Contents

[1. Literature Review 1](#_Toc91973430)

[1.1 Introduction 1](#_Toc91973431)

[1.2 Mini apartment manager app domain 1](#_Toc91973432)

[1.2.1 History 1](#_Toc91973433)

[1.2.2 Status 1](#_Toc91973434)

[1.2.3 Trend 2](#_Toc91973435)

[1.2.4 Technologies 2](#_Toc91973436)

[2. Technologies 3](#_Toc91973437)

[2.1 Front-end technologies 3](#_Toc91973438)

[2.1.1 Angular framework 3](#_Toc91973439)

[2.1.2 Vue JS framework 4](#_Toc91973440)

[2.1.3 React Js framework 4](#_Toc91973441)

[2.2 Back-end technologies 6](#_Toc91973442)

[2.2.1 Laravel framework 6](#_Toc91973443)

[2.2.2 Node + Express framework 7](#_Toc91973444)

[2.2.3 Spring Boot framework 8](#_Toc91973445)

[2.3 Database 10](#_Toc91973446)

[2.3.1 MySQL 10](#_Toc91973447)

[2.3.2 What is MySQL 10](#_Toc91973448)

[2.3.3 How MySQL use 10](#_Toc91973449)

[2.3.4 Why use MySQL 11](#_Toc91973450)

[2.3.5 When to use MySQL 11](#_Toc91973451)

[2.3.6 MongoDB 12](#_Toc91973452)

[2.4 Selected Technologies 13](#_Toc91973453)

[2.4.1 Front-end framework 13](#_Toc91973454)

[2.4.2 Back-end framework 13](#_Toc91973455)

[2.4.3 Database 13](#_Toc91973456)

[3. Methodologies 13](#_Toc91973457)

[3.1 Waterfall model 14](#_Toc91973458)

[3.2 Scrum Model 14](#_Toc91973459)

[3.3 Selected Methodologies 15](#_Toc91973460)

# Literature Review

## Introduction

The 4.0 era is an era of rapid technological development, and this is when all industries apply technology to economic activities to be able to develop dramatically. Digital transformation is no stranger to businesses today. MAMS - Mini Apartment manager system is also a digital transformation project aimed at managing boards of apartment buildings and inns to manage and operate their work more consistently and scientifically. From there can create more development steps in the future.

## Mini apartment manager app domain

### History

An inn is a house or facility, a structure built or used to provide accommodation for visitors, overnight accommodation, and possibly food and water, and pay rent to the innkeeper. Hostels are usually located on the street front but can also be located in an alley.

The history of inns dates back to Europe and first appeared when the Romans built the Roman road system two millennia ago. Several inns in Europe for centuries. In addition to providing for visitors' needs, traditional inns serve as a gathering place for the local community. (Callaway, 2010)

At the end of the 18th century, inns and inns in Vietnam became popular in the cities because of trade and scholars who came and stayed. Since then, housing demand has increased in the city. Students, temporary workers, and temporary workers are the most prominent tenants. The way inn management of the innkeepers is often used through a lot of records. In the 2004s, many houses used computer software to manage data. (TienNN, 2004)

### Status

For the current real estate market, housing prices have become many times higher than the annual income of most middle-class families. In addition, the daily needs to spend in life always increase over time. In developed provinces, for customers with an average income of less than 20 million VND/month, the opportunity to buy a house, or a piece of land to build in, becomes increasingly difficult.

The number of students and workers from provinces coming to gather in large urban areas to study and work is increasing. Therefore, the demand for housing is an inevitable trend. The investment segment in building motels for rent gradually develops in a more professional direction.

Starting from the most popular segment, motels with reasonable prices for workers, freelancers, students… Many landlords have begun to expand and upgrade motel rooms for households. Young, single office worker, group of young customers with good income. Some homeowners are creative with the homestay model for young people who want to live in a collaborative environment with modern space and many utilities.

The needs of tenants are increasing, and the services of the innkeepers are increasingly affluent, meeting all prices and customer segments. However, which model has high potential and can develop sustainably over time must be carefully analyzed before implementation.

### Trend

According to the 2020 Cisco & IDC report on the digital maturity of small and medium-sized enterprises (SMEs) in 14 countries in the Asia Pacific region, only about 3% of businesses believe that transformation Numbers are not important to their operations, much lower than 22% in 2019. Up to 62% of companies expect digital transformation to help businesses create new products and services. 56% of companies find the competition is changing, and digital transformation allows businesses keep pace. (Tino, 2021)

According to Gartner, the world's leading information technology research and consulting company, digital transformation projects are a priority for many businesses in the market. Specifically, up to 87% of leaders consider process digitization the number 1 priority, 40% of organizations have been widely implementing activities to digitize business processes and management processes. And up to 91% of business leaders have started digitizing activities in certain areas. Statistics of market research company Market Research Future show that in 2018, the investment for global digital transformation reached 205.65 billion USD. It is estimated that by 2025, this number will reach about 817.05 billion USD with an average annual investment growth rate of 18.87%. (Tino, 2021)

Hostel management software is a comprehensive management and operation solution that helps increase work efficiency and minimize costs. With the name MAMS, the software quickly solves all difficulties and problems in the operation of motels and mini-apartments.

As a comprehensive, self-contained solution, MAMS allows businesses to operate professionally, automatically, and accurately. Right on one software, the inn management board can track customer details, contracts on each type of customer, manage space information, the status of each room, manage services.

Before MAMS, there were many similar applications such as Khutro.com, Simple House, Landsoft, Mona Media, DigiStay, LaLaHome. These are all good websites, applications and full of activities and operations of the rental business. MAMS is also heavily influenced by existing and existing applications in the market.

As soon as MAMS is applied to operation and business, businesses and innkeepers can easily capture all information, coordinate operations quickly, and increase work efficiency, services, and indicators. Electricity, water, gas, room charges are done correctly, avoiding unnecessary errors. Moreover, the application of this software solution also saves operating time and quickly solves the requests and questions of tenants. Since then, they have been improving the quality and service of motels and mini-apartments, bringing a stable source of customers.

### Technologies

For the web today, there are many rich technologies to develop. In it we can mention frameworks that help developers build their websites. First we need to understand what a framework is, Frameworks are "materials" that programmers can use to build their own applications/software. Instead of having to design them themselves, they simply mined these materials, took steps to put them together, and created the final product. The popular frameworks that are popular today include CodeIgniter, Laravel Framework, CakePHP, Node.js, Spring Framework, .NET Framework.

# Technologies

Currently, there are many technologies to be able to build a cms website. For example, the following technologies are prevalent and powerful.

## Front-end technologies

### Angular framework

**What is Angular framework**

Angular is considered an open-source or free framework dedicated to web design work. Angular has been in development since 2009 and is maintained by Google. These frameworks are considered as the most powerful front end frameworks dedicated by advanced HTML cutting programmers. (Angular, 2021)

**How Angular framework work**

After AngularJS is embedded in the page, it will be displayed for parsing the HTML code. This HTML code will have a tag with the ng-app="" attribute. This attribute will then be used to initiate the initialization of the AngularJS application. The following tag has the ng-model="name" attribute, which creates the name variable inside the above AngularJS application. From there, the variable's value is always equal to the last field of the 2nd tag with the attribute. It will be used every time the application can detect the change of the value inside the variable name, and it will attach this value to the HTML content and place it inside this 2nd tag. (Angular, 2021)

**Why use Angular framework**

* AngularJS is considered a solution for Single Page Applications to work quickly.
* Code Front end is usually very user-friendly, thanks to the ability to bind data on top of HTML platforms to make all sorts of extraordinary actions.
* You can easily Unit test.
* Angular JS can reuse components more easily
* Support for programmers can code less with more functionality.
* You can run AngularJS on a variety of browsers and PC or mobile.

**When to use Angular work**

After understanding what Angular is, here are the things you can apply Angular to get familiar with them gradually.

CRUD Web Apps: this is one of the features that Angular users prefer to use the most.

Mobile Apps: Developers can use Angular in combination with Phonegap to create a kind of Mobile App

### Vue JS framework

**What is Vue JS framework**

Vue.js is a very flexible framework widely used to build user interfaces. Completely different from monolithic frameworks, Vue usually owns the design from the ground up in ways that allow as well as encourage work to make developing applications easier step-by-step. (You, 2018)

**How Vue JS framework work**

Vue.js is a framework (original English: progressive) for developing graphical user interfaces. In contrast to monolithic frameworks, Vue was built from the ground up to support and promote incremental application development. Users simply need to construct the view layer using Vue's core library, which is simple to learn and combine with existing libraries or projects. Simultaneously, when paired with contemporary approaches such as SFC (single file components) and support libraries, Vue readily fits the requirements for developing considerably more complicated single-page apps (SPA - Single-Page Applications). (You, 2018)

**Why use Vue JS framework**

Currently, Vue has over 160k stars; the frontend frameworks with the most ratings are React (> 146k) and Angular (> 59.2k). Listed below are some advantages to utilize Vuejs.

There is no construction step required: If you utilize Vue, you won't have to go through a long list of stages and can swiftly get to the point. Because Vue does not require the usage of a sophisticated build tool, you may design an application using Vue by just declaring a script. (You, 2018)

Vue's command-line interface enables it to establish project structures more rapidly.

Nowadays, Vue documentation is becoming more broad and transparent in its language, making it possible for you to rapidly become an expert.

Vue has a strong ecosystem that can help you develop even the most basic frontend application. Vue-router, vuex, vue-test-utils, vue-dev-tools, and vue-cli are all examples.

Core Vue has a small set of features due to its ability to focus exclusively on generating the user interface and its interactions. As a result, it will provide just the bare minimal characteristics essential for the design and building of architecture. It will assist you with removing superfluous components from the Vue.js core library, resulting in a more compact and versatile framework.

**When to use** **Vue JS framework**

Vue is an easily accessible framework for those using cross-platform front-end frameworks in transition and even those just getting started with Vue JS. It is suitable for Single-page Application (SPA) projects. (You, 2018)

### React Js framework

**What is React Js framework**

ReactJS may be thought of as a library that comprises a large amount of open-source JavaScript, and its parent is a large guy with a well-known name: Facebook. The goal of ReactJS was to enable the rapid development of appealing web apps with minimum code. And the primary objective of ReactJS is to ensure that any website built with it runs smoothly, rapidly, is highly extendable, and is simple to implement.(ref)

**How React Js framework work**

React is a declarative framework that makes reasoning about your application easy and aspires to be both efficient and adaptable. It creates basic views for each state of your application, then React updates and renders the appropriate component rapidly when your data changes. The declarative perspective improves the predictability and debugging of your code (reactjs, 2018)

Each component in a React application is responsible for producing a tiny, reusable piece of HTML. Components can be layered within other components to enable the construction of sophisticated applications using simple building elements. Additionally, a component may have an internal state.

While developing client-side applications, a Facebook development team discovered that the Document Object Model (DOM) is inefficient (The Document Object Model (DOM) is an application programming interface (API) for HTML and XML documents. It establishes the logical structure of documents and the manner in which they are accessed and modified.). As a result, React implements a virtual DOM, which is a JavaScript version of a DOM tree. As a result, whenever it wants to read or write to the DOM, it will make use of its virtual representation. The virtual DOM will then attempt to determine the most effective method of updating the browser's DOM.

**Why use React Js framework**

There are six reasons as well as six strengths of React JS that we should use in our projects. (reactjs, 2018)

1. Simplicity

ReactJS is just easier to learn. The component-based methodology, well-defined lifecycle, and plain JavaScript make React easy to understand, create, and support. React employs JSX, a proprietary syntax that combines HTML and JavaScript. You can still write in ordinary JavaScript, but JSX is much easier to use.

2. Ease of use

Angular and Ember are regarded to as ‘Domain-specific Languages', meaning that they are tough to master. To respond, all you need is simple CSS and HTML.

3. Approche native

React may be used to build mobile apps (React Native). And React is a big admirer of reusability, thus reusing code is encouraged. So we can create IOS, Android, and web apps simultaneously.

4. Binding Data

React employs one-way data binding, while Flux regulates data flow to components through a single control point — the dispatcher. It's simpler to troubleshoot small ReactJS apps.

5. Acting

React lacks a built-in dependency container idea. Browserify, Require JS, EcmaScript 6 modules through Babel, ReactJS-di may automatically inject dependencies.

6. Testability

Testing React JS apps is a breeze. We may alter the state we send to the ReactJS display and look at the output and triggered actions, events, functions, etc.

**When to use React Js framework**

React JS is a valuable and robust framework. We can use React Js to do everything. It is well suited for external APIs, e-commerce sites, management websites, and mobile apps. (reactjs, 2018)

## Back-end technologies

### Laravel framework

**What is Laravel framework**

Laravel is a free and open-source PHP Framework developed by Taylor Otwell, with the first version released in June 2011. Laravel was born to support the development of web applications based on the model. MVC (Model - View - Controller). (Laravel, 2021)

Laravel is currently released under the MIT license, with the source code hosted at Github.

**How Laravel framework use**

Laravel strives to improve the developer experience without losing application functionality. Developers that are content create the finest code. To do this, we've endeavored to mix the greatest features of existing web frameworks, including frameworks written in a variety of languages, such as Ruby on Rails, ASP.NET MVC, and Sinatra. (Laravel, 2021)

**Why use Laravel framework**

1. Getting started is straightforward

The first reason is that Laravel is extremely easy to learn for newcomers. Even if you just know PHP, you can still create a five-page website in a few of hours.

2. Utilize open source software

The Laravel framework is a free, open-source framework that enables you to rapidly and easily construct big, sophisticated online applications.To get started, all you need to do is install PHP and a text editor. (Laravel, 2021)

3. Community Involvement

Nothing beats being stuck with complex bugs but having someone go through and guide you. Laravel comes with a robust support library and is more powerful than other frameworks.

If you report a problem or a security breach in the Framework, the community will respond quickly. (Laravel, 2021)

4. Tracking of MVC

The Laravel Framework retains the MVC framework and OOP object-oriented programming, which results in improved documentation and performance.

5 Supercharged Frameworks

Laravel's route section inherits the advantages and characteristics of other Frameworks due to its late birth. Laravel uses the greatest Symfony components.

6. Database Migration Made Simple

Laravel's database migration functionality is vital. It keeps the application database structure without having to recreate it.

Database migration allows you to control the database with PHP instead of SQL. It also allows you to undo recent database modifications.

7. Full safety features

The Laravel Framework is secure. Laravel utilizes PDO, anti-insert SOL. Laravel's crsf security also helps against XSS. Escaping HTML given as view parameters automatically prevents cross-scripting on the web page. Use the framework's relevant components here.

**When to use Laravel framework**

Laravel may be used to create both websites and web applications that adhere to object-oriented programming concepts and the MVC design. Laravel developers may design solutions of any complexity and scale, from one-page websites to full-fledged social networks, thanks to a large variety of built-in capabilities. (Laravel, 2021)

### Node + Express framework

**What is Express framework**

One of the best NodeJS frameworks is Express. It provides powerful features for web or mobile development. Expressjs supports HTTP and middleware methods creating a powerful and easy-to-use API. (expressjs, 2020)

**How Express framework use**

The following is a summary of some of Express Js's primary functions:

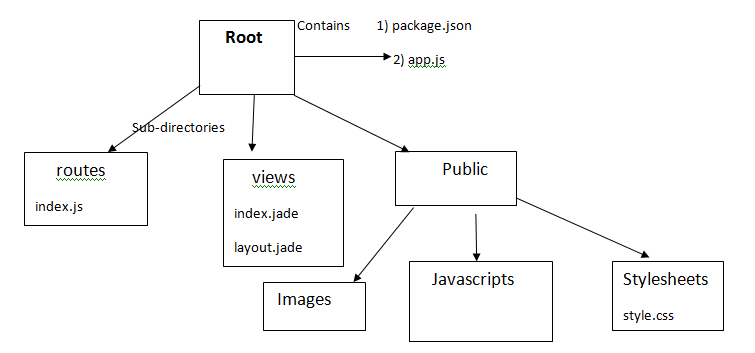


Figure The diagram shows how the Express framework works.

- Create intermediate classes that will respond to HTTP queries.

- Defining a router enables it to be used with a variety of various actions depending on the HTTP method and URL.

- Allows for the return of HTML pages in response to parameters. (expressjs, 2020)

**Why use Express framework**

Server-side programming, routing, and debugging are all express. We can write less code because Express is a Node.js Framework. With Node.js, Express can provide a more complicated routing system capable of serving dynamic URLs. Finally, Express has a debugging mechanism that makes troubleshooting simple. (expressjs, 2020)

IBM, Twitter, Accenture, and Intuit all utilize Express.

Express Benefits:

* Learnable
* Using Full-Stack JS
* High performance

**When to use Express framework**

The express framework is suitable for typical real-time, multi-user application websites such as social networks, chat, or fast update websites such as stock exchange, weather, statistics. (expressjs, 2020)

### Spring Boot framework

**What is Spring Boot framework**

Spring Boot is a Java framework developed by the Pivotal Team based on the open-source Java framework for creating microservices to build stand-alone Spring applications with instant execution quickly. (spring.io, 2019)

**How Spring Boot framework use**

Spring Boot is a project under the Spring IO Framework's IO Execution layer.

Spring Boot is Spring's next step in making it easier to set up and build apps using Spring. Spring configurations are reduced using Spring Boot. Spring Boot supports embedded containers, which enable web applications to operate independently without the need to deploy to Web Servers.

Spring boot may be used to construct Java Web applications that can be started using the command line 'java -jar' or exported to a war file and deployed to the Web Server as normal. Spring Boot has a "CLI Tool" for running Spring scripts (spring scripts). (spring.io, 2019)

The following picture explains Spring Boot in a nutshell:



**Why use Spring Boot framework**

Spring Boot has the following advantages (spring.io, 2019):

* Spring-based apps may be easily developed in Java or Groovy.
* It shortens the development process and boosts production.
* It eliminates the need for extensive boilerplate code, annotations, and XML customizations.
* Spring Boot applications may easily communicate with Spring ecosystems such as Spring JDBC, Spring ORM, Spring Data, and Spring Security.
* It adheres to the "Default Configuration Principle" in order to decrease application development time and effort.
* It includes embedded HTTP servers like as Tomcat, Jetty, and others for rapid development and testing of web applications.
* It includes a CLI (Command Line Interface) tool for developing and testing Spring Boot (Java or Groovy) applications directly from the command prompt.
* It includes a large number of plugins that enable rapid development and testing of Spring Boot apps using build technologies such as Maven and Gradle.
* It has several plugins that make it easy to deal with embedded databases and in-memory databases.

**When to use Spring Boot framework**

The following is a list of Java Spring Boot apps and examples (spring.io, 2019):

* Use Spring Boot to build a Web Application

You can start your Spring learning journey by creating a simple web application. You’ll use either Maven 3.2+ or Gradle 4+. You’ll first have to create an application class then run the application. You’ll also have to add unit tests.

* Create REST Service for an Education Site

Create a REST API for a course-delivery website. REST stands for REpresentational State Transfer, and Spring Boot is used to develop these services. For example, a service can use the Get request method to get a student's courses. Other service examples include requesting a certain class's students or registering a student.

* Create an Employee Management System (Using Spring Boot and Thymeleaf)

You may create an employee management system using Spring Boot and Thymeleaf. But you should know the basic ideas of both technologies. Your EMS solution should allow users to add, view, and delete employees, sort data, and paginate.

* Work on the Open-source Project Sagan

Project Sagan is a real-world app that helps Spring Boot (spring.io). It's a popular open-source project on Github. Working on this project will teach you a lot about Spring Boot's capabilities, as well as its framework, Elasticsearch, Thymeleaf UI, and Gradle.

* Create a Web App with Spring Boot Starter Web

They can assist you skip several tedious processes in the development process. They are dependency descriptors that you may add to your application to use Spring. Spring Boot Starter Web is widely used. It lets you develop a restful app.

## Database

To list all the types of databases currently, we can have a list of about 10 types but here I will only talk about the two most common types.

### MySQL

### What is MySQL

Oracle Corporation created, distributed, and maintained MySQL, an open-source relational database management system (RDBMS) based on the structured query language (SQL). MySQL is available on a wide variety of systems, including Linux, UNIX, and Windows. MySQL is frequently used in conjunction with web applications. (mysql, 2017)

### How MySQL use

MySQL is a client-server database management system. MySQL's heart is the MySQL server, which executes all database operations (or commands). MySQL Server is available as a stand-alone application for usage in client-server networks and as a library that may be incorporated (or linked) into certain applications. (mysql, 2017)

MySQL is used in combination with a number of utility packages that aid in the management of MySQL databases. The MySQL server receives commands through the MySQL client, which is installed on the PC.

MySQL was initially designed to efficiently handle big databases. Although MySQL is typically installed on a single system, it is feasible to distribute databases across numerous sites due to the fact that users may access them through various MySQL client interfaces. These interfaces communicate with the server using SQL commands and then show the results.

### Why use MySQL

To support the functioning of a website, the program includes a variety of data management systems. In this regard, MySQL is well regarded for its exceptional benefits. (mysql, 2017)

* Superior security

Having a high degree of security makes it more difficult for hackers to target MySQL, assuring the safety of each website's functioning. As a result, data management for big and small websites, with huge and little volumes of data, is provided with an optimal degree of security.

* Rapidity

MySQL's remarkable and lightning-fast performance in usage is an essential benefit while considering it. MySQL's assistance is usually welcomed due to its query speed and outstanding data reactivity, making it the best option for increasing job efficiency.

* Useful

MySQL is easy to use and intuitive. So it is suited for all users, regardless of their expertise level. Whether you are a beginner or an expert, you may utilize MySQL to meet your job needs.

* Expandable

It is simple to design and grow as an open-source code that aids the MySQL data management system. With a wide range of needs, MySQL's flexibility makes it easier to meet them.

* No cost

When using MySQL data management system, users may efficiently cut expenses. Free creates advantages and benefits for users when picking MySQL for their own purposes. This is why many programmers trust and utilize it.

### When to use MySQL

Currently, large websites operating with many users, such as social networks Facebook, Yahoo, Google, Twitter, etc, are using the MySQL data management system to support the information storage done. Effective now. From there, we can see the usefulness and popularity of MySQL in website design and development. (mysql, 2017)

With the MySQL database management system, when put into use, it is highly appreciated for its integration with apache as well as PHP. Not only that, the compatibility with many browsers, with many typical operating systems such as Ubuntu, Linux, macOS, Microsoft Windows, etc., makes the use of MySQL more trusted and preferred. Among the many RDBMS software, MySQL is the most widely known and famous today, developing many websites.

### MongoDB

**What is MongoDB**

MongoDB is a document-oriented database (document), a type of NoSQL database. Therefore, MongoDB will avoid the relational database's table-based structure to accommodate documents like JSON that have a very flexible schema called BSON. MongoDB uses data stored in Document JSON so that each collection will have different sizes and documents. The data is stored in the JSON document so that the query will be speedy. (mongodb, 2016)

**How MongoDB use**

MongoDB is a popular open-source NoSql database used by millions. MongoDB is a Db (document). Instead of JSON, the data is kept in JSON-style documents. Tables are like a relational database for quick queries. Tables are used by relational databases (like MySQL or SQL Server) to hold data. Instead of tables, MongoDB uses collections. In RDBMS, collection correlates to table, and document to row, however in MongoDB, records replace rows. MongoDB collections are incredibly flexible, allowing data to be saved without having to follow a structure. The MongoDB query language stores related data together for rapid query access. (mongodb, 2016)

**Why use MongoDB**

Following are some advantages of MongoDB:

* Minor schema: MongoDB is a Document Database, documents in the same collection do not have to be the same infield numbers and data types as in SQL.
* The structure of a Document is apparent, easy to read and understand.
* No need to use complex JOIN commands.
* Easy data extensibility, no need to worry about data types, primary keys, foreign keys like SQL.
* Save data on RAM, help access data faster.
* Quickly Scale-Out (Horizontally Scale). (mongodb, 2016)

**When to use MongoDB**

Therefore, when should we utilize MongoDB (mongodb, 2016):

* Utilize documents to store data, allowing for easy addition and deletion, as well as expansion of random data.
* The application is highly insert-oriented (write-intensive), necessitating the use of replication and a high-availability method.
* A mechanism for sharding is required.

MongoDB is widely used in a variety of applications, including digital content management systems, big data analytics systems, e-commerce product catalog management, and social applications.

## Selected Technologies

### Front-end framework

To complete a large project with a small number of human resources and students, I found a very suitable project, which is Vue Js.

Vue Js is very suitable for this project because of the following conditions:

* Vue Js is easy to learn and use for beginners. The main personnel of the project are students, so it is easy to apply in the project.
* This project is a cms website, a SPA site, so this is also a strong point of VueJs.
* Vue Js inherits the strengths of other powerful front-end frameworks like Angular, React.

### Back-end framework

One similarity between Vue Js and Laravel is that it's easy for beginners. The compatibility of Vue Js and Laravel is also why I chose Laravel as the back-end framework for my project. The developer of Laravel also chose Vue Js as the front-end framework for his project and created the complete framework that is laravue.

In addition, the framework itself is also suitable for this project. With MVC structure to help increase the performance of the code.

Easy database migration is also laravel's strong point. It allows maintaining the database structure without necessarily recreating it. Database migration also allows you to write PHP code to control the Database, instead of using SQL. It also allows you to roll back the most recent changes in the database. This is very suitable for projects that need a lot of access.

Finally, complete security features. Your application will be safe using the Laravel Framework. Laravel's ORM technique uses PDO, anti-insert SOL.

Additionally, Laravel's case protection helps prevent cross-site request forgery. It's a syntax that automatically escapes any HTML being passed as view parameters, to prevent cross scripting on the web page.

### Database

As a management site, the data needs many relationships to control the data in a uniform way. Laravel has better mysql support so my choice for this project is MySQL instead of mongoDB. The performance of the two data models can be said to be the same, the query language is diverse and can be used for any project. So the choice of database will lean towards the developer using which one is more convenient.

# Methodologies

A well-managed System Development Life Cycle (SDLC) should result in a high-quality system that satisfies customer expectations, is completed within the estimated time and cost, and functions effectively and efficiently within the existing and planned information technology infrastructure.

My research revealed that the WaterFall model and the Agile model can both be used for this project.

## Waterfall model

**What is Waterfall model**

Waterfall - is a cascading SDLC paradigm in which the development process resembles a flow, progressing incrementally through the stages of analysis, planning, realization, testing, implementation, and support.

**How Waterfall model use**

This SDLC model comprises the entire execution of each step in a progressive manner. This method is meticulously documented and planned, with characteristics required at each stage of the software development life cycle model.

**Why use Waterfall model**

This paradigm is used in the majority of projects since it is straightforward and easy to implement. Because of the simplicity and rigor of management, we always have concrete outcomes at each step and can easily follow the project's development. The task division is likewise clear and uncomplicated, making it ideal for small-scale projects.

**When to use Waterfall model**

When this approach is used, it is necessary for the project's requirements to be explicit, unambiguous, and concise. All concepts and designs have been clear from the start, allowing us to utilize the model to implement it most efficiently.

## Scrum Model

**What is Scrum model**

Scrum is an Agile methodology (agile software development) based on iterative and growth mechanics. Scrum is designed to support the development, delivery, and improvement of complex products.

**How Scrum model use**

With Scrum, the product is built in a series of iterative processes, called a sprint. Thereby, you can continuously improve the product, technique, team (team) and work environment. That way you can provide value to your customers throughout the development process.

**Why use Scrum model**

Scrum is preferred by programmers when it is necessary to develop software based on Agile methods because of its ability to quickly and effectively manage and handle complex problems, thereby producing good, effective products. High value. Scrum brings convenience and flexibility, specifically:

* Easily allow users to deploy during application development freely.
* Easy to learn, easy to use.
* Change operations are done quickly and easily.
* Minimize risks when building and developing products.
* Support to optimize the work efficiency and efforts of the developer team.
* Fast and compact processing, allowing customers to use the products at an earlier time.
* There is continuous improvement and upgrading to meet users' needs in the current rapidly developing technology era.

**When to use Scrum model**

The Scrum model may be used to practically any project, although it is best suited for medium to large-scale projects with complicated needs that cannot be specified at the beginning.

## Selected Methodologies

Before going into comparison and choosing which model is the right model for the Mini apartment manager project, let's evaluate the project overview. Mini apartment manager system (MAMS) came up with clear ideas and requirements after research and evaluation. The functions have been listed and the design is there, the plan is clear. The MAMS project is a small project with few human resources.

Next we will create a comparison between the two Agile and Waterfall models, and compare the project.

|  |  |  |  |
| --- | --- | --- | --- |
| MAMS | Waterfall | Scrum | Choice |
| Clear requirements | Suitable | Quite suitable | WaterFall |
| Small project size | Suitable | Not suitable | WaterFall |
| Not much change when development | Suitable | Quite suitable | WaterFall |
| Less manpower | Suitable | Quite suitable | WaterFall |

Based on the project's criteria, the Waterfall model has a slight advantage over Agile in this project. So I decided to choose Waterfall to develop MAMS project.

# Bibliography

Angular. (2021). *angular*. Retrieved from angular: https://angular.io/

Callaway, W. (2010, January 22). *RENT HISTORY: PART 1 FROM PYRAMIDS TO POOLHOUSES HOW RENT HISTORY APPLIES TODAY*. Retrieved from RentPost: https://rentpost.com/blog/other/from-pyramids-to-poolhouses-rent-history-and-how-it-applies-today/

expressjs. (2020, 4 4). *expressjs*. Retrieved from expressjs: https://expressjs.com/

Laravel. (2021, 12 2). *laravel.com*. Retrieved from laravel.com: https://laravel.com/docs/8.x/installation

mongodb. (2016, 6 2). *mongodb*. Retrieved from mongodb: https://www.mongodb.com/blog

mysql. (2017, 8 12). Retrieved from https://www.mysql.com/

reactjs. (2018, 3 12 ). *reactjs*. Retrieved from reactjs: https://reactjs.org/

spring.io. (2019, 4 1). *spring.io*. Retrieved from spring.io: https://spring.io/projects/spring-boot

TienNN. (2004, 03 08). *hanoimoi*. Retrieved from Accommodation in Hanoi past and present: https://hanoimoi.com.vn/tin-tuc/Phong-su-Ky-su/698171/tro-o-ha-noi-xua-va-nay

Tino. (2021, 6 16). *TINO GROUP JSC*. Retrieved from Assess the situation of digital transformation in the world and in Vietnam: https://tino.org/vi/chuyen-doi-so-tren-the-gioi-va-tai-viet-nam/

You, E. (2018, 2 2). *vuejs*. Retrieved from vuejs: https://vi.vuejs.org/v2/guide/