User Experience Analysis For Arcade First Person Shooter Vehicle Based Game on Gear VR With Participatory Design Methodology Approach

Yoga Tri Nugroho
Indonesian Computer University
Jalan Dipatiukur No. 112-116, Coblong, Lebakgede, Bandung, Bandung, West Java 40132
yogatrinugroho@outlook.com

ABSTRAK

Virtual Reality (VR) technology is currently a trend and is widely implemented for various purposes such as medical, simulation, education, and gaming. Although VR technology is already implemented for various needs, people's interest in using products that implement VR technology is still less due to various complaints such as not knowing how to use it, dizziness while using it, to feel nauseous after playing the game using VR headset. Those problems is caused by the interaction that implemented by the developer still using the developer's own assumptions and does not involve or adjust to the user experience to be implemented in the game he made. In order for the game created by the developer to adjust to the experience owned by the require design analysis using participatory design methodology approach. Stages performed in research using this participatory design is to involve users in designing the design that will be implement in the game. In this study will be going by analyzing the user using the persona and empathy map. After know the pattern of user habits will be make design using participatory design methods that will be make prototype and tested with usability testing. Making the prototype of arcade game first person shooter named Tour To Sea using participatory design methodology approach can form the interaction and interface that can be understood by the players even though in the first try. Players can also comfortably play the Tour To Sea prototype game because the interaction and display used in the game are based on the experience possessed by the users themselves. Prototype of this game can also use to be a reference for developers who want to create games with the same genre using Virtual Reality technology.

Keywords : Design Methodology, User Experience, Virtual Reality, First Person Shooter Vehicle Based, Arcade Game.

1. INTRODUCTION

Virtual Reality is a technology that is becoming a trend and used by the community for various needs. The development in virtual reality technology is also very fast. The development that implemented in VR is able to help various needs such as medical, design engineering, education, military training, aviation, until game making [1]. Although VR technology is very useful, user interest to use the technology is still somewhat small.

Developers do not know the proper interaction so the functional development and display built into the game are the developer's own assumptions that result in users feeling confused when they first try the games they build. In accordance with the usability testing by conducting interviews and observations about the first person shooter game available on the Gear VR of six participants who are on average 20 years old [3], found that five of them do not understand how to play the game and all Participants often feel confused with the game they play. As the situation created too many movements from the characters to make the participants uncomfortable with the game he played. In addition, the lack of information in user interface components that provide in-game makes participants confused about general information that is usually present in FPS games such as health points, ammunition and radar [4]. Such errors can be fatal in game development as users will easily switch to other games or apps when they are not comfortable with a game they play [5].

Required user experience analysis with participatory approach to understand the purpose of the developer that adapts to the needs of users in playing games developed [6], as well as to know and learn the viewpoints and habits of users in interacting with products to be developed. This participatory approach is well suited to determine UX on a new thing because it involves the end user in making the product [7]. From the results of user experience analysis will generate knowledge that can be utilize by the game developers to create games with the interaction that is easy to use for its users [8]. Users can easily interact with the game and developers will be easier in developing the game.

2. RESEARCH CONTENTS

2.1. Problem Analysis

Based on interviews with Handika as a programmer in Tinker game Studio and Budi as virtual reality interaction designer in Octagon also the result of usability testing on virtual reality game there are problems in user experience that is implement when making and using virtual reality application. The problem is Developers have

problem in determining the interaction and appearance of the games that they will create because they are not know of the model mental by its users. Users feel confused by the interaction on the virtual reality game they play because the games played using Gear VR by the developer assumption. In addition to feeling confused with the interactions made in the game, users also feel dizzy and nauseous after playing the game.

The problems experienced by virtual reality developers is caused by technology that newly known by the community. Therefore, it takes an approach to know the user experience that suits the needs of the user without having to sacrifice the purpose of the developer. With participatory design methodology, developers can jointly design games that want to be create by involving users on the design process.

2.2. User Analisis

Identify specific characteristics of users. With process to the user is expect to get information that can be process to determine the user interface and user experience in the game to be created. In analyze the user can be used user persona which later can be made map to define user needs and behavior.

2.1.1. Making Persona

On making persona must get information from as many participants who can be group according to the level of similarity to at least three persona. Some persona who have been make will be selected one as the main persona. As for questions asked to participants to obtain information used in the formation of persona. List of questions asked to participants according to the category of questions given so that the information obtained can be focus according to the category. The list of questions asked is question of identity, game playing activity, IU question in the FPS game, questions signal in game, activity questions on Gear VR [16].

1. Identify behavioral variables.

Based on the answers to the questions raised, there are custom variables held by the participant. Custom variables are make to facilitate in knowing the habitual information of each participant who will be group in accordance with similar habits [14].

2. Map interview subjects to behavioral variables.

From habitual variables that have been obtain then can be formed map interview based on the identification of behavior variables to learn the patterns of habit owned by participants. By using willing interview will facilitate the designer to see the patterns of habits owned by participants so that it can help to group the behavior in a persona. Here is an interview map based on the identification of variables.

3. Identify significant behavior patterns.

After forming interview map based on custom variables then the next step is to define a logical habit pattern so that the persona that formed later can have their own character and not resemble other persona characteristics. Identification of this habit pattern done by considering the habit of continuous and interconnected.

4. Synthesize characteristics and relevant goals.

After knowing the habit patterns possessed by each participant with other participants then the next step is to unify every characteristic that is on the same answer by paying attention to the pattern of habit. Here are the results of bringing together the same characteristics based on participants' habitual variables.



Fig. 1 Synthesize Characteristics

5. Check for redundancy and completeness.

On check of the completeness of each persona and the similarity of persona with each other, look at the results of unity persona earlier step. After checking the completeness and similarity in the three persona that have been formed there is nothing to be added because the collected is complete and in accordance with one another. In addition, the data is divided on each persona has a distinct enough clear so it has no similarity in it.

6. Expand description of attributes and behaviors.

At this stage can be create by writing it down clearly and depicted as describing someone who is truly alive. In the depiction of persona in this study use template provided by Xtensio. Which is re-edited using Photoshop so that the information provided is much more informative. Here is a picture of the persona formed according to the steps that has done before.

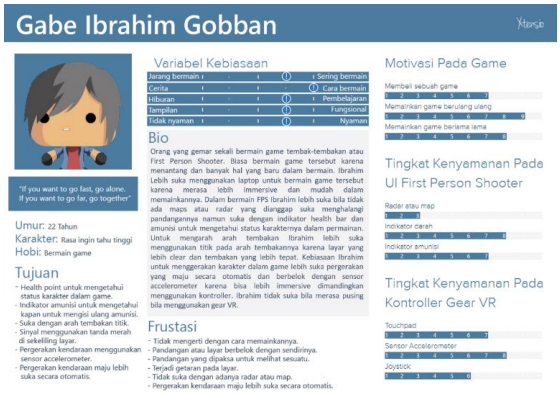


Fig. 2. Gabe Ibrahim Gobban Persona

Gabe Ibrahim Gobban is derived from Steam's company name Gabe Newell who represents a person who often plays games and sees a game from a technically sound point of view. Gabe Ibrahim Gobban is a man who likes to play games and feel at home for a game. Gabe Ibrahim Gobban's fondness for novelty makes him happy and comfortable playing games using Gear VR. In game play Gabe Ibrahim Gobban prefers to see from how to play a game rather than the story contained in the game. In addition to entertainment, Gabe Ibrahim Gobban more often make the game as a medium of learning. Gabe Ibrahim Gobban also has a functional orientation that is used when playing games compared to the display contained in the game he played. Because of his passion for playing games, Gabe Ibrahim Gobban enjoys playing the game in a long time and feel at ease playing the same game over and over again. For the first person shooter game, Gabe Ibrahim Gobban does not really like the map or radar but likes the presence of a blood indicator or a health point and also an ammunition indicator.

7. Designate persona types.

There are six types of persona to choose from to help solve problems according to their priorities. Because the designer is not possible to meet all the needs required in building functional and in-game display that is made then required a priority scale on the persona to designers can easily determine who will be the main target in the making of this game.

TABLE I Selection of Persona Type

Persona	Persona Type
Persona Gabe Ibrahim Gobban	Primary
Persona Putra Picasso	Secondary
Persona Hamzah Rowling	Supplemental

Gabe Ibrahim Gobban have chosen as the primary persona because it has the highest level of commonality of habitual variables held by 15 participants. Gabe Ibrahim Gobban has been the same goal with this research is more focus on the interactions that occur in the game compared with the display provided in the game. Primary persona is a persona who has the highest priority scale to be fulfilled first purpose and desire than other persona. Persona Putra Picasso becomes a secondary persona because it has a similarity level of habitual habit is lower than the persona Gabe Ibrahim Gobban and more than the persona Hamzah Rowling. Secondary persona will usually remain satisfied with what has been made in accordance with the goals and desires of the pimary persona but if there is an additional need that can be formed without disturbing the concept of the game that has been made then the objectives and dislikes on the secondary persona can be considered. Persona Hamzah Rowling was chose as a supplemental type because of the same habitual variable at least. Hamzah Rowling's need is a representation of a mixture of primary persona needs Gabe Ibrahim Gobban and secondary persona Putra Picasso. Supplemental persona used for the decision in determining the design that is not too a major focus.

2.1.2. Empathy Map

Empathy map is create to get specific information to the user. Empathy map is a more detailed persona advanced information to clarify the aspects that each person has. The following four folders are form according to the three previously created persona.

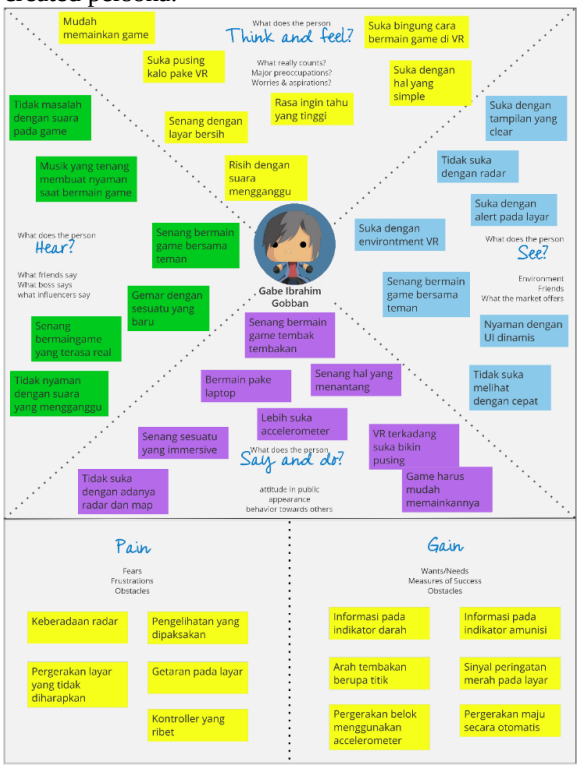


Fig. 3. Gabe Ibrahim Gobban Empathy Map

Gabe Ibrahim Gobban is very fond of the game of shooting that is played using a computer device or laptop. In game play, Gabe Ibrahim Gobban prefers the challenging and immersive things in sight. Gabe Ibrahim Gobban is often disturbed by the disturbing sounds in the game in giving certain signals. When playing games, Gabe Ibrahim Gobban is more comfortable when playing his game is easy. Gabe Ibrahim Gobban tells a lot more from a functional point than a view. Music is an element that is considered important by Gabe Ibrahim Gobban to feel at home in playing games.

2.3. Design Planning

In this stage, using participatory design approach is to invite the end-user to participate in the creation of both the display and the flow of his game. There are four stages done in making the design using

participatory design approach that is framing, planning, facilitating, and analyzing [16].

2.1.1. Framing

At the framing stage there are four steps that be done, is to determine the user, create design goals, create a design hypothesis, and identify the method to be done.

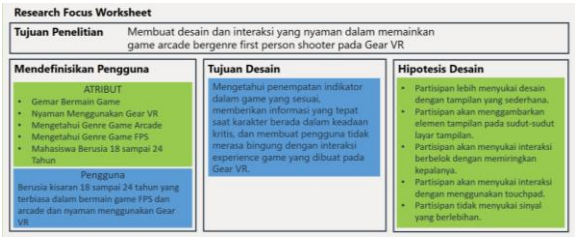


Fig. 4. Research Focus Worksheet

2.1.2. Planning

Planning is the stage to prepare and plan activities used in conducting research. The things that must be prepared include preparing research facilities, determining the many participants who participate, as well as preparing tools for recording the research path. In this study used six participants who participated in designing prototype game design. Activities that can be done at this stage there are four namely narrate, create, prioritize, and contextualize. Each activity performed has its own role and usefulness. In this research, only two activities are narrate and create. Activity contextualize and prioritize not done because this research is not done design improvement [28].

TABLE II Participant Activities

No.	Activity	Participants	Goal
1	*Narrate*	Teacher	Know requirement
2	*Create*	Designer	Creating design

In a narrate activity, participants will act as teachers who will provide designers with information about what they need and what they want. Next on the create activity will be done interface design and functional games by drawing on blank paper.

2.1.3. Facilitating

Facilitating is the stage where the designer will create the design with the participants. At this stage the participants and designers will jointly describe the game and display flows that will be tailored to the user's needs and the purpose of the game. Activities undertaken at this stage are pre-planned activities. Here are the results of the activities performed.

In the activity narrate will be made a user journey mapping to know the experience ever done by participants in the game first person shooter, arcade, and Gear VR. In this study, the journey mapping type used is retrospective maps because the mapping done by looking at how the participants participate in playing games and using or interacting with the elements contained in the game. In this experiment, participants are invite to play the game "Smash Way" to know his habit in playing using Gear VR [21].

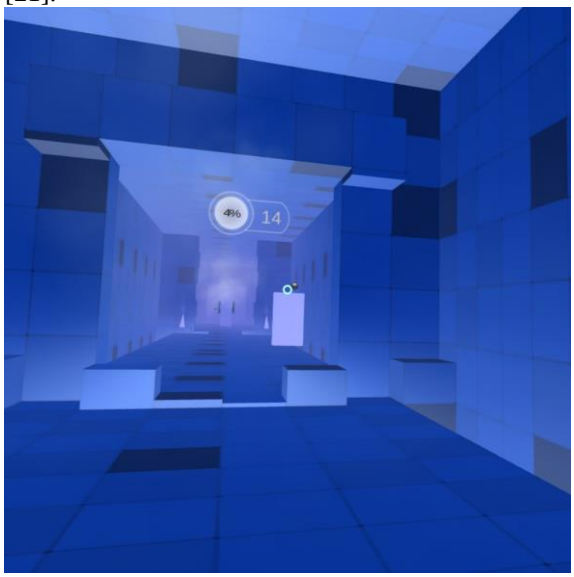


Fig. 5 Smash Way

Create activity or activity of making is activity to make design along with participant refers to user requirement contained in persona and empathy map and user journey mapping, which has made before. In this create activity will be done drawing activities on blank paper or the basic view of the game to be drawn how it looks by the participants. Create activity that done, among others, making the design of the menu display and display during game play.

2.1.4. Analyzing

At this stage will be analyzed the data that has been obtained from participatory activities that have been done. Activities undertaken in this stage are removing inappropriate data, ensuring the data obtained in accordance with the required, and doing the documentation of activities that has done previously. Here are the design results that has made in accordance with the results of participatory activities that have done before. Here is a look designed when players start the game.



Fig. 6 Game Sketch Sample

2.4. Requirement Spesification Analysis

Based on problem analysis, user characteristic analysis, business requirement analysis, and participatory design method analysis can be determined software requirement from prototype game Tour To Sea, software requirement specification that built into two requirement that is functional requirement specification and non-functional requirement. During the game, there will be three elements that serve as to provide information such as health points, ammunition, and coins. The elements are stored dynamically following the direction of the user's view. Here is the interface design that can be view on Fig. 6.



Fig. 6 Hi-Fi Game Prototype

2.5. Game Prototype Design

In designing the prototype game, something that will be discuss are gaming asset planning, planning storyline, gameplay design, and interface design.

2.6. Research Implementation

Implementation, by explaining the user experience applied in the prototype that has established and the implementation environment in which the prototype game will run which will further explain about the implementation of the class used during the construction of game prototype.

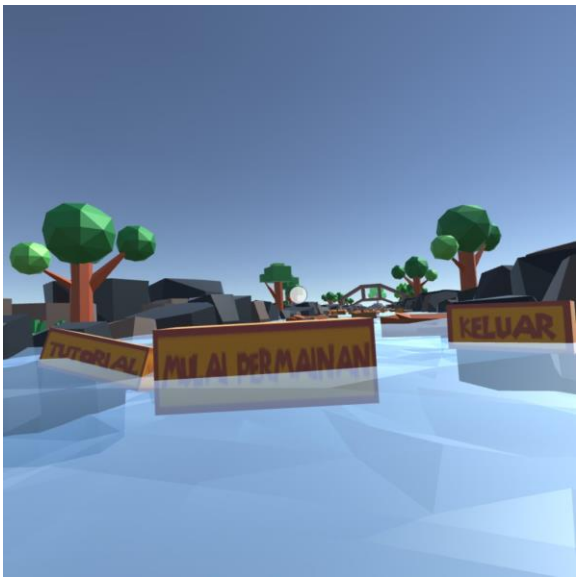


Fig. 7 Interface Implementation

Next is the implementation of the interface used in the game in accordance with the results of participatory design analysis and interface design that has been make before. Some of the things that are implement in this research is the implementation of user experience (shooting and moving), environmental implementation, class implementation, and interface implementation.

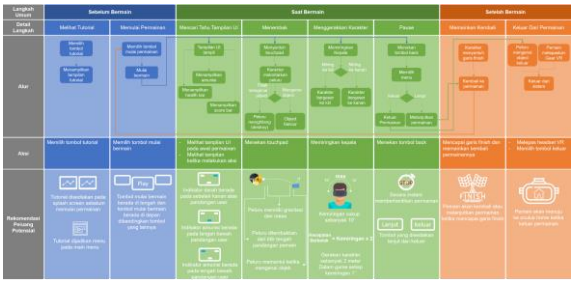


Fig. 8 User Experience Implementation

The implementation environment is the application of what has been previously planned. At this stage will be defined about the elements involved in making the prototype game Tour To Sea.

2.7 Testing

The research was conduct in two stages in accordance with the research objectives. The first stage is to test prototype games to users who will try to play the prototype game Tour To Sea to measure the level of user satisfaction in playing the game. Next will be interview to developers about the research that has done this [25].

Testing game prototype is a step done with the aim to test the prototype game that has built and ensure the absence of errors or deficiencies in the prototype to be test directly by the user. It also ensures that the prototype made has been in accordance with what

has been previously plann. This test also aims to determine whether the prototype is made to meet the criteria expected by the user or not by doing usability testing which refers to the article written by Jerry Cao on UXPin website with the title "How to Run an Insightful Usability Test In 6 Steps". Testing to be done in this research there are six stages of testing that is defining the purpose of testing, choosing the test method, making user task planning, making testing planning, testing and documenting test results, and evaluation testing.

In the early stages of test hypothesis first. After creating a prototype game Tour To Sea, researchers produced three hypotheses to be tested. After creating the test hypothesis then the next step that must done is to make the test goal. The purpose of the test should be no more than two to five test objectives. The purpose of the test should also be measurable in order to know whether the test is successful or not. The next step that must be determined is the participants who participated in trying the prototype game Tour To Sea.

TABLE III Testing Goal

No.	Testing Goal
1	80% of participants did not feel dizzy or nauseous when or after playing the prototype game Tour To Sea until it reached the finish line.
2	80% of participants can know the status of in-game characters such as blood loss, ammunition, and score.
3	80% of participants can control the character to turn and shoot.

2.7.1 Test Method

Usability testing conducted in the course of the assessment of the Tour To Sea game prototype consists of introduction, seven tasks to be completed by players, short interviews, and questionnaires after trying out the prototype of the Tour To Sea game. Players will try to play the prototype game Tour To Sea after reading the list of tasks read by the researchers. Each session is conduct individually with each session lasting for 15 minutes.

2.7.2 Task Participants

Participants will be ask to state aloud every word in their minds for testing to run optimally and maximally.

TABLE 4 Participant Task

No.	Participants Task
1	Added ammunition by taking the added objects of ammunition.
2	Added the rest of the blood by taking the added object of blood.
3	Doing a game pause.
4	Add up to 20 points by taking the object of the coin.
5	Destroy obstacles by firing bullets.
6	Leaving health until the indicator of blood is red
7	Reached the finish line.

2.7.3 Test Result

In the testing phase will be obtain four parts that must be completed by the researcher is the result of testing usability testing based on the task given to the participants, the questionnaires that must be filled by the participants about the level of difficulty in carrying out their duties, and then will be conducted a brief interview about the mistakes experienced by participants.

TABLE V Test Result

Participants	Task						
	1	2	3	4	5	6	7
Participants 1	1	1	0	1	1	1	1
Participants 2	1	1	1	1	1	0	1
Participants 3	1	1	1	1	1	1	0
Participants 4	1	1	0	1	1	1	1
Participants 5	1	1	1	1	1	1	1
Total	**5**	**5**	**3**	**5**	**5**	**4**	**4**
Success Rate %	**100**	**100**	**60**	**100**	**100**	**80**	**80**

REFERENCES

[1] [1] S. Mandal, “Brief Introduction of Virtual Reality & its Chalange,” International Journal of Scientific & Engineering Research, vol. Volume 4, no. Issue 4, p. 1, April-2013.

[2] [2] R. M. Utomo, “Melihat Perkembangan Virtual Reality, Augmented Reality, dan Mixed Reality,” MetroTV News, 05 Desember 2016. [Online]. Available: http://teknologi.metrotvnews.com/read/2016/12/05/623630/melihat-perkembangan-virtual-reality-augmented-reality-. [Diakses 4 April 2017].

[3] [3] J. NIELSEN, “How Many Test Users in a Usability Study?,” Nielsen Norman Group, 04 Juni 2012. [Online]. Available: https://www.nngroup.com/articles/how-many-test-users/. [Diakses 08 Mei 2017].

[4] [4] Lens, K and Fox,D., “Examining the Critical User Interface Components of First-Person Shooter (FPS) Games,” SURL, 14 Oktober 2008. [Online]. Available: http://usabilitynews.org/examining-the-critical-user-interface-components-of-first-person-shooter-fps-games/. [Diakses 8 Februari 2017].

[5] [5] M. Wilson, “5 User Experience Goals to Set,” UX Motel, 30 Desember 2014. [Online]. Available: http://ux.walkme.com/5-user-experience-goals-set/. [Diakses 8 Mei 2017].

[6] [6] K. Trisno, “USER EXPERIENCE DESIGN PROCESS,” BINUS UNIVERSITY School of Information Systems, 29 July 2016. [Online]. Available: http://sis.binus.ac.id/2016/07/29/user-experience-design-process/. [Diakses 06 Februari 2017].

[7] [7] C. Rohrer, “When to Use Which User-Experience Research Methods,” Nielsen Norman Group, 12 Oktober 2014. [Online].

Available: https://www.nngroup.com/articles/which-ux-research-methods/. [Diakses 26 Januari 2017].
[8] [8] I. Anec, "Participatory Design: What is it, and what makes it so great?," 4 November 2015. [Online]. Available: http://www.uxpassion.com/blog/participatory-design-what-makes-it-great/.
[9] [9] "About Samsung Gear VR," Samsung, September 2014. [Online]. Available: http://www.samsung.com/global/galaxy/gear-vr/. [Diakses 21 Januari 2017].
[10] [10] O. VR, "Developsers Oculus," Oculus, 2017. [Online]. Available: https://developer.oculus.com/mobile/. [Diakses 8 Mei 2017].
[11] [11] P. Jhon P. Flynt, Software Engineering For Game Developers, Boston: Thomson Course Technology, 2005.
[12] [12] R. Unger dan C. Chander, A Project Guide To UX Design, New York, 2007.
[13] [13] P. Moh. Nazir, Metode Penelitian, Bogor: Ghalia Indonesia, 2013.
[14] [14] R. R. D. C. Alan Cooper, About Face The Essentials of Interaction Design 3, Indianapolis: Wiley Publishing, Inc., 2007.
[15] [15] "Create a Customer Empathy Map in 6 Easy Steps!," Conceptboard, 2015 Agustus 2015. [Online]. Available: https://conceptboard.com/blog/create-a-customer-empathy-map-in-6-easy-steps/. [Diakses 4 April 2017].
[16] [16] E. M. David Sherwin, "Bringing Users Into Your Process Through Participatory Design," dalam UX Week, 2013.
[17] [17] K. Pernice, "UX Prototypes: Low Fidelity vs. High Fidelity," Nielsen Norman Group, 18 Desember 2016. [Online]. Available: https://www.nngroup.com/articles/ux-prototype-hi-lo-fidelity/. [Diakses 8 Mei 2017].
[18] [18] N. Norman, "Turn User Goals into Task Scenarios for Usability Testing," Nielsen Norman Group, 12 Januari 2014. [Online]. Available: https://www.nngroup.com/articles/task-scenarios-usability-testing/. [Diakses 8 Mei 2017].
[19] [19] "User Experience Basics," usabilitygov, [Online]. Available: https://www.usability.gov/what-and-why/user-experience.html. [Diakses 27 Maret 2017].
[20] [20] M. Grocki, "How to Create a Customer Journey Map," UX MASTERY, 16 September 2014. [Online]. Available: http://uxmastery.com/how-to-create-a-customer-journey-map/. [Diakses 21 April 2017].
[21] [21] H. Brignull, "How to Run an Empathy & User Journey," Medium, 4 Januari 2016. [Online]. Available: https://medium.com/@harrybr/how-to-run-an-empathy-user-journey-mapping-workshop-813f3737067. [Diakses 21 April 2017].
[22] [22] R. R. D. C. C. N. Alan Cooper, THE ESSENTIALS OF INTERACTION DESIGN, Canada: Jhon Wiley & Sons,Inc., 2014.
[23] [23] "Usability Testing," usability.gov, [Online]. Available: https://www.usability.gov/what-and-why/index.html. [Diakses 28 Maret 2017].
[24] [24] D. R. O. G. Ali Carmichael, "What is usability testing?," experience ux, 2016. [Online]. Available: http://www.experienceux.co.uk/faqs/what-is-usability-testing/. [Diakses 27 Maret 2017].
[25] [25] J. Cao, "How to Run an Insightful Usability Test In 6 Steps," UXPin, 05 Februari 2016. [Online]. Available: https://www.uxpin.com/studio/blog/how-to-run-an-insightful-usability-test/. [Diakses 12 Mei 2017].
[26] [26] D. Sherwin, "A 5-Step Process For Conducting User Research," Smashing Magazin, 23 September 2013. [Online]. Available: https://www.smashingmagazine.com/2013/09/5-step-process-conducting-user-research/. [Diakses 13 Mei 2017].
[27] [27] T. Sharon, "The UX Research Plan That Stakeholders Love," Smashing Magazine, 26 Januari 2012. [Online]. Available: https://www.smashingmagazine.com/2012/01/ux-research-plan-stakeholders-love/. [Diakses 13 Mei 2017].
[28] [28] J. Nielsen, "How Many Test Users in a Usability Study?," Nielsen Norman Group, 4 Juni 2012. [Online]. Available: www.nngroup.com/articles/how-many-test-users/. [Diakses 09 Februari 2017].
[29] [29] S. Henry, Panduan Praktis Membuat Game 3D, Yogyakarta: GRAHA ILMU, 2005.
[30] [30] S. Rikman Aherliwan Rudawan, "Unity Tutorial Game Engine Edisi Revisi," dalam Unity Tutorial Game Engine Edisi Revisi, Bandung, Informatika, 2016, p. 2.
[31] [31] R. S. J. C. Gilson Giraldi, "Introduction to Virtual Reality," National Laboratory for Scientific Computing, p. 1.
[32] [32] K. G. D. Herlangga, "Virtual Reality dan Perkembangannya," CodePolitan, 7 Maret 2016. [Online]. Available: https://www.codepolitan.com/virtual-reality-dan-perkembangannya. [Diakses 20 Maret 2017].
[33] [33] Budi, "X-periences of virtual reality, augmented reality, and gameplay," dalam XR MeetUp, Bandung, 2017.
[34] [34] K. H. Russ Miles, Learn UML 2.0, Sebastopol: O'Reilly Media, 2006.
[35] [35] I. D, Perancangan Object Oriented Software dengan UML, Yogyakarta: Andi, 2006.
[36] [36] G. Booch, J. Rumbaugh dan I. Jacobson, THE UNIFIED MODELING LANGUAGE, Harlow: ADDISON-WESLEY, 1999.
[37] [37] J. Bimmy, "Top 10 Lists: The Top 10 Video Game Genres," GameFAQs, 03 15 2012.

[Online]. Available: https://www.gamefaqs.com/top10/2422-the-top-10-video-game-genres. [Diakses 21 Maret 2017].