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Larong Pinoy: An Android Game Application

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Abstract: **This study entitled "Larong Pinoy: An Android Game Application" was developed to teach young generation kids to learn the different traditional Filipino games. The main function of the application its games that users can play with. The development tools used were Unity 3D for coding, CrazyTalk Animator 2 for creating the characters and Adobe Photoshop for design. The game was tested using conformance test and compatibility test for the improvement of the performance of the application. The evaluation instrument used was based from the Android Core App Quality (developer.android.com) with the criteria of functionality, performance and stability, and Google Play. The evaluation was participated by ten (10) IT experts and thirty (30) mobile users. The overall mean garnered 2.87 with a Standard Deviation of 0.09 and interpreted as —Fairly Acceptable‖. The result of evaluation shows that the mobile application is a tool used to learn the guidelines and mechanics of playing the traditional Filipino games.**

Keywords: **Larong Pinoy, 3D, Android game application.**

1. INTRODUCTION

In the Philippine society, playing games is an important part of growing up. Some of them are challenging. Some are delicate. Some are physical, and some are mentally stimulating. Be that as it may we play diversions however - as a gathering or a group, recreations show us sportsmanship. Looking at this logically, we delighted in and played those recreations for a long time when we were young with no referees or umpires. As kids, we made the rules and abided by it too. The research aimed to maintain the essence of Filipino traditional games or street games. Because nowadays, most of the kids are playing through their mobile gadgets; they are starting to forget the existence of our traditional games.

In this generation, mobile applications are more useful and convenient to use rather than old things used by the old generations. Just like the calculator, clock, and camera etc. many developers create a mobile applications about these things to make life easier or to have complete things in one mobile gadget. Mobile applications also provide information easier because users just click the mobile application itself and the information will be displayed rather than using books, newspapers, and magazines etc. to obtain information.

Mobile applications are easier to than the traditional Filipino games. Traditional Filipino games are played manually in the streets. While mobile applications are played or used on mobile gadgets. By touching the screen of the mobile gadgets the application reacts or functions according to the user's activity.

1.1 Project Context:

Traditional Filipino games like ***Luksong Baka, Luksong Tinik, Sipa, Palosebo*** and many more are games commonly played by children in the streets. These games are learned through reading books or by learning in the streets while playing with other kids. The traditional way of playing ***Luksong Baka*** is that the player jumps over the person called the "Baka" without touching or falling over. In ***Luksong Tinik***, players should be able to jump the height of the hands placed one on top of the other without touching them. In ***Sipa,*** players must not allow the *sipa* to touch the ground by hitting it several times with his/her foot. The player must count the number of times he/she was able to kick the *sipa*. The person/player with the most number of kicks wins the game. Lastly, in *Palosebo*, the player should climb the greased bamboo pole until the player reaches the prize on the top of the bamboo pole.

1.2 Project Description:

The project provides users the history, game play and mechanics of each traditional Filipino game just like in books or articles about the traditional Filipino games. Users can play each traditional Filipino game just like the traditional way of playing it outside on the street but this time users can play it on their mobile devices. In *Sipa*, the player should click the leg, elbow or hand button to hit the *sipa*. The *sipa* should not fall to the floor for the game to continue. In *Palosebo*, there are two players and the player who taps the button and reaches the top of the *palosebo* the fastest wins. In *Luksong Baka* there is a color meter. The player should click the red button to stop the green cursor on the green meter. As the level goes higher the cursor goes fast and fast. In *Luksong Tinik*, there is a color meter; the player should click the blue button to stop the green cursor to the green meter. As the level goes higher the green cursor goes faster and faster.

1.3 Objectives of the Project:

The objective of the project is to develop "*Larong Pinoy*: An Android Game Application"

Specifically, the project aimed to:

1. To design and develop an Android application that has the following features:

a. Game application that displays the history, game play and mechanics of each traditional Filipino game.

b. Application that provides users a game about the Traditional Filipino games.

2. To create the project using Unity: Game Development as front-end and using Crazytalk Animator 2 as back-end. It will run on android devices/platform.

3. To test and improve the application using conformance and compatibility testing.

4. To evaluate the acceptability of the developed application based on the Android Core App Quality with the following criteria:

a. Visual Design and User Interaction;

b. Functionality;

c. Performance and Stability;

d. Google Play

1.4 Scope and Limitations of the Project:

The users of this game application are v game enthusiasts who want to learn and play the traditional Filipino games in the Philippines. The game application contains four main Filipino games; *Sipa*, *Luksong Baka*, *Luksong Tinik* and *Palosebo*. The mobile application provides the information about the different traditional Filipino games like history and how to play the game.

The game application only run on mobile devices that have an Android version of 4.0 and up. The game can be played offline. It can be played in 2D only. Other traditional Filipino games are not included in the application like *Agawang Sulok*, *Araw-Lilim*, *Bahay-Bahayan*, *Bati-Cobra*, *Bulong-Pari*, *Calohoyo* ("Hole-in"), Chinese Garter, *Declan Ruki*, Hand clapping games, *Holen*, *Iring-Iring*, *Jack 'n' Poy*, *Juego de Anillo*, *Juego de Prenda*, *Kapitang bakod*, *Langit-Lupa*, *Lagundi*, *Lawin at Sisiw*, *Pataypatayan*, *Pitik-Bulag*, *Piko*, *Presohan*, *Sambunot*, *Sawsaw-Suka*, *Taguan*, *Takip-Silim*, *Teks*, Ten-Twenty, *Tinikling*, *Tsato/Siyato*, *Tumbang Preso* and *Ubusang Lahi*.

1.5 Significance of the Project:

The project is a game application that gives information about traditional Filipino games. The traditional Filipino games can be played on mobile devices. The project benefits the following:

Game Enthusiasts. For entertainment and familiarity in the traditional Filipino games.

Future Researchers. Another beneficiary of this project would be the future researchers who may conduct a study that is related to the said application are interested in developing mobile applications.

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2. REVIEW OF RELATED LITERATURE AND STUDIES

In this chapter, Researchers discuss about the related literature, the related articles, books, magazines that helped give ideas to the development of the project.

2.1 Review of Related Literature:

The purpose of the related literature is to give the researchers an idea about the related topics on their desired topic and to help them understand it.

2.1.1 Traditional Filipino Games:

These are games normally played by kids, for the most part utilizing local materials or instruments. In the Philippines, because of restricted assets of toys of Filipino kids they, more often than not come up with creating recreations without the need of anything besides the players themselves. With the adaptability of a human to think and act makes the diversion all the more fascinating and testing. Since it is conventional for Filipinos to play in a greater and extensive region, most diversions are typically played outside the house. A few diversions are played or held amid town holidays in the areas.[1]

According to Magna Kultura (2012), "Filipino children nowadays spend their childhood playtime on Internet cafes or with their handheld game consoles instead of socializing with other children playing the traditional street games that for years is a culture and a norm for a typical Filipino child. " [2]

"Filipino games must at least be seen played by many children if it won't be possible anymore that it would be back in the mainstream, at least that's what these writers are trying to tell. They believe (especially Magna Kultura) that these games should be preserved not only because they prefer Filipino children play these games as what they did when they were in their childhood but they insist and believe that these games help the children grow in mind, body and character and it also helps instill patriotism and nationality in a child's mind" [3]

Traditional Filipino games are the main topic of the project.

2.1.2 Android:

Android is an operating system for smart phones, tablets and laptops from the Google-sponsored Open Handset Alliance. With myriad models to choose from, Android is the leading mobile platform worldwide. Android is a Linux OS, and Android apps are programmed in Java. Users download applications from Google Play Store (formerly Android Market), the Amazon Appstore and other online sources (see Google Play and Amazon Appstore). Is an operating system for smart phones, tablets and laptops from the Google-sponsored Open Handset Alliance. [4]

Android is the most popular mobile operating system in the Philippines. A large portion of the population of the Philippines is composed of Android users. The advantages of android: multitasking, ease of notification, easy access to thousands of applications via Google Play Store, phone options are diverse, can install a modified ROM, widget, and Google Maniac. [5]

The researcher already had developed a project that ran on an android device.

2*.1.3 Mobile Application:*

A portable application, most ordinarily alluded to as an application, is a kind of utilization programming intended to keep running on a cell phone, for example, a cell phone or tablet PC. Portable applications as often as possible serve to furnish clients with comparable administrations to those got to on PCs. Applications are by and large little, singular programming units with restricted capacity. This utilization of programming has been promoted by Apple Inc. Furthermore, it's an App Store, which offers a great many applications for the iPhone, iPad and iPod Touch. [6]

The authors Harrison, Flood, and Duce (2013), stated that "The handiness of cell phones has expanded incredibly as of lately permitting clients to perform more assignments in a portable setting. This expansion in handiness has come to the detriment of the ease of use of these gadgets in a few connections. [7]

The researchers developed project is a mobile application.

2.1.4 Mobile Game:

Mobile games are games intended for cell phones, for example, cell phones, highlight telephones, pocket PCs, individual computerized partners (PDA), tablet PCs and compact media players .[8]

According to Viswanathan (2016) "Portable applications or versatile applications will be applications created for little handheld gadgets, for example, cellular telephones, cell phones, PDAs and so on. Portable applications can come preloaded on the handheld gadget and in addition can be downloaded by clients from application stores or the Internet."[9]

The researchers developed project is a mobile game.

2.1.5 Mobile & Handheld Device:

Mobile device is a small computing device. It displays screen with touch input and a miniature keyboard. A mobile device has an operating system and can run different types of application.

The advantages of a mobile device are: easy to carry, easy to use and it is all in one. All the things have an application that users can use and also to communicate easily to others.

The researchers developed a mobile application that could be used or played in a mobile device. The controls of the application are applicable for touch screen mobile devices.

2.1.6 Unity 3D:

Unity is a cross-stage diversion motor created by Unity Technologies and it is used to create computer games for PC, comforts, cell phones and sites. Initially declared just for OS X, at Apple's Worldwide Developers Conference in 2005, it subsequently been stretched out to target more than fifteen platforms. It is currently the default programming improvement unit (SDK) for the Wii U.

1. The benefit of Unity is that clients can make any 2D or 3D game with Unity.

2. Clients can make it easily, clients can make it very upgraded and lovely, and clients can convey it with a tick to a bigger number of stages than you have fingers and toes. Besides, you can utilize Unity's coordinated administrations to accelerate your improvement process, enhance your game interface with a group of people, and make progress.

The team used Unity 3D in developing the game and creating the codes.

***2.1.7 Photoshop*:**

Photoshop is an image editing software developed and manufactured by Adobe Systems Inc. Photoshop is considered one of the leaders in photo editing software. The software allows users to manipulate, crop, resize, and correct color on digital photos. The software is particularly popular amongst professional photographers and graphic designers. [10]

With Adobe Photoshop, one can quickly and easily import videos and photos into the software. Once imported, everything is neatly organized on the screen. This makes it easy to handle numerous videos and photos. Additionally, the proper organization of the workspace makes it easy to find editing tools and other features. [11]

The researchers used Adobe Photoshop as an image editor. The team used it to create or edit objects like background, icon and many more.

***2.1.8 CrazyTalk Animator 2*:**

CrazyTalk Animator 2 provides an exciting new approach to traditional 2D animation with innovative new tools that allow users to apply 3D motions to 2D characters. New powerful tools have opened new possibilities for freely editing 2D motions and viewing them from any angle with a single click. Combined with functional features like facial puppet and auto-lip sync, it has become the most creative software for 2D character animation. [12]

Advantages of Crazytalk Animator 2: drag n drop, photo fitting with preset bones, decorate characters with virtual dressing room, build your custom character library, instant animation with embedded motion templates, auto lip-sync and expression switch, real-time puppeteering control and custom profile. [13]

The researchers used Crazytalk Animator 2 to create characters and animations.

2.1.9 Incremental Development:

The incremental form model is a strategy for programming improvement where the item is outlined, executed and tried incrementally until the item is done. It includes both advancement and upkeep. The item is characterized as completed

when it fulfills the majority of its prerequisites. This model consolidates the components of the waterfall model with the iterative rationality of prototyping.

The team chose Incremental Development as the method in developing the project.

2.1.10 Android Core App Quality:

Android clients expect amazing applications. Application quality straightforwardly impacts the long haul accomplishment of your application—as far as introduces client rating and surveys, engagement, and client maintenance. This archive offers you some assistance with assessing fundamental parts of value in your application through a minimal arrangement of center application quality criteria and related tests. All Android applications ought to meet these criteria. Before distributed your applications, test them against these criteria to guarantee that they work well on numerous gadgets, meets Android measures for route and plan, and are readied for limited time opportunities in the Google Play store. You're trying well to go past what's portrayed here—the motivation behind this record is to indicate the key quality attributes all applications ought to show, with the goal that you can cover them in your test arranges.

The project was evaluated by the Android Core App Quality.

2.2 REVIEW OF RELATED STUDIES:

The related studies helped the team to understand from a different point of view.

***2.2.1 Flash Game Development: Alien Whacker*:**

The study of Garcia et.al.,[2010], aimed to explore how to develop a game using different programming language. The authors wanted to share their 2d finding object game that was stress relieving and a game that was created using Flash Action Script 2.0.

***2.2.2 Save the Tamaraw: A Mobile Game*:**

A study of Hila and Mirasol[2010], that was about 2d graphical game that raised the awareness of the decreasing population. The author's main goal for this game was to control the tamaraw in order to cut the grasses while avoiding the hunters chasing the tamaraws. The hunters were AI. The project could be played in mobile phones.

2.2.3 Accelerator Based Game Programming on Android Mobile Phone:

The author Yifan [2013], wanted to be familiar with Android smart phone and implemented an application that could run on an actual Android smart phone. The author made a game that was about a drunken chicken going back to his home, this was an endless running game. The author used accelerometer to keep the balance of the chicken and add a lateral acceleration so the game would not be easy. The author developed the game through Adobe Flash.

2.2.4 Reality Ends Here: Environmental Game Design and Participatory Spectacle:

This study of Watson [2012], was about a body theory regarding the production of space and the changing nature of spectacle. This study was designed to immediately affect change in the community of learners at USC School of Cinematic Arts (SCA).

2.2.5 Simulation-Based Approach to General Game Playing:

This study of Finnson and Bjornsson [2012] aimed to create intelligent agents that automatically learn how to play many different games at an expert level without any human intervention. Authors introduced and empirically evaluated a new scheme for automatically learning search-control knowledge to guide the simulation play outs, showing that it offered significant benefits for a variety of games.

2.2.6 LPU-C FAMS Faculty Attendance Monitoring System Using Android Device:

This study of Arancillo et al. [2014], was about an attendance monitoring system that had used the house office in checking and monitoring faculty attendance and gave an accurate and reliable report. Authors developed a Faculty Attendance Monitoring System (FAMS) to replace the manual process and to organize the flow of process and to make process easier. The authors used Eclipse for Android Application, PHP as their main program and language then MySQL for the database.

2.2.7 LPU Student University Guide: A Mobile Application:

Vedar et al. [2014], made this study to help the LPU-Cavite students have a guide on the policies, violations and rules. Authors made this guide a mobile application because they believed that it was more convenient and easier to use than using the handbooks. The authors wanted to help students gain information about the university by using the said mobile application.

2.2.8 MOBIDESK 1.0: A Productivity Application for Computer and Android Device:

Peji et. al [2014], studied about an internet & mobile computing application that lets users access their files anytime and anywhere. The developers used Microsoft Visual Studios 2013 as their programming language for desktop application, Eclipse for android application and PHP for the website.

2.2.9 PIPETPH LARONG PINOY: 3D Game Application with Online Multiplayer System:

Ranico ET. Al [2014], studied is about a 3D multiplayer game that has a concept of pet taming. Authors created this study because they believe that computer and video games are spreading remarkably as generations passed by. Authors made the interface of the game inspired by the Philippine culture and environment because the authors wanted to promote the country to the local and foreign gamers. The game could be played online to interact with other players and Windows as its Operating System.

2.3. Mobile Applications: Games that Transform Education:

The authors Zhang and Loeb [2013] created a study that combines machine learning and attention-grabbing graphics to not only make learning easier and interesting, but also personalized. The authors created a mobile app that focuses on teaching players SAT 1 Math concepts using Pokémon game design model. [14]

2.3.1 Features for Mobile Applications Popularity:

This study of Victoria [2014] discussed about the factors affecting the popularity and ranking of mobile games application. It also discovered the particular features of mobile games application and released influence on their popularity. [15]

2.3.2 Strategic Game for the Android Platform:

Orsava [2011] created a game for Android OS that has a theme of a galactic war over the control of the galaxy. It was successfully developed and offered multiplayer capabilities both on one device and over the Internet. [16]

***2.3.3 Mobile, location-based games for learning*:** Wake's [2013] study was about exploring how mobile, location-based games could be used to teach and learn practices within education showed learning in playing mobile location-based games could be motivating and engaging to students. [17]

2.3.4 Mobile application development to enhance higher education lectures:

The author Despotou [2013] studied about understanding the benefits of learning through mobile devices provided an analysis of principles, patterns of mobile interface design and provide an m-learning application that offered direct communication between students and teachers. The application had a poll form that served as the questionnaire with various choices of answers. [18]

2.3.5 Andood – an Android application:

Bedyński [2011] presented a study that was about an android application that enables users to interact with the existing web service called Dood. The android application supports Android 2.1 version onwards. The application was dedicated for designing and implementing a RESTful API that constitutes communication protocol between client applications and web service. [19]

3. TECHNICAL BACKGROUND

This consists of the technical definition of terms. It is divided into two parts; the first part is the conceptual definition. It is the definition that an ordinary human being would be able to know without explaining it to them. The second part is the operational definition. These are the terms that were encountered in developing the application or the terms that were needed by the application to be developed. Also talks about the technologies used in developing the application or the software used to develop the project. And lastly, the functionality of the software project that is about how the project works on the users or to the beneficiaries like gaining information from the project.

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3.1 Technical Definition of Terms:

Technical definition of terms is a conceptual and operational terminology that describes or explains its technical terminology. It is also used to introduce the vocabulary which makes communication in a particular field briefly and clearly explained.

Android. An operating system designed for smart phones, tablets, and laptops. The application was developed to run in an Android platform device.

Filipino Traditional Games. Games that are commonly played by children. The application presented the traditional Filipino games.

Player. The one who controls/plays the game and accesses the settings of the Larong Pinoy.

Mobile Device The tool needed to run the project.

3.2 Technologies to be Used:

In this part, the researchers discussed the technologies used by the team to develop the project.

Mobile Technology was the main requirement of this application because it is made for mobile. The main requ
this technology is a Mobile Device.

Wi-Fi Technology or popularly known as an acronym for wireless fidelity is required to download and update the application

Android Technology was used in this project because the application was made for Android mobile devices. Android is a mobile operating system of a Smartphone.

3.3 Process Design:

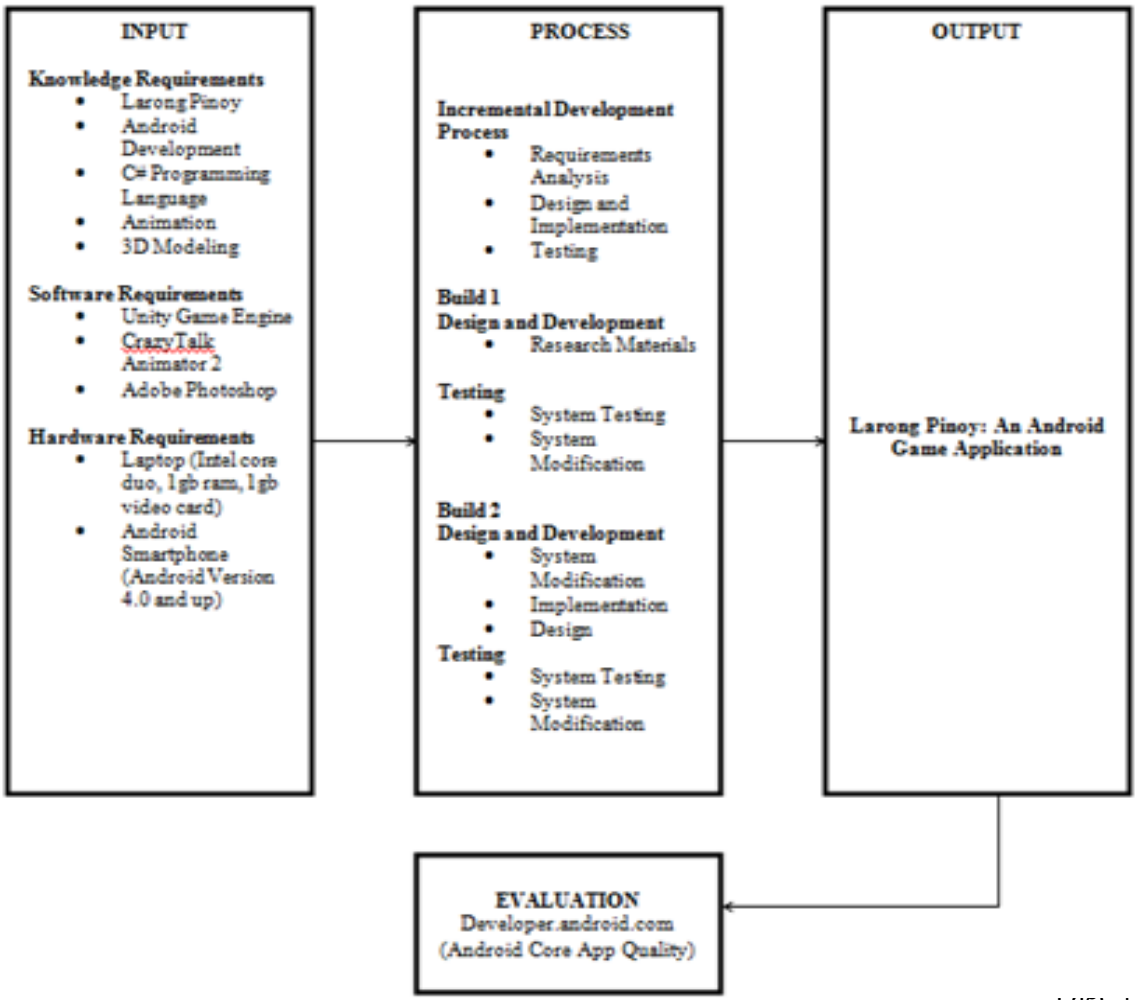

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Figure 1. Conceptual Framework of the "Larong Pinoy: An Android Game Application"

Figure 1 shows the project plan. The input section includes the knowledge requirements in Larong Pinoy, Android development, C# programming language, animation and 3D modeling. The software requirements are Unity Game Engine, CrazyTalk Animator 2 and Adobe Photoshop. The hardware requirements are Laptop (Intel core duo, 1 GB ram and 1 GB video card) and Android Smartphone that has an android version 4.0 and up. The process section includes the Incremental Development Process. First are the requirements analysis, design, implementation and testing. Build 1 is the design and development under this are the research materials. Testing; under this are system testing, and system modification. Build 2 designs and development. Under this is the system modification, implementation, and design. The output is the project itself, Larong Pinoy: An Android Game Application and the application was evaluated by the Android Core App Quality.

4. DESIGN AND METHODOLOGY

This is about the specifications, feasibilities and diagrams that showed how the interactions in the project and how it was developed.

4.1 Project Requirement Analysis Specifications:

This topic discussed the requirements needed for developing the project. This part also describes the processes in the system such as the schedule, technical, and economic feasibility

4.1.1 Technical Feasibility:

This part shows and explains the technical requirements that were being used in developing the system. Technical Feasibility also covered the compatibility checking of software and hardware technologies.

4.1.2 Software Specification:

To create the project, the researchers used Unity for coding, CrazyTalk Animator 2 for creating the character and animation, and Adobe Photoshop for the design. The android version that was compatible for the application is Android 4.0 (Ice-cream Sandwich) and up for the app to work properly and smooth.

4.1.3 Hardware Specification:

The hardware needed is Laptop that has at least a single and dual core processor. Also the device should have a single core Graphic Processing Unit (GPU) to render the graphics of the game. The laptop was needed to create the project using Crazy talk Animator 2, Unity Game Engine and Photoshop. The team also used Android Smartphone that has an android version of 4.0 (Ice cream Sandwich) and up because these are the versions compatible to the application and these were needed so the app will work properly and smoothly.

4.1.4 Schedule Feasibility:

This part shows how much time the team utilized to develop the project.

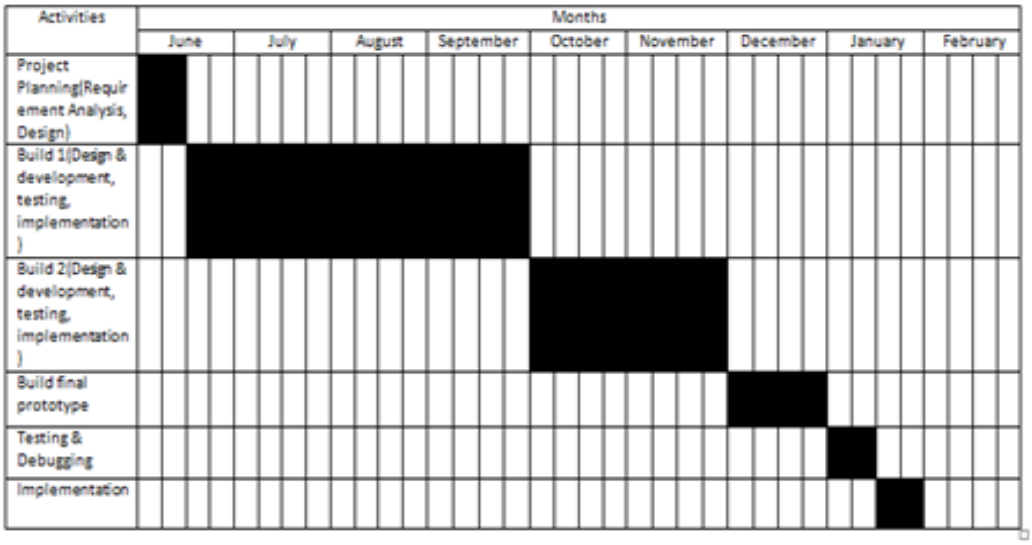

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Figure 2. Gantt chart of Larong Pinoy: An Android Game Application

The project planning (Requirement analysis, Design) consumed 2 weeks because the team analyzed the requirements needed and the design of the developed application. Build 1(Design & development, testing and implementation) was created on the 3rd week of June until the end of September. Build 2(Design & development, testing and implementation) was created on the 1st week of October until the end of November. Building the final prototype was created on the 1st week of December until the end of December, Testing and debugging were started on the 1st week of January until the 2nd week. Lastly, the implementation was started on the 3rd week until the 4th week of January.

4.1.5 Economic Feasibility:

This part shows the possible cost of the project through Cost and Benefit Analysis and Cost Recovery Scheme.

4.2 Project Design:

Project design is the list of activities that were used for the development. It is made to meet the concepts and ideas of the system.

4.2.1 Requirements Modeling:

The Input-Process-Output chart was the tool used to summarize the functionalities of the game

4.2.2 System Architecture:

System architecture defines the structure, behavior, and gives the user more views of the system. This was used to help people understand or simulate a system the model represents. It gives a birds-eye view of the system.

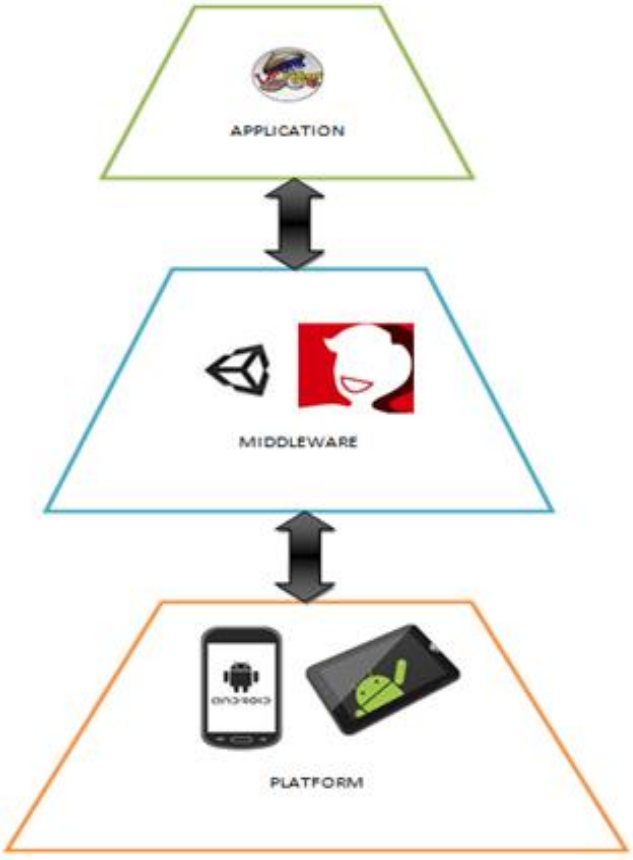

Figure 3. System Architecture of Larong Pinoy

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The diagram above shows the application (*Larong Pinoy*), middleware used, and the platform where *Larong Pinoy* can run. The middleware used were Unity for coding the app ”CrazyTalk“ Animator 2 for creating the characters and animation. It ran only on Android mobile devices/ tablets.

5. PROJECT IMPLEMENTATION PLAN

5.1 Project Implementation Plan:

5.1.1 Description:

After the testing and evaluation phase, the system is now ready to be implemented into the client’s environment. This chapter discusses, in detailed way how the project will be completely deployed in the market.

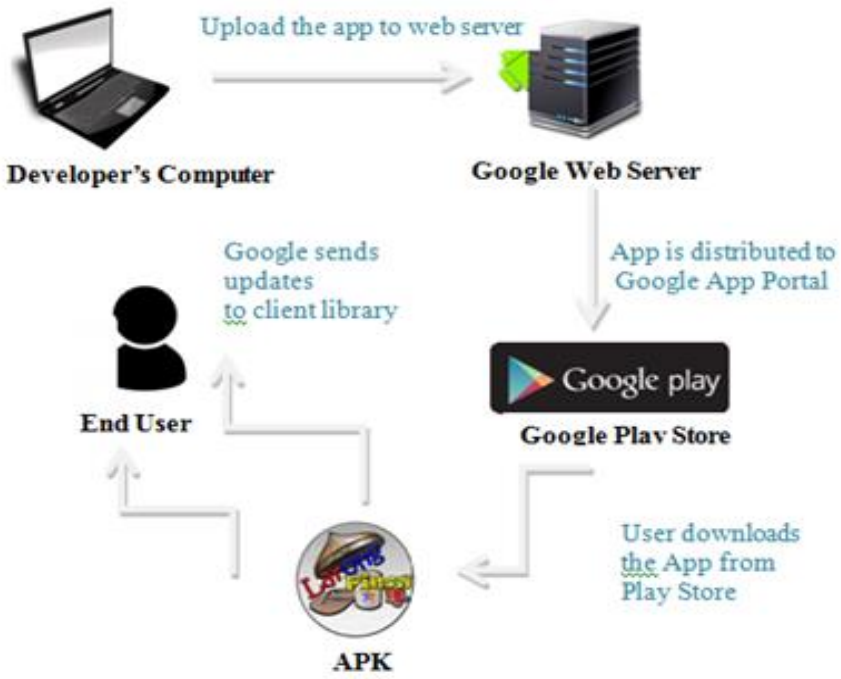

Figure 4.Infrastructure Diagram of Larong Pinoy

The figure above shows how the application could be accessible to the client. After the game had been totally developed, the application was uploaded on Google Play Store wherein a server stores the application and disperses it to Google play members.

5.1.2 Infrastructure/Deployment:

After accomplishing the project implementation checklist, the game application was completely ready for use and is now downloadable on Google Play Store. Below is the Infrastructure Diagram of the project which discusses the hardware, software and other peripherals necessary in deploying the game application.

5.1.3 Implementation Contingency:

The developers need to guarantee that the game is prepared for sending to give a decent client experience to the players. In actualizing the framework, Larong Pinoy might in any case experience a few issues. The diversion might likely show general bugs and errors and the game application might back off in the middle of play contingent upon the gadget the client will utilize. The game may have compatibility issues with different android devices because the game is only compatible for Android 4.0 up to latest and minimum RAM of 256MB.

To resolve these matters, the developers planned to do a scheduled maintenance of the game. In case the software does not run smoothly or the end user encounters bugs, the developers will fix the game and update the game.

In the full implementation of the system, it was uploaded on Google Play Store where the users could download it for free. Google play checks the game application and ensures that there would be no viruses before releasing it to the Store.

5.1.4 Risk Management/Analysis:

This part shows what risks may cause the project to fail. The errors and bugs are the risks that may harm the project; because of this the users cannot use or play the game application well because it would not function properly or the objects in the game may not move. To manage the risks of the application the developers will see through the feedbacks or reviews of the users. If the users discuss about the errors and bugs about the app, the developers will create another update of the app that the errors and bugs that occurred are gone.

5.2 Project Testing and Evaluation:

This part of the report examines about the framework documentation investigation to get ready for future utilization of the application to the Android Smart telephones and tablets in which a cautious learn about the framework are finished by separating the things that is expected to make the framework viable.

5.2.1 Operating and Testing Procedure:

The developers used an evaluation instrument that is based on developer.android.com for conducting the test.

- **Verification, Validation, Testing:**

The Verification, and Validation Testing was an evaluation where the advocates did a testing to check if the task was substantial for use, and if the undertaking was useful for deployment. This segment examined the experiment instruments utilized in the middle of the game application testing.

- **Conformance Testing*:***

The researchers utilized Conformance Testing to confirm the application's usage conformance to Android developer Criteria (developer.android.com). This surveyed the fundamental parts of the nature of the application in wording with installation, functionality and communicating with the user.

- **Compatibility Testing**:

The Compatibility Testing was utilized by the proponents to guarantee the compatibility of the application with various android versions, screen sizes, and gadget brands.

5.2.2 Evaluation Instrument:

This section discusses about the application evaluation procedures in which the application runs properly and how the users recognize the application.

5.2.2.1 Evaluation Procedure:

The developers used manual evaluation using evaluation forms and pen to evaluate the application and to ensure the standard and quality based on the following characteristics from developer.android.com.

1. Visual Design and User Interaction

a. Standard Design

b. Navigation

c. Notification

2. Functionality

a. Permissions

b. Install Location

c. Audio

d. UI Graphics

e. User/App state

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3. Performance and Stability

a. Stability

b. Performance

c. Media

d. Visual Quality

4. Google Play

a. Policies

b. App Details Page

c. User Support

Numerical Value	**Interpretation**
3.51 – 4.00	Highly Acceptable
2.51 – 3.50	Moderately Acceptable
1.51 – 2.50	Fairly Acceptable
1.00 – 1.50	Unacceptable

5.2.3 Statistical Treatment of Data:

The gathered data were tabulated and calculated using statistical computations. The mean and the standard deviation were computed. These are the formulas that were used to compute the result.

Weighted Mean

The formula is:

$$\overline{X} = \frac{\Sigma X}{N}$$

Where $\overline{X}$ = Weighted mean

Σ means "summation of"

X = Score proper weight

N = total number of respondents

$$S = \sqrt{\frac{\Sigma(X - \overline{X})^2}{N}}$$

This was the formula used by the team to compute and get the weighted mean of the scores given by the mobile users and IT experts.

Standard Deviation

The formula is:

$$\overline{X} = \frac{\Sigma X}{N}$$

Where S = the standard deviation

Σ means "summation of"

X = each value in the data set

$\overline{X}$ = mean of all values in data set

N = number of all values in data set

This was the formula used by the team to compute the standard deviation of the scores given by the mobile users and IT experts.

6. RESULTS AND DISCUSSION

6.1 Test Results:

This determined the quality of the developed application in terms of the installation, functionality and user interaction through sets of quality criteria and test.

The game application was tested using the conformance test, compatibility test case instrument based on the criteria of android.developers.com which was participated by technical adviser and mobile users.

The failed portion in the testing was the screen size did not fit to the screen of the gadget to fix this, the developers provided the required screen size gadgets and ran the application. The application should fit to the screen of the gadgets.

In the compatibility test, the project got the score of 6 out of 10 and in conformance test, the project got the score of 26 out of 34 so the project passed the test.

6.2 Evaluation Results:

The following were the results of the evaluation conducted with thirty participants. Four criteria were used to evaluate the software application. The results were as follows:

For the first criterion, Visual Design and User Interaction, the application got an average mean of "2.74" and an average standard deviation of "0.64" which were interpreted as Fairly Acceptable. In the second criterion, Functionality, the application got an average mean of "2.89" and an average standard deviation of "0.60" which was interpreted as Fairly Acceptable. For the next criteria, Performance and Stability, the application got an average mean of "2.90" and an average standard deviation of "0.54" which was interpreted as Fairly Acceptable. Lastly, for the criteria of Google Play, the application got an average mean of "2.93" and an average standard deviation of "0.57" that was interpreted as Fairly Acceptable. Overall, the application got an average mean of "2.87" and an average standard deviation "0.59", interpreted as "Fairly Acceptable". The criterion got the highest score is "Google Play" and the criterion that got the lowest score is "Visual Design and User Interaction".

7. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary of Findings:

The project is a 2D mobile game application developed for Android phones which is basically about the traditional games in the Philippines. The application contained history and mechanics on how to play it. The development tools used by the team were Unity Game Engine for the functions of the game, Adobe Photoshop for the logos and designs, and CrazyTalk Animator 2 for the creation of the characters and animations.

The developers chose the above development tools because they found them easy to use and they were compatible with it. Because of this capstone project the developers enhanced their skills in using these development tools so they used it in other projects.

The project had undergone testing to test the application's compatibility, performance, visual design, audio, navigation and stability. The project was tested by 4 IT students.

The project had undergone evaluation to ensure the quality of the game application. The evaluation used by the team was based on the Android Core App Quality. There were a total of forty (40) respondents, divided into two groups. The first participants were ten (10) IT experts while the second was consisted of thirty (30) mobile users. Based on the evaluation analysis of the project, the game application received acceptable results and the study had the following findings:

1. For the Visual Design and User Interaction, the evaluators rated it as fairly acceptable since the game applications standard design conform the criteria of Google, its GUI was well presented and navigation with the software worked well and notifications were permissible.

2. For the Functionality, the evaluators mostly rated it as fairly acceptable since the game worked well after installing it on the SD card, its audio pauses and resumes, its UI graphics and design was well design well and it responded to User/app state testing.

3. For the Performance and Stability, the evaluators rated the application with the interpretation of Fairly Acceptable. The software's operations were performing well without bugs and responded quickly;

4. For Google Play, the application was already uploaded to the Google Play store and had passed the standards of android applications and is now ready to be downloaded in the market.

The overall evaluation of both IT Experts and Mobile users got an average mean of "2.85"and an average standard deviation of "0.63" which was interpreted as "Fairly Acceptable". Fairly acceptable because when the team conducted the test and evaluation, the respondents had reacted to the game like there were no error. Thus, they said that it is interesting and thrilling.

Google play was part of the evaluation that had the highest score because the developed application could be downloaded in the Google Play store. Visual design and user interaction got the lowest score because the application didn't have notifications that remind the users about the updates. For the future the developers plan to add notifications to the application to remind users about the updates of the application.

7.2 Conclusions:

Larong Pinoy was developed to be a 2D mobile game application for Android. The game was designed with the features of the history, mechanics, and game play of each traditional Filipino game and also the game about traditional Filipino games.

The application was created using the development tools such as Unity 3D as the game engine, Crazy Talk Animator 2 for creating the characters, and Adobe Photoshop for designing the background, buttons and logos.

The system had undergone testing through conformance and compatibility test. The result of the test was used to improve the systems over-all performance. The evaluation was conducted to achieve the system's acceptance of the user based from the Android Core App Quality standards using the criteria such as Visual Design and User Interaction, Functionality, Performance and Stability and Google Play. The evaluation instrument used was based from the Android Game Application and participated by ten (10) IT Experts and thirty (30) mobile-users. The result garnered an overall mean of "2.85" and standard deviation of "0.63" with an interpretation of "Fairly Acceptable" which meant that the system could be played and provided insights about the Larong Pinoy or Traditional Filipino Games.

7.3 Recommendations:

The evaluation respondents and the developers suggested additional features of the application for the improvement of the project.

- Leader board for saving list of the names of the people who got the highest scores.
- Synchronize to Facebook to be able to share the game in their accounts.
- Add more traditional games like *piko, taguan* etc. for more entertainment.

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