

Development of Android-based Petmily Application

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Abstract: Pet is a loyal companion animal that always give accompany and entertainment to people especially pet lovers. Pet lovers treat their pet as one of their family members and always record their every moment in photo and post to the social media as a memory. This is because pet can give the advantage in both emotional and physical to pet lovers, for example, pet plays the role as a loyal companion to pet lovers especially for those are alone and feel lonely. The objective of this project is to develop Petmily application in mobile based android platform. The Petmily application is a social and lifestyle application for pet lovers. It is developed in English version. This application serves as a pet social media platform, and at the same time provides pet information platform regarding to common pet emergency and basic obedience pet training. Task recording platform development like a to-do list also included. The methodology used in this development of this Petmily application is Agile model. Generally, the satisfying results with 93.33% positive feedbacks have been obtained from the testing and it can be concluded that Petmily application is accepted by the target users based on the system usability scale. This application will be monitored from time to time to improve the performance and it is hoped that benefits its target users.

Keywords: Pet, Pet Social Media Platform, Common Pet Emergency, Basic Obedience Pet Training, To-Do List

1. Introduction

Nowadays, most families have pets at home especially cat and dog. Pet can be defined as a tamed animal that always give accompany and entertainment to people. Pets always give pet lovers in emotional and physical benefits [1]. For example, pets can give company to people especially for those are seldom communicate with other people. People are enjoying the companions and the moments together with the pets. Despite people always share the content related to pets, this does not mean that people are really understand on how to take good care of pets especially involving pet injuries. People will feel helpless when the pet is injured because the pet may be in pain or scared.

There are many similar pet social media applications in market. However, most of pet social media applications are characterized as social platform only without extra modules or functions provided. To resolve this lacking module problem, a social and lifestyle mobile application, Petmily is developed for users who have common interest on pets to enjoy the pet social network and learn other relevant information about pets such as basic obedience pet training and common pet emergency. The three modules in this application are Social module, Info module, and To-Do module. This application is embedded with multiple multimedia elements such as text and graphics.

After that, the remaining of this paper is organized as follows. In section 2, all the related work of the project will be discussed. Section 3 will explain the methodology used for the application development and Section 4 will discuss the results and discussion. Lastly, section 5 will discuss the conclusion and the future works of this project.

2. Related Work

This section discusses about the related work of the project that covers topic on mobile application and comparisons between existing applications and Petmily.

2.1 Pet Social Media Application Background

Currently, the relationship of “pets social” as a common vertical social method has played an important role in reducing loneliness of people and growing the social network of people [2]. Therefore, pet social media is available at online for pet lovers or pet owners. This is because pet social media application connects with the other pet lovers from everywhere. Besides, most pet applications provide module such as First Aid Guide and Training other than Social module for sharing photos, likes and comments on a post. Although pet lovers cannot estimate any medical emergency that could happen to pets, pet first aid can save valuable seconds when pet lovers need it most to have right pet emergency details [3]. With this, module information and guides about pet first aid are presented to the pet lovers or owners. Other than that, cats and dogs are the common pet population that adopted by pet lovers [4]. Some pet lovers prefer to train the pet to do some basic physical action based on command given such as to sit, to come, and to leave. Therefore, pet social application is encouraged to include the basic information or modules related to pets.

2.2 Mobile Application

Mobile applications are classified as mobile apps or software applications that launch on mobile devices [5]. There are many types of mobile applications offered at Google Play Store or App Market such as gaming apps, educational apps, social and lifestyle apps, travel apps, and others. Although mobile applications are designed in small software unit, however, the mobile applications are still provided in high quality and functionality to the users [6]. Users can straight away download from the store and enjoy the convenience and functionality of the mobile application.

2.3 Comparison of Existing Application

In this section, a comparison is made among the pet social applications exist in the market which are PetStory [7], App4Pets [8], Flockr [9], and the developed application namely Petmily. The comparison made is based on the system requirement, features, strengths, and weakness. The comparison is tabulated in Table 1.

Table 1: Comparison between existing applications with the developed application

Element	Pet Story	App4Pets	Flockr	Petmily Application (Developed Application)
Platform	Android 4.1 and above	Android and above	5.1 Android and above	5.0 and above Android 4.4 and above

Online/Offline Mode	Online	Online	Online	Online
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Table 1: Comparison between existing applications with the developed application (Cont.)

Element	Pet Story	App4Pets	Flickr	Petmily Application (Developed Application)
Security Protection	Available	Available	Available	Available
Fee	Free to install	Free to install	Free to install	Free to install
Module	Social networking	Social networking	Social networking	- Social module - Info module - To - Do module
Dynamic Infographic in (GIF) format	Unavailable	Unavailable	Unavailable	Available (In Info module)
Strengths	- Free to use - Give security protection	- Free to use - Give security protection	- Free to use - Give security protection - Provide edit photo features	- Free to use - Give security protection - Provide extra module
Weakness	Lack of related module	Lack of related module	- Language supported is not consistent - Lack of related module - Error on displaying number of follower and following	- Information in common pet emergency and basic obedience pet training is limited

Table 1 shows the comparison between the developed application which is Petmily application and the existing application such as PetStory, App4Pets, and Flickr based on some elements. The comparison shows the strengths and weakness of the existing applications. This developed application was designed with three modules which are Social module, Info module, and To-Do module. Features such as to view post, like and comment on a post, and update a post were included in the Social module. Moreover, the Info module consists of information of common pet emergency and basic obedience pet training. The dynamic infographics had been included in the Info module in Graphics Interchange format (GIF) to display a better visual.

3. Methodology

In this section, the methodology used will be discussed. The methodology used in this project is Agile model [10]. This Agile model consists of six phases and each phase will be further explained in the sub section below.

3.1 Requirement

In requirement phase, brainstorming was carried out to generate ideas about which type of application to be developed. The objectives and problem statement were defined. Besides, the target users were also established. The functions and the features of the application were also being determined. The schedule of carrying out this project was planned in the form of Gantt Chart. Besides, some research related to this proposed project was analyzed to gather the information. The existing similar applications were studied and tested to analyze the module, functions, and features of the application in market. Not

only that, project requirement such as functional requirements and non-functional requirements were analyzed. The hardware and software requirement acquired to develop this application were determined.

Table 2: Software and Hardware Requirement for Developer

Requirement	Software / Hardware	Details
Software	Android Studio	To implement the application with Kotlin scripts
	Adobe Illustrator 2020	To design the graphic image
	Animaker	To design and create the dynamic infographic
	Wondershare Filmora 9	To edit the dynamic infographic
Hardware	Laptop	8 GB RAM

Based on Table 2, developer needs to acquire the software and hardware listed to develop and design the application.

Table 3: Software and Hardware Requirement for Users

Requirement	Software / Hardware	Details
Software	Operating system	Version: Android 4.4 and above
Hardware	Android mobile	Minimum specification: Android version 4.4 and above

Based on Table 3, users need to acquire the software and hardware listed to install and launch the application.

3.2 Design

In this design phase, the storyboard had been designed. The user experience (UX) and user interface (UI) designs of the application were considered during creating the storyboard. For this project, Adobe Illustrator was used for the graphical design while Animaker and Wondershare Filmora 9 were used to design the dynamic infographic. Besides, the structure diagrams of this project were also designed in this stage, for example, Context diagram, Data Flow diagram (DFD), Entity Relationship diagram (ERD), Flowchart diagram, Application Navigation diagram, and Content Design diagram.

3.2.1 Context Diagram and Data Flow Diagram

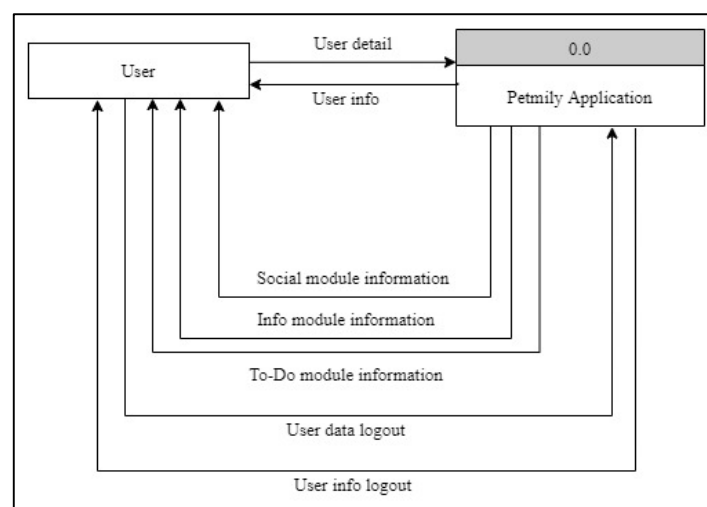


Figure 1: Context Diagram

Figure 1 shows the context diagram of this application. The user is required to input the personal information as an input to browse this application. This application will display three modules which are Social module information, Info module information, and To-Do module information as the output of this application. The user data will be logout when the user logout from this application.

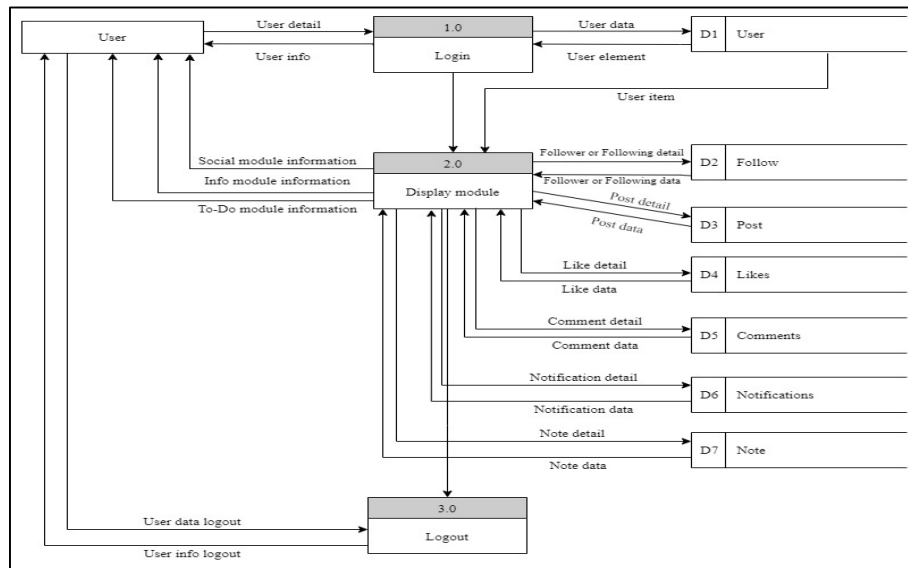


Figure 2: Level 0 of Data Flow Diagram

Figure 2 shows the data flow in Petmily application. The data of user is stored in User table. In Display module process, user can choose the module displayed such as Social module information, Info module information, and To-Do module information. User can search other users who are using this application and follow the other user in Social module. The follower and following detail are stored in Follow table. The post details are stored in Post table. Besides, the like detail and comment detail are stored in Likes table and Comments table respectively. The user can receive notifications which is stored in Notifications table. Furthermore, the task is stored in Note table. In logout process, the data member will be logout from the application.

3.2.2 Flowchart

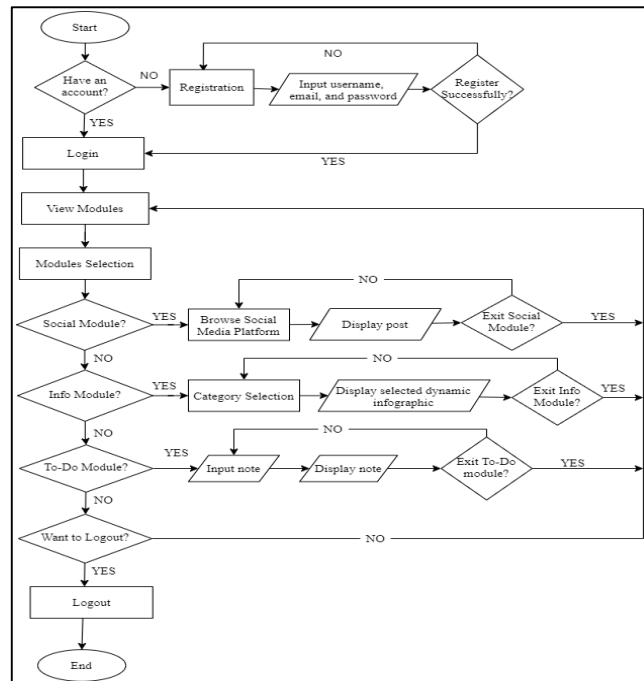


Figure 3: Flowchart Diagram

Figure 3 shows the flowchart diagram of the application. First, user needs to login to the registered account by entering email address and password respectively. If user has no account, user is required to register an account by filling username, email, and password to create an account. After user login to the application, user can view the module displayed such as Social module, Info module, and To-Do module. If the user chooses social module, user can browse the social media platform. If user does not want to browse social module user can choose to view Info module. After user selects Info module, users can choose the category displayed inside the Info module and view the information displayed in dynamic infographic. Besides, user also can select To-Do module, if the user wants to jot down a task. After user select To-Do module, user can add and list out the note.

3.2.3 Entity Relationship Diagram

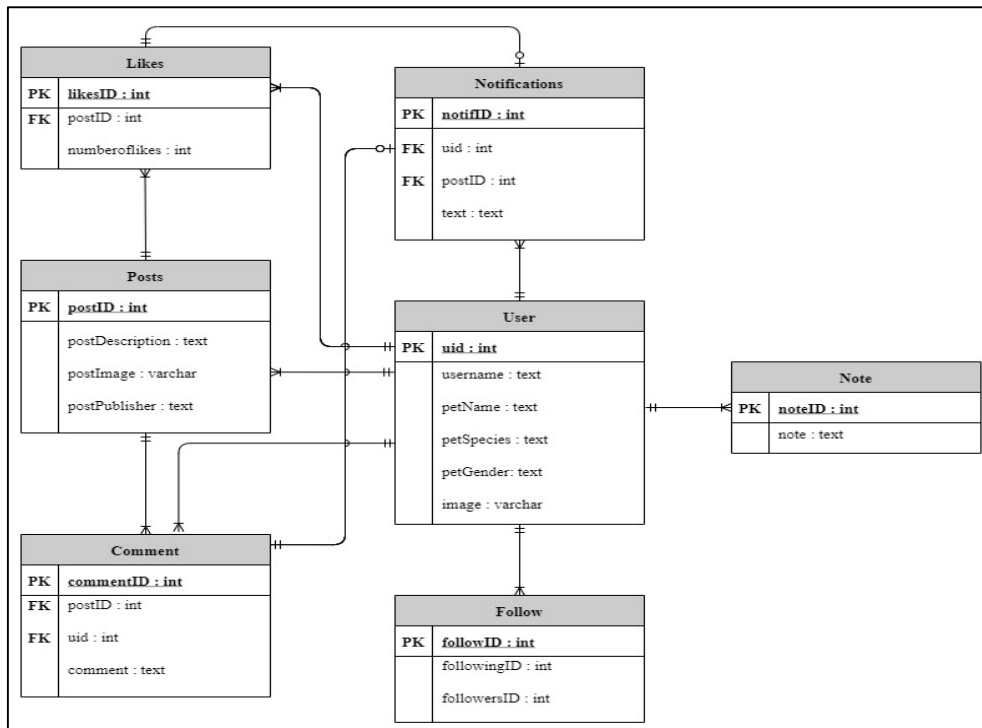


Figure 4: Entity Relationship Diagram

Based on Figure 4, User entity is used to store the information of user such as user id (uid) which is a Primary Key, username, petName, petSpecies, petGender, and image is stored in url form. Next, the Posts entity is used to store information of post. It includes postID which is primary key, postDescription, postImage, and postPublisher. Besides, the Likes entity used to store the information of Likes number. It includes LikesID which is primary key, postID which is foreign key, and numberOflikes. Moreover, the CommentsID which is primary key, postID and userID which are foreign key are also included in Comment entity. Furthermore, notifID which is primary key, postID and userID which are acting as foreign key, and text are stored in Notifications entity. The Follow entity also includes followingID and followerID to show the follower and following status. Lastly, there are userID and note are stored in Note entity.

3.2.4 Content Structure

Content structure as shown in Figure 1 in Appendix A showing how the content is structured and arranged systematically for easy understanding of the user. There are three modules in this application which are Social module, Info module, and To-Do module. Users should be able to understand each of the modules, for example social platform which can provide the social lifestyle to the user. Besides, user also can get the information related to pet such as common pet emergency and basic obedience pet training. The To-Do module is aided users for recording task as a reminder.

3.2.5 Application Navigation

Application navigation describes how Petmily application can be navigated by the user by using buttons as shown in Figure 2 in Appendix A. The home page consists of three main navigations buttons which are social module, info module, and to-do module. All of the three main navigations buttons have its own sub buttons to navigate to the specific interface.

3.3 Development

Android Studio was used to develop this social and lifestyle application, Petmily. On the other hands, the database was created by using Firebase. Besides, the main functions and the layouts had been developed as prototype application.

3.3.1 Development of Graphics

The development of graphics used in Petmily are created by Adobe Illustrator. Figure 5 shows the development of icon for button selection in Petmily application.

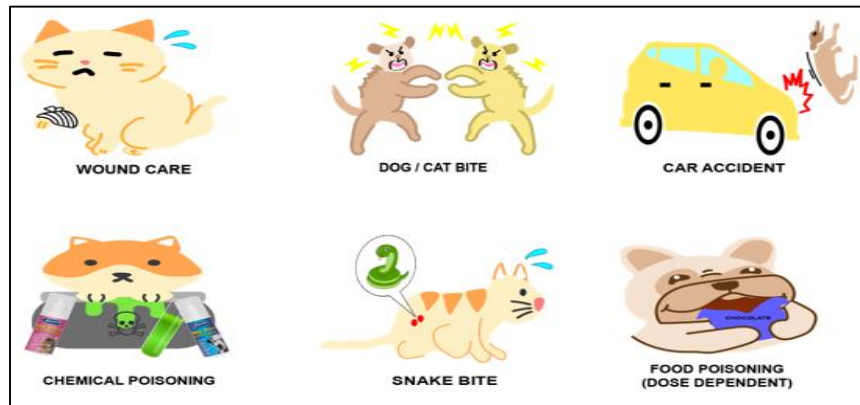


Figure 5: Development of Icon (Common Pet Emergency Module)

3.3.2 Development of Infographics

The development of infographics for Info module are created by using Online Animaker. The example of infographics that are successfully developed as shown in Figure 6.

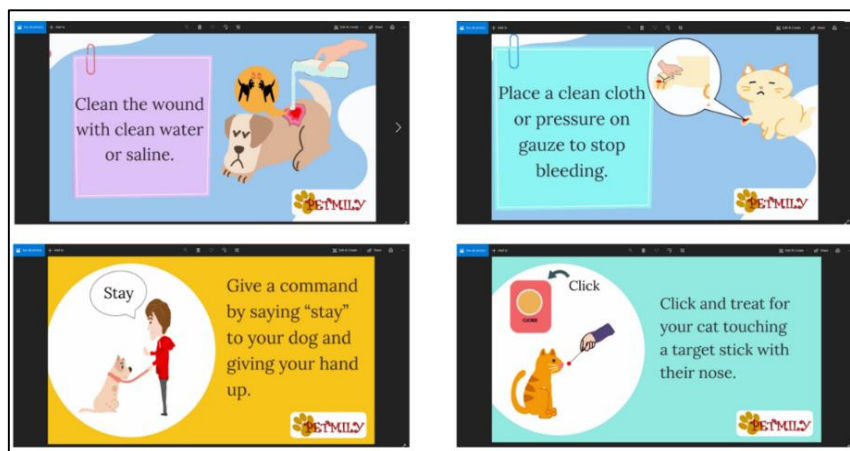


Figure 6: Screenshot of infographics

3.3.3 Development of Modules

This section will discuss the integration of what in Android Studio with Scripting.

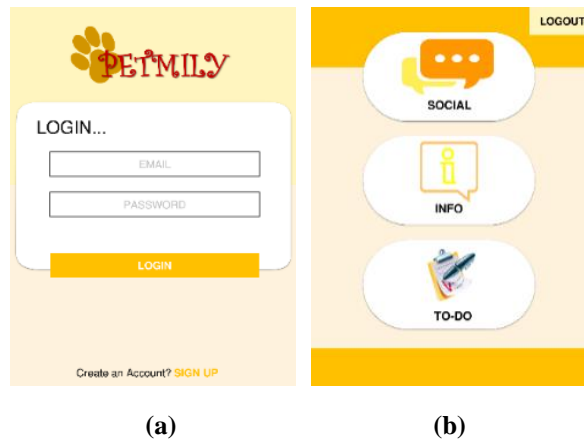


Figure 7: (a) Login Interface (b) Menu Page

Figure 7 (a) shows the login interface. Users are required to insert the email address and password to login to the application by clicking the LOGIN button. Figure 7 (b) shows the menu page in Petmily application. There are three modules represented by the SOCIAL button, INFO button, and TO-DO button respectively.

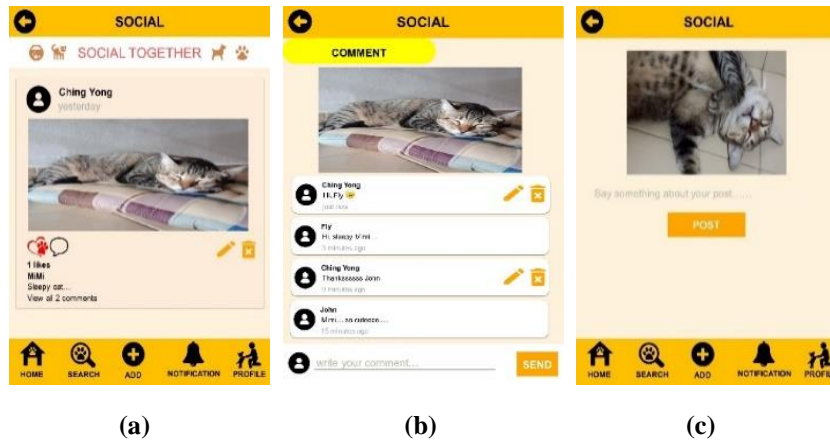


Figure 8: (a) Social Home Page (b) Add Comment Interface (c) Add Post Interface

Figure 8 (a) shows the home page in Social module. User can view and like the post. Beside, user can edit post description and delete post by clicking pen button and dustbin button respectively. There are five items included in the bottom navigation which are Home, Search, Add, Notification, and Profile. Figure 8 (b) shows the add comment interface. User can write comment at the editing box and add the comment by clicking SEND button. User also can edit and delete the comment by clicking pen button and dustbin button respectively. Figure 8 (c) shows the add post interface. User is required to write some descriptions in the input box after an image is chosen. The post will be created after clicking the POST button.

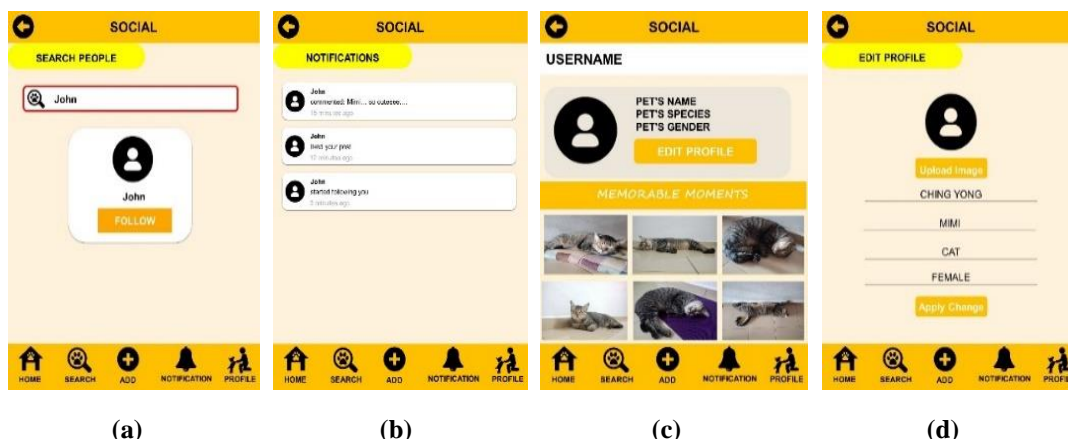


Figure 9: (a) Search Interface (b) Notifications Interface (c) Profile Interface (d) Edit Profile Interface

Figure 9 (a) shows the interface of searching friend. User needs to insert the username of friend in order to view the profile or follow the friend by clicking FOLLOW button. Figure 9 (b) shows the notifications interface. The notification message will be displayed at the notification interface. User can view the message by clicking the statement. Figure 9 (c) shows the profile interface in Social module. User can view information of user on this profile interface such as username, name of pet, species of pet, gender of pet, and the image posted. User also edit profile information as shown in Figure 9 (d). User can upload the profile by clicking Upload Image button and update the information by clicking on Apply Change button to update all the information.

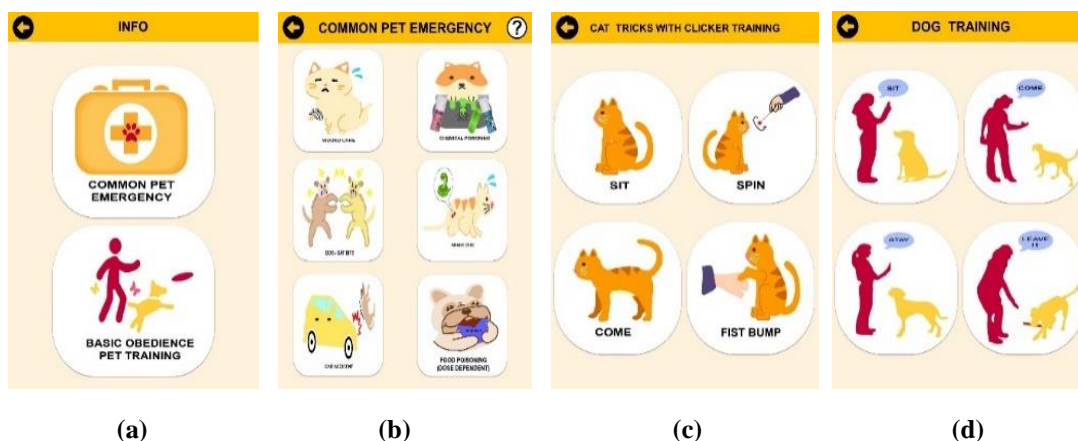


Figure 10: (a) Selection of Info module (b) Selection of Common Pet Emergency (c) Selection of cat tricks with clicker training Interface and (c) Dog training Interface

Figure 10 (a) shows the selection of Info module interface. There are two buttons: Common Pet Emergency module and Basic Obedience Pet Training module respectively. Besides, Figure 10 (b) shows the interface for selection of common pet emergency. User can select the emergency case to view the step of first aid when pet injures happen. For example, car accident, wound care, and others. Not only that, user can view the cat tricks with clicker training as shown in Figure 10 (c). On the other hand, user also can view the dog training as shown in Figure 10 (d).



Figure 11: To-Do List Interface

Figure 11 shows the to-do list interface. User can add task by inserting the task at textbox and clicking the (+) button. Besides, user also can edit and delete the task added by clicking pen and dustbin image button.

3.4 Testing

In testing phase, alpha testing had been conducted to test the application by the developer. This application was tested in terms of its functionality before implementing to the product environment. Bugs and non-core functionality issues were discovered in this phase and solved to make sure this application function well.

3.4.1 Alpha Testing

Alpha testing was done throughout the whole development process until the project was completed. The functionality of the modules buttons was tested during alpha testing to make sure the functionality of this application. The result of alpha testing according to the functionality of buttons designed in Petmily as shown in Table 4.

Table 4: Result of Alpha Testing

Modules	Test	Expected Result	Actual Result	Corrective Action
Login & Sign Up	Login Button	Navigate to Home page (Menu).	Function well.	No need.
	Register Button	Register an account.	Function well.	No need.
	Login link	Navigate to Login interface.	Function well.	No need.
	Sign Up link	Navigate to Sign Up interface.	Function well.	No need.
Menu	Social Button	Navigate to Social module.	Function well.	No need.
	Info Button	Navigate to Info module.	Function well.	No need.
	To-Do Button	Navigate to To-Do module.	Function well.	No need.
	Logout Button	Navigate to Login page.	Function well.	No need.
Social	Home Button	Navigate to Home fragment.	Function well.	No need.
	Like Button	Give like to post.	Function well.	No need.
	Comment Button	Navigate to Comment interface.	Function well.	No need.
	Edit Post Button	Display the dialog box for editing post description.	Function well.	No need.
	Like Button	Display Like activity of user.	Function well.	No need.
	Send Button	Post the comment.	Function well.	No need.
	Delete Post Button	Display the dialog box to delete post.	Delete directly without confirmation.	Use dialog builder() function.

Table 4: Result of Alpha Testing (Cont.)

Modules	Test	Expected Result	Actual Result	Corrective Action
	Edit Comment Button	Display dialog box to edit comment.	Function well.	No need.
	Delete Comment Button	Display the dialog box to delete comment.	Application is forced to stop.	Ensure use correct variable.
	Search Button	Navigate to Search fragment.	Function well.	No need.
	Follow Button	Follow user.	Function well.	No need.
	Following Button	Unfollow user.	Function well.	No need.
	Add Post button	Navigate to choose image.	Function well.	No need.
	Post button	Upload the post.	Function well.	No need.
	Notification Button	Navigate to Notification fragment.	Function well.	No need.
	Profile Button	Navigate to Profile fragment.	Function well.	No need.
	Edit Profile Button	Navigate to Edit Profile interface.	Function well.	No need.
	Upload Image Button	Upload the profile picture.	Function well.	No need.
Info	Apply Change Button	Save the profile information.	Function well.	No need.
	Basic Obedience Pet Training Button	Navigate to Basic Obedience Pet Training module.	Function well.	No need.
Common Pet Emergency	(?) Button	Navigate to Symptoms of Poisoning interface.	Function well.	No need.
	Wound Care Button	Navigate to Wound Care (GIF) interface.	Function well.	No need.
	Dog/Cat Bite Button	Navigate to Dog/Cat Bite (GIF) interface.	Function well.	No need.
	Car Accident Button	Navigate to Car Accident (GIF) interface.	Function well.	No need.
	Chemical Poisoning Button	Navigate to Chemical Poisoning (GIF) interface.	Function well.	No need.
	Snake Bite Button	Navigate to Snake Bite (GIF) interface.	Function well.	No need.
	Food Poisoning Button	Navigate to Food Poisoning (GIF) interface.	Function well.	No need.
	Back Button	Navigate to Info module.	Function well.	No need.
Basic Obedience Pet Training	Cat Button	Navigate to Cat Training module.	Function well.	No need.
	Dog Button	Navigate to Dog Training module.	Function well.	No need.
	Back Button	Navigate to Info module.	Function well.	No need.
Cat Training	Sit Button	Navigate to Sit (GIF) interface.	Function well.	No need.
	Spin Button	Navigate to Spin (GIF) interface.	Function well.	No need.
	Come Button	Navigate to Come (GIF) page.	Function well.	No need.
	Fist Bump Button	Navigate to Fist Bump (GIF) interface.	Function well.	No need.
	Back Button	Navigate to Cat Training module.	Function well.	No need.

Table 4: Result of Alpha Testing (Cont.)

Modules	Test	Expected Result	Actual Result	Corrective Action
Dog Training	Back Button	Navigate to Cat Training module.	Function well.	No need.
	Come Button	Navigate to Come (GIF) page.	Function well.	No need.
	Stay Button	Navigate to Stay (GIF) interface.	Function well.	No need.
	Leave it Button	Navigate to Leave it (GIF) page.	Function well.	No need.
	Back Button	Navigate to Dog Training	Function well.	No need.
To-Do	Add Button	Add a task.	Function well.	No need.
	Edit Button	Display dialog box to edit task.	Function well.	No need.
	Delete Button	Display dialog box to delete task.	Function well.	No need.
	Back Button	Navigate to Home page (Menu).	Function well.	No need.

Based on Table 4, the alpha testing was tested according to the module implemented in this application. There were some corrective actions had been carried out such as applying dialog.Builder() function for displaying the dialog box to delete post and ensuring the correct variable was used to avoid the application from forcing to stop.

3.5 Deployment

In this phase, all the programming and compiling process were done. Then, the APK file was implemented and finally can be released to the users.

3.5.1 Building Petmily in Android Based

This section will discuss application implementation in Android Studio, which is to package the APK file. Figure 12, Figure 13, and Figure 14 show the processes to generate the APK file of Petmily.

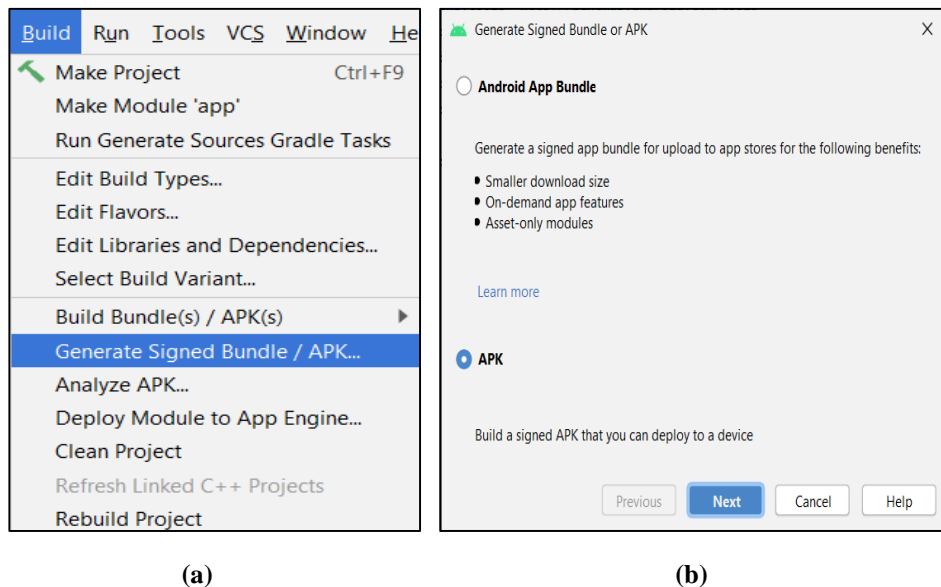


Figure 12: Process of generating APK file for Petmily shown in (a) Step 1 and (b) Step 2

Based on Figure 12, to build the APK file of Petmily, go to Build > Generate Signed Bundle or APK, then choose the APK option.

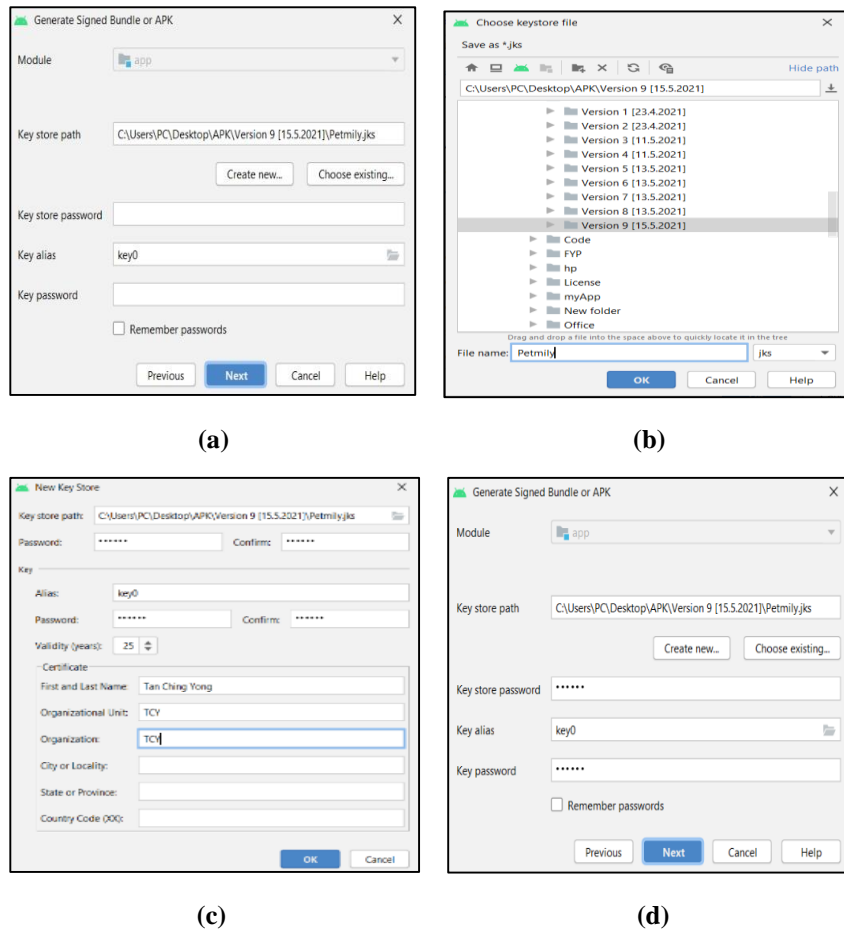


Figure 13: Process of Choosing Key Store File in (a) Step 1, (b) Step 2, (c) Step 3, and (d) Step 4

Based on Figure 13, developer needs to create a new location for key store file and fill in the password and other relevant information such as first and last name.

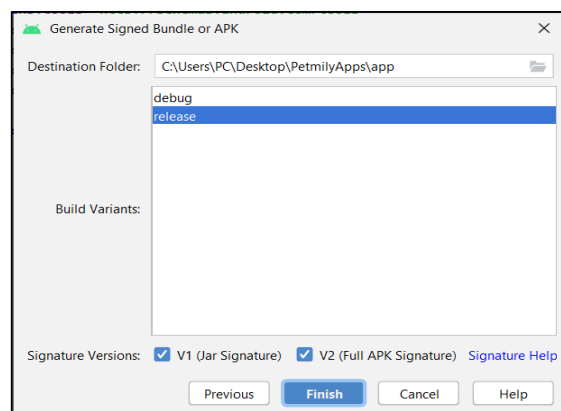


Figure 14: Release APK file

Figure 14 shows the final step to release APK file. Release, Jar Signature, and Full Signature are chosen to generate a complete APK file.

3.6 Review

In review phase, beta testing had been conducted to the target users to collect the feedbacks and recommendations. The collected data and feedback were analyzed for the further enhancement. The iteration of Agile model cycle is one for this development of application.

4. Results and Discussion

In this section, testing phase of the development of Petmily will be discussed. Alpha testing and beta testing were conducted to make sure that the application is well function and accepted by the user.

4.1 Beta Testing

Beta testing was carried out after the project was completed with the involvement of target users in order to get the feedback from target user while using this application. A set of questionnaires through Google Form was prepared and distributed to the target users. There were 10 pet lovers involved in beta testing. Figure 15 (a) and (b) display the gender analysis and age analysis and of target users.

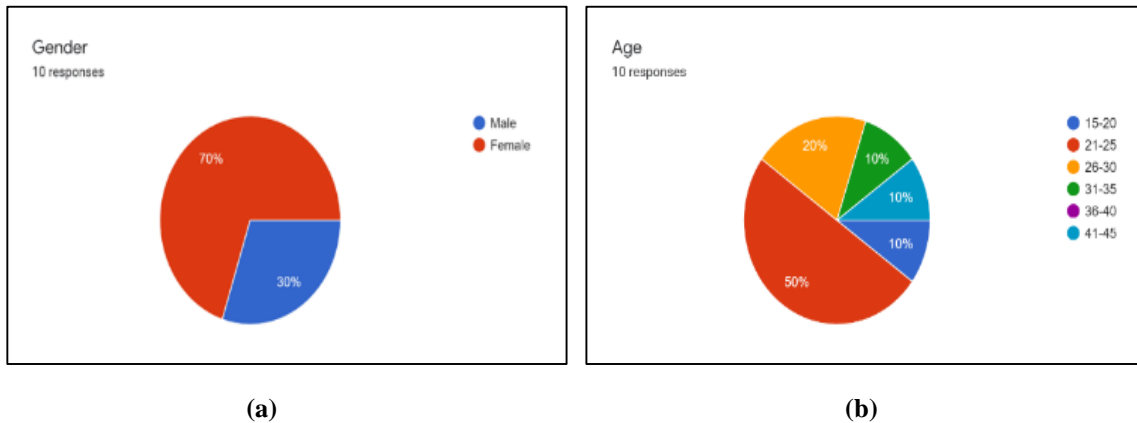


Figure 15: Respondents according to (a) Gender (b) Age

Based on Figure 15 (a), there are 7 out of 10 respondents which is 70% are female and 3 out of 10 which is 30% are male. Besides, based on Figure 15 (b), there are 50% from the target users are from 21 to 25 years old and 10% are from 26 to 30 years old. On the other hand, there are 10% from the target users are from 15 to 20 years old, from 31 to 35 years old, and from 41 to 45 years old respectively. All respondents have completed the user acceptance testing.

The questionnaire consists of two components which are user acceptance level and functionality as shown in Figure 16 and Figure 17 respectively.

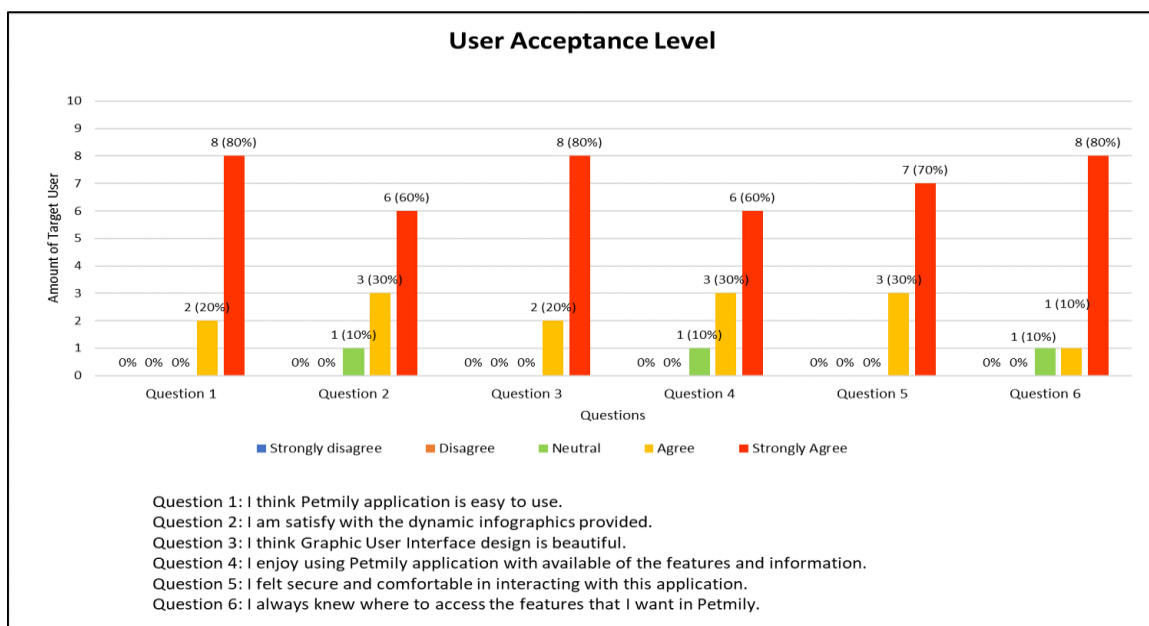


Figure 16: User Acceptance Level Analysis

According to Figure 16, there are 6 questions included in analysis of user acceptance level. For Question 1 and Question 3, both of these questions have the same results with 80% respondents strongly agreed and 20% respondents agreed that Petmily application is easy to use and the graphic user interface is beautiful respectively. As for Question 2 and Question 4, both of these questions also have the same results with 60% of the respondents responded to ‘Strongly Agree’, 30% of the respondents responded to ‘Agree’, and 10% of the respondents responded to ‘Neutral’ that satisfying with the dynamic infographic provided and enjoying to use this application with the available features and information. Besides, for Question 5, 70% of the respondents strongly agreed and 30% of the respondents agreed that the secure and comfortable interacting with this application. For Question 6, there are 90% of the respondents give the positive response with 80% represents for ‘Strongly Agree’ and 10% represents for ‘Agree’ respectively whereas 10% of the respondent answered for ‘Neutral’. There is no negative feedback from the respondents. Therefore, this application generally is accepted by the respondents.

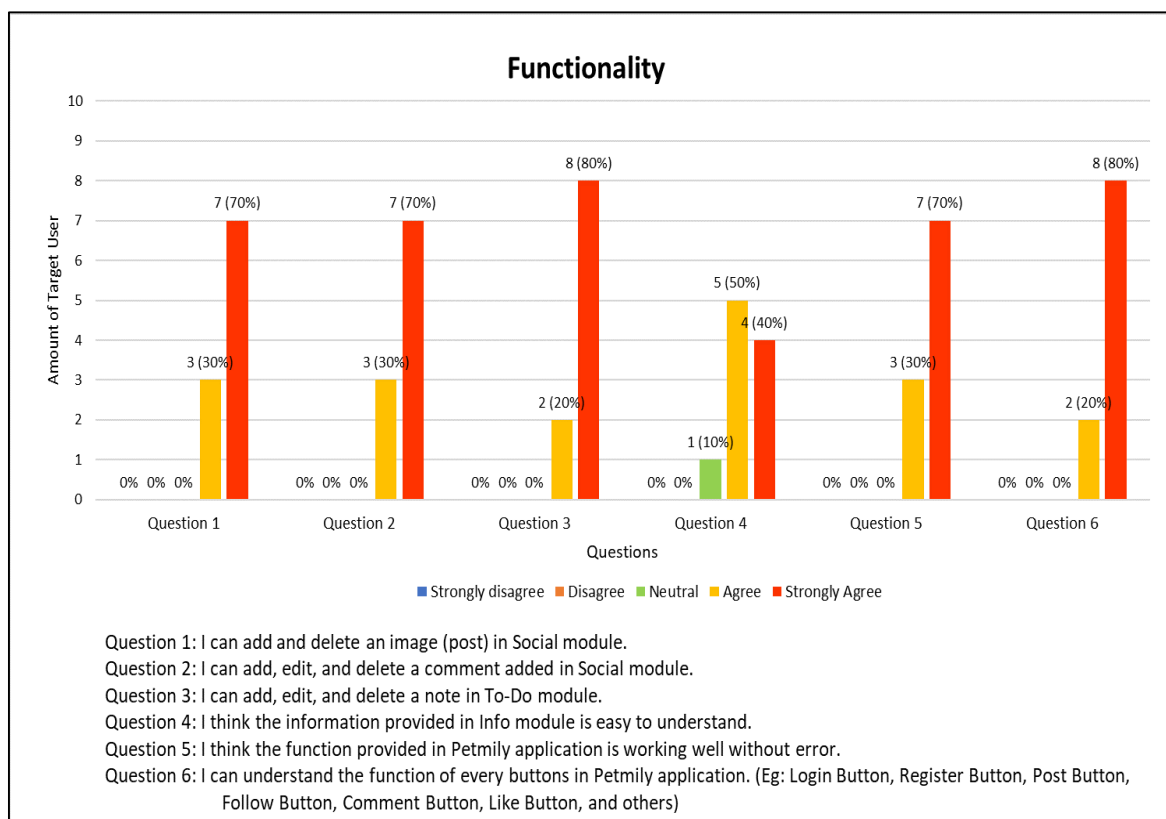


Figure 17: Functionality Analysis

Based on Figure 17, functionality analysis consists of six questions. As for Question 1, Question 2, and Question 5 have the same results with 70% respondents strongly agreed and 30% respondents agreed that the image (post) can be added and delete in Social module, a comment can be added, edited, and deleted in Social module, and the function provided in Petmily application is working well without errors respectively. Besides, for Question 3 and Question 6, both of these questions have the same results with 80% respondents strongly agreed and 20% respondents agreed that respondents can add, edit, deleted a note in To-Do module and understand the function of every buttons such as Login Button, Register Button and others. Lastly, 70% of the respondents stand to “Strongly Agree” and 20% of the respondent stand to “Agree” that the information included in the Info module is easy to read and understand whereas 10% of the respondents stand to ‘Neutral’. There are 0% of the respondent stands for negative feedback. Thus, this functionality analysis can be concluded with good performance in functionality. From these tests, it can be concluded that the user likes the application because it provides infographic content and it is easy to use. Besides that, in functionality test, all modules function well.

Table 5: Respondent’s Score (User Acceptance Test)

Respondent	Question												Score
	1	2	3	4	5	6	7	8	9	10	11	12	
R1	4	3	5	3	5	3	4	5	5	3	5	5	50
R2	5	5	5	5	5	5	5	5	5	5	5	5	57
R3	5	5	5	5	5	5	5	5	5	5	5	5	57
R4	5	5	5	5	5	5	5	5	5	5	5	5	60
R5	5	5	5	5	5	5	5	5	5	5	5	5	58
R6	5	5	5	5	5	5	5	5	5	5	5	5	50
R7	5	5	5	5	5	5	5	5	5	5	5	5	60
R8	5	5	5	5	5	5	4	4	5	5	5	5	58
R9	5	4	5	4	4	5	5	5	5	4	4	5	55
R10	4	5	4	5	4	5	5	5	4	5	5	4	55
Total Score												560	

$$\begin{aligned}
 \text{System Usability Scale} &= \frac{\text{Total Score}}{\text{Overall Total Score}} \times 100\% \quad \text{Equation 1} \\
 &= \frac{560}{600} \times 100\% = 93.33\%
 \end{aligned}$$

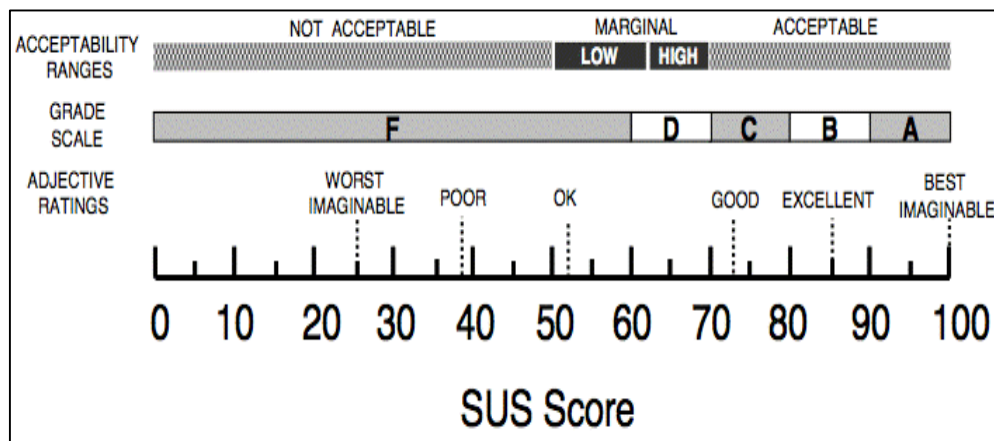


Figure 18: System Usability Scale [11]

In conclusion, the result with overall percentage 93.33% by using the calculation of system usability scale as shown in Equation 1 and Table 5 for both testing of user acceptable level and functionality from the respondents. Overall, this developed application is acceptable by the respondent based on system usability scale as shown in Figure 18.

5. Conclusion

In conclusion, Petmily application is designed for pet lovers to record every moment with the pet and connect with other pet lovers. At the same time, pet lovers also can learn new knowledge related to common pet emergency and basic obedience pet training which are provided in this application. Besides, pet lovers can jot down some notes or tasks in the To-Do module. Petmily application is designed and developed following by the Agile model. Lastly, some improvements such as creating feature of uploading video or short story, providing updates to cover more information related to pets are suggested in order to enhance the performance of this application in the future.

Acknowledgement

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Appendix A

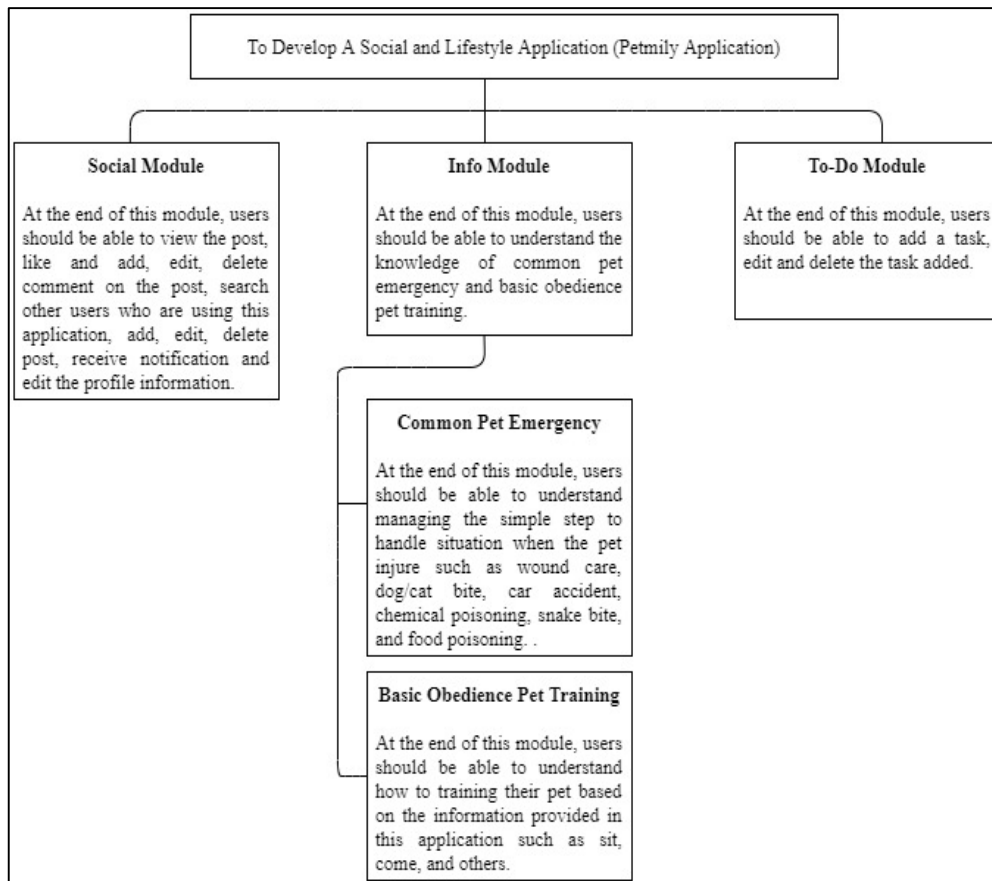


Figure 1: Content Structure of Petmily application

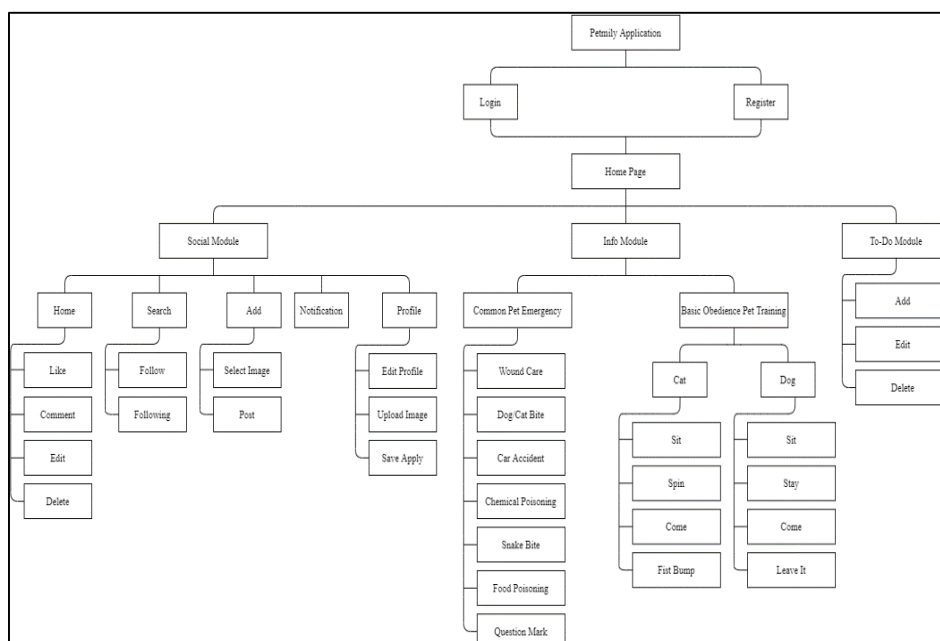


Figure 2: Application Navigation of Petmily application**References**

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