

The Development of Mobile Application for Online Psychotherapy and Mood Tracking

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Abstract: The mobile application is developed to solve the problems faced by the public of the ways of handling mental issues, which are that the geographic separation between the therapists and the patients makes psychotherapy difficult to be carried out, the lack of awareness of mental health issues, and the mental illness stigma. This project is to develop a mobile application which serves as a tool for mood tracking and as a platform for users to conduct psychotherapy online. The project is developed using prototyping methods. The mobile application is constructed using Android Studio and Firebase database. Testing is conducted at the end of this project to ensure the developed mobile application achieves the objectives. The outcomes of the project are that users can easily connect with professionals in mental health therapy and users can track and always be aware of their mental health condition.

Keywords: Mental Health, Mobile Application, Psychotherapy

1. Introduction

According to the World Health Organization (WHO) [1], the definition of mental health is “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stress of life, can work productively and fruitfully, and is able to make a contribution to his or her community”. The statistics from the National Health and Morbidity Survey which was carried out by the Minister of Health (MOH) of Malaysia in the year of 2019 [2] shows that 2.3% of Malaysian adults suffer from depression, which is approximately five hundred thousand people. Not only that, in the same survey, 424000 Malaysian children were found to have mental health disorders.

One of the reasons for the current situation is geographic separation. Patients with mental illness must travel to specific locations to get treatment, which requires time, money, and motivation. It is also very difficult for those who live in the area which do not have a center which provides mental health related services.

Moreover, lack of awareness poses a challenge to mental health issues [3]. The patients cannot identify the features of mental illness and hence they do not know that they have mental illness.

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Furthermore, mental illness stigma has been identified as a major barrier for those who suffer from mental illness [4]. The individuals with mental illness are considered as crazy and dangerous. This adds on more stress toward the individuals.

Several objectives are set to be achieved to solve the problems, which are:

1. To design a specific platform which allows users to get services from the professionals and record their mental health condition.
2. To develop a mobile application using a web-based approach.
3. To test the developed application.

The target of the mobile application is people who are concerned about their mental health and the professionals in mental health. Users can get services like psychotherapy and counseling from the professionals and the professionals provide the service like psychotherapy and counseling.

2. Related work

2.1 Mental health

Mental health is defined by the World Health Organization (WHO) as an emotional positive state in which an individual knows his or her own abilities, can deal with the normal stresses of life, can work productively and is able to contribute to his or her community [1].

There are several major methods to deal with mental health problems [5]. Among the methods, pharmacotherapy is a therapy which uses drugs such as antidepressants to treat mental illness. The drugs can only be prescribed by certificated professionals in the field of psychiatry. Moreover, psychotherapy or also known as talking therapy, is the psychological method which helps patients relieve their mental health problems by the interactions with the psychotherapist.

2.2 Application Programming Interface (API)

API is a type of interface which provides service to other software. It is not intended to be used directly by the end users. Hence, API must be called by a program to be used [6].

To use the API, first, the client application must send a request with proper format to the web server. Then, API sends a call to the web server after receiving a valid request. After that, the web server sends a response to the API with the requested information. Finally, the API sends the data to the client application [7].

The API protocol is the set of rules which defines the format of the input data types and commands. There are several types of API protocol, 2 major API protocols nowadays are SOAP and REST. SOAP, also known as Simple Object Access Protocol, is written using XML. It allows clients to make requests and get responses through SMTP and HTTP. REST, also known as Representational State Transfer, is a set of web API architecture principles. It is relatively easier for systems to communicate with each other because it has no official standards [7].

2.3 A study on similar applications

Three existing applications similar to the mobile application to be developed in this project were chosen to be compared. The selected applications were BetterHelp, ThoughtFullChat and My Online Therapy. The comparison between the existing applications and the proposed application is shown in Table 1.

Table 1: Comparison between the existing applications and the proposed application

Features	BetterHelp	ThoughtFullChat	My Online Therapy	Proposed Application
Support IOS	✓	✓	✓	X
Support Android	✓	✓	✓	✓
Text messaging	✓	✓	✓	✓
Audio messaging	✓	✓	X	X
Voice call	✓	X	X	X
Video call	✓	X	✓	✓
Record mood	X	✓	✓	✓
View mood record	X	✓	✓	✓
Mental health courses	X	✓	✓	X
Auto match with therapists	✓	X	✓	X

✓ = exist, yes
X = not exist, no

BetterHelp, ThoughtFullChat and My Online Therapy support both IOS and Android operating systems but the proposed application supports Android system only. Moreover, all the applications provide mood tracking features except BetterHelp. The proposed application provides a feature for users to rate the therapists which is not provided by the existing applications. Furthermore, only ThoughtFullChat and My Online Therapy provide mental health courses. Betterhelp and My Online Therapy also provide a feature to auto match patients with the suitable therapists which is not provided by ThoughtFullChat and the proposed application.

3. Methodology

The methodology model used in the project is the prototyping model. Prototype is a premature sample of the products, which is created to be tested [8]. In prototyping models, the process of creating a prototype and testing the prototype are kept repeating before achieving the final version of the product. There are six Software Development Life Cycle (SDLC) phases in the model as shown in Figure 1.

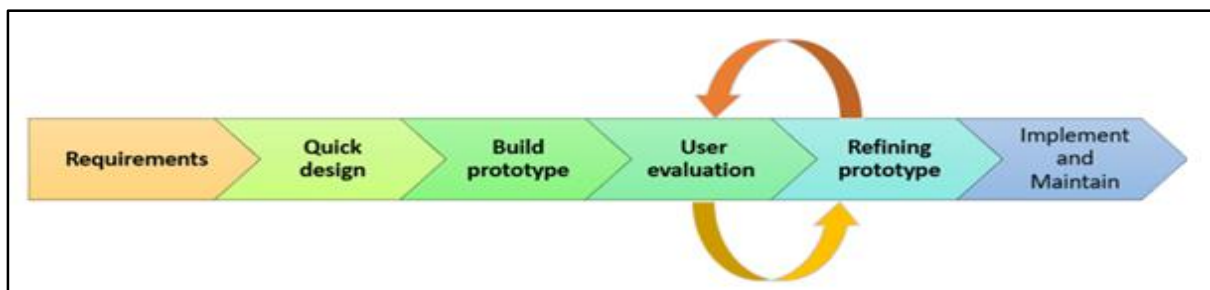


Figure 1: The prototyping model [8]

There are several types of prototyping models, which are rapid throwaway prototyping, evolutionary prototyping, incremental prototyping and extreme prototyping.

In rapid throwaway prototyping, a prototype is constructed based on the preliminary requirements to visualize the requirements. The feedback of the users will be collected to improve the

prototype, Then, the prototype will be discarded and recreated until the requirements are met. This method is useful to explore ideas and get instant feedback from the users to update the requirements.

Evolutionary prototyping is the method in which a prototype is created and is incrementally refined according to the feedback from the users until all the requirements are met. This method is useful for complicated products and when the technologies used in the project are not well-understood.

Moreover, incremental prototyping divides the requirements into small individual parts to be created as different prototypes. The small prototypes will finally be combined into the final products.

Lastly, extreme prototyping. This method is commonly used by web-based applications. It is made up of three sequential phases, which are:

1. Create basic prototype with basic requirements using HTML format.
2. Simulate data process using a prototype services layer.
3. Implement and integrate the services into the final prototype.

Evolutionary prototyping is chosen to be used in this project because the project is complicated, the technologies used are not familiar and the requirements will be changed due to the feedback from the users.

3.1 Requirements gathering and analysis

In this phase, several requirements are gathered, such as functional requirements, non-functional requirements, hardware requirements and software requirements. The requirements are gathered by referring to the existing applications and referring to the materials like academic theses, and academic journals. The hardware requirements are shown in Table 2 and the software requirements are shown in Table 3. The functional requirements and non-functional requirements are respectively shown in Table 4 and Table 5. The user requirements are also represented by using a use case diagram represented by Figure 2. In this phase, activity diagrams for users, therapists and admins are also drawn to have a better understanding of the flow of the activities. Activity diagrams for users, therapists and admins are represented respectively by Figure 3, Figure 4 and Figure 5.

Table 2: Hardware requirements (Laptop)

No.	Device specifications	Description
1.	Processor	Intel(R) Core (TM) i5-9300H CPU @ 2.40GHz 2.40 GHz
2.	RAM	16.0GB
3.	ROM	1 TB HDD + 256 SDD
4.	Graphic card	Nvidia 1050ti

Table 3: Software requirements

No.	Software	Description
1.	Microsoft Word 2019	Used for documentation.
2.	ProjectLibre	Used to create Gantt charts.
3.	Android studio	Used to develop Android applications.
4.	Firebase	Used as a database to store and retrieve data.
5.	Draw.io	Used to create diagrams, such as class diagrams, Entity-Relationship diagrams.
6.	Adobe XD	Used to design wireframes.

Table 4: Functional requirements

No.	Functions	Functionalities
1.	Register	Allow users and therapists to register a new account of the application with a valid email, username and password.
2.	Login	Allow users, therapists and admins to login into the application with valid email, username and password.
3.	Logout	Allow users, therapists and admins to log out of the application.
4.	Mood record	Allow users to record their mood into the application.
5.	Report summary	<ul style="list-style-type: none"> - Users can view mood history - Therapists can view summary of progress in pie chart form - Admin can view the therapist's monthly number of clients
6.	Account management	<ul style="list-style-type: none"> - Users and therapists can edit their personal profile and personal information. - Therapists can upload and update their certificates - Admin can view, update, block users and therapist's account - Admin can verify therapist's account
7.	Therapy	<ul style="list-style-type: none"> - Users can have therapy with therapists - Therapists can conduct therapy with patients
8.	Payment	<ul style="list-style-type: none"> - Users can pay to make subscribe to therapists

Table 5: Non-functional requirements

No.	Requirements	Description
1.	Security	<ul style="list-style-type: none"> - Users can only access the application with valid email and password. - The password must be longer than six characters.
2.	Performance	<ul style="list-style-type: none"> - The application should be available 24/7, except for scheduled maintenance. - The application can locate the correct session depending on the user authorized.
3.	Operational	<ul style="list-style-type: none"> - The application is only available when there is internet connection. - The application runs on the Android operating system.

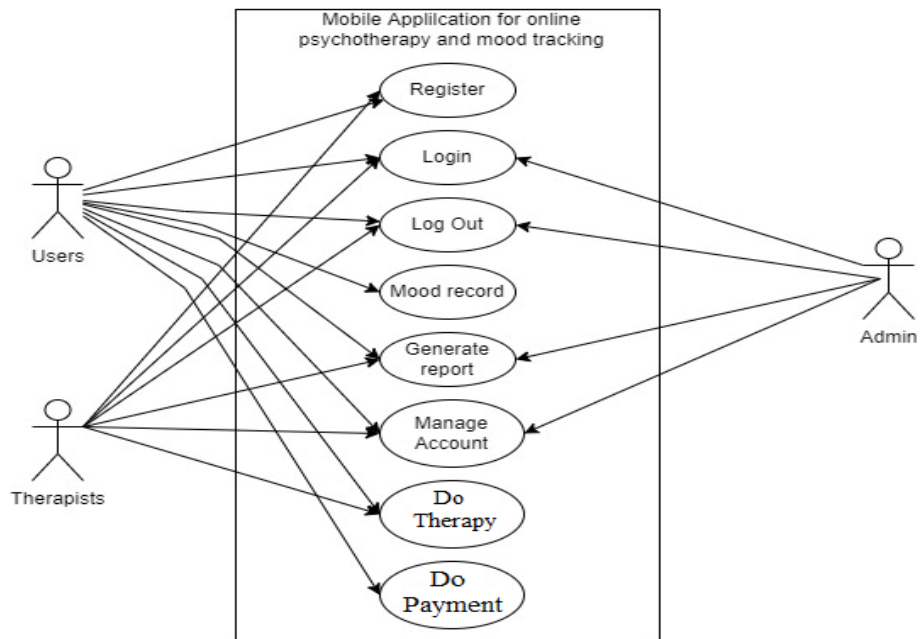


Figure 2: Use case diagram

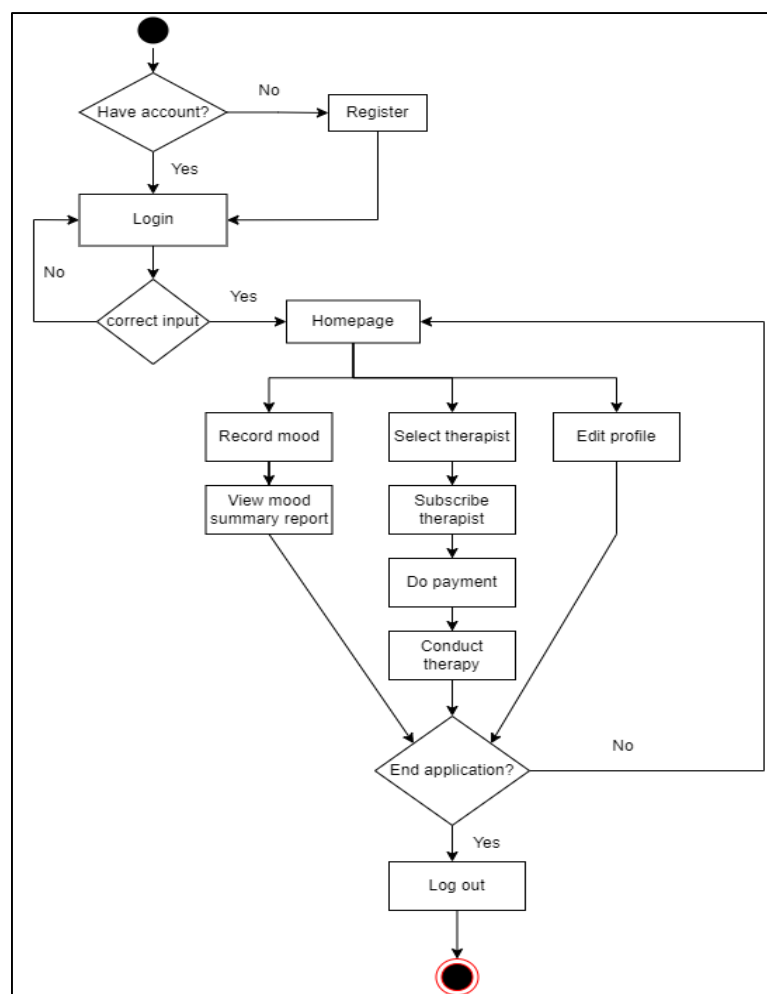


Figure 3: Activity diagram for users

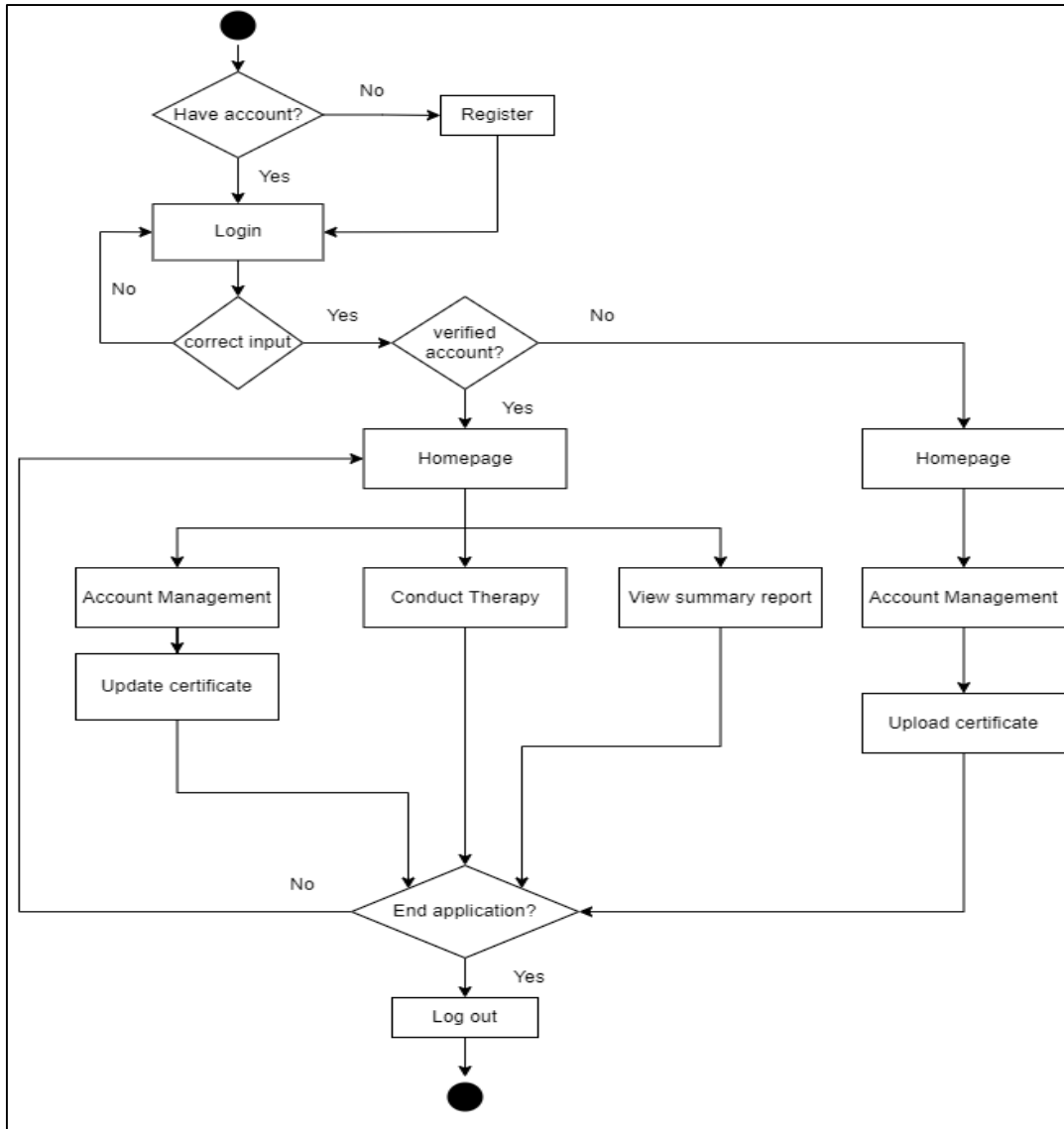


Figure 4: Activity diagram for therapists

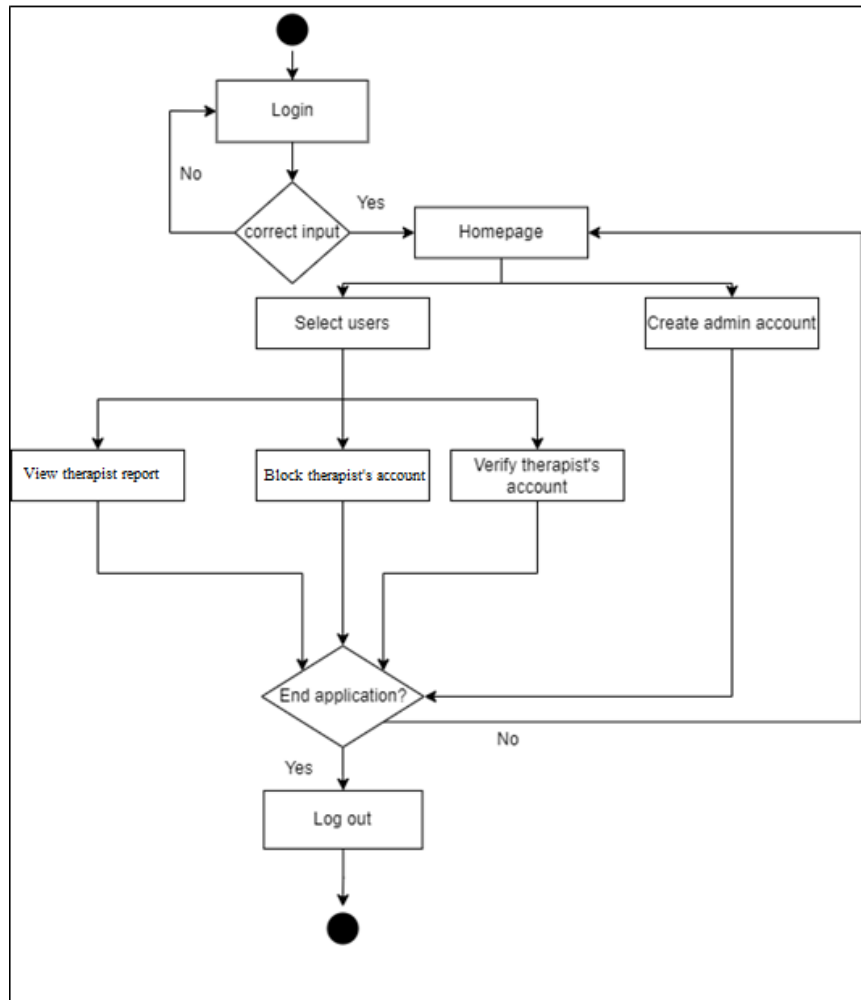


Figure 5: Activity diagram for admins

3.2 Quick design

In the quick design phase of evolutionary prototyping, a wireframe is designed using Adobe XD software. The wireframes were designed based on the user requirements gathered in the previous stage. It is created to give clearer ideas of how the user interface of the mobile application should be looked like. Database is also designed to ensure the data integrity in the database. The Entity Relationship Diagram (ERD) is drawn using “draw.io” and is represented by Figure 6.

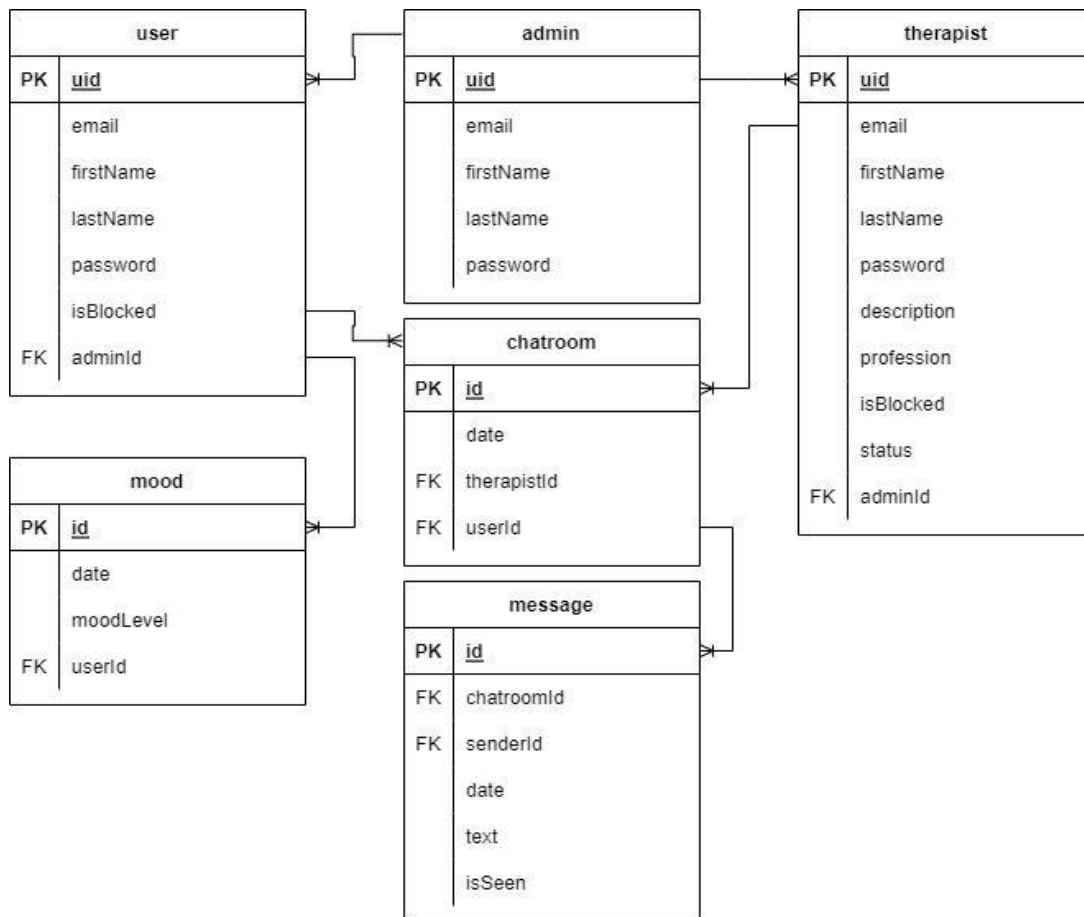


Figure 6: ERD of the project

3.3 Build Prototype

In this phase, a prototype will be developed in Android Studio IDE using flutter framework and dart language. Firebase is used as the database of the prototype.

3.4 User Evaluation

The prototype will be evaluated by users. After this, the prototype will be refined according to the feedback given by the users.

3.5 Refining Prototype

In this stage, the prototype will be reviewed and will be enhanced according to the feedback given by the users. The phase is iterative and keeps repeating until all the requirements are met. After all the requirements are achieved, the final product can be created based on the final version of the prototype.

3.6 Implement and Maintain

The final product is developed in this stage based on the final version of the prototype created. The proposed mobile application will be developed in Android Studio IDE using Flutter framework and Dart language. Firebase is used as the database of the proposed mobile application to store and retrieve all the data used in the mobile application. After that, the developed mobile application will be tested to ensure it achieves all the requirements without bugs. Lastly, functional testing and User Acceptance Testing will be carried out in this phase.

4. Implementation and Testing

4.1 Implementation

The mobile application is developed using Android Studio. Moreover, the Framework used is Flutter and the language used is dart. The database used is Firebase.

Figure 7 shows the registration page and login page. Users must choose an account type, fill in first name, last name, email, password and confirm password to register. All types of users use the same login page, users must enter valid email addresses and password to login. There is a “forgot password” button for those who forgot password to reset password.

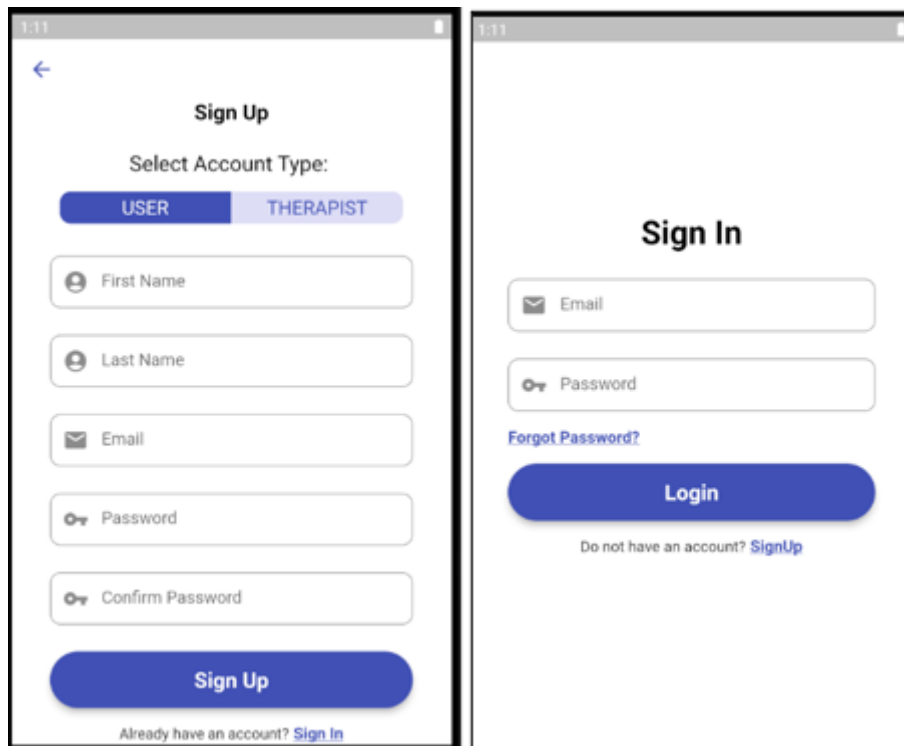


Figure 7: registration page and login page

After login, users can view a list of “verified” therapists, users can view the therapist profile and click the consult button to start communicating with the therapists as shown in Figure 8.

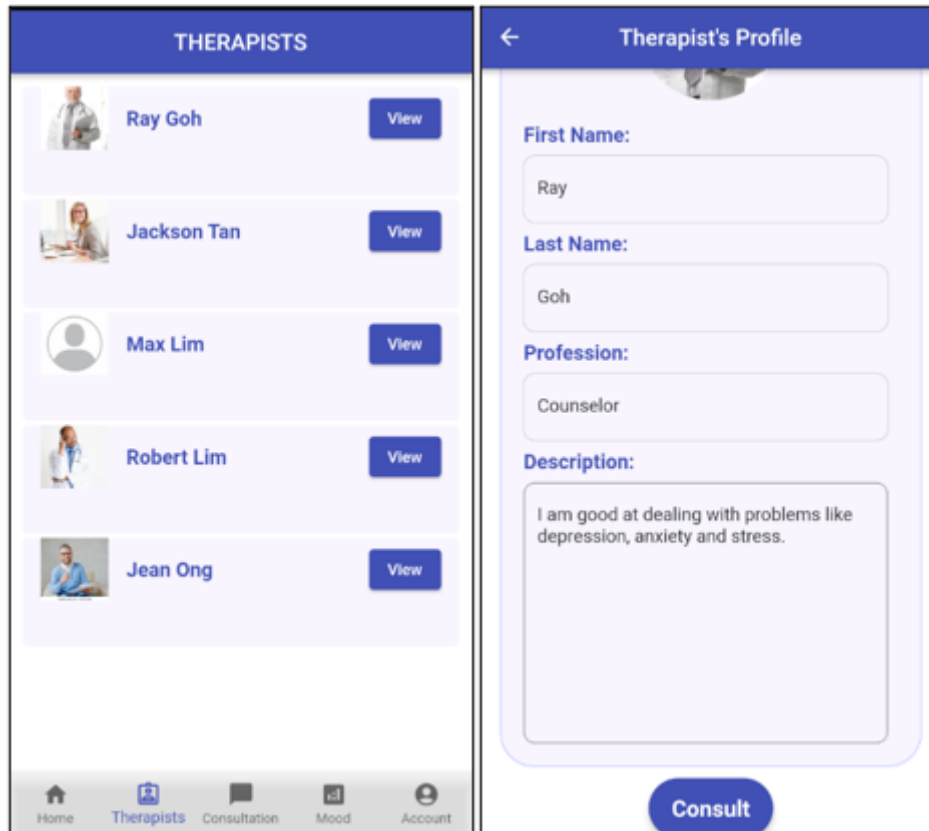


Figure 8: UI to view therapist

After clicking the consult button, they can send a message and video call with the therapists by clicking the button at the right top corner, the process is shown in Figure 9.

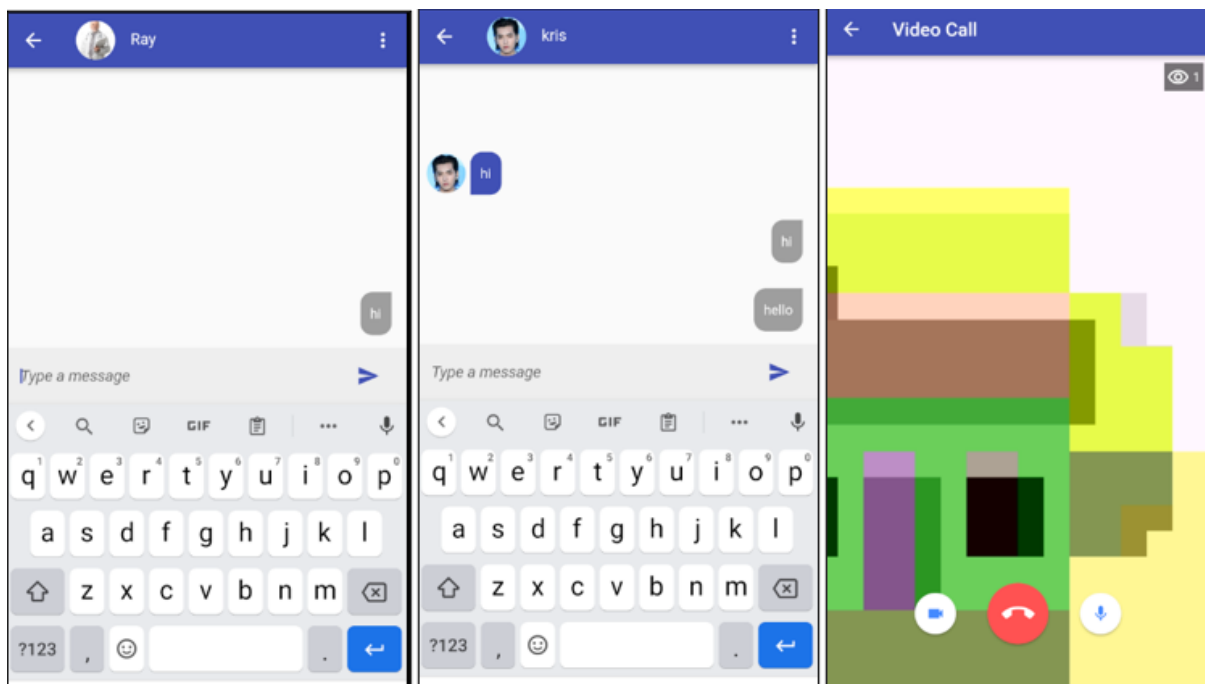


Figure 9: the process of communication between user and therapist

Moreover, users can record their mood level from 1 (very bad) to 5 (very good). The monthly record will be shown in line chart for the selected month as shown in Figure 10.

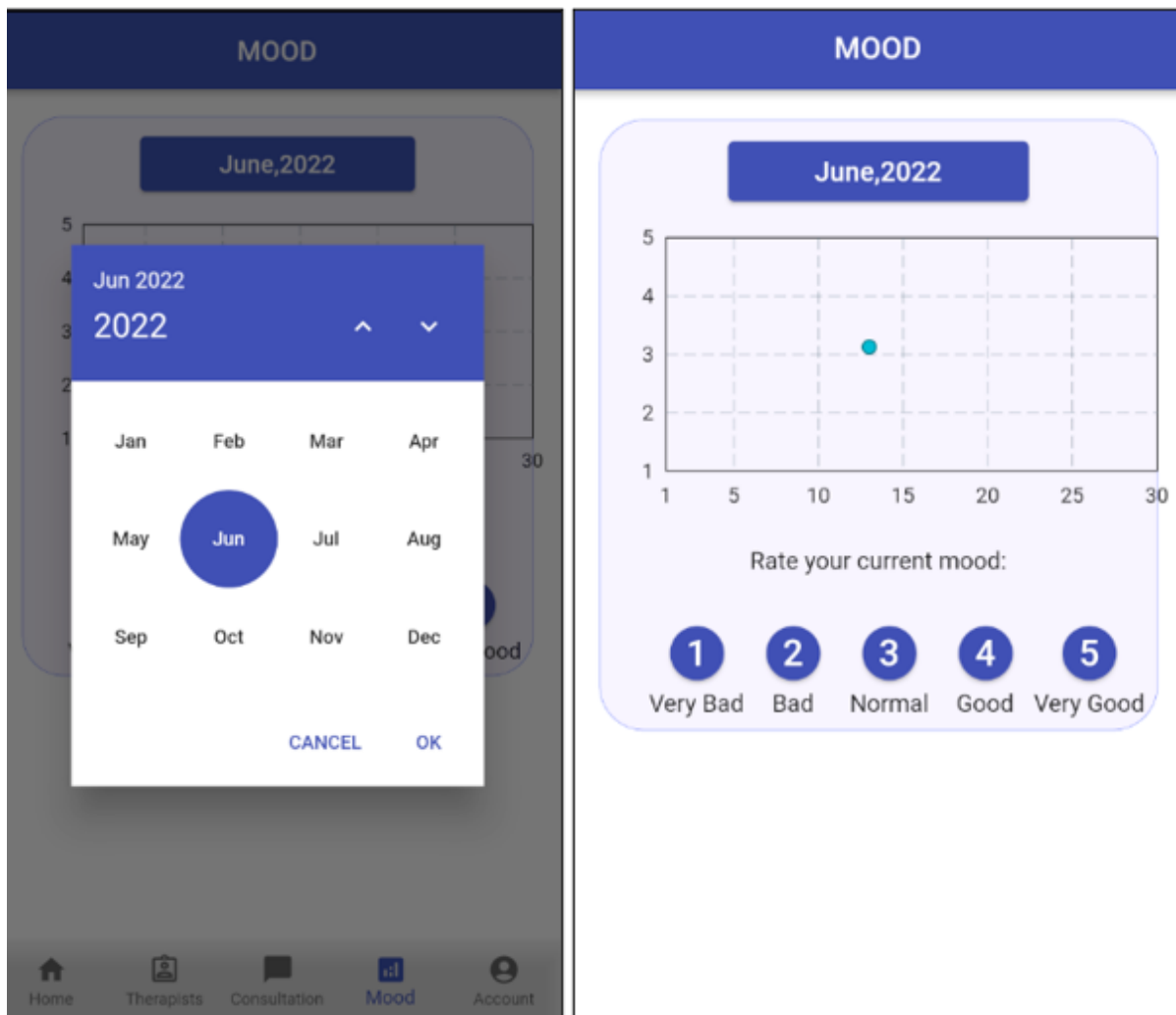
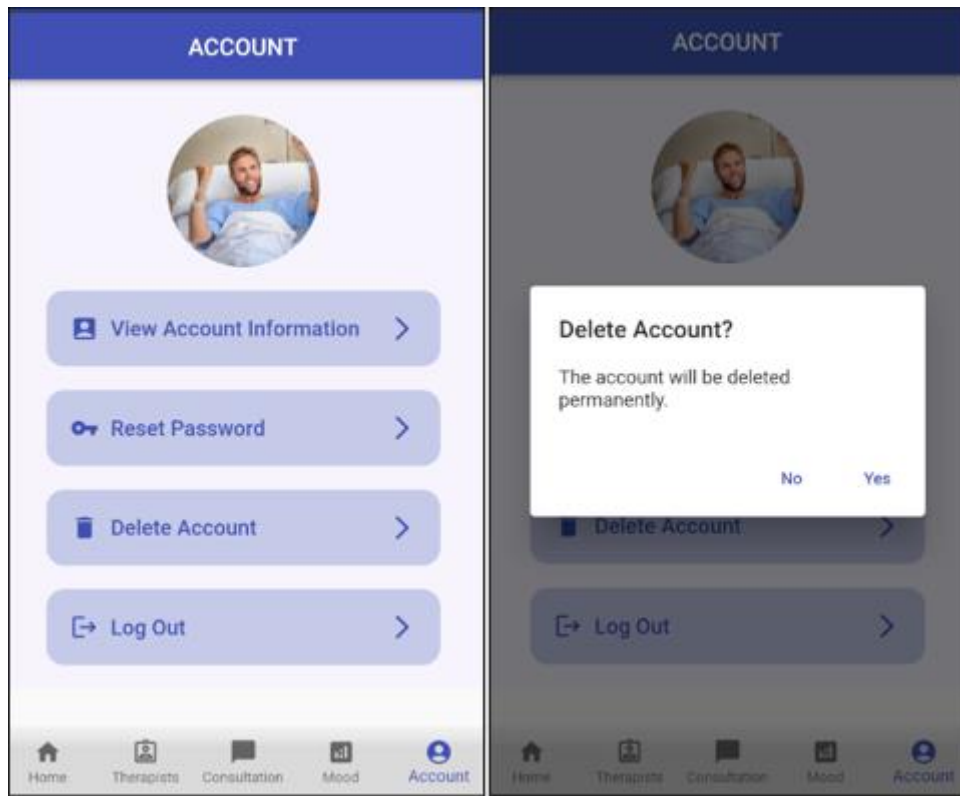


Figure 10: UI for mood tracking

Users can delete their account if they want to. The user's data will be permanently deleted from the database if users delete their account. The UI is shown in Figure 11.



Therapists can view the report on the progress of the current clients. The report is shown in pie chart form. The UI is shown in Figure 12.

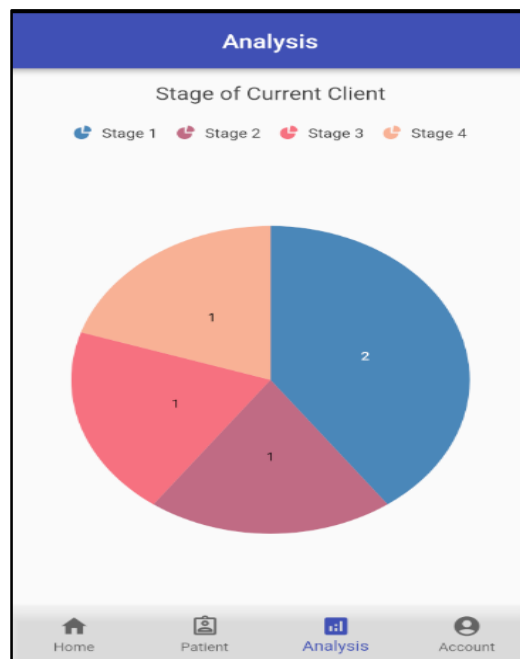


Figure 12: Analysis of current progress.

For the verification of the therapist account, the therapist has to upload documents to prove that he is qualified. Admin can view the uploaded documents and verify the therapist account by clicking on the verify button. Admin can also click the “Data” button to view the monthly report of the total number of clients of the therapist. The process is shown in Figure 13 and Figure 14.

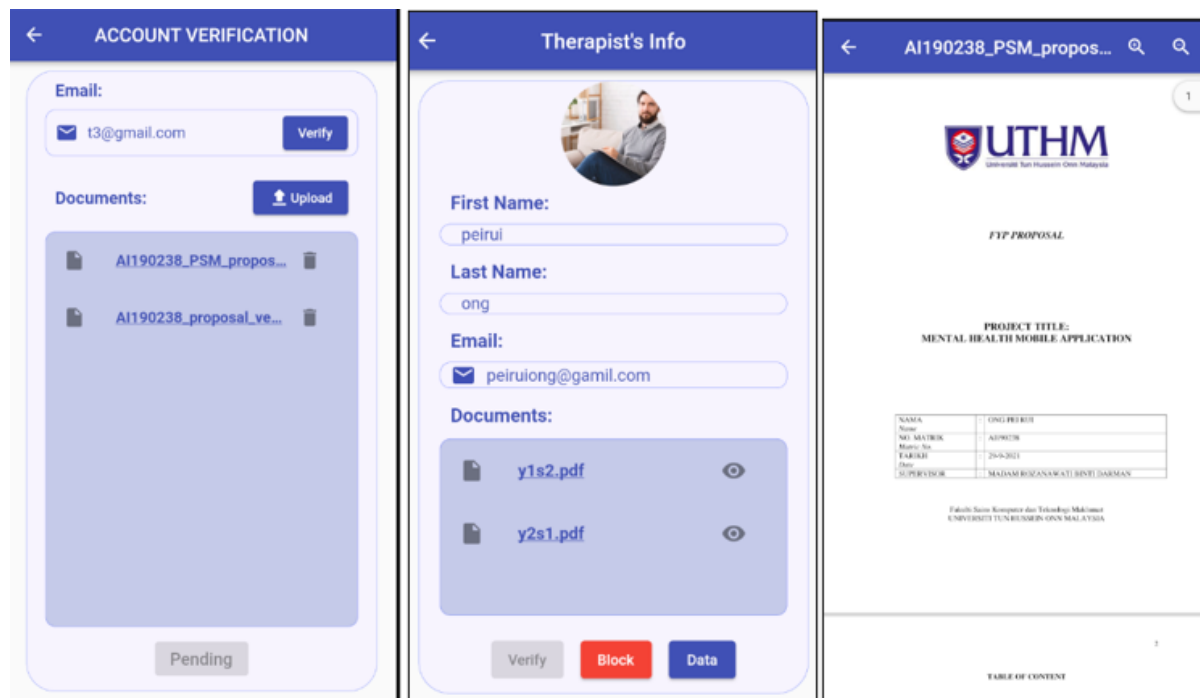


Figure 13: Process of therapist account verification

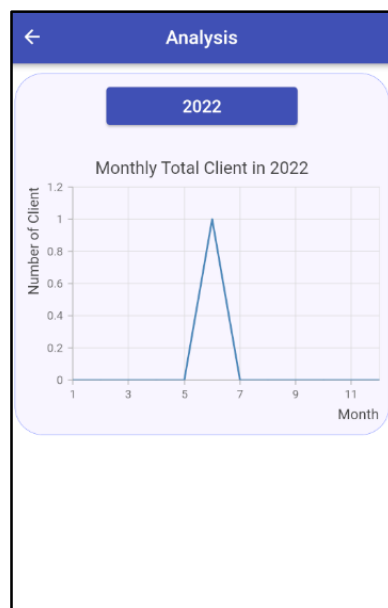


Figure 14: UI of monthly total client of the therapist

4.2 Testing

4.2.1 Functional Testing

Functional testing is conducted on the proposed mobile application to ensure that the functionality of the mobile application is working as per the requirements specification, within the capabilities of the mobile application. A test plan documents the strategy that will be used to verify and ensure that the developed application meets its design specifications and other requirements. Table 6 shows the testing results of the proposed mobile application.

Table 6: Testing results of the proposed mobile application

Functions	Test Cases	Expected result	Actual result
Registration	The data input field is blank	An alert message will be displayed if the field is blank.	Pass
	Unique email	An alert message will be displayed if the email is already used.	Pass
	Invalid email format	An alert message will be displayed if the email is badly formatted.	Pass
	Invalid password	An alert message will be shown if the password is shorter than 6 characters.	Pass
	Invalid confirm password	An alert message will be shown if the confirmed password is not the same with the password.	Pass
	Complete registration	Successfully create a new account with information and redirect to the login page.	Pass
Login	Data input field is blank	An alert message will be shown	Pass
	Users enter invalid email	An alert message will be shown	Pass
	User account is blocked	Cannot log in to the application	Pass
	Users enter invalid password	An alert message will be shown	Pass
	Successfully login with valid email and password	Redirect user to the correct page based on the user type	Pass
Forgot password	User enters email	An email with password reset link will be sent to the email entered by the user	Pass
View therapist list	Generate therapist list	Display all therapists in the database with "verified" status	Pass
Therapist profile	Display therapist profile	Display therapist profile with correct profile picture, first name, last name, profession and description	Pass
	Therapists update their own profile	Successfully update profile picture, profession and description	Pass
Chatting	User sends message to therapist	Therapist can receive the message in real time	Pass
	Therapist sends message to user	User can receive the message in real time	Pass
Videocall	User video call therapist	Therapist can see user in the video call	Pass
	Therapist video call user	User can see therapist in the video call	Pass
	User switch camera	The camera can switch between front camera and back camera	Pass

	Users turn off mic	User can mute the mic	Pass
	End call	User can end the call	Pass
Mood tracking	User records mood level	The mood level will be saved in database	Pass
	Display line chart based on the mood level recorded	The mood level will be shown in line chart	Pass
	Select and view mood record for different months	Display line chart showing the mood level of the selected month	Pass
User profile	Edit profile picture	The new profile picture will be saved into database and will be displayed	Pass
	Select profile picture	Only image with type jpg, jpeg can be selected	Pass
Log out	Log out	Log out from the current account and redirect to the login page	Pass
Block account	Admin block user	The user is blocked and cannot login to the application	Pass
	Admin block therapist	The therapist is blocked and cannot login to the application	Pass
Verify account	Admins verify therapist account	The therapist can be viewed by user	Pass
Upload document	Therapist upload documents	The documents are saved into the database and can be view in a list	Pass
	Selecting document	Only document with pdf type can be selected	Pass
View document	Admin view the document uploaded by therapist	Can view the document uploaded	Pass
	Admin zoom in and zoom out the document	The document can be zoomed in and zoomed out	Pass

4.2.2 User Acceptance Testing (UAT)

UAT is a kind of testing which involves end-users to test the product before proceeding to production. The UAT is carried out using Google Form. 30 Android phone users from UTHM are chosen randomly for the UAT. Users were required to download the proposed mobile application and then were requested to evaluate the mobile application in terms of user interface and features based on their user experience. The outcome of the UAT is evaluated and presented in a chart as shown in Figure 12 and Figure 13.

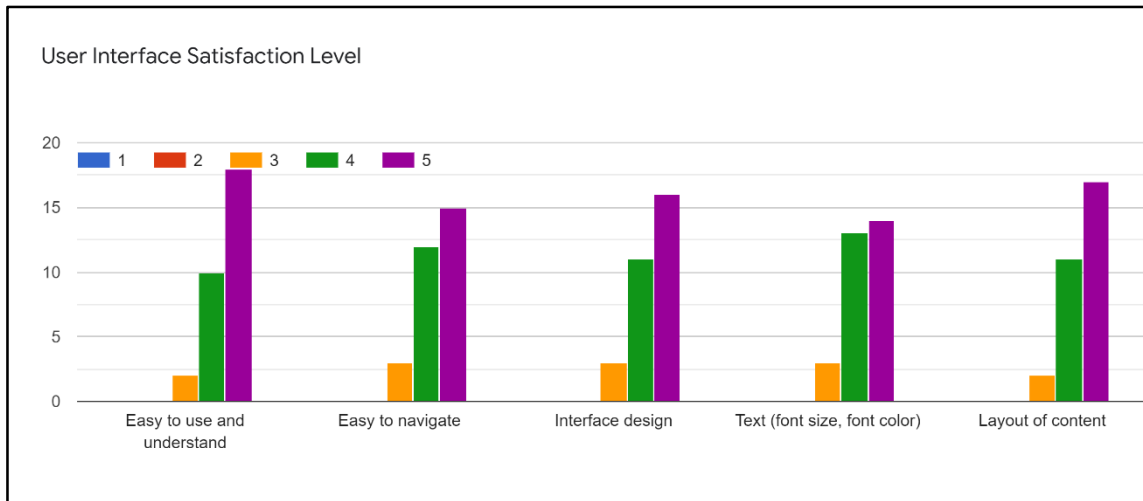


Figure 12: Results of user interface satisfaction level

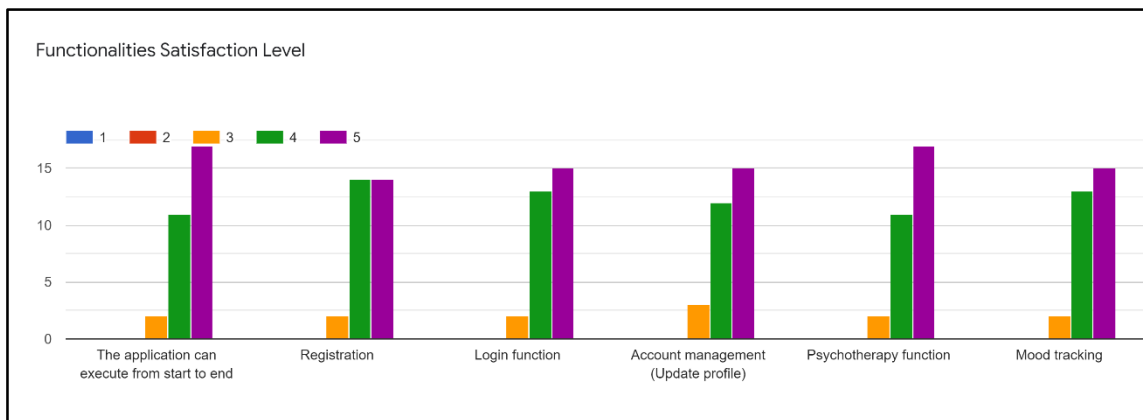


Figure 13: Results of functionalities satisfaction level

5. Conclusion

In conclusion, the proposed mobile application achieved the objectives and user requirements.

The advantages of the application are the therapists in the application must be verified by the admin before they can start conducting psychotherapy with the users. Hence, the treatment received by the patients is safe, proper, and professional. Besides, this platform allows users to always record and track their mood. Hence, this raises the awareness of users about their mental health condition. Finally, users do not need to travel to certain locations to get mental illness treatment.

The disadvantages of the application are one email can only be used once to sign up account. Hence, if a user already registered as therapist, he or she cannot register one more account of normal user type using the same account. Therapist cannot receive treatment from another therapist in this application. Moreover, the video call is created by using API provided by Agora.io for testing purposes only. Hence, the API only available a short period and have to manually request from Agora.io for new token to connect to the API. Due to time constraints, the video call only works for Android users. Lastly, username authentication and phone authentication are not allowed in this application. User can only register account using email. This decreases the choices of method for user to sign up for account.

Some improvements are found to enhance the application. Firstly, the video call function can be developed to support IOS systems. By doing this, IOS users can also use the video call function to have a better way to conduct psychotherapy with the therapists. Moreover, in the mood tracking page, a warning will be shown if the mood of the users is constantly low for a long period of time. The color

of the line chart can also be changed based on the average mood level of the users over a certain period to give a clearer indication of mood conditions. Finally, a function for users to self-test their depression, anxiety and stress level can be added into the mood tracking page. This function allows users to track their depression level, anxiety level and stress level to give more detailed information about the user's mental health condition.

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