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Novelty Luther-Sutopo method for game development

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Abstract. This research proposed a new Luther-Sutopo method to create multimedia product. The old Luther-Sutopo method was successfully used to create a multimedia product like a movie, video or interactive multimedia application and game. But there was missing maintenance step as one of important step to successfully develop a game. On the other side, Luther-Sutopo method only suitable for short term game development without considering the sustainability of multimedia development. In this paper, we aimed to create a framework that modify basic Luther-Sutopo concept. The new framework has been tested to create Bedugul Forest game. The study found that the framework successfully applied to create the game and the development process more suitable for game development with limited resources.

1. Introduction

Technological developments are now rapidly increased. In Indonesia, more than 50% of population have an access to the internet and Java island is the area with the most extensive internet coverage, which is 57.7% [1]. In another hand, rapid technology development also influence the gaming industry. The game market value in Indonesia is estimated to reach USD 700 Million in 2019. In addition, in 2016 there was an increase of 192% of users who installed games on their devices [2]. Report from PwC outlook shows that the game industry revenue still increase until 2022 since they developing new streams of revenue strategy from releasing annual blockbusters to reinventing franchises [3].

Games now considered as an entertainment media. People will feel happy because they feel that they have their own world. In the game, every player has a goal to be able to win the game. Even if a player defeated, the game can be repeated [4]. Aside from being a media for fun, the game also has benefit of being an educational medium and usually called as educational game. Educational games have a purpose to be able to increase students comprehension so students will be interested in exploring and learning new things [5].

Some studies prove the positive impact of educational game. Bian Wu et.al conducted a research with applying a game development framework for learning computer skill in Higher Education to replace traditional exercises and improve student participation and motivation [6]. The research shows that the framework successfully increase learning motivation of the student and understanding course theory. In line with the paper before, Ulrich Münz conducted a research to solve a gap when teach a complex theoretical material in engineering while engineering student mainly interested with practical problems [7]. The approach by using educational games shows improvement of student motivation that can be seen from the course evaluation and student feedback. Another study conducted by Y. Liu



et al., integrating game design and development based on a project that created by collaboration of undergraduate biology student with computer science and bioinformatics to create an educational game based on college level biology concept [8]. The focus in this research are the reinforcement of biology major student in learning biology theory, the understanding of software engineering principles and the understanding of biology concept by general student. The result of the research shows that the games are entertaining and student think the games could enhance the understanding of learning in biology. An online game was developed by Bin-Shyan Jong et al. to enable student learn cooperatively [9]. The author convey there are no studies investigated the use of game-based cooperative learning so far. The findings of the research indicate that student are achieve better learning outcome since their desire to win the game was motivated the students to learn online course material before they play the game. From those research explained before educational game successfully improve the motivation of student to learn and help student to achieve better learning outcome.

There are various methods that can be used to develop a game, among other is Luther-Sutopo method. The Luther-Sutopo method is a method developed by Hadi Sutopo by modifying multimedia development life cycle method [10]. The Luther-Sutopo method can be used to make various kinds of multimedia products like film, video or multimedia applications and games [5]. But Hidayat and Astari write maintenance is one of the steps that must be done in the game so that the publishing game step will be successful and runs smoothly [11]. Beside it, game development based on Luther-Sutopo method is not suitable for development process with limited resources and time. For this reason, the author need to combine the Luther-Sutopo method and maintenance step to see how the influence of maintenance on game development uses the Luther-Sutopo method and to find out whether there are other steps to complete Luther-Sutopo's method for game development. Beside it, the flow of the framework also modified so that suitable for game development with limited time and resources.

For the case study of game development, the theme will be taken from a museum located in the Bali Botanic Garden complex, the Panca Yadnya Museum. The Panca Yadnya Museum is a museum which was opened in July 2018. The museum stores artefacts and plants related to five ceremonies in Hinduism [12].

2. Research method

2.1. Luther-Sutopo method

The Luther-Sutopo method consist of 6 basic steps begin with Concept, Design, Obtaining content material, Assembly, Testing and Distribution as mention in figure 1 [5]. Concept step is the first step to developing multimedia product. This step is fundamental for developing a game because the purpose of the application, targeted users, and all basic rules are determined. The second step is Design while developer defining the specifications of the multimedia product that include architecture style, appearance, material and story board as the main guideline. The next step is Obtaining Content Material for creating and collecting materials to be used in the product. These materials can be in the form of pictures, sounds, animations or other product support material that can be obtained free or purchased. The fourth step is Assembly where all materials will be combined based on the steps in the storyboard. The assembly step includes illustration creation, audio making and programming. The fifth step is Testing, to assure the product feasibilities when delivered to users. The last step is Distribution, for creating master file such as product documentation and user manual. Various researches in game development conducted Luther-Sutopo Method have positive result. Renavitasari developed educational game to introduce Indonesian culture through an apps called "JELAJAH" and the result shows 70% of respondents were very agree with various questions [13]. This research proposed a new framework to develop multimedia product based on Luther-Sutopo method to more adaptive with limitation of time and resources.

2.2. Steps of making game

The process of making games is divided into 3 core steps. Those steps are an idea, development, and publishing [11]. To make an idea, writers must have knowledge of game design. The steps in processing idea will be divided into brainstorming and prototyping. From brainstorming and prototyping, a game design document will be produced. To make this step success, the writer must do research on the market data and the game to be chosen. After that, the target market and the concept that has business prospect must be determined.

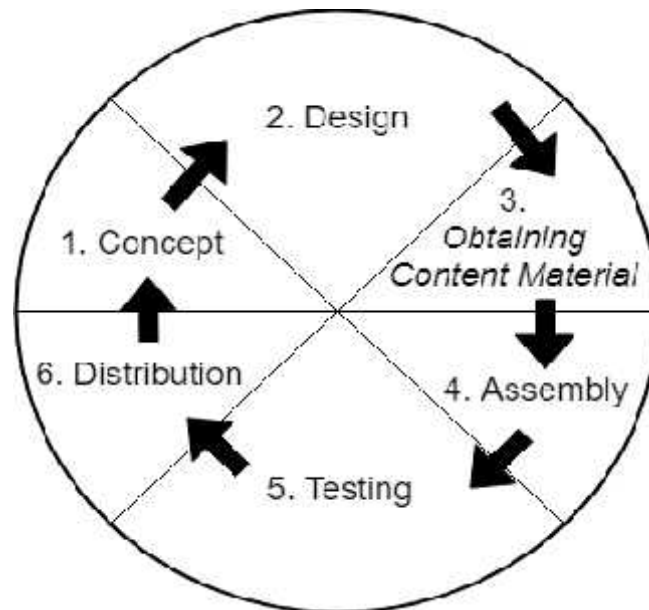


Figure 1. The Luther-Sutopo method is a multimedia development method introduced by Hadi Sutopo. This method is a base on the multimedia development lifecycle. In this method, there are 6 steps; concept, design, obtaining content material, assembly, testing and distribution.

The second step after idea is development. The output of the steps of development is a game that is ready to be published. At the development step, the team must consist of several people and there must be a game programmer among the team. At this step there are some tips to be followed, namely small game size if published on Google Playstore, use the Google Play Service feature to create a chance feature in the Google Playstore, use natively to make simple games or game engines if the game is complicated, use the user nice interface and must be easy to use [11].

After the game is finished, the next step is publishing. This step is the step for disseminating games that have been made to users. At this step, there are several key successes, namely “DevOps” or regular content updates. The Analysis-Driven decision, all updates in the game will affect user data. Marketing, pre-release to the media to introduce the game made. As well as retention, updating the game accordingly to analyse the user and evaluate successes and shortcomings regularly.

In this research, Luther-Sutopo method is modified by adding Maintenance step in the last cycle. Then the modified method implemented to create a game with limited resource (time and developers). The flow of the method also modified for more suitable with the limitation and the case. The game created only with 2 developers within 1.5 months. The game created by collaboration with Panca Yadnya Museum as a public service to improve the visitor engagement using educational game.

3. Result and analysis

3.1. Development steps

3.1.1. Concept. At the concept step, field observations were carried out at the Bali Botanic Garden. On this observation, the author saw that there was no visit to the Panca Yadnya Museum because the museum had not been opened to the public. Because of that, the author gave an idea to make a game as a promotional media for the Panca Yadnya Museum so that later it could help in increasing the visit to the Panca Yadnya Museum. This game in the future will be integrated into an information system at the Bali Botanic Garden

In the developed game, there will be mini games that must be completed to obtain enough information about artefact that collected by the Panca Yadnya Museum. The mini games will be randomized so that all of them could be tried by the users. Linier Congruent Generator Method applied to randomize the mini games. LCM method also implemented to random an event so that the event will appears randomly and not repeated, E. Muningsih, et al proofed this method to randomizing the question when create educational game so the question are not repeated [14].

3.1.2. Game design. From the concepts that have been made before, two game design documents are designed. This game design document contains of features and features contents in the game will then be created. From the two game designs, it was agreed to the game idea titled Bedugul Forest. The game design defined by drawing system flow, gameplay, flow when the game over, the mini games inside the game while player achieve the goals, items in the game, flow when player finish the minigame.

3.1.3. Material collecting. At this step, the materials will be collected to be used in the making of the game. Pictures of artefacts at the Panca Yadnya Museum also collected. At this step, the design of assets used in the game is also carried out along with the assembly steps. This step will run together with the assembly step. Style flat design with Mid Century Modern Design is applied for picture style in the gameplay. This style was applied because many designers believe that this style will become trend in 2019. The implementation of the design shown in figure 2.

3.1.4. Assembly. At the assembly step, all materials will be combined to become a program. At this step, the authors use the Construct 2 game engine to combine it into a playable game. Construct 2 is a game engine that produces the final HTML5 project. The HTML5 file will then modified by using Cocoon.io to get the APK file that can be installed on the Android device.

3.1.5. Testing. After the assembly step is completed, the testing phase will begin with black box testing. Black box testing is divided into 2 phases, the first phase is to test the game which applied to those who requested the game to be made, while the second phase to carry out to general users, who will play this game later. The second phase will be carried out after the first phase of testing is completed and the revised results are approved by the examiner. The first testing result obtain information to change the game story more complex and interesting. The characters and interface also change based on data obtained. In this situation developer should back to Game Design step. The second phase testing show that some feature in the game are not working like player want such as waiting time, the energy of the character is run out too fast. The modification are needed to improve the experience of the game player while in this phase, developer should back to material collecting and assembly step in the framework.



Figure 2. Museum items collected by observation in Panca Yadnya Museum. The left picture is raw image and the right picture is the result after Mid Century Modern Design applied in the gameplay including detail information of the item when player finish a mini game.

3.1.6. Distribution. After black box testing is complete and there are no system bugs, then distribution step will be started. In the distribution step, the game will be uploaded on Google Playstore (for Android users). After the game is uploaded, the steps will be continued by testing validity and reliability to obtained game ratings from the user. The game is available in Playstore with name Bedugul Forest.

3.1.7. Maintenance. After the game is uploaded through the Google Playstore, the next step is the maintenance step. This maintenance step is an optional, and may be done base on need basis. Maintenance can be done when the game has been distributed through Google Playstore, and there is a problem found by the user.

Maintenance steps can occur due to differences in screen resolution, different types, and specifications of smartphones, which can cause differences in appearance or performance than those tested by the researcher. As of January 19, 2019, there are 4007 different types of smartphones and different brands and manufacturers [15]. With the variety of smartphone models and screen resolutions, researchers are expected to be able to carry out regular maintenance to the game applications that have been distributed.

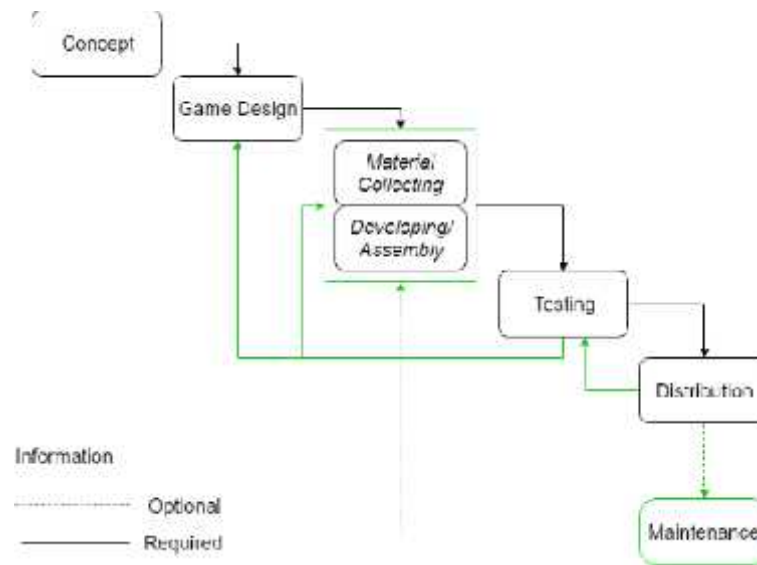


Figure 3. Novelty Luther-Sutopo method for game development.

3.2. Analysis and proposed framework

Modification of Luther-Sutopo method to develop a game with limited resource (time and developers) are successfully implemented [10]. The complete purpose framework shown in figure 3. The steps of making games will start from the concept, which will continue with game design. After the game design has been approved by all the authorities, then the production of material will be included in the game. This step will coincide with the developing step so that the assets made can be used entirely and also the overview of final results of the game may be obtained. Furthermore, after the developing process is complete, the testing process will be continue. If bug or failure occur, the process will return to developing and collecting materials. The process can also return to the game design step if there any conditions in the game design which not suitable with the desired final result. After the testing phase is completed, the game can be distributed to the user. The last process is maintenance. The maintenance process is optional when the game has been distributed. The maintenance may be conducted if there any crash report or new device developed.

4. Conclusion

In this research, the proposed framework for game development is already tested and successfully implemented to develop educational game called Bedugul Forest. The framework is basically modification from Luther-Sutopo method with adding Maintenance step in the last development cycle and modify the flow so the framework is suitable for game development with limited resources such as time and developers. Proposed method offer flexibility for developers when develop a game when time and human resource are limited. The effectiveness of proposed method will be determined in the next research.

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