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The Development of Mobile Application of Organ Donation Using Flutter

Ong Kai Sian[1], Suriawati Suparjoh[1]*

[1]Faculty of Computer Science and Information Technology,,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, MALAYSIA

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Abstract: In Malaysia, people require to visit government hospitals or health clinics and manually fill out the organ donation registration form to request to become an organ donor. However, the current manual registration process is time-consuming and difficult as on the way to the hospital, people will face traffic problems and need to wait in line for a long time. Therefore, a mobile application named "Pledge For Life" was developed by incorporating 2D animation to convey the information attractively. The methodology applied in this project is the prototyping model, which can determine the requirements in detail along the development process until achieving an acceptable outcome. The developed mobile application can assist people in registering to become organ donors and explore the information about organ donation in a better visualization with 2D animation. The User Acceptance Test (TAM) shows that 77.17% (Grade C) is within an acceptable result.

Keywords: Organ Donation, Mobile Application, 2D Animation, Flutter

1. Introduction

Organ Donation is an action of taking a healthy organ from one person (donor) and surgically placed to someone who needs it (recipient) [1]. In Malaysia, the type of organ that can be donated in Malaysia includes the liver, kidney, pancreas, heart, lungs, and tissues like cornea (eye), skin, heart valves, and bones [2]. There are two types of donors which are living donor and cadaveric donor. Organ donation among the Malaysian community today is not a new phenomenon. However, the current organ donation registration system for Malaysia is less user-friendly.

The traditional way of manually registering as an organ donor is difficult and time-consuming as people need to go to the hospital to fill out forms in line, and they may encounter traffic jams on the way to the hospital and waste more time, or another way is, people need to download the form from the official website, fill it out and email or mail it to the National Transplant Resource Centre which is very troublesome procedures. Even though the MySejahtera application has provided an organ donation registration function, it only conveys awareness via text information, and there is a limit in which the donors cloud does not update their wishes from time to time.

*Corresponding author: suriati@uthm.edu.my

Based on research through Google Play Store, a little has been known that is no specific Organ Donation registration mobile applications in the scope of Malaysia can be found or developed with interactive and informative features. Therefore, by a study of other similar applications for another country, those applications just only use graphics and text to convey information to the user. A study has shown that dynamic content, such as animations, is important to attract users' concentration [3]. As a result, a mobile application that can provide visual and dynamic media, such as graphics and animations, will offer people a good user experience and catch their attention [4]. Therefore, the "Pledge For Life" mobile application is developed to fulfill the requirement.

The objectives of this study are to design a "Pledge For Life" mobile application based on Object-Oriented Approach, to develop a platform that enables users to register as an organ donor and retrieve information about organ donation by incorporating prototyping, and to perform functional testing and user acceptance test on the developed application to the target user. The "Pledge For Life" mobile application is developed for age 18 and above Malaysian. Moreover, the delivery language of all the content in the application will be English, except the pledge form will be bilingual in English and Malay. Besides that, the Deputy Director of the National Transplant Resource Center consulted as the project Subject Method Expert (SME) and thirty students from UTHM participated as the target user for this project. The SME and target user will be involved in the user testing on the developed mobile application to collect feedback for making improvements.

The "Pledge For Life" mobile application consists of 5 modules, User Sign-in and Sign-up module, Donor Registration module, Information Sharing module, TRC Location module, and User Profile module. The User Sign-in and Sign-up module will let the user register and log in to an account on the developed mobile application. The Donor Registration module allows users to register as organ donors. The Information Sharing modules contain information about the type of donor, close blood relatives, and FAQ on organ donation and organ transplant process. The TRC Malaysia Location module allows the user to search for the location of the hospital directly. The User Profile module will display the username and email of the user. Additionally, the user can upload a profile picture from the gallery.

2. Related Work

In this section, the study domain, technology used, and the result of the comparative analysis are discussed.

2.1 Organ Donation

Organ Donation is an action of taking a healthy organ from one person (donor) and surgically placed to someone who needs it (recipient) [1]. The organ transplant surgery will be undertaken after obtaining a written consent from the next of kin and only organs or both which are viable will be taken [2]. The process can take between 2 to 8 hours depending on the number of organs and tissues to be donated [2].There are two types of donors which are the living donor and cadaveric donor. A living donor is a donor who donates organs during life and can only donate one kidney or part of the liver. Nevertheless, donation during life has two types which are the donations that have family ties and the donation without family ties. Next, a cadaveric donor is a donor who has died and there are two types of cadaveric donors which is brain death donors and normal death donor with a declaration of death when the heart stops beating. Brain death donors can only donate organs and tissues such as heart, lung, liver kidney, eye (cornea), bone, and skin, while the normal death donor can donate tissues like eyes (cornea), bone, skin, and heart valves [2].

2.2 Mobile Application

A software program created specifically for wireless handheld devices like smartphones, tablets, or other portable devices is known as a mobile application [5]. The general functionality of a mobile application is limited to specific features such as an alarm clock, a calculator, a notepad, a calendar, and

others. Mobile applications can provide users with high-quality services and experiences even though they are often small software units with limited functionality.

In the past, porting a desktop-based program directly to a mobile device was the simple approach to creating a mobile application. However, it will become challenging when the program grows more complex. Therefore, creating an application specific to the mobile environment is a recommended strategy for mobile application development.

Mobile applications consist of three category application frameworks which are native, hybrid, or progressive web. Native applications are designed for specific operating systems and can provide a good user experience. For example, WhatsApp is one of the most popular native applications. Hybrid applications are the best combination of local applications and Web applications because they can work on a variety of platforms and operating systems, without changes in scripts. One of the efficient hybrid applications such as Instagram. A progressive web application is a website extension that can be downloaded to a computer or mobile device and used like an application [6]. As an example, Telegram and Google Maps are two examples of progressive Web applications [7]. Flutter is a framework that uses the Dart programming language. Besides that, it is open-source and enables the creation of mobile applications that can operate on Android and iOS devices using a single piece of code [8].

2.3 Comparative Analysis

In this section, the developer has come out with a comparison between the existing applications, such as the "Organ Donation" mobile application [9], "Life After Death" mobile application [10], "MySejahtera" mobile application [11], and the developed mobile application, "Pledge For Life" as shown in Table 1. The discussion includes features and functionality such as user authentication, user interface design, language, platform, database, 2D animation, and modules. Meanwhile, Figure 1 shows the main interface of the three existing applications.

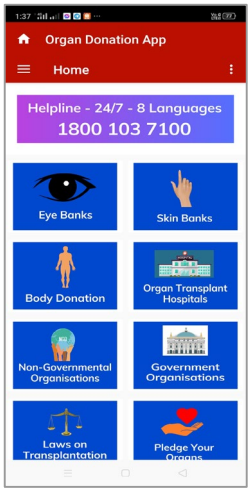


Figure 1: Organ Donation Mobile App [9]

Figure 2: Life After Death Mobile App [10]

Figure 3: MySejahtera Mobile App [11]

Table 1: Comparison between existing applications resources from Google Play Store and developed application.

	Organ Donation App	Life After Death	MySejahtera	Pledge For Life
User Sign-in and Sign-up module	Users can access without logging in to an account.		Allow users to register and log in to an account with a mobile phone number or an email address.	Allow users to register and 1og in to an account with an email address and password.
User Interface Design	Content is arranged in regular form, practical, but less flexible.	More usage of graphics components, but less organized.	More usage of graphics components, well-organized, and practical.	Well-organized and user-friendly.
Language	English	English and Hindi	English and Malay	English
Platform	Android			
Database	The application software itself have no database.		The application has its own database under the Government of Malaysia.	The developed application has using Firebase to store the data.
Content display	Content is most displayed in text form with less use of graphics and the content is static.			Content is fewer words and uses 2D animation to make the content innovative. In addition, the application provides information about Organ donation activities in Malaysia.
Information Sharing Module	Provide medical law and common questions about organ transplantation.	Provide a definition and common questions of organ donation, and organ transplantation events in the form of posters and articles.	Provide some common questions about organ donation in a link and allow the user to download it in PDF form.	Provide information on types of donors, close blood relatives, the organ donation process, and common questions about organ donation.

	Organ Donation App	Life After Death	MySejahtera	Pledge For Life
Donor Registration Module	By providing a link that links to a website for users to register as an Organ Donor.	By providing a link that links to a website with an application form for users to register as an Organ Donor.	Directly providing an application form with simply requests details for users to register as an Organ Donor.	Directly register to become an organ donor and will receive a Donor e-Card. Additionally, the user can update the wishes from time to time.
TRC Location Module	Provide the address of hospitals and organizations such as eye banks, skin banks, and organ transplantation hospitals in India.	Does not provide any location for any organ transplantation hospitals and organizations.	Does not provide any location for any organ transplantation hospitals and organizations.	Provide the address of organ transplantation hospitals in Malaysia.
User Profile Module	Does not provide user profile		The profile can edit personal data and upload a profile picture.	

Based on Table 1, the "Pledge For Life" mobile application has several advantages. Such as the content conveyed is supported by images, video, and 2D animation. Next, the "Pledge For Life" mobile application has updated events on Organ Donation Campaign in Malaysia. Besides that, the user interface design is user-friendly, as the navigation buttons will use appropriate icons and keywords, and the navigation will apply a three-click rule. Moreover, the "Pledge For Life" mobile application allow the user to update the wish. In addition, this application has a database for collecting data records of organ donors.

3. Methodology

The prototyping model in software engineering, as Figure 4 shows, has 6 phases, requirements, quick design, build prototype, user evaluation, refining prototype, and implementation and maintenance [12]. Meanwhile, the Prototyping model is based on the currently known basic requirements to build a throwaway prototype, and the prototyping model focuses on customer requirements which is more suitable for mobile application development [13]. Therefore, based on its applicability and efficiency, it is selected as the model of this project. Each phase of the prototyping model will be discussed in the following subsections.

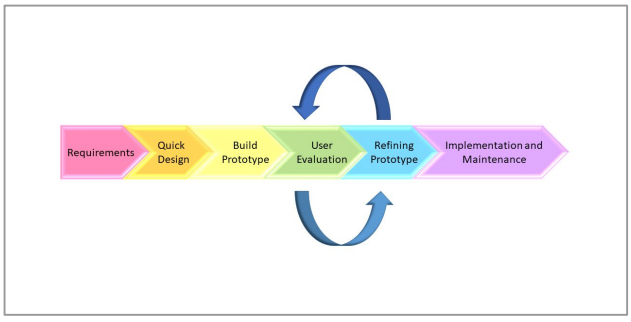


Figure 4: Prototyping Model in Software Engineering [13]

3.1 Phase 1 - Requirements

In the first phase of the prototyping model, the developer will determine the user requirement of the proposed application. The developer will collect the user requirement through two methods of information collection: interviews and online questionnaires. Firstly, the developer will conduct an interview session with a Subject Matter Expertise (SME) expert in organ donation, Dr. Hasdy Bin Haron, the Deputy Director of the National Transplant Resource Center. Next, the developer has prepared two online questionnaires and distributed the form to UTHM students and staff (Target User) through Google Form. The first set of questionnaires related to the proposed application content will be distributed to a total of 66 respondents, while the second set of questionnaires related to the UI design of the proposed application will be distributed to a total of 17 respondents. These respondents are 18 to 27 years old, and their responses have been collected and attached in Appendix A. In summary, most respondents (54.5%) indicate that traditional organ donation registration procedures are difficult. Next, appropriate information should be shared in the proposed application suggested by the respondents, including the types of organs that can be donated in Malaysia (88.2%), types of organ donors (88.2%), and organ transplant processes (76.5%). Besides that, most respondents preferred user-friendly UI designs such as easy-to-use (76.5%), neatness (64.7%), consistency (70.6%), simplicity, and clarity (76.5%). Moreover, 100% of respondents prefer to use 2D animated graphics in UI design. In Table 2, the results of user analysis are tabulated.

Table 2: User Analysis

Resource	Role in Product	Design Implications	Actions Needed
Subject Matter Expertise (SME)	Content consultant expert on Organ Donation	Based on the interview, innovative and attractive content conveying	● Convey awareness of organ donation through images, video, and 2D animation.
General User	Content consultant	Based on the questionnaire, easy to navigate is the user preference.	● The icon-based button should with an appropriate icon. ● The text-based button should use keywords. ● Apply the three-click rule for the navigation.
		Reliable and appropriate information is the user preference.	● The definition, registration, and process of Organ Donation. ● The type of organ donor. ● The close blood relatives. ● The contact and address of the Transplant Resource Centre in Malaysia. ● The events of the organ Donation campaign. ● FAQs about Organ Donation.
	UI design consultant, and end-user of the system	Based on the questionnaire, user-friendly interface design is the user preference.	● The navigation button should be consistent in terms of shape, color, and size for the specific purpose. ● Less words but with important content. ● Simplicity and clarity of UI design.
		Innovative content also is the user preference.	● Apply 2D animation in the UI design.

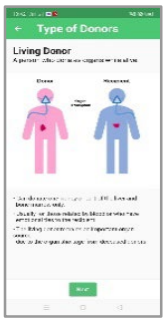
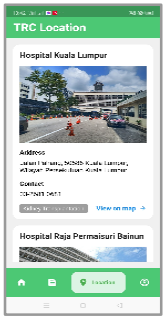
3.2 Phase 2 - Quick Design

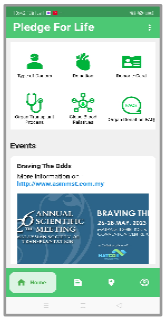
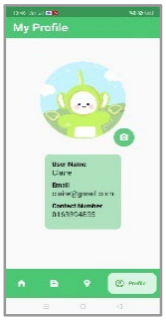
In this section, the button icon design and user interface design are created to provide a simple visual structure that helps the developer work best in organizing the information and ideas of the proposed application. The button icon design is shown in Table 3, while the user interface design is shown in Table 4. Next, the UML diagram such as the Use case Diagram, Sequence Diagram, Class Diagram, and Activity Diagram have been created to help the developer identify the separate steps of the application development process in sequential order and represent the static view of different aspects of the application. Figure 5 shows the Activity Diagram, Figure 6 shows the Use Case Diagram and Figure 7 shows the Sequence Diagram, while Figure 8 will be displayed in Appendix B.

Table 3: Button Icon Design

Button	Description	Button	Description
	Information Sharing Module Button for type of donors		Organ Transplant Process Button
	Donation Flow Button		Information Sharing Module Button for close blood relatives
	Donor e-Card Button		Information Sharing Module Button for common questions on Organ Donation

Table 4: User Interface Design

Interface	Description	Interface	Description
	This is the login page of the proposed application. There is a login button for login to the homepage after the user has keyed in the correct email and password. There is also a sign-up button for the first-time user to sign up for an account.		This is one for the information-sharing page of the proposed application. This page is about the type of organ donors.
	This is the sign-up page for the first-time user to sign up for an account by inputting personal data.		This is one of the TRC Malaysia Location pages, which shows the address and contact of the Transplant Resources Centre.

Interface	Description	Interface	Description
	This is the reset password page for the user to reset a new password.		This is the Organ Donor Pledger Form page of the proposed application, which allows the user to register as an organ donor.
	This is the homepage of the proposed application. There are some text-based buttons for navigating to the information page that is related to organ donation and icon-based buttons for several functions such as view profile and organ donor registration.		This is the E-card of the organ donor once the user has done the organ donation registration. It shows the personal data and the date of the organ donor registration.
	This is the user profile page which have shown the personal detail and the status of organ donor registration of the user.		This is the donation flow page were shown the procedural for donor to complete the registration.

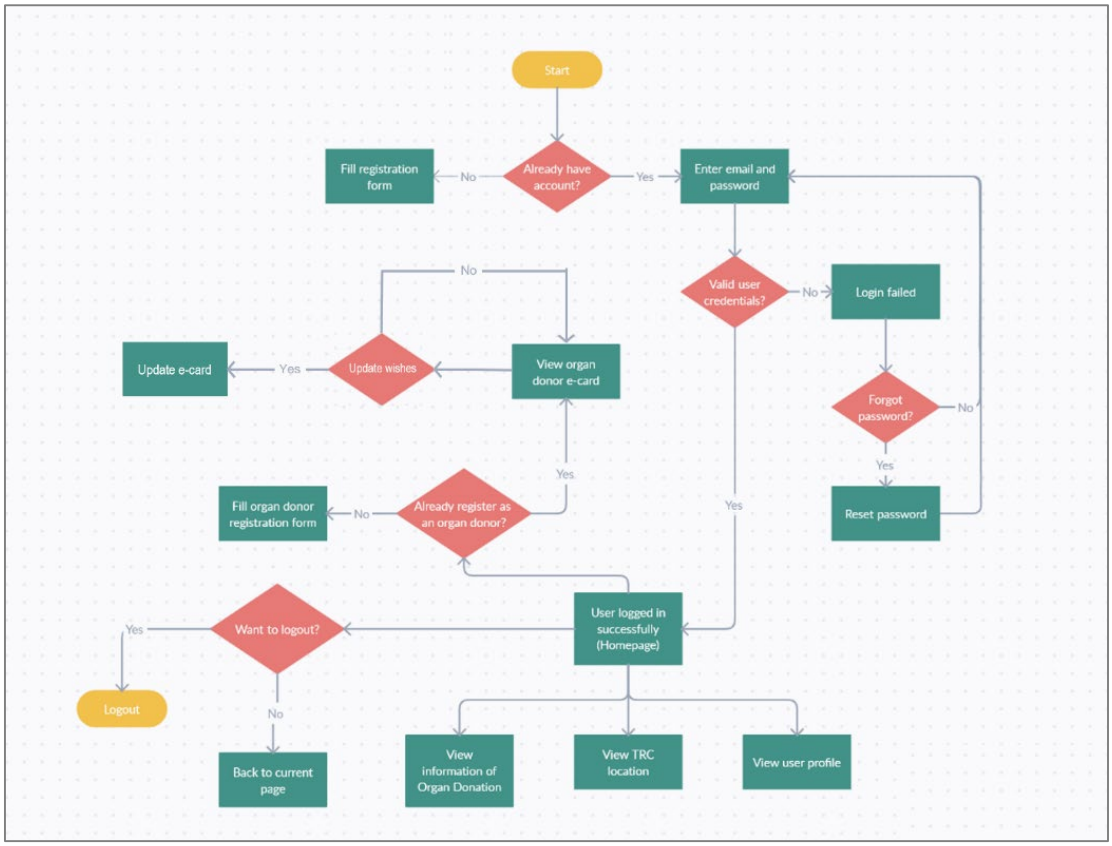


Figure 5: Activity Diagram

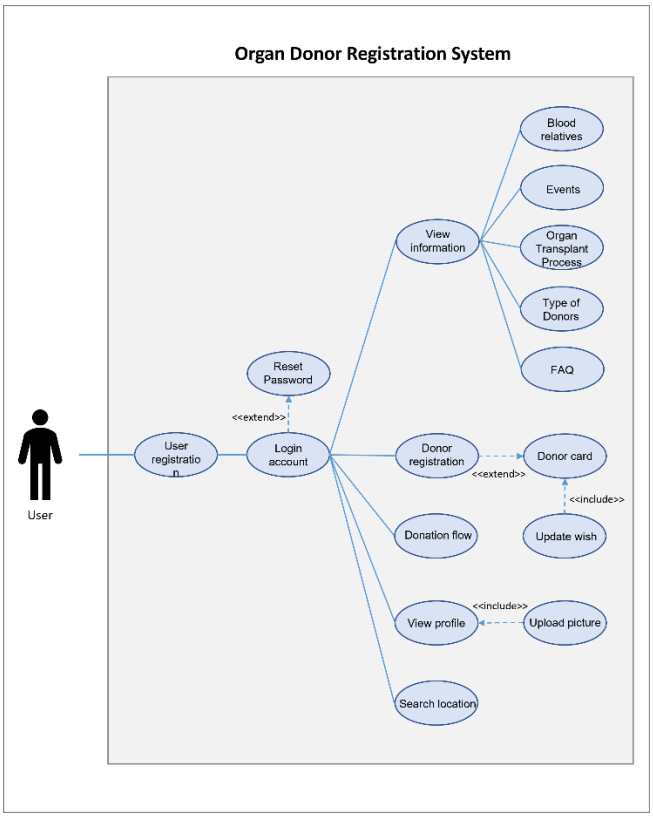


Figure 6: Use Case Diagram

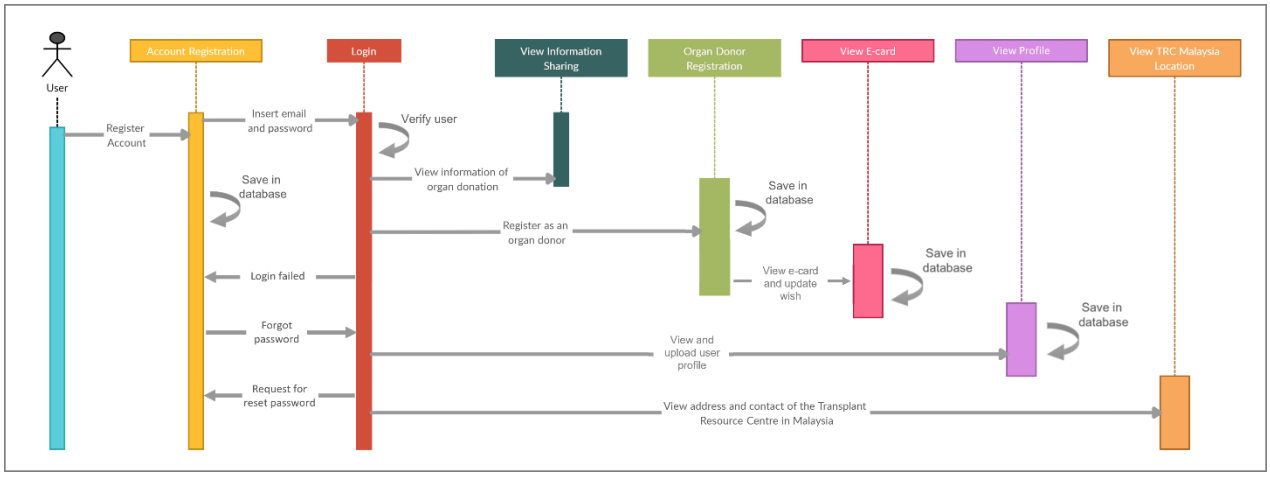
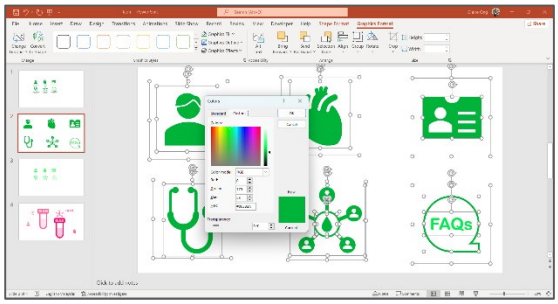
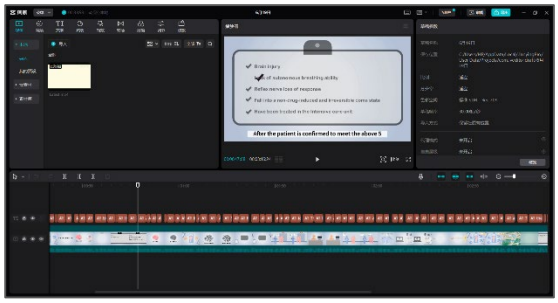


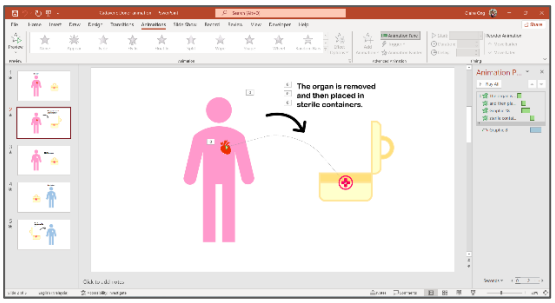
Figure 7: Sequence Diagram

3.3 Phase 3 - Build Prototype

In this phase, based on the information collected from the requirements and rapid design stages, a practical prototype of the proposed application was constructed using Flutter. At the same time, the main functions of the proposed application are being developed. It involves developing assets for applications and integrating these assets into Virtual Studio Code software. There are four multimedia elements developed as assets of the application. It consists of images, video, and 2D animation, as tabulated in Table 5.

Table 5: Application Assets Development

Assets	Development	Description
Images		These are the icon of the button on the homepage of the proposed application where resources from the stock images library Microsoft PowerPoint. Those icons have been edited and modified to fix the term of the button and then apply a pink color that matches the theme of the proposed application. After that, it will be exported in Portable Network Graphics Format (PNG) and applied to the proposed application using Flutter.
Video		This video is about the Organ Donation Transplant Process, developed using Microsoft PowerPoint and further edited using Microsoft Clipchamp. These images are resources from the image library in Microsoft PowerPoint and Canva. In addition, the voice of the narration uses the Speedify AI sound generator, and the background music is sourced

Assets	Development	Description
		from YouTube resources, which are free and do not have a copyright.
2D animation		This animation is developed using Microsoft PowerPoint. These images are resources from the image library and shapes in Microsoft PowerPoint. After that, it will be exported in animated GIF format and applied to the proposed application using Flutter.

Furthermore, the function of the proposed application is scripting using the Dart programming language. Those functions include user sign-up and sign-in, donor registration, wish update, donation flow, and profile picture uploading. Table 6 will further explain those functions.

Table 6: Integration in Visual Studio Code with Flutter Dart Script

Functions	Dart Scripts	Description

	function firebaseButton(context, title, onTap):
	create a container
	set child to an elevated button
	set onPressed to call the onTap function
	if states contains MaterialState.pressed:
	return Colors.black26
	else:
	return Color.fromRGBO(59, 190, 101, 0.8)
	set shape to RoundedRectangleBorder with a circular border radius of 30
	return the container
		In reusable_widget.dart, an ElevatedButton() widget have used to create a reusable button to act as a Sign-in button and a Sign-up button in a widget named firebaseButton.

User sign-up (Data store into Firebase) and Sign-in (Data read from Firebase)	function firebaseButton(context, title, onTap):
	try:
	authResult = await FirebaseAuth.instance.createUserWithEmailAndPassword(
	email: _emailTextController.text,
	password: _passwordTextController.text
	)
	userUid = authResult.user?.uid
	await FirebaseFirestore.instance.collection('users').doc(userUid).set({
	'user name': _userNameTextController.text
	})
	navigate to SignInScreen
	catch error:
	print "Error: error"
		In sign_up_screen.dart, firebaseButton() is constantly being called. At the same time, Firebase Authentication and Firestore Database awaited to hold on until the value of username, email, and password are input. Firebase Authentication will store the value of the email and password. In addition, the username value will be stored in the string field named "user name" in the collection named "users" in the Firebase database, depending on the document ID "userUId" automatically generated after the user registers a new account. After that, Navigator. push() will navigate to the SignInScreen() we called in MaterialPageRoute().

	function firebaseButton(context, title, onTap): FirebaseAuth.instance.signInWithEmailAndPassword(email: _emailTextController.text, password: _passwordTextController.text	In sign_in_screen.dart, firebaseButton() is constantly being called. The user has to enter their

Functions	Dart Scripts	Description
	).then((value): navigate to HomeBottomNavigationBar).catchError((error):)	email and password to be analyzed. If the value matches with the Firebase Authentication, the Navigator. push() will navigate to the HomeBottomNavigationBar() we called in MaterialPageRoute(). Otherwise, the showDialog() will run, and an error message will display.

Donor registration	function NextButton_Donor(context, false, onTap):
	try:
	user = await FirebaseAuth.instance.currentUser
	print "Data has been stored into Firestore"
	
	userUid = user?.uid
	
	await FirebaseFirestore.instance.collection('donors').doc(userUid).set({
	'donor name': _nameTextController.text,
	'donor ic number': _icNumTextController.text,
	'donor phone number': _phoneTextController.text,
	'state': _selectedState,
	'submissionDate': current date and time
	})
	
	navigate to DonorFormFillScreen02
	catch error:
	print "Error: error"
		In donor_form_fill_part_1.dart, the Firebase Authentication is constantly calling to ensure the status is the current user that login to the account. The entered value will be stored in the several string field in the collection named "donors" in the Firebase database once the NextButton_Donor() has functioned. Additionally, the current time of the data stored in the Firestore Database will also be recorded and stored in the same collection using DateTime.now(). After that, Navigator. push() will navigate to the DonorFormFillScreen02() we called in MaterialPageRoute().

Donor Wish update	function UpdateButton_Donor(context, false, onTap):
	try:
	user = await FirebaseAuth.instance.currentUser
	print "Data has been stored into Firestore"
	
	userUid = user?.uid
	
	await FirebaseFirestore.instance.collection('organs').doc(userUid).set({
	'selectedOrgans': selectedOrgans
	})
	
	navigate to DonorCardScreen
	catch error:
	print "Error: error"
		In update_form_part_3.dart, the Firebase Authentication is constantly calling to ensure the status is the current user that login to the account. The selected value will be stored and updated in the collection that is named "organs" in the Firebase database once the UpdateButton_Donor() has functioned. After that, Navigator. push() will navigate to the DonorCardScreen() we called in MaterialPageRoute().

Donation Flow Navigation	_currentStep = 0
	_isRegistered = false
	
	method initState():
	super.initState()
	checkDonorRegistration()
	
	method checkDonorRegistration():
	user = FirebaseAuth.instance.currentUser
	
	FirebaseFirestore.instance.collection('donors').doc(user?.uid).get().then((docSnapshot):
	if docSnapshot exists:
	set _isRegistered to true
	data = docSnapshot.data()
	else:
		In donation progress.dart, a stepper widget is applied to create the navigation through the Donation Flow. The Stepper widget cloud includes several Step widgets. Each Step() can customize with the Text() widgets by following the theme of the "Pledge For Life" mobile application. CheckDonorRegistration() checks the status before allowing users to use if else statements and boolean values to go to another step. If data

Functions	Dart Scripts	Description

	set _isRegistered to false
	).catchError((error):
	
	create Stepper
	set steps to list of Step objects
	create Step
	set title to 'Step 1'
	set content to Column with children
	create Text 'Donor Registration'
	if _isRegistered is true:
	create Text 'Status: Registered' with style and color green
	else:
	create Text 'Status: Not Registered' with style and color red
	set isActive to _currentStep == 0
		exist in the 'donors' collection, the state '_isRegistered' will return the value as 'true': the system fetches out the data to be displayed. Otherwise, the status will return the value as 'false': the user has not registered.

3.4 Phase 4 - User Evaluation

In this phase, the prototype of the proposed application is performed to the Subject Method Expert (SME) for an initial evaluation to identify its strength and weaknesses. Comments and suggestions are collected from the Subject Method Expert (SME) for the developer to further improvement in the next phase.

3.5 Phase 5 - Refining Prototype

According to the feedback from the Subject Method Expert (SME) in the previous stage, the developed application needs to improve in these areas. First, the color theme of the previously developed mobile application is pink. However, as the theme method expert (SME) commented, Malaysia's pink is mainly used for blood and cancer awareness, while the color theme of Organ donation in Malaysia is green. Therefore, developers must change the theme color of the developed mobile application from pink to green, as shown in Figure 9 and 10. Next, it should be beneficial for users to register as organ donors. Therefore, those who register as donors using the developed mobile application can have a medical check-up offer.

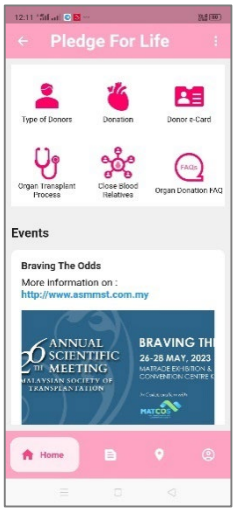


Figure 9: Previous design

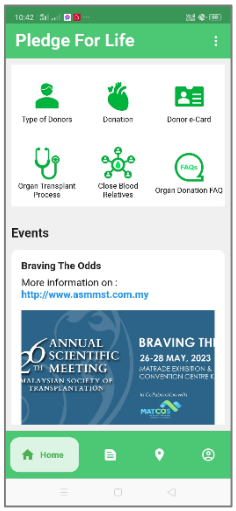


Figure 10: Revised design

3.6 Phase 6 - Implementation and Maintenance

In the final stage of the prototype model, the 'Pledge For Life' mobile application is exported in an APK file. The functional testing and user acceptance test on the developed application are performed on the target user to test and check the function of the “Pledge of Life” mobile application, to see whether it is the same as the expected result. If this application needs further improvement, it will proceed to the next phase, refining the prototype. Table 7 will show the outcome of the functional testing, while Section 4 will further discuss the user acceptance testing. Moreover, the application will be maintained if found any buffering issues after the testing process.

Table 7: Functional Testing

Test	Expected Result	Actual Result	Correction Action
Sign Up Button	Store date into Firebase and then navigate to Sign-in page	Work well as expected	No needed
Sign In Button	Navigate to Homepage		
Reset Password Button	Trigger an reset password send to user and then navigate to Sign-in page		
Homepage Button	Navigate to Homepage		
Pledge Form Button	Navigate to Donor Registration Page		
Submit/Save Button	Store date into Firebase and then navigate to Homepage		
Update Button	Able to update the donor record		
Location Button	Navigate to Homepage		
Profile Button	Navigate to Profile page		
Type of Donors Button	Navigate to Type of Donors page		
Donation Button	Navigate to Donation Flow page		
Donor e-Card Button	Navigate to Donor e-Card page		
Organ Transplant Process Button	Navigate to Organ Transplant Page	Work well as expected	No needed
Close Blood Relatives Button	Navigate to Close Blood Relatives page		
FAQ Button	Navigate to Common Asking Question page		
About Button	Navigate to About page		
Logout Button	Navigate back to the Sign-in page		
Back Button	Back to previous page	Sometime navigate to wrong page	Ensure the screen path inside the MaterialPageRoute() is linked to the correct screen
Photo Upload Button	Upload photo from gallery	Able to upload the photo, but it will disappear when the user moves to another page	Linked the upload button with Firebase by creating a new collection named "profile" for storing the photo

4. Results and Discussion

Section 4 will analyze and discuss the responses collected through user acceptance testing. The user acceptance testing on the usability of the various functions of the "Pledge for Life" mobile application was conducted by involving 30 respondents at Makmal Data Science and Faculty of Computer Science and Information Technology Universiti Tun Hussein Onn. The questionnaire applied the System Usability Scale (SUS) with options such as strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5).

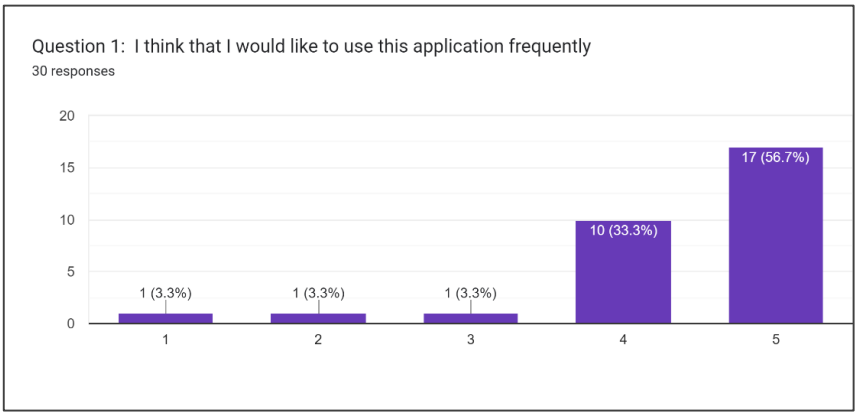


Figure 11: Result of Question 1

Based on Figure 11, the most respondent (58.7%) strongly agree that they would like to use the “Pledge For Life” mobile application frequently, followed by 33.3% of people agree, and each 3.3% of people for the option, neutral, disagree, and strongly disagree.

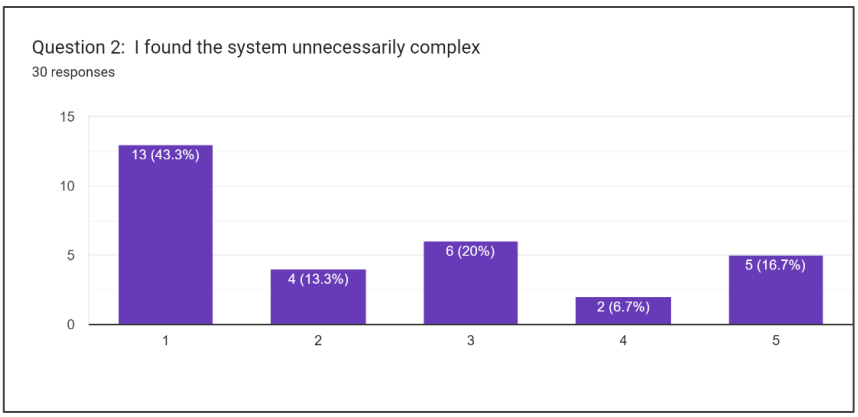


Figure 12: Result of Question 2

Based on Figure 12, most respondents (43.3%) strongly disagree the “Pledge For Life” mobile applications are unnecessarily complex, followed by 13.3% of people disagree, 20% of people are neutral, 6.7% of people agree, and 16.7% people strongly agree.

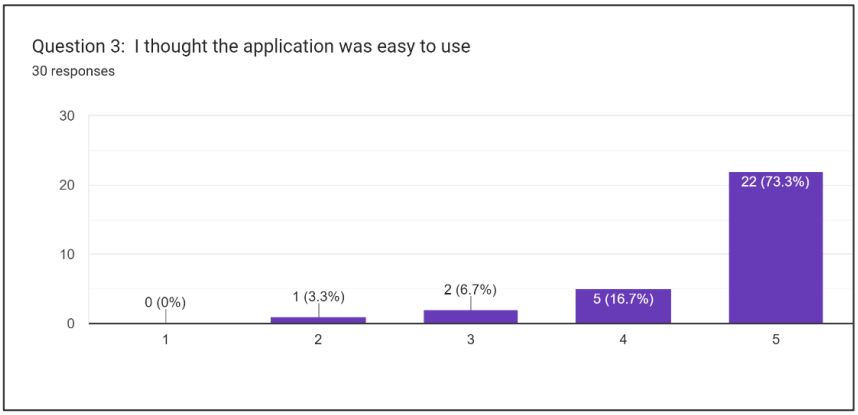


Figure 13: Result of Question 3

Based on Figure 13, most respondents (73.3%) strongly agree the "Pledge For Life" mobile applications was easy to use, followed by 16.7% of people agree, 6.7% of people are neutral, and 3.3% of people disagree.

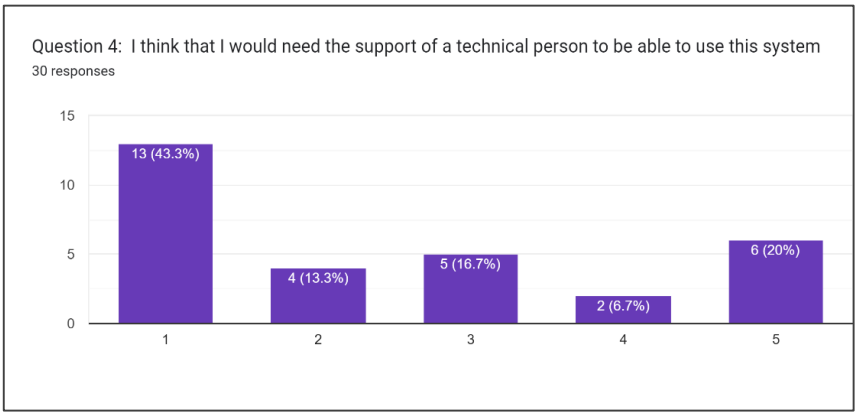


Figure 14: Result of Question 4

Based on Figure 14, most respondents (43.3%) strongly disagree that they need the support of a technical person to be able to use the "Pledge For Life" mobile applications, followed by 13.3% of people disagree, 16.7% of people are neutral, 6.7% of people agree, and 20% people strongly agree.

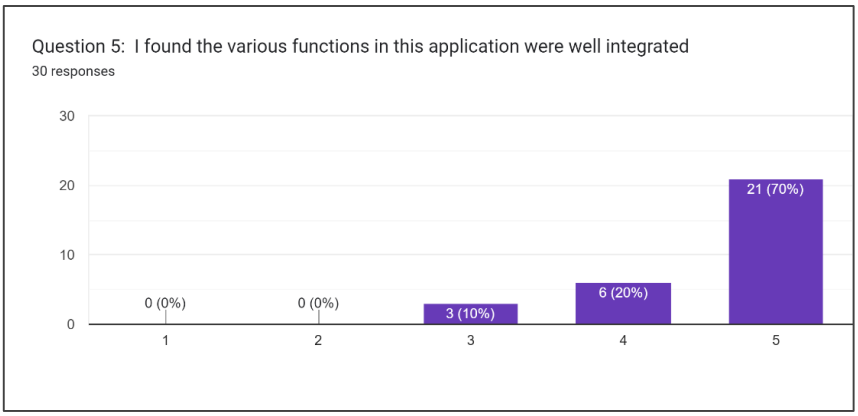


Figure 15: Result of Question 5

Based on Figure 15, most respondents (70%) strongly agree the various functions in the "Pledge For Life" mobile applications were well integrated, followed by 20% of people agree, and 10% of people are neutral.

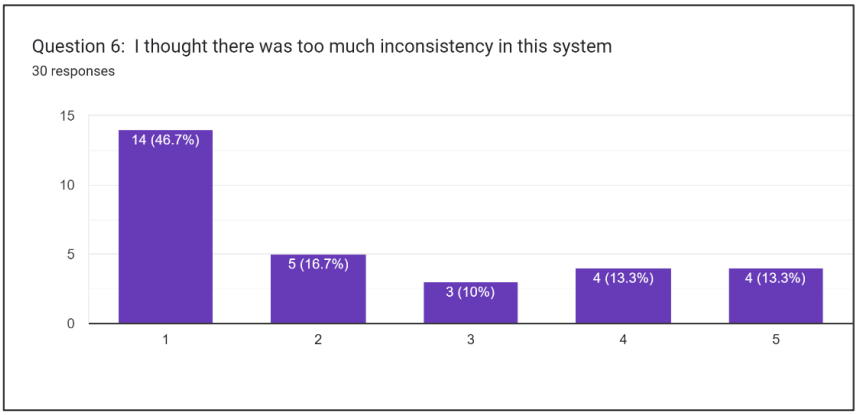


Figure 16: Result of Question 6

Based on Figure 16, most respondents (46.7%) strongly disagree the "Pledge For Life" mobile applications was too much inconsistency, followed by 16.7% of people disagree, 10% of people are neutral, and each 13.3% of people for the option, agree, and strongly agree.

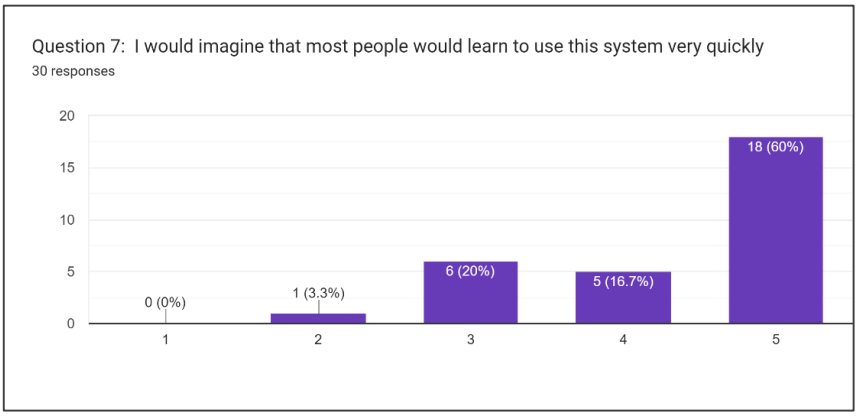


Figure 17: Result of Question 7

Based on Figure 17, most respondents (60%) strongly agree that they will learn to use the "Pledge For Life" mobile applications quickly, followed by 16.7% of people agree, 20% of people are neutral, and 3.3% of disagree.

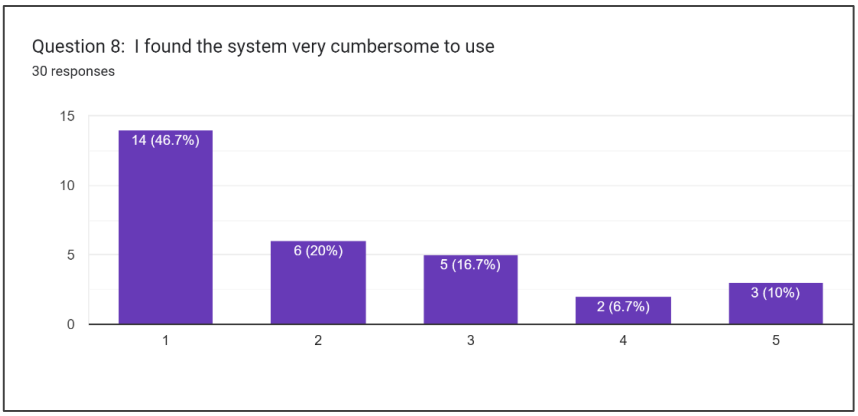


Figure 18: Result of Question 8

Based on Figure 18, most respondents (46.7%) strongly disagree the "Pledge For Life" mobile applications very cumbersome to use, followed by 20% of people disagree, 16.7% of people are neutral, and 6.7% of people agree, and 10% of people strongly agree.

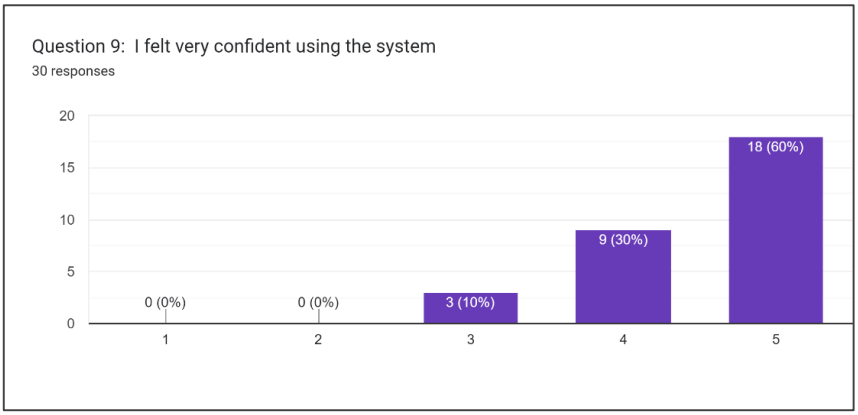


Figure 19: Result of Question 9

Based on Figure 19, most respondents (60%) strongly agree they felt very confident using the "Pledge For Life" mobile applications, followed by 30% of people agree, and 10% of people are neutral.

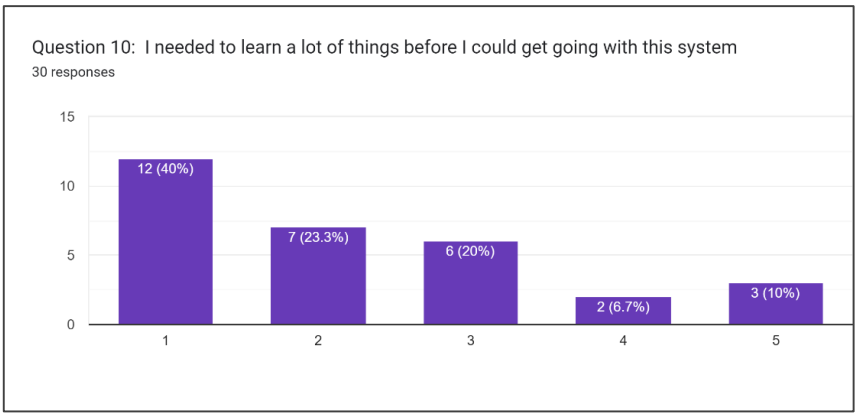


Figure 20: Result of Question 10

Based on Figure 20, most respondents (40%) strongly disagree they need to learn a lot of things before using the "Pledge For Life" mobile application, followed by 23.3% of people disagree, 20% of people are neutral, and 6.7% of people agree, and 10% of people strongly agree.

The next step is using the SUS formula to determine the user acceptability results of the "Pledge For Life" mobile application shown in Table 8.

Responden	Skor Item										Skor Ganjil	Skor Genap	Jumlah Skor
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10			
R01	4	4	5	2	5	2	5	1	4	3	18	13	77.5
R02	5	1	5	1	5	1	5	1	5	1	20	20	100
R03	5	1	5	3	5	1	5	1	5	3	20	16	90
R04	5	1	5	5	5	1	5	1	5	1	20	16	90
R05	1	2	4	2	4	4	3	2	3	2	10	13	57.5
R06	5	1	5	1	5	1	5	1	5	1	20	20	100
R07	4	1	2	1	5	5	5	1	5	2	16	15	77.5
R08	5	1	5	1	5	1	5	1	5	2	20	19	97.5
R09	5	2	5	2	4	1	3	2	4	3	16	15	77.5
R10	2	1	4	1	4	1	4	3	4	1	13	18	77.5
R11	4	3	5	2	5	3	4	2	4	2	17	13	75
R12	4	3	5	1	5	2	4	1	4	1	17	17	85
R13	3	3	4	3	3	2	2	3	4	2	11	12	57.5
R14	5	5	5	5	5	5	3	3	5	5	18	2	50
R15	4	4	4	4	3	4	4	4	4	4	14	5	47.5
R16	4	3	4	5	5	5	5	5	5	5	18	2	50
R17	5	1	5	1	5	1	5	5	5	1	20	16	90
R18	4	1	5	1	5	1	5	2	5	1	19	19	95
R19	5	2	5	3	4	4	5	3	5	3	19	10	72.5
R20	5	5	5	5	5	5	5	5	5	5	20	0	50
R21	5	1	5	5	4	4	5	4	5	2	19	9	70
R22	4	2	5	3	4	2	3	1	4	2	15	15	75
R23	5	5	5	1	5	1	5	1	5	1	20	16	90
R24	5	5	5	1	5	1	5	1	5	1	20	16	90
R25	4	3	3	3	5	2	3	3	3	3	13	11	60
R26	4	3	3	4	3	3	3	2	3	3	11	10	52.5
R27	5	5	5	5	5	3	5	2	4	4	19	6	62.5
R28	5	1	5	1	5	1	4	1	5	1	19	20	97.5
R29	5	1	5	1	5	1	5	1	5	1	20	20	100
R30	5	1	5	1	5	1	5	1	5	1	20	20	100
											Skor Purata		**77.167**

Figure 21: Result of User Acceptance Test

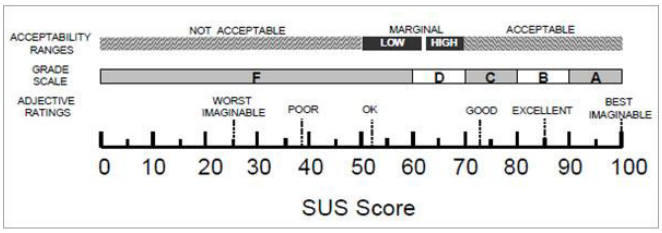


Figure 22: Grade rankings of SUS scores [14]

In summary, according to Figure 21 and 22, the overall percentage of 77.17% (Grade C) is within an acceptable range, and the "Pledge For Life" mobile application is acceptable.

5. Conclusion

In summary, the 'Pledge For Life' mobile application provides new information transmission through the application of 2D animations and videos, making the user experience more innovative. All navigation buttons, videos, and 2D animations perform well. The 'Pledge For Life mobile application is easy for users to register as organ donors and search for organ donation information more attractively. Besides that, users can update their wishes from time to time. Moreover, the TRC Location module in the developed application is convenient for the user to search the location of hospitals and will directly

bring the user to Google Maps without logout the application. With a well-planned Prototyping model methodology, "Pledge For Life" was designed and developed within a specific time constraint. Averagely, User Acceptance Testing has obtained 77.17% valuable positive feedback. Therefore, the "Pledge For Life" mobile application has achieved project objectives.

Table 8: Advantages and limitation of "Pledge For Life" mobile application in the current version

Advantages	Limitations
Able to update the wish of organs to be donated.	Unable to share donation cards on social media.
Explore the information about organ donation in a better visualization with 2D animation.	Not all content conveys applied 2D animation.

Acknowledgment

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support.

Appendix A

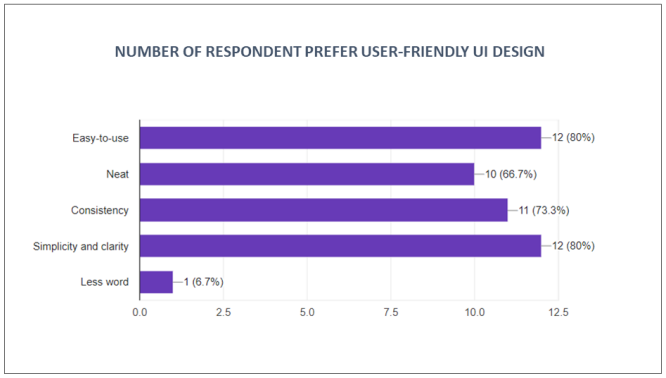


Figure 23: User preference towards UI design

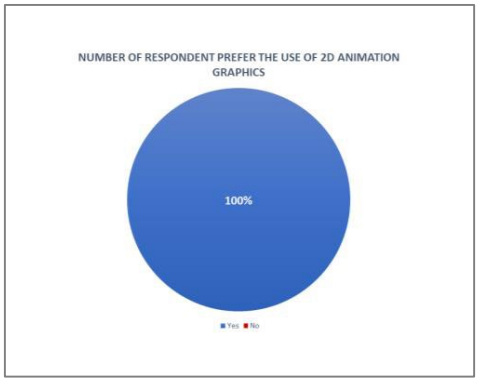


Figure 24: User preference towards innovative content

Appendix B

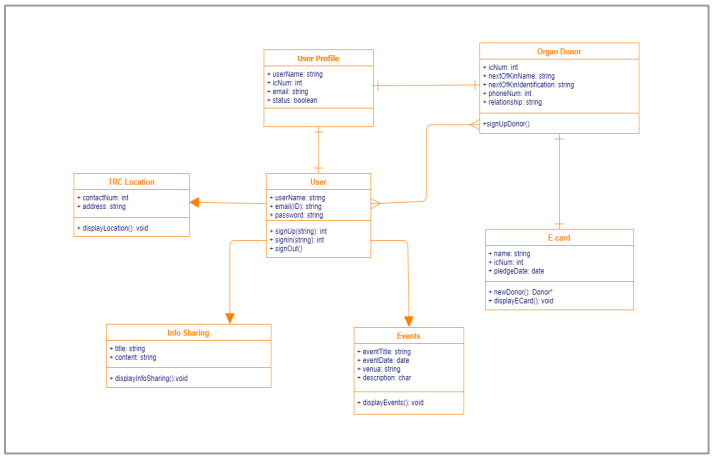


Figure 8: Class Diagram

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