CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter discusses the system development methodology that will be used for UTM LetGo project. The methodology that will be chosen for this project is justified in detail in the chapter. The technology used for the project is then clarified in detail from the aspects of hardware and software requirements.

3.2 Methodology Choice and Justification

After reviewing the five well known software development models which are Agile model, Rapid Prototyping, Rational Unified (RUP) model and waterfall model (Munassar & Govardhan, 2010), the most appropriate software development methodology for this project is Agile methodology. Choosing Agile methodology has advantages over the other methodologies for the project.

Agile methodology is an adaptive approach which allows rapid response to changes of requirements at every stage of development so that the developed system can better fulfill the expectation of customers (Shaikh & Abro, 2019). Besides, agile methodology can easily deal with the situation where customers change their mind suddenly or dissatisfy with the user interface or functionalities of the developed system without having to start over the development cycle to fulfill the requirements. This methodology is user-oriented approach which always put user at the first place of the development, aiming to develop a customer satisfied system. In addition, it is beneficial to implement agile methodology in this individual project as implementing agile methodology in small-scale project allows easier tracking of project design and

documentation under the situation with ever-changing requirements (McCormick, 2012).

3.3 Phases of the Chosen Methodology

In agile, the project will undergo a series of iterations which include phases like requirement analysis, design, development, testing, deployment, delivery of partially implemented software and feedback from stakeholders. At the beginning of agile development, brainstorming of requirements occur and the requirements are well defined. The initial planning of the project will be conducted by creating Gantt charts to plan and schedule time for the project activities. Figure 3.1 shows the life cycle of agile development methodology.

There are several agile methodologies such as Scrum, Crystal Clear, Dynamic Software Development Method (DSDM), Feature Driven Development (FDD), Lean Software Development, Adaptive Software Development (ASD) and Extreme Programming (XP) (Kumar & Bhatia, 2012). Scrum methodologies is commonly used for project development in agile.

Scrum is an incremental software development process where the entire development work is broken down into a series of iterations called sprint. Each feature will go through all the stages of development cycle starting from planning until deployment throughout a sprint. Sprint is a period with a limited duration of time which is typically between two to four weeks and the maximum duration of a sprint is 30 days. In the planning stage of each sprint, requirements of system feature are analysed and defined as user stories. The release of user stories in each sprint will be determined based on the priority. After planning and development stages, the testing stage is mainly about the evaluation of products and identifying of defects. The defects and bugs identified will be resolved to assure the quality of products. At the end of each sprint, a shippable product is incremented to the previous release to ensure that the product is usable.

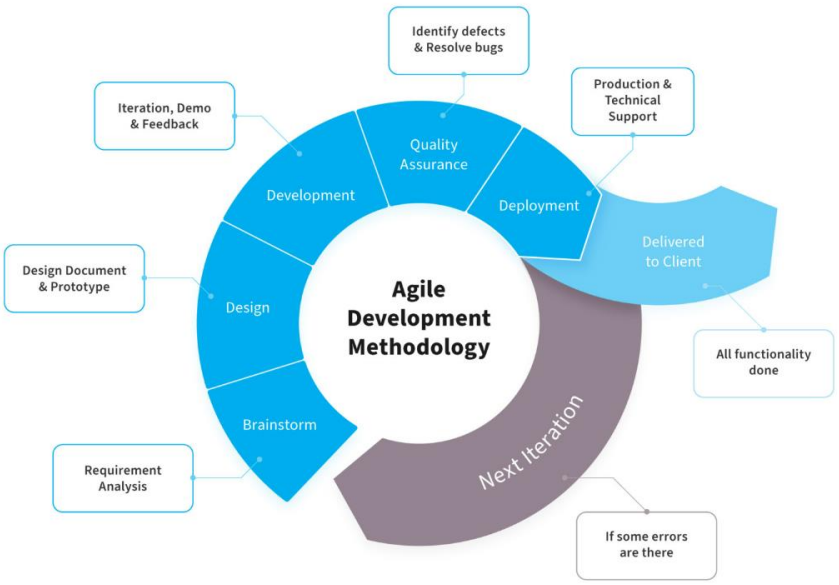

Figure 3.1 Agile Development Methodology (Vorobiova, 2021)

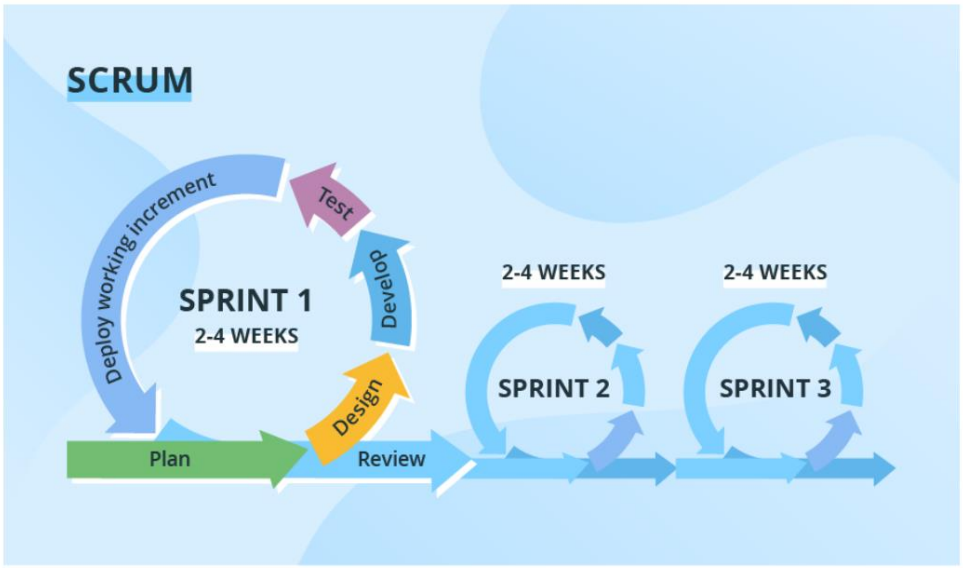

Figure 3.2 Scrum Methodology (Shiklo, 2019)

3.4 Technology Used Description

This section will discuss about the technology that will be used for the system development. For our system development, Flutter is chosen to be used for the frontend as it has rich libraries of widget that consists of various attractive interface

components which are very useful to develop android application with awesome interfaces. Firebase is chosen to be used as the backend of the system as it has easy-to-use features authentication, cloud firestore, and cloud storage. By using Firebase for backend system, the development time can be greatly shortened.

3.4.1 Flutter Framework

Flutter framework is chosen to be used in this project as it supports for cross-platform application development from a single codebase which make the development of this project to become easier as the development of web and Android applications can be done only using one programming language which is Dart. Besides that, this framework also provides the similar experience just like native application on Android platform.

3.4.2 Firebase Backend Service

Firebase backend service is the ideal back-end service for the proposed system as it offers many features that can reduce development workload and time and almost all these features can be used at free. Firebase authentication provides comprehensive authentication that allows user authentication through email address and password, widespread identity providers such as Facebook, Google, Twitter, Github and other, phone numbers, and anonymous. This authentication feature offers a complete function of authentication starting from sign up, sign in, password reset, email reset, SMS and email verification. Next, Cloud Firestore will be used as the NoSQL database for the proposed system as it provides real-time data storage and synchronization. Secure content delivery is one of the advantages of this feature as zero-configuration SSL is integrated into the hosting which ensure the safety of content.

3.5 System Requirement Analysis

In this section, system requirements are discussed in two different specifications, which are hardware and software specifications. Minimum requirements of hardware and software for this application to operate smoothly are listed and justified.

3.5.1 Hardware Requirements

Table 3.2 summarizes the minimum specification of the required hardware to develop the UTM LetGo system. Both Window-based and MacOS-based laptops are viable to be used for system development. However, Window-based laptop will be used in this project.

Table 3.1 Hardware Requirement and Its Justification

Hardware Name	**Specification**	**Justification**
Laptop	Processor: Intel® Core ™ i5-5200U CPU @ 2.20GHz RAM: 8.00GB and above System type: 64-bit Operating System (Windows, MacOS)	Used for system development, testing and debugging purposes.
Smartphone	Processor: Qualcomm SDM636 Snapdragon 636 (14nm) RAM: 4 GB and above Operating system: Android 10	Used for system testing.

3.5.2 Software Requirements

Table 3.3 summarizes the minimum software requirements for the development of UTM LetGo system with justifications.

Table 3.2 Software Requirement and Its Justification

Software Name	**Justification**
Visual Studio Code	Coding platform
Enterprise Architect	A UML Modelling tool to develop system requirements, design diagrams and to produce documentation of the system
Flutter	A framework for development of the system
Firebase	Acts as back-end service of the system including the services of database, authentication, hosting
Stripe API	Used for online payment gateway of the system in test mode

3.6 Chapter Summary

This chapter summarizes the methodology used in the proposed system. The implementation of agile method, listing of each planning phase, technologies used, software and hardware requirements of the system are well explained in detail in this chapter.