Designing a Mobile-based Fitness and Diet Guide Application Using Flutter Framework

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Abstrak

Kesehatan dan kebugaran jasmani merupakan elemen penting dalam kehidupan manusia. Aktivitas fisik, seperti latihan beban, aerobik, dan olahraga lainnya, kini telah menjadi bagian penting dari gaya hidup modern. Namun, masih banyak orang yang belum menjadikan kebugaran sebagai bagian dari keseharian mereka karena keterbatasan informasi dan pengetahuan yang dimiliki. Penelitian ini bertujuan untuk mengembangkan aplikasi berbasis mobile untuk panduan fitness dan diet menggunakan framework Flutter, yang dilengkapi dengan fitur-fitur seperti pencatatan kalori, penimbangan berat badan, penghitung langkah, serta panduan olahraga berbasis video. Metode pengembangan sistem yang diterapkan dalam penelitian ini adalah Software Development Life Cycle (SDLC) menggunakan Model Waterfall. Aplikasi ini diharapkan dapat membantu pengguna dalam memantau aktivitas fisik harian mereka, termasuk kebutuhan kalori, perubahan berat badan, jumlah langkah, dan rutinitas latihan lainnya.

Kata kunci: *Fitness, Diet, Mobile, Flutter, Software Development Life Cycle (SDLC)*

Abstract

Maintaining physical health and fitness is a vital aspect of human life. Physical activities such as weight training, aerobic exercises, and other sports have increasingly become a part of modern lifestyles. Nevertheless, many individuals have not yet incorporated fitness into their daily routines due to limited access to knowledge and information. This study focuses on developing a mobile-based fitness and diet guide application using the Flutter framework. The application features include calorie tracking, weight monitoring, step counting, and video-guided workouts. The system development in this research follows the Software Development Life Cycle (SDLC) approach with the Waterfall Model. The application is intended to support users in observing their daily physical activities, including calorie consumption, body weight changes, step counts, and workout routines.

Keywords : *Fitness, Diet, Mobile, Flutter, Software Development Life Cycle (SDLC)*

1. Introduction

Health and physical fitness are essential aspects of human life. Health is defined as a condition in which the body is free from disturbances such as disease or injury. Maintaining health can be achieved through appropriate physical activity and proper nutrition. Exercise, as a structured and planned activity, aims to improve physical performance [1]. One common form of exercise is fitness, which has now become an integral part of modern urban lifestyles.

Fitness includes activities such as weight training, aerobic exercise, and proper nutrition. Despite its accessibility, many individuals have not embraced it due to limited awareness. Gym workouts often depend on manual instruction or personal trainers, which can be costly and lack flexibility. Beginners may also face difficulties in using equipment and understanding correct

movements, leading to reduced motivation and ineffective training. In response to growing digital adoption, mobile-based solutions are increasingly relevant. However, the lack of comprehensive fitness and diet guidance applications highlights the need for a platform that improves accessibility and supports healthier lifestyles.

Several similar studies have been conducted in developing supportive applications for healthy living that include fitness and wellness guidance. Kusuma et al. [2] developed an Android-based diet program companion app to assist athletes in aligning their diet with the intensity of their workouts. Purwaningtyas [3] designed an Android-based application intended to provide fitness guidance, helping users exercise using proper techniques and instructions through the app. Similarly, Kristina et al. [4] created a workout application as a guide for exercising without equipment. This study resulted in an application that offers correct workout techniques and calculates Basal Metabolic Rate (BMR) and Body Mass Index (BMI). Suherman [5] implemented a mobile-based information platform for weight calculation and diet guidance. This application helps users determine their body mass index and suggests diet menus based on their blood type.

The proposed solution is to design a mobile application using the Flutter framework. This framework is chosen due to its capability to create attractive, responsive applications that can run across multiple platforms [6]. The application will include features such as calorie tracking, weight monitoring, step counting, and workout guidance via embedded YouTube video links. Its uniqueness lies in the integration of step counting and video-based workout tutorials. The application is expected to provide users with effective and practical guidance on fitness and diet, thereby supporting a healthier lifestyle.

2. Research Methodology

The analytical process conducted in this study, which focuses on a mobile application for fitness and dietary guidance, adopts the Waterfall model as its development methodology. This model follows a structured and sequential progression, where each phase of development is completed before the next begins.

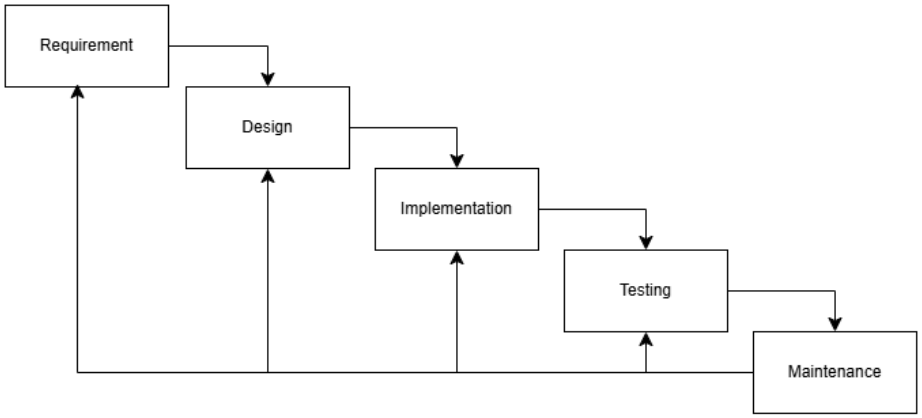

Figure 1. Waterfall Method

Figure 1 illustrates the analytical workflow based on the Waterfall development model. The process begins with requirements analysis to determine core features, followed by a design phase that outlines the system architecture. Implementation proceeds according to the established design, after which black-box testing is conducted to assess functionality and performance. The final stage, maintenance, ensures long-term stability and adaptability of the application [7].

2.1 Requirement

Requirement is the first phase of the waterfall method, which aims to gather information about user needs in software development. This process is intended to facilitate system development in accordance with user requirements. In this phase, the information-gathering method used is a literature study, which involves several references sourced from books, journals, and similar applications.

2.2 Design

This process focuses on detailing requirements from the previous phase through system design, outlining how the system will operate. A context diagram illustrates the system's relationship with external entities, while a physical data model (PDM) defines the database structure used in system development.

2.3 Implementation

The implementation stage in the Waterfall model represents the system programming phase, where the system is divided into smaller components to simplify development. This phase utilizes the Dart language with the Flutter framework for mobile application development, supported by Visual Studio Code as the development environment and SQLite for data management.

2.4. Testing

The testing stage in the Waterfall model aims to ensure each system component functions as intended after module integration. Using a black-box testing approach, the system is evaluated based on input-output behavior without inspecting internal code. Test scenarios are designed to assess the performance and reliability of features from the user's perspective.

2.5 Maintenance

The final stage in the Waterfall model is maintenance, which involves ongoing support after system deployment. Activities include bug fixes, feature enhancements, and adjustments to meet changing user needs or technological developments.

3. Literature Study

The literature review covers various types of sources relevant to the research being conducted. The sources pertinent to the study Designing a Mobile-Based Fitness and Diet Guide Application Using the Flutter Framework are described as follows.

3.1 GYM and Fitness

A gym is a business entity in the field of sports that provides exercise services and facilities, which are professionally managed and commercially beneficial [8]. Fitness, on the other hand, refers to activities that improve a person's health and physical condition through weight training, aerobic exercises, and proper nutrition. Today, fitness has become a global lifestyle trend.

3.2 Mobile Application

Mobile refers to a device's ability to maintain connectivity while moving. Mobile applications are designed for portable devices, enabling access to data on the go. In Android, WebView serves as a key component that renders websites in a mobile-optimized format. The mobile web facilitates wireless data access via smartphones and similar devices. Mobile app development encompasses the design and distribution of software for handheld devices, whether pre-installed or downloaded through app stores [9].

3.3 Android

Android is a Linux-based operating system tailored for mobile devices, encompassing its core OS, middleware, and essential applications. Originally developed by Android Inc. and later acquired by Google, it is now supported by the Open Handset Alliance. Since its debut in 2007, Android has provided developers with comprehensive resources, including the SDK and open documentation. Android Studio, the official IDE built on IntelliJ IDEA, offers an integrated environment for efficient coding, debugging, and deployment of Android applications [10].

3.4 Flutter

Flutter is a mobile UI framework by Google that enables cross-platform application development using a single codebase in Dart. It provides customizable widgets for building responsive interfaces and supports both Material and Cupertino design systems to ensure consistent user experiences across devices [11].

3.5 Dart

Dart is a programming language developed to support the creation of cross-platform applications. It adopts an object-oriented structure and C-style syntax, incorporating features such as interfaces, classes, generics, and collections. Originally focused on web development, Dart has evolved to also serve mobile and server-side applications. When paired with Flutter, Dart provides a powerful toolset for building high-performance user interfaces across Android and iOS platforms [12].

3.6 SQLite

SQLite is a compact, serverless database engine designed for direct integration into applications. It adheres to ACID principles, ensuring data integrity and transactional reliability. With no external dependencies, SQLite allows efficient local data storage and access, typically within a device's internal memory. Its cross-platform database files enable flexible deployment, while its support for complex queries and advanced features makes it well-suited for mobile application development [13].

3.7 Waterfall Method

The Waterfall Model follows a linear and sequential process consisting of planning, analysis, design, implementation, testing, and maintenance. Each phase must be fully completed before advancing to the next, emphasizing a structured approach from requirements analysis to system maintenance [14].

3.8 Black-Box Testing Method

The black-box testing method is used to evaluate system functionality based on input-output behavior, without examining internal architecture. This approach enables comprehensive validation of performance and helps identify issues such as interface errors during execution [15].

4. Result and Discussion

This section outlines the outcomes of the system design in conjunction with its development process. A general explanation of the system architecture is provided, starting with a system overview. Furthermore, the interaction between the system and external components is described through a Context Diagram, while the database schema is detailed using a Physical Data Model (PDM).

4.1 System Overview

The overview of the mobile-based fitness and diet guide application presents a comprehensive system modeling that can serve as a reference during the development phase. Figure 2 illustrates the system overview.

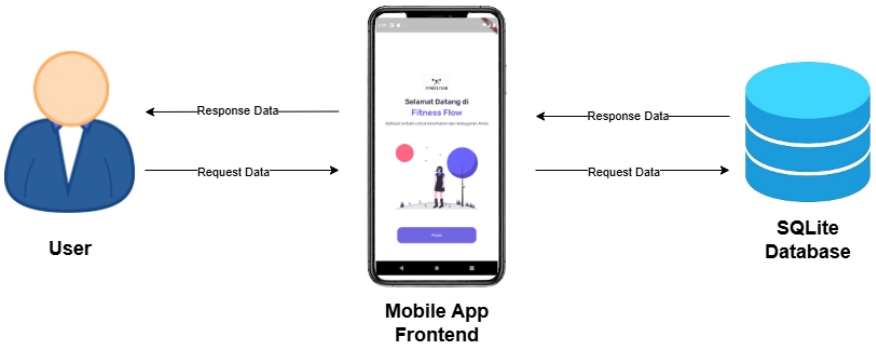

Figure 2. System Overview

Figure 2 presents the system overview of the mobile-based fitness and diet guide application, which includes a single role: the user. The user is an individual who utilizes the system. The user interacts with the mobile application developed using the Flutter framework. Data processing is managed using SQLite as the database.

4.2 Context Diagram

The context diagram is an information system model designed to present the overall scope and processes of the system. It depicts the entities involved in the system, the data flows, and the processes that occur within the system. Figure 4 illustrates the context diagram.

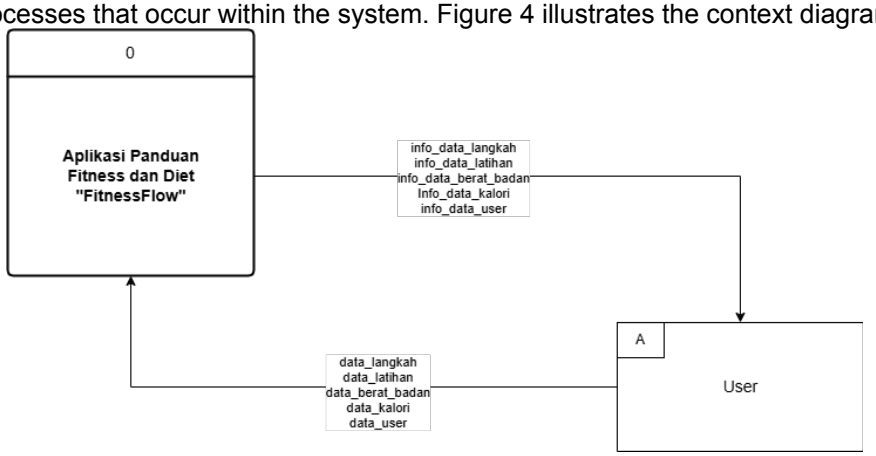

Figure 3. Context Diagram

Figure 3 illustrates the context diagram of the mobile-based fitness and diet guide application. There is a single entity, namely the user, who interacts with the system. The process involves the user requesting the necessary data, and the system responding by providing the requested data in the form of information.

4.3 Physical Data Model

The Physical Data Model (PDM) is a schema model that serves to implement the Conceptual Data Model, or the initial concept of a database, in preparation for its actual implementation as a functional database. Figure 4 illustrates the physical data model.

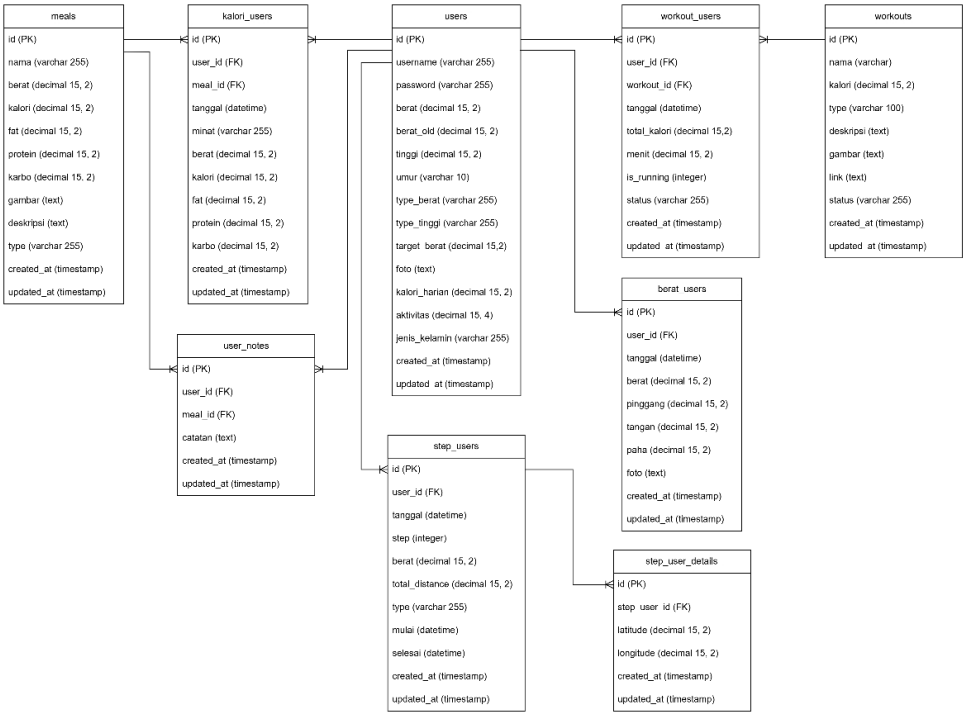

Figure 4. Physical Data Model

Figure 4 illustrates the Physical Data Model (PDM) of the mobile-based fitness and diet guide application. The PDM of this system consists of nine tables: users, workout_users, workouts, kalori_users, meals, berat_users, step_users, step_user_details, and user_notes.

4.4 System Implementation

The system currently under development is being implemented using the Dart programming language, with Flutter serving as the primary framework. Flutter is utilized to construct the mobile-based user interface, while SQLite operates as the database solution for the application. The following figures depict several interface components that have been successfully implemented.

Figure 5. Landing Page

Figure 5 illustrates the interface of the landing page. The landing page serves as the initial screen of the fitness and diet guide application. On this page, users are required to press the Start button to proceed to the subsequent pages, which are designed to collect user data before accessing the home page.

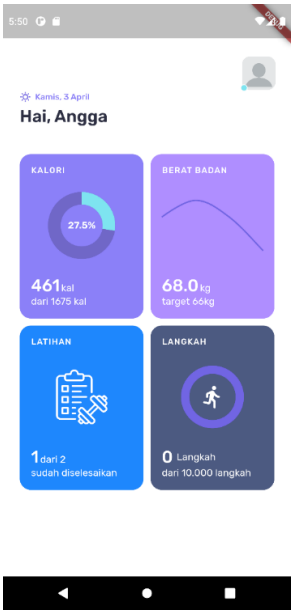

Figure 6. Home Page

Figure 6 illustrates the interface of the home page. This page appears after the user has completed entering data on the landing page. It contains several features accessible within the application, including calorie tracking, body weight tracking, workout tracking, and step tracking.

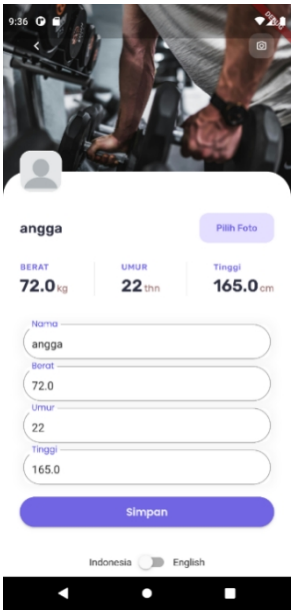

Figure 7. Profile Page

Figure 7 illustrates the interface of the profile page. This page contains the user's profile information. Users can update their profile data on this page. The information displayed includes the user's name, profile photo, age, body weight, and height.

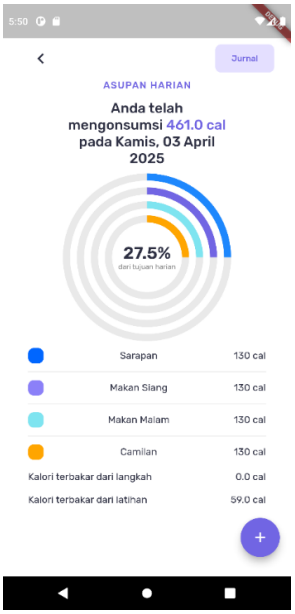

Figure 8. Calorie Tracking Page

Figure 8 illustrates the interface of the calorie tracking page. This page is designed to manage the user’s calorie intake. Users can view their daily calorie budget and the total number of calories consumed each day. Additionally, this page provides information on the number of calories burned through workouts and steps.

Figure 9. Body Weight Tracking Page

Figure 9 illustrates the interface of the body weight tracking page. This page is designed to display the user's body weight progress. It contains information such as the user's current weight, target weight, a curve showing the user's weight progress over time, and a timeline that serves as a history of the data input by the user.

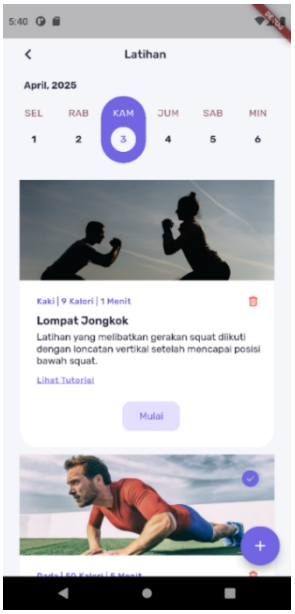

Figure 10. Workout Tracking Page

Figure 10 illustrates the interface of the workout tracking page. This page functions to record the workouts performed by the user. In addition to logging workouts, users can also view tutorials demonstrating the correct exercise movements. The page also provides information on the number of calories burned from the workouts performed.

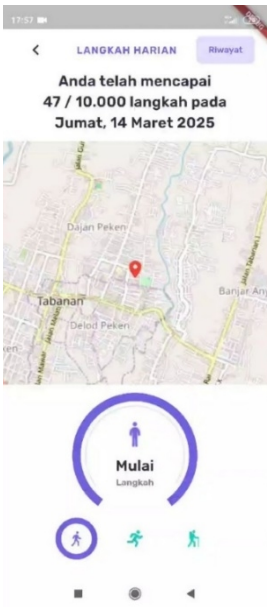

Figure 11. Step Tracking Page

Figure 11 illustrates the user interface of the step tracking feature, which calculates the cumulative number of steps and estimates step counts based on the traveled distance. It also displays data on calories burned, total distance, and walking duration, while allowing users to view their walking history and route via an integrated map

4.5 System Testing

The black-box testing method was used for system testing in this study. A set of test scenarios was designed to evaluate the mobile-based fitness and diet guide application. The testing was conducted with 22 students from the Information Technology study program. The evaluation was carried out solely from the users perspective, based on the features that had been implemented in the application. The following are the results of the testing of the fitness and diet guide application.

Table 1 Results of the Black Box Testing method

Test Scenario	Expected Result	Test Result	Conclusion
The user inputs their name using the correct format in the input form provided on the landing page.	The form successfully displays the submitted data and permits the user to proceed to the subsequent.	The form successfully displays the submitted data and permits the user to proceed to the subsequent.	Success
The user enters their name using an incorrect format in the input field located on the landing page.	The form fails to display the user-submitted data, prompting the system to show a message indicating that the field must not be left empty.	The form fails to display the user-submitted data, prompting the system to show a message indicating that the field must not be left empty.	Success
The user updated the profile data.	The user successfully updates their profile information, and the system generates a confirmation message indicating the update was	The user successfully updates their profile information, and the system generates a confirmation message indicating the update was	Success

	completed.	completed.	
The user did not complete the input data in the profile.	The user is unable to update their profile details, and the system prompts a message instructing them to complete all required profile fields.	The user is unable to update their profile details, and the system prompts a message instructing them to complete all required profile fields.	Success
The user added a food item with complete data.	The system successfully added the food item to the journal page and displayed a success message indicating that the food item was added.	The system successfully added the food item to the journal page and displayed a success message indicating that the food item was added.	Success
The user attempted to add a food item with incomplete data.	The user fails to add food-related data, resulting in a system message requesting completion of the necessary food data form.	The user fails to add food-related data, resulting in a system message requesting completion of the necessary food data form.	Success
The user added a body weight entry with complete data.	The system successfully added the body weight entry and displayed a success message indicating that the body weight was added.	The system successfully added the body weight entry and displayed a success message indicating that the body weight was added.	Success
The user attempted to add a body weight entry with incomplete data.	The attempt to input body weight data is unsuccessful, and the system advises the user to complete all required fields within the body weight form.	The attempt to input body weight data is unsuccessful, and the system advises the user to complete all required fields within the body weight form.	Success
The user added a workout entry with complete data.	The user successfully records a workout entry, and the system responds with a message confirming the data addition.	The user successfully records a workout entry, and the system responds with a message confirming the data addition.	Success
The user attempted to add a workout entry with incomplete data.	The workout data submission is unsuccessful, prompting the system to notify the user to complete the workout data form.	The workout data submission is unsuccessful, prompting the system to notify the user to complete the workout data form.	Success
The user added a step count entry.	The user successfully logs their steps, with the	The user successfully logs their steps, with the	Success

	total step count updated accordingly, and the system displays a message indicating successful data entry.	total step count updated accordingly, and the system displays a message indicating successful data entry.	
The user viewed the step count history data.	The system will display the step count history page.	The system will display the step count history page.	Success

Table 1 displays the outcomes of black-box testing performed by the user on the developed application. The scenarios executed, involving both valid and invalid data inputs, produced system responses that aligned correctly with the expected behavior in each case. In addition, all interactive buttons within the application operated as designed, without any malfunctions or unexpected behaviors. Each test case was completed successfully and yielded consistent results, demonstrating that the application functions according to the predefined requirements. These findings suggest that the implemented features are stable, responsive, and capable of handling user interaction as intended, thereby meeting the core functional objectives of the system.

4.6 Application Comparasion

The comparison of applications was conducted to ensure that the currently developed application demonstrates advancements in features when compared to existing ones. The development process draws references from functionalities offered by prior applications, serving as a foundation for further feature enhancement. Table 2 outlines the availability or absence of specific features in the application being developed.

Table 2. Application Comparasion

Application Name	Feature				
	Calorie Management	Step Tracking	Body Weight Tracking	Workout Tracking	Reporting
Hitung Kalori Makanan	Yes	No	No	No	No
Fat Secret	Yes	No	Yes	No	Yes
Hit Meal	Yes	No	Yes	Yes	Yes
My Diet Coach	Yes	No	Yes	Yes	Yes
Muscle Wiki	No	No	No	Yes	No

Table 2 presents a comparative analysis of applications examined in previous studies. These earlier applications are evaluated against the features implemented in the current development, including calorie management, step tracking, body weight tracking, workout tracking, and reporting. The findings indicate that most of the earlier applications lacked the step tracking feature, which is now integrated into the new application. This integration marks a significant improvement and distinguishes the current application from other systems with similar foundations.*

5. Conclusion

The conclusion that can be drawn from the research on the Mobile-Based Fitness and Diet Guide Application Using the Flutter Framework is that the application provides users with ease in monitoring their daily physical activities, such as calorie requirements, weight progress, step count, and workout routines. The results of the black-box testing on the Mobile-Based Fitness and Diet Guide Application indicate that the application interface functions properly, and the system successfully manages input and produces output in accordance with user requirements.

In addition, while the calorie feature currently serves solely as a record of food-based caloric deficits, future development could include expert-designed dietary programs. These programs may offer tailored meal recommendations aligned with individual user goals, such as muscle gain or weight reduction, thereby enhancing the personalization and effectiveness of the application.

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