

Mobile Application for Mental Health (Afterglow)

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Abstract: Poor mental health has become a serious issue in many countries, Malaysia is also no exception especially among university students. Students with poor mental health may struggle to focus on their studies, particularly if they do not have a plan to deal with their condition. The purpose of this project is to develop a Mobile Application for Mental Health (Afterglow). The concept for this application formed through conversations regarding the stigma of mental health problems and access to counseling for students who may be afraid to seek help. Moreover, an iterative model was chosen to develop this application because it is easier to do testing and debugging. In addition, the iterative model is easily adaptable to meet the needs of the project. This application was developed in VS code using Dart programming language. Thus, the application developed is expected to help students control and manage emotions as well as increase their level of awareness of mental health issues in their daily lives.

Keywords: Mobile Application, Mental Health, Iterative Model, University Student, Dart

1. Introduction

Mental health refers to emotional, psychological, and social well-being. It is affecting the way people think, feel, and behave. Poor mental health has become a serious issue in many countries, Malaysia is also no exception especially among university students. Despite the government's efforts to raise awareness, Malaysian students' mental health remains challenging [1]. The performance of university students can be affected by mental health disorders such as depression, anxiety, and stress that are quite common among the students. However, today's universities are working hard to improve and expand mental health services, as well as to create an environment that are welcoming to students who are dealing with mental health problems.

The concept for this mental health app formed through discussions with University Counseling Centre (PCU), regarding the stigma of mental health problems and access to counseling for students who may be afraid to seek help in person or who do not have the transportation to get help right away. Most students are faced a problem that they do not know where to begin their knowledge on how to improve their mental health. They often tend to be hesitant or delay seeking treatment because they are

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concerned about being treated differently. Thus, PCU has recommended taking several simple therapy approaches, among them are self- monitoring, mood journal, and breathing exercises.

According to Malaysia's 2019 National Health and Morbidity Survey [2], one in every five adolescents suffered from depression which is highly treatable but is frequently diagnosed and untreated, two out of every five adolescents were anxious, and approximately one in every ten adolescents was stressed. The evidence clearly shows that students have difficulties from receiving proper support. For that reason, a mobile application for mental health will be developed specifically for depression, anxiety, and stress. As a result, students will learn to identify factors that cause depression, anxiety, and stress as well as provide awareness in dealing with mental health issues. This mobile application for mental health also will be able to record their emotions, focus on their thoughts, and send messages to counselors safely between the sessions anytime and anywhere. All the features and functions designed in this application are to provide a friendly environment for students who face mental health problems. Additionally, the application will motivate student to learn how to manage and improve their mood.

2. Literature Review

Most university counselling centres do not have a web-based system for maintaining data about students, staff, and counsellors. They maintain their records using Microsoft Excel and Microsoft Word. It is impractical to retain all data for a longer length of time, especially if the system was used for several purposes. There is a high probability of duplication, error, and mistake. Although UTHM's Counselling Management System (CMS) can record and store information about students, staff, and counsellors without entering data manually, the analysis shows that application is more popular than the web-based system as they are more convenient. The mobile application provides a superior user experience, load content faster, and have special features.

2.1 Android

Android is an operating system and software package for mobile devices like smartphones and tablet computers that is based on the open-source platform. Most of the code for Android is written in Java language, but other languages can also be used. The objective of the Android project is to develop a commercially viable product that enhances the mobile experience for end users.

Android is a comprehensive platform, meaning it is a complete mobile device software stack. Furthermore, android provides developers with the necessary tools and framework for rapidly and easily creating mobile applications. Even without a physical phone, a developer can begin developing for Android using the Android SDK [3]. Additionally, users have a lot of control over how their phone works. Not only the Android core libraries provide the functionality required to create incredible mobile applications, but the Android development tools also make running, debugging, and testing the applications effortless [4].

2.2 Study of Existing Systems

There are three existing applications that have been studied and compared to the features of the proposed application. The existing application studied including TFChat: Mental Health, Naluri and followed by Peerfy Mental Health Community. Each application has many advantages and special features of its own. This includes the modules contained in the Mobile Application for Mental Health (Afterglow). The comparison results are shown in Table 1.

Table 1: Comparison between Existing Application and Proposed Application

Features/System	TFChat	Naluri	Peerfy	Afterglow
Login and Sign-up	✓	✓	✓	✓
User Profile	✓	✓	✓	✓
Emergency	✓	✓	—	✓
Setting	✓	✓	✓	✓
Self-monitoring & Mood Journal	✓	✓	✓	✓
Breathing Exercises	—	—	—	✓
Matching with Counselor	✓	✓	—	✓

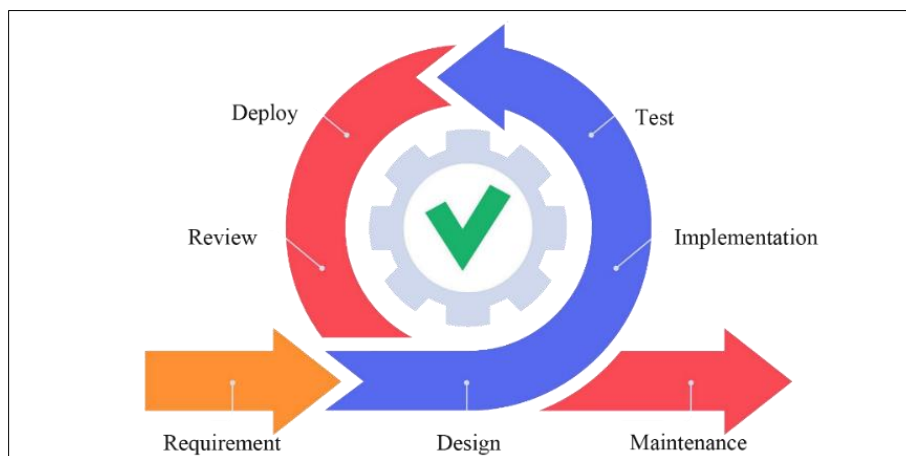
From a summary of comparisons between existing and proposed applications, the proposed application combines all three features into one application. Therefore, users do not have to abandon the application to use certain services. In addition, all functions in one application will reduce operating costs. Most of the existing apps are subscription-based apps, which require users to pay a fee to subscribe to the company's services.

3. Methodology

This section discusses the methodology and techniques applied to achieve the project objectives. The purpose of the methodology is to outline the methods used and analyze information gather to help the development process.

3.1 Iterative Model

The iterative model was chosen to develop this application because it is truly flexible where it is easier to do testing and debugging. It is something that is best suited for the development of this Mobile Application for Mental Health (Afterglow) as it will be constantly changing, and new updates are required depending on user feedback. During this mental health application development, more than one iteration of the software development cycle may be in progress at the same time. There are total of 7 phases from the Iterative model as shown in Figure 1 [5].

**Figure 1: Iterative Model**

As shown in Table 2, each phase has its own task and output that need to produce during the entire project development.

Table 2: Functional requirements

Phase	Task	Output
Requirement Gathering & Analysis	<ul style="list-style-type: none"> • Choosing the project title • Gathering and determining project requirements and information • Analyze and compare existing applications. 	<ul style="list-style-type: none"> • Project proposal • Develop Gantt chart • Discussion with PCU
Designing	<ul style="list-style-type: none"> • Specifying the programming language, frameworks, and libraries • Listing feature and test with prototype. 	<ul style="list-style-type: none"> • UI/UX • UML, Class diagram • Flowchart
Implementation	<ul style="list-style-type: none"> • Writing code. • Transformed into software. 	<ul style="list-style-type: none"> • Develop the application • Make improvements
Testing	<ul style="list-style-type: none"> • Perform some tests that involves functional testing, performance testing, interoperability, and user acceptance testing. • Identify whether this mental health application can meet the objectives and scope 	<ul style="list-style-type: none"> • Fixing the bugs or malfunctions • Perform further testing with the user
Deployment	<ul style="list-style-type: none"> • Deliver the completed and fully functional application to the user • A counselor from PCU and a few UTHM students will be trained. 	<ul style="list-style-type: none"> • Launch the application on the Play Store. • Keeping the application running smoothly and resolving the new bugs
Review	<ul style="list-style-type: none"> • Receive review • Examine the effectiveness of the application 	<ul style="list-style-type: none"> • If any errors are identified, the process starts over from beginning
Maintenance	<ul style="list-style-type: none"> • Some errors or new updates 	<ul style="list-style-type: none"> • Involves debugging and new functions or features.

Based on Table 2, each phase has its own assignment and output that need to produce during the entire project development. Besides that, the output had been completed within the specific days that have been given.

3.2 Analysis and Design

Analysis and design are an important phase to get a holistic view of the system. In addition, this analysis and design phase needs to be done more carefully to achieve the objectives that have been outlined for the development of the mobile application.

3.2.1. Functional & Non-Functional Requirements

This section will discuss functional and non-functional requirements. Unclear requirements result in a poorly defined scope. Thus, there are 7 modules in the functional requirements and their functions are discussed in Table 3 below.

Table 3: Functional requirements

No	Modules	Functionalities
1	Login Module	<ul style="list-style-type: none"> The application should allow the user to login using a username and password. The application should allow the user to input a valid username and password to be logged in as user. The application should alert the user for any invalid input. The application should redirect the user to their respective home page after successful login.
2	Sign-up Module	<ul style="list-style-type: none"> The system should allow the new user to register before login. The application should display an error when a duplicate username is entered.
3	Profile Module	<ul style="list-style-type: none"> The application should allow the user to view the profile. The application should allow the user to update their personal information.
4	Setting Module	<ul style="list-style-type: none"> The application should allow the user to change password. The application should allow the user to update their emergency contact The application should allow the user to change the setting for notification.
5	Self-monitoring & Mood Journal Module	<ul style="list-style-type: none"> The application should allow the user to add and view their mood. The application should allow the user to explain their mood and habit.
6	Breathing Exercises Module	<ul style="list-style-type: none"> The application should allow the user to view a list of breathing exercises. The application should allow user to choose the breathing exercise they want.
7	Matching with Counselor	<ul style="list-style-type: none"> The application should allow the user to connect with the counselor. The application should allow users to choose the counselor they want.

Non-functional requirements specify the criteria that can be used to judge the operation of a system, rather than specific behaviors [6]. Hence, the non-functional requirements are listed in Table 4.

Table 4: Non-functional requirements

No	Requirements	Description
1.	Performance	The reasonable operation and response time of the operating system should be expected.
2.	Operational	The application should be able to work on the android platform.
3.	Usability	The general appearance and flow of the application are easily understood by all type of users.
4.	Security	The physical installation and from a cyber perspective are protected from an unauthorized party. The login module will verify the correct user account and if not verified the login information will be denied access to the application
5	Integrity	The database of the application will be kept properly and secured by the system from any corruption and non-readable

As can be seen, a non-functional requirement is important to ensure the overall mobile application usability and effectiveness.

3.2.2. Use Case Diagram

Use case diagram represents the methodology used in system analysis to identify, clarify, and organize system requirements of Mobile Application for Mental Health (Afterglow). The actor or user identified as Student, who perform the different type of use case as shown in Figure 2 below.

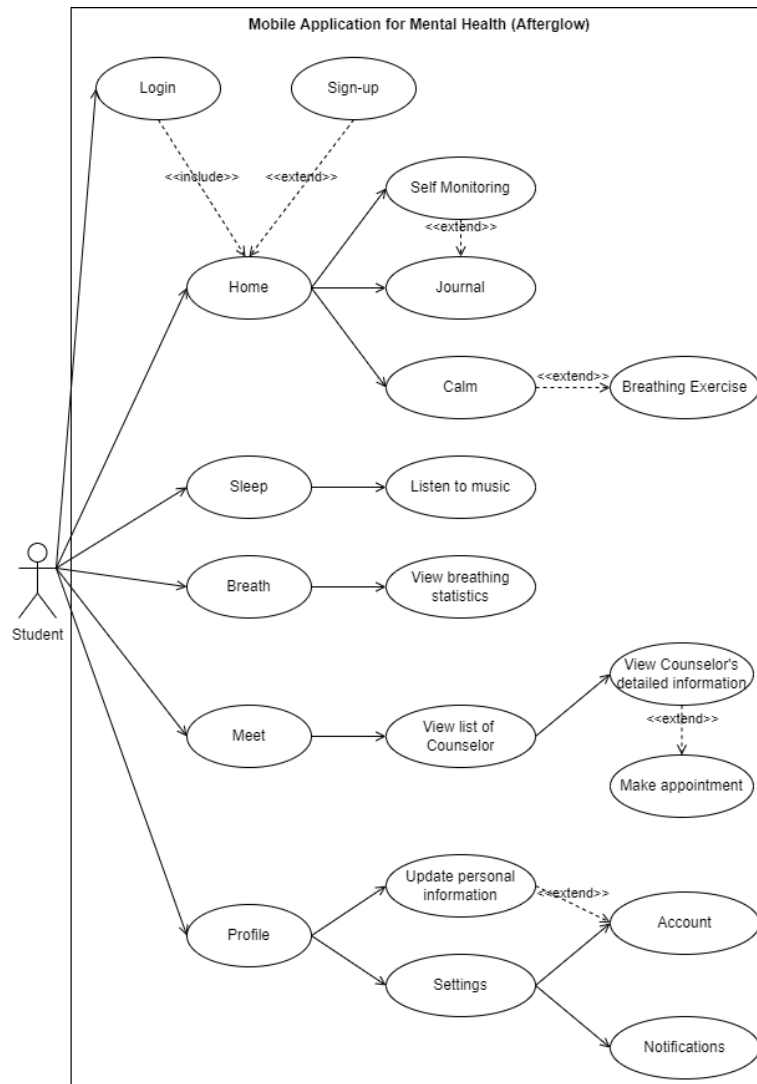


Figure 2: Use Case Diagram for Student

The students must first log in to use the application. For students who are using the application for the first time are required to complete the registration process. However, students who have already used the application will go directly to the home page and select a mood journal or self -monitoring or breathing exercise according to their choices.

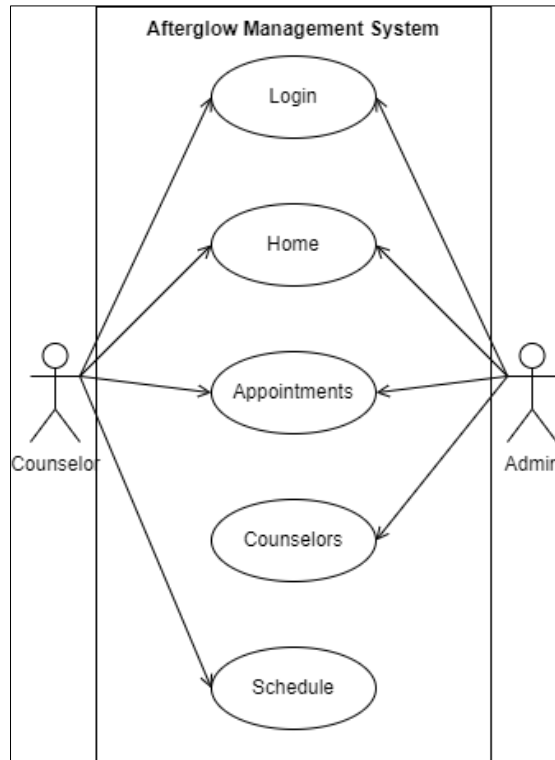


Figure 3: Use Case Diagram for Admin and Counselor

Besides that, the counselor can accept or reject the appointment made by the student through matching with counselors. Beforehand, the administrator will first need to update the schedule for counselor as available at the Matching with Counselor module to ease the student find a suitable counselor and make an appointment.

3.2.3. Flowchart

This flowchart will show the different entry points and alternate paths for student. The flow roughly will be drawn from one operation to another. Figure 3 below shows the flowchart of the Mobile Application for Mental Health (Afterglow).

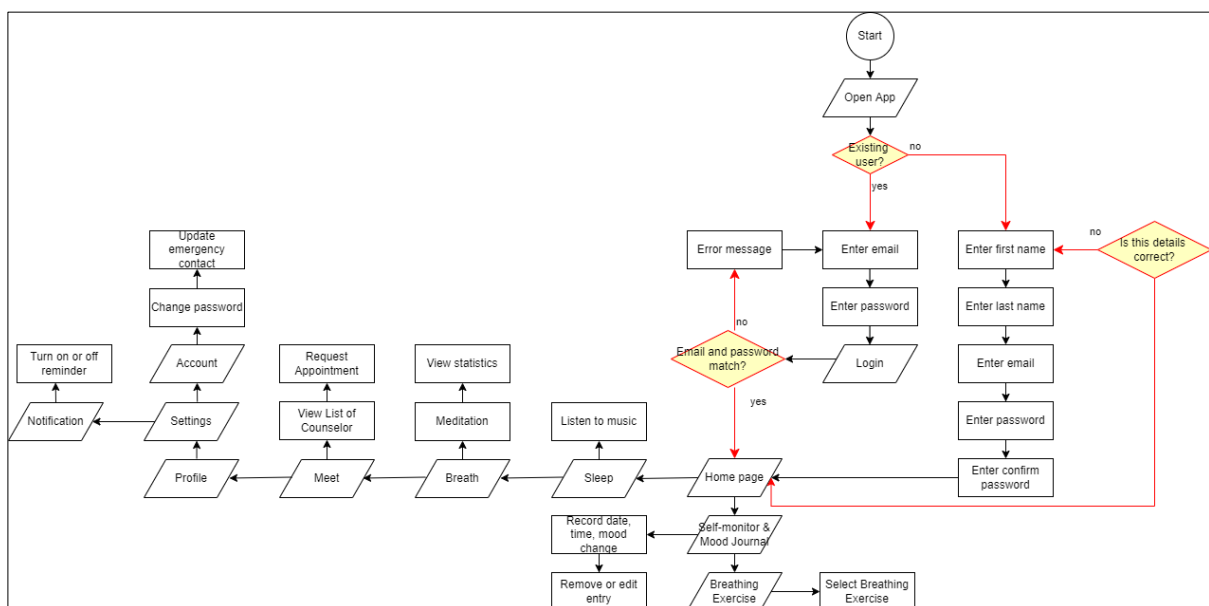


Figure 4: Flowchart of the Mobile Application for Mental Health (Afterglow)

Figure 4 above illustrates the flowchart of Afterglow application. First-time users of the application are required to register before being given permission to use the application. However, user who has previously used the application will proceed directly to the home page and select either a self-monitoring & mood journal, or breathing exercise based on their preferences.

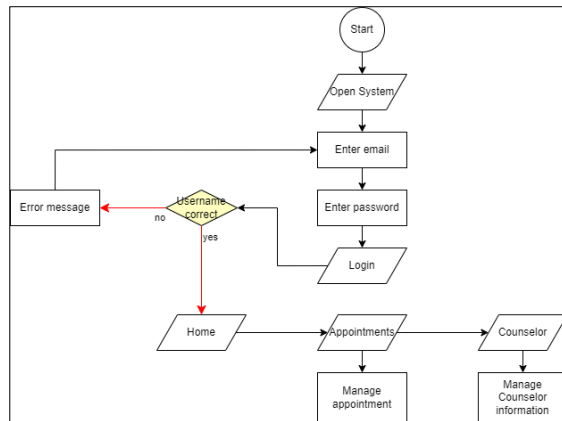


Figure 5: Flowchart of the Afterglow Management System for Admin

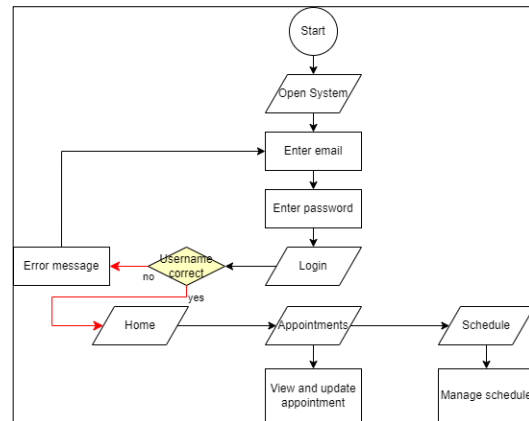


Figure 6: Flowchart of the Afterglow Management System for Counselor

Figure 5 and 6 provides a visual representation of flowchart for Admin and Counselor in this Afterglow Management System. A login page requires user identification and authentication, which is typically accomplished by entering an email and password.

For Admin, they can add new appointments for counselor and student. Not only that, admin also can update and select the status of appointments to approve them in the system. In the same way, appointment statuses, such as "request", "confirm", or "reschedule" can be updated by the counselor. Besides that, admin can add a user and grant them certain privileges. To point out, admin can insert the counselor's information in the counselor's form.

3.2.4. Interface Design

The interface of this application was developed using Visual Studio Code. The application interface is very important to help users to use the system more easily.

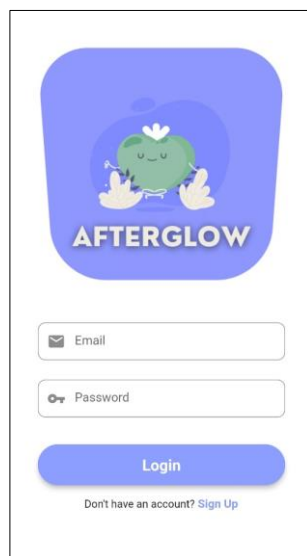


Figure 7: Login Screen

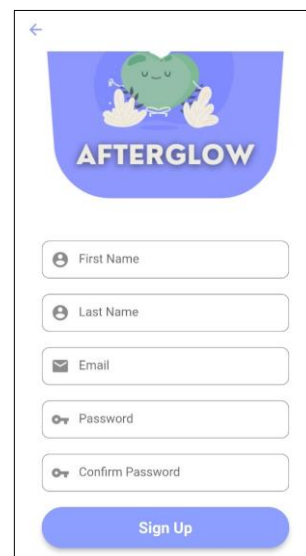


Figure 8: Sign-up Screen

Figure 7 shows that a username and password are needed to identify the user and verify their identity. The users will need to re-enter their username and password if their initial attempt fails. In addition, users who are using this mobile application for the first time must register by clicking the Sign-up button displayed in Figure 8.

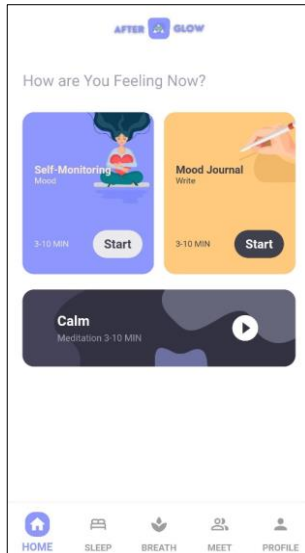


Figure 9: Home Screen

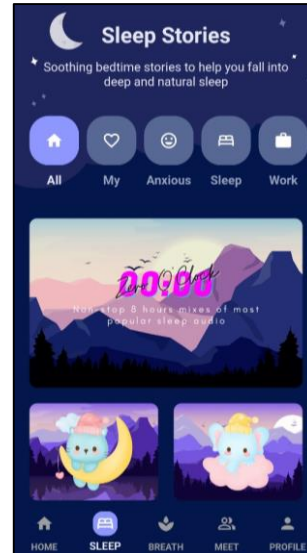


Figure 10: Sleep Screen

The application will take the user to the home page after they have successfully logged in, as shown in Figure 9 above. From there, the user can select a self-monitoring, a mood journal, or a breathing exercise based on their preferences. Moreover, user can click to Sleep page as display in Figure 10. Sleep Page is a form of therapy that uses music to help user get a better night's sleep.

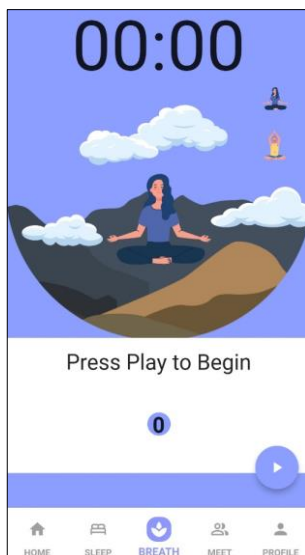


Figure 11: Breath Screen

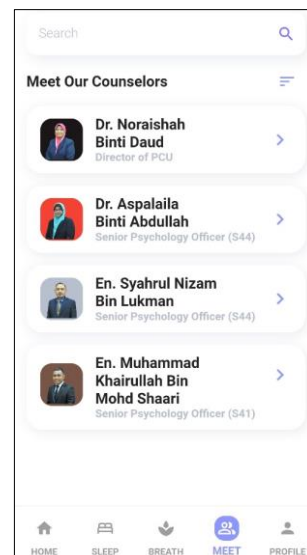


Figure 12: Meet Screen

If users start to feel out of control, taking a few deep breaths can help them to calm down and center themselves. If they need to, they can keep going as long as they want as shown in Figure 11. Other than that, students also can view counselor details and make counseling appointments as shown in Figure 12, which will be accommodated according to the counselor's schedule.

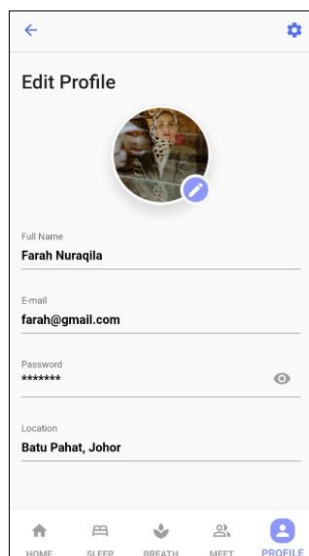


Figure 13: Profile Screen

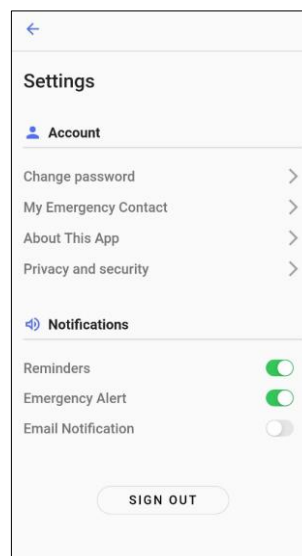


Figure 14: Setting Screen

Based on Figure 13, a user profile is a collection of information and settings associated with a user. It includes identifying information such as names, email addresses, and profile pictures. In addition, the setting page, allows users to specify preferences regarding how the application should operate. According to Figure 14, the application includes change password, my emergency contact, about this app, privacy and security, reminders, emergency alert, and email notifications.

4. Result and Discussion

This section explains the phase of implementation and testing for the entire application. There are a few processes involved in this phase, which define how the mobile application should be built and ensure that the overall functionality of the application will be operated to meet the PCU requirements.

4.2 Functional Testing

The testing phase is where the application for mental health is nearly ready for release. Nonetheless, the developer must conduct tests to ensure that the application is fully functional. In general, writing a test case can assist to ensure that the mental health application is bug-free and compatible with everything written in the previous phases. Thus, the functional test case is briefly described in Table 5 as below:

Table 5: List of functional test cases

No.	Test Cases	Description	Status
Test Case Database Connection (Test_01)			
1.	TEST_01_01	Connect the mobile application to Firebase	PASS
2.	TEST_01_02	Connect the system to Firebase	PASS
Test Case Login Screen (Test 02)			
1.	TEST_02_01	User inserts correct username and password	PASS
2.	TEST_02_01	User inserts incorrect username and password	PASS
Test Case Sign Up Screen (Test 03)			
1.	TEST_03_01	User inserts the correct information	PASS
2.	TEST_03_02	User let the field empty	PASS
Test Case Home Screen (Test 04)			
1.	TEST_04_01	User can record the date, time, mood change	PASS
2.	TEST_04_02	User can remove or edit the entry	PASS

Table 5: List of functional test cases (cont.)

No.	Test Cases	Description	Status
3.	TEST_04_03	User can choose breathing exercise	PASS
Test Case Sleep Screen (Test 05)			
1.	TEST_05_01	User can listen to the music	PASS
Test Case Breath Screen (Test 06)			
1.	TEST_06_01	User can click button to start breathing	PASS
2.	TEST_06_02	User can see the statistic after breathing	PASS
Test Case Meet Screen (Test 07)			
1.	TEST_07_01	User clicks the counselor detail	PASS
2.	TEST_07_02	User makes an appointment	PASS
Test Case Profile Screen (Test 08)			
1.	TEST_08_01	User can edit personal information	PASS
2.	TEST_08_02	User can change setting	PASS
Test Case Login Page for Admin and Counselor (Test 09)			
1.	TEST_09_01	Admin and counselor can insert correct username and password	PASS
2.	TEST_09_02	Admin and counselor can insert incorrect username and password	PASS
Test Case Appointment Page for Admin (Test 10)			
1.	TEST_10_01	Admin can add new appointments for counselor and student	PASS
Test Case Counselors Page for Admin (Test 11)			
1.	TEST_11_01	Admin can add new counselor	PASS
2.	TEST_11_02	Admin can give certain access to the system	PASS
Test Case Appointment Page for Counselors (Test 12)			
1.	TEST_12_01	Counselor can update their status of their appointment	PASS
Test Case Schedule Page for Counselors (Test 13)			
1.	TEST_13_01	Counselor can view their schedule	PASS

In this functional testing phase, the output of each function is compared to the corresponding requirement to see if it meets the expectations of the end-user.

4.2 User Acceptance Testing

User acceptance testing is conducted by actual users of the application. The test was performed to determine whether or not the application meets the requirements. Particularly, a questionnaire was prepared and shared with the users for them to evaluate and provide feedback on the application. Table 6 displays the results obtained from the users.

Table 6: User Acceptance Testing Form

No	Acceptance Requirement	Test Result (Number of People)	
		Accept	Reject
1	Registration module working well	7	
2	Login module working well	7	
3	Profile module working well	7	
4	Setting module working well	7	
5	Self-monitoring & Journal module working well	6	1
6	Breathing module working well	7	
7	Counselor module working well	5	2
8	Buttons in the application are functional	7	
9	Typography, colours, icons and graphic are appropriate	7	
10	Interface is attractive	7	
11	Application are user friendly	7	

As shown above, where the user acceptance of the mobile applications is tested, and a total of 7 users were involved in helping provide feedback. In this case, users are given the opportunity to interact with the application before its official release to determine if any features or bugs have been overlooked.

Overall, the respondents agreed that this mobile application for mental health works because it's easy to use, increases engagement in treatment plans and makes monitoring symptoms easier.

5. Conclusion

To sum up everything that has been stated, this mobile application for mental health (Afterglow) has been successfully developed to meet its goals, even though it had some difficulties in the beginning, but it still meets the needs and wants of its users. As a result, the Afterglow can be an effective tool for improving the mental health of its users. Aside from reducing stress and anxiety, it offers to help in dealing with depression. It also claims to help students control and manage their emotions. Furthermore, it can assist in reaching out to students and increasing their awareness of mental health issues in daily life. After all, the objectives of this project have reached a very satisfactory level, starting with the planning stage, and going all the way to the end. Therefore, with the existence of this application, it can help users to record their emotions and concentrate on their thoughts anytime and anywhere. All the features and functions designed in this application provide a friendly environment for students who face mental health problems. In fact, the recommendation for improvements that have been provided will surely be helpful in helping others.

Acknowledgment

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