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Implementation of Gamification Octalysis Method at Design and Build a React Native Framework Learning Application

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Abstract—**There are many kinds of frameworks that can be used to make a mobile hybrid application. One of the frameworks that a lot of big companies' use is React Native. React Native offers a feature to build cross platform mobile based application but there are some difficulties in learning this framework such as understand the ecosystem and concept of React and how declarative programming works. This makes learning React Native harder for a software developer who wants to learn this framework. Octalysis is a gamification method that have eight core that focused on human. This research aims to design and build a React Native learning application using the Octalysis gamification method and measuring the level of behavioral intention to use and immersion of the application based on Hedonic Motivation System Adoption Mode (HMSAM). Application testing is carried out by field testing to user who wants to learn React Native. Questionnaire that has been created referring to HMSAM model to measure intrinsic motivation of the user such as user's desire to use the application again (behavioral intention to use) and user focus when using the application (immersion). Evaluation result shows that users strongly agree that they are going to use the React Native learning application in the future with average percentage of 83,24% and users agree that they feel focus when using the React Native learning application with average percentage of 73,79%.**

Keywords—gamification, HMSAM, learning application, octalysis, react native

I. INTRODUCTION

Framework is a working platform that have purpose to make creating and developing application easier [1]. There are two ways to developing a mobile application, native and hybrid. Native means developing the mobile application using the original platform tools such as Java or Kotlin in Android and Swift or Objective C in iOS. Hybrid means developing the mobile application using a framework and the developer only need to write the code once, for example using Ionic, Xamarin, React Native, and Flutter [2]. One of the frameworks that being used by large companies is React Native. The large companies that use React Native are Facebook, Instagram, Bloomberg, Pinterest, Skype, Tesla, Uber, and many more [3].

React native created by Facebook in 2012 and offering many features to create a cross platform mobile application but there are some difficulties in learning such as the developer must understand the ecosystem and concepts of React and declarative programming. This makes learning React Native difficult for a software developer that want to learn this framework [4].

Gamification is an implementation of fundamentals and elements that exist in a game for the purpose of learning. In a survey to workers that being done in 2018, it shows that 80% of the respondents enjoy using gamification application, 87% feels more productive, and 82% feels happier when using a gamification application [5]. Also, there is another survey to students in 2016 that shows that 82% of the respondents choose learning technique with gamification [6]. Each survey shows that application that implement gamification gives a positive experience for its user.

To design a gamification, it needs to use a gamification framework to helps the design process. There are many frameworks that available such as GAME and RAMP framework [7]. Besides those frameworks, there are a framework that made by Yu-Kai-Chou called Octalysis [8].

Octalysis have eight core that focused in human behavior [8]. When comparing Octalysis with other frameworks, it shows that Octalysis can create a more motivating and enjoyable experience. With such reason, Octalysis gamification method can be used to make React Native learning experience easier and more fun [9].

Based on explanation of the problem above, it is needed to make a fun learning application that can help software developer to learn React Native. There is previous research about gamification in Java programming language and shows that by implementing gamification can help people to learn more by relieve the difficulties in learning such as lack of motivation [10]. There is another research that shows that gamification can be used as a tool to learn about programming language that can give a positive result in motivation, collaboration, fun, and effectiveness in the learning process [11].

II. LITERATURE REVIEW

A. React Native

React Native is a Javascript framework to create a mobile application for Android and iOS using React. React itself is a

framework that created by Facebook to make rich and interactive user interface. React Native will compile React component to native iOS and Android component so that React Native will render the application using mobile UI component, instead of web view. Furthermore, the developer only needs to write the code once and the code will run in both iOS and Android. There are two ways of making React Native component, such as class and function.

B. Octalysis Gamification Method

Octalysis gamification method have eight core that focused on human behavior such as meaning, accomplishment, empowerment, ownership, social influence, scarcity, unpredictability, and avoidance [8].

Meaning means the player is doing something that greater than themself. Accomplishment means player have an urge to finish a challenge. Empowerment means player have to think creative to finish a challenge or task. Ownership means the player can own something from the game for example an in-game currency or an item. Social influence means the application must have a social element like friending. Scarcity means that the player wants something but can't have it yet. Unpredictability means the player cannot anticipate what will happen next. Lastly, avoidance means the player must avoid negative consequences if not act fast [8].

C. Hedonic Motivation System Adoption Model (HMSAM)

HMSAM is a model that is used to measure intrinsic motivation of a system or application that implements hedonic motivation. The model of HMSAM can be seen in Figure 1.

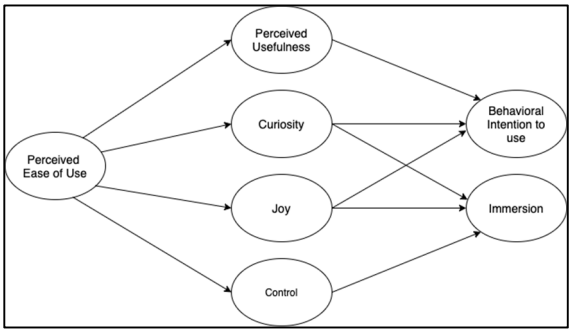

Fig 1. HMSAM Model [12]

HMSAM will measure seven points of intrinsic motivation. Those seven points are:

1. Perceived ease of use (PEOU), measure the ease of use of a system or application
2. Perceived Usefulness (PU), measure the usefulness of a system or application.
3. Curiosity (C), measure the curiosity of the user
4. Joy (J), measure the joy of the user when using a system
5. Control (Co), measure the user perception when interacting with system
6. Behavioral Intention to Use (BIU), measure user's intention to use the system
7. Focused Immersion (I), measure user's focus when using the system.

HMSAM have two final aspects, behavioral intention to use and immersion. Behavioral intention to use is determined by perceived ease of use, perceived usefulness, curiosity and joy. While immersion is determined by curiosity, joy, and control.

D. Likert Scale

Likert scale is a scale that used to measure a person's demeanor, opinion, and perception about a social phenomenon [13]. The measurement can be done by giving a question to a respondent with an answer that consists of five answer that have five different weights. Likert scale generally using five answers.

1. Strongly Agree (SS) have weight of 5
2. Agree (S) have weight of 4
3. Neutral (RR) have weight of 3
4. Disagree (TS) have weight of 2
5. Strongly Disagree (STS) have weight of 1

Following equation can be use to calculate the score percentage from a questionnaire.

$$\text{Percentage} = \frac{(\text{SS}*5)+(S*4)+(RR*3)+(TS*2)+(STS*1)}{5*\text{Responedents Total}}$$

Following equation is used when there is a * symbol in a HMSAM question.

$$\text{Percentage} = \frac{(\text{STS}*5)+(TS*4)+(RR*3)+(S*2)+(SS*1)}{5*\text{Respondents Total}}$$

III. Methodology and Application Design

A. Methodology

Methodology that is used in this research are:

1. Observation

   Observation is done by finding out what is the problem that is currently happening in programming world. In this phase, it is known that there are difficulties in understanding the ecosystem and concepts of React Native and declarative programming [4].

2. Literature Study

   Literature study is done by searching and studying reference that will be used in designing and developing a React Native framework learning application.

3. Designing Application

   Designing application is done by designing the application that is easy to use and function well. React Native learning application have several features such as edit profile, journey, achievements, friends, shop, leaderboard, and many other.

4. Developing Application

   Developing application is done after designing the application. The application is developed using React Native web framework and the API is made by Node JS framework with Firebase

5. Testing Application

   Testing application is done to make sure that the application that have been made is running without a problem. The testing is done by sharing a questionnaire that is made with HMSAM model to application users

B. Gamification Design

React Native learning application that being made is based on eight cores of Octalysis.

1. Meaning: Beginner's Luck is implemented in a chance reward system in early level and Elitism is implemented in the rare avatar system. User can receive a rare avatar or buy an expensive avatar.
2. Accomplishment: Leaderboard is implemented in both global and your friends' leaderboard and Progress Bar is implemented in level progress bar in the sidebar.
3. Empowerment: Milestone Unlocks is implemented in a system where the user needs to finish the previous level to unlock the next one and Blank Fills is implemented in the answer system. The user needs to fill the correct answer.
4. Ownership: Exchangeable Points is implemented in in-game currency in the application.
5. Social Influence: Friending System is implemented in friending system in the application.
6. Scarcity: Prize Pacing is implemented in the reward system. The faster the user finish a level, the more reward they get.
7. Unpredictability: Easter Egg is implemented in many areas in the application. The easter eggs includes reference and hidden achievement.
8. Avoidance: Evanescence Opportunity is implemented in the reward system. If the user didn't quickly finish the level, they will lose the chance to get more reward.

IV. IMPLEMENTATION & EVALUTAION

The implementation of the application is based on the design prototype and the flowchart of the application. The name React Native framework learning application is Reactive.

A. Implementation

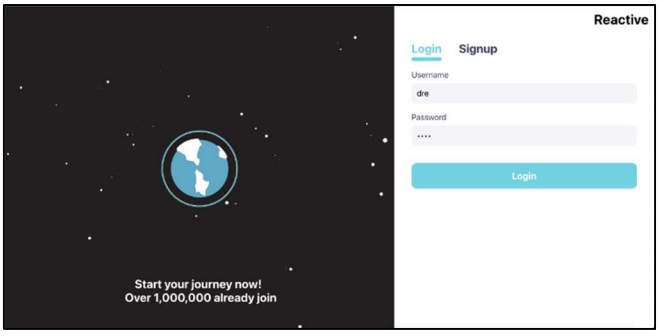

Fig 2. Auth Scene (Login)

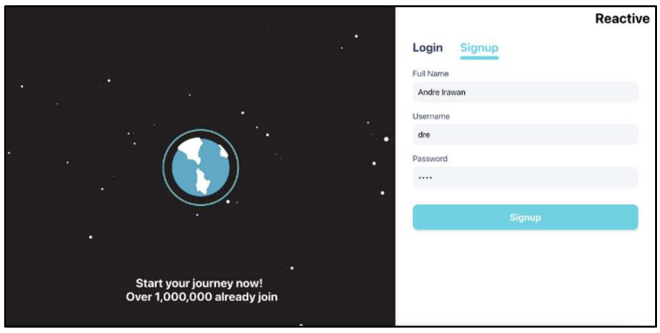

Fig 3. Auth Scene (Signup)

Figure 2 is an image of Auth Scene for login and signup process. User can input their username and password in the "Login" tab. If the user doesn't have an account, they need to navigate to "Signup" tab and register their account, shown in Figure 3.

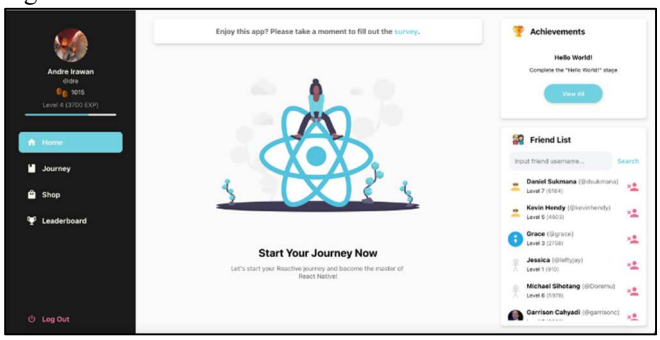

Fig 4. Main Scene

Figure 4 is an image of Main Scene of the application. There are many module that can be accessed from Main Scene like Home, Journey, Shop, and Leaderboard. User can navigate to Edit Profile by clicking the avatar in the sidebar. There are many informations that can be view in the sidebar such as username, coffee beans (in-game currency), and user's level.

Home module is selected by default. User can view their latest achievement in the Achievements card. User can view list of all achievements in the game by clicking the View All button. User also can add others by inputting their friend's username in the search box and press search.

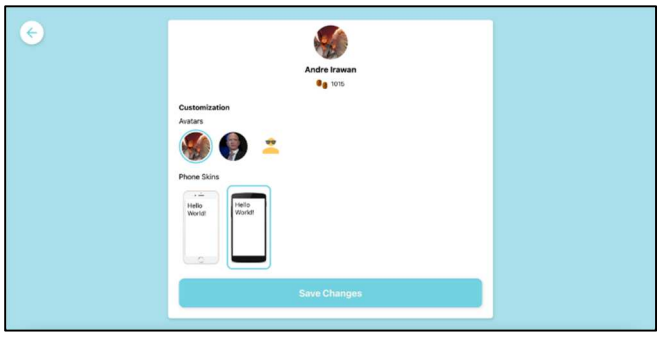

Fig 5. Edit Profile Scene

Figure 5 is an image of Edit Profile Scene. User can change their avatar and phone skin in this scene. After making changes, the user can save their changes by pressing the Save Changes button.

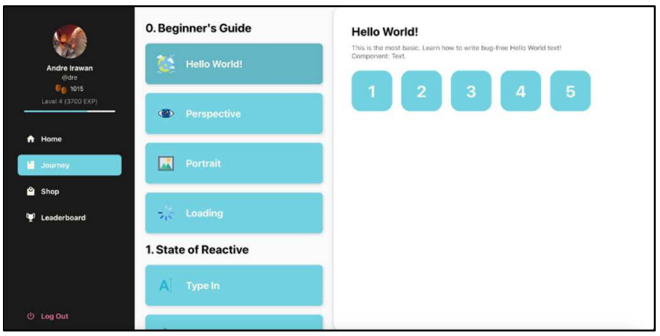

Fig 6. Journey Module

Fig 6 is an image of Journey module. User can choose component that they want to learn. For example "Hello World!" is for Text component, Perspective for View component, Type In for Text Input component, and so on. The components is divided into two sections. Beginner's guide is for stateless component and State of reactive for a component that needs state.

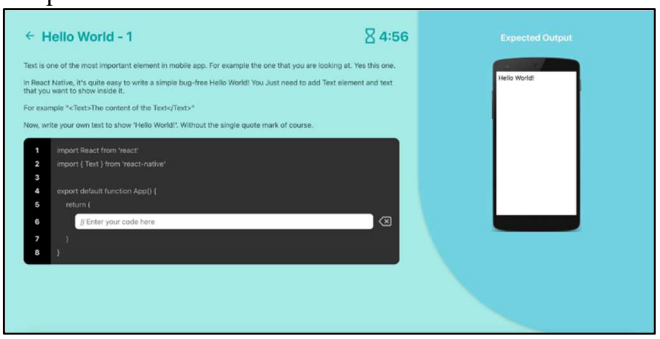

Fig 7. Level Scene

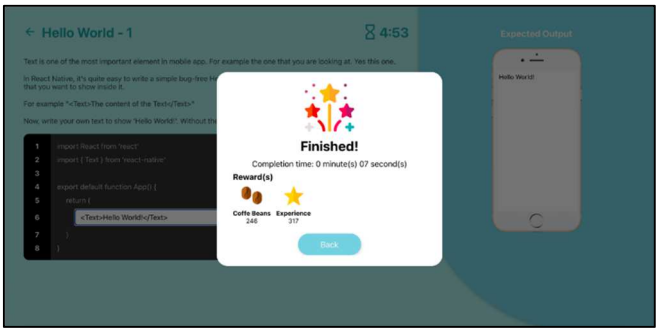

Fig 8. Level Scene (Success)

Figure 7 is an image of Level Scene where user must input a correct answer based on the level description and expected output. If the user input the right answer, a modal will be shown with the reward of the current level as shown in Figure 8.

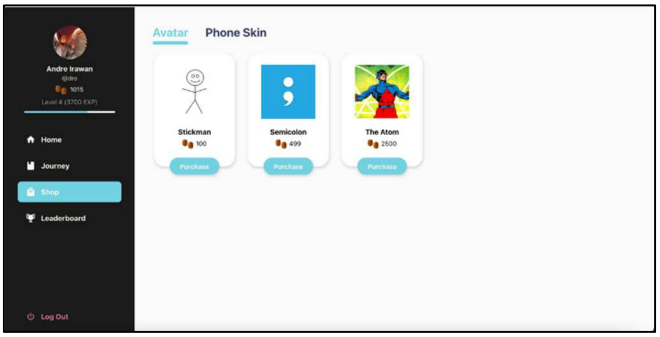

Fig 9. Shop Module (Avatar)

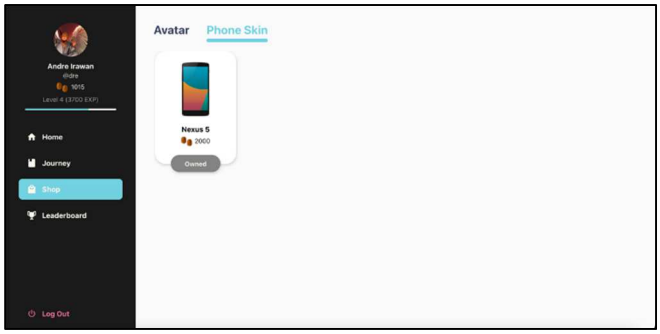

Fig 10. Shop Module (Phone Skin)

Both Figure 9 and Figure 10 shows the Shop module. In this module, user can buy a new avatar or a phone skin. If the user already have the item, the "Purchase" text will change to "Owned" and unclickable.

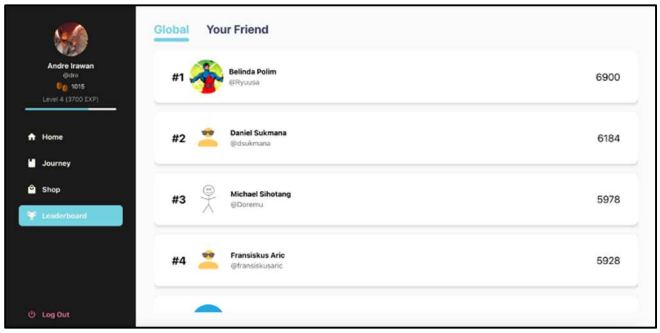

Fig 11. Leaderboard Module

Both Figure 11 shows Leaderboard module. User can view top ten users globally based on their experiences. If user wants to view their friend's ranking, the user can choose "Your Friend" tab.

B. *Evaluation*

Reactive application is being tested by sharing application website link to user that wants to learn React Native. User that registered can fill the questionnaire by clicking the link inside the application. There are 70 user that filled the survey. Questionnaire that's being made is based on HMSAM model to measure the behavioral intention to use and immersion of the user when using the application. There are 30 questions and divided by 7 parts based on HMSAM points. The questions can be seen in Table 1 below and is in Indonesian language.

Table 1. Questionnaire Question List

Questions
Perceived Ease of Use
1. My interaction with Reactive app is clear and easy to understand.
2. I can understand the directions of the questions well.
3. I can easily buy a new avatar or phone skin.
4. I didn't find any bugs in the Reactive app

5. I find it easy to interact with Reactive app 6. I find the Reactive application easy to use
Perceived Usefulness 1. Reactive app helps me in understanding React Native 2. Reactive application provides knowledge to me 3. I got nothing from the Reactive app 4. Reactive app trains my logic 5. Reactive app helps me to pass the time well
Curiosity 1. Hearing reactive apps makes me curious. 2. I cannot wait to use the Reactive app 3. I wonder if i can enter the Top 10 Leaderboard 4. I am curious about hidden achievement in Reactive app 5. I can't wait to buy a new avatar or phone skin
Control 1. I have complete control over my interactions on Reactive app 2. I can freely choose what i want to do with the Reactive app 3. I have no control over my interactions on Reactive app
Joy 1. I enjoy learning React Native by using the Reactive app 2. I get bored when i use Reactive app 3. I feel satisfied when using Reactive app 4. Reactive app gives a pleasant impression 5. I get annoyed when i use Reactive app
Behavioral Intention to Use 1. I will use the Reactive app again 2. I will continue to use the Reactive app 3. I will use the Reactive app again if there is a new content like avatar, phone skin, level, or new features
Focused Immersion 1. I focus when using Reactive app 2. I can be distracted by outside interference when using Reactive app 3. I can ignore anything else when using Reactive app 4. I feel immersed when using Reactive app

The answers of each respondent will be calculated using Likert Scale that mentioned in previous chapter. The percentage category of each question can be seen in Table 2.

Table 2. Interval Percentage and Answer Category

Interval	Category
0% - 20%	Strongly Disagree
>20% - 40%	Disagree
>40% - 60%	Neutral
>60% - 80%	Agree
>80% - 100%	Strongly Agree

The percentage results of each question in each HMSAM parts are summed and calculate the average percentage. The average percentage of the HMSAM parts will be categorized based on Table 2. The final result can be seen in Figure 12 below.

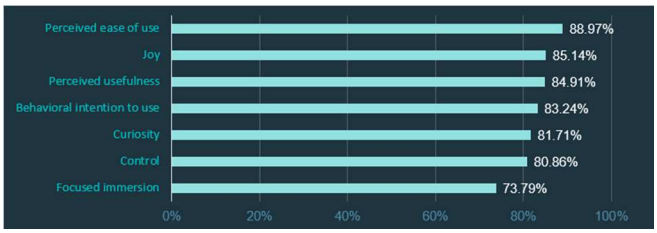

Fig 12. Final Percentage Result

After testing the Reactive application, the results are from calculation of the data obtained is as follows.

1. Perceived Ease of Use: 88,97%
2. Perceived Usefulness: 84,91%
3. Curiosity: 81,71%
4. Control: 80,86%
5. Joy: 85,14%
6. Behavioral Intention to Use: 83,24%
7. Focused Immersion: 73,79%

V. CONCLUSIONS

React Native framework learning application using Octalysis gamification method called Reactive has been successfully designed and built. Reactive is made using Typescript with React Native web framework and Node JS framework with Firebase for the API. Octalysis points that being used in this application are elitism, badges, leaderboard, progress bar, milestone unlocks, blank fills, exchangeable points, virtual goods, avatar, friending, prize pacing, easter eggs, and evanescence opportunity.

Reactive is evaluated by 70 users by submitting a questionnaire that is based on HMSAM model to measure intrinsic motivation from user. Questionnaire evaluation result shows that the users are strongly agreed will using Reactive app in the future based on Behavioral Intention to Use percentage (83,24%) and users are agreed that they are feels focused when using Reactive based on Focused Immersion (73,79%).

This application can be used as React Native learning tool that is fun, easy to use, and have attractive user interface based on average percentage of Joy (85,14%) and Perceived Ease of Use (88,97%).

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