AITCS

Development of Go GANOO Board Game for Terengganu Tourism Attraction

A'lia Huda Abu Bakar, Muhammad Fakri Othman*

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

Abstract. Go GANOO board game application is a Terengganu Travelling board game that is meant to help users to know more about places in Terengganu. Nowadays, people can hardly travel even inside the country due to the covid-19 virus outbreak that people cannot go and learn new places at this country. The objectives of this project are to design and develop a Terengganu traveling 3D board game that helps to give brief ideas about Terengganu using the Unity game developer and to test the game prototype to the target user which is a person who would love to travel. The methodology used to develop this application is the Game Development Life cycle (GDLC) methodology which consists of six phases initiation, pre-production, production, testing, beta testing, and release, that was chosen for its practicality in developing games application for it has production cycle. Based on the user testing on this game application, the data shows that 100% of user learns new places from the game application. Therefore, it can be concluded that games and the 3D approach can help to make users learn and memorize new things better than from common reading materials and this finding can be applied to an educational-based application for kids.

Keywords: Board game, Terengganu, Game Development Life Cycle, game application, 3D approach.

1. Introduction

There are countless of attempts on defining games and the process has not shown any sign of coming to an agreement [1]. From all the definitions, one of them stated that, a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome [2]. A game is an organized type of play, for the most of the time it is meant for amusement or fun, and in some cases, it is also used as a working or learning tool. Game is a very common and high demand medium these days. Everyone at all range of age might be engaged to games especially on mobile phone. Mobile application are the types of software that are developed to run on mobile devices. Mobile applications are meant to provide users with similar services as provided in computers, except mobile applications are portable and light-weighted. Mobile game is a game that we play on a mobile phone, tablet, and any

other portable media player. [3] Tetris variant on Hagenuk MT-2000 is known as the first game on mobile phone. In 1997, the Snake game was launched by the Nokia company and is preinstalled in most of the Nokia mobile Phone and soon after be the first to release the first two-player game on mobile phone using the infrared port [4]. Today, mobile phones are usually downloaded from apps stores or mobile operator's portal.

Today, there are numbers of type of application available online and offline, such as gaming apps, productivity apps, lifestyle and entertainment apps, and utility apps. Gaming apps are among the most popular types of apps. About 33 percent of apps downloaded are the gaming apps and account three quarter of all consumer spending. Therefore, an educational game might be the very right approach to gain people's interest in learning about Terengganu. Apps can be divided into three categories which are the native apps, web apps and the hybrid apps. Native apps are built for a specific mobile operating system, usually iOS or Android [5]. These apps can only be installed through apps Store such as Google Play or Apple's Apps Store this is because the apps are specifically built for one specific platform for better functions and full advantage of the device features can be used.

The application that will be built is Terengganu Travelling Board Game, called Go GANOO. This Go GANOO board game is quite similar to the existing monopoly game but focused on one state in Malaysia which is Terengganu. This game is an initiative to introduce the beauty of Terengganu to the World in a fun way. The Go GANOO Board Game will use Terengganu places as the property slots on the board game, display 3D models of famous Terengganu landmarks, and a page for information about some places in Terengganu.

Some of the problem statements that lead to the idea of the development of the Go GANOO board games application are, first, nowadays, people can hardly travel and explore new places due to the virus outbreak. Secondly, there are few similar existing applications such as Monopoly, Rento, and Business board game, but these applications did not use Malaysia places as their base area. The existing applications also did not utilize 3D technology to explain about the places and did not provide details and explanations about the places that user will never actually learn anything apart from the name of the places from the game. Lastly, all of the existing application requires internet connection in order to use the application which would be trouble at places with bad internet coverage. There are three objectives of making this Go GANOO board game application. first is to design a Terengganu traveling 3D board game that helps to give brief ideas about Terengganu, secondly is to develop a mobile application platform-based board game using the Unity game developer, and lastly to test the game prototype to the target user which is a person who would love to travel.

This proceeding consists of five sections. The first part is the introduction which includes the background of the project, such as the problem statement, the objectives, the importance of the project, and the scope covered in the plan. Next, the second part explains the Literature Review of the project such as systematic analysis of articles, other sources related to the project topic, and comparison between existing applications and applications of this project. In part 3, the methodology used for the application development phase, the Game Development Life Cycle (GDLC) is described in detail. Section 4 describes the discussion and results of the project through the functionality test and the user acceptance test. Lastly, in section 5 the conclusions discuss the advantages, disadvantages, and improvements of the application for the future and the acknowledgment part presents gratitude to the University.

2. Literature Review

Many business board games can be found through Apps store or google play these days. Business board games is a board game that allows player to buy properties such as lands and houses [6]. One common business board game that most people play is Monopoly. Three related applications have been selected as reference and they are called Rento, Monopoly [7] and Business. Table 1 below will show the characteristics of each of the applications including Go GANOO.

Table 1: Analysis on existing applications

Application name	Description
Monopoly	-Use 3D graphic for the board game
	-This application in premium and cost RM16.90 to download.
	-user can play board game online with friends
	-user can buy more premium theme for the board game
BUSINESS	-use 2D graphic for the board game
	-This application is free
	-allow user to play multiple and solo player
RENTO	-Use 3D graphic for the board game
	-This application allow user to play online with friends.
	-this application provides 18 languages
Go GANOO	-Use 3D graphic for the board game
	-This application is free of charge
	-This application displays information about few places in Terengganu
	-This application provides 3D models of landmark in Terengganu

3.   Methodology

The methodology that is used for this project is Game Development Life Cycle (GDLC) life cycle. This methodology is an approach that is specifically meant for game development because the normal System Development Life Cycle (SDLC) is not sufficient to be used for game development due to the challenges that usually occur during the life cycle of the project. This methodology consists of six phases, initialization, pre-production, production, testing, Beta testing, and release. [8] Details and explanations of phases in this methodology will be explained in the subtopics. Figure 1 will show the flow of GDLC methodology.
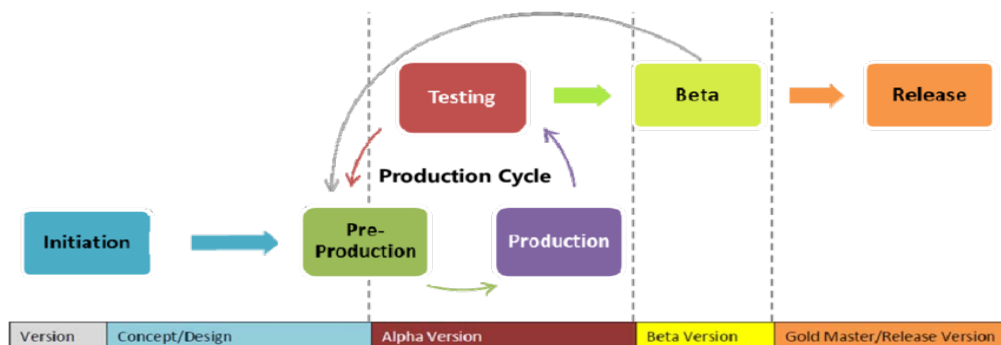

Figure 1: Game Development Life Cycle model [8]

3.1 Initiation

This first stage is the most important phase in developing this application. It is where the idea of the Go GANOO board game being brainstormed with possibilities and consequences that need to be considered. This includes deciding the game concept of the project, gameplay, flowchart, functional requirement, non-functional requirement and target user for the application was decide which is people from the age 17-30. The flowchart of the application will be shown in figure 18 in appendix A. After the game concept and gameplay are decided, Unity engine was chosen as the developer software for this project for it is simple and easy to use. An interview with SME, Muhammad Ikram bin Muhammad Shafiq who is a licensed Malaysian tourist guide was carried out to get the functional and non-functional requirements. Tables 2 and 3 will list the functional and non-functional requirements for the application.

Table 2: Functional requirements

Functional requirement	Description
Board game module	• In this module, user get to play business board game.
	• user get to roll the dice to move their turtle token.
	• user get to buy properties that they want to buy.
	• user get to pay rent when they step in opponent's properties.
3D view module	• user get to see 3D models of buildings in the 3D section.
	• user get to interact with the 3D models
Information module	• user get to know interesting fact about selected places in Terengganu
	• user get to see images of selected places in Terengganu

Table 3: Non-functional requirements

Non-functional requirement	Description
Performance	• The application shall operate offline.
	• The application shall take less than 5 second to launch for Android mobile that fulfil the system requirement.
Usability	• Users are able to use this application anytime
	• Users shall find this application easy to use and provide enjoyable user experience.
Cultural	• This application will be using simple English language.
Legal	• Users can only use and navigate through the application but cannot modify them.

3.2 Pre-Production

The pre-production phase is the second phase after the initiation phase. In this phase, the game object such as game buttons, background images, and 3D models for the game was created using selected software. For the buttons and background image, the Sketchbook application was used, and the

application used for 3D modeling was the Blender. Besides, the interface of existing applications was also being observed and compared through the making of the game object to match the concept of the application. Examples of game objects design will be shown in figure 2 and 3.
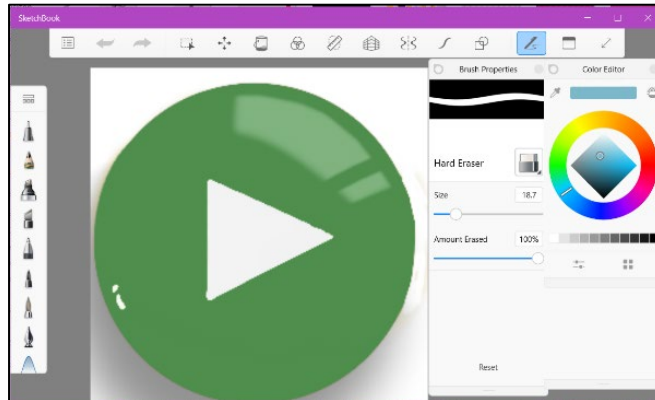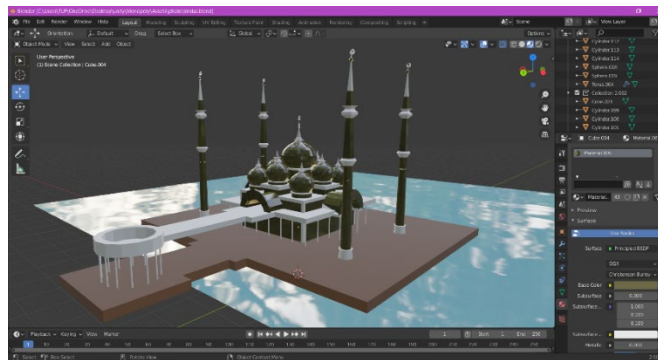

Figure 2: Game button designing

Figure 3: 3D model designing

3.2.1 Application interface

Application interface will show and explain the function of all interfaces in Go GANOO application. Figure 4 until figure 11 will show the image of the Go GANOO interface. Figure 4 shows the intro screen for the application. This intro screen is the first screen to appear after user click open the application.

Figure 4: Intro screen

Figure 5 shows the main menu of the application. The main menu has three buttons which are the 3D view button, board game button, and the about Terengganu button. The 3D view button will take the user to the 3D view module, the board game button will take the user to the board game module, and about Terengganu button will take the user to the info module.
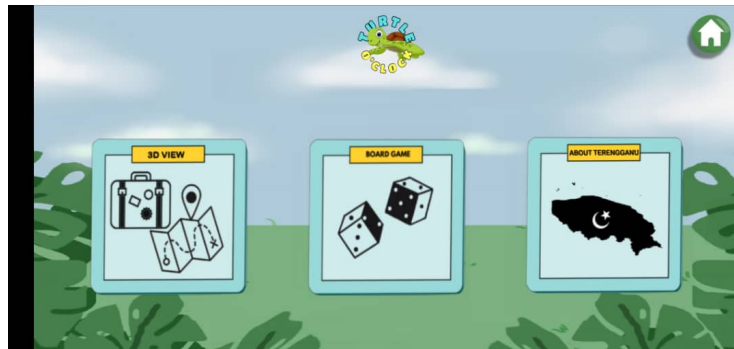

Figure 5: Main menu

Figure 6 shows the 3D option interface. This in the first interface in 3D module. User have four options of 3D models that they want to see.
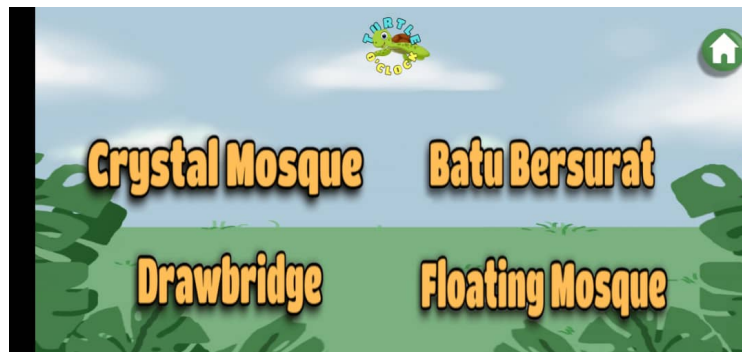

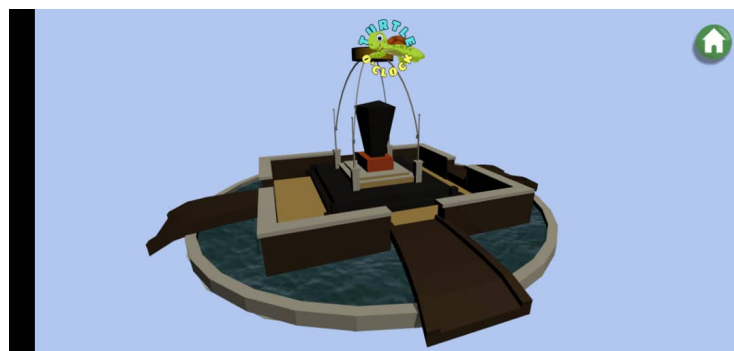**Figure 6: 3D options interface**

Figure 7: 3D view interface

Figure 7 shows the 3D view interface. This interface displays the 3D models of landmarks in Terengganu. In this interface, user get to interact with the 3D model to the model from many angles. Figure 8 shows the information interface. This interface shows explanation and image of places in Terengganu. Figure 9 shows the instruction interface. This instruction interface will be the first interface that will be displayed when user click the board game button. This interface has the game instructions to make sure user know how to use the board game.
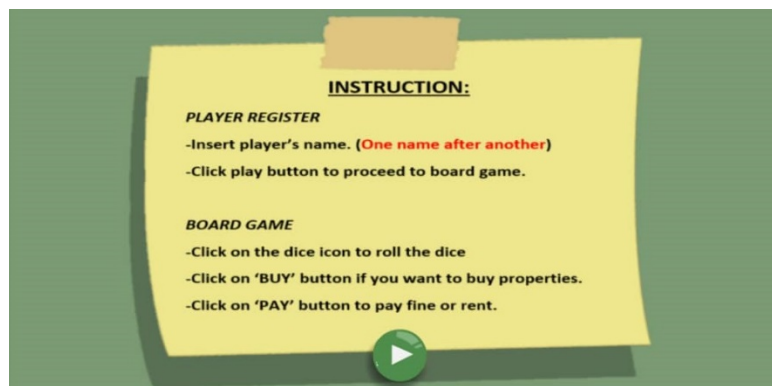
Figure 8: information interface

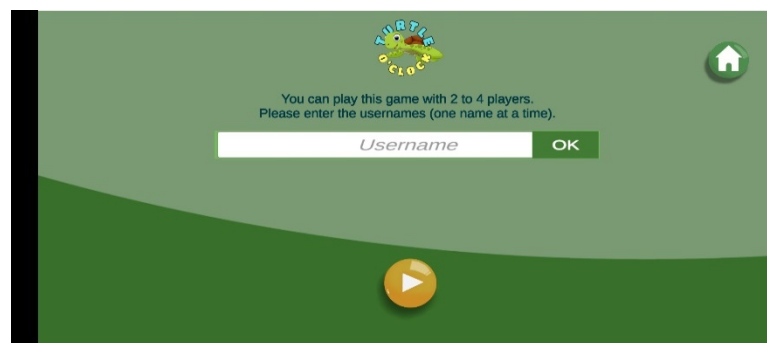**Figure 9: board game instruction**

Figure 10: player registration interface

Figure 10 shows the player registration interface to assign the board game player. User can assign minimum two names and maximum four names to play the board game.

Figure 11: board game interface

Figure 11 shows the board game interface. Here, there will be a board game with 40 slots of places and penalty boxes on the board. The user can click on the dice button to roll the dice to make a move. Their token will then go to the slots according to the dice number. Users will have options whether to buy or to pass.

3.3 Production

After all the previous phases are done, the cycle will proceed to the next step which is the production phase. This phase is where the GANOO board game application is being developed. In this phase, the script for the game function such as buttons, dice roller, player movement, and 3D model interact was initialized. The game object that was made in the previous phase was also implemented in the game. The game will also be made sure that it can run its features and works well. For example, figure 12 shows script implementation on the 3D object to make it interactable.
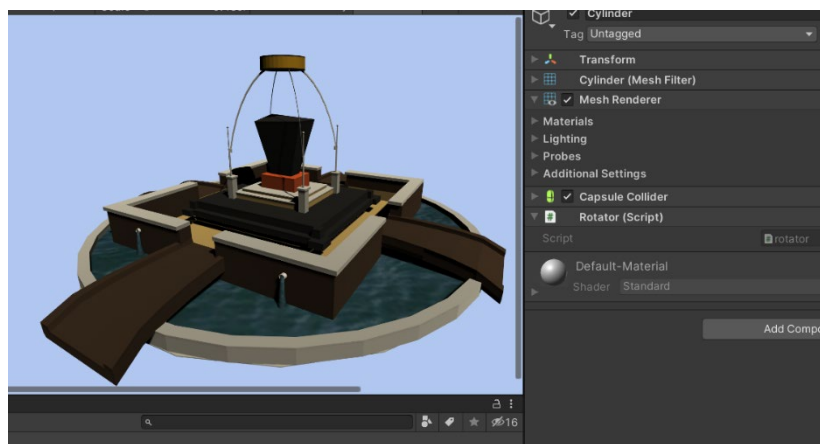

Figure 12: script implementation

3.4 Testing

In this testing phase this GANOO board game application was tested based on few aspects such as the buttons, dice roller, user token movement, and user register functionality; and the ability to run on the target platform. The test was run by the developer through the exe file of the GANOO board game application. After the testing was done, based on the result the process will either proceed to the next step which is the Beta testing, or go back to the pre-production cycle phase if there are any changes needed. For the GANOO board game application, the testing result shows positive outcomes with no correction needed to be done, therefore the process proceeded to the next phase which is the Beta testing phase.

3.5 Beta

Beta testing is testing that is done by a third party such as a game reviewer or potential buyer. This test was carried out online where The GANOO board game application was put into APK format and was distributed to 12 target users and the user was required to fill in their feedback in the given google form with few questions regarding the tested application. This is to gain user's feedback based on a few aspects which are the design of the interface, functionality of the application, and bugs detection. Just like the previous testing, the next step will be decided based on the test result. If the feedback is nice and ready to be released then the application will proceed to the next step which is released otherwise it will go back to the pre-production phase. Figure 13 shows one of the target user testing on the application during the Beta testing.

Figure 13: Target user running test on the application

3.6   Publish

Publish is the last phase of the project where the game application is finally being released to the appropriate marketplace whether on the apps store or the google play.

4.   Result and Discussion

Each data and information collected is analyzed then the requirements specification is carried out in the next phase so that it can be explained and understood by the developer after the information obtained meets the requirements of the proposed application scope.

4.1   Functionality Testing

Functional testing is software testing that validates software systems based on the functional requirements [9]. The purpose of functional testing is to test each function of a software application by providing the appropriate input and checking the output. If any error occurs, or the system failed to produce the output according to the plan, correction will be made to make sure the application functions the way it should. The result of the testing will be listed in table 4.

Table 4: Application functionality test

Test	Expected result	Actual result	Correction
Start button	Navigate to the main menu	work as expected	Not needed
3D view button	Navigate to 3D view interface	Work as expected	Not needed
Board game button	Navigate to the board game registration interface	work as expected	Not needed
Information button	Navigate to the about Terengganu interface	work as expected	Not needed
Home button	Navigate to the main menu	work as expected	Not needed

Table 5: (continued)

Test	Expected result	Actual result	Correction
OK button	Validate user's name registration	work as expected	Not needed
Play button	Navigate user to the board game interface	work as expected	Not needed
Dice button	Roll the dice and show random number	work as expected	Not needed
Buy button	Allow user to buy properties on the board game	work as expected	Not needed
Pay button	Allow user to pay rent or fine on the board game	work as expected	Not needed
Exit button	Allow user to exit board game play and navigate to endgame interface	work as expected	Not needed
Replay button	Navigate user to the board game player registration	work as expected	Not needed

Based on the functionality test, it can be concluded that the GANOO board game application functions are working as expected and there's no correction needed to be done.

4.2 User Acceptance Test

User Acceptance Test is the final stage of the entire software development life cycle. This is when real users test the software to make sure they can perform the tasks they need, this is meant to make sure the application can handle real-world situations [10]. It is also to get users' opinions on the current presentation and performance of the game application for evaluation purposes. This Go GANOO application has been tested by 12 individuals with various backgrounds and ages. This test was carried out online where The GANOO board game application was put into APK format and was distributed to 12 target users and the user was required to fill in their feedback in the given google form with few questions regarding the tested application. The results will be displayed in figure 14 until figure 17.
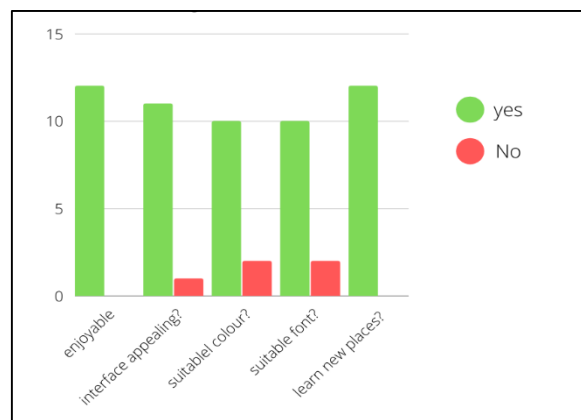

Figure 14: Users' feedback on question 1 until 5

Figure 14 shows the user's feedback on question 1 until question 5. Question 1 until 5 are questions related to the applications' appearance and the overall outcome shows a positive result from the user. For question 1, 100% of the user agree that the game application is enjoyable. For question 2, on "did you find the game application's interface appealing", 91.7% gives a yes and only 8.3% answer a no. For the third and fourth question, 83.3% of users agree that the color and font used is suitable for the

application. Lastly is question 5, on users learn new places from the application, 100% of the user agreement with the statement.
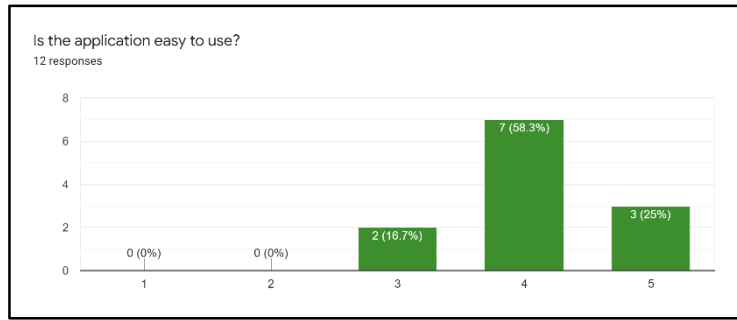

Figure 15: User's rating on the game easiness' of use

Figure 15 shows the user's response on question 6 which is on the ease of use of the application with the range answer of '1' as so hard to use and '5' as very easy. Two people answer '3', seven people answer '4' and three people answer '3'. Therefore, it can be said that the user's view on the ease of use of this application is positive.
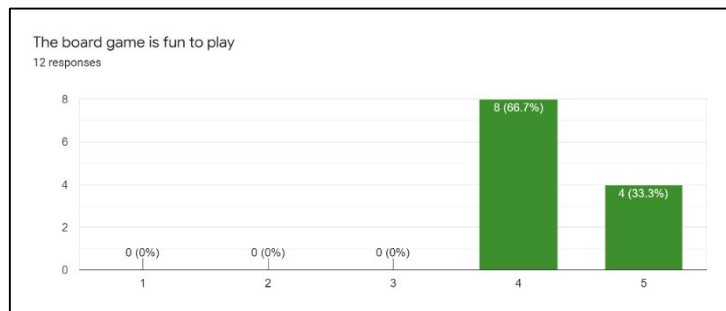

Figure 16: user's rating on the game fun level

Figure 16 shows result for question 7 on fun level of the game application with the range answer of '1' as boring and '5' as so fun. From the result, it can be seen that 66.7% gives the score 4 as fun. And other 33.3% gives 5 as score which is so fun. It can be concluded that 100% of the application find this game application fun to play.
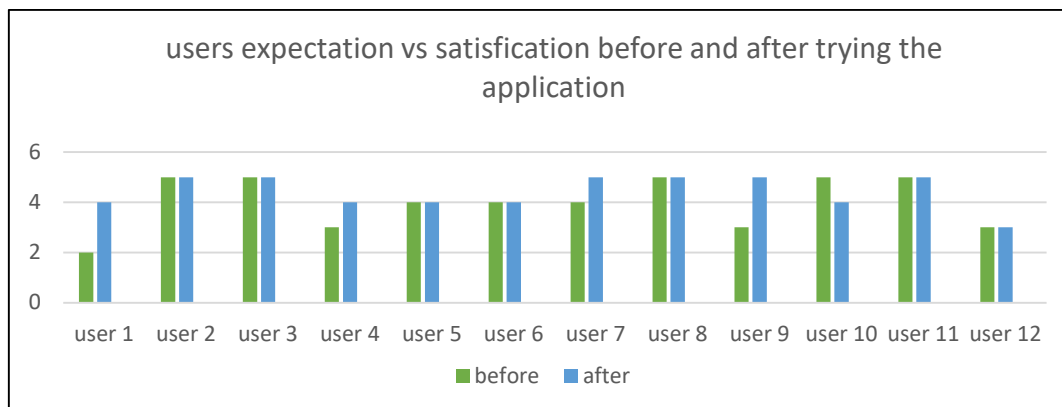

Figure 17: User's expectation and satisfaction before and after using the application

Figure 17 shows the result of the user's expectation level before using the application and the user's satisfaction level after using the application with '1' for the lowest and '5' as the highest point for both categories. User 1 gave '2' as expectation level and '4' on satisfaction level. User 2, 3, 8, and 11 gave '5' for both expectation and satisfaction level. User 4 had '3' as expectation level and '4' as satisfaction

level. User 5 and 6 gave '4' for both expectation and satisfaction level. User 7 had an expectation level of 4 and a satisfaction level of 5. User 9 gave '3' as expectation level and '5' as satisfaction level. User 10 gave '5' as expectation level and '4' as satisfaction level which shows the negative result and lastly, user 12 gave the same level for both expectation and satisfaction which is 3.

Based on the results, only one user shows the negative result and other 11 user shows positive result where the satisfaction result is higher or equal to the expectation level. Therefore, it can be concluded that the users are satisfied with the application.

5.   Conclusion

This Go GANOO board game application was managed to be built according to the given time using the Game Development Life Cycle methodology (GDLC) and all the objectives of the project are successfully achieved. This application is a is a Terengganu Travelling board game that is meant to help users to know more about places in Terengganu. This application allows 2 to 4 people to play the board game at one time. Player can learn new places from the board game on the board game module. They can also read more regarding Terengganu tourism places in the About Terengganu module and last but not least, they can view 3d models of Terengganu and interact with the 3D models at the 3D view module. 12 respondents were chosen to carry out the testing for the application and fill out feedback form. The result of the resting shows positive feedbacks and it can be concluded that all the users are satisfied with the outcome of the application. It cannot be denied that there are indeed limitations on the application. Such as the board game cannot be played by more than four players, the user cannot navigate the 3D model freely, the application appears bigger on phone with smaller screen size and board game did not provide the name of the winner for the game. Future work will be done to make sure the application can be improved from time to time to bring the best out of the application so that it could bring benefit to many people.

In conclusion, this application is to provide an interactive application that allow user to learn more about Terengganu through fun board game and see the beauty of famous landmarks in Terengganu through the 3D view features. User can also simply play this Go GANOO board game like any other business board game even with no intention to learn about Terengganu. Based on the tester review, it shows positive feedback on how user get to learn more about Terengganu by using this game application. supported with the information interface, user get to learn interesting information about Terengganu alongside with the location of the interaction places.

Acknowledgement
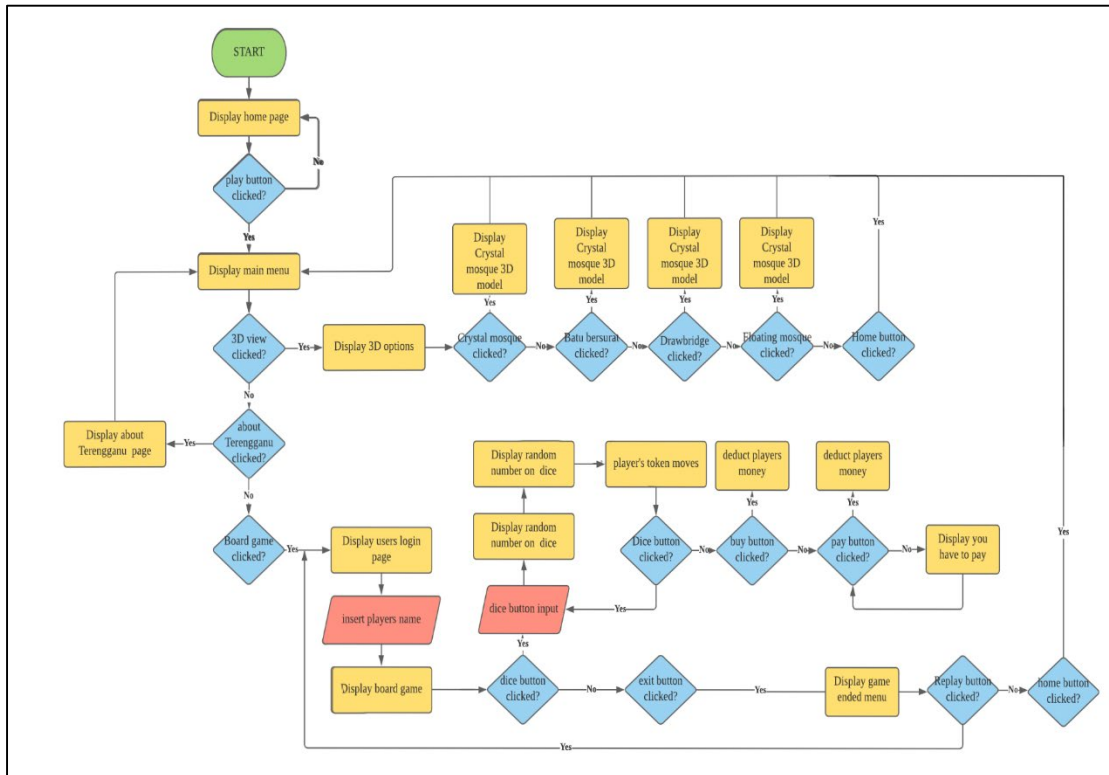
Appendix A

Figure 18: Application flowchart

Reference

[1]   C. Wright, "A Brief History of Mobile Games: In the beginning, there was Snake," |Pocket Gamer.biz | PGbiz. Pocket Gamer, [Online]. Available: https://www.pocketgamer.biz/feature/10619/a-brief-history-of-mobile-games-in-the-beginning-there-was-snake/ [Accessed Aug 20, 2020].

[2]   L. Valdellon, "What Are the Different Types of Mobile Apps? ," | CleverTap [Online]. Available: https://clevertap.com/blog/types-of-mobile-apps/ [Accessed Aug 17, 2020].

[3]   B. DaCosta, "What is Mobile game," | IGI Global, [Online]. Available: https://www.igi-global.com/dictionary/mobile-game/18854 [Accessed Jan 23, 2021].

[4]   E. Aarseth, and G. Calleja, "The Word Game: The Ontology of an Undefinable Object," invited talk at The Philosophy of Computer Games 2009. Oslo, 13-15 August 2009.

[5]   Dixie, "Rules of play: game design fundamentals," [Online]. Available: https://dixieching.wordpress.com/2011/10/02/salen-k-zimmerman-e-2004-rules-of-play-ch-3-7-8-9-11-12-13 [Accessed Dec 16, 2020].

[6]   K. Shalini, "Business Game: How To Play Business Game? Know all the Basic Rules of Business Game, Property, Chance and Community Play Here!" [Online]. Available: https://latestnews.fresherslive.com/articles/how-to-play-business-game-know-all-the-basic-rules-of-business-game-146499 [Accessed Aug 15, 2020].

[7]   T. Britannica. Monopoly Encyclopaedia Britannica. [Online]. Available: https://www.britannica.com/sports/Monopoly-board-game [Accessed Nov 26, 2020].

[8]   W. Yani, "Game development life cycle guidelines," [Online]. Available: https://www.researchgate.net/publication/271548605_Game_development_life_cycle_guidelin es [Accessed Feb 25, 2021].

[9]   B. Shreya, "Functional Testing: A Detailed Guide," [Online]. Available: https://www.browserstack.com/guide/functional-testing [Accessed Nov 24, 2020].

[10]   E. Eyal, "User Acceptance Testing (UAT) Process Explained," [Online]. Available: https://www.panaya.com/blog/testing/what-is-uat-testing/ [Accessed Aug 15, 2020].