CHAPTER 2

THEORETICAL FOUNDATION

This chapter will focus more on the theoretical foundation which are going to be used in this project. This project will be focused on the client's side point of view, therefore this project is designed using some of the system and application program. Those will be discussed furthermore on this chapter.

2.1 Smartphone

Mobile phone with various functions and benefits enhanced with an operating system that allows the user to obtain more features are known as smartphones. The statistic below shows that the smartphone users are expected to be increasing over the year which leads to mass users of the game application.

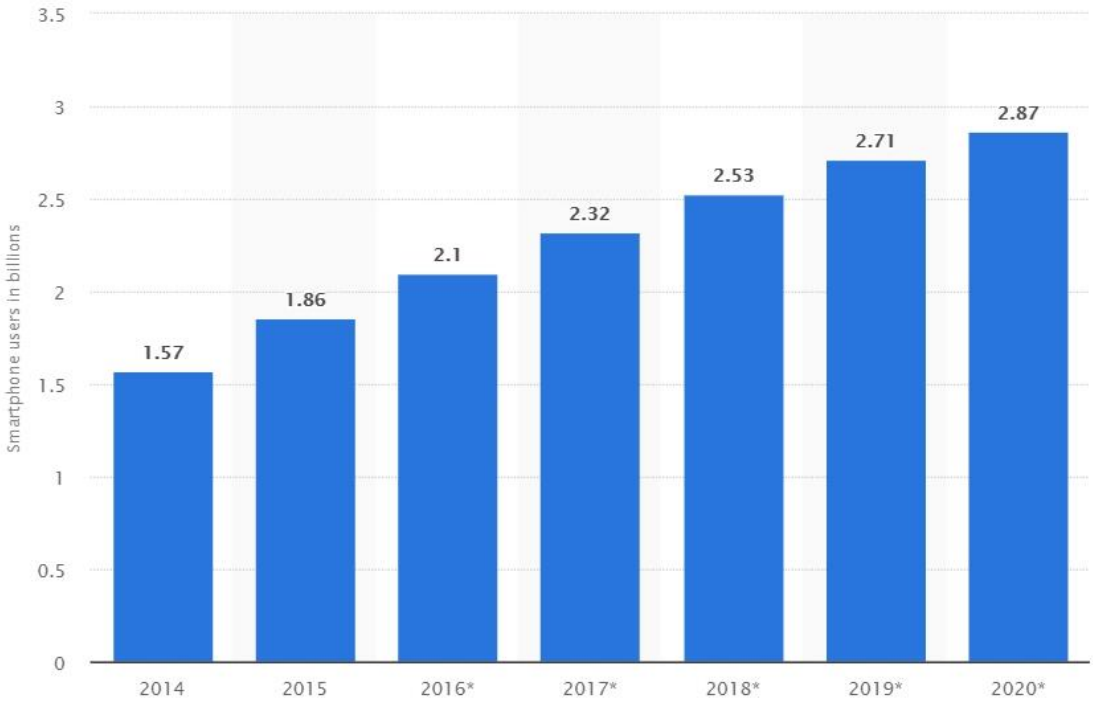

Figure 2.1 Statistic of smartphone users [9]

2.1.1 Android

Android is a mobile operating system which is based on the Linux kernel and it is a software stack for mobile devices [10]. From the statistic (figure 1.1) that is shown in chapter one, Android is the most used operating system. Therefore, the Author will create a game based on Android operating system.

Figure 2.2 Logo of Android [11]

2.1.2 Game application

Game is an entertainment which can be played by everyone, not only children, but also young adults to adults can also use this project. Game application is a software where people can play it using PC, tablets and smartphones.

Figure 2.3 Illustration of applications [12]

2.2 Android SDK

Android SDK is a Software Development Kit to create an application for android. To build android application, the Author may use sample projects with source code, development tools, an emulator, and required libraries which are included in Android SDK.

Figure 2.4 Logo of Android SDK [13]

2.3 Unity

Unity 5.5 is an engine which is capable of creating various kind of games and a simple program in terms of development environment. Beginners can use it easily, due to the flexibility, but Unity can be powerful enough for experts. This engine is possible to create a 3D-games, applications for mobile, desktop, the web, and console [14].

Figure 2.5 Logo of Unity [15]

2.4 Adobe Photoshop

Adobe Photoshop is a software that allows the user to edit an image such as raster (pixel-based) images as well as vector graphics. Using a layer-based editing system, it enables image creation and altering with multiple overlays that support transparency [16].

Figure 2.6 Logo of Adobe Photoshop [17]

2.5 Spaced Repetition

The SRS (Spaced Repetition System) is a presentation method which makes sure that it stays constantly fresh in your mind and that gives you the information before you would forget it [18]. Using spaced repetition method as an approach, it will optimize the relation between time spent learning and learning success. Kornell said that flashcards are the beginning of the spaced repetition approach, that has a common technique for learning by repetition and feedback [19]. Like the figure below, flashcard is a card printed with words or numbers and briefly displayed as part of a learning drill. This is often used for tasks like learning vocabulary from foreign languages.

Figure 2.7 Illustration of flashcards [20]

Bjork's research shows that repeatedly testing yourself on what you've learned and learning in short bursts over time is much more effective for long-term recall than cramming [21]. Cramming is a memorization technique by absorbing copious amounts of information in a short period prior to an exam that only lasts for the short term [22]. It is recommended students practice active learning and critical thinking through discussions, individual thinking and studying in groups.

Table 2.1 Comparison of learning games [23]

Classic Learning Game	Spaced-Repetition based Learning Game
Intrinsic triggers make the learner play the game.	Extrinsic reminders make learners play the game at a calculated time.
Played at unspecified times.	Alerts remind learners to play the game when it is best according to the spacing effect.
Engage learners over a long period of time.	Keep learners in the game only for one round of the scheduled content.
Bloom's taxonomy (Anderson revision): Apply, Analyze, Evaluate, Create	Bloom's taxonomy (Anderson revision): Remember, Understand
Raise intrinsic motivation through extrinsic triggers like rewards, every time the learners reach a certain goal	Create motivation to play the game at given times by only rewarding learners when playing according to calculated intervals

The table above shows the comparison between Classic Learning Game and Spaced-Repetition based Learning Game. For example, Spaced-Repetition based Learning Game keeps learners in the game only for one round of the scheduled content whereas Classic Learning Game took a long period of time.

2.6 Research Method

The Author will conduct a research choosing qualitative and quantitative approach. After gathering both data, The Author is hoping to solve the existing problem in learning Mandarin.

2.6.1 Quantitative Research

This research is done to gather the data in a numerical form which can be measured by categories and can be used to construct graphs. Gathering the data from 25 people through spreading questionnaire forms. This research intends to discover how many of those who are interested in learning Mandarin. Also, to make a concrete conclusion based on the data related the amount of people who have the willingness to use this game application as one of the alternatives to learn Mandarin.

2.6.2 Qualitative Research

This research is an empirical research which involves a natural approach to understand more towards the individuals. The Author will be interviewing three sources who often play mobile games. This approach intends to gather more information about their interest in learning Mandarin and what are their obstacles in learning Mandarin so far. Interview session will contain some questions starting from the number of hours consuming game applications, then it goes deeper to their background, experience, interest and obstacles in learning Mandarin. As for the final question, the audience will be questioned by the Author, regarding the intention to learn Mandarin through application.

2.7 Software development methodology

2.7.1 Agile Method

As for this project, Agile Scrum Method will be used by The Author to help him addresses the complexity of this project during the development level. According to scrumalliance.org in 2017, Agile Scrum Development Methods are a group of software development methodologies based on the same principles or short-term system development that require rapid adaptation of developers to changes in any form [24]. Scrum's development process involves several phases, such as:

1. Detailed Requirements

At the beginning of this stage, gathering all the qualified information and identifying all the key information in order for The Author to develop this program is necessary. The further step after gathering all the data is analyzed and summarized all the information which will be needed in the future.

2. Design & Analysis

At this stage, The Author begins to develop a design of the system flow and also another attribute that this game application needed. There will be sound projection of how to pronounce some of the Mandarin words.

3. Implementation & Developer Testing

At this stage, The Author will continue implementing a system that will be used in the application. In order for The Author to get a better result, conducting test to several people regarding the effectiveness of the application will be needed for further improvement of this project.

4. Quality Assurance / Acceptance Testing

At this stage, The Author will check the built-in prototypes and make sure that the prototypes are built in a way that allows the functionality to work in its full capability and ready to be shown at the public.

5. Evaluation / Prioritization

After getting feedbacks from the respondents, The Author will create the software according to existing prototype and continue to add its functionality simultaneously in order for the application to be dynamic and achieving the company's goal.