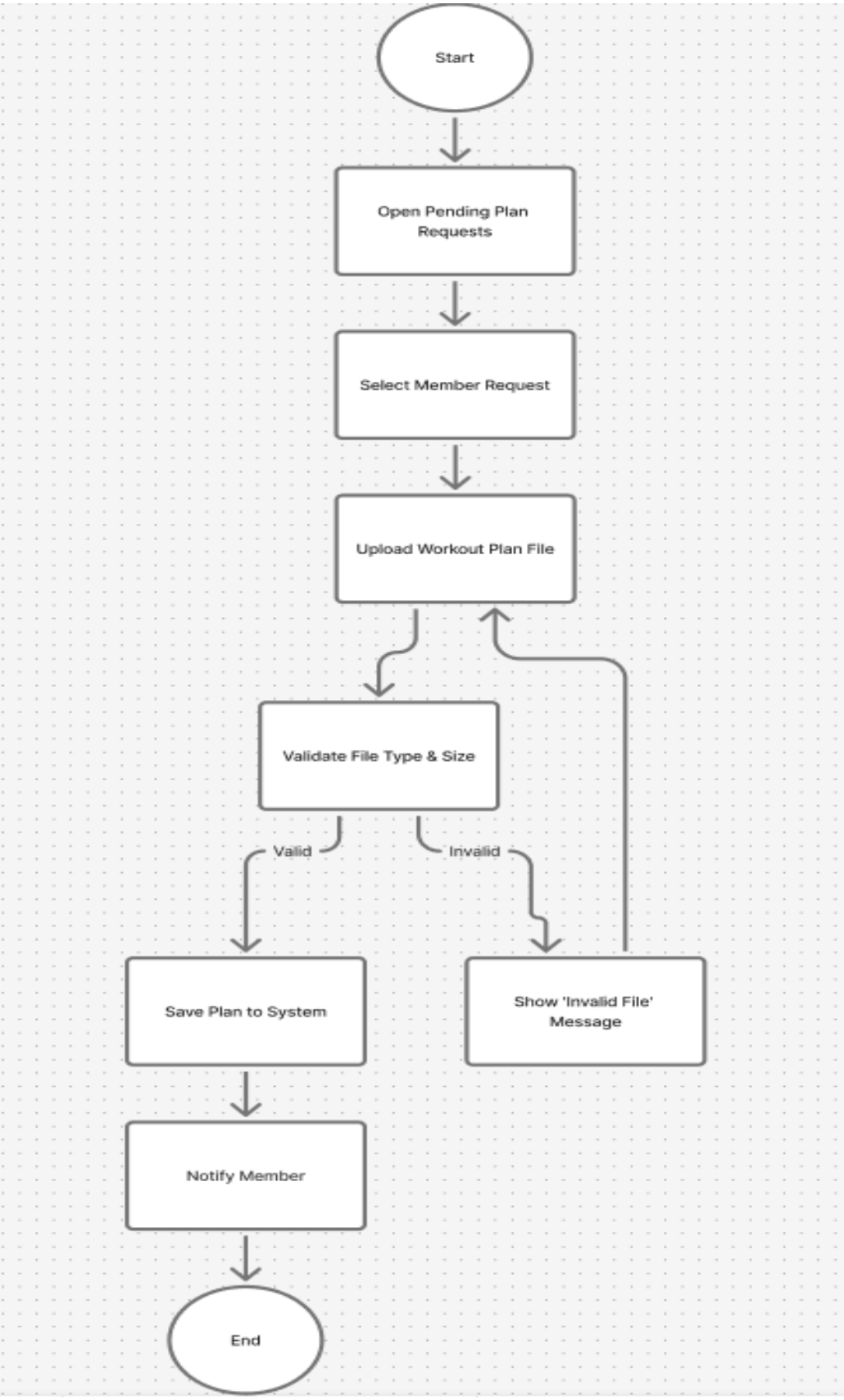
Activity Diagram 3: Membership Renewal



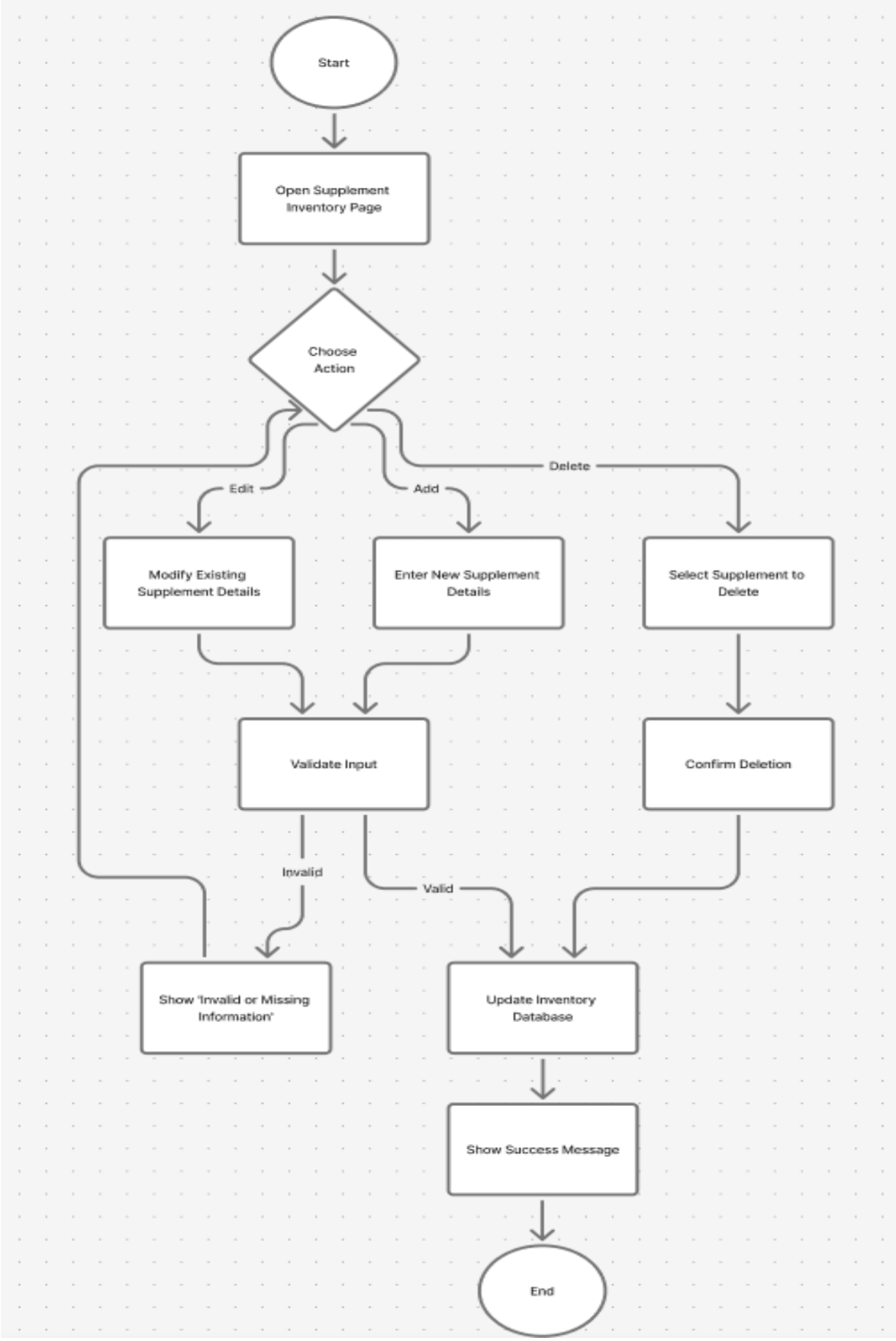
Activity Diagram 4: Purchase Supplements



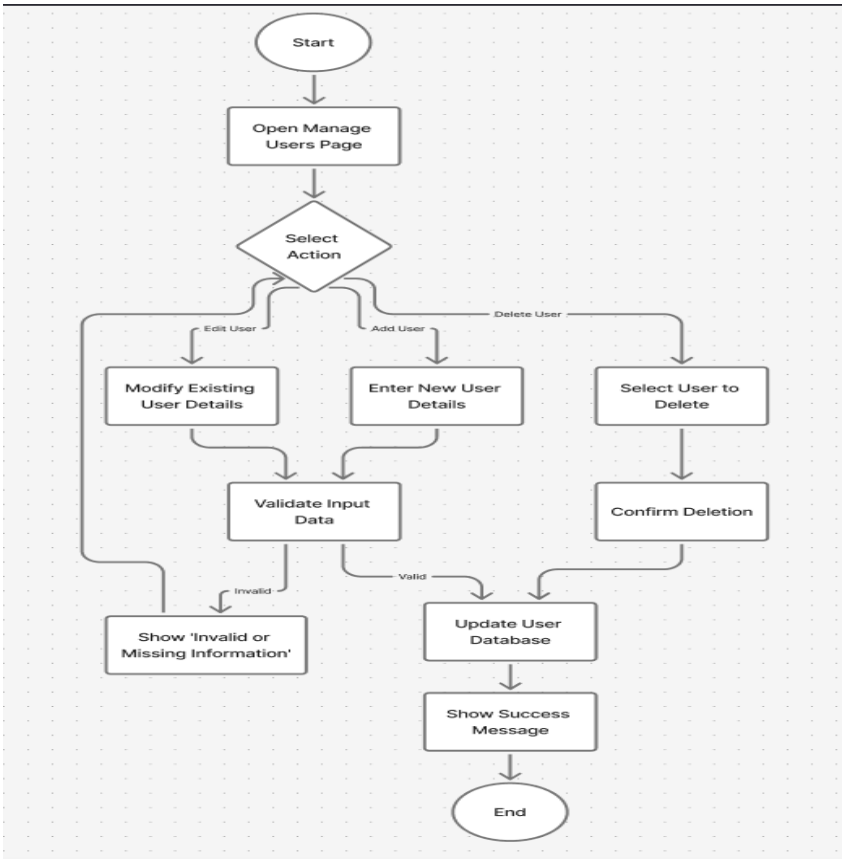
Activity Diagram 5: Upload Workout Plan



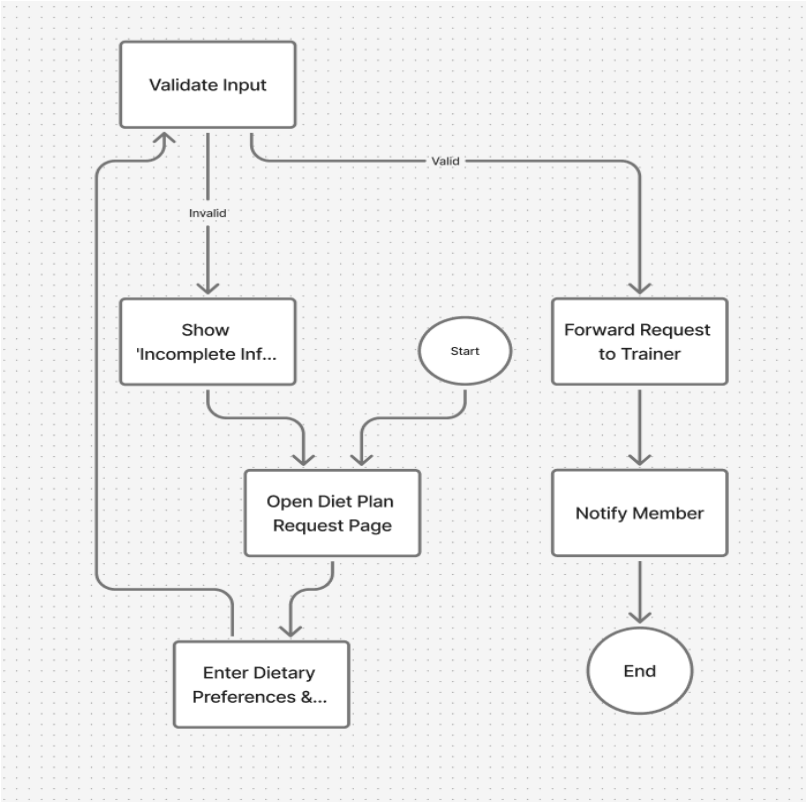
Activity Diagram 6: Manage Supplement Inventory



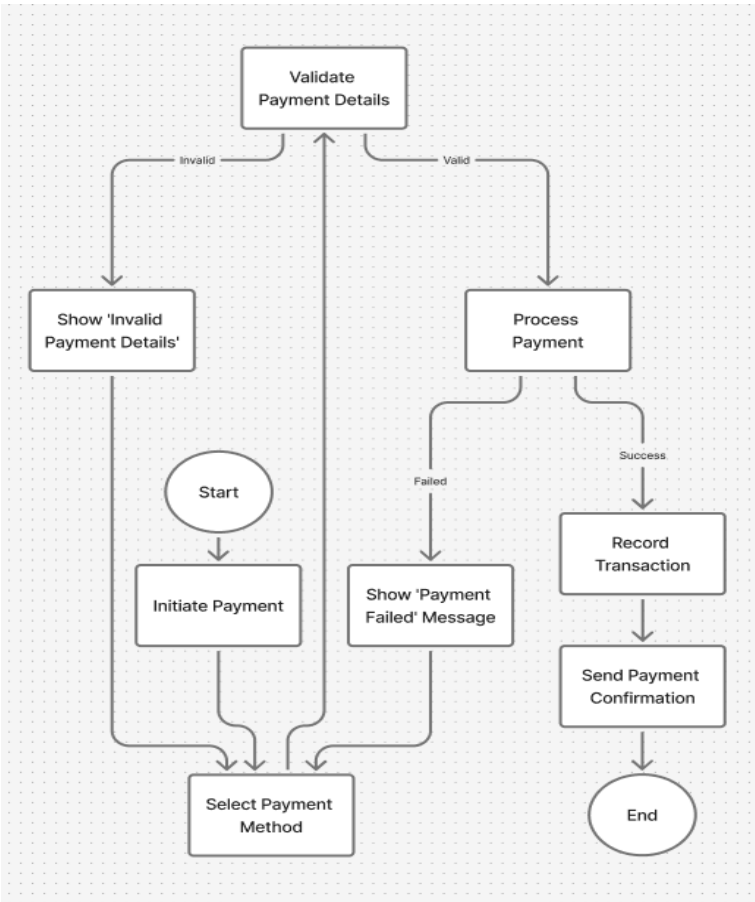
Activity Diagram 7: Manage Users (Admin)



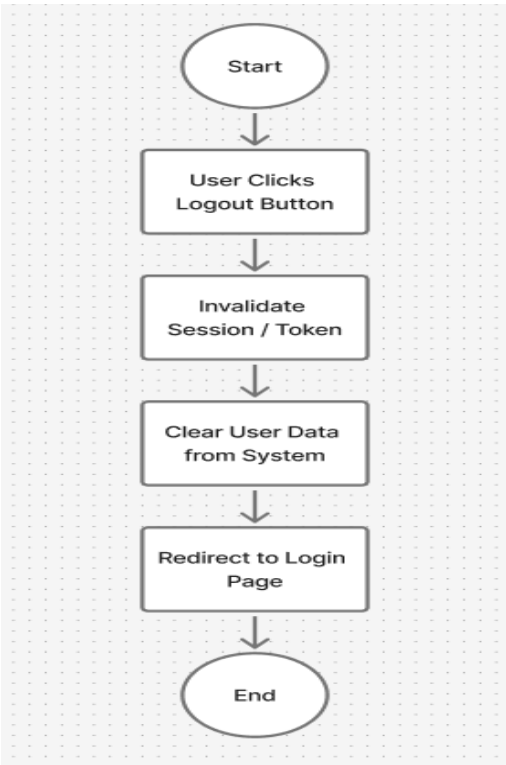
Activity Diagram 8: Request Diet Plan



Activity Diagram 9: Payment Process

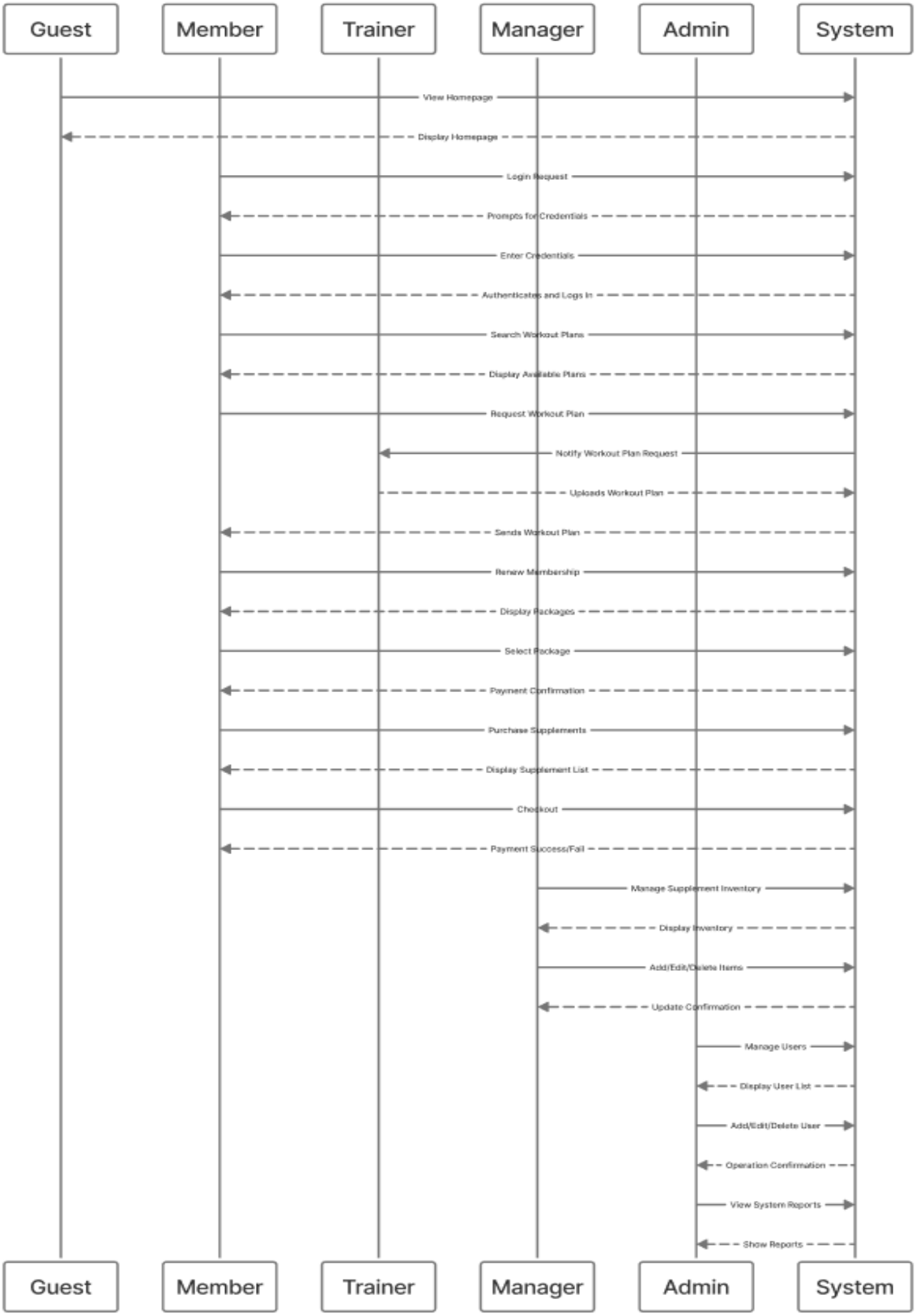


Activity Diagram 10: Logout Process

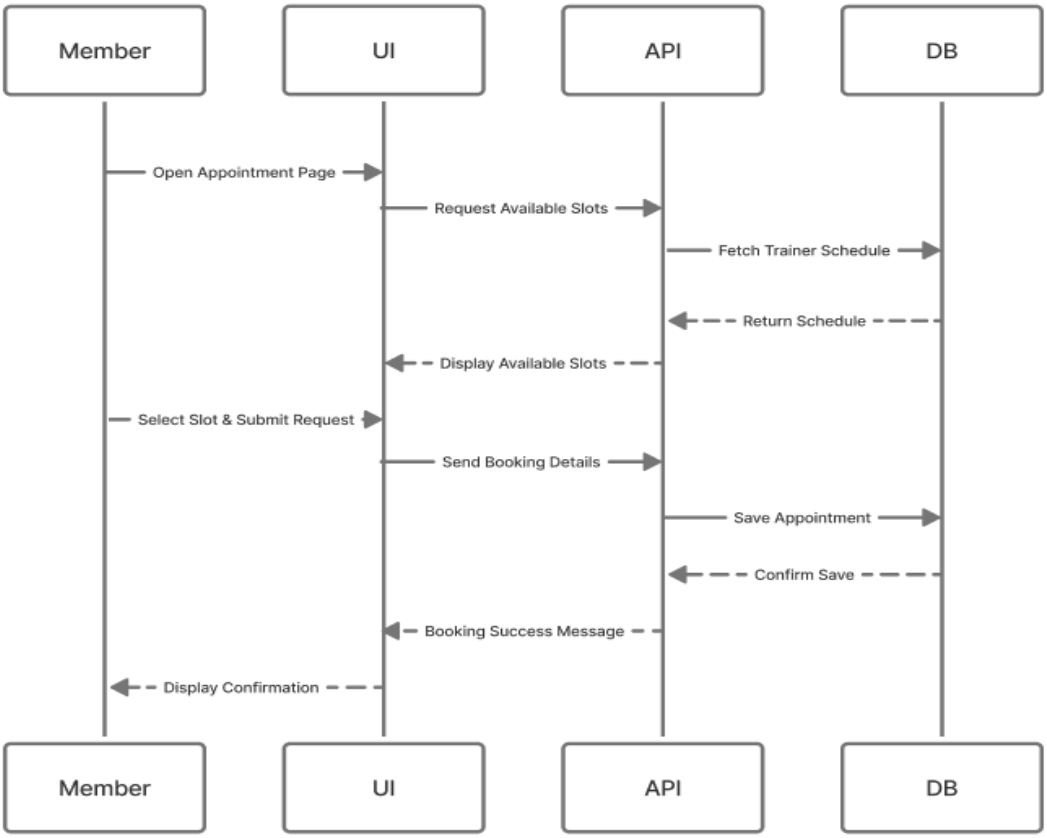


2.4.4 Sequence Diagram

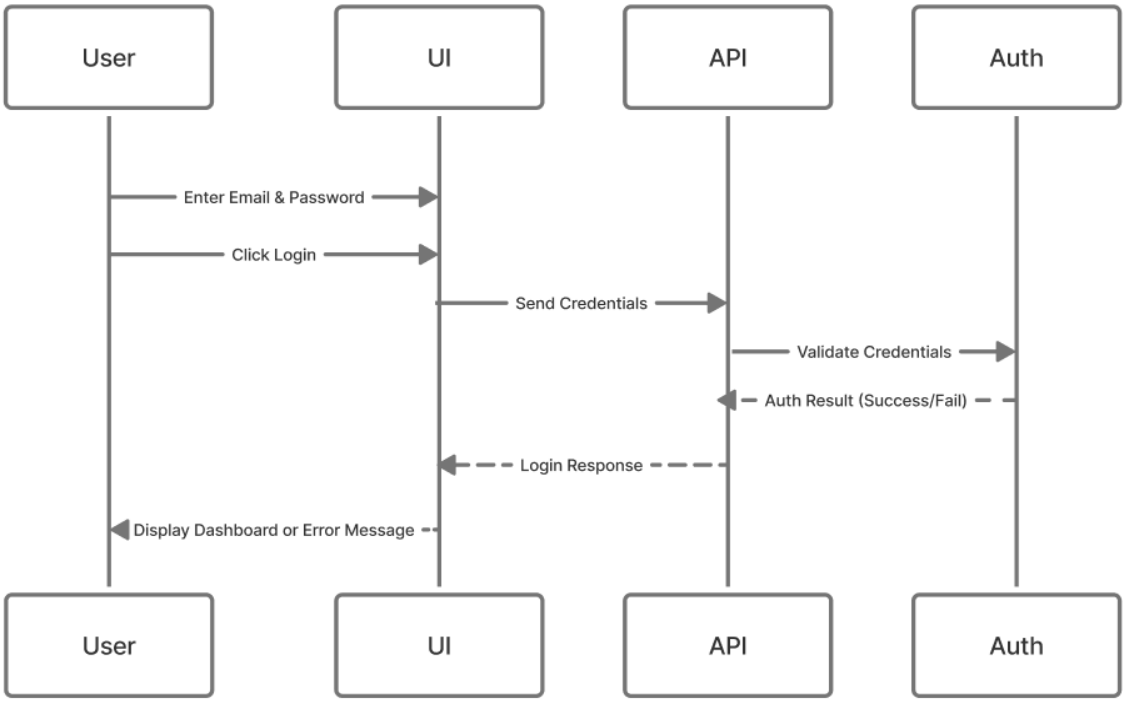
Figure 4: Sequence Diagram



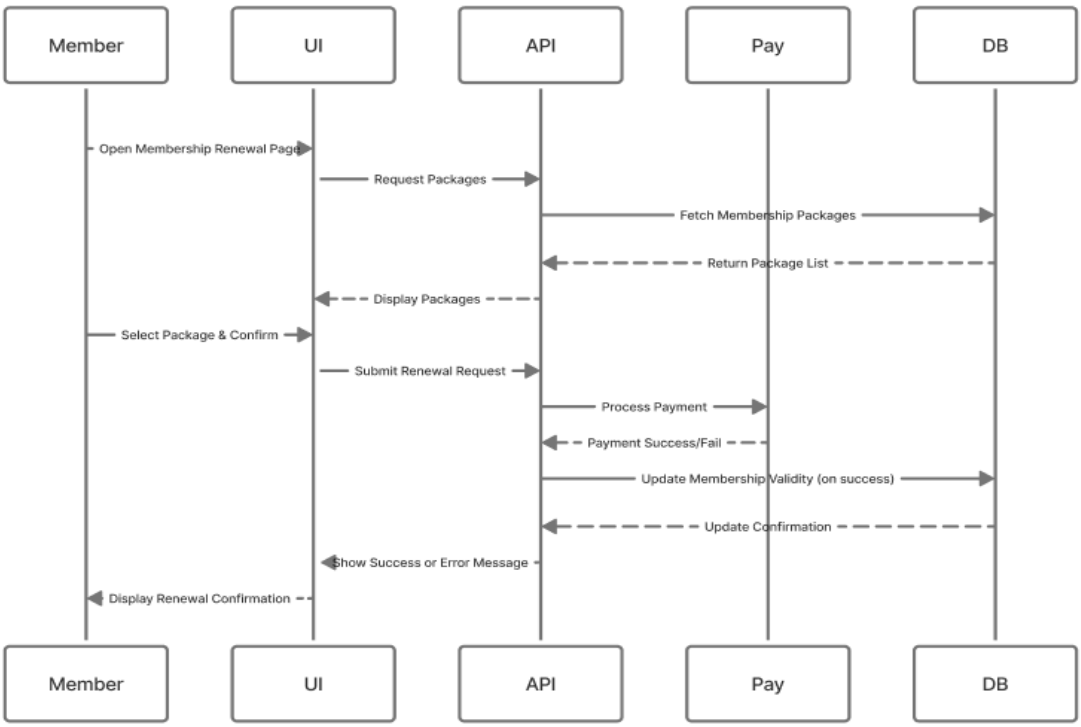
Sequence Diagram 1: Book Appointment



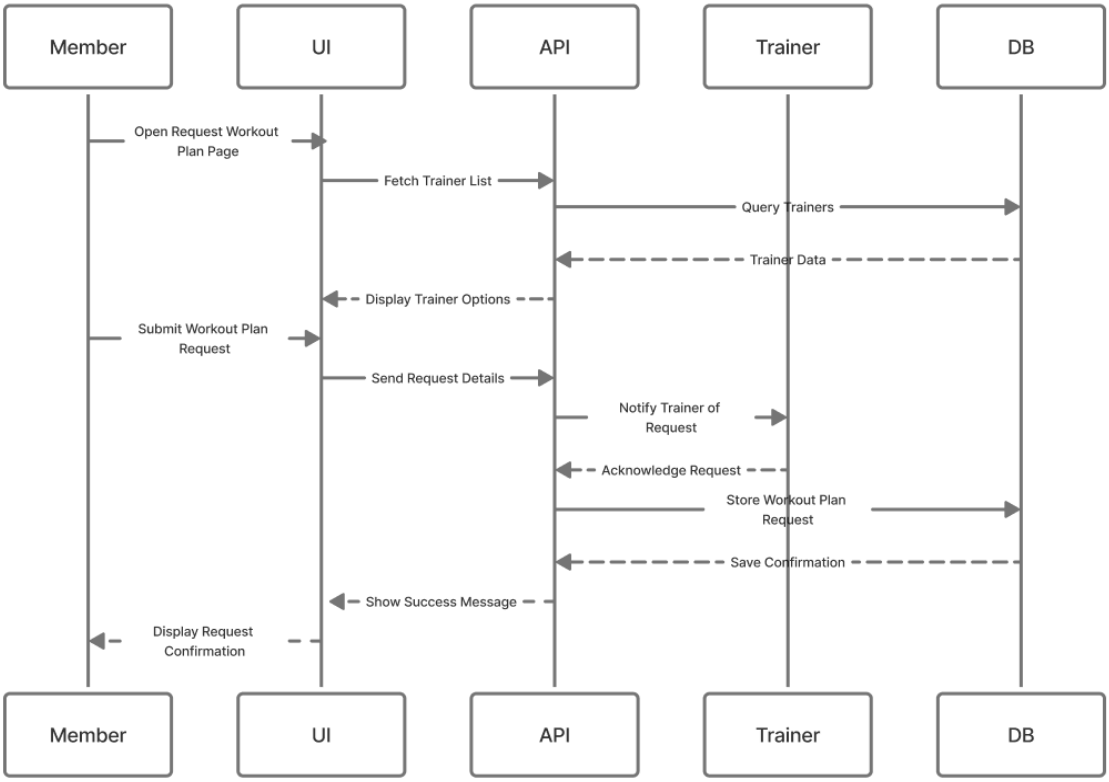
Sequence Diagram 2: Login Process



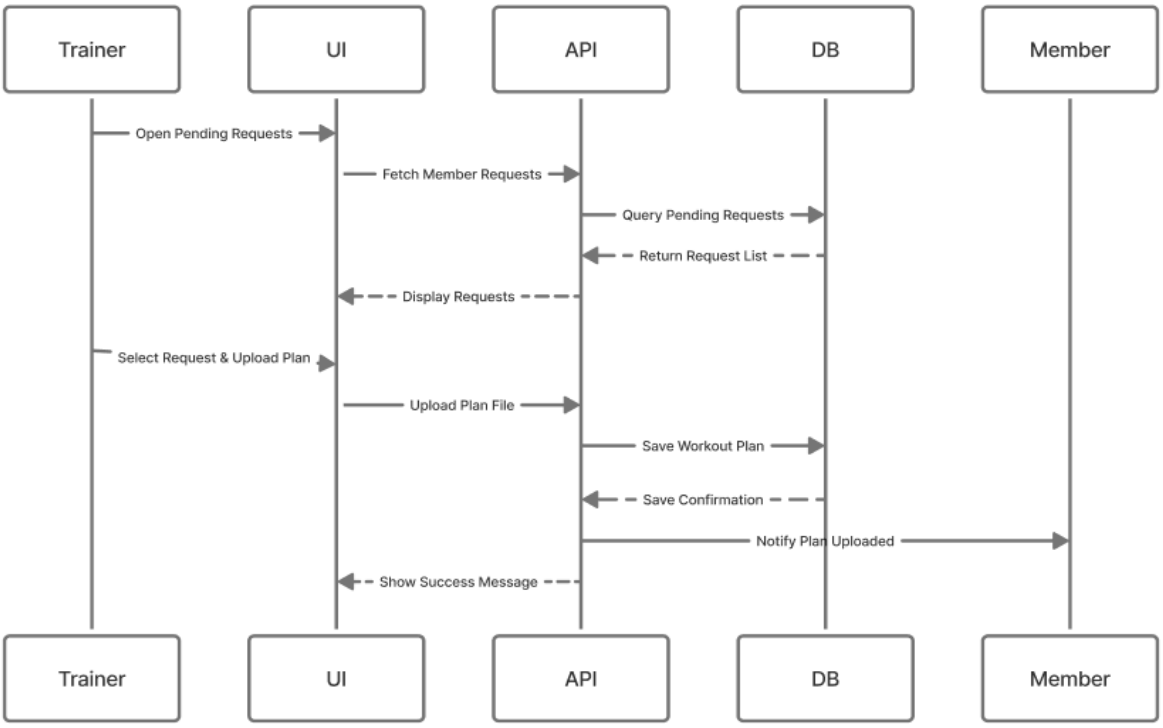
Sequence Diagram 3: Membership Renewal



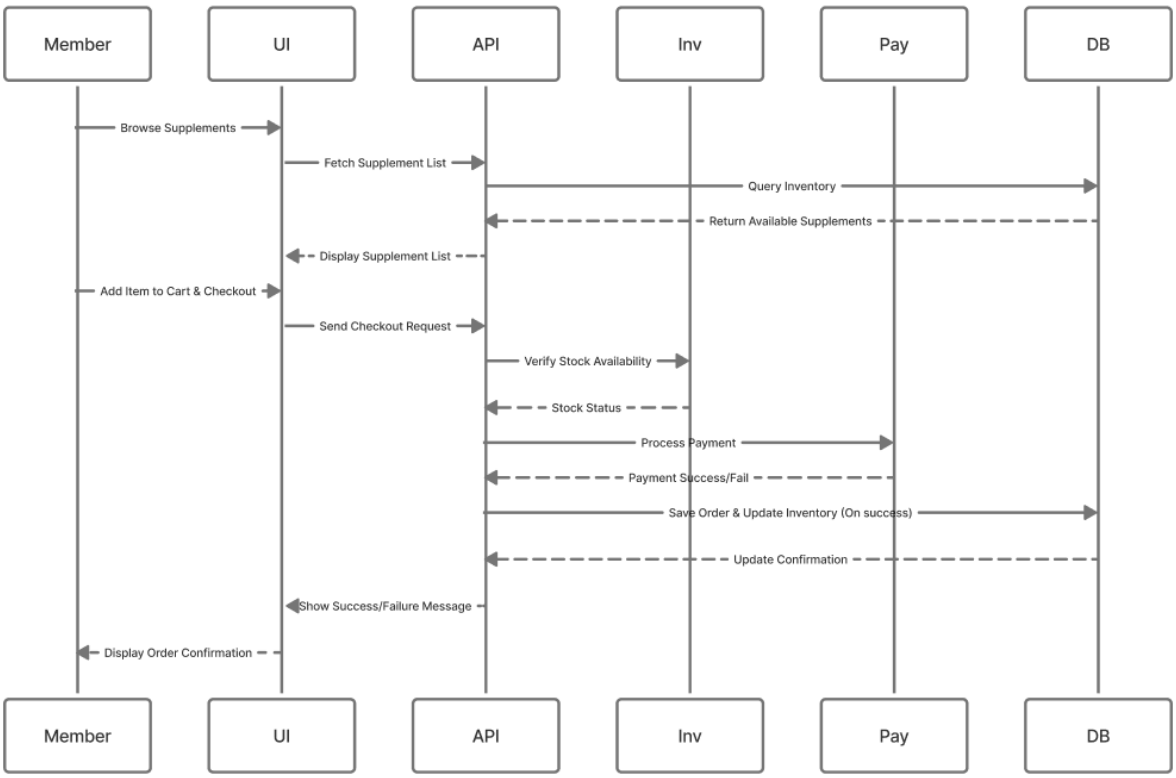
Sequence Diagram 4: Request Workout Plan



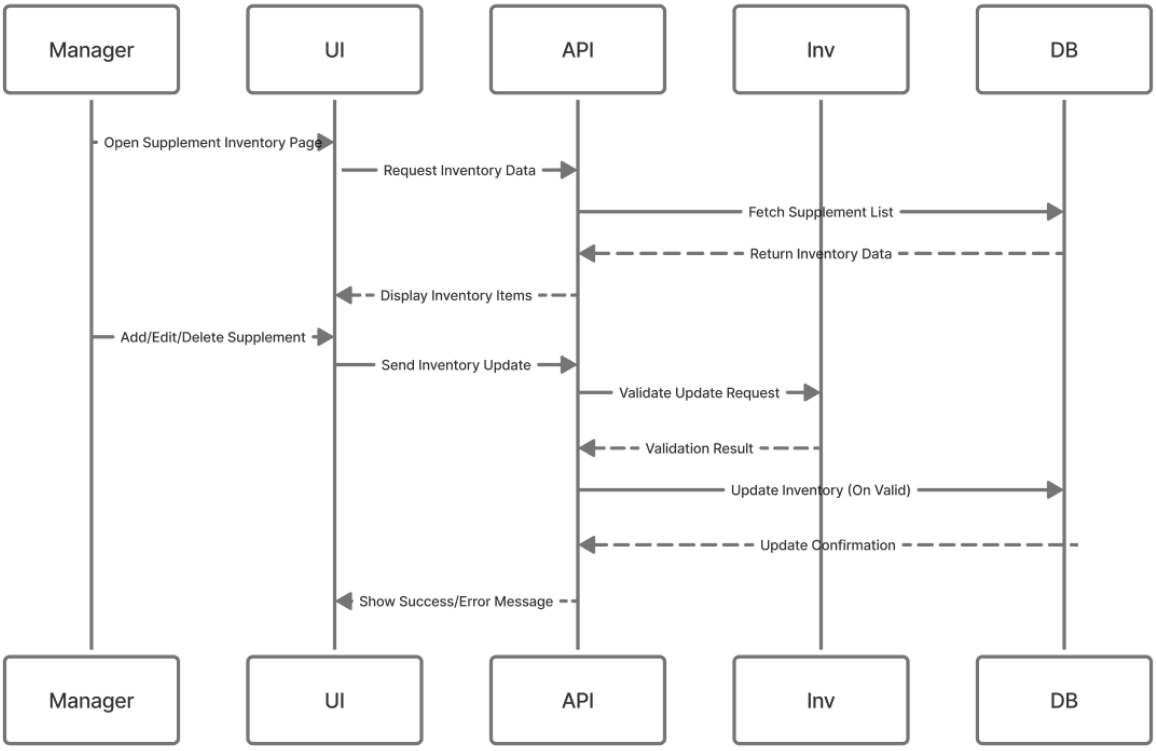
Sequence Diagram 5: Upload Workout Plan



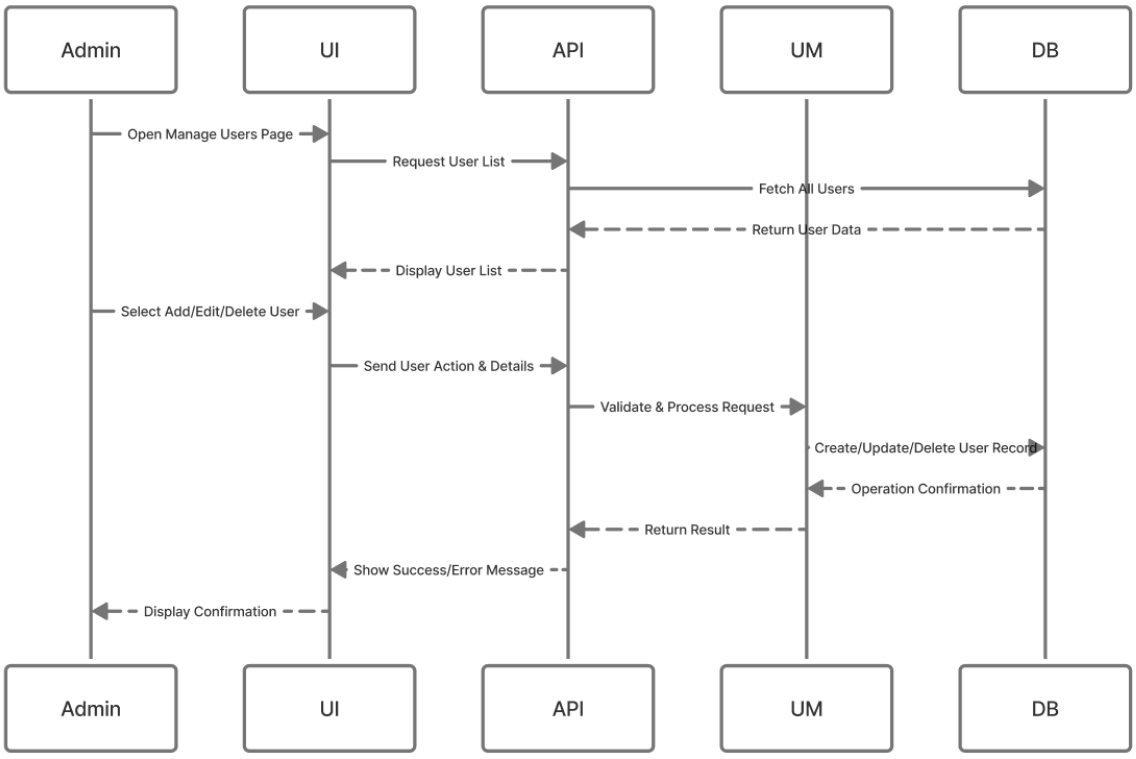
Sequence Diagram 6: Purchase Supplements



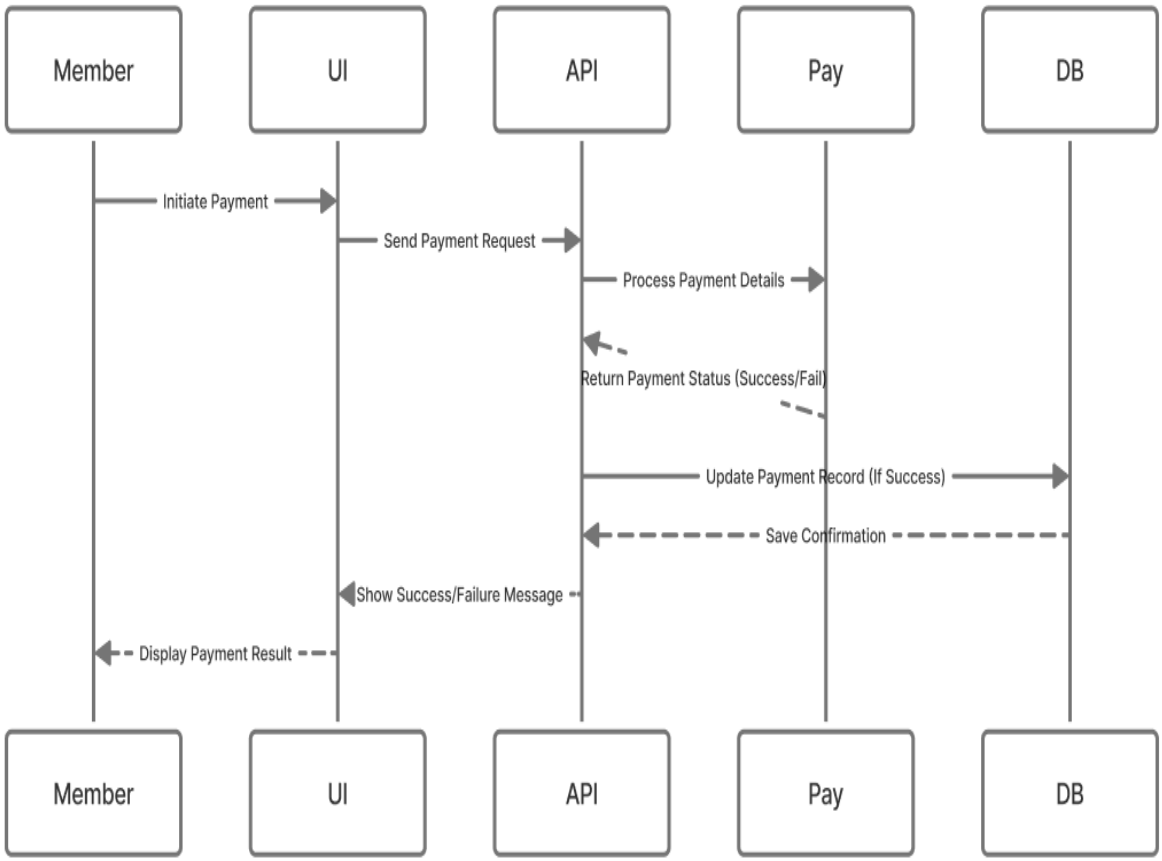
Sequence Diagram 7: Manage Supplement Inventory



Sequence Diagram 8: Manage Users (Admin)



Sequence Diagram 9: Payment Processing



Class Diagram

Figure 5: Class Diagram

ER Diagram

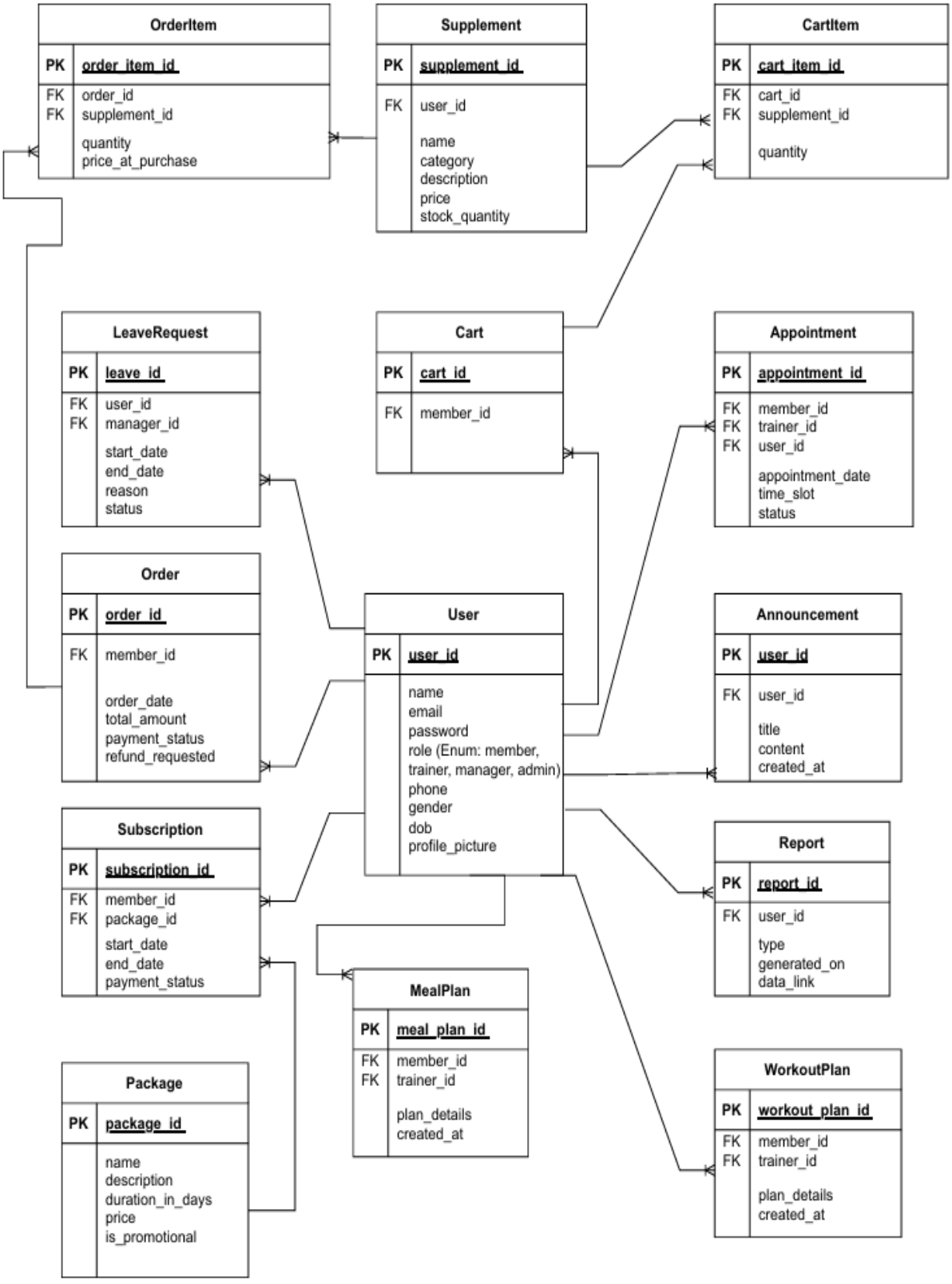


Figure 6: ER Diagram

2.5 Summary

The entire design and implementation framework of the Smart Gym Management System was shown in this chapter. It has started by determining the functional and non-functional requirements of the system, what the platform needs to accomplish and what quality properties it needs to hold. System behavior, workflows, and interactions among various actors such as members, trainers, managers, and administrators were represented visually by the UML diagrams namely use case, activity, sequence, and classes.

The database design and system architecture further indicated communication between various components and storage of information effectively. Lastly, the code appendix offered sample back-end and front-end code which shows how the main services like authentication, membership renewal, workout plan management, supplement inventory and payment processing have been implemented.

All in all, this chapter created the basis of the internal structure of the system, which will make the implementation consistent with the needs of users and help to operate the system efficiently and easily.

Chapter 3

Software Testing

3.1 Introduction

The software testing is important in quality, reliability and general performance of the Smart Gym Management System. Since the system will have different user functions, including members, trainers, managers and administrators, as well as a variety of functions, it is necessary to ensure that every single module of the system works properly in isolated context as well as in the context of the rest of the system. In this chapter, the testing methodology followed in the development is described, the features to be tested, the methods to be employed to test system behaviour, and the criteria which should be adopted to decide whether the different tests are passing or failing. It is centered on the assessment of the key functions, including user authentication, membership renewal, working out and diet plans management, purchasing supplements, inventory management, and processing payments. Using systematic methods of testing, the objective would be to have the system provide a smooth, secure, and easy-to-use platform regardless of the devices and types of users. Extensive testing also makes sure that the end product is in line with its functional and non-functional requirements which ultimately enhance customer satisfaction and durability.

3.2 Testing Features

3.2.1 Feature to Be Tested

a. User Registration
b. User Login
c. View Workout Plans
d. Request Workout Plan
e. View Uploaded Workout Plan
f. Purchase Supplements
g. Manage Supplement Inventory
h. Manage User Accounts
i. Membership Renewal
j. Process Payments

3.3 Testing Strategies

The testing framework of Smart Gym Management System aims at verifying that every functionality of the system works correctly, reliably and safely on all the user roles. To test the system, a mix of black-box testing, functional testing and unit testing technique was employed. Black box testing assisted in validating user facing features without understanding of internal code whereas functional testing confirmed that every module e.g. user login, membership renewal, workout plan requests, and supplement purchasing responded appropriately to valid and invalid inputs. Backend modules, such as authentication, database operations, and payment processing, were also used on unit testing to confirm the logic of specific functions.

3.3.1 Test Approach

The testing process was based upon black-box testing model in which there were input and desired outputs that were tested to ensure the system behaved as expected without the analysis of internal code. Multiple tests were done to be sure that every module of the Smart Gym Management System works properly and fits well into another.

Unit Testing - Each module was tested separately like the login, membership renewal and supplement purchase module, workout plan upload, and user management to ensure the appropriateness of their fundamental logic.

Integration Testing - The communications between modules were also tested such as communication between frontend and backend, workout plan requests between members and trainers, payment gateway testing and database testing.

System Testing- The whole system was tested to receive the confirmation that all system features, so to speak, authentication, workout plans, supplements, inventory, and payments, operate in a connected end-to-end mode.

User Acceptance Testing (UAT) - The system underwent testing by potential users such as students, trainers, managers, and supervisors to be able to confirm usability, clarity, performance, and satisfaction by different user groups.

The test condition was as follows:

Platform Visual Studio Code / Node.js / React.

Browsers: Google Chrome / Microsoft Edge.

URL frontend: http://localhost:3000/ (Frontend), URL Backend API: http://localhost:5000/

3.3.2 Pass/Fail Criteria

Criteria	Description
Pass	The system delivers as per the expectation and the operation goes on successfully.
Fail	The system fails to deliver the anticipated outcomes or an error is generated or the system fails to do the expected task.
Pending	The feature is either being tested or is being retested following initial failure, some modification, or half-completion.

3.4 System Testing (Test Cases with Report)

Test Case	Feature	Test Description	Expected Output	Actual Output	Result
1	Registration	Register a new member with valid details	User account created successfully	As expected	Pass
2	Login	Login with valid credentials	Redirects to user dashboard	As expected	Pass
3	Request Workout Plan	Submit workout plan request with valid inputs	Trainer receives request	As expected	Pass
4	Upload Workout Plan	Trainer uploads workout plan for assigned member	Plan uploaded & visible to member	As expected	Pass

Test Case	Feature	Test Description	Expected Output	Actual Output	Result
5	Request Diet Plan	Submit diet plan request	Diet request stored and sent to trainer	As expected	Pass
6	Manage Users	Admin adds/updates user accounts	User data updated in system	As expected	Pass
7	Manage Supplement Inventory	Add/update supplement items	Supplement list updated	As expected	Pass
8	Purchase Supplements	Member purchases available supplements	Purchase saved & inventory updated	As expected	Pass
9	Membership Renewal	Renew membership using valid payment	Membership status updated	As expected	Pass
10	Payment Processing	Process payment for renewal or purchase	Payment successful & recorded	As expected	Pass
11	Logout	User logs out from the system	Redirects to login page and session closes	As expected	Pass

3.5 Summary of Testing

The testing of the Smart Gym Management System was conducted successfully and the core modules and functionality of the system were found to be functioning as was supposed to be the case. Unit Testing, Integration Testing, System Testing, and User Acceptance Testing (UAT) were mutually combined to make sure that every element works under different circumstances. One of the modules, user authentication, membership management, workout/diet plan handling, supplement inventory, and payment processing were tested separately during the unit testing. Integration test ensured that there were no issues with the interaction between the interconnected modules, such as between the trainer and the member, uploading exercise plans and the logic behind membership renewal.

The system testing revealed that the platform worked effectively under the simulated real world environment where all its workflows, such as the login, plan requests, renewals, transactions and supplement management, were executed successfully. Lastly, the UAT response of sample users (members, trainers, and administrators) showed that the system was user friendly, functionally comprehensive and met user expectation. In general, all tests showed that Smart Gym Management System is stable, secure and can be deployed. Each of the key features was passed, and there were no critical defects.

Chapter 4

System Implementation

4.1 Introduction

The Deployment and Maintenance stage is concerned with the traditional implementation of the Smart Gym Management System into the desired environment and with the proper functioning of the latter once implemented. This is the stage where a system has undergone all the significant testing processes and is now okay to be used in the real-life. Deployment involves the preparation of the hosting environment, database configuration, installation of the required components as well as the opening of the application to the end-users like members, trainers and administrators. Maintenance is also all the activities after the deployment, such as monitoring the system performance, correction of problems reported by the users, updating the system and adding minor changes. As the gym operations are 24/7, the system has to be stable, efficient and secure enough to accommodate the daily operations of the gym including creation of workout plans, member management, payment processing, and real time attendance tracking. In general, this stage will guarantee the successful delivery of the Smart gym management system as well as maintenance of its reliability and relevancy within the operational life cycle.

4.2 Software Release Life Cycle (SRLC) – Detailed Explanation

To achieve a smooth development, testing, deployment, and maintenance of the Smart Gym Management System, the system adopted a well-planned Software Release Life Cycle. The stages were very important in enhancing the reliability and stability of the system.

1. Pre-Alpha Phase

During the Pre-Alpha, the main system requirements were gathered and examined depending on the user needs like members, trainers and administrators. The major design models such as the use case diagrams, activity diagrams, class diagrams and the database structures were developed to visualize the system. It was only a simple prototype (the initial login page and the simple layout of the UI) to get a clue about how the system works. At this stage, they had no full functionality of features.

2. Alpha Release

The basic modules of the system were applied during the Alpha phase. These involve user registration, the ability to log in, framework member profile, logic requesting workout plans, and basic supplement inventory framework. The Alpha release was aimed at seeing whether the core

functionality of the system was able to be running. The development team engaged in internal testing to determine the presence of major bugs, structural and missing components.

3. Beta Release

All the necessary features were also realized in the Beta version. Features like uploading workout plans by the trainers, the membership renewal system, buying of supplements, managing the administrative user, and payment systems were Part of the modules that were integrated and tested. The system was tested on the real users (gym staff and the chosen trainees) who had to comment on the usability, navigation, and accuracy. Feedback gathered during this phase enabled to optimise UI, modify workflows and make the system responsive.

4. Release Candidate (RC)

The Release Candidate is referred to as a close to final version of the system. All significant bugs that were discovered during the beta testing were resolved at this stage. The system was also optimized in terms of its performance, indexing the database, server-side validation and security like password hashing and access control. Some minor visual and functional enhancements were incorporated to make the system smooth and stable to be deployed finally.

5. Production Release

The Smart Gym Management System was finally put into the live environment to be used in the Production Release. The system was made available to every user; members, trainers, and administrators. True membership and records of supplements and timetable of trainers were incorporated. The non-beta version offered full functionality including safe login, workout and nutrition plans, purchasing of supplements, renewing of membership and reporting.

6. Maintenance & Updates

The system was deployed to the Maintenance phase. In this phase, the sustained performance was carried out via constant monitoring. Any reported problems by the users were resolved by patches or minor updates. The other features like dashboard improvements, some added supplement classes, better analytics, or UI upgrades were introduced as per the feedback of the users. The continuous updates made the system secure, efficient and in line with the expectations of the users.

4.3 System Deployment

The implementation of the Smart Gym Management System was associated with the organization of the required environment of the application hosting and its accessibility by the real users - members, trainers, managers, and administrators. The system was implemented on a web server

that has PHP/ Node.js and a MySQL/MongoDB database setup. Once the server was prepared, the frontend and backend files have been uploaded, database tables have been imported and environment variables, including API routes, authentication keys, and configuration variables, were completed.

Connection of the system with the live data sources, facilitation of internet access, and adequate domain and hosting configurations were among the other deployment processes. The sensitive information of the users was safeguarded by security control measures, like HTTPS, password encryption, limited access of the admins, and control over sessions. Upon the deployment, the system was again tested in the live environment where real-world performance, navigation flow, and responsiveness in devices were checked. The system was opened to full operational use as soon as it was found to be stable.

4.4 System Maintenance

Maintenance guarantees that the Smart Gym Management System will keep on running in a smooth manner even after being deployed. This stage entails the performance monitoring of the system, bug correction, feature enhancement, and the general user experience. The routine maintenance activities involve issues that are reported by users, query optimization, server health checks, updating supplement inventory modules, enhancing the trainer-member communication facilities, and payment processes.

Maintenance of security is also a major concern, which includes regular updates on the authentication logic, patching the vulnerabilities and safe data management. Also, new features or enhancements to the UI can be added according to the user feedback. Maintenance will assure the system is in operation, secured, and within the changing needs of the users, which will provide a long-term system reliability.

4.5 Summary

The Smart Gym Management System was deployed and maintained in this chapter. The process of deployment included preparing the system environment, setting the backend and database settings, and releasing the application in the real-life. The regular updates of the system, bug fixes, and performance optimization ensured the further smooth running of the system. These two phases combined will ensure that the system remains stable, secure and can sustain all the operations of the gym effectively. Upon successful implementation and on-going maintenance, the system can be used in the long term and enhanced in the future

Chapter 5

User Manual

5.1 Introduction

The User Manual has straightforward and easily understandable guidelines to use the Smart Gym Management System. There are many forms of users in the system, and they are meant to be members, trainers, managers and administrators; therefore, this manual will ensure that every user is able to easily grasp how to access, navigate and use the features that are applicable to him or her. Some of the key functions incorporated in the system are user logins, renewal of memberships, workout program and diet plans, purchasing of supplements, managing inventory and administrative functions.

This manual is aimed at ensuring that users learn how to use the system step-by-step to ensure that even non-technical individuals can use it without difficulties. The functions have been outlined using straightforward words, with clear reasoning of interaction with interface by users. With this manual, every user will be able to accomplish his or her duties effectively and utilize the system to the maximum level and experience a comfortable and efficient stay within the gym facility.

5.2 Project Functionalities

The Smart Gym Management System offers a full range of features that will help members, trainers, managers and administrators in their day-to-day operations. All functions are designed in such a way that they are user-friendly, efficient and smooth to all users. The system automates most of the manual processes in the gym including membership management, workout planning, purchase of supplements and user management. The key functionalities of the system have been broken down and listed below.

login:

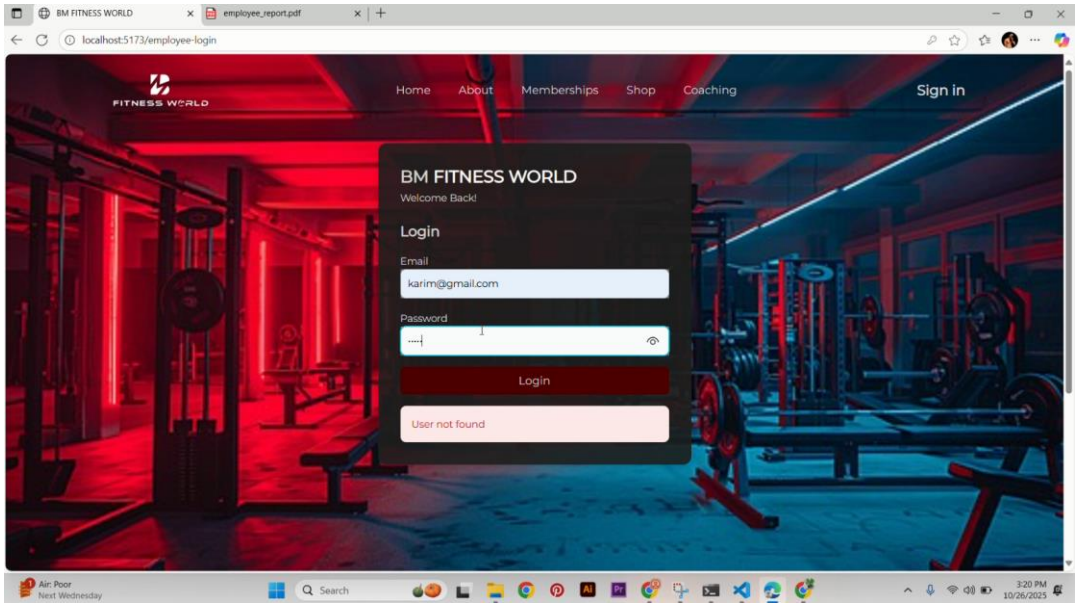


Figure: login

Sign Up:

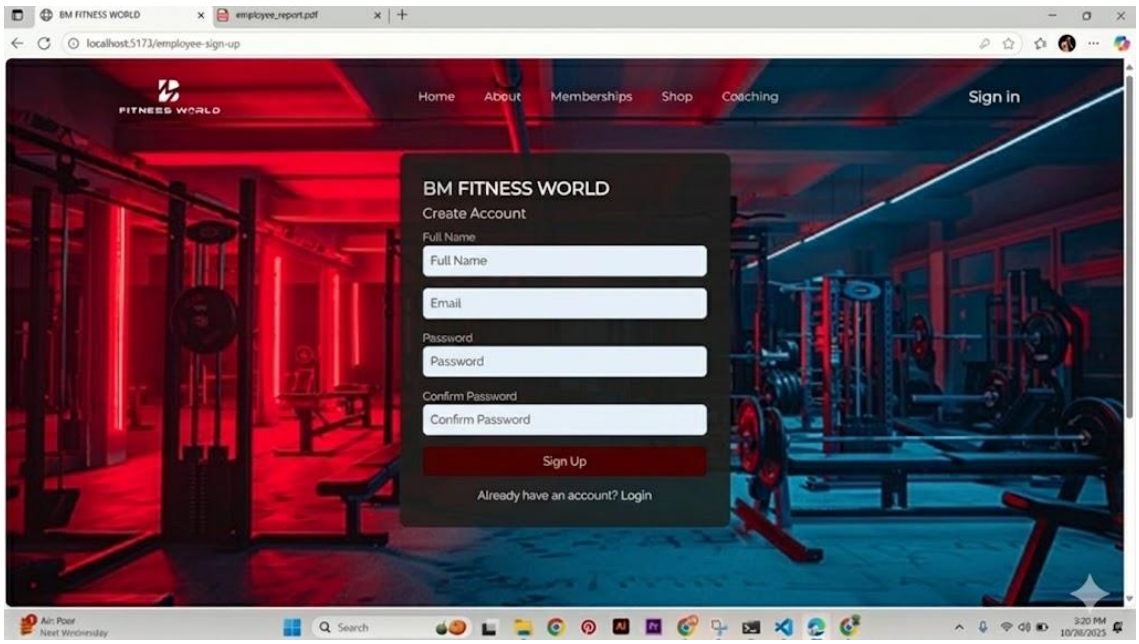


Figure: Sign Up

User Profile:

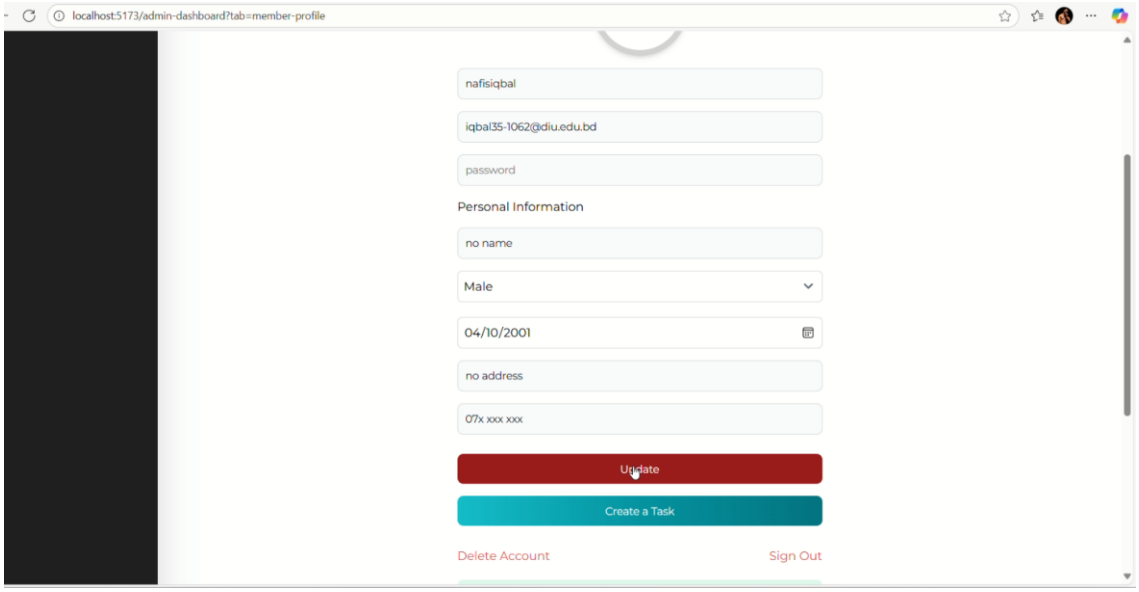


Figure: User Profile

Add Product:

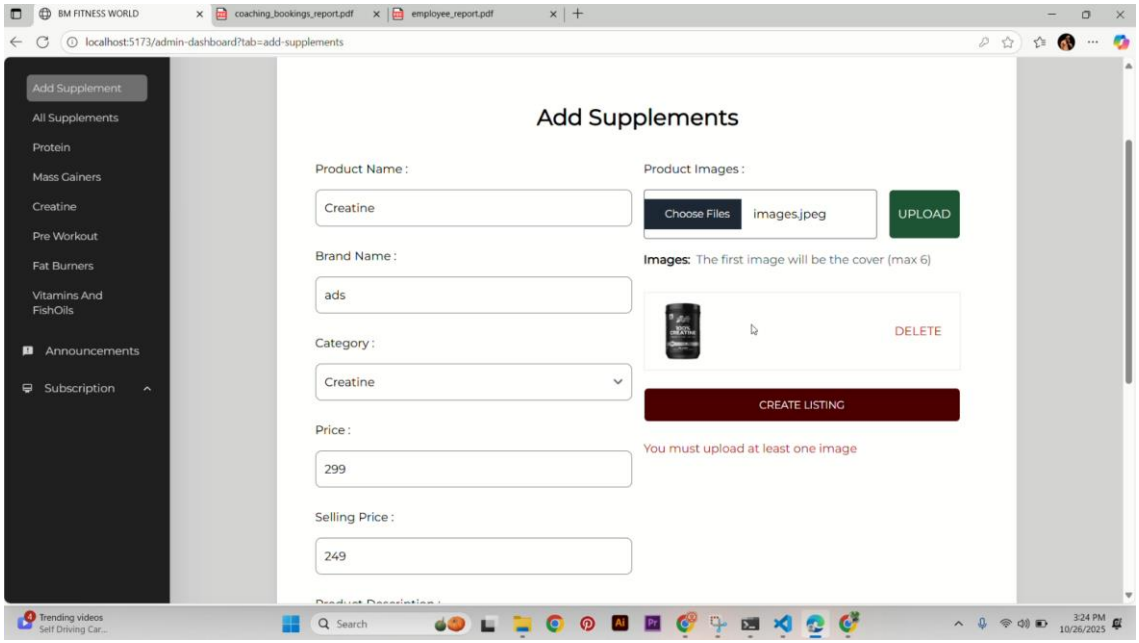


Figure: Add Reservation

Homepage:

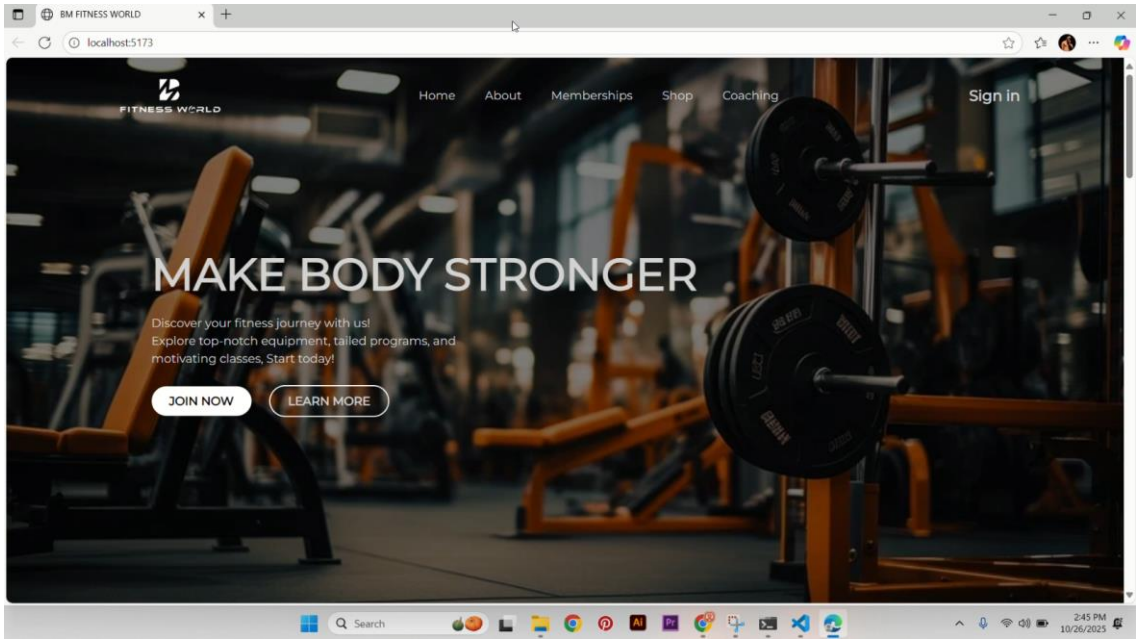


Figure: Homepage

Membership Plan:

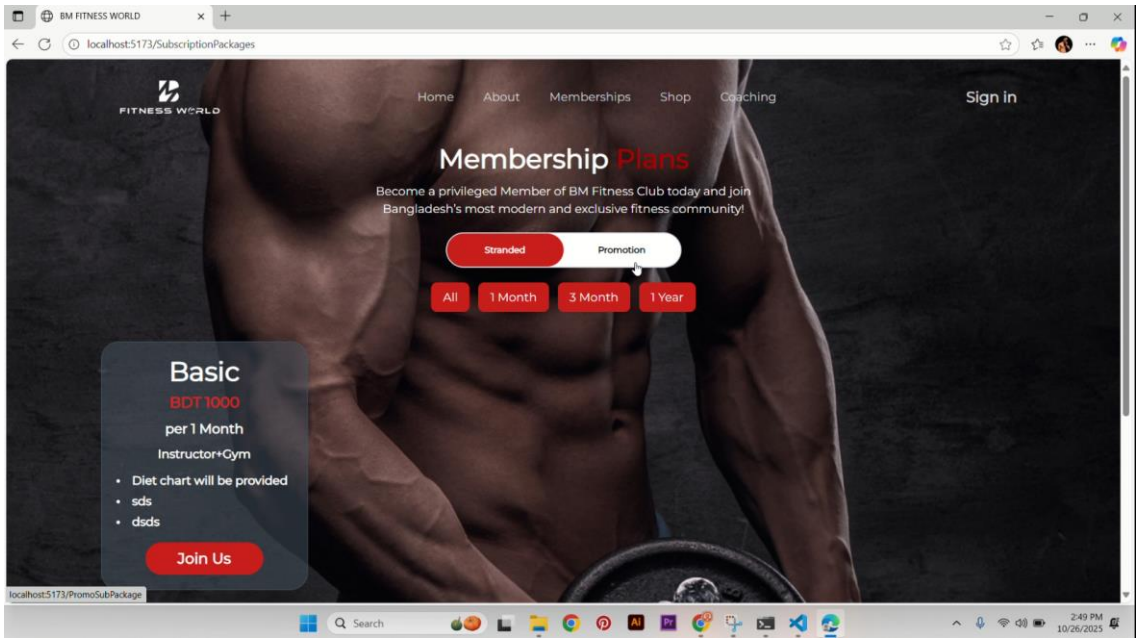


Figure: Membership Plan

Check Out:

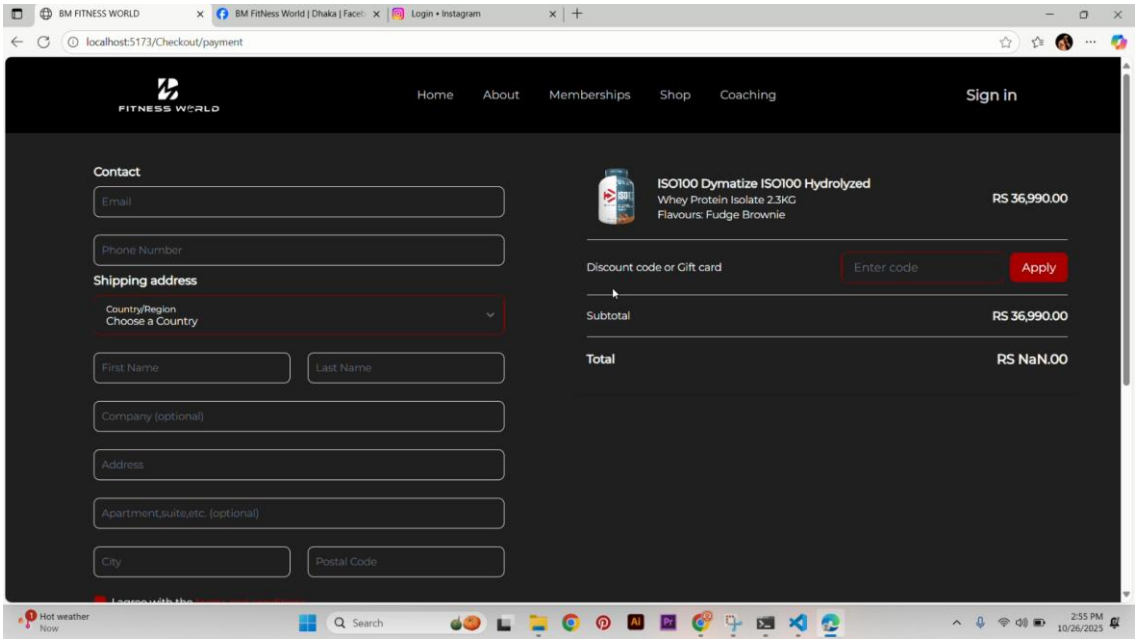


Figure: Check Out

Payment Options:

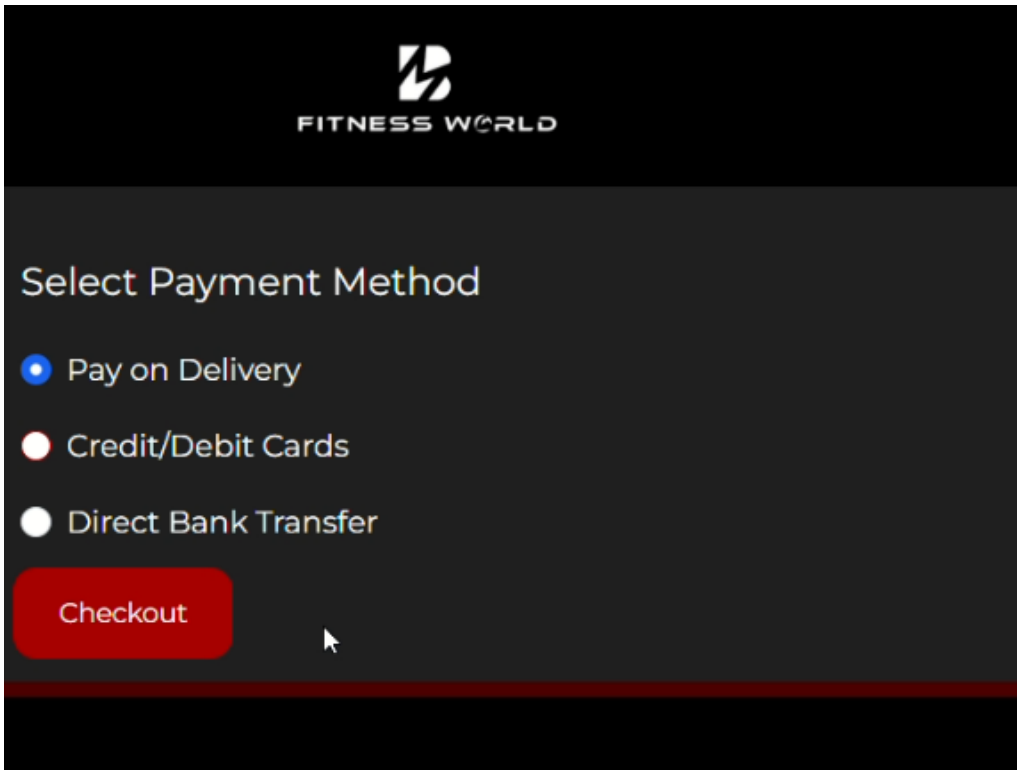


Figure: Payment Options

BMI Calculator:

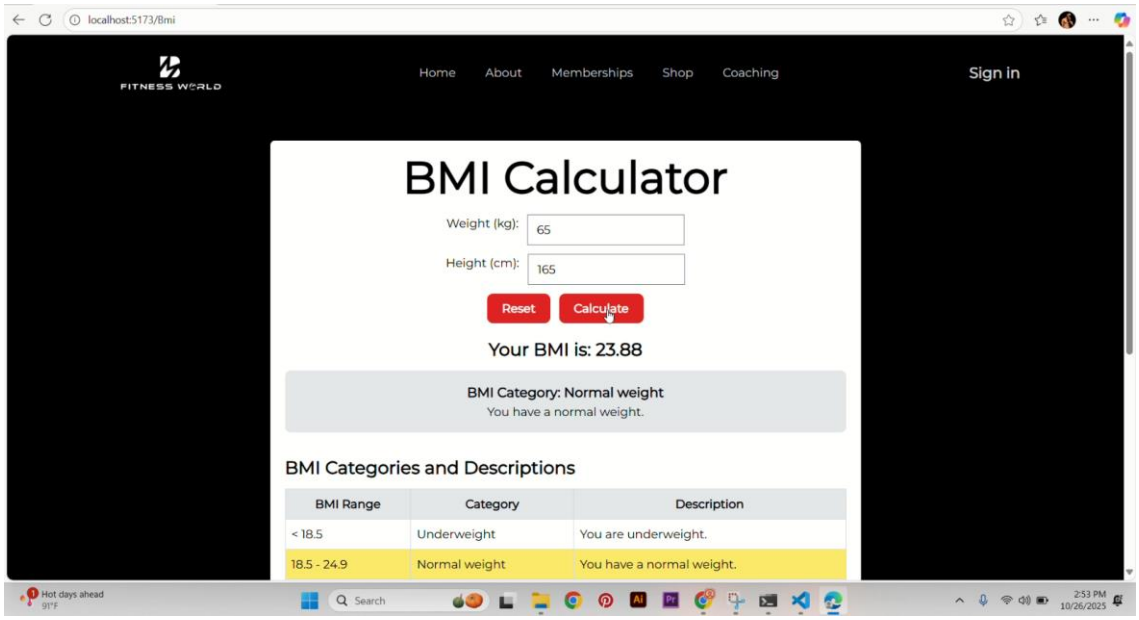


Figure: BMI Calculator

Appointment Booking:

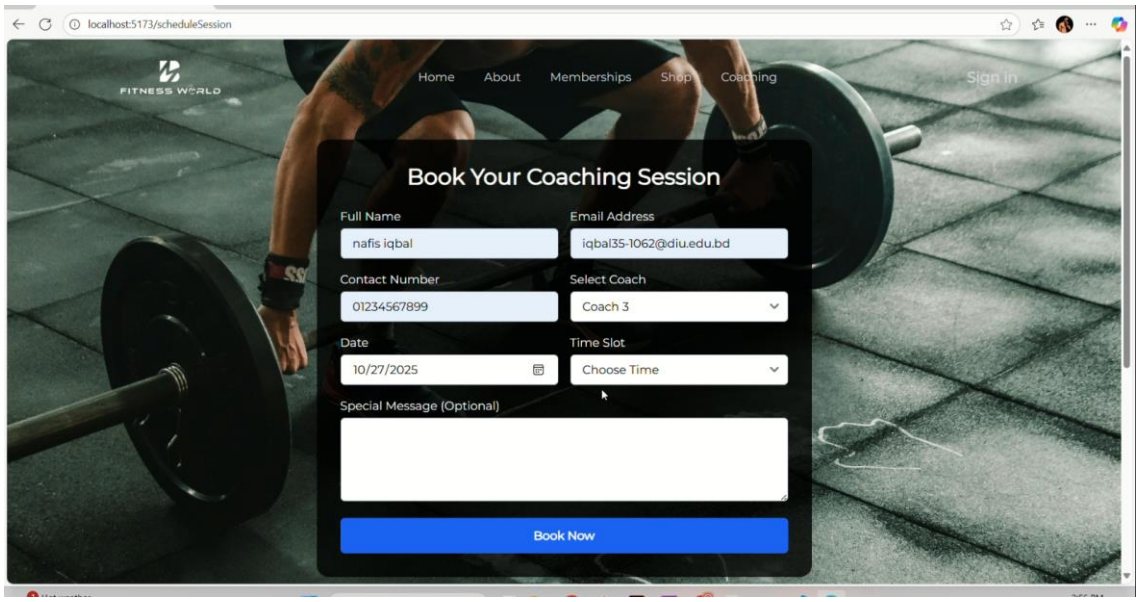


Figure: Appointment Booking

Admin Dashboard:

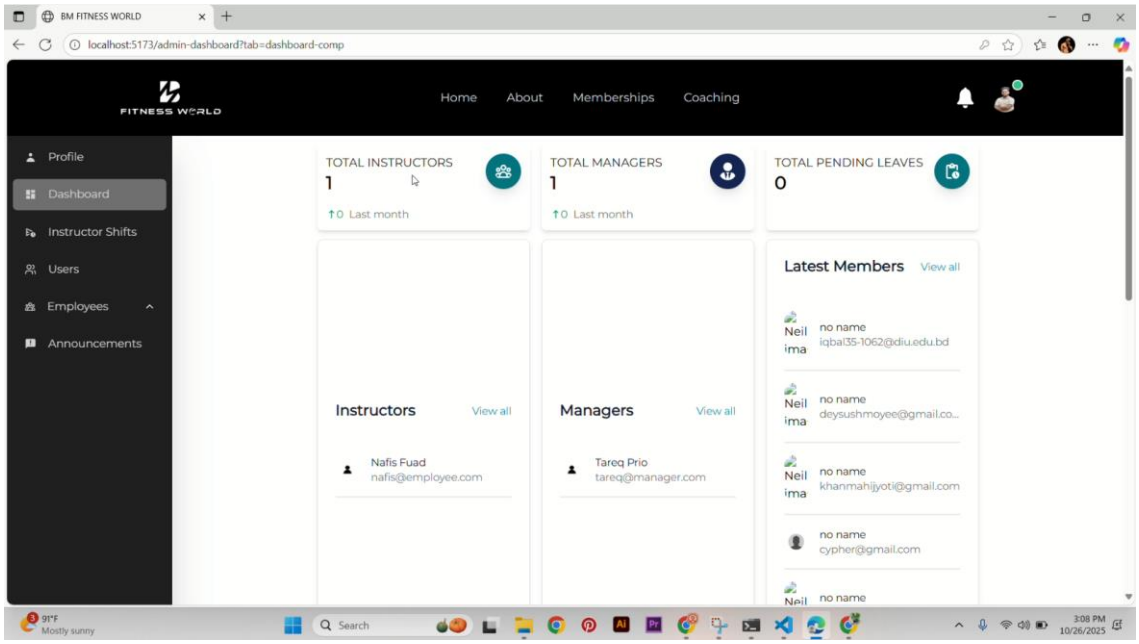


Figure: Admin Dashboard

ADD Employee:

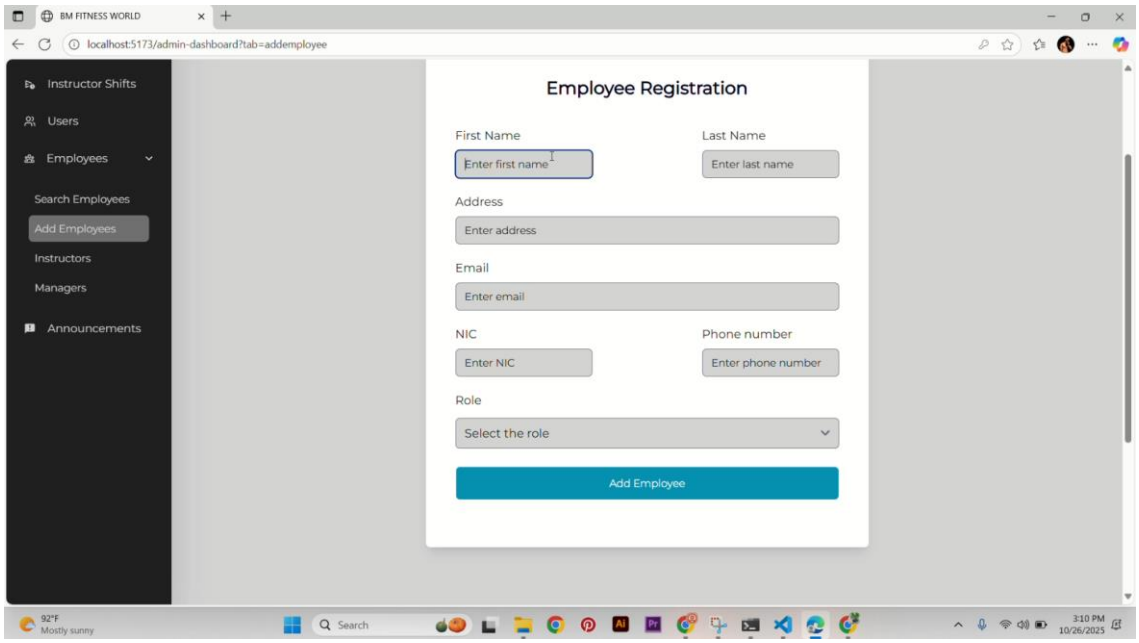


Figure: ADD Employee

5.3 Summary

This chapter presented a complete user guide for the Smart Gym Management System, explaining how different users can interact with the system and access its various features. The manual described key functionalities such as login, sign-up, managing user profiles, browsing the shop, using the BMI calculator, booking appointments, renewing memberships, and accessing different dashboards. Each role—member, trainer, manager, and admin—was provided clear instructions on how to perform tasks relevant to their responsibilities. Overall, the user manual ensures that all users can operate the system confidently without requiring technical knowledge. The functionalities are designed to be intuitive, allowing smooth navigation and efficient workflow across the entire gym environment. With this manual, users can fully utilize the system's features and enjoy a seamless digital experience.

Chapter 6

Project Summary

6.1 Introduction

This chapter is a general overview and analysis of the Smart Gym Management System as a result of the work done during the project. It ponders on the objectives, results, constraints and the possibility of future improvement of the system. This chapter serves the purpose of giving an overall overview of the performance of the system, the key achievements in the system, and those areas that can be improved in the future. In the course of development, the system was created with the following objectives that are to cope with the most common challenges within the gym management, I.e. membership management, workout plan management, management of the supplement inventory, payment processing and supporting the various user functions such as the members, trainers, managers and administrators. The system that incorporates all these features in one platform will result in increased operational efficiency and offer users a smooth digital experience. This chapter will assess the level of effectiveness of these goals and provide a general impression of the overall impact of the project, as well as unresolved challenges and opportunities in future development.

6.2 Project Limitation

Despite successfully providing the key functionality of the management of gym activities, some weaknesses were detected when the Smart Gym Management System was developed and tested. A primary shortcoming is that the system is a web based application which implies that the users must have a stable internet connection in order to utilize the application fully. The lack of a specific mobile application could limit its usability among members who want to have a workout plan, diet plan, or information about the membership at the same time. Also, there were no developed features like smart workout suggestions, AI-enhanced tracking of progress, and live chats between members and trainers, as there was no time and resources to develop them. The third-party gateways are also relied upon in the payment system and therefore can be a constraint to the system in case those services experience downtime or connectivity problems. The existing inventory control remains simple and does not involve such sophisticated options as low-stock warnings or purchase predictions. Lastly, the reporting module provided by the system contains valuable information, but does not have in-depth analytics and graphical dashboard, which may offer significant business analysis to the administrators. Such limitations are also a possibility to improve the system in the future since the system is progressive.

6.3 Scope

The delimits of the project are determined by the scope of the Smart Gym Management System and delineate the capabilities that will be handled by the system. This system is aimed at digitalizing the main operations of the gym, enhancing the convenience of the user, and reducing the burden on the administration. It contains the necessary services like user authentication, membership management, booking of appointments, shopping of supplements, and staff management. The system facilitates the interaction of the members, trainers, managers, and administrators through its web-based interface, and allows them to use the relevant services through one platform. The system allows activities such as, log-in, sign-up, profile, viewing membership plans, buying supplements, BMI calculation and scheduling appointments with trainers. Administrators are able to control all the activities on a central dashboard, control employees and have an overview of the inventory of the products. The system will be configured in order to make it easy to use, get access to, and operate without any complications. Even though the project encompasses fundamental features of gym management, it is not in advanced analytics, AI-based in-recommendation systems, biometric attendance systems, and a dedicated mobile app. Nevertheless, they can be taken into consideration in the future improvements. The determined scope makes the system viable, manageable, and effective to within the project timeframe and resources.

6.4 Future Work

The Smart Gym Management System has been able to implement the basic functionalities needed to run a gym efficiently, but these can be improved in some areas, and these can be discussed in the further development. The presentation of a specific mobile application on both Android and iOS is one of the aspects that need to be worked on. The availability of a mobile app will make it much more accessible to the user, in particular to the members who would like to get workout plans, diet charts, and membership specifics on their phones. One more possible improvement is the use of AI-based workout and nutrition suggestions, which would process the user data including BMI, goals, age, and activity level to automatically create the individual plans. The introduction of a real-time chat/messaging between members and trainers might also enhance communication and support. Also, biometric authentication (fingerprint, face recognition) and check-ins with the use of the QR-code might assist in the automation of attendance and enhance the security. Advanced analytics, such as performance reports, revenue graphs, membership trends, and product sales dashboards, can also be used in the system. Supplement management would be more efficient with improved inventory options like stock forecasting, low-stock warnings and supplier integration. Finally, the system can be made more accommodating to the different-abled users by adding support and accessibility features that enable it to be multilingual.

Such enhancements would bring the system to a higher level of being more intelligent, modern and user-friendly gym management software.

6.5 Conclusion

The Smart Gym Management System has been successful in integrating all the necessary operations in the gym into a single digital platform that provides a marked better enhancement to the manual processes. The system offers a smooth user experience to the members, trainers, managers, and even administrators through its features, which include user authentication, management of membership, purchase of supplements, and booking of appointments, as well as administrative controls. The system helps improve operational efficiency and user convenience in the gym setting by automating most of the daily operations and properly and efficiently handling data. Through the course of its working, the project has shown that web-based solutions in modern times can resolve a variety of typical problems of fitness centers, including keeping the stock, interacting with their users, and dealing with membership renewal. Though the system is already able to provide all the basic features, it also leaves the opportunity to add new features in the future such as mobile app support, artificial intelligence to give recommendations, extended analysis, and better reporting features. On the whole, the Smart Gym Management System is a stable, convenient, and scalable system which preconditions a more modern and technology-based process of managing a gym.

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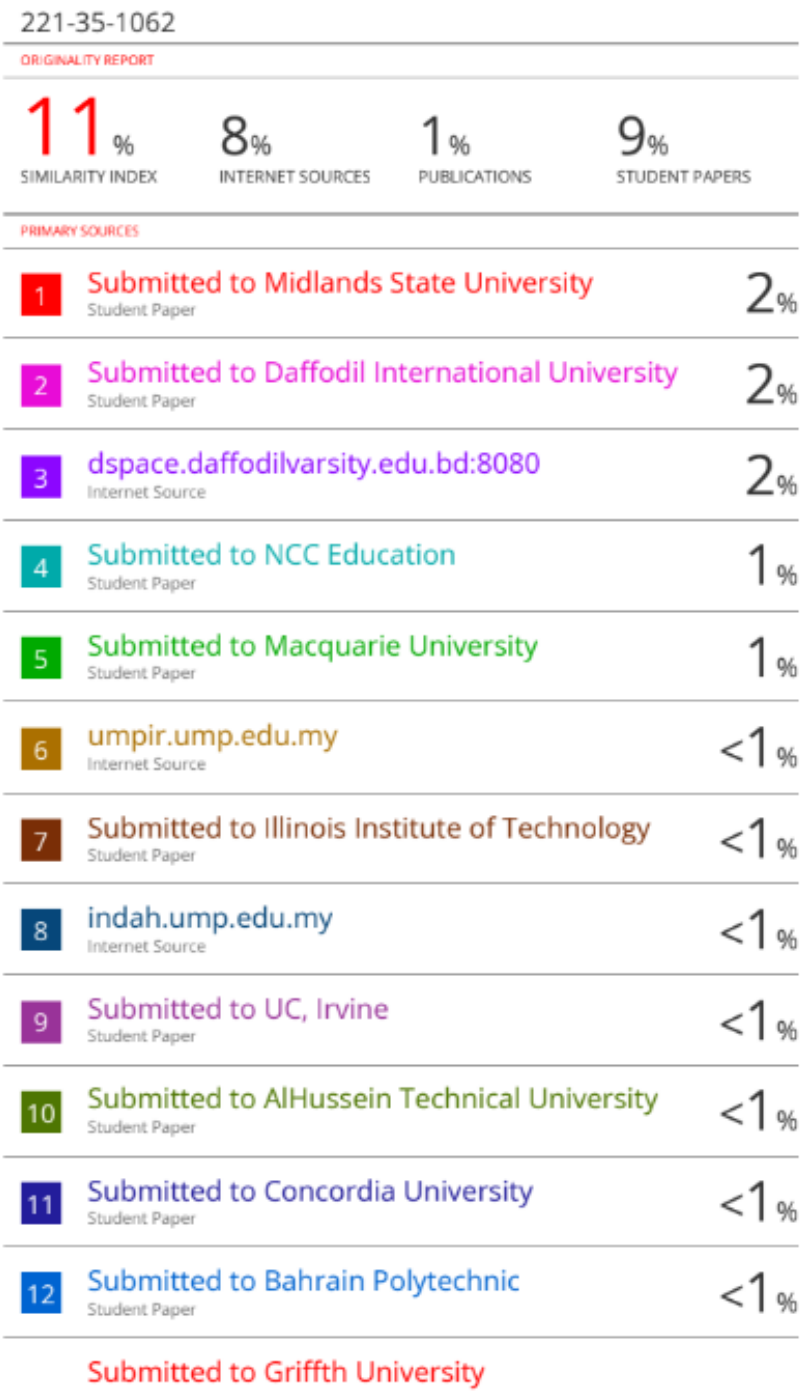

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