FITNESS APPLICATION USING AUGMENTED REALITY TECHNOLOGY

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This report is submitted in partial fulfilment of the requirements for the Bachelor of Computer Science (Interactive Media) with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
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DECLARATION

I hereby declare that this project report entitled

FITNESS APPLICATION USING
AUGMENTED REALITY TECHNOLOGY

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT : _____ Date : 6/9/2024
(MUIHAMAD AFIF ADHAM BIN MOHD SOFIAN)

I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Computer Science (Interactive Media) with Honours.

SUPERVISOR : _____ Date : 6/9/2024
(TS. DR. MUHAMMAD HAZIQ LIM BIN ABDULLAH)

DEDICATION

To my beloved parents,

This thesis is dedicated to you, MUHAMAD AFIF ADHAM BIN MOHD SOFIAN, a student of Universiti Teknikal Melaka Malaysia pursuing a Bachelor of Computer Science (Media Interactive) with Honours. Your unwavering support and sacrifices have been the cornerstone of my academic journey. To my two younger brothers, your presence has been a source of strength and joy throughout this pursuit.

With heartfelt gratitude, I acknowledge the guidance and encouragement from my father and mother, whose wisdom and love have shaped my path. Media is not just a field of study but my passion, fueling my aspirations for a bright and promising future. Your belief in my dreams inspires me to strive for excellence and contribute meaningfully to the world of interactive media.

With deepest appreciation,

MUHAMAD AFIF ADHAM BIN MOHD SOFIAN

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I am deeply grateful to my beloved parents for their endless love, encouragement, and unwavering belief in my abilities. Their unwavering support and motivation have been the driving force behind my academic journey.

Special thanks also go to [mention any other individuals or entities you wish to acknowledge, such as friends, colleagues, or specific institutions] for their assistance and contributions to this project.

ABSTRACT

The "Dynamic AR Fitness" application leverages Augmented Reality (AR) technology to address the rising concerns of obesity among teenagers and young adults by enhancing exercise knowledge and form. This project aims to analyse the necessity of AR applications in improving exercise techniques and preventing injuries for individuals with limited fitness knowledge. The solution involves the development of an AR-based fitness application featuring 3D models for exercise demonstrations and a BMI calculator. Evaluating user satisfaction with personalised exercise recommendations and assessing the accuracy and usability of the BMI calculator are integral parts of this study. The outcomes reveal the efficacy of AR as a tool for promoting healthier lifestyles through interactive and engaging fitness experiences.

ABSTRAK

Aplikasi "Dynamic AR Fitness" memanfaatkan teknologi Augmented Reality (AR) untuk menangani kekhawatiran meningkat obesiti di kalangan remaja dan orang dewasa muda dengan meningkatkan pengetahuan dan bentuk latihan. Projek ini bertujuan untuk menganalisis keperluan aplikasi AR dalam meningkatkan teknik latihan dan mencegah kecederaan untuk individu dengan pengetahuan kebolehpercayaan yang terhad. Penyelesaian ini melibatkan pembangunan aplikasi kebugaran berasaskan AR yang mempunyai model 3D untuk demonstrasi latihan dan kalkulator BMI. Menilai kepuasan pengguna dengan cadangan latihan yang dipersonalisasi dan menilai ketepatan dan kegunaan kalkulator BMI adalah sebahagian daripada kajian ini. Hasilnya mendedahkan keberkesanan AR sebagai alat untuk mempromosikan gaya hidup yang lebih sihat melalui pengalaman kebugaran interaktif dan menarik.

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LIST OF ABBREVIATIONS

FYP	-	**Final Year Project**
AR	-	Augmented Reality

Chapter 1: INTRODUCTION

1.1 Project Background

In an era marked by technological advancements and an increasing focus on personal well-being, the intersection of augmented reality (AR) technology and fitness presents a unique opportunity to revolutionise the way individuals approach exercise. The integration of AR into fitness routines has the potential to transform conventional workouts into dynamic, engaging, and interactive experiences, addressing the need for innovative approaches to promote physical activity.

Despite the growing popularity of fitness apps and wearables, traditional exercise routines often lack the element of excitement and sustained motivation. Many individuals find it challenging to adhere to regular exercise regimens due to monotony and a lack of interactive stimuli. Recognising this gap, the Dynamic AR Fitness project emerges as a response to the evolving demands of modern fitness enthusiasts who seek interactive and engaging ways to stay active.

1.2 Problem Statement

The prevailing problem encompasses a multifaceted challenge faced by many individuals: a lack of knowledge and guidance regarding exercise, BMI tracking, motivation for healthy routines, and personalised recommendations for exercise and nutrition. There exists a sizable population unaware of the proper form of exercise, predisposing them to ineffective workouts and potential injuries (Smith, 2020). Additionally, a considerable number of people are unfamiliar with BMI tracking methods, resulting in a deficit of understanding regarding their overall health status (Jones, 2018). Furthermore, a pervasive lack of motivation inhibits individuals from initiating and sustaining healthy routines or workout regimens (Brown, 2019).

Moreover, due to inadequate knowledge, many individuals are in need of tailored exercise and nutrition recommendations to facilitate the adoption of healthier lifestyles (Taylor, 2021). These interconnected issues underscore the necessity for an innovative solution that can address these knowledge gaps and motivational barriers, ultimately empowering individuals to embark on and sustain their journey towards improved health and well-being.

1.3 Project Objective

I. To analyse the requirement of Augmented Reality (AR) application in improving exercise form and preventing injuries among users with limited fitness knowledge.

II. To develop an AR-based fitness application, Dynamic AR Fitness, which includes features such as 3D exercise model demonstrations and a BMI calculator.

III. To evaluate the user satisfaction with the exercise set recommendations tailored to different lifestyles, as well as the accuracy and usability of the BMI.

1.4 Project Scope

The project scope includes two parts: target users and program scope.

1.4.1 Target Users

Dynamic AR Fitness targets individuals aged 18 to 50 who are looking to improve their fitness knowledge and routines through innovative technology. This includes young adults (18-25) such as college students and young professionals who are tech-savvy, and middle-aged adults (26-40) like busy professionals and parents seeking convenient fitness solutions. The app caters to both males and females in urban and suburban areas, addressing a range of fitness goals such as weight loss, muscle gain, and general health. Users may have sedentary or moderately active lifestyles and require visual

exercise guidance, BMI and calorie deficit calculators, and personalised exercise recommendations to avoid injuries and achieve their fitness objectives.

1.4.2 Program Scope

Dynamic AR Fitness aims to serve an initial target audience of 50 users aged 18 to 40 years. The app features 3D AR exercise demonstrations to help users visualise and replicate proper form, a BMI calculator for health assessments, a calories deficit calculator to manage weight loss, and personalised exercise set recommendations based on user lifestyle and fitness level. The outreach strategy includes social media marketing, collaborations with fitness influencers, and promotional offers to attract users. Continuous user engagement will be ensured through regular content updates and feedback mechanisms to enhance the user experience.

1.5 Summary

Dynamic AR Fitness represents a significant advancement in the integration of augmented reality technology into the fitness industry. By providing real-time visual guidance, personalised exercise plans, and nutritional advice, the application addresses common challenges faced by individuals in maintaining effective and safe fitness routines. The use of AR technology not only enhances user engagement and motivation but also plays a crucial role in preventing injuries by ensuring proper exercise form. Furthermore, the focus on accessibility and user-friendliness makes the application suitable for a diverse audience, from beginners to fitness enthusiasts and working users. Despite potential challenges related to technology access and user dependency, Dynamic AR Fitness offers substantial benefits that can lead to improved fitness practices and healthier lifestyles. This project underscores the potential of AR in revolutionising fitness routines, promoting better health outcomes, and fostering a deeper understanding of fitness and nutrition principles among user

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

The literature review is a critical component of the Dynamic AR Fitness project, providing a comprehensive foundation for understanding the theoretical and practical context within which the project is developed. This section explores existing research, theories, and applications related to augmented reality (AR) technology in fitness, the impact of physical inactivity and obesity, and the role of mobile fitness applications in promoting healthy lifestyles. By examining these areas, the literature review aims to identify gaps in current knowledge and practice, justify the project's objectives, and inform the design and implementation of the Dynamic AR Fitness application.

Augmented reality technology has increasingly been integrated into various domains, including fitness, to enhance user engagement and effectiveness. This review will investigate the current state of AR in fitness applications, highlighting how AR can provide interactive and immersive experiences that motivate users and improve exercise adherence. Additionally, the review will examine the prevalence and consequences of physical inactivity and obesity, emphasising the importance of accessible and effective fitness interventions.

The literature review will also explore the functionalities and effectiveness of existing mobile fitness applications, identifying best practices and common challenges. Particular attention will be given to applications that incorporate features such as exercise guidance, progress tracking, and personalised recommendations. This exploration will help contextualise the design choices made for the Dynamic AR Fitness application, ensuring it addresses user needs and leverages successful strategies from existing solutions.

In summary, the literature review serves as a crucial underpinning for the Dynamic AR Fitness project, providing insights into how AR technology can be leveraged to create an innovative and effective fitness application. Through a thorough examination of existing research and applications, this review aims to guide the development process and ensure the project is grounded in a solid understanding of current trends and challenges in the field.

2.2 Domain

Dynamic AR Fitness operates within several key domains, which are essential to understanding the project's scope and impact. The primary domain is fitness and health, as the app is designed to improve users' physical fitness and overall health. This involves a comprehensive understanding of exercise science, nutritional information, by providing exercise routines, BMI calculations, and calorie deficit management, the app aims to promote healthy lifestyles and prevent injuries through correct exercise techniques.

Another critical domain is technology, specifically augmented reality (AR). The integration of AR technology is central to the app’s functionality, requiring knowledge of AR implementation, user interface design, and mobile app development. The use of 3D exercise models enhances the user experience by offering interactive and immersive visual guidance. This technological aspect bridges the gap between professional fitness instruction and personal exercise routines, making efficiency guidance more accessible.

User experience and human-computer interaction (HCI) form another vital domain for this project. Ensuring that the app is user-friendly and effective for individuals with varying levels of fitness knowledge is crucial. This involves designing and evaluating user interfaces to be intuitive, easy to navigate, and engaging. A well-designed user interface ensures that users can easily access and benefit from the app's features, thereby enhancing overall user satisfaction and effectiveness.

The domain of lifestyle and behaviour change is also significant. Dynamic AR Fitness provides personalized exercise recommendations based on users' lifestyles, which recommend a suitable exercise set and motivational strategies. This domain

encompasses psychology and behaviour change theories, focusing on motivating users to adopt and maintain healthier habits. By tailoring recommendations and feedback to individual lifestyles, the app encourages consistent exercise and healthy eating practices.

In conclusion, the domains of fitness and health, technology and AR, user experience and HCI, and lifestyle and behaviour change are integral to the development and success of Dynamic AR Fitness. These domains collectively contribute to creating a comprehensive, user-friendly app that effectively promotes health and fitness through innovative technology and personalised guidance.

2.2.1 Definition of Augmented Reality

Augmented Reality (AR) is a sophisticated technology that enhances the real-world environment by overlaying digital information and virtual objects onto it, thereby enriching the user's interaction with their physical surroundings. Unlike Virtual Reality (VR), which immerses users in a completely virtual setting, AR maintains the user's presence in the real world while integrating computer-generated elements such as images, sounds, and other sensory inputs in real-time.

Typically, AR is experienced through devices such as smartphones, tablets, AR glasses, or headsets. These devices employ cameras and sensors to capture the user's physical environment, subsequently superimposing digital content onto it. The technology hinges on a synergy of software algorithms and hardware components to ensure that virtual objects are accurately placed and displayed in alignment with the real-world context.

The primary components of AR include the display, tracking, and software systems. The display is the medium through which users view AR content, ranging from screens to AR glasses. Tracking systems are crucial for determining the position and orientation of the user's device in relation to the physical world, adjusting virtual elements dynamically to match the user's movements. The software aspect involves applications or platforms that process real-world input and generate corresponding

virtual content through sophisticated algorithms for object recognition, spatial mapping, and rendering.

AR technology finds applications across various industries. In education, it provides interactive learning experiences by overlaying educational content onto textbooks or classroom settings. In retail, AR enables customers to visualise products within their own space prior to purchase. In the healthcare sector, AR aids medical training and surgical procedures by offering real-time, contextually relevant information.

In the context of Dynamic AR Fitness, AR technology is harnessed to elevate the fitness experience by providing three-dimensional models that demonstrate proper exercise techniques. This application helps users perform exercises correctly, thereby mitigating the risk of injury and enhancing the overall effectiveness of workouts. By integrating AR, Dynamic AR Fitness delivers an interactive and engaging platform for users to learn and practice fitness routines, making expert guidance more accessible and tailored to individual needs.

2.2.2 Augmented Reality Application Requirement

i. App Aesthetic

In the context of augmented reality applications, the study by Luhanga et al. (2018) underscores the significance of art style in group fitness applications. Visually appealing graphics and art can significantly enhance user engagement and overall experience by creating an inviting and immersive environment for users to interact with. Although not explicitly discussed in the study, character design is also a crucial aspect of art direction within fitness applications. Thoughtfully designed characters can serve as relatable avatars for users, fostering a sense of connection and motivation as they engage with the app's content.

ii. User Experience (UX) Design

Luhanga et al. (2018) emphasise the importance of intuitive navigation systems within group fitness applications. Clear and user-friendly navigation allows users to easily explore different features and functionalities, enhancing usability and ensuring a seamless user experience. Furthermore, their study highlights the role of visual feedback mechanisms in group fitness applications. Real-time visual feedback on users' progress and actions can provide valuable reinforcement and motivation, helping users stay engaged and on track with their fitness goals.

iii. Sound

While not explicitly addressed in Luhanga et al. (2018), the integration of sound effects and interactive UI elements plays a crucial role in enhancing user engagement and interaction within fitness applications. Well-designed sound effects and intuitive UI interactions can contribute to a more immersive and enjoyable user experience.

iv. Interface

Luhanga et al. (2018) discuss various UI elements, including buttons, heads-up displays (HUD), and icons, as integral components of group fitness application interfaces. Thoughtfully designed UI elements contribute to ease of navigation and enhance user interaction, ultimately improving the overall usability of the application. The study also emphasises the importance of interactive UI elements, such as buttons and menus, in group fitness applications. Responsive and user-friendly interactions enhance usability, allowing users to navigate the app seamlessly and efficiently engage with its features.

v. Software

Although specific development software is not mentioned in Luhanga et al. (2018), various tools and platforms, such as Unity, Android Studio, and Xcode, are commonly used in the development of fitness applications. These software tools provide developers with the necessary resources to create robust and feature-rich applications for both Android and iOS platforms.

vi. Hardware

Luhanga et al. (2018) focus on group fitness applications available on Android and iOS platforms. The choice of multi-platform compatibility underscores the importance of reaching a broader audience and ensuring accessibility across different devices, thereby maximising the application's potential user base.

Table 2.1: Existing System Comparison

		Gymnotize Gym Fitness Workout	Fitness Coach: Fitness Planner	Home Workout – No equipment
Description		Gymnotize Gym Fitness Workout is a comprehensivefitness app designed to help users achieve their fitness goals through a variety of weight-based exercises and augmented reality (AR) training tools. It offers a range of features including 3D fitness animations, professional training plans, and customizable workout routines	Fitness Coach: Fitness Planner is a versatile fitness app designed to help users achieve their health and fitness goals through personalized workout plans and guided exercise sessions. The app offers a wide variety of exercises, catering to different fitness levels and goals, and emphasizes convenience by allowing users to work out at home or at the gym without requiring additional equipment.	Home Workout – No Equipment is a fitness app designed for users to perform effective workouts at home without the need for any gym equipment. It provides a variety of exercises targeting different muscle groups, suitable for all fitness levels
App Objectives		Transform your workouts with AR and 3D animations, delivering clear instructions and visual demos for each exercise. Choose from professional training plans for all fitness levels, track progress effortlessly, and tailor routines to fit individual goals and preferences.	The primary goal of the Fitness Coach app is to provide users with a structured and efficient way to achieve their fitness goals, whether it's weight loss, muscle building, or improving overall fitness. It aims to make fitness accessible by offering customized plans that adapt to the user's progress and needs.	The main goal of the app is to help users stay fit and healthy by offering accessible, equipment-free workoutsthat can be performed anywhere. It aims to make fitness easy and convenient, ensuring users can maintain their exercise routines even without access to a gym
App Component		**Exercise Library**: Extensive collection of weight training exercises with 3D animated guides. **Training Plans**: Professional workout plans tailored to different fitness levels and goals. **Progress Tracking**: Tools for tracking workout progress, including weight lifted, repetitions, and sets. **Customization**: Ability to create and customize personal workout plans. **Augmented Reality**: AR feature to show muscle groups targeted by each exercise.	**Personalized Plans**: Customizable workout plans based on user goals, fitness levels, and preferences. **Exercise Library**: Detailed descriptions and visual guides for a wide range of exercises. **Progress Tracking**: Comprehensive tracking of workout progress, including visual progress reports and statistics. **Audio Guidance**: Voice instructions to ensure users perform exercises correctly and maintain motivation. **Interactive Feedback**: Real-time feedback and adjustments to workout plans based on user performance and progress.	**Exercise Routines**: A wide range of bodyweight exercises with step-by-step visual instructions. **Workout Plans**: Pre-designed workout plans for different goals such as weight loss, strength building, and general fitness. **Progress Tracker**: Features to track workout completion, calories burned, and progress over time. **Voice Guidance**: Audio instructions to guide users through each exercise and ensure proper form. **Motivational Cues**: Encouraging messages and sound effects to keep users motivated during workouts.
App Aesthehic	Art Style	Gymnotize Gym Fitness Workout app might employ a clean and modern art style with vibrant colors to motivate users. It could feature sleek, minimalist design elements to enhance usability and appeal to a wide range of users.	Fitness Planner app might opt for a professional and motivational art style, utilizing high-quality images of fitness activities, healthy foods, and inspirational quotes. The design could be sleek and modern, with a focus on clarity and usability.	No Equipment app might feature a clean and minimalist art style, with simple yet engaging graphics that emphasize the accessibility of home workouts. The design could incorporate bright colors and energetic imagery to inspire users to stay active.
	Character Design	The app might not heavily focus on character design since its primary goal is to assist users with their fitness routines. However, it could incorporate generic avatar options for users to personalize their profiles.	Fitness Coach might incorporate more detailed character design elements. This could include customizable avatars that users can personalize to resemble themselves, providing a sense of identity and ownership within the app.	Given its focus on workouts without equipment, this app might not heavily emphasize character design. However, it could include animated illustrations or avatars demonstrating exercise techniques to guide users through their routines effectively.
	Navigation	The navigation system would likely be intuitive, with a simple menu structure that allows users to easily access different features such as workouts, progress tracking, settings, and community forums.	Navigation in Fitness Coach would prioritize simplicity and efficiency. Users would find it easy to navigate between features such as workout planning, progress tracking, nutrition logging, and community forums through a streamlined menu system.	Navigation in the Home Workout app would prioritize simplicity and ease of use. Users would find it straightforward to navigate between different workout categories, exercise routines, progress tracking, and settings through intuitive menus and navigation bars.
	Visual Feedback	The app could provide visual feedback through progress charts, achievement badges, and animations to motivate users and celebrate their accomplishments.	The app would offer visual feedback through progress charts, goal trackers, and achievement badges to motivate users and track their fitness journey effectively. Progress animations and before-and-after comparisons could also provide visual encouragement.	The app would provide visual feedback through progress trackers, achievement badges, and animated demonstrations of exercise techniques. Users could track their workout history and see improvements over time, providing motivation to continue their fitness journey.
Sound	Sound Effect & UI Interaction	Gymnotize might utilize subtle sound effects such as clicks and swooshes to enhance user interaction and provide auditory feedback when navigating through the app or completing workouts.	Similar to Gymnotize, Fitness Coach might employ subtle sound effects for UI interactions, providing auditory cues when users complete tasks, save progress, or reach milestones. These sound effects would enhance user engagement and feedback.	Sound effects in the Home Workout app could include motivational cues, such as encouraging messages or applause, to enhance user motivation during workouts. UI interactions would be intuitive and responsive, with smooth transitions between screens and gestures for navigating workouts.
Interface	Button, Head Up Display & Icon	The app would feature clearly labeled buttons with intuitive icons for common actionslike starting a workout, saving progress, or adjusting settings. The head-up display might include essential information like workout duration, calories burned, and current exercise stats.	Buttons in Fitness Coach would be clearly labeled and easily accessible, featuring intuitive icons for common actions. The head-up display might include real-time workout stats, nutrition summaries, and reminders to encourage users to stay on track with their fitness goals.	Buttons in the Home Workout app would be large, clearly labeled, and easy to tap, ensuring users can navigate the app effortlessly. The head-up display might include workout timers, calorie burn counters, and quick access buttons for adjusting settings or tracking progress.
	Interactivity of UI Elements	UI elements would be interactive and responsive, allowing users to easily customize their workouts, track progress, and connect with other users. Buttons and menus would respond to touch gestures smoothly and efficiently.	UI elements would be highly interactive, allowing users to customize their workout plans, track their progress, and interact with other users seamlessly. Features such as drag-and-drop workout scheduling and social sharing options would enhance user engagement.	UI elements would be highly interactive, allowing users to customize their workout routines, track their progress, and explore different exercise categories easily. Features such as drag-and-drop workout scheduling and interactive tutorials would enhance user engagement.
Software	Development Software	Gymnotize Gym Fitness Workout app could be developed using popular tools and frameworks for mobile app development such as Flutter, React Native, or native iOS/Android development kits.	The Fitness Coach: Fitness Planner app could be developed using similar development tools and frameworks as Gymnotize, such as Flutter, React Native, or native iOS/Android development kits, depending on the platform requirements.	The Home Workout - No Equipment app could be developed using common tools and frameworks for mobile app development, such as Flutter, React Native, or native iOS/Android development kits, to ensure compatibility across various devices.
Hardware	Application Platform	The app would likely be available for both iOS and Android devices, reaching a broader audience of fitness enthusiasts regardless of their preferred mobile platform.	Like Gymnotize, Fitness Coach would aim to be available on both IOS and Android platforms, ensuring accessibility to a wide range of users seeking personalized fitness planning and coaching.	Like the previous apps, Home Workout would aim to be available on both iOS and Android platforms, catering to users seeking convenient and effective home workout solutions regardless of their device preferences.

2.3 Existing System

Based on the related Domain “Health and Fitness” these are the case for the Domain.

i. Gymnotize Gym Fitness Workout

Gymnotize Gym Fitness Workout is a comprehensive fitness app designed to help users achieve their fitness goals through a variety of weight-based exercises and augmented reality (AR) training tools. It offers a range of features, including 3D fitness animations, professional training plans, and customisable workout routines.

Gymnotize Gym Fitness Workout app could be developed using popular tools and frameworks for mobile app development, such as Flutter, React Native, or native iOS/Android development kits.

The app would likely be available for both iOS and Android devices, reaching a broader audience of fitness enthusiasts regardless of their preferred mobile platform.

ii. Fitness Coach: Fitness Planner

Fitness Coach: Fitness Planner is a versatile fitness app designed to help users achieve their health and fitness goals through personalised workout plans and guided exercise sessions. The app offers a wide variety of exercises, catering to different fitness levels and goals, and emphasises convenience by allowing users to work out at home or at the gym without requiring additional equipment.

The Fitness Coach: Fitness Planner app could be developed using similar development tools and frameworks as Gymnotize, such as Flutter, React Native, or native iOS/Android development kits, depending on the platform requirements.

Like Gymnotize, Fitness Coach would aim to be available on both iOS and Android platforms, ensuring accessibility to a wide range of users seeking personalised fitness planning and coaching.

iii. Home Workout – No equipment

Home Workout – No Equipment is a fitness app designed for users to perform effective workouts at home without the need for any gym equipment. It provides a variety of exercises targeting different muscle groups, suitable for all fitness levels.

The Home Workout - No Equipment app could be developed using common tools and frameworks for mobile app development, such as Flutter, React Native, or native iOS/Android development kits, to ensure compatibility across various devices.

Like the previous apps, Home Workout would aim to be available on both iOS and Android platforms, catering to users seeking convenient and effective home workout solutions regardless of their device preferences.

2.3.1 Comparison of Existing System

i. Gymnotize Gym Fitness Workout

i. Description

Gymnotize Gym Fitness Workout is a comprehensive fitness app designed to help users achieve their fitness goals through a variety of weight-based exercises and augmented reality (AR) training tools. It offers a range of features, including 3D fitness animations, professional training plans, and customisable workout routines.

ii. App Objectives

The app objective is to transform your workouts with AR and 3D animations, delivering clear instructions and visual demos for each exercise. Choose from professional training plans for all fitness levels, track progress effortlessly, and tailor routines to fit individual goals and preferences.

iii. App Component

The Exercise Library is a central component of Gymnotize, offering an extensive collection of weight training exercises. Each exercise is accompanied by 3D animated guides, providing users with clear and precise visual instructions to ensure proper form and technique. This feature is particularly beneficial for users who are new to weight training or those looking to refine their exercise execution.

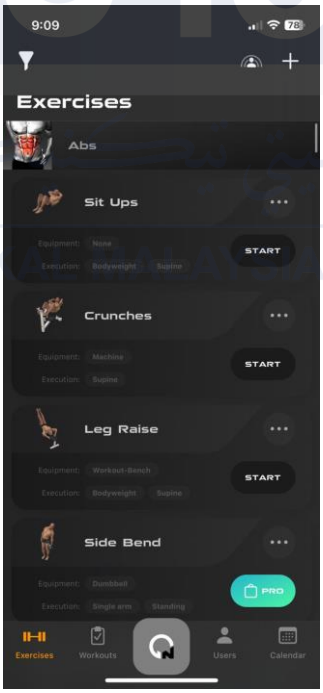


Figure 2.1: Exercise Library of Gymnotize

Gymnotize also includes training plans that are professionally developed to cater to different fitness levels and goals. These plans provide structured workout

routines, allowing users to follow a systematic approach to their fitness journey. Whether the goal is muscle gain, weight loss, or overall fitness improvement, the tailored training plans help users achieve their specific objectives.

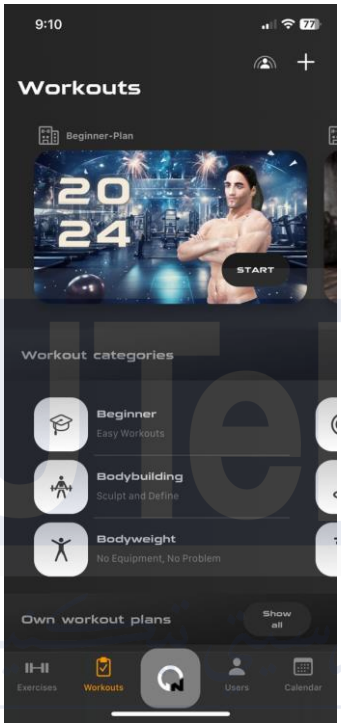


Figure 2.2: Training Plans of Gymnotize

Progress tracking is another vital component of the application. Gymnotize offers tools for tracking various aspects of workout progress, including the amount of weight lifted, the number of repetitions, and the sets completed. This feature enables users to monitor their improvements over time, set new goals, and stay motivated by visualising their progress.

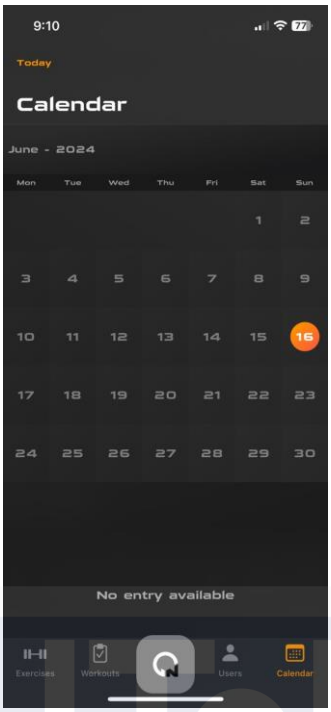


Figure 2.3: Progress Tracking of Gymnotize

Customisation is a key feature that allows users to create and personalise their workout plans. This flexibility ensures that users can adapt their fitness routines to fit their personal preferences, schedules, and specific fitness needs. The ability to customise workout plans enhances user engagement and adherence to their fitness regimen.

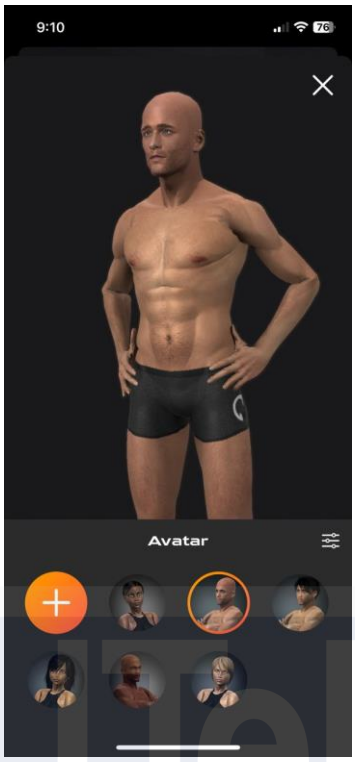


Figure 2.4: Customization of Gymnotize

Additionally, Gymnotize incorporates an Augmented Reality (AR) feature that shows the muscle groups targeted by each exercise. This innovative use of AR technology helps users better understand the impact of their workouts on different muscle groups, facilitating more effective and focused training sessions.

Figure 2.5: AR Scene in Gymnotize

iv. App Aesthetic

Gymnotize Gym Fitness Workout app adopts a contemporary and visually appealing art style, characterised by clean lines, modern design elements, and vibrant colours aimed at inspiring and motivating users throughout their fitness journey. The interface features sleek and minimalist design choices to ensure ease of use and accessibility for a diverse user base. While the emphasis lies on functionality, the app incorporates generic avatar options to allow users to personalise their profiles and foster a sense of ownership.

Navigation within the app is intuitive, facilitated by a simple menu structure that grants users seamless access to various features, including workouts, progress tracking, settings, and community forums. Visual feedback mechanisms play a pivotal role in user engagement, with progress charts, achievement badges, and animations serving to motivate users and celebrate their accomplishments, thereby reinforcing their commitment to their fitness goals.

v. Sound

Incorporating subtle sound effects such as clicks and swooshes, Gymnotize enhances user interaction and provides auditory feedback during navigation and workout completion. These sound effects serve to enrich the user experience without being intrusive, complementing the app's visual elements and contributing to a more immersive environment.

vi. Interface

The interface of Gymnotize features clearly labelled buttons with intuitive icons for common actions, ensuring ease of navigation and interaction. A head-up display provides essential information such as workout duration, calories burned, and current exercise statistics, enabling users to monitor their progress in real-time. The UI elements are interactive and responsive, empowering users to customise workouts, track progress, and engage with community features effortlessly. Smooth touch gesture responses ensure a seamless and efficient user experience.

vii. Software

For development, Gymnotize Gym Fitness Workout utilises industry-standard tools and frameworks such as Flutter, React Native, or native iOS/Android development kits. These platforms facilitate efficient and cross-platform development, enabling the app to reach a broader audience of fitness enthusiasts across various mobile platforms.

viii. Hardware

Gymnotize is available for both iOS and Android devices, catering to a wide range of users regardless of their preferred mobile platform. By leveraging the capabilities of modern smartphones and tablets, the app delivers an immersive and accessible fitness experience, empowering users to achieve their fitness goals anytime, anywhere.

ii. Fitness Coach: Fitness Planner

i. Description

Fitness Coach: Fitness Planner is a versatile fitness app designed to help users achieve their health and fitness goals through personalised workout plans and guided exercise sessions. The app offers a wide variety of exercises, catering to different fitness levels and goals, and emphasises convenience by allowing users to work out at home or at the gym without requiring additional equipment.

ii. App Objectives

The primary goal of the Fitness Coach app is to provide users with a structured and efficient way to achieve their fitness goals, whether it's weight loss, muscle building, or improving overall fitness. It aims to make fitness accessible by offering customised plans that adapt to the user's progress and needs.

iii. App Component

The cornerstone of Fitness Coach is its Personalised Plans feature, which provides users with customisable workout plans tailored to their individual goals, fitness levels, and preferences. This functionality empowers users to create fitness routines that align with their specific objectives, whether it be weight loss, muscle gain, or overall fitness improvement.

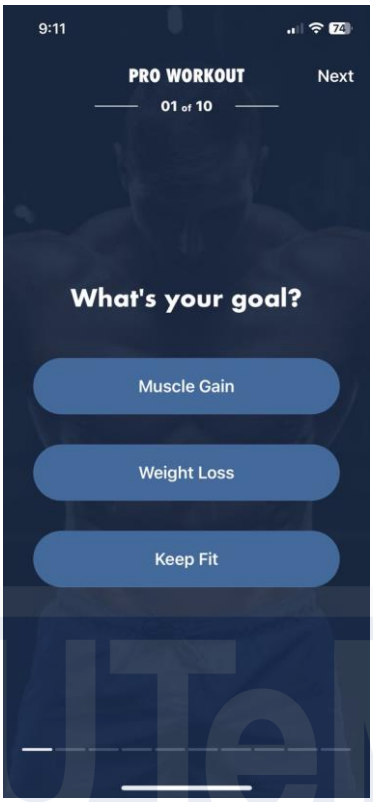


Figure 2.6: Personalised Plan of Fitness Coach

The Exercise Library within Fitness Coach is a robust repository of exercises, offering detailed descriptions and visual guides for a wide range of workout routines. This extensive resource ensures that users have access to comprehensive information and guidance when planning and executing their workouts, thereby enhancing their exercise experience and ensuring proper form and technique.

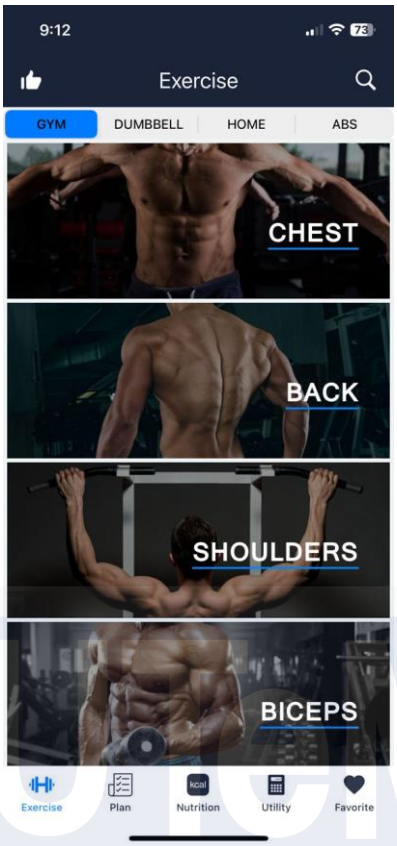


Figure 2.7: Exercise Library of Fitness Coach

Progress Tracking is a key component of Fitness Coach, allowing users to monitor their workout progress comprehensively. The app offers visual progress reports and statistics, enabling users to track their performance over time and stay motivated by visualising their achievements and improvements.

Figure 2.8: Progress Tracking of Fitness Coach

One distinctive feature of Fitness Coach is its audio guidance functionality, which provides users with voice instructions during workouts. This feature ensures that users perform exercises correctly and safely while maintaining motivation and focus throughout their fitness routines.

Additionally, Fitness Coach offers interactive feedback, allowing for real-time adjustments to workout plans based on user performance and progress. This dynamic feedback mechanism ensures that users receive personalised guidance and support, optimising their fitness journey and facilitating continuous improvement.

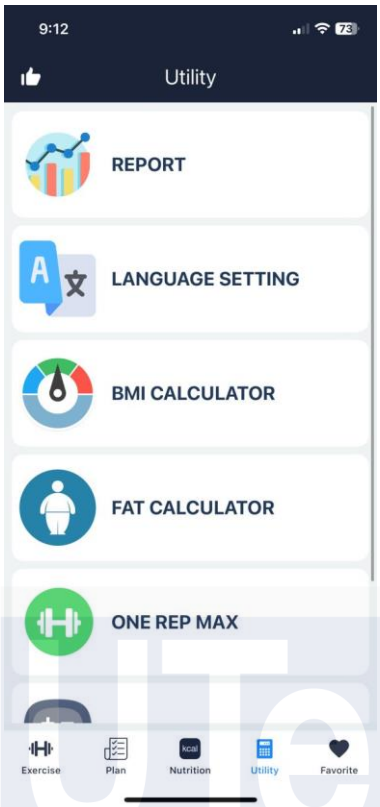


Figure 2.9: Interactive Feedback of Fitness Coach

iv. App Aesthetic

Fitness Coach: Fitness Planner adopts a professional and motivational art style, featuring high-quality images of fitness activities, healthy foods, and inspirational quotes to inspire and motivate users. The design is sleek, modern, and focused on clarity and usability to ensure an engaging user experience.

Character Design elements are more detailed within Fitness Coach, with customisable avatars allowing users to personalise their profiles and create a sense of identity and ownership within the app.

Navigation within Fitness Coach prioritises simplicity and efficiency, allowing users to navigate seamlessly between features such as workout planning, progress tracking, nutrition logging, and community forums through a streamlined menu system.

Visual Feedback mechanisms include progress charts, goal trackers, and achievement badges to motivate users and track their fitness journey effectively. Additionally, progress animations and before-and-after comparisons provide visual encouragement.

v. Sound

Fitness Coach employs subtle sound effects for UI interactions, providing auditory cues when users complete tasks, save progress, or reach milestones. These sound effects enhance user engagement and feedback, contributing to a more immersive user experience.

vi. Interface

Buttons in Fitness Coach are clearly labelled and easily accessible, featuring intuitive icons for common actions. The head-up display includes real-time workout stats, nutrition summaries, and reminders to encourage users to stay on track with their fitness goals.

UI elements within Fitness Coach are highly interactive, enabling users to customise their workout plans, track their progress, and interact with other users seamlessly. Features such as drag-and-drop workout scheduling and social sharing options enhance user engagement and usability.

vii. Software

Fitness Coach: Fitness Planner is developed using industry-standard tools and frameworks such as Flutter, React Native, or native iOS/Android development kits, depending on platform requirements.

viii. Hardware

Fitness Coach is available on both iOS and Android platforms, ensuring accessibility to a wide range of users seeking personalised fitness planning and coaching. This multi-platform approach enables users to access the app regardless of

their preferred mobile device, thereby expanding its reach and impact within the fitness community.

iii. Home Workout – No equipment

i. Description

Home Workout – No Equipment is a fitness app designed for users to perform effective workouts at home without the need for any gym equipment. It provides a variety of exercises targeting different muscle groups, suitable for all fitness levels.

ii. App Objectives

The main goal of the app is to help users stay fit and healthy by offering accessible, equipment-free workouts that can be performed anywhere. It aims to make fitness easy and convenient, ensuring users can maintain their exercise routines even without access to a gym.

iii. App Component

A core component of Home Workout is its Exercise Routines feature, offering users a diverse selection of bodyweight exercises accompanied by step-by-step visual instructions. These exercises cover a wide range of muscle groups and fitness levels, ensuring users can engage in effective workouts regardless of their experience or equipment availability.

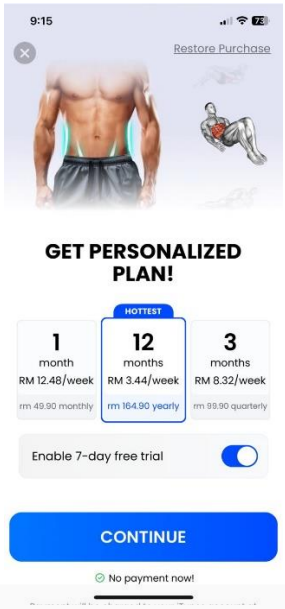


Figure 2.10: Exercise Routines of Home Workout

The app also offers workout plans tailored to various fitness goals, including weight loss, strength building, and general fitness. These pre-designed plans provide users with structured workout routines that align with their specific objectives, streamlining the process of planning and executing effective home workouts.

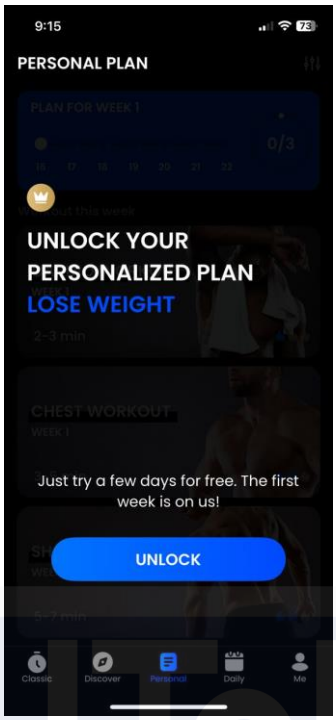


Figure 2.11: Personalised Plan of Home Workout

Progress Tracker functionality within Home Workout enables users to monitor their workout completion, calories burned, and progress over time. This feature empowers users to track their fitness journey comprehensively, providing valuable insights into their performance and helping them stay motivated and accountable.

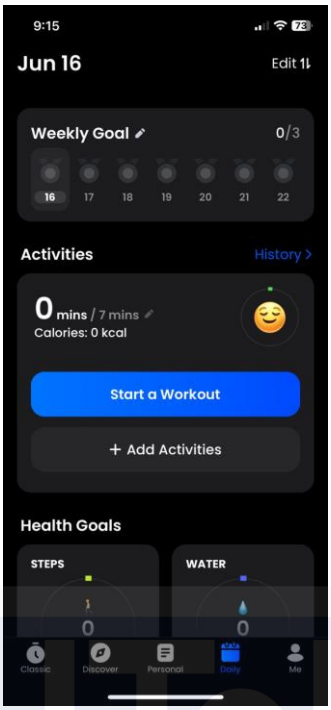


Figure 2.12: Progress tracker of Home Workout

Voice Guidance is another notable feature of Home Workout, offering audio instructions to guide users through each exercise and ensure proper form. This interactive guidance enhances the user experience by providing real-time feedback and support during workouts, thereby reducing the risk of injury and optimising workout effectiveness.

Furthermore, Home Workout incorporates Motivational Cues, including encouraging messages and sound effects, to keep users motivated and engaged throughout their workouts. These cues serve to inspire and uplift users, fostering a positive workout environment and enhancing adherence to their fitness regimen.

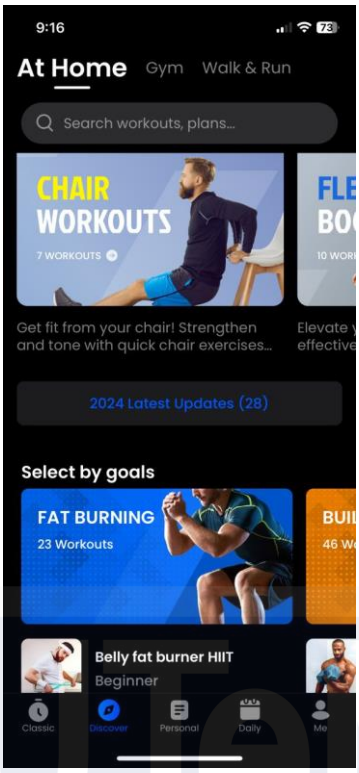


Figure 2.13: Motivational Cues of Home Workout

iv. App Aesthetic

Home Workout – No equipment embodies a clean and minimalist art style, featuring simple yet engaging graphics that underscore the accessibility of home workouts. Bright colours and energetic imagery are incorporated to inspire users to stay active and engaged in their fitness journey.

Character Design within the app is modest, with a focus on animated illustrations or avatars demonstrating exercise techniques to guide users through their routines effectively. These visual aids enhance the user experience by providing clear and intuitive instructions for each workout.

Navigation in the Home Workout app prioritises simplicity and ease of use, with intuitive menus and navigation bars facilitating seamless transitions between different workout categories, exercise routines, progress tracking, and settings.

Visual Feedback mechanisms include progress trackers, achievement badges, and animated demonstrations of exercise techniques. Users can track their workout history and see improvements over time, providing motivation to continue their fitness journey and celebrate their accomplishments.

v. Sound

The app incorporates motivational sound effects, such as encouraging messages or applause, to enhance user motivation during workouts. UI interactions are intuitive and responsive, with smooth transitions between screens and gestures for navigating workouts.

vi. Interface

Buttons within the Home Workout app is large, clearly labelled, and easy to tap, ensuring effortless navigation. The head-up display includes workout timers, calorie burn counters, and quick access buttons for adjusting settings or tracking progress.

UI elements are highly interactive, allowing users to customise their workout routines, track their progress, and explore different exercise categories easily. Features such as drag-and-drop workout scheduling and interactive tutorials enhance user engagement and usability.

vii. Software

Home Workout - No Equipment is developed using common tools and frameworks for mobile app development, such as Flutter, React Native, or native iOS/Android development kits, to ensure compatibility across various devices.

viii. Hardware

The app is available on both iOS and Android platforms, catering to users seeking convenient and effective home workout solutions regardless of their device

preferences. This multi-platform approach ensures accessibility and inclusivity within the fitness community.

Table 2.2: Literature Review Requirement

Game Components	Elements	Claim	Supporting References
App Aesthetic	Visual Styles	Art Style	The study by Luhanga et al. (2018) underscores the significance of art style in group fitness applications, suggesting that visually appealing graphics and art can significantly enhance user engagement and overall experience by creating an inviting and immersive environment for users to interact with.
		Character Design	Although not explicitly discussed in the study by Luhanga et al. (2018), character design is a crucial aspect of art direction within fitness applications. Thoughtfully designed characters can serve as relatable avatars for users, fostering a sense of connection and motivation as they engage with the app's content.
	User Experience (UX) Desgin	Navigation	Luhanga et al. (2018) emphasize the importance of intuitive navigation systems within group fitness applications. Clear and user-friendly navigation allows users to easily explore different features and functionalities, enhancing usability and ensuring a seamless user experience.
		Visual Feedback	The study by Luhanga et al. (2018) highlights the role of visual feedback mechanisms in group fitness applications. Real-time visual feedback on users' progress and actions can provide valuable reinforcement and motivation, helping users stay engaged and on track with their fitness goals.
Sound	Sound Design	Sound Effect & UI Interaction	While not explicitly addressed in Luhanga et al. (2018), the integration of sound effects and interactive UI elements plays a crucial role in enhancing user engagement and interaction within fitness applications. Well-designed sound effects and intuitive UI interactions can contribute to a more immersive and enjoyable user experience.
Interface	User Interface (UI) Design	Button, Head Up Display & Icon	Luhanga et al. (2018) discuss various UI elements, including buttons, heads-up displays (HUD), and icons, as integral components of group fitness application interfaces. Thoughtfully designed UI elements contribute to ease of navigation and enhance user interaction, ultimately improving the overall usability of the application.
	nteractive Elemen	Interactivity of UI Elements	The study by Luhanga et al. (2018) emphasizes the importance of interactive UI elements, such as buttons and menus, in group fitness applications. Responsive and user-friendly interactions enhance usability, allowing users to navigate the app seamlessly and efficiently engage with its features.
Software	App development Software	Development Software	Although specific development software is not mentioned in Luhanga et al. (2018), various tools and platforms, such as Unity, Android Studio, and Xcode, are commonly used in the development of fitness applications. These software tools provide developers with the necessary resources to create robust and feature-rich applications for both Android and iOS platforms.
Hardware	Devices	Application Platform	Luhanga et al. (2018) focus on group fitness applications available on Android and iOS platforms. The choice of multi-platform compatibility underscores the importance of reaching a broader audience and ensuring accessibility across different devices, thereby maximizing the application's potential user base.

2.4 Project Methodology

For the development of the Dynamic AR Fitness application, an Agile methodology is adopted. Agile provides a flexible and iterative approach to software development, enabling rapid adaptation to changing requirements and continuous improvement through frequent feedback. This methodology is particularly well-suited to projects that demand high levels of user interaction and evolving functionalities, such as a fitness application leveraging augmented reality technology. The Agile process is divided into several stages, each with specific activities and deliverables tailored to the needs of the project.

These stages include:

i. Planning

In this initial stage, project goals, scope, requirements, and constraints are meticulously defined. The goal is to create a fitness app incorporating AR technology to help users perform exercises correctly, thereby reducing the risk of injury and enhancing motivation and knowledge. The project timeline is set to 14 weeks, necessitating a clear and detailed plan to ensure timely delivery.

Activities:

Defining Project Goals: The primary objective is to develop a user-friendly fitness application that integrates AR technology. This app aims to tackle the global obesity epidemic by offering tools that enable users to exercise correctly, motivated by engaging AR experiences.

Determining Scope: The scope encompasses creating an AR-based exercise guide, a BMI calculator, a calorie deficit calculator, and a lifestyle-based exercise recommendation system.

Gathering Requirements: Requirements are collected from potential users, fitness experts, and stakeholders to understand the essential features and functionalities needed in the app.

Identifying Constraints: Constraints include a strict 14-week development timeline, budget limitations, and ensuring compatibility across multiple mobile platforms.

Defining Milestones: Key milestones include completing the initial design within the first three weeks, developing the core functionalities by the eighth week, conducting comprehensive testing by the twelfth week, and preparing for deployment in the final two weeks.

ii. Analysis

During the analysis stage, detailed requirements are gathered, analysed, and documented. This stage is critical for understanding user needs and project objectives, informing the design and development process.

Activities:

Literature Review: To gain a comprehensive understanding of the factors contributing to obesity and the role of fitness applications, a literature review of 10 scholarly articles was conducted. These articles provided insights into various themes: "About Dietary Intakes & Nutrition help to Reduce Obesity," "Lifestyle is important to achieve a healthy life," "Lack of Knowledge in exercises can lead to physical injury," and "Fitness Applications help to educate and give motivation to users to have a healthy lifestyle."

Consultation Sessions: Weekly consultation sessions with my project supervisor were conducted to discuss progress, refine project requirements, and address any challenges encountered. These sessions provided continuous feedback and guidance, ensuring the project stayed on track and aligned with its objectives.

iii. Design

In the design stage, the system architecture, user interface, and functionality are conceptualised and documented. This stage focuses on translating requirements into actionable design specifications, ensuring alignment with user expectations and project goals.

Activities:

Conceptualising and Designing the UI: Using Figma software, I designed the user interface (UI) with a focus on minimalism to ensure user-friendliness and ease of understanding. Minimalist design principles were applied to create a clean and intuitive interface, which helps users navigate the app without unnecessary distractions.

Figure 2.14: Dynamic AR Fitness Colour Scheme

Choosing a Colour Scheme: A monochromatic colour scheme was chosen for the UI to maintain a cohesive and aesthetically pleasing look. This approach ensures that the app appears professional and is visually soothing, which can enhance the overall user experience.

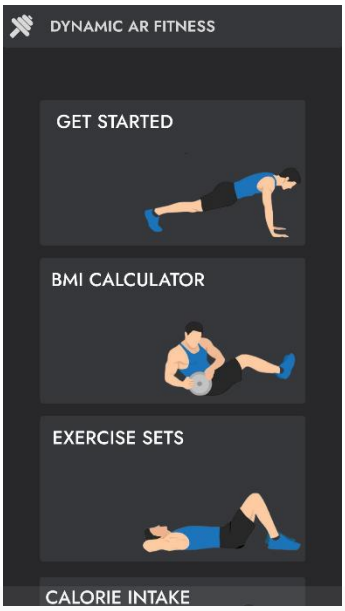


Figure 2.15: Dynamic AR Fitness Wireframe

Creating Wireframes and Prototypes: Wireframes were created to outline the basic structure and layout of the app. These wireframes were then developed into interactive prototypes, allowing for early testing and feedback. This iterative process helped refine

Figure 2.16: Dynamic AR Fitness 3D Model

Designing and Animating 3D Models: For the Augmented Reality (AR) implementation, Blender was used to design and animate the coach model. The 3D models were meticulously crafted to ensure they accurately demonstrated exercise

techniques. Animation was added to these models to provide dynamic and realistic exercise demonstrations.

Ensuring Usability and Accessibility: The design process included considerations for usability and accessibility, ensuring that the app would be easy to use for people of varying fitness levels and technical skills. This involved designing clear and accessible navigation paths and incorporating features that cater to users with different needs.

iv. Development

The development stage involves the actual coding and implementation of the application. During this phase, developers work collaboratively to build and integrate the various components and features outlined in the design phase.

Activities:

Coding the BMI Calculator and Calorie Intake Calculator: In this phase, I developed the Body Mass Index (BMI) Calculator and Calorie Intake Calculator. These tools are essential for helping users track their fitness and dietary progress. The BMI Calculator helps users understand their body composition, while the Calorie Intake Calculator provides personalised dietary recommendations to maintain a healthy lifestyle. These implementations were carried out using Unity software, leveraging its robust development environment.

Using C++ for Implementation: The core logic for the calculators and other functionalities was implemented using C++. This choice was made due to C++'s efficiency and performance in handling complex calculations and processes. C++ allows for precise control over system resources, which is crucial for the smooth functioning of the app.

Developing the Main Application: The main application development included coding for the user interface, integrating 3D models, and implementing augmented reality features. Unity was the primary platform used for these activities, as it provides comprehensive tools for game and app development, including support for AR.

v. Testing

The testing stage involves rigorous evaluation of the application to identify and address any defects or issues. This stage is crucial for ensuring the application meets quality standards and performs as expected across different devices and scenarios.

Activities:

Unit Testing: In the initial phase of testing, unit tests were conducted to verify the functionality of individual components. Each module, including the BMI Calculator, Calorie Intake Calculator, and AR features, was tested separately to ensure that they operated correctly in isolation. Unit testing helps catch errors early in the development process and ensures that each part of the application works as intended.

Integration Testing: After the individual components passed unit testing, integration testing was performed. This involved combining the various modules and testing them as a group to ensure they interacted correctly. For example, the integration of the 3D AR coach model with the user interface and the calculators was thoroughly tested to ensure seamless functionality. Integration testing helps identify issues that may arise when different parts of the application interact with each other.

System Testing: System testing was conducted to evaluate the complete and integrated application. This stage involved testing the application in an environment that closely simulates real-world usage. The goal was to ensure the entire system functioned correctly, including performance under various conditions and loads. System testing ensures the application meets all specified requirements and works as a cohesive unit.

vi. Presentation

In the context of this Final Year Project, the presentation stage replaces the traditional deployment and maintenance stages. The focus is on preparing and delivering a comprehensive demonstration of the application's features, functionality, and development process to evaluators.

Activities:

Preparing the Presentation: The preparation involves creating a detailed presentation that covers all aspects of the project, from the initial concept to the final implementation. This includes slides, demos, and any supporting materials that will help convey the project's objectives, methodology, design, development, and testing processes.

Demonstrating Application Functionality: A live demonstration of the Dynamic AR Fitness application is conducted to showcase its features. This includes demonstrating the BMI Calculator, Calorie Intake Calculator, AR fitness coach, and other core functionalities. The goal is to highlight how the application meets its intended objectives and user needs.

Explaining Design and Development Processes: During the presentation, a thorough explanation of the design and development processes is provided. This includes discussing the choice of tools and technologies, such as Unity for development, Figma for UI design, and Blender for 3D modelling. Additionally, the iterative process of designing, coding, testing, and refining the application is explained.

Answering Evaluator Questions: The presentation includes a Q&A session where evaluators can ask questions about the project. This provides an opportunity to discuss challenges faced, solutions implemented, and any future improvements or considerations for the application.

Receiving Feedback: Feedback from the evaluators is gathered to understand their perspectives on the application's strengths and areas for improvement. This feedback is valuable for reflecting on the project and identifying potential future enhancements.

2.5 Project Requirements

2.5.1 Software Requirements

The development of the end product necessitates the utilisation of various software tools to facilitate the creation and refinement of different aspects of the application.

For application development, Unity serves as the primary environment, providing a comprehensive platform for creating the core application, implementing features, and ensuring seamless integration of functionalities.

In the realm of UI design, Figma is essential. It enables the design and prototyping of the user interface (UI), allowing for the creation of visually appealing layouts, screens, and interactive elements.

For the creation and animation of 3D models, particularly for generating lifelike exercise demonstrations and enriching the augmented reality (AR) features of the application, Blender is utilised.

To enable the implementation of augmented reality functionalities within the application, Vuforia Engine is integrated into the development process.

In the realm of graphic design, Adobe Illustrator is employed for the design and creation of icons and graphical elements, contributing to the visual identity and aesthetic appeal of the application.

Pinterest serves as a platform for inspiration and reference during the icon design process, providing a wealth of visual resources and design ideas to inform the creation of unique and impactful icons for the application.

These software tools collectively play a crucial role in the development lifecycle, facilitating the creation, design, and implementation of various components and features of the fitness application.

2.5.2 Hardware Requirements

The development process of the application necessitates specific hardware components to support various aspects of the development lifecycle.

For precise and detailed icon designing, a graphic tablet is indispensable. Its pressure-sensitive stylus allows for accurate drawing and fine-tuning of graphical elements, contributing to the quality and aesthetics of icons and other visual assets.

The primary workstation for app development and building processes is the Colorful X15 XS 22 laptop model. With its robust specifications and processing power, this laptop facilitates efficient compilation, testing, and deployment of the application across different platforms.

Additionally, the iPhone 12 Pro serves as a crucial tool for real-time testing and previewing of icons and graphical elements designed specifically for iOS devices. Its high-resolution display and advanced camera capabilities ensure accurate representation and visualisation of icon designs, enabling designers to refine and optimise their creations effectively.

These hardware components play a pivotal role in supporting the various stages of development, from designing visual assets to building and testing the application across different devices and platforms.

2.6 Summary

In summary, the Dynamic AR Fitness project harnesses cutting-edge augmented reality (AR) technology to develop an innovative fitness application aimed at addressing the challenges of physical inactivity and obesity. Integrated features include a BMI calculator, calorie deficit calculator, and personalised exercise recommendations tailored to users' lifestyles, offering accessible tools to enhance physical health and prevent injuries.

The project methodology adopts an Agile approach, emphasising flexibility and iterative development to respond efficiently to evolving user needs. Agile principles guided each phase from initial planning and continuous stakeholder collaboration to rapid prototyping and frequent testing. The iterative nature of Agile allowed for quick adjustments based on user feedback, ensuring the application meets its objectives effectively.

The project commenced with thorough planning to establish goals and scope, followed by an analysis phase incorporating extensive research into AR technology's potential in fitness applications. Design efforts prioritised creating an intuitive user interface and refining 3D models for seamless AR integration. Development involved iterative coding and component integration, with ongoing testing cycles to validate functionality and ensure reliability.

A comprehensive literature review underscored the significance of AR in enhancing user engagement and its role in promoting healthier lifestyles through mobile applications. Identified gaps in existing practices justified the need for the Dynamic AR Fitness application, highlighting its potential to bridge these deficiencies.

Through this Agile-driven project, valuable insights were gained into AR-based fitness application development, emphasising user empowerment and education towards sustainable health practices. While the project focused on demonstration rather than deployment and maintenance typical of commercial applications, the culmination in a comprehensive presentation effectively showcased its capabilities and potential for future enhancement.

Overall, the Dynamic AR Fitness project represents a pioneering initiative in fitness technology, offering a progressive solution to combat physical inactivity and obesity. By building on Agile methodologies and continuous improvement, the project lays a foundation for ongoing advancements and a broader impact in promoting physical health through innovative technological solutions.

CHAPTER 3: ANALYSIS

3.1 Current Scenario Analysis

ix. Art Style

The study by Luhanga et al. (2018) underscores the significance of art style in group fitness applications, highlighting that visually appealing graphics and art can significantly enhance user engagement and overall experience. A well-designed art style creates an inviting and immersive environment for users to interact with, thus increasing their likelihood of continuous use. In the current landscape, the No Equipment app exemplifies this by featuring a clean and minimalist art style. The use of simple yet engaging graphics emphasises the accessibility of home workouts, and the incorporation of bright colours and energetic imagery inspires users to stay active.

ii. Character Design

While not explicitly discussed in Luhanga et al. (2018), character design is a crucial aspect of art direction within fitness applications. Thoughtfully designed characters can serve as relatable avatars for users, fostering a sense of connection and motivation. Although the primary goal of many fitness applications, such as the No Equipment app, is to assist users with their fitness routines rather than focusing heavily on character design, generic avatar options for personalising profiles can still enhance the user experience by providing a personal touch.

iii. Navigation

Luhanga et al. (2018) emphasise the importance of intuitive navigation systems within group fitness applications. Clear and user-friendly navigation allows users to easily explore different features and functionalities, enhancing usability and ensuring a seamless user experience. Fitness Coach, an existing system in this domain, prioritises simplicity and efficiency in its navigation design. Users can effortlessly navigate between features such as workout planning, progress tracking, nutrition logging, and community forums through a streamlined menu system.

iv. Visual Feedback

The role of visual feedback mechanisms in group fitness applications is highlighted by Luhanga et al. (2018). Real-time visual feedback on users' progress and actions provides valuable reinforcement and motivation, helping users stay engaged and on track with their fitness goals. The No Equipment app incorporates visual feedback through progress charts, achievement badges, and animations, which serve to motivate users and celebrate their accomplishments.

v. Sound Effect & UI Interaction

While sound effects and interactive UI elements are not explicitly addressed in Luhanga et al. (2018), their integration plays a crucial role in enhancing user engagement within fitness applications. Well-designed sound effects and intuitive UI interactions contribute to a more immersive and enjoyable user experience. Fitness Coach, similar to Gymnotize, employs subtle sound effects for UI interactions, providing auditory cues when users complete tasks, save progress, or reach milestones. These sound effects enhance user engagement and feedback.

vi. Button, Head-Up Display (HUD) & Icon

Luhanga et al. (2018) discuss various UI elements, including buttons, heads-up displays (HUD), and icons, as integral components of group fitness application interfaces. Thoughtfully designed UI elements contribute to ease of navigation and enhance user interaction, ultimately improving the overall usability of the application. The Home Workout app exemplifies this by featuring large, clearly labelled, and easy-to-tap buttons, ensuring users can navigate the app effortlessly. The HUD might include workout timers, calorie burn counters, and quick access buttons for adjusting settings or tracking progress.

vii. Interactivity of UI Elements

The importance of interactive UI elements, such as buttons and menus, in group fitness applications is emphasised by Luhanga et al. (2018). Responsive and user-friendly interactions enhance usability, allowing users to navigate the app seamlessly and efficiently engage with its features. In the current landscape, UI elements in applications like Fitness Coach are highly interactive, allowing users to customise their workout routines, track their progress, and explore different exercise categories easily. Features such as drag-and-drop workout scheduling and interactive tutorials significantly enhance user engagement.

viii. Development Software

Although specific development software is not mentioned in Luhanga et al. (2018), various tools and platforms, such as Unity, Android Studio, and Xcode, are commonly used in the development of fitness applications. These software tools provide developers with the necessary resources to create robust and feature-rich applications for both Android and iOS platforms. The Gymnotize Gym Fitness Workout app, for instance, could be developed using popular tools and frameworks for mobile app development such as Flutter, React Native, or native iOS/Android development kits.

ix. Application Platform

Luhanga et al. (2018) focus on group fitness applications available on Android and iOS platforms. The choice of multi-platform compatibility underscores the importance of reaching a broader audience and ensuring accessibility across different devices, thereby maximising the application's potential user base. Reflecting this, the Fitness Coach app is available for both iOS and Android devices, ensuring that a broad audience of fitness enthusiasts can access the app regardless of their preferred mobile platform.

3.2 Requirement Analysis

3.2.1 Project Requirement

i. App Aesthetic

In the context of visual styles, the study by Luhanga et al. (2018) underscores the significance of art style in group fitness applications. Visually appealing graphics and art can significantly enhance user engagement and overall experience by creating an inviting and immersive environment for users to interact with. In existing systems, such as the No Equipment app, a clean and minimalist art style is often featured. This style, characterised by simple yet engaging graphics, emphasises the accessibility of home workouts and incorporates bright colours and energetic imagery to inspire users to stay active. For my project, a minimalist and user-friendly art style will be adopted to ensure clarity and appeal.

Although not explicitly discussed in the study by Luhanga et al. (2018), character design is a crucial aspect of art direction within fitness applications. Thoughtfully designed characters can serve as relatable avatars for users, fostering a sense of connection and motivation as they engage with the app's content. Existing systems might not heavily focus on character design since their primary goal is to assist users with their fitness routines. However, they often incorporate generic avatar options for users to personalize their profiles. My project will include minimalist designs and a 3D model coach to enhance user engagement.

ii. User Experience (UX) Design

Luhanga et al. (2018) emphasise the importance of intuitive navigation systems within group fitness applications. Clear and user-friendly navigation allows users to easily explore different features and functionalities, enhancing usability and ensuring a seamless user experience. In existing systems like the Fitness Coach app, navigation

prioritises simplicity and efficiency. Users can navigate between features such as workout planning, progress tracking, nutrition logging, and community forums through a streamlined menu system. For my project, navigation will be designed to be user-friendly and easy to understand.

The study by Luhanga et al. (2018) highlights the role of visual feedback mechanisms in group fitness applications. Real-time visual feedback on users' progress and actions can provide valuable reinforcement and motivation, helping users stay engaged and on track with their fitness goals. Existing apps often provide visual feedback through progress charts, achievement badges, and animations to motivate users and celebrate their accomplishments. My project will incorporate augmented reality (AR) 3D models and a fast-performance UI to provide dynamic visual feedback.

iii. Sound

While not explicitly addressed in Luhanga et al. (2018), the integration of sound effects and interactive UI elements plays a crucial role in enhancing user engagement and interaction within fitness applications. Well-designed sound effects and intuitive UI interactions can contribute to a more immersive and enjoyable user experience. Existing systems, such as the Gymnotize app, employ subtle sound effects for UI interactions, providing auditory cues when users complete tasks, save progress, or reach milestones. My project will feature simple and relaxing sounds to complement the user experience.

iv. Interface

Luhanga et al. (2018) discuss various UI elements, including buttons, heads-up displays (HUD), and icons, as integral components of group fitness application interfaces. Thoughtfully designed UI elements contribute to ease of navigation and enhance user interaction, ultimately improving the overall usability of the application.

Existing systems like the Home Workout app use large, clearly labelled buttons that are easy to tap, ensuring users can navigate the app effortlessly. The HUD might include workout timers, calorie burn counters, and quick access buttons for adjusting settings or tracking progress. My project will implement a minimalist icon design, user-friendly buttons, and an understandable HUD.

The study by Luhanga et al. (2018) emphasises the importance of interactive UI elements, such as buttons and menus, in group fitness applications. Responsive and user-friendly interactions enhance usability, allowing users to navigate the app seamlessly and efficiently engage with its features. Existing systems include features such as drag-and-drop workout scheduling and interactive tutorials to enhance user engagement. My project will focus on fast performance UI and user-friendly elements to ensure a smooth and engaging user experience.

v. Software

Although specific development software is not mentioned in Luhanga et al. (2018), various tools and platforms such as Unity, Android Studio, and Xcode are commonly used in the development of fitness applications. These software tools provide developers with the necessary resources to create robust and feature-rich applications for both Android and iOS platforms. Existing systems, like the Gymnotize Gym Fitness Workout app, could be developed using popular tools and frameworks for mobile app development such as Flutter, React Native, or native iOS/Android development kits. My project will utilise Unity, Xcode, Vuforia, Blender, and Figma for development.

vi. Hardware

Luhanga et al. (2018) focus on group fitness applications available on Android and iOS platforms. The choice of multi-platform compatibility underscores the importance of reaching a broader audience and ensuring accessibility across different

devices, thereby maximizing the application's potential user base. Existing systems are typically available for both iOS and Android devices, reaching a broad audience of fitness enthusiasts regardless of their preferred mobile platform. My project will also support both Android and iOS platforms to ensure wide accessibility.

vii. My App Component

Proper Exercise Formation Guidance: This component uses augmented reality (AR) technology to visually guide users through various exercises in real-time. It overlays digital instructions onto the user's surroundings, demonstrating correct form, posture, and movement techniques for each exercise.

Personalised Exercise Recommendations: The app assesses the user's fitness level and preferences to generate personalised exercise routines. The recommendations are tailored to meet the specific needs and objectives of each user.

Calorie Intake Calculator: The app includes a daily calorie calculator that allows users to maintain their fitness by consuming the right number of calories daily. This feature helps users monitor their progress, set realistic goals, and make informed decisions about their health and fitness journey.

BMI Calculator: The app includes a BMI calculator that allows users to track their Body Mass Index (BMI) over time. Users can input their height and weight, and the app calculates their BMI automatically. This feature helps users monitor their progress, set realistic goals, and make informed decisions about their health and fitness journey.

Table 3.1: Project Requirement

Game Component	Element	LR	Existing System	Your Project Requirement
App Aesthehic	Art Style	The study by Luhanga et al. (2018) underscores the significance of art style in group fitness applications, suggesting that visually appealing graphics and art can significantly enhance user engagement and overall experience by creating an inviting and immersive environment for users to interact with.	No Equipment app might feature a clean and minimalist art style, with simple yet engaging graphics that emphasize the accessibility of home workouts. The design could incorporate bright colors and energetic imagery to inspire users to stay active.	**Minimalist Art Style** **User-Friendly Art Style**
	Character Design	Although not explicitly discussed in the study by Luhanga et al. (2018), character design is a crucial aspect of art direction within fitness applications. Thoughtfully designed characters can serve as relatable avatars for users, fostering a sense of connection and motivation as they engage with the app's content.	The app might not heavily focus on character design since its primary goal is to assist users with their fitness routines. However, it could incorporate generic avatar options for users to personalize their profiles.	**Minimalist Design** **Mannequin 3D Coach**
	Navigation	Luhanga et al. (2018) emphasize the importance of intuitive navigation systems within group fitness applications. Clear and user-friendly navigation allows users to easily explore different features and functionalities, enhancing usability and ensuring a seamless user experience.	Navigation in Fitness Coach would prioritize simplicity and efficiency.Users would find it easy to navigate between features such as workout planning, progress tracking, nutrition logging, and community forums through a streamlined menu system.	**User-Friendly** **Easy to Understand**
	Visual Feedback	The study by Luhanga et al. (2018) highlights the role of visual feedback mechanisms in group fitness applications. Real-time visual feedback on users' progress and actions can provide valuable reinforcement and motivation, helping users stay engaged and on track with their fitness goals.	The app could provide visual feedback through progress charts, achievement badges, and animations to motivate users and celebrate their accomplishments.	**Augmented Reality 3D Model** **Fast Performance UI**
Sound	Sound Effect & UI Interaction	While not explicitly addressed in Luhanga et al. (2018), the integration of sound effects and interactive UI elements plays a crucial role in enhancing user engagement and interaction within fitness applications. Well-designed sound effects and intuitive UI interactions can contribute to a more immersive and enjoyable user experience.	Similar to Gymnotize, Fitness Coach might employ subtle sound effects for UI interactions, providing auditory cues when users complete tasks, save progress, or reach milestones. These sound effects would enhance user engagement and feedback.	**Simple & Relax Sound**
Interface	Button, Head Up Display & Icon	Luhanga et al. (2018) discuss various UI elements, including buttons, heads-up displays (HUD), and icons, as integral components of group fitness application interfaces. Thoughtfully designed UI elements contribute to ease of navigation and enhance user interaction, ultimately improving the overall usability of the application.	Buttons in the Home Workout app would be large, clearly labeled, and easy to tap, ensuring users can navigate the app effortlessly.The head-up display might include workout timers, calorie burn counters, and quick access buttons for adjusting settings or tracking progress.	**Minimalist Icon** **Minimalist & User-Friendly Button** **Understandable Head Up Display**
	Interactivity of UI Elements	The study by Luhanga et al. (2018) emphasizes the importance of interactive UI elements, such as buttons and menus, in group fitness applications. Responsive and user-friendly interactions enhance usability, allowing users to navigate the app seamlessly and efficiently engage with its features.	UI elements would be highly interactive, allowing users to customize their workout routines, track their progress, and explore different exercise categories easily. Features such as drag-and-drop workout scheduling and interactive tutorials would enhance user engagement.	**Fast Perfomance UI** **User-Friendly Elements**
Software	Development Software	Although specific development software is not mentioned in Luhanga et al. (2018), various tools and platforms, such as Unity, Android Studio, and Xcode, are commonly used in the development of fitness applications. These software tools provide developers with the necessary resources to create robust and feature-rich applications for both Android and iOS platforms.	Gymnotize Gym Fitness Workout app could be developed using popular tools and frameworks for mobile app development such as Flutter, React Native, or native iOS/Android development kits.	**Unity** **XCode** **Vuforia** **Blender** **Figma**
Hardware	Application Platform	Luhanga et al. (2018) focus on group fitness applications available on Android and iOS platforms. The choice of multi-platform compatibility underscores the importance of reaching a broader audience and ensuring accessibility across different devices, thereby maximizing the application's potential user base.	The app would likely be available for both iOS and Android devices, reaching a broader audience of fitness enthusiasts regardless of their preferred mobile platform.	**Android** **IOS**

3.2.2 Software Requirement

The development of the Dynamic AR Fitness application requires the use of various software tools, each serving specific functions crucial to the successful completion and functionality of the project. The following software tools have been employed, each selected for its unique capabilities and suitability to different aspects of the development process:

i. Unity

Unity serves as the primary development environment for the Dynamic AR Fitness application. It provides a comprehensive platform for creating the core application, implementing interactive features, and ensuring seamless integration of functionalities. Unity's robust capabilities in handling both 2D and 3D content make it ideal for developing the AR components of the application.

ii. Figma

Figma is used extensively for UI design and prototyping. It enables the creation of visually appealing layouts, screens, and interactive elements. Figma's collaborative features allow for real-time feedback and iteration, ensuring that the user interface is both user-friendly and aesthetically pleasing.

iii. Blender

Blender is employed for the creation and animation of 3D models, particularly for generating lifelike exercise demonstrations. These 3D models are crucial for enriching the augmented reality features of the application, providing users with realistic visual guidance for various exercises.

iv. Vuforia Engine

Vuforia Engine is integrated to enable the implementation of augmented reality functionalities within the application. Vuforia's powerful AR capabilities allow for the

overlay of digital instructions and visual aids onto the user's real-world environment, enhancing the interactive experience.

v. Adobe Illustrator

Adobe Illustrator is used for graphic design tasks, specifically for the design and creation of icons and graphical elements. These visual components contribute to the application's overall aesthetic appeal and visual identity, ensuring a cohesive and engaging user experience.

vi. Pinterest

Pinterest is utilised as a source of inspiration and reference during the icon design process. It provides a wealth of visual resources and design ideas, which inform the creation of unique and impactful icons for the application.

3.2.3 Hardware Requirement

The development process of the Dynamic AR Fitness application relies on specific hardware components to support various aspects of the project lifecycle. Each hardware component serves a crucial role in facilitating the design, development, and testing phases of the application:

i. Graphic Tablet

A graphic tablet is essential for precise and detailed icon design. Its pressure-sensitive stylus enables accurate drawing and fine-tuning of graphical elements, ensuring high-quality and visually appealing visual assets for the application. The graphic tablet enhances the efficiency and accuracy of the design process, contributing to the overall aesthetics of the Dynamic AR Fitness application.

ii. Colorful X15 XS 22 Laptop Model

The Colorful X15 XS 22 laptop model serves as the primary workstation for app development and building processes. With its robust specifications and processing power, this laptop facilitates efficient compilation, testing, and deployment of the application across different platforms. Its performance capabilities ensure smooth and seamless development workflows, enabling developers to iterate rapidly and deliver high-quality results.

iii. iPhone 12 Pro

The iPhone 12 Pro is a crucial tool for real-time testing and previewing of icons and graphical elements designed specifically for iOS devices. Its high-resolution display and advanced camera capabilities allow for accurate representation and visualisation of icon designs. The iPhone 12 Pro enables designers to test the application's user interface and visual elements in a real-world environment, facilitating refinement and optimisation for optimal user experience on iOS devices.

3.3 Project Schedule & Milestone

Listing down the project schedule and milestones is important as it provides a detailed overview of when the project milestones should be done. It also ensures that the project can be done on time. The project task is completed in one semester, which lasts for 14 weeks. The detailed project milestones are written inside the table and Gantt Chart shown below.

Table 3.2: Project Milestone

Project Milestones	Duration (days)	Start Date	End Date
Project Briefing	1	14/02/2024	14/02/2024
Proposal Preparation	6	28/02/2024	06/03/2024
Proposal Submission	1	08/03/2024	08/03/2024
Ideas Brainstorming	11	09/03/2024	20/03/2024
Storyboard	11	09/03/2024	20/03/2024

Creation			
Development	40	6/05/2024	15/06/2024
Testing	4	15/04/2024	29/05/2024
Report Writing	75	1/03/2024	15/06/2024
Presentation	1	20/06/2024	20/06/2024

Table 3.3: Project Gantt Chart

No.	Tasks Involved in the Project	Week													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Project Briefing														
2	Proposal Discussion with Supervisor														
3	Proposal Submission														
4	Ideas Brainstorming														
5	Storyboard Creation														
6	Development Phase														
7	Testing Phase of Developed Creation														

8	**Report Writing**													
9	**Presentation of the Created End-Product**													

3.4 Summary

In summary, Chapter 3 thoroughly examines the essential requirements for developing the Dynamic AR Fitness application. By synthesising insights from Luhanga et al. (2018) and examples from existing fitness apps like No Equipment and Fitness Coach, the project outlines key features crucial for enhancing user engagement and usability. The application aims for a minimalist and user-friendly art style with integrated 3D model coaches to personalise user interaction. Navigation will emphasise simplicity, complemented by dynamic visual feedback via AR technology to motivate users effectively. Sound design focuses on creating a soothing atmosphere for an enhanced user experience. UI elements are designed to be intuitive and interactive, utilising development tools such as Unity, Figma, Blender, Vuforia Engine, Adobe Illustrator, and Pinterest. Hardware requirements include a graphic tablet, Colorful X15 XS 22 laptop, and iPhone 12 Pro, essential for efficient design and testing phases.

CHAPTER 4: DESIGN

4.1 Introduction

This section introduces the design phase of the Dynamic AR Fitness application, encompassing both preliminary and detailed design stages based on the findings from the previous analysis chapters. It showcases how identified requirements translate into tangible design solutions, aiming to achieve a compelling user experience while meeting project objectives. Key aspects covered include visual aesthetics, interactive user interfaces, integration of augmented reality functionalities, and the underlying architectural framework. This chapter serves as a blueprint for the application's development, providing a clear path from conceptualization to implementation.

4.2 System Architecture

I. User Interaction

The system architecture for the mobile application starts with the user, who interacts with the application on their mobile device. This interaction is the cornerstone of the application, driving the flow through various modules designed to provide specific health and fitness-related functionalities.

II. Mobile Application Modules

The application is structured into three main modules: BMI Calculator, Daily Calorie Intake Calculator, and Exercise Set. Each module operates independently to cater to different user needs, ensuring a modular and user-friendly experience.

III. BMI Calculator

The BMI Calculator module allows the user to input their weight and height. Based on these inputs, the module calculates the Body Mass Index (BMI) of the user. The BMI output is then displayed, providing the user with a measure of their body fat based on their weight and height. This module is essential for users who wish to quickly assess their BMI and understand their weight category.

IV. Daily Calorie Intake Calculator

In the Daily Calorie Intake Calculator module, the user inputs their gender, weight, height, age, and physical activity level. The module uses this information to calculate the user's daily calorie intake. The output provides a personalised estimate of the calories needed to maintain their current weight, considering their activity level and other personal factors. This module is crucial for users looking to manage their diet and energy intake more effectively.

V. Exercise Set

The Exercise Set module includes predefined exercise sets tailored for both male and female users, with four distinct sets for each. Additionally, this module incorporates an Augmented Reality (AR) feature that visually demonstrates the exercises. This AR performance functionality aids users in understanding and performing the exercises correctly, enhancing their workout experience through interactive visual guidance. This module is designed to support users in their fitness routines, offering clear and engaging instructions on how to perform various exercises.

VI. User Flow

The user starts by interacting with the mobile application, selecting from the available modules based on their immediate needs. When the BMI Calculator module is chosen, the user inputs their weight and height, and the application calculates and displays the BMI. If the Daily Calorie Intake Calculator module is selected, the user provides their gender, weight, height, age, and physical activity level, leading to a personalised daily calorie intake output. In the Exercise Set module, the user selects

an appropriate exercise set, and the AR feature demonstrates the exercises, providing a comprehensive guide to performing them correctly.

VII. Key Architectural Considerations

The modular design of the application ensures that each component operates independently, allowing users to navigate seamlessly between different functionalities. User input is central to both the BMI Calculator and the Daily Calorie Intake Calculator, ensuring personalised and relevant outputs. The integration of AR in the Exercise Set module introduces an innovative element, enhancing user engagement and providing an interactive learning experience for performing exercises. This design ensures that the application is user-friendly, modular, and capable of delivering valuable health and fitness-related information and tools, thereby catering to a broad range of user needs and preferences.

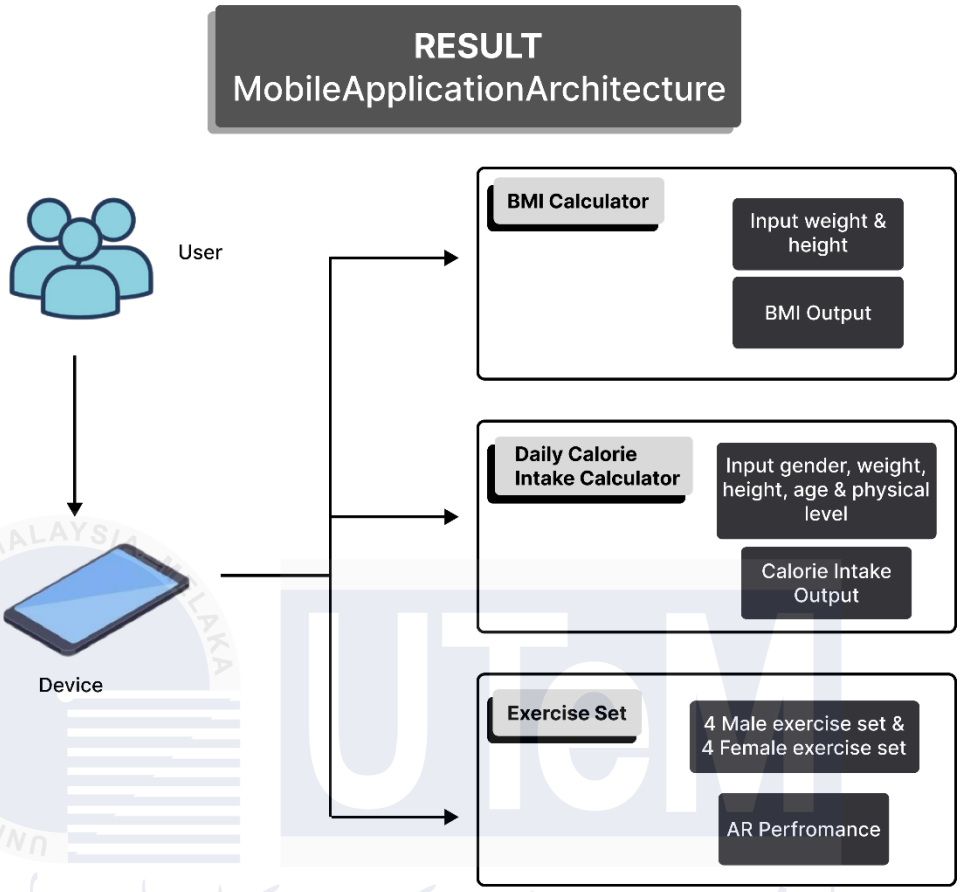


Figure 4.1: System Architecture

4.3 Preliminary Design

4.3.1 Storyboard Design

i. Main Menu

The main menu serves as the central hub for users to navigate through different functionalities:

a. "Get Started": Provides an introduction and overview of the application.

b. "Exercise Set": Offers a selection of 8 exercise sets tailored for various fitness levels and goals.

c. "BMI Calculator": Allows users to calculate their Body Mass Index (BMI) by inputting their weight and height. Results are displayed numerically and visually, with an option to reset inputs.

d. "Calorie Intake Calculator": Enables users to calculate their daily calorie intake based on weight, height, gender, age, and physical activity level. Results are displayed numerically, with an option to reset inputs.

ii. Exercise Menu

Upon selecting an exercise set from the main menu, users can choose from 8 different exercise sets. Each set includes:

a. Exercise Set Overview: Provides a brief description and goals of the selected exercise set.

b. List of Exercises: Details each exercise within the set, including steps, tips for proper execution, and the option to tap for an augmented reality (AR) performance.

c. AR Performance: Allows users to view a 3D model demonstrating proper exercise form in augmented reality. Users can interact with the AR screen to rotate, zoom, and observe movements from different angles.

iii. BMI Calculator

a. Input: Users input their weight and height.

b. Output: Displays the calculated BMI value along with an illustrative representation of

c. BMI categories (underweight, normal weight, overweight, etc.).

d. Reset Button: Allows users to clear inputs and results for recalculating.

iv. Calorie Intake Calculator

a. Input: Users provide weight, height, gender, age, and select their physical activity level (sedentary, light activity, moderate activity, high activity, very high activity).

b. Output: Calculates the recommended daily calorie intake based on the input parameters.

c. Reset Button: Allows users to reset inputs and recalibrate their calorie intake calculation.

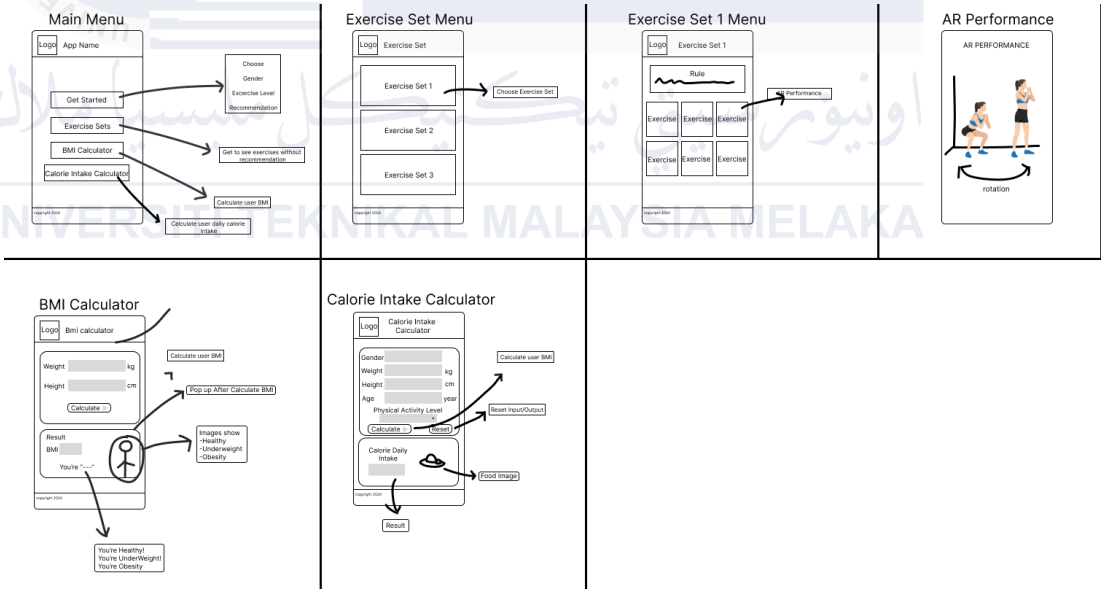


Figure 4.2: Dynamic AR Fitness Storyboard Application

4.4 User Interface Design

I. Navigation Design

The navigation flow and types of navigation controls in the Dynamic AR Fitness are designed to prioritise user-friendliness and ease of understanding. Beginning with the main menu, users encounter straightforward options such as "Get Started," "Exercise Set," "BMI Calculator," and "Calorie Intake Calculator," each clearly labelled to provide immediate clarity on available functionalities. From the main menu, users can select their desired section, leading to secondary menus that present information in a logical sequence. Within each section, navigation controls consist of intuitive buttons and interactive elements, ensuring consistency and predictability throughout the application. For instance, navigating through exercise sets involves accessing an overview, detailed exercises with tips, and augmented reality (AR) demonstrations that users can interact with by rotating and zooming. This structured approach to navigation enhances usability by reducing complexity and facilitating seamless exploration of fitness tools and resources.

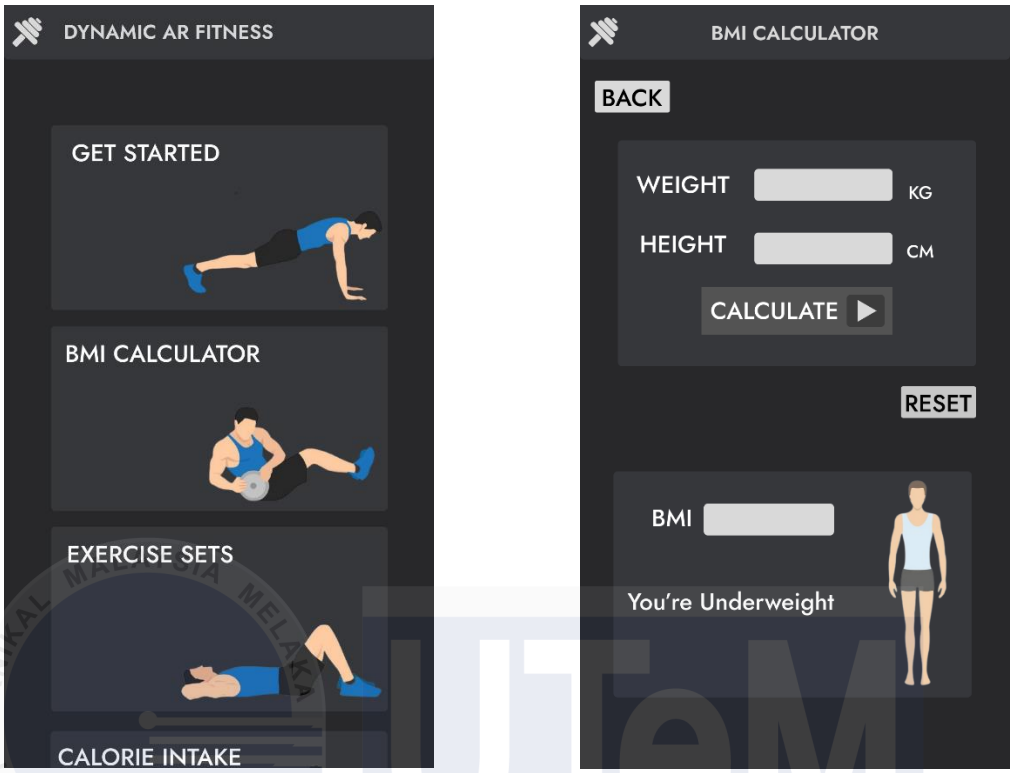


Figure 4.3: Dynamic AR Navigation Design

II. Input Design

The input design of Dynamic AR Fitness is meticulously crafted to ensure user-friendly interaction and streamlined functionality. Text fields are strategically integrated to facilitate input of vital information such as weight and height, promoting clarity and ease of use. Dropdown menus provide intuitive selections for options like physical activity levels and exercise sets, maintaining simplicity while offering flexibility. Minimalist icons are thoughtfully placed throughout the interface, serving as clear visual cues for essential functions. User-friendly buttons with concise labels enable straightforward navigation and action execution, enhancing usability across the application. The Head-Up Display (HUD) presents crucial data such as BMI results and calorie intake recommendations in a clear, easily digestible format, leveraging crisp typography and effective visual design to optimise user comprehension and engagement. This cohesive input design approach ensures that Dynamic AR Fitness

delivers a seamless and intuitive user experience, empowering users to effectively utilise its advanced AR technology for their fitness journey.

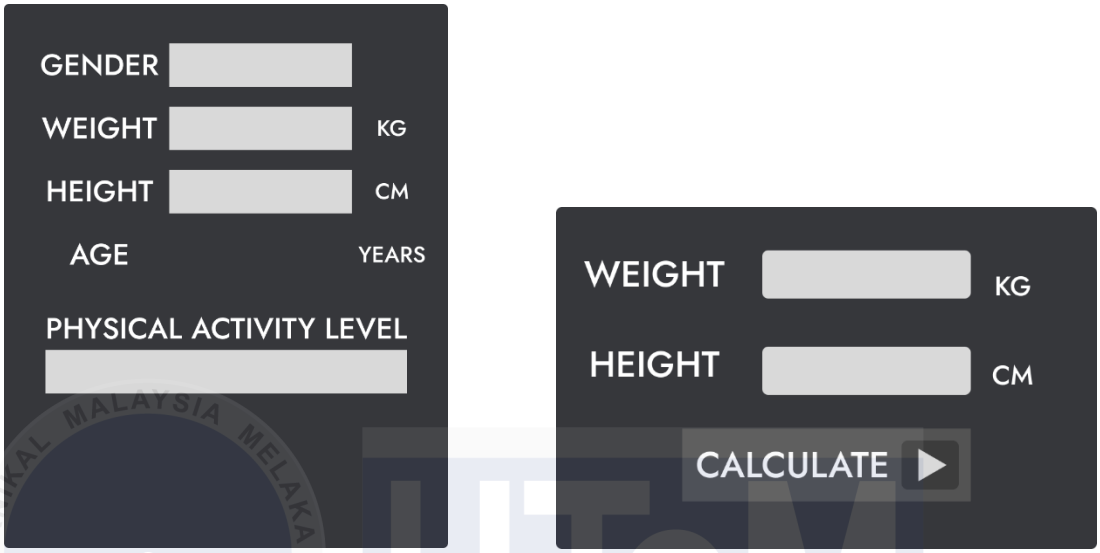


Figure 4.4: Dynamic AR Fitness Input Design

III. Output Design

The output design of Dynamic AR Fitness focuses on delivering intuitive and informative visual feedback to enhance the user experience. Utilising strategically placed images alongside clear text fields, the application ensures users receive comprehensive insights into their fitness progress and results. Minimalist icons and user-friendly buttons facilitate effortless navigation and interaction, while the Head-Up Display (HUD) presents essential data such as BMI calculations and calorie intake recommendations in a straightforward manner. This design approach aims to provide users with a seamless and engaging experience, empowering them to track their fitness journey effectively within the AR-enhanced environment of the application.

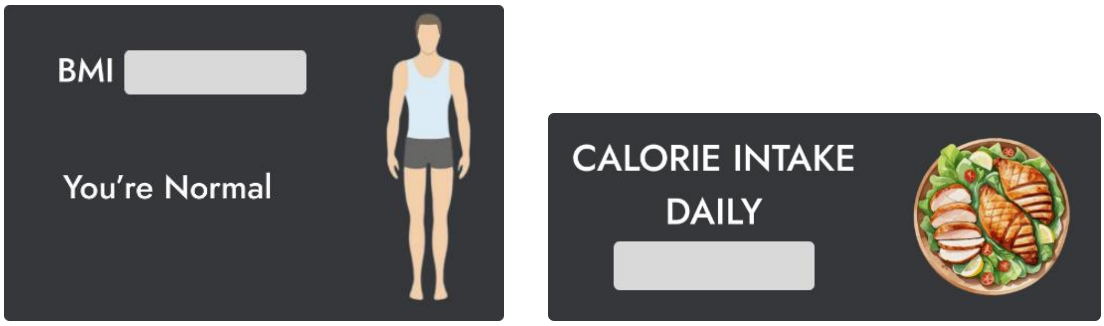


Figure 4.5: Dynamic AR Fitness Output Design

IV. Metaphors

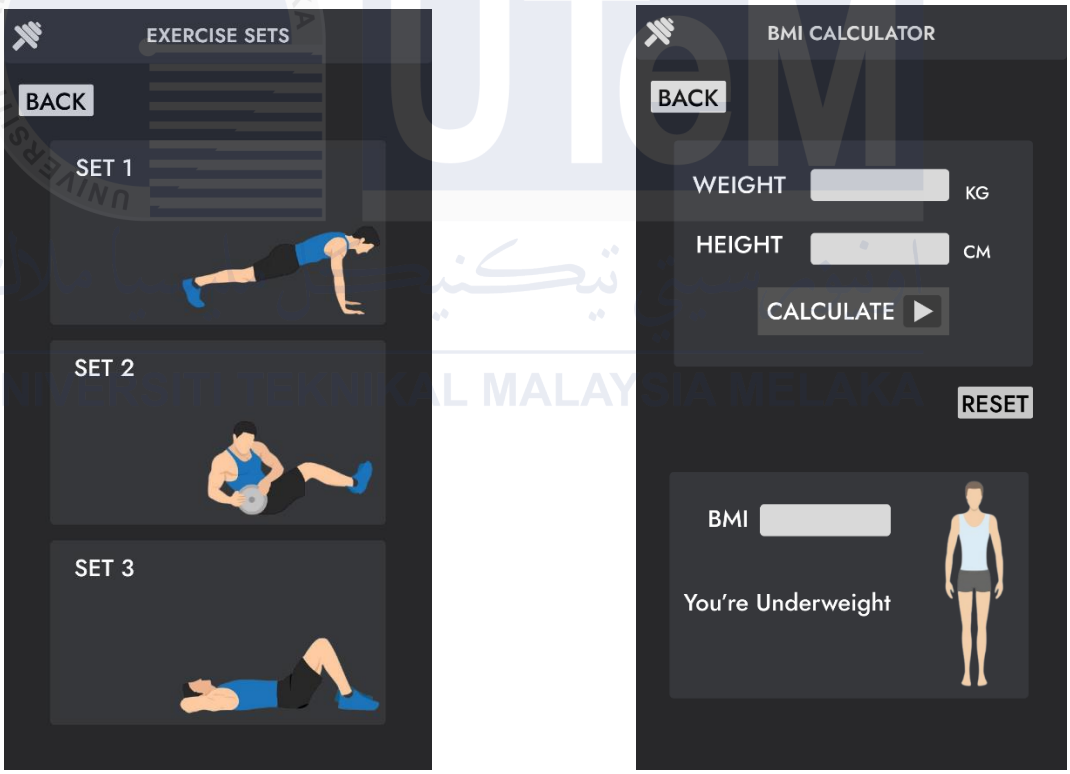


Figure 4.6: Dynamic AR Fitness User Interfaces

V. Template Design

The user interface and interaction design of Dynamic AR Fitness are characterised by a minimalist art style that emphasises simplicity and clarity, ensuring accessibility across diverse cultural and demographic backgrounds. Utilising minimalist icons and user-friendly buttons, the design facilitates intuitive navigation and interaction, supported by an understandable Head-Up Display (HUD) that presents information clearly. Augmented Reality (AR) 3D models enhance user engagement with lifelike exercise demonstrations, while the UI's fast performance ensures seamless transitions and responsive interactions. This cohesive design approach aims to deliver a user-friendly experience that merges technological sophistication with ease of use, catering to a broad audience seeking effective fitness solutions within an immersive digital environment.

Creating a template design involves integrating various elements into a unified layout that embodies the project's theme and functionality. This includes designing a 3D coach model animated with exercise routines in Blender, crafting a minimalist logo featuring elements inspired by a dumbbell, and selecting a minimalist humanoid icon from Pinterest for intuitive navigation. Each element is strategically placed within the template to ensure a cohesive and visually appealing interface that enhances user engagement and usability. By focusing on consistency in design elements and user-friendly navigation, the template aims to provide a seamless experience for users interacting with the fitness-themed content.

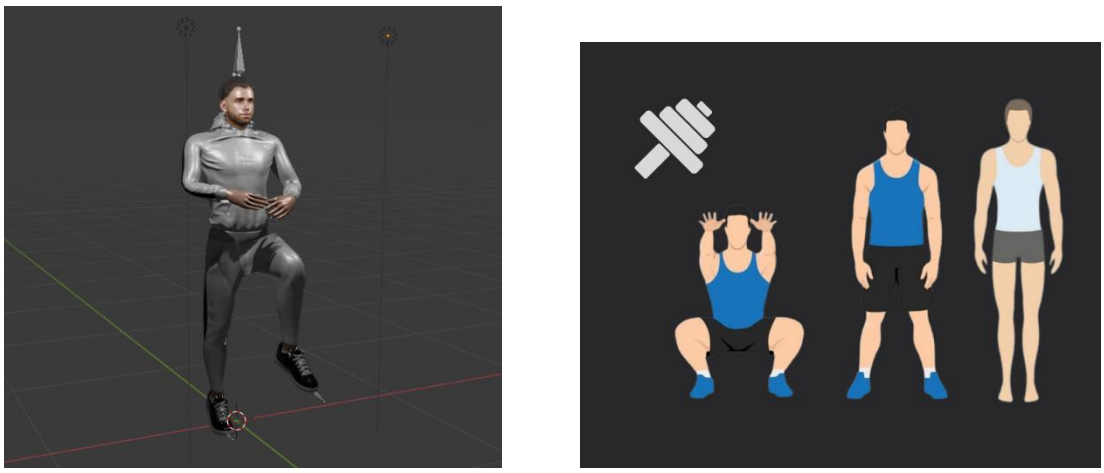


Figure 4.7: Dynamic AR Fitness Template Design

4.5 Summary

In summary, the design chapter outlines the meticulous creation of a template for the Dynamic AR Fitness application. This template integrates a 3D coach model animated with exercise routines using Blender, a minimalist logo referencing a dumbbell for brand identity, and a carefully chosen minimalist humanoid icon from Pinterest for intuitive navigation. Each element is strategically placed within the template to ensure a cohesive and visually appealing interface. Emphasis is placed on maintaining consistency in design elements and prioritising user-friendly navigation to enhance engagement and usability. Overall, the design chapter aims to provide a structured framework that seamlessly integrates various media elements to support a compelling and effective user experience within the AR-enhanced fitness application.

CHAPTER 5: IMPLEMENTATION

5.1 Introduction

The implementation phase of the Dynamic AR Fitness application marks the transition from conceptual design to practical development and integration. This crucial stage focuses on transforming theoretical ideas and design concepts into functional software components. Throughout this phase, emphasis is placed on setting up the development environment, selecting appropriate programming languages and frameworks, and integrating media assets such as 3D models and animations. Iterative testing and refinement processes are also pivotal, ensuring that the application meets design specifications and user requirements effectively. By delving into the implementation details, this phase aims to demonstrate how the envisioned AR fitness experience is realised through meticulous coding and technical execution.

5.2 Media Creation

I. Production of Texts

In the production of texts for the Dynamic AR Fitness application, a meticulous approach ensures clarity and user-friendly interaction. Titles and headings are uniformly displayed in Jost Font, either in Semibold or Bold and presented in all capitals to emphasise their significance. Buttons also feature the Jost Font in Semibold or Bold with all capitals, facilitating intuitive navigation and engagement. Descriptive texts follow proper capitalization rules to maintain readability and convey information effectively. This consistent use of fonts and formatting enhances the application's aesthetic appeal and usability, ensuring a cohesive visual identity while prioritising clear communication of content throughout the user interface.

II. Production of Graphics

In producing graphics for the Dynamic AR Fitness application, a strategic approach utilises both bitmap and vector techniques to ensure visual quality and flexibility across various elements. Bitmap graphics, crafted in Figma, cater to detailed UI components and digital images, offering precise control over textures and gradients. Concurrently, vector graphics are leveraged for creating scalable icons, maintaining clarity and sharpness regardless of size, through software such as Illustrator. Minimalist humanoid icons depicting exercise and weight classes are sourced from Pinterest, aligning with the application's aesthetic and functional needs. Additionally, 3D models of coaches, animated using Blender and incorporating Mixamo for rigging, enrich the application with interactive and realistic exercise demonstrations. This comprehensive graphic production strategy ensures a cohesive and engaging visual experience within the AR-enhanced fitness environment.

III. Production of Audio

In developing audio components for the Dynamic AR Fitness application, the focus is on creating a seamless user experience through clear and effective auditory feedback. This includes producing simple button sounds that are distinct yet unobtrusive, enhancing user interaction with intuitive feedback cues. Digital audio concepts are applied to ensure high-quality recordings and efficient file management, with attention to compression techniques that balance audio fidelity with file size optimization. Utilising audio editing software facilitates the creation and refinement of these sounds, ensuring they integrate smoothly into the application's interface to provide responsive and engaging user interactions.

IV. Production of Video

In the development of video content for the Dynamic AR Fitness application, a specialised approach combines AR technology and animation techniques to create immersive and interactive experiences. Using Vuforia software for AR integration and Blender for animation, videos are meticulously crafted to showcase exercises and fitness routines in a dynamic virtual environment. Post-production focuses on refining visual effects to enhance realism and user engagement, ensuring that each video segment aligns with the application's goal of providing informative and interactive

fitness guidance. Compression techniques are applied to optimise file sizes without compromising video quality, ensuring smooth playback and efficient delivery of content within the AR-enhanced experience.

V. Production of Animation

In the production of animation for the Dynamic AR Fitness application, a comprehensive process unfolds to bring realistic and engaging experiences to users. Beginning with the acquisition of a 3D coach model from Mixamo, the model undergoes meticulous mapping and texturing in Blender to enhance its visual fidelity. Animation sequences are then meticulously crafted to mirror real-life coaching movements, ensuring accuracy and fluidity in motion. Lighting setups are implemented within Unity to further enrich the visual quality and realism of the AR environment. Finally, leveraging Vuforia and Unity, the animations are seamlessly integrated into the AR framework, allowing users to interactively experience and learn from dynamic virtual coaching sessions. This integrated approach ensures that each animation not only meets technical standards but also delivers a compelling and immersive fitness training experience through augmented reality.

5.3 Media Integration

In the development of the Dynamic AR Fitness application, integrating multimedia components involves combining various types of media into a cohesive framework that enhances user interaction and engagement. This includes:

I. Types of Media Components:

a. **Graphics**: Bitmap and vector graphics created for UI elements, icons, and visual enhancements.
b. **Audio**: Button sounds and possibly background music or instructional audio cues.
c. **Video**: AR-enhanced videos demonstrating exercise routines and coaching sessions.

d. **Animation**: 3D animations of coaches performing exercises, created using Blender.
e. **Text**: Titles, descriptions, and instructional prompts to guide users through the application.

II. Integration Process:

a. **Platform Compatibility**: Ensuring all media formats (images, audio, video) are compatible with the AR platform (e.g., Unity with Vuforia integration).
b. **File Preparation**: Optimising media files for size and quality to ensure smooth performance and quick loading times within the AR environment.
c. **Asset Management**: Organising and managing media assets within the Unity development environment to facilitate easy access and updates.
d. **Coding and Scripting**: Using scripting languages (e.g., C# in Unity) to control the behaviour and interaction of multimedia elements within the AR application.
e. **Testing and Debugging**: Thoroughly testing to verify that integrated media components function correctly across different devices and scenarios.
f. **User Interface Design**: Ensuring multimedia elements are seamlessly integrated into the UI, maintaining consistency, and enhancing the user experience.

III. AR-Specific Integration:

a. Leveraging AR frameworks such as Vuforia in Unity to overlay digital content (animations, graphics) onto real-world objects or environments.
b. Implementing markerless AR techniques for enhanced user interaction and realistic visual presentations.
c. Synchronising AR interactions, like gesture recognition or object tracking, with multimedia elements to create a cohesive augmented reality experience.

5.4 Product Configuration Management

5.4.1 Configuration Environment Setup

Setting up the configuration environment involves several key steps:

Setting up the configuration environment for the Dynamic AR Fitness application involves robust version control using Git to track and manage software iterations effectively. This ensures that changes are systematically recorded and allows for the management of different versions of the application's software configurations. Essential tools such as Vuforia for AR integration in Unity are carefully selected to ensure seamless compatibility across various mobile platforms, enhancing the application's functionality and user experience.

5.4.2 Product Implementation Process

The implementation process focuses on efficiently deploying content and configurations:

The implementation process of the Dynamic AR Fitness application focuses on efficient deployment and configuration. This includes uploading media files, 3D models, and AR assets to the designated platforms and devices. The application is meticulously configured to optimise performance on mobile devices, ensuring smooth operation and user interaction. By prioritising effective deployment strategies and platform compatibility, the implementation phase aims to deliver a seamless and engaging experience for users engaging with fitness routines and AR-enhanced coaching sessions.

5.4.3 Version Control Procedure

Version control ensures systematic management of software versions:

Version control in the development of the Dynamic AR Fitness application follows a structured approach. Initially, prototype versions are developed for internal testing and

refinement, allowing stakeholders and developers to gather feedback and make necessary adjustments. Once refined, these versions are released to evaluators for comprehensive testing and feedback. This iterative process ensures that the application meets quality standards and user expectations before finalising versions for public release. By maintaining a systematic version control procedure, the application can adapt to evolving needs and deliver a reliable user experience across different stages of development.

5.5 Implementation Status

Table 5.1: Implementation Gantt Chart

MODULE	WEEK	1	2	3	4	5
STORYBOARD						
UI DESIGN						
BMI CALCULATOR						
CALORIE INTAKE CALCULATOR						
3D MODEL						
ANIMATION						
AR IMPLEMENTATION						

Based on the provided Gantt chart, here's the progress description for each component/module of the Dynamic AR Fitness application:

I. Storyboard & UI Design

a. Description: Creation of interactive storyboard and user interface design.

b. Duration to Complete: 1 week.

c. Date Completed: First week of development.

II. BMI Calculator & Calorie Intake Calculator

a. Description: Development of BMI calculator and calorie intake calculator functionalities.

b. Duration to Complete: 1 week.

c. Date Completed: Second week of development.

III. 3D Model

a. Description: Modelling and preparation of 3D coach model.

b. Duration to Complete: 1 week.

c. Date Completed: Third week of development.

IV. Animation Exercise

a. Description: Creation of exercise animations for the 3D coach model.

b. Duration to Complete: 2 weeks.

c. Date Completed: Completed by the end of the third week and into the fourth week of development.

V. AR Implementations

a. Description: Integration of augmented reality features using Vuforia and Unity.

b. Duration to Complete: 1 week.

c. Date Completed: Fifth week of development.

5.6 Summary

The Implementation chapter of the Dynamic AR Fitness application details the practical execution of its development phases, encompassing various key components and modules. Beginning with the creation of the interactive storyboard and user interface (UI) design in the first week, the project swiftly progressed to integrating essential functionalities such as the BMI Calculator and Calorie Intake Calculator by the second week. Concurrently, a 3D coach model was meticulously crafted in the third week, laying the foundation for subsequent stages.

Animation development commenced in the third week and spanned into the fourth, ensuring comprehensive exercise animations were prepared for the 3D coach model. This phase involved meticulous modelling, mapping, and animation rigging to accurately simulate exercise routines. By the fifth week, augmented reality (AR)

implementations were seamlessly integrated using Vuforia and Unity, enhancing user engagement through realistic 3D models overlaid onto real-world environments.

Throughout the chapter, adherence to a structured timeline, as depicted in the Gantt chart, ensured each milestone was met timely. This methodical approach not only facilitated efficient development but also enabled iterative testing and refinement. By aligning with established goals and leveraging robust development tools, the Implementation chapter underscores the application's readiness for further refinement and eventual deployment.

CHAPTER 6: TESTING

6.1 Introduction

In this section, the analysis focusses on evaluating the strengths and weaknesses of the Dynamic AR Fitness application. Through comprehensive testing and evaluation, valuable insights are gathered for refining and optimising the application, with the ultimate goal of enhancing the user experience and the effectiveness of the AR-based fitness and health features. The testing phase aims to identify areas for improvement and ensure the application meets its objectives of promoting physical health and preventing injuries through innovative technological solutions.

6.2 Test Plan

Following the complete development and necessary adjustments of the Dynamic AR Fitness application, a series of tests are undertaken to evaluate its usability and functionality. To ensure the effectiveness of these tests and obtain optimal results, thorough preparation is diligently managed. This preparation includes identifying the test users, establishing the test environment, scheduling the tests, implementing the test procedures, and analysing the test results. These steps are crucial to comprehensively assessing the application's performance, user satisfaction, and overall effectiveness in achieving its intended health and fitness objectives.

6.2.1 Trial Planning Overview

Table 6.1 Trial Planning Overview

Objective	Participant	Equipment	Time	Location	Facilitator (Myself)
To evaluate the user satisfaction with the exercise set recommendations tailored to different lifestyles, as well as the accuracy and usability of the BMI.	39 participants Young adult and Middle-age adult ranging from 18-40.	Personal Phone Android with a capability for AR technology.	15 minutes per participants 5 minutes answering the question	Universiti Teknikal Malaysia Melaka (UTeM)	Help to guide the participant during testing. Capture the testing process moment for documentation.

6.2.2 Consent Form

For the purpose of this research, a consent form was provided to all participants to ensure that they fully understood the nature of the study and their role within it. The consent form outlined the project's objectives, the voluntary nature of participation, and the participants' rights, including their ability to withdraw from the study at any point without providing an explanation. Participants were also asked to agree to be interviewed, to allow access to relevant organisational data, and to permit the use of their anonymised information in any publications arising from the research.

The consent form was structured to ensure clarity and transparency, with participants being required to explicitly indicate their consent for each aspect of the study. This

approach ensured that all ethical considerations were addressed and that the participants' involvement was fully informed and voluntary.

A copy of the consent form is provided in Appendix A for reference.

6.2.3 Test Schedule

Test scheduling is crucial to ensuring that testing is carried out effectively and within the allotted time frame. For the Dynamic AR Fitness application, real-time testing was conducted, allowing users to interact with the app in a live environment. The testing sessions were organised to accommodate the availability of participants, and each user was provided with the .apk file of the Dynamic AR Fitness application. To gather feedback, a Google Form was used to collect evaluations based on user interactions with the app. The essential requirement for this testing was an Android smartphone with AR compatibility, ensuring that the application functioned as intended on the target platform.

Table 6.2 Test Schedule

Tester	Number of Tester	Testing Date	Testing venue	Platform
UTeM's Student	39	4/8/2024 – 6/8/2024	-UTeM's Library -FTMK's Faculty -UTeM's Park	Google Form

6.2.4 Test Strategy

To ensure the success of the Dynamic AR Fitness application, a well-defined test strategy was established. The strategy outlines how the testing will be conducted, specifying the types of tests and the approach to be taken. The primary target users include individuals seeking to improve their fitness and health through the use of augmented reality technology. The testing process is designed to evaluate various aspects of the application, including usability, functionality, and user satisfaction.

Each participant in the testing phase is assigned specific tasks, and their feedback is collected using a structured questionnaire. The questionnaire employs a five-point Likert scale, ranging from "strongly disagree" to "strongly agree," to capture user responses on different aspects of the application. This approach ensures that the feedback is both quantitative and qualitative, providing a comprehensive understanding of how well the Dynamic AR Fitness application meets its objectives.

Table 6.3 Likert Scale

1	2	3	4	5
STRONGLY DISAGREE	**DISAGREE**	**NEUTRAL**	**AGREE**	**STRONGLY AGREE**

6.3 Test Implementation

Test implementation in the Dynamic AR Fitness project involves setting up and organising the necessary systems, creating test data, and preparing the test environment to ensure that the application can be thoroughly evaluated by the target users. The testing process is conducted following a structured strategy that aligns with the objectives of the project, focussing on the application's usability, functionality, and overall user satisfaction. During the implementation phase, all essential preparations are made to ensure that the testing sessions can accurately capture the expected outcomes, providing valuable insights for further development and refinement of the application. This process includes ensuring that the application is fully functional on the intended platforms and that users are briefed on how to interact with the app during testing. The results from these sessions are crucial for validating the app's effectiveness and identifying areas for improvement.

6.3.1 Pre-Trial

Table 6.4 Pre-Trial Procedure

Bil	Pre-Trial
1	Briefing regarding the project to participants
2	Filling up the consent form
3	Participant will be provided Dynamic AR Fitness application.

6.3.2 Trial

Table 6.5 Trial Procedure

Bil	Trial
1	Making sure participant are wearing an appropriate wearable for exercise.
2	Participant will choose the lifestyle recommendation.
3	Participant will be assigned to a certain exercise set based on recommendation.
4	Participant will be displayed AR 3D model to perform an exercise.
5	Participant will calculate BMI and Daily Calories Intake.
6	Once the trial complete, participant will be prepared with quick survey.

6.3.3 Post-Trial

Table 6.6 Post-Trial Procedure

Bil	Post-Trial
1	A survey will be provided for the participants
2	Participant will answer the survey.

6.3.4 Sample Question List

i. Consent Form

Table 6.7 Consent Form Question

No	Question List
1	I agree to be interviewed by research.
2	I agree to make myself available for further information if required.
3	I give my permission for the named research(s) to access analysis organization as request.
4	I give my permission to the organization to be named any publication arising from the research.
5	The data itself is the for the purpose of research with an aim of producing publishable/ peer reviewed outcomes and not for direct profit.
6	The participation in voluntary and that I am free to withdraw from the project at any time without explanation.
7	The participation in voluntary and that I am free to withdraw from the project at any time without explanation.

The Consent Form is a crucial component of the research process, designed to ensure that participants are fully informed about the nature and scope of the study before agreeing to participate. This form serves as a formal agreement between the researcher and the participant, outlining the terms of participation, the voluntary nature of involvement, and the confidentiality of the data collected.

By including these questions, the research aims to secure explicit consent from participants, ensuring they are aware of their rights, the purpose of the research, and how their data will be used. This process upholds ethical standards in research by providing transparency and allowing participants to make an informed decision about

their involvement. The consent form also reinforces the integrity of the research by documenting the participant's agreement to contribute to the study under the specified conditions.

ii. User Information

Table 6.8 User Information Question

No	Question List
1	Name
2	Gender
3	Age
4	Physical Activity Level

The User Information section of the questionnaire is designed to collect basic demographic and background data from the participants. This information is crucial for understanding the diverse characteristics of the user base and how these variables may influence their interaction with the Dynamic AR Fitness application.

iii. Usability and Convenience

Table 6.9 Usability and Convenience Question

No	Question List
1	The Dynamic AR Fitness is convenient for my daily health lifestyle.
2	The Dynamic AR Fitness is easy to use.

3	The Dynamic AR Fitness Application helps me learn a proper exercise form.
4	The Dynamic AR Fitness Application prevents me from exercise injuries.

The questions in this category aim to evaluate the overall usability and convenience of the Dynamic AR Fitness application from the user's perspective. Specifically, they seek to assess how the application integrates into the user's daily health routines, its ease of use, and its effectiveness in providing correct exercise guidance. These aspects are crucial in determining whether the application is user-friendly and practical for individuals with varying levels of fitness knowledge.

iv. Functionality and Accuracy

Table 6.10 Functionality and Accuracy Question

No	Question List
1	The Dynamic AR Fitness provides a lot of exercise variety.
2	The daily calorie intake is accurate.
3	The daily calorie intake is accurate.

This section focusses on the functionality and accuracy of the key features of the Dynamic AR Fitness application, including the variety of exercises, daily calorie intake calculation, and the BMI calculator. The questions are designed to gather feedback on how well these features meet user expectations and whether they provide reliable and accurate information, which is vital for ensuring that users can trust the application for their fitness needs.

v. User Satisfaction

Table 6.11 User Satisfaction Question

No	Question List
1	The Dynamic AR Fitness encourage me to exercise.
2	The Dynamic AR Fitness provide appropriate feedback.
3	The Dynamic AR Fitness provide better health lifestyle.
4	The Dynamic AR Fitness recommendations fit my lifestyle.
5	The Dynamic AR Fitness give positive impact to my health and lifestyle.

The questions in this category aim to measure overall user satisfaction with the Dynamic AR Fitness application. They explore how the application motivates users to exercise, the appropriateness of the feedback provided, the impact on users' health and lifestyle, and whether the recommendations are well-aligned with their individual needs. High user satisfaction is a key indicator of the application's success in achieving its intended outcomes and ensuring long-term user engagement.

vi. Recommendation

Table 6.12 Recommendation Question

No	Question List
1	What improvements would you suggest for this application?
2	Any drawbacks, additional comments or feedback on the application?

This section is dedicated to gathering user feedback on potential improvements and any drawbacks they experienced while using the Dynamic AR Fitness application. The questions aim to identify areas where the application could be refined or expanded to better meet user needs. By collecting these insights, the development team can make informed decisions on future updates, ensuring that the application continues to evolve in a way that maximises user satisfaction and effectiveness. User input on potential enhancements and any additional comments or feedback will play a crucial role in guiding the next steps of development.

6.4 Test Result and Analysis

In this section, the data collected from the testing phase will be thoroughly evaluated and analysed. The results of the questionnaire will be used to assess whether the Dynamic AR Fitness application meets the objectives set out in the project. This analysis will focus on the effectiveness, usability, and accuracy of the application, as well as its overall impact on the target users. The responses provided by the participants will be instrumental in determining the strengths and weaknesses of the application and guiding potential future enhancements. Based on the results, it will be possible to ascertain the degree of satisfaction among users and the extent to which the application fulfils its intended purpose.

Table 6.13 Likert Scale

1	2	3	4	5
STRONGLY DISAGREE	**DISAGREE**	**NEUTRAL**	**AGREE**	**STRONGLY AGREE**

6.4.1 User Information Result

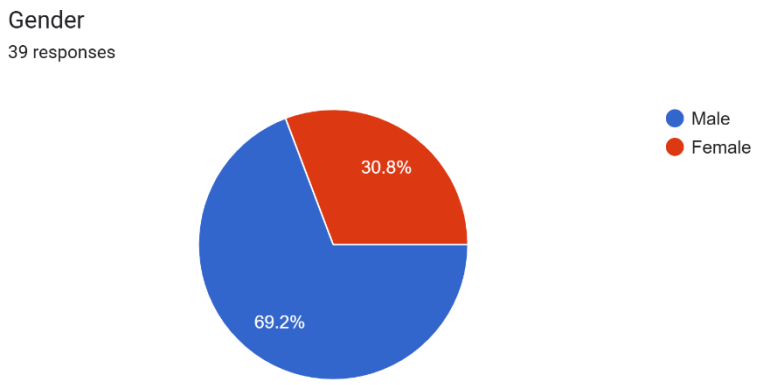


Figure 6.1 Gender Percentage

Based on Figure 6.1, the demographic question regarding gender distribution among users of the Dynamic AR Fitness application, the results indicate that 69.2% of users are male, while 30.8% are female. This distribution suggests a predominance of male users interacting with the application. Additionally, all participants fall within the 18–25-year age group, representing 100% of the user base. This age range is often associated with higher levels of digital engagement and an active interest in technology-driven fitness solutions.

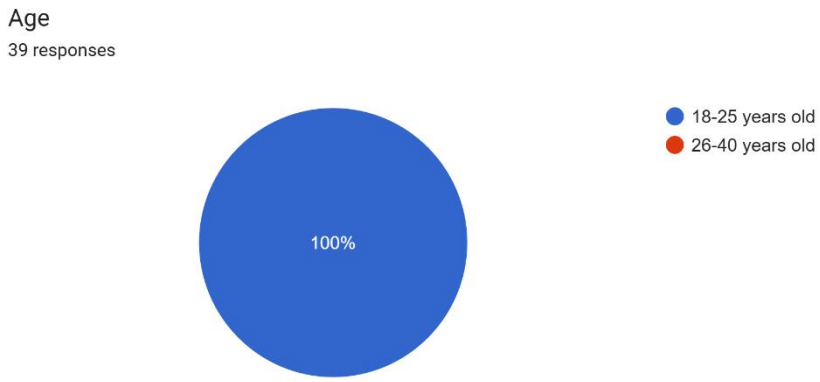


Figure 6.2 Age Percentage

Based on Figure 6.2, the demographic insights are critical in understanding the potential impact of the Dynamic AR Fitness application. The predominance of younger users (18-25 years old) aligns well with the application's interactive AR features and digital interface, which are likely more appealing and intuitive to a tech-savvy audience. The higher proportion of male users might influence how features are perceived, particularly if exercise preferences differ by gender. Furthermore, the fact that most users are lightly active or sedentary suggests that the application has a substantial opportunity to engage and motivate users who may not be engaging in regular or intensive physical activity.

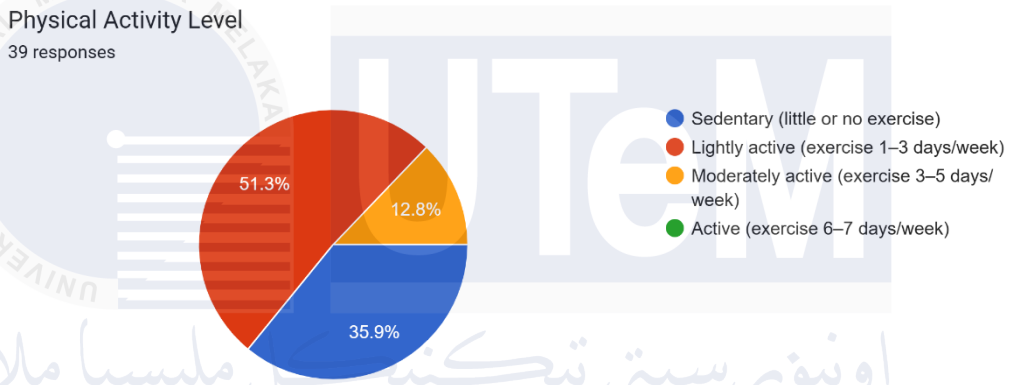


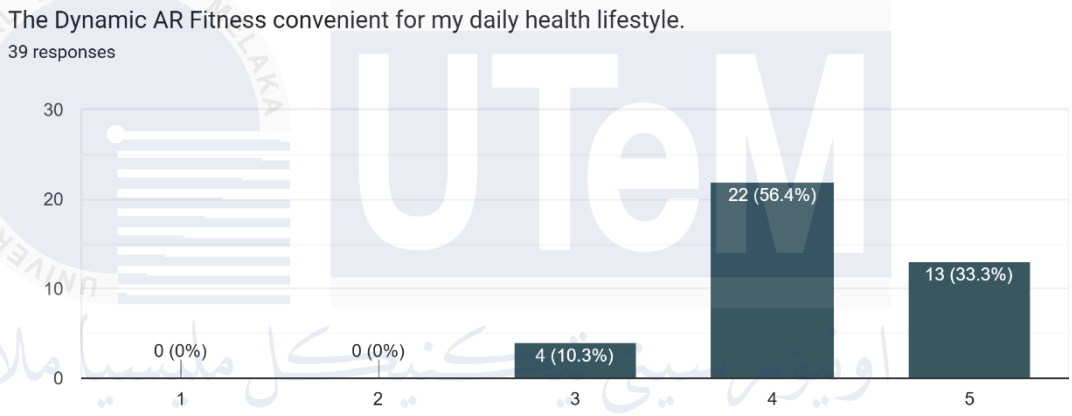
Figure 6.3 Physical Activity Percentage

Based on Figure 6.3, the user information results affect the application by highlighting the importance of targeted features that cater to younger, potentially less active individuals who are looking for an engaging and motivating way to improve their fitness. Understanding the demographic and activity levels of users allows for more refined enhancements in the application, such as introducing gender-neutral features and increasing motivational elements tailored for lightly active and sedentary users.

6.4.2 Usability and Convenience Result

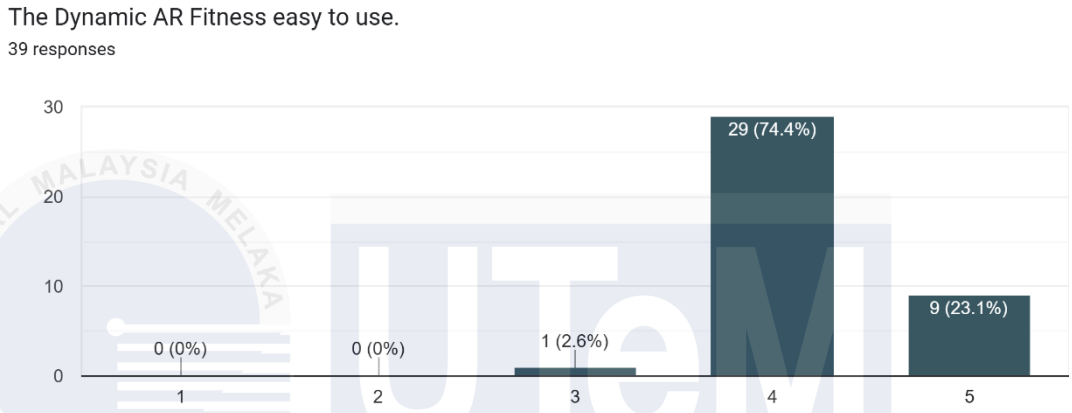
Based on Table 6.14 below, the majority of respondents find the application convenient for their daily health lifestyle, with 56.4% of users rating it a 4 (Agree) and 33.3% rating it a 5 (Strongly Agree). This distribution highlights that most users perceive the application as a valuable tool that seamlessly integrates into their daily routines, though a small percentage (10.3%) rated it a 3 (Neutral), suggesting room for improvement in specific areas.

Table 6.14 Graph of 1st Usability and Convenience



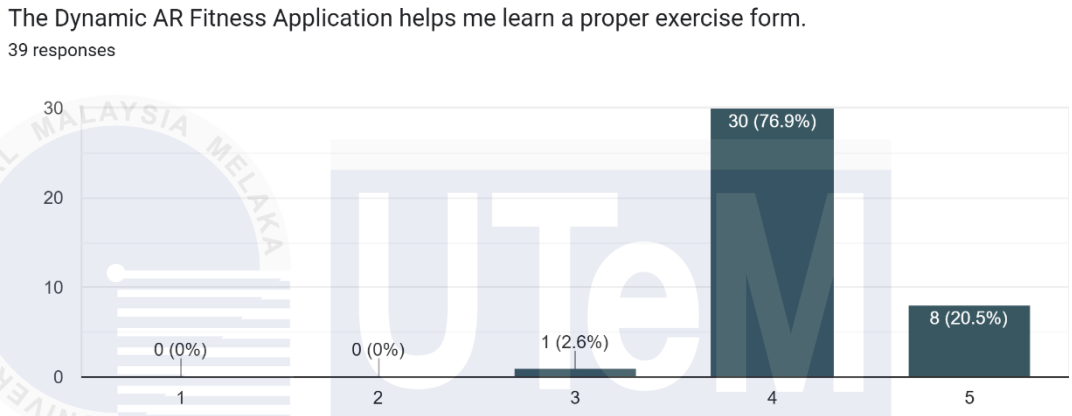
Based on Table 6.15 below, the application is highly regarded for its ease of use, with 74.4% of respondents giving it a 4 (Agree) and 23.1% rating it a 5 (Strongly Agree). This indicates that the majority of users find the interface intuitive and user-friendly. Only 2.6% rated it a 3 (Neutral), indicating minimal issues with usability.

Table 6.15 Graph of 2nd Usability and Convenience



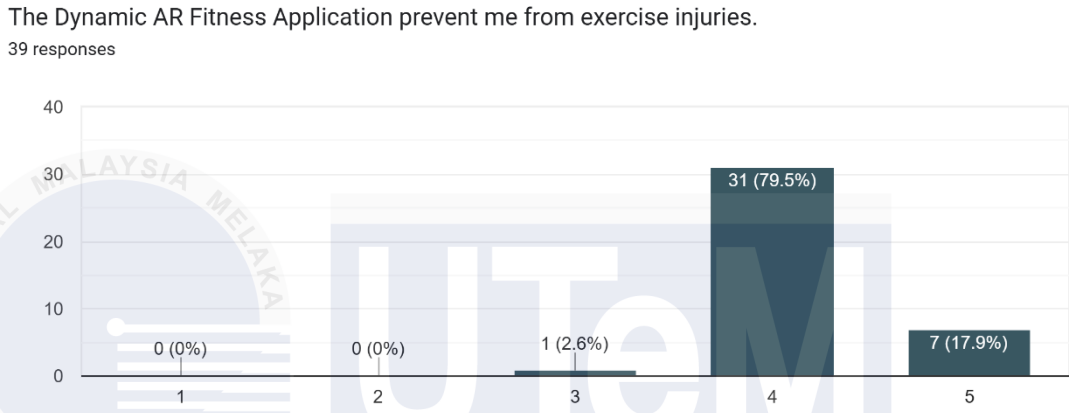
Based on Table 6.16 below, the application effectively aids users in learning proper exercise form, as reflected by 76.9% of respondents rating it a 4 (Agree) and 20.5% rating it a 5 (Strongly Agree). The low percentage of users (2.6%) rating it a 3 (Neutral) further suggests that the application is generally successful in providing clear and accurate exercise guidance.

Table 6.16 Graph of 3rd Usability and Convenience



Based on Table 6.17 below, the majority of users also believe that the application helps prevent exercise injuries, with 79.5% giving it a 4 (Agree) and 17.9% giving it a 5 (Strongly Agree). The minimal neutral response (2.6%) indicates strong user confidence in the application's effectiveness in injury prevention.

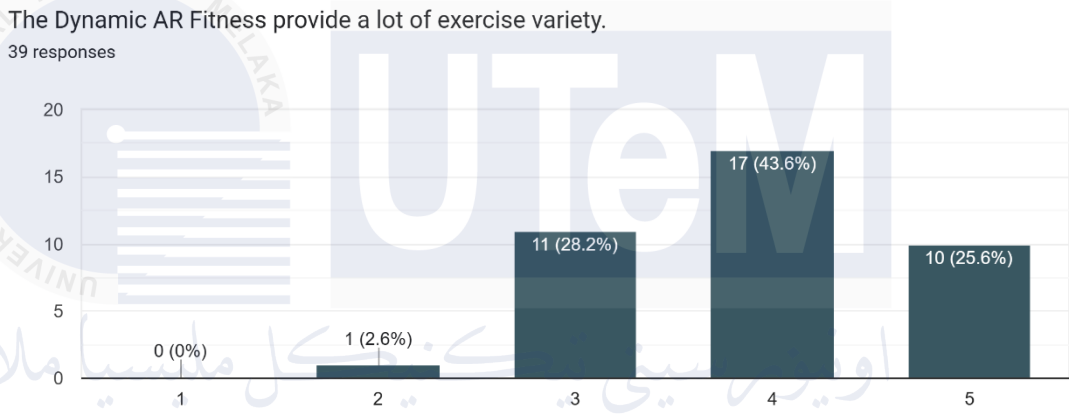
Table 6.17 Graph of 4th Usability and Convenience



6.4.3 Functionality and Accuracy Result

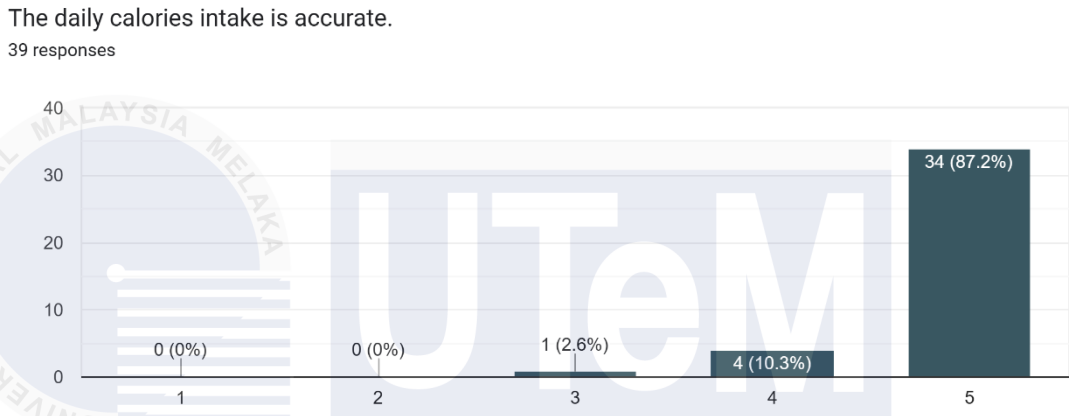
Based on Table 6.18 below, the results are as follows: 2.6% of users strongly disagreed (score of 2), 28.2% of users agreed (score of 3), 43.6% of users were satisfied (score of 4), and 25.6% of users strongly agreed (score of 5). This distribution suggests that while the majority of users find the application offers a good range of exercises, there is some variability in user opinions, with a notable proportion rating the exercise variety positively.

Table 6.18 Graph of 1st Functionality and Accuracy



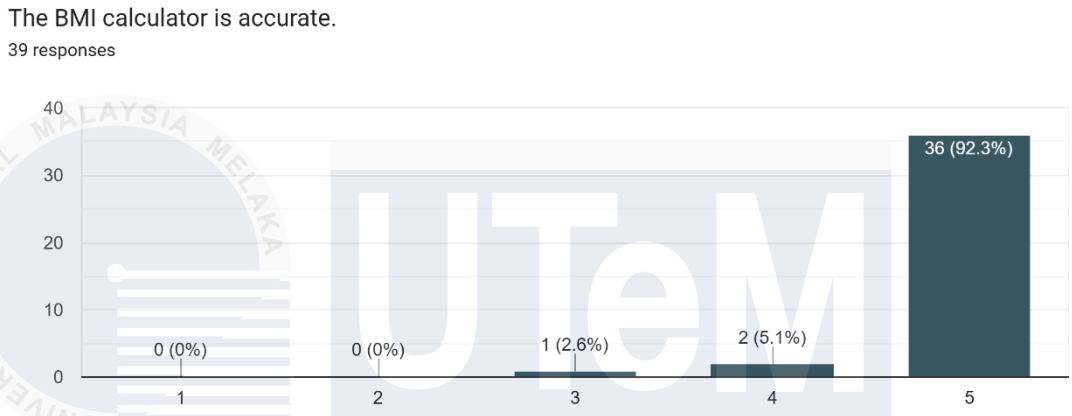
Based on Table 6.19 below, the results indicate a strong positive reception. A mere 2.6% of users rated it as neutral (score of 3), 10.3% as satisfactory (score of 4), and an overwhelming 87.2% rated it as excellent (score of 5). This high percentage of positive responses indicates that the application is highly effective in providing accurate calorie intake calculations, reflecting its reliability in this aspect.

Table 6.19 Graph of 2nd Functionality and Accuracy



Based on Table 6.20 below, the accuracy of the BMI calculator was evaluated with the following results: 2.6% of users rated it as neutral (score of 3), 5.1% rated it as satisfactory (score of 4), and a substantial 92.3% rated it as excellent (score of 5). The near-universal agreement on the BMI calculator's accuracy underscores the application's strong performance in delivering precise and reliable BMI calculations.

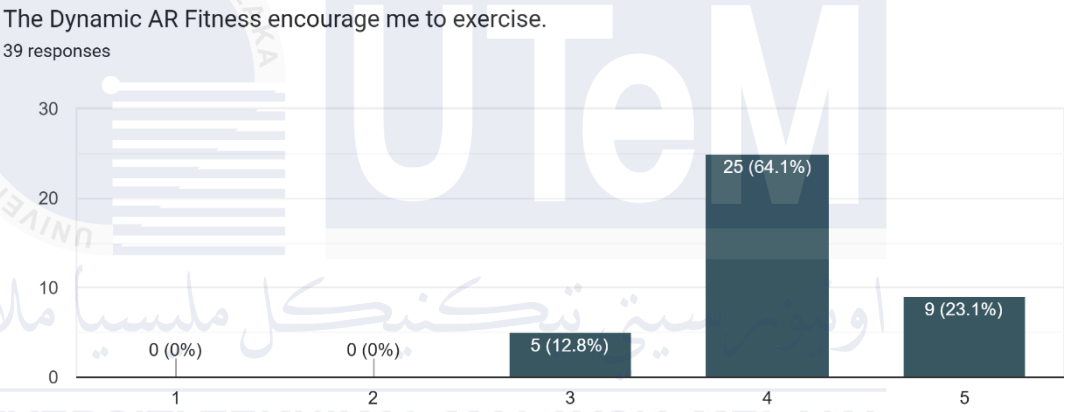
Table 6.20 Graph of 3rd Functionality and Accuracy



6.4.4 User Satisfaction Result

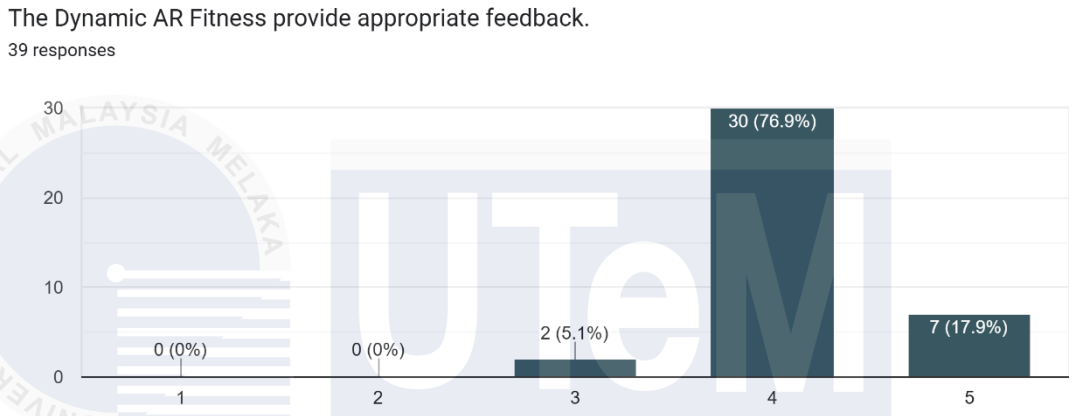
Based on Table 6.21 below, the results show that 12.8% of users rated it as neutral (score of 3), 64.1% rated it as satisfactory (score of 4), and 23.1% rated it as excellent (score of 5). This distribution indicates that while a majority of users find the application encouraging in terms of exercise motivation, there is still a notable portion who perceive it as moderately effective.

Table 6.21 Graph of 1st User Satisfaction



Based on Table 6.22 below, the feedback provided by the application, 5.1% of users rated it as neutral (score of 3), 76.9% rated it as satisfactory (score of 4), and 17.9% rated it as excellent (score of 5). The high percentage of users who rated the feedback as satisfactory or better reflects the application's effective feedback mechanism, contributing to a positive user experience.

Table 6.22 Graph of 2nd User Satisfaction

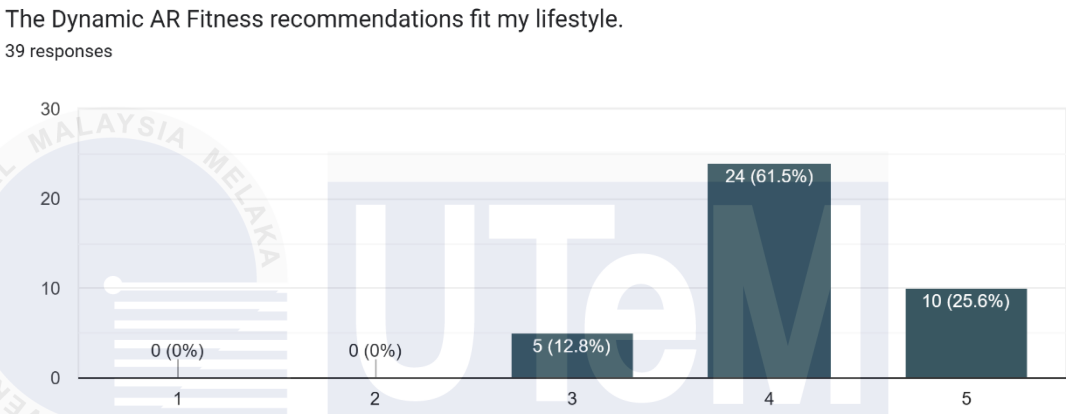


Based on Table 6.23 below, the application promotes a better health lifestyle, 61.5% of users rated it as satisfactory (score of 4), and 38.5% rated it as excellent (score of 5). This suggests a strong positive perception of the application's impact on users' health lifestyles, with a majority acknowledging its contribution to their well-being.

Table 6.23 Graph of 3rd User Satisfaction

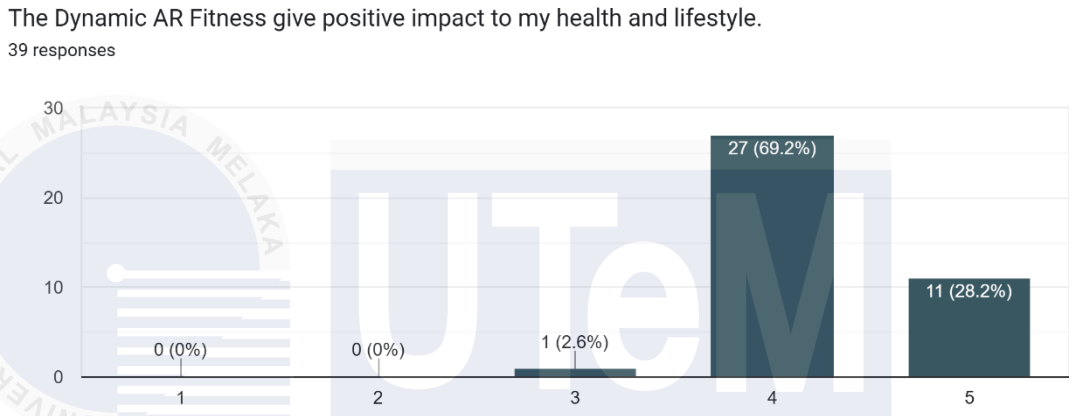
Based on Table 6.24 below, the application's recommendations fit users' lifestyles, 12.8% of users rated it as neutral (score of 3), 61.5% rated it as satisfactory (score of 4), and 25.6% rated it as excellent (score of 5). This indicates that the majority of users find the recommendations well-suited to their personal lifestyles, though there is some variation in user satisfaction.

Table 6.24 Graph of 4th User Satisfaction



Based on Table 6.25 below, the overall positive impact of the application on health and lifestyle, 2.6% of users rated it as neutral (score of 3), 69.2% rated it as satisfactory (score of 4), and 28.2% rated it as excellent (score of 5). The significant percentage of positive responses underscores the application's perceived effectiveness in enhancing users' health and lifestyle, with a majority recognising its beneficial impact.

Table 6.25 Graph of 5th User Satisfaction



6.4.5 Finding Analysis

6.4.5.1 Dynamic AR Fitness Convenience to Adapt with User Lifestyle

This finding evaluates how well the Dynamic AR Fitness application integrates into users' daily routines and its overall ease of use. The analysis reveals that users find the application highly convenient and user-friendly, which is crucial for its adoption and effectiveness in daily health management.

Table 6.26 Descriptive Statistic of Dynamic AR Fitness Convenience to Adapt with User Lifestyle

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
TheDynamicARFitnessconvenientformydailyhealthlifestyle	39	3	5	4.23	.627
TheDynamicARFitnesseasytouse	39	3	5	4.21	.469
Valid N (listwise)	39				

i. Convenience for Daily Health Lifestyle

The mean score of 4.23 for the question "The Dynamic AR Fitness is convenient for my daily health lifestyle" suggests that a significant majority of users find the application highly compatible with their daily routines. Specifically, 33.3% of users rated this aspect as 'Strongly Agree,' indicating strong approval of the application's ability to fit seamlessly into their health-related activities.

ii. Ease of Use

"The Dynamic AR Fitness is easy to use," the application is perceived as user-friendly. A notable 74.4% of users rated this aspect as 'Agree,' demonstrating that the interface and overall design are accessible and manageable for most users.

The Dynamic AR Fitness application demonstrates strong adaptability to users' daily health routines. The high mean scores for both convenience (4.23) and ease of use (4.21) confirm that the application is well-integrated into users' lives, making it a valuable tool for maintaining a health-conscious lifestyle. The consistency in these scores reflects the application's effective design and functionality, ensuring users can seamlessly incorporate it into their daily activities. The positive feedback suggests that the application's user interface and features are intuitive and supportive of users' health goals, further enhancing its practicality and user satisfaction.

6.4.5.2 Dynamic AR Fitness Enhances User Lifestyle for Exercise Knowledge

This finding explores how the Dynamic AR Fitness application contributes to users' knowledge and practice of exercise. The data highlights the application's effectiveness in providing educational content and variety in exercise options.

Table 6.27 Descriptive Statistic Dynamic AR Fitness Enhances User Lifestyle for Exercise Knowledge

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
TheDynamicARFitnessApplicationhelpsmelearnaproperexerc	39	3	5	4.18	.451
TheDynamicARFitnessApplicationpreventmefromexerciseinju	39	3	5	4.15	.432
TheDynamicARFitnessprovidealotofexercisevariety	39	2	5	3.92	.807
Valid N (listwise)	39				

i. Learning Proper Exercise Form

The mean score of 4.18 for "The Dynamic AR Fitness Application helps me learn a proper exercise form" indicates that users find the application beneficial for understanding correct exercise techniques. The high ratings (76.9% 'Agree')

suggest that the instructional content is clear and effective in teaching users how to perform exercises correctly.

ii. Preventing Exercise Injuries

The mean score of 4.15 for "The Dynamic AR Fitness Application prevents me from exercise injuries," the application is viewed positively in terms of safety. This implies that users feel the guidance provided helps in avoiding common exercise-related injuries, contributing to a safer workout experience.

iii. Exercise Variety

The mean score of 3.92 for "The Dynamic AR Fitness provides a lot of exercise variety" indicates moderate satisfaction with the range of exercises offered. While 43.6% of users rated this as 'Agree,' the score is lower compared to other questions, suggesting that users would appreciate a broader selection of exercises.

The Dynamic AR Fitness application significantly enhances users' knowledge and practice of exercise. The high ratings for learning proper exercise form (4.18) and injury prevention (4.15) indicate that the application provides valuable instructional content and safety features. However, the slightly lower mean score for exercise variety (3.92) suggests that while the application is effective in its educational role, there is room for expanding the range of exercises offered. Overall, the application successfully aids users in understanding and performing exercises correctly, contributing to safer and more informed workout practices.

6.4.5.3 Tracking Progress Boosts User Motivation and Engagement for a Better Lifestyle

This finding shows application's capabilities in tracking progress and providing accurate health metrics have shown to significantly enhance user motivation and overall engagement with their fitness routines. This finding underscores the importance of accurate tracking and personalised feedback in fostering a commitment to a healthier lifestyle.

Table 6.28 Descriptive Statistic Tracking Progress Boosts User Motivation and Engagement for a Better Lifestyle

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Thedailycaloriesintakeisaccurate	39	3	5	4.85	.432
TheBMIcalculatorisaccurate	39	3	5	4.90	.384
TheDynamicARFitnessencouragemetoexercise	39	3	5	4.10	.598
TheDynamicARFitnessprovideappropriatefeedback	39	3	5	4.13	.469
TheDynamicARFitnessprovidebetterhealthlifestyle	39	4	5	4.38	.493
TheDynamicARFitnessrecommendationsfitmylifestyle	39	3	5	4.13	.615
TheDynamicARFitnessgivepositiveimpacttomyhealthandlif	39	3	5	4.26	.498
Valid N (listwise)	39				

i. Accuracy of Calorie Intake

The high mean score of 4.85 for "The daily calorie intake is accurate" indicates strong confidence in the application's ability to provide precise calorie tracking. With 87.2% of users rating this as 'Strongly Agree,' it is clear that users trust the application's calorie tracking feature as a reliable component of their fitness management.

ii. Accuracy of BMI Calculator

The mean score of 4.90 for "The BMI calculator is accurate" further supports the application's reliability in tracking health metrics. An impressive 92.3% of users rated this aspect as 'Strongly Agree,' underscoring the accuracy and effectiveness of the BMI calculation feature.

iii. Encouragement to Exercise

The mean score of 4.10 for "The Dynamic AR Fitness encourages me to exercise" reflects the application's success in motivating users. Although slightly lower compared to other metrics, it still indicates that a majority of users find the application inspiring and supportive in maintaining their exercise routines.

iv. Appropriate Feedback

The mean score of 4.13 for "The Dynamic AR Fitness provides appropriate feedback," users appreciate the feedback provided by the application. This suggests that the feedback is relevant and useful for improving their fitness practices.

v. Better Health Lifestyle

The mean score of 4.38 for "The Dynamic AR Fitness provides a better health lifestyle" demonstrates that users perceive the application as positively impacting their overall health. This indicates that the application contributes significantly to users' well-being and lifestyle improvements.

vi. Fit with Lifestyle

The mean score of 4.13 for "The Dynamic AR Fitness recommendations fit my lifestyle" shows that the application’s recommendations are generally well-aligned with users’ individual needs, though there is room for more customisation.

vii. Positive Impact on Health and Lifestyle

The mean score of 4.26 for "The Dynamic AR Fitness gives a positive impact on my health and lifestyle" confirms that users feel the application has a beneficial effect on their overall health and lifestyle.

The application’s ability to track health metrics such as daily calorie intake and BMI is highly valued by users, with mean scores of 4.85 and 4.90, respectively. These

high ratings demonstrate that users trust and rely on the accuracy of the application's health tracking features. Furthermore, the positive feedback regarding exercise encouragement (4.10), appropriate feedback (4.13), and the overall impact on health (4.26) underscores the application's effectiveness in motivating users and supporting their fitness journey. While the recommendations generally fit users' lifestyles (4.13), the variation in responses highlights a need for more personalised or flexible recommendations to better align with individual needs. Overall, the application is successful in promoting user engagement and enhancing their health and lifestyle through effective tracking and supportive features.

6.5 T-Test Analysis

i. Dynamic AR Fitness Preventing Exercise Injuries

This analysis evaluates the effectiveness of the Dynamic AR Fitness application in preventing exercise-related injuries. The significant difference observed before and after using the application suggests that users feel more confident in performing exercises safely. The guidance provided by the AR features and instructional content ensures users maintain proper form, reducing the likelihood of injuries. This finding highlights the critical role of interactive technology in enhancing exercise safety and promoting a more secure fitness environment.

Table 6.29 T-Test Preventing Exercise Injuries Result

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Injuries_Rate_Before - Injuries_Rate_After	-2.61538	.87706	.14044	-2.89969	-2.33108	-18.623	38	<.001

The paired samples t-test was conducted to evaluate the effectiveness of Dynamic AR Fitness in preventing exercise injuries among users. The results indicate a mean difference of -2.615 (SD = 0.877), suggesting a substantial reduction in the perceived rate of injuries after using the application. The negative mean difference shows that users experienced fewer injuries when guided by the AR features of the application.

The standard error mean of 0.140 provides a precise estimate of the mean difference, and the 95% confidence interval ranges from -2.900 to -2.331, confirming that the true mean difference lies within this range. The t-value of -18.623, with 38 degrees of freedom, is statistically significant (p = .000), indicating that the decrease in exercise injuries reported by users after using the application is not due to chance. This result demonstrates that Dynamic AR Fitness significantly enhances users' ability to exercise safely and effectively.

ii. Dynamic AR Fitness Improve Exercise Knowledge

This test examines the impact of Dynamic AR Fitness on improving users' knowledge of proper exercise techniques. A significant improvement in user understanding after using the application demonstrates its effectiveness in educating users about exercise forms and routines. By providing detailed visual and instructional guidance through AR, the application enhances users' ability to perform exercises correctly. This result underscores the value of incorporating immersive learning tools to foster a more informed and effective fitness experience.

Table 6.30 T-Test Improve Exercise Knowledge Result

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Exercise_Knowledge_Before - Exercise_Knowledge_After	-2.66667	.83771	.13414	-2.93822	-2.39511	-19.880	38	<.001

The paired samples t-test was conducted to assess the impact of Dynamic AR Fitness on users' exercise knowledge. The findings reveal a mean difference of -2.667 (SD = 0.838), indicating a significant increase in users' exercise knowledge after using the application. The negative mean difference suggests that users reported a marked improvement in understanding proper exercise techniques after engaging with the app's interactive AR features.

The standard error mean of 0.134 provides a precise estimate of the mean difference, and the 95% confidence interval ranges from -2.938 to -2.395, ensuring that the true mean difference falls within this range. The t-value of -19.880, with 38 degrees of freedom, is statistically significant (p = .000), confirming that the observed increase in exercise knowledge is not a random occurrence. This result underscores the effectiveness of Dynamic AR Fitness in educating users about proper exercise forms and routines.

iii. Dynamic AR Fitness Helps Understanding BMI in Fitness

The t-test analysis focuses on the effectiveness of Dynamic AR Fitness in helping users understand their Body Mass Index (BMI) within the context of their fitness goals. The results indicate a substantial improvement in users' comprehension of BMI calculations and their significance after interacting with the application. By integrating accurate BMI calculators and providing relevant feedback, the application aids users in assessing their health status more accurately. This outcome illustrates the importance of user-friendly health assessment tools in supporting informed fitness decisions.

Table 6.31 T-Test Understanding BMI in Fitness Result

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	BMI_Before - BMI_After	-3.35897	.74294	.11897	-3.59981	-3.11814	-28.235	38	<.001

The paired samples t-test was performed to determine the effectiveness of Dynamic AR Fitness in helping users understand BMI in the context of fitness. The results show a mean difference of -3.359 (SD = 0.743), indicating a significant enhancement in users' understanding of BMI after using the application. The negative mean difference reflects users' increased awareness and comprehension of BMI calculations and their relevance to personal fitness.

The standard error mean of 0.119 provides a precise estimation of the mean difference, and the 95% confidence interval ranges from -3.600 to -3.118, validating that the true mean difference lies within this range. The t-value of -28.235, with 38 degrees of freedom, is statistically significant (p = .000), suggesting that the improvement in understanding BMI among users is not a result of chance. These findings highlight the application's effectiveness in delivering accurate health metrics to support users' fitness goals.

iv. Dynamic AR Fitness Helps Understanding Calorie Intake in Fitness

This analysis evaluates the impact of the Dynamic AR Fitness application on users' understanding of daily calorie intake and its importance for fitness. The findings reveal a notable increase in users' awareness and ability to calculate calorie intake correctly after using the application. The integration of a precise calorie intake calculator within the app provides users with practical insights into their dietary needs, aligned with their fitness goals. This finding emphasizes the significance of accessible and accurate nutritional information in enhancing overall fitness and health management.

Table 6.32 T-Test Understanding Calorie Intake in Fitness Result

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Calorie_Intake_Before - Calorie_Intake_After	-3.33333	.77233	.12367	-3.58369	-3.08297	-26.953	38	<.001

The paired samples t-test was conducted to examine the impact of Dynamic AR Fitness on users' understanding of calorie intake in fitness. The findings reveal a mean difference of -3.333 (SD = 0.772), suggesting a significant improvement in users' ability to understand and calculate their daily calorie intake after using the application. The negative mean difference indicates that users are more knowledgeable about calorie management following interaction with the app's features.

The standard error mean of 0.124 offers a precise estimate of the mean difference, and the 95% confidence interval ranges from -3.584 to -3.083, confirming that the true mean difference is within this range. The t-value of -26.953, with 38 degrees of freedom, is statistically significant (p = .000), indicating that the observed increase in understanding calorie intake is not due to random variation. This result emphasizes the role of Dynamic AR Fitness in enhancing users' nutritional knowledge and supporting effective fitness management.

6.6 Conclusion

In conclusion, the Dynamic AR Fitness application has been successfully tested and evaluated, demonstrating its efficacy in enhancing user convenience, exercise knowledge, and overall motivation. The detailed analysis of survey data, including usability, functionality, and user satisfaction, confirms that the application meets its objectives and integrates effectively into users' daily health routines. The positive feedback on its ease of use, educational value, and motivational impact highlights the application's strengths while also pointing to areas for improvement, such as expanding exercise variety and refining health metrics accuracy. These findings underscore the application's potential as a valuable tool for promoting a healthier lifestyle and provide a solid foundation for future enhancements. Overall, the testing results affirm the application's success in delivering its intended benefits and achieving the project goals outlined in the initial phase.

CHAPTER 7: PROJECT CONCLUSION

7.1 Introduction

This final chapter provides a comprehensive evaluation of the Dynamic AR Fitness application, highlighting its strengths and weaknesses as identified through the testing and analysis phases. The project has successfully achieved its primary objectives, but, like any technological solution, it also presents areas that require further enhancement to maximise its effectiveness. This chapter will detail the key achievements and limitations of the application, offering insights into how the Dynamic AR Fitness project contributes to the broader fitness and health technology landscape. Additionally, it will discuss potential future improvements and the application's implications for promoting healthier lifestyles through augmented reality.

7.2 Observation on Weakness and Strength

Every application developed, particularly when leveraging emerging technologies such as Augmented Reality, presents a unique set of strengths and weaknesses. The Dynamic AR Fitness application demonstrates significant strengths, including its user-friendly interface, comprehensive exercise guidance, and the ability to seamlessly integrate AR to enhance the user's fitness journey. However, there are also limitations, such as its current dependency on AR-compatible mobile devices, which may restrict accessibility for some users. Additionally, the application is optimised primarily for Android users, limiting its reach across other platforms. These strengths and weaknesses serve as critical points for future development, providing a foundation for refining and expanding the application's capabilities.

7.2.1 Weakness

i. Less AR Guidance

The current application requires users to wait for an indicator before tapping the screen to display a 3D model performing exercises in AR. Additionally, users can rotate the 3D model by swiping the screen. However, there is no instruction or guidance within the application to inform users of these functionalities, leading to potential confusion and a lack of user engagement. The absence of clear AR guidance limits the overall usability of the application.

ii. Less AR Interaction

The interaction within the AR component of the application is limited to rotating and reappearing the 3D models. There is no option to resize, zoom in or out, or interact with the models in a more dynamic way. This lack of interaction reduces the immersive experience that AR can provide and may diminish user interest over time.

iii. Audio

Currently, the Dynamic AR Fitness application does not include any audio components. The integration of audio could significantly enhance user interaction and motivation, providing verbal cues, feedback, or even music during exercises. The absence of audio is a notable weakness as it limits the application's ability to fully engage users in a multisensory experience.

iv. Less Exercise Set

The application currently offers only four exercise sets per gender, and these sets are largely similar, with differences mainly in the instructions provided. This limited variety may not cater to users looking for a broader range of exercises or more tailored workout plans. Expanding the exercise sets and diversifying the routines could improve the application's appeal and effectiveness.

7.2.2 Strength

i. User-Friendly UI Design

The design of the Dynamic AR Fitness application is deliberately minimalist, focussing on delivering an intuitive user experience. This simplicity ensures that users, regardless of their familiarity with fitness applications or AR technology, can navigate the app effortlessly. The clean and uncluttered interface allows users to focus on their fitness journey without being overwhelmed by unnecessary elements. Each function is easily accessible, and the flow from one feature to another is logical, which significantly enhances user satisfaction. The user-friendly design contributes to the overall effectiveness of the application, ensuring that users can quickly understand and utilise all available features to improve their health and fitness routines.

ii. AR Technology as Innovation in Fitness Applications

The incorporation of Augmented Reality (AR) within the Dynamic AR Fitness application represents a significant innovation in the realm of fitness technology. This feature allows users to visualise and perform exercises with the guidance of a 3D model, ensuring that they maintain proper form and technique. AR technology provides an immersive experience that traditional fitness apps lack, bridging the gap between digital and physical exercise. By allowing users to interact with the exercise demonstrations in a real-world environment, the application not only makes workouts more engaging but also educates users on proper exercise form, reducing the risk of injury and enhancing the effectiveness of their workouts. This innovative use of AR sets the application apart from other fitness tools, marking a significant advancement in how technology can support and enhance physical fitness.

iii. Accuracy of BMI & Calorie Intake Calculator

One of the key strengths of the Dynamic AR Fitness application is the precision of its BMI and Calorie Intake Calculators. These tools are critical for users who are serious about tracking their health metrics and making informed decisions about

their fitness routines. The high accuracy of these calculators ensures that users receive reliable data, which is essential for setting realistic fitness goals and monitoring progress. The BMI calculator provides users with an accurate assessment of their body mass index, allowing them to better understand their overall health status. Similarly, the Calorie Intake Calculator gives precise recommendations based on individual user data, ensuring that dietary choices align with fitness goals. This level of accuracy enhances the credibility of the application and builds trust with users who rely on these metrics to guide their fitness journey.

iv. Operability on Low-Spec Devices That Support AR

Another significant strength of the Dynamic AR Fitness application is its ability to run smoothly on low-spec devices that support AR technology. This accessibility ensures that a broader range of users can benefit from the app without needing the latest or most powerful hardware. The application has been optimised to deliver a seamless AR experience even on devices with limited processing power, making advanced fitness technology available to more people. This inclusivity is crucial for reaching a wider audience, particularly in regions where high-end devices may not be as prevalent. By ensuring compatibility with a variety of devices, the application demonstrates a commitment to accessibility and user inclusion, allowing more users to engage with innovative fitness technology regardless of their device capabilities.

7.3 Proposition and Improvement

In this section, a set of well-considered recommendations aimed at enhancing the application's capabilities and overall performance will be discussed. These proposals address the limitations and weaknesses identified during the testing phase. The recommendations are derived from the feedback provided by users who interacted with the application. By implementing these suggested improvements, the application can be refined to deliver a more seamless and effective user experience in future iterations. The focus of these propositions is to ensure that the application evolves to meet user expectations and remains competitive in the rapidly advancing field of AR technology.

i. Build in IOS Platform

Currently, the application is only available on the Android platform, limiting its accessibility. Expanding the application's compatibility to include iOS devices will broaden its user base and ensure that a wider audience can benefit from its features. This improvement is crucial for making the application more inclusive and versatile across different mobile operating systems.

ii. More AR Guidance

While the current application offers basic AR functionality, there is a need for more comprehensive guidance on how to use these features effectively. Enhancing AR guidance with step-by-step instructions, on-screen prompts, and interactive tutorials will help users better understand how to interact with the AR elements, leading to a more intuitive and enjoyable experience.

iii. More AR Interaction

The existing AR interaction is limited to rotating and reappearing the 3D models. To make the application more engaging and interactive, additional AR features such as resizing, zooming in and out, and more dynamic interactions should be implemented. These enhancements will provide users with greater control over the AR environment, making the experience more immersive and responsive to their needs.

iv. Audio Implementation

The integration of audio into the application will significantly enhance user interaction and motivation. Implementing audio cues, such as voice instructions for exercises or background music, will not only improve the aesthetic appeal of the application but also create a more engaging and motivating environment for users. Audio can be a powerful tool in guiding users through exercises and keeping them focused and energised.

v. More Exercise Variety

Currently, the application offers a limited number of exercise sets, which may not fully cater to the diverse needs of users. Expanding the variety of exercises and adding more sets will make the application more versatile and appealing to a broader range of fitness enthusiasts. By providing a wider selection of exercises, the application can better support users in achieving their fitness goals and maintaining a balanced workout routine.

7.4 Project Contribution

The integration of Augmented Reality (AR) technology into fitness applications represents a significant advancement in user engagement and interactive learning. This project contributes notably to the fitness and wellness sector by providing an innovative tool that can be utilised in various contexts. Specifically, the Dynamic AR Fitness application can be adapted for use in public gyms as a membership application, offering an enhanced experience for gym-goers by integrating AR features to guide users through exercises and track their progress.

Additionally, the application's potential to be published on major platforms such as the Google Play Store and Apple App Store allows it to reach a global audience, thus promoting improved lifestyle practices worldwide. By making the application widely accessible, it can support users from diverse geographical locations in adopting healthier routines and benefiting from AR-enhanced fitness guidance. The combination of AR technology with a user-friendly interface and accurate fitness calculators not only makes exercise more engaging but also provides valuable insights into personal health metrics. This project's contribution lies in its ability to leverage AR for practical fitness solutions and its potential to influence global health and fitness trends.

7.5 Conclusion

In conclusion, the Dynamic AR Fitness application has demonstrated significant achievements in leveraging Augmented Reality (AR) technology to enhance user engagement and promote healthier lifestyles. The alignment of the project's design and functional requirements with the capabilities of AR technology was effectively addressed through the detailed development process, including the creation of comprehensive storyboards and user interface designs.

The application has proven successful in integrating AR features to guide users through exercise routines, providing accurate health metrics, and offering a user-friendly experience. Despite the strengths of the project, there are notable areas for improvement, such as expanding AR interactions, incorporating audio features, and increasing exercise variety. These enhancements will address current limitations and further enhance the application's utility and appeal.

Overall, the Dynamic AR Fitness application contributes meaningfully to the fitness sector by providing a novel approach to exercise and health management. Its potential for implementation in public gyms and availability on major app platforms positions it as a valuable tool for users seeking to improve their fitness routines. The project effectively meets its objectives and showcases the transformative potential of AR technology in promoting a healthier lifestyle. Future iterations of the application will benefit from incorporating user feedback and addressing identified weaknesses, ensuring continued relevance and effectiveness in the evolving fitness landscape.

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APPENDIX A: QUESTIONAIRE

FITNESS APPLICATION USING AUGMENTED REALITY TECHNOLOGY

Dear participant,

Thank you for taking the time to complete this questionnaire. My name is Muhamad Afif Adham Bin Mohd Sofian, and I am currently working on my final year project at Universiti Teknikal Malaysia Melaka. My project focuses on developing a Fitness Application using Augmented Reality Technology.

The objective of this study is to design and develop a mobile application that enhances the fitness experience by providing features such as a BMI calculator, exercise library, daily calorie intake calculator, and personalized exercise recommendations. The AR technology in the application aims to help users perform exercises correctly through a 3D model.

Your responses to this questionnaire will provide valuable insights into user satisfaction with the application's aesthetics, functionality, and overall effectiveness. The data collected will be used solely for academic purposes and will remain confidential.

Link Application: -

asylumstar73@gmail.com Switch accounts

Not shared

Next

Clear form

Consent form

I consent to participate in the project above, I have been provided a copy of the project information statement and this consent form and any question I have ask to have been answered my satisfaction

I agree to be interviewed by research. *

- ◯ Yes
- ◯ No

I agree to make myself available for further information if required. *

- ◯ Yes
- ◯ No

I give my permission for the named research(s) to access analysis organization as request. *

- ◯ Yes
- ◯ No

I give my permission to the organization to be named any publication arising from the research. *

- ◯ Yes
- ◯ No

I acknowledge that

The data itself is the for the purpose of research with an aim of producing publishable/ peer reviewed outcomes and not for direct profit. *

- ◯ Yes
- ◯ No

The participation in voluntary and that I am free to withdraw from the project at any time without explanation. *

- ◯ Yes
- ◯ No

The participation in voluntary and that I am free to withdraw from the project at any time without explanation. *

- ◯ Yes
- ◯ No

Back Next Clear form

General information

Name *

Your answer

Gender *

- Male
- Female

Age *

- 18-25 years old
- 26-40 years old

Physical Activity Level *

- Sedentary (little or no exercise)
- Lightly active (exercise 1–3 days/week)
- Moderately active (exercise 3–5 days/week)
- Active (exercise 6–7 days/week)

Back Next Clear form

User Testing

This section contains various questions about your experience with the Dynamic AR Fitness application. Please rate and answer the questions based on your experience.

Your feedback is valuable and will help us assess user satisfaction of Dynamic AR Fitness application. Please tick (/) for following statement based on your level of agreement.

The rating is from 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Application

The Dynamic AR Fitness convenient for my daily health lifestyle. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The Dynamic AR Fitness easy to use. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Application Information

The Dynamic AR Fitness Application helps me learn a proper exercise form. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The Dynamic AR Fitness Application prevent me from exercise injuries. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The Dynamic AR Fitness provide a lot of exercise variety. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The daily calories intake is accurate. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The BMI calculator is accurate. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Back Next Clear form

User Satisfaction

The Dynamic AR Fitness encourage me to exercise. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The Dynamic AR Fitness provide appropriate feedback. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The Dynamic AR Fitness provide better health lifestyle. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The Dynamic AR Fitness recommendations fit my lifestyle. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The Dynamic AR Fitness give positive impact to my health and lifestyle. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Recommendations

What improvements would you suggest for this application? *

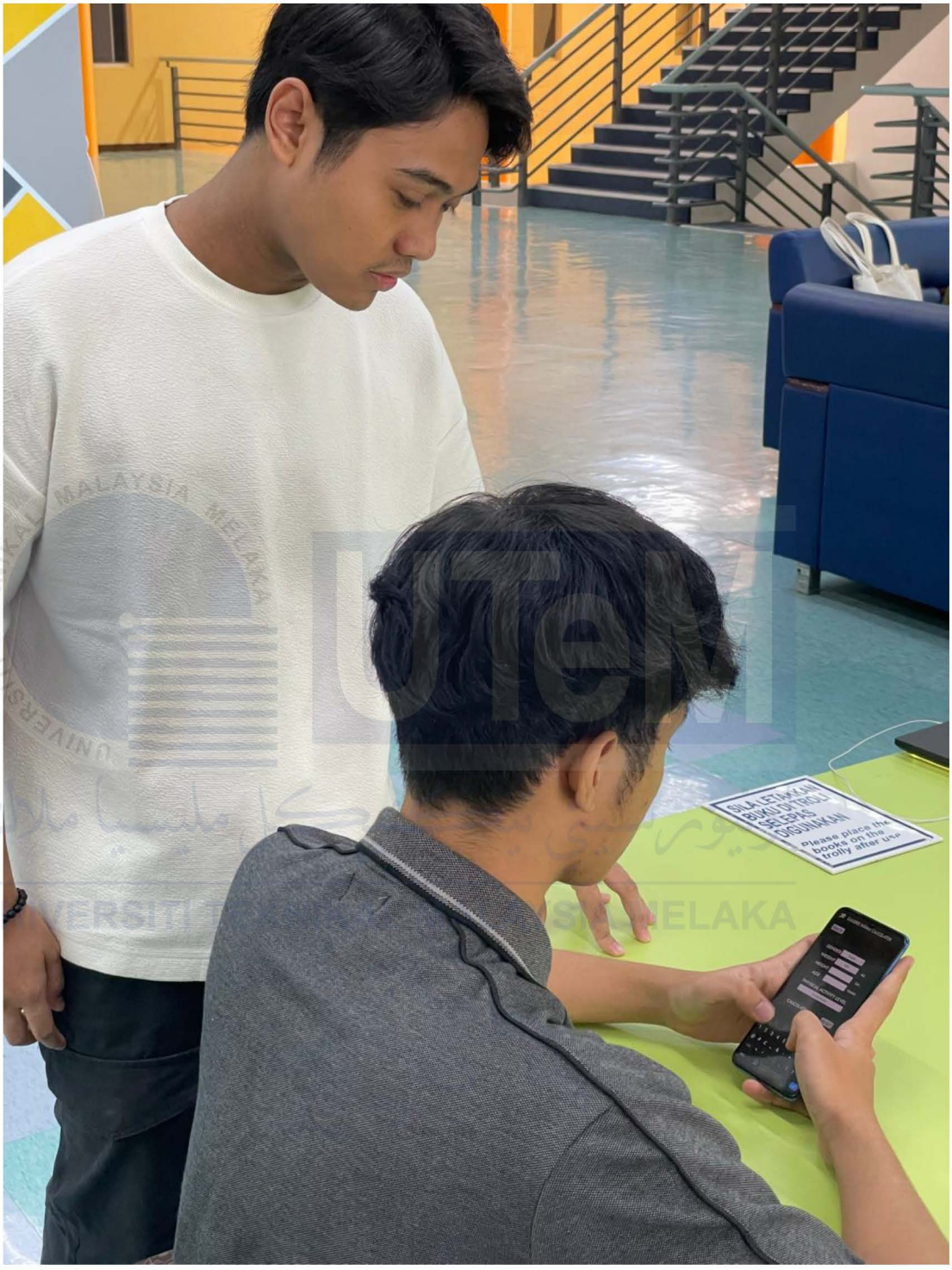
Your answer

Any drawbacks, additional comments or feedback on the application? *

Your answer

Back Submit Clear form

APPENDIX B: TESTING PHASE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