Mobile System Development (COMP826)

Prototype, Evaluation and Recommendations

Pilates Progress Application

Submitted by

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1 Overview

1.1 Background of the topic

1.1.1 Description of the topic

In the present day, we often lead hectic lives filled with stress and ongoing pressure. During the COVID-19 lockdown and the period following it, there has been a notable decrease in physical activity, coupled with a rise in sedentary behaviors (Stockwell et al., 2021). Engaging in physical exercises can lead to positive outcomes in managing healthier lifestyle.

As Michopoulou et al. (2016) stated that the affordability of wellness has become a significant concern in light of the current economic circumstances. In other words, people's incomes have decreased in the aftermath of the COVID-19 pandemic, and there is compelling evidence indicating that the population's unfavorable financial situation affects their access to wellness services. Meanwhile, it is worth noting that prevention and health promotion are more economically efficient compared to the existing model of treating illnesses. Therefore, Pilates progress application was presented in Milestone 1 as an effective and affordable rehabilitation system.

Based on my research, I did not found apps with structured technical knowledge of Pilates which provide quick and accessible way to practice Pilates. As discussed in Milestone 1, Pilates progress app is a system which is going to be built on iOS and Android platforms. The phone's camera captures the video, which is then transmitted to a server for analysis using a neural network system. Subsequently, the findings are relayed back to the phone. App provides statistics and history of achievements which make user more motivated to practice and progress. However, Milestone 2 covers the development process and app will be built only for the Android platform due the limited timeframe. Furthermore, this project primarily emphasizes the aspect of user interface design (UI). Curry (2023) stated that the most popular apps are TikTok, Facebook, Instagram, and WhatsApp, it is evident that a significant portion of the global population is drawn to mobile applications that offer a pleasant user experience (UX) and captivating design. Therefore, this study will primarily concentrate on UX/UI design.

1.1.2 Description of project details and its justification

As previously mentioned in Milestone 1, the system will encompass an achievement system, three training levels, two training types, and statistical tracking. The system is comprised of two main components: a server and a mobile application. Users log in or create new accounts using the mobile app. On the server, a security protocol validates the accuracy of the client's data, encrypts it, and stores it in a database. Once access is granted, clients can input their personal information, which is also subjected to security checks, encrypted, and stored in the database. When a training session begins, the video is transmitted to a decoder, compressed, and saved in a database. Subsequently, the video undergoes analysis by a neural system, which assesses the compressed video and records the results in a database. The server then conveys this information to the mobile application and concurrently signals the correctness of the user's movements.

My role in this project as a designer (I do not have any background in coding) and the whole development process are divided into UX and UI stages which will be covered more detailed in System artefacts section. The intended users for the app are individuals of varying age groups who are enthusiastic about sports but have limited time and financial resources. Further insights regarding the expected users will be elaborated upon in User Persona section. Moreover, the primary goal of this application is to draw a wider audience to engage in Pilates and to enhance the affordability of this sport.

1.2 Project description

In this project, we are creating the prototype for the user interface designs of the Pilates Progress App, as outlined in the wireframes presented in Milestone 1. My role as the UI/UX designer involves focusing on the elements displayed on the app screens. The development criteria were outlined in Milestone 1, but you will find more specific information about the main components to be implemented in this project in Table1.

Feature/Screen	**Artefacts to build**
Splash screen*	✓ Logo
Welcome screen*	✓ Container with welcome text ✓ Button for registration ✓ Link for login in case user has already registered
Home screen	✓ App bar at the bottom of the screen with a "Home", "Settings of training", "Training page", "Statistics" and "Profile" icons ✓ Header section with text ✓ Two sliders
Sign In screen	✓ Circular textboxes for user input of email and password ✓ Buttons for sign in and sign up ✓ Customized app bar at the top of the screen, with a back button which leads back to "Welcome screen" ✓ Link to reset password ✓ Logo
Sign Up screen	✓ Circular textboxes for user input of name, email, password and confirmed password ✓ Button for sign up ✓ Customized app bar at the top of the screen, with a back button which leads back to "Welcome screen" ✓ Logo
Reset password screen	✓ Circular textboxes for user input email ✓ Button which leads to "Sign in screen" ✓ Customized app bar at the top of the screen, with a back button which leads back to "Sign in screen" ✓ Logo
Profile screen*	✓ Customized app bar at the top of the screen with tools to edit profile ✓ Container including user photo, personal information ✓ App bar at the bottom of the screen with a "Home", "Settings of training", "Training page", "Statistics" and "Profile" icons ✓ Container with buttons leads to goals, trainings in progress and favourite trainings
Statistics screen*	✓ Container with control panel to change date ✓ Diagram of statistics ✓ Graph based on average activity ✓ App bar at the bottom of the screen with a "Home", "Settings of training", "Training page", "Statistics" and "Profile" icons
Choose the program screen	✓ App bar at the bottom of the screen with a "Home", "Settings of training", "Training page", "Statistics" and "Profile" icons ✓ Two pictures and two buttons lead to "Choose the level screen"

Choose the level screen	✓ App bar at the bottom of the screen with a “Home”, “Settings of training”, “Training page”, “Statistics” and “Profile” icons ✓ Three pictures and three buttons lead to “Video streaming screen”
Video streaming screen	✓ App bar at the bottom of the screen with a “Home”, “Settings of training”, “Training page”, “Statistics” and “Profile” icons ✓ Video player ✓ Container with the description of the training ✓ Button leads to “Statistics screen”

*Note: * is where the UI design has been changed (or modified) or new page was created. The applied changes will be explained in the System Artefacts section.*

1.3 Development Environment and Process

In Milestone 1, I explored and chose several technologies. However, I made some adjustments for efficiency and more familiar technology to me. I switched from using Visual Studio Code to Android Studio due to the tight development schedule and my greater familiarity with the Android IDE. Additionally, I changed the programming language from JavaScript to Kotlin because Android Studio does not support the former language.

Furthermore, in Milestone 1, I investigated various development processes and opted for the Scrum methodology. This choice is suitable for my solo project, given the constraints of limited development time and a strong focus on the UX/UI aspects. Scrum allows for iterative design refinement, typically in short sprints lasting 1 or 2 weeks, based on user feedback. It ensures that the final product aligns with user expectations and requirements. Consequently, this project has adopted the Scrum methodology to produce prototypes.

Link to the GitHub repository: https://github.com/Alex90-cmd/Pilates_App

Link to YouTube video: https://www.youtube.com/watch?v=srpU-WQ0Jdw

To execute the projects on your computer, you can use .zip file enclosed in this report. Alternatively, you have the option to access the project via the GitHub link provided earlier.

2 System artefacts

2.1 Features evidence and demo

Only three frames (“Home screen”, “Video Streaming screen” and “Choose the program”) were transferred from Figma to Android Studio and implemented into the code for the purposes of demonstration animation and how navigation is working between all screens since there was no requirement to develop fully functional application. Despite the fact that app is supposed to work on both platforms, design is running only on Android emulator because of the tight timeline.

The details of the project can be found in:

link to the GitHub repository containing a readme.md file

link to a video on YouTube (in addition to the functional prototype in Figma's preview, the mock UI operates seamlessly on the Android Emulator). Details about the behaviour of each frame will be explained in the following sections.

2.2 Design and implementation

2.2.1 User Persona

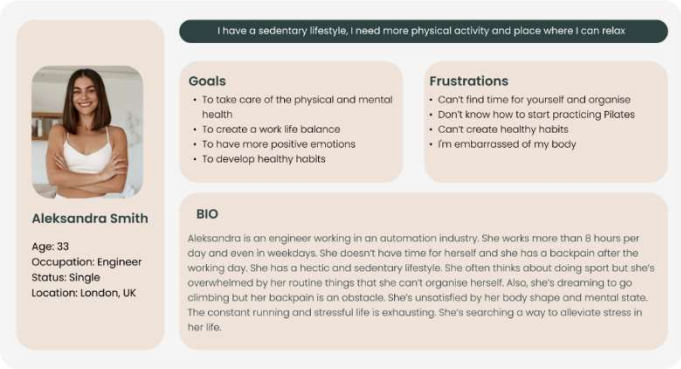

Figure 1

According to Siricharoen (2012), crafting a user persona is crucial for precisely targeting the application's intended audience, as it underscores the significance of people over technology. Consequently, I devised personas to delineate shared objectives and traits that encapsulate the requirements of a broader spectrum of potential users (see Figure 1).

2.2.2 Extra screens

This section outlines the screens for which wireframes were initially omitted, as I had not considered their design details during Milestone 1. However, as I progressed with app development and conducted research, I recognized the necessity of these two screens.

2.2.2.1 Splash screen

Figure 4

Although this artifact (Figure 4) lacks functionality, the splash screen plays a pivotal role in shaping the initial impression of the application. As Singh (2021) stated, this screen should be straightforward, easily recognizable, and utilize animations carefully. According to Saini (2022), minimalistic design is one of the prominent design trends in 2023. Consequently, my goal was to create a minimalistic design that prioritizes simplicity and functionality, incorporating a limited colour palette, preferably featuring soft and soothing colours. This design aligns with the underlying philosophy of Pilates, reflecting the state of mind and body after engaging in this activity.

Figure 5

Figure 5 depicts the colour scheme employed in the application. The chosen green, brown, and light beige hues not only reduce the screen's blue light but also evoke emotions such as calmness, relaxation, freshness, and balance in users (Stanton, 2023). Green and beige colours, with their strong natural associations, contribute to a balanced design and inspire users to make progress in their exercises. Additionally, it is worth noting that the application is intended for indoor use, making screen readability under intense sunlight less critical.

2.2.2.2 Welcome screen

In Figure 6, you can observe the "Welcome page" featuring a button that leads to the "Sign Up page" and a text link directing users to the "Log In page." The primary purpose of this page is to welcome the user and express gratitude for using the application. All the call-to-action elements, especially the button, are prominently coloured in dark green, ensuring their visibility, attractiveness, and motivation for user interaction. The text "Get started!" adds a strong visual focal point and encourages visitors to act.

Furthermore, all text fields and buttons have rounded shapes, contributing to a more modern and user-friendly design. Regarding button placement, following the rule of thumb that ensures users can access all buttons and interactive elements comfortably without straining or extending their

Figure 6

hand unnaturally, it was chosen to position buttons on the lower half of most screens, primarily for user convenience in tapping or clicking on them.

As Bröhl et al. (2017) stated, the way individuals handle their smartphones varies across different generations of technology. Research indicates that older age groups tend to hold their smartphones with one hand while using a finger from the other hand for interaction, whereas the youngest age groups hold the smartphone and interact with the thumb of the same hand. Hoober (2017) also stated that people employ various gripping methods for their phones and tend to prefer viewing and touching the central area of the screen. Therefore, it is advisable to position primary content at the screen's center, with secondary actions placed along the top and bottom edges. Clark (2020) supported this idea and suggested that a 44-pixel space is the optimal zone for touch interactions, reducing the likelihood of user errors. Based on this literature, I made the decision not to implement a hamburger menu, as it has the drawback of collapsing the main navigation and concealing important content.

2.2.3 Authorization screens

During the development phase, several minor modifications were incorporated. The rationale behind these adjustments is substantiated by the supporting literature detailed in the previous section.

2.2.3.1 Log In screen

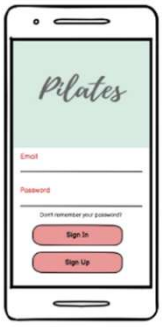

Figure 7 Wireframe

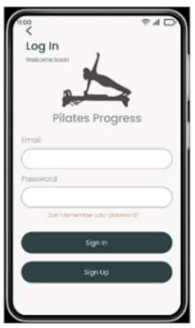

Figure 8 Final screen

The significant alterations encompass the adoption of rounded designs for text fields and buttons, along with the implementation of dark green hues for the buttons. Additionally, the decision was made to introduce the "Arrow" app bar for the purpose of returning to the "Welcome page" (Figures 7, 8).

2.2.3.2 Sign Up Screen

The same changes were implemented for the “Sign Up screen”. “Arrow” control element leads to “Log In screen” (see Figures 9, 10).

2.2.3.3 Reset Password Screen

The same changes were implemented for the “Reset Password screen”. “Arrow” control element leads to “Log In screen” (see Figures 11, 12).

2.2.4 Home Screen

Figure 14 presents the implementation of the home screen, while Figure 13 displays the initial layout design in Milestone 1. This screen comprises several key elements: a bottom navigation bar, two sliders (with their functionality detailed in the Figma prototype), and a header featuring a welcoming message. The use of a tab bar serves to eliminate the need for the "Arrow" control element on all screens, except for the authorization screens, as it helps declutter the space and eliminates unnecessary functionality.

Figure 9

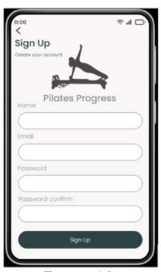

Figure 10

Figure 11

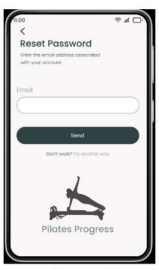

Figure 12

Figure 13

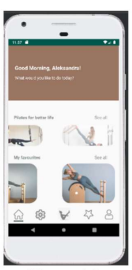
Figure 14

Furthermore, the tab bar enables users to quickly switch between the most vital app screens. Based on the Babich (2022), I made icons visible by using dark green colour and the content clearly communicates with icons. To enhance user orientation, a bold line is included beneath the relevant icon, indicating the user's current page. The home screen also features icon animations within the bottom tab bar, which serve to capture the user's attention.

Moving to Figure 15 and 16, it showcases the code for we description of the element rotation animation pattern (rotate.xml).

```xml
<?xml version="1.0" encoding="utf-8"?>
<set xmlns:android="http://schemas.android.com/apk/res/android"
    android:interpolator="@android:anim/linear_interpolator">
    <rotate
        android:fromDegrees="0"
        android:toDegrees="360"
        android:pivotX="50%"
        android:pivotY="50%"
        android:duration="500"
        android:startOffset="0"
        android:repeatCount="1"
        android:repeatMode="reverse" />
</set>
```

```
Btn3 = (ImageButton) findViewById(R.id.setting_2dd);
rot3 = AnimationUtils.loadAnimation( context: this, R.anim.rotate);
```

Also, I allocate memory for the gear button BTN3 and the animation for it rot3. After that, I bind our animation template rotate.xml to this animation.

2.2.5 Profile screen

Figures 17 and 18 show the wireframe and implementation of design for the “Profile screen”. The description of components can be found in Table 1. The main changes are colour scheme and achievements buttons. Each button is supposed to lead to the relevant pages, but these pages are not included in the scope of this project.

2.2.6 Statistics screen

Figures 19 and 20 illustrates the wireframe and implementation of design for the “Statistics screen”. During the development process, the appearance of this page was changed drastically. I added date picker (animation of this element are out of scope of the project), bar chart based on statistics and graph with the average activity for the period of time. Regarding the date picker, there are the bar with the selection of timeframe (day, week and etc) and custom selection of date. In addition, I placed date picker on the top of the screen to improve visibility of the main content and I highlighted the chosen mode by using the darker colour to improve usability which is identified the most important characteristic for runtime view in Milestone 1.

Figure 19

Figure 20

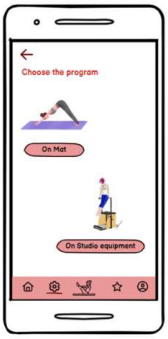

Figure 21

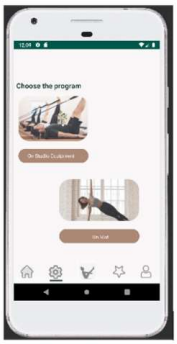

Figure 22

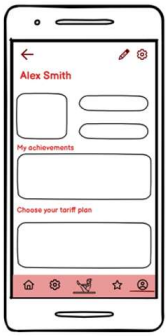

Figure 17

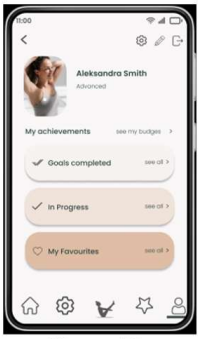

Figure 18

2.2.7 Settings screens

The functionality of screens is similar and the main aim to allow user to opt for preferred type of training (on mat or on special Pilates equipment) and level of difficulty.

2.2.7.1 Choose the program Screen

Figures 21 and 22 presented the wireframe and implementation of design on Android Emulator. Figures 23 illustrates binding the animation to the button. After that, I attached a listening event to the rot3 animation, where after the end of the animation there is a transition to the choose_the_program_screen_activity page (Figure 24).

```
Btn3.setOnClickListener(new View.OnClickListener() {
                        Alex90-cmd
                        @Override
                        public void onClick(View v) {
                            Btn3.startAnimation(rot3);

                        }
                    }
);
```

```
rot3.setAnimationListener(new Animation.AnimationListener() {
    Alex90-cmd
    @Override
    public void onAnimationStart(Animation animation) {

    }

    Alex90-cmd
    @Override
    public void onAnimationEnd(Animation animation) {
        Intent intent = new Intent( packageContext: main_form_copy_activity.this, choose_the_program_screen_activity.class);
        startActivity(intent);

    }
```

2.2.7.2 Choose the level Screen

Figures 25 and 26 presented the wireframe and implementation of design. The selected colour palette is implemented in the buttons, and the selection of shapes corresponds to the level's complexity, ranging from the simplest (beginner) to the most intricate (advanced), thereby enhancing the app's learnability and usability. Each button directs users to the "Video Streaming screen."

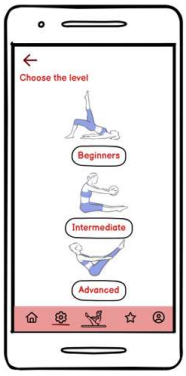

Figure 25

Figure 26

Figure 27

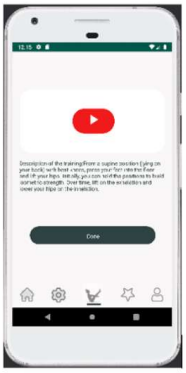

Figure 28

2.2.8 Video Streaming screen

Figures 27 and 28 illustrates the wireframe and implementation of design on Android Emulator. Also, there are description of the training and button which leads to “Statistics screen”. After completing the training, the result will be recorded in the database to collect statistics.

Figure 29 shows the behavior pattern for animation of icon disappearing upon user click. Figure 30 shows the behavior pattern for animation of icon enlargement upon user click.

```
<?xml version="1.0" encoding="utf-8"?>
<set xmlns:android="http://schemas.android.com/apk/res/android"
    android:interpolator="@android:anim/linear_interpolator">
    <alpha
        android:fromAlpha="1.0"
        android:toAlpha="0.1"
        android:duration="500"
        android:repeatCount="1"
        android:repeatMode="reverse" />
</set>
```

```
<?xml version="1.0" encoding="utf-8"?>
<set xmlns:android="http://schemas.android.com/apk/res/android"
    android:interpolator="@android:anim/linear_interpolator">
    <scale
        android:fromXScale="1.0"
        android:toXScale="2.0"
        android:fromYScale="1.0"
        android:toYScale="2.0"
        android:pivotX="50%"
        android:pivotY="50%"
        android:duration="200"
        android:repeatCount="1"
        android:repeatMode="reverse" />
</set>
```

2.3 Development process

As established in Milestone 1, I have opted to employ the Scrum development methodology for this project. This choice is rooted in the project's focus on design and the constraints of a tight development schedule. Consequently, Scrum aligns well with my objectives, particularly since the sprints have a duration of just one week. This approach facilitates ongoing design enhancements driven by user feedback, ensuring the final product aligns with user expectations and requirements.

Figures 31 and 32 represent the updated Gantt Chart and Scrum board in the middle of the Iteration 2.

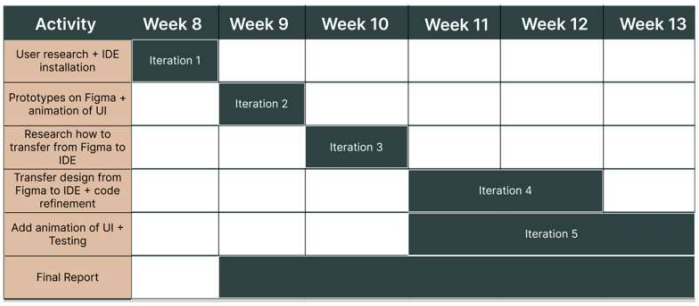

Figure 31

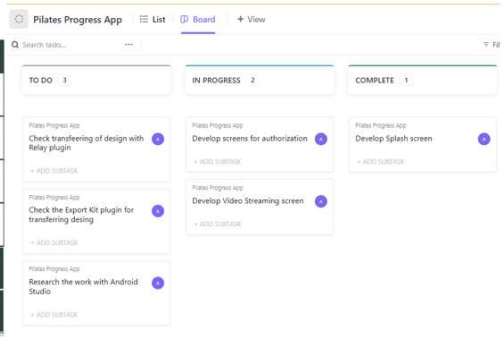

Figure 32

During the development process, the research stage of how to transfer design from Figma to Android Studio consumed more time that it was expected in Milestone 1 due to the lack of programming skills. If there were more time, it would have been possible to implement more frames and animated elements.

Testing activity consists of Usability Test and User Acceptance Tests which will be discussed further.

2.4 Physical considerations

In Milestone 1, we pinpointed the characteristics of portability and compatibility. Although my design is presently operational on the Android Emulator, it can also effectively function on the iOS platform, thereby enhancing compatibility. Concerning the portability aspect, I believe that implementing a responsive design would significantly bolster this trait. Regrettably, due to time constraints, I was not able to incorporate responsive design. However, as Schade (2014) has noted, responsive design can impact performance since it sends the same amount of code to every device, regardless of its type, potentially causing a slowdown in the device's operation. But in my case, the Figma project can be exported and adjusted to devices with different screen sizes and operation systems which provide better portability characteristic.

In reference to the usability aspect identified during the Runtime process in Milestone 1, you can find a comprehensive presentation of the enhancements I have made in the Design and Implementation Section.

3 System evaluation

In this section, application of the refined evaluation produced for this milestone will be shown. As it shown in Table 1 Project Description section, project has 11 artefacts that were detailed in System Artefacts section, this section will demonstrate the application of evaluation of two of the core features of Pilates Progress App: performance and usability.

3.1 Application of Evaluation Criteria

3.1.1 Home screen evaluation criteria

The revised evaluation criteria for the Home screen are detailed in Table 1. The Home page holds significant importance within the application as it typically serves as the starting point for the user's journey, where they interact with the majority of implemented functions. Singh et al. (2005) emphasize the significance of understanding the fundamental factors influencing how users perceive web pages to create effective home pages. Therefore, assessing the level of usability for this screen is crucial.

Utilizing an app bar at the bottom of the screen, housing the application's primary functionalities, enables the decluttering of screen space and eliminates the need for a hamburger menu. Consequently, valuable information, including sliders with additional details about Pilates training, can now be placed in the center of the screen, where the user's attention is naturally drawn. Since the implementation of all components aligns with the criteria outlined in Table 1, the requirements have been satisfied.

3.1.2 Video Streaming screen evaluation criteria

This page encompasses the primary feature of my application, which is the video streaming of selected training sessions. Despite the fact, that implementing a neural system is beyond the scope of this project, this feature adds a novel dimension to such applications. Like the previous section, all evaluation criteria for this screen are outlined in Table 1. The video content used in the application is categorized as educational video. As Tubik (2022) highlights, educational videos serve to clarify the flow of information, making it more easily comprehensible, and they can convey the desired atmosphere, which is an integral part of the customer experience. Hence, it is imperative to assess the usability of this screen.

One of the most critical considerations when integrating video content is the loading time, particularly in the context of mobile applications. Unfortunately, I cannot make assumptions about loading times since video integration is not within the scope of my project. However, the placement of buttons, descriptive text, and the video itself holds significance for evaluation. You can find comprehensive details regarding the positioning of these components in the System Artifacts section, supported by relevant literature. Consequently, the implementation of the Video Streaming screen effectively aligns with the established criteria.

3.2 Evaluation approach, methods and execution

3.2.1 Usability Test

User testing should be happening at every point in the process as an integral part of an iterative design process (Murphy, 2018). Moreover, the author mentioned the key points why it is important to conduct testing, when it is applicable and specific steps how to perform the usability test. To begin performing the usability test, a set of questions were prepared earlier. In addition, based on the developed User Persona in section 2.2.1, I establish clear criteria for recruiting participants and made possible scenarios based on the preliminary evaluation criteria which were described in Milestone 1 in section 5.2. Also, Murphy (2018) mentioned that for the better results designer need to create the convenient conditions in which participants will know that there are no wrong answers, and nobody will interrupt them.

The usability test primarily involved instructing users to navigate through the prototype in Figma and perform tasks without any prompts or guidance. Given the constraints of limited development time, this test was carried out for the entire application. Details about the tasks assigned for the Usability Test can be found in Table 2.

Number	Task	Percentage
1	How can you navigate “Video Streaming screen”, “Statistics screen” and “Profile screen”?	40%
2	Explain what you think the animated gear icon on the bottom app bar is doing?	5%
3	Can you show me how to select the level and type of training?	15%
4	Can you show me how to finish the training?	15%
5	Please return from the “Reset Password screen”	15%

The percentage columns represent the user's success rate in completing specific tasks. For example, some users misunderstood the gear icon and its connection with the choose settings for the training pages.

Metrics used to test the mock UI of Pilates Progress App is displayed in Table 3 below.

Test Metric	User
Successful Task Completion	High
Critical Errors	None
Time on Task	Rapid
Subjective measures	3
Recommendations	Recommended to replace the gear icon in the bottom app bar and add description to different types and levels of training

Explanation of the metrics presented in Table 3:

Successful task completion: This indicates the high quality of task completion. The results may not be entirely clear because users can only perform a limited number of functions as available in the Figma design.

Critical errors: None were encountered across all tested participants.

Time on task: All users completed tasks quickly, demonstrating the ability to perform tasks promptly.

Subjective measures: This is a rating scale from 5 to 1, where 5 represents a highly satisfied user, and 1 indicates a completely dissatisfied user. My application received an average score of 3.

3.2.2 Result of Usability Test

The results presented in Table 2 are derived from the Usability Test conducted for the Pilates Progress App. The results indicate a high level of user satisfaction, suggesting that the application effectively meets user needs. However, some minor improvements are recommended, such as changing the gear icon and adding a description for the training settings to enhance user clarity. In conclusion, the implementation of the Pilates Progress App has been successful, and it exhibits a high level of usability.

4 Conclusion and recommendations

The primary limitation of this project stems from a lack of programming skills, which resulted in certain ideas, such as implementing a neural system, being beyond the project's scope. The main focus of this endeavour was to provide an affordable application for practicing Pilates at home while maintaining training quality. Consequently, an appealing design and excellent usability were prioritized, as users are often drawn to visually attractive apps.

The project's notable strengths include a straightforward UI layout and a well-chosen colour palette that reflects the application's spirit. Additionally, the Gantt Chart displayed in Figure 31 indicates that the project adhered to the planned timeline, notwithstanding some delays caused by challenges in transferring the design from Figma to Android Studio.

A key recommendation is the implementation of features like hot reload and hot restart in Android Studio when using Kotlin, as this would significantly reduce development time. Waiting for the entire project to rebuild can be time-consuming and taxing. Moreover, accessing relevant information on design transfer proved challenging, as many instructional resources, including YouTube videos and official Android and Figma guides, lacked comprehensive coverage of the process. Consequently, this task consumed more time than anticipated.

In hindsight, dedicating more time to research and skill development before project development is advisable. Such an approach can save time, regardless of one's role as a developer or designer. While the technology selection was partly suitable in this case, choosing Flutter would be a preferred option if starting the project anew, as it is a cross-platform technology with hot reload and restart features.

Future research in the mHealth application domain, which includes the Pilates Progress App, should focus on finding the most effective method for measuring movement and achieving measurement accuracy without compromising user security and privacy.

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