DEVELOPMENT OF RESIDENTIAL APARTMENT RENTAL MANAGEMENT SYSTEM FOR MARLYN'S HOUSE RENTAL

A Research Project

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Chapter 1

THE PROBLEM AND ITS SETTING

Introduction

The fundamental benefit of owning a property is to raise one's standard of living on an economic, social, and individual level. According to the Contract Act, 1950 (Act 136) established by the nation of Malaysia, making a contract on behalf of the tenant and the rental home's owner is necessary when renting a home. The tenants will locate the rental home in the existing method by visiting a rental home that is still available. When the landlord is contacted, the tenants will inquire as to whether or not the residence is still available. The landlord is also questioned by the tenants regarding the specifics and costs of the monthly rent.

In order to begin the rental procedure, the tenants must advise the owner that they are happy to rent the property. The owner will get information from the tenants during the booking process, including payment information and the date of entry into the rental home. However, there are several issues with the current method of renting a house that both the renters and the landlord must deal with. Finding a rental property that matches their income and costs is tough for the tenants. Additionally, the renters' and the landlord's agreement about the rental home is not in writing. The payment history for the rental home is kept hidden from the tenants. (Misyam & Selamat, 2021)

Background of the Study

As the current paradigm dictates, the technical community must immediately embrace and appreciate the benefits that technology can provide. Hence, a house rental project is essential for the management of rental properties. Users who own or rent from Marlyn's House Rental play a crucial role in the system's operation. Communication on the unit and rental updates to the owner. Owners of Marlyn's House Rental will like the Residential Apartment Rental Management System since it streamlines operations, allows for direct communication with the right person, and eliminates the need for verbal descriptions of rooms. A person may be guided to the perfect home based on their budget, the quality of their interactions with the company, the ease with which they can search for the right property, and the location of the property. (Gommans et al., 2014).

The majority of websites for renting out property displays a search box in the center where you can enter your desired location and check its prices or its availability. On a lot of these websites, the navigation bar also includes sections for buying, selling, and renting. Every single one of these websites requires a login. Their listings include pictures along with information about the unit's cost, availability, reviews, and locations.

Since landowner has become a rarer commodity in recent years, property rental businesses have exploded. Property owners might engage in this type of business to make money or maintain repairs on their properties by renting them out or leasing them to others. Some of the issues regarding this topic are Excessive Stress Over Property Management Responsibilities. Which is the most crucial part of being a landlord where you are supposed to know your tenants, collect their rent, and hear

their complaints. Then we have the Handling Tenants and their Complaint. These complaints range from minor disputes with other renters to serious cases involving the condition of the property. Every complaint must be addressed; none should be disregarded, particularly those that point to possible issues with the building. Next is the Payment issues. Not receiving rent on time is a major issue faced by all property owners. And with this issue it causes the loss of profit for the landlord. The following is the Communication gap. Tenants and landlords usually communicate via mobile phone, which is an ineffective method because calls and messages may be lost due to a lack of time to communicate or respond right away. When a tenant request is urgent and calls for prompt notification and response, this problem becomes much more significant (Kalachova, 2022).

Another issue and the most common problem are the managing of the documents. Each property's information and papers kept on paper, making it difficult to manage, organize, change, delete or even the list goes on. Speaking of management, when there are several properties to maintain, it is difficult to manually manage a calendar and keep to the dates set in the past. If there is a contract, when does it expire, when are the tenants expected to pay rent, and when are the scheduled maintenance appointments? One missed date can lead to a wide range of problems. Daily automated reminders are beneficial. A system facilitates efficient maintenance and repair management. When it is most needed, do not waste time or money searching for papers and copying data. Information is more visible and can be discovered and utilized much more quickly when it is stored in a single location by well-designed property management systems. This allows to follow the investment trend. Owners can save all of the data in one location and have total control over it if your

management and accounting systems are connected. Some software programs can provide a forum for communication between owners and tenants. (Anonymous, 2015)

Although there are many issues that current property managers or owners face on a daily basis, their duties can now be made much simpler and easier. Their company may increase performance and also save time and money by implementing a rental property management system. Even more important that that is the possibility of gaining passionate and happy tenants who can be confident that all problems will be promptly and honestly resolved.

Many systems that exist explored the aspects of rental management, development of such system and implementation for the market; but has been left behind by the ever-changing development of technology. Most legacy systems are susceptible to attacks; that is why we are conceptualizing in using newer technologies for the development of our system. Software that is not only more useful and easier to use but also simpler and easier to construct (Constantine, Lockwood, n.d)

Accessibility is also in consideration because the majority of management systems are built around application software; but would a web-based system fulfill the accessibility needs? The nature of a web application is its availability and portability, requiring only a web browser and the internet for access. In terms of the design of the system, almost all rental management systems revolve around the hotel and condominium sector. One example is Jinisys Software Inc., a property management system provider in the Philippines; properties such as hotel, restaurants, real estate, condominiums, resorts, and many more. Building a management system for house rentals may pave way for further indication of development in the housing sectors. In this paper, we address the investigation of the effectiveness of

implementing such system for landlords who has not utilized in this type of technology. Therefore, the goal of this study is to analyze whether such system will be beneficial for the long term and how will it affect the housing sectors.

The purpose of this study is to develop a web-based online platform for the house owners and potential tenants so that both can have mutual benefit from the system. The benefit for landlords such as keeping track of payments to reduce the risk of losing income; secure transactions by generating invoices for transparency; advertise available properties. This will be a platform for affordable renting for the average urban people.

According to Voumick, most families choose to rent houses based on their income and family situations. Unfortunately, there may not be enough good quality rental housing for these families. The demand for rental houses is extremely high and more rental houses need to be put in place (2021). This system will provide a platform for tenants that utilize remote interaction with the landlords; serve as a means of communication; distributed announcements. Evaluate whether such system has an impact in the influx of potential tenants and in terms of service and advertisement.

Objectives of the Study

This study aims to create and design a property rental management system for Marlyn's house rental. In this research, we will observe how the system may help in managing and advertising affordable housing. Specifically, this study aims to:

1. To design a rental management system with the following features and services:

   a) Tenant Module

b) Registration Module

c) Listings Module

d) Financial Process Management Module

e) Asset Management Module

f) Requirements Module

g) Maintenance Module

h) Complaint Module

i) Point of Sales Module

j) Billing Module

k) Apartment Module

l) Document Generator Module

m) Tenant-in form Module

n) Tenant-out form Module

o) Change Password Module

p) Messaging Module

q) Contract Module

r) Dashboard Module

s) Profile Module

2. To develop a progressive web application using:
    a. JavaScript libraries such as React.js for building user intefaces; Redux for state management. TailwindCSS for UI design.
    b. MongoDB as the database, Express.js for building APIs for request handling and serving files, Postman for HTTP method testing.
    c. Vite as the development environment for implementing hot module replacement (HMR) and bundling web resources.

3. To test and improve the system in using Systems and software engineering – Systems and software Quality Requirements and Evaluation (SQuaRE) system quality standard.
4. To evaluate the suitability of the developed system in accordance with the ISO 25010 quality software model.

Scope and Limitations

The focus of this study is to develop a system that will serve as a management for house rental property of Marlyn's House Rental. The project goal is to provide the maintenance of a updated and complete records monthly. It has automated computation of every transaction, wherein all the details regarding in transaction and every fee is stored in a database. This project will also let the landowner to manage and organize all the important details of the house/apartments and in terms of the complaints of tenants, it will have a chat system. It will be conducted on three different locations: ten(10) houses in Quiapo, Manila; two(2) apartments in Taguig City and two(2) apartments in Sampaloc, Manila with a total of 14 houses/apartment.

This study will not cover the house rental property management of the entire NCR or other companies. This is only exclusive for Marlyn's House Rental on her three different rental property branches. Since it only has a chat system, the tenants and landowner can only communicate through messaging not in voice calling.

Significance of the Study

The rental property management is usually conducted manually. Since we lived in a digital world, technology is evolving, developing management sytem are being developed. In order to manage the properties, landowners employ a manual process. The manual process involves recording with paper and a pen, which is susceptible to human error. With the help of a rental property management system, tenants can have a way to communicate with their landownwers offsite for their convenience. When data is stored in a single area via well-designed property management systems, it is more visible, discoverable, and used much more rapidly.

The study is essential to the landowners and tenants by giving a good and efficient management system for rental property to maintain updated and full records on a monthly basis and has automated transaction calculation.

The success of the development of this study, will enhance the tenants overall experience when renting house. Tenants can virtually communicate the problems as well as individually access payment history information. The system can also assist landowners in tracking and monitoring their tenants payments, the availability or occupancy of rooms, utility fees like water, internet and electricity bills, and tenant reports. They can easily oversee every aspect of managing their properties. By carrying out the study, the current researchers can benefit from this because their knowledge and abilities will be further developed. This proposed study will also beneficial to the future generation, as it is developed with new and inventive system that will help in managing a house property.

This study will benefits the following:

The Landowners

This study would keep a good management of their rental property and minimize their difficulties in managing using manual method.

The Tenants

This study would make things easier to report their complaints, problems and difficulties as well as examine their payment history information directly.

The Future Researchers

This study would be used to enhance and improve the present system. It can used as a reference for the future development of rental property management system.

Chapter 2

CONCEPTUAL FRAMEWORK

This chapter will discuss the review of related literature, studies, and system, conceptual frameworks and also the definition of terms.

Review of Related Literature

This section includes various works of literature, concepts, and ideas that were viewed significant to establish the fundamentals of this research.

Rental Properties

The term "rental property" refers to a property whose owner receives payment from its tenants in return for living in their rented property. Rental properties be either classified into business or residential. Residential properties are where tenants are inhabited, whereas commercial property is used for business activities and purposes. The landlord is responsible for a variety of tasks, including finding a suitable renter, maintaining the flat, collecting payment for rent, and marketing the property(Nachuch, 2021).

Standards for Rental Properties

According to research, before landlords accept their first paying tenant, there are a few things to keep in mind. There are minimum requirements that all landlords must adhere to in order to keep tenants satisfied and in compliance with the law, even though landlords are not required to offer all modern conveniences (Together, 2022).

1. **Increasing the affordability of housing**

   According to research, issues with pricing are less associated with the total need for greater construction and more to do with changes in the characteristics of the housing stock, including issues like social stock erosion and reductions in housing benefits. In the long run, this issue might be resolved by offering more reasonably priced social housing, as was mentioned above. Moreover, difficulties with affordability may be resolved by reinstituting housing benefit support (Tinson et. al., 2020).

2. **The building must be in good structural condition.**

   This calls for frequent maintenance and inspection of every component of the building, from the roof to the fixtures and fittings, as well as prompt completion of any necessary repairs.

3. **There shouldn't be any hazards on the property.**

   A landlord must address a few fundamentals because a tenant has a right to feel secure and at home. This entails checking that the hot water and drainage are operational and that there are no damaged windows, damp areas, or mold growth.

4. **The safety requirements must be followed by all furniture and appliances.**

   All soft furnishings must adhere to fire safety regulations, and appliances must be frequently inspected for problems and properly fixed or replaced if they exist.

Property Management

According to research, For the benefit of both the tenants and the community, landlords must keep the property in a safe and livable state. An effective strategy is to find minor problems before it becomes too expensive to repair is to do proactive property inspections. For instance, seasonal maintenance of the heating and cooling system and gutter cleaning before the start of the rainy and cold seasons may assist to prevent costly repairs totaling significant amounts of money.

Another duty of self-managing a rental property is to complete a move-in and move-out checklist with the tenant. It is easier to distinguish between regular wear and tear and abnormal damage if the condition of the house is documented both before the renter moves in and at the end of the rental agreement(Rohde, 2022).

Basic Components of Rental Management

Property management is the maintenance and management of real estate on a physical, administrative, or financial level for a fee, commission, or other compensation or things of value. It is the method of overseeing all daily operations focused on a specific piece of real estate. Shops, shopping centers, office buildings, and industrial parks are examples of commercial property. offices used for business, professional services, and other governmental and administrative tasks. Shops can be either a consumption outlet or a shopping mall. Production involves the use of industrial property. The care of a person's, family's, or organization's investment in buildings necessitates specialized abilities in order to optimize return. According to research, a wide range of factors affect a property's worth, therefore identifying these features is crucial to property appraisal. Commercial property is not properly

maintained when there is no property management. To optimize financial return, it is essential to keep commercial properties in good condition. One of the essential components required to enhance the profits on real estate investments is effective property management. Commercial property is not properly maintained when there is no property management. In order to optimize economic return, it is crucial to keep commercial assets in good condition (Mazikana, 2022).

Basic Components of Rental Management

According to research by CRMJetty (2022), the four basics of property management services in order are:

1. **Maintenance and Repairs**

   Monitoring the expense of property maintenance is something that property managers are keen in doing. Property maintenance reduces profitability in the near term and raises operational costs. In the long run, keeping a property up to date lowers the pace of economic deterioration, stabilizing the condition of the building and supporting future rent values. Understanding the degree of maintenance activities helps property owners and their representatives monitor the quality of rental properties. (Mazikana, 2022).

2. **Rent and Fee Collection**

   The foundational elements of rental property also include rent collection. The most widely used methods for collecting rent include actual cash collection, cheques, money orders, and credit cards. Accepting personal cheques has obvious drawbacks because they may bounce and leave a substantial cost that the landlord would pass on to the tenant.

On the contrary, manually collecting money or using a neighborhood convenience store to do so takes a lot of time. Making ensuring the money is there when it should and in the proper amount takes a lot of work. Because of this, the majority of reputable property management companies choose an online rent collection system.

However, considering the above, safe payment management becomes crucial to property management. Consequently, providing your property management solution with a safe and secure payment management option would be beneficial. (CRMJetty, 2022)

3. **Leasing and Documentation**

The results of the Mazikana (2022) study indicate that integrating leasing operations with a company is another way to obtain property management requirements. One of the tactics is this. To maximize the possibility that a proposal to manage the property will be quickly accepted, one must always prioritize offering exceptional service to leasing clients.

4. **Property Inspection**

Property management requires routine inspections. This is done to ensure that any faults are discovered quickly and reported to the person in charge of fixing them. To prevent a problem from getting worse and to ensure that repairs are made if there aren't enough finances to cover them, communication about property maintenance issues should be done as soon as possible. Additionally, tenants are given a forum to voice their complaints during inspections, and if these are effectively addressed, incidences of conflict between the owner, the tenant, and the property manager are reduced. Property managers should set aside funds for property maintenance when

urgent needs arise because most repairs are unpredictable, so that maintenance won't have to be neglected because of a lack of funds. (Mazikana, 2022).

Types of Rental Property Management

According to new research some businesses specialize in managing a specific kind of property, while others provide management services for a variety of property kinds. There are different property management types, and it is possible to manage a wide variety of them. (Property Management: Definition, Roles, Types, and Duties, 2022).

1. **Residential Property Management**

   Property managers exist in a variety of forms, much like different sorts of real estate. In addition to offering management services for a variety of property kinds, some businesses specialize in providing management for a specific kind of property. It is possible to handle a wide variety of property types.

2. **Commercial Property Management**

   The focus of commercial property management, like that of residential property management, is on overseeing the commercial spaces that tenants have leased. Tenants only utilize these locations as a place to conduct business, not as residences.

3. **Industrial Property Management**

   Residential property management is the term used to describe the management of homes or other private residences. In a nutshell, property management is the process of overseeing all aspects of a property from the

time you purchase it until you sell it. In this guide, we'll be concentrating on this kind of property manager.

4. **Special-Purpose Property Management**

A special purpose property, according to the Small Business Administration, is created for a particular purpose. It could have a distinctive design or use unusual building materials. It takes specialized knowledge to manage this kind of property. You should have a strong background in property law and business management. Listed below are a few special-purpose attributes examples:

Tenant Retention

Rental companies that treat tenants with importance and value help the real estate investors they represent to achieve their goals and succeed financially. Tenants should be valued and respected because doing so will help similar properties thrive financially and put the real estate investors who hold them in a better way to benefit on evolving market trends. Additionally, it says that these advantages can be attained by implementing a number of tried-and-true quality standards that put client satisfaction at the forefront of property investment operations (Sanderson, 2020).

Best Practices for Tenant Retention

Among other researchers, Morgan et al. (2019) asserts that the property management sector in general might be unprepared to provide the high standards of customer service that tenants are going to anticipate. Fortunately, according to Sanderson (2022) the issue can be solved by implementing these best practices:

1. **Build on a strong foundation**

Although challenging, customer-focused property management is not necessarily complex. Effective customer service platforms still depend on listening to renters, ensuring that they are special, and handling them how they want to be managed. Those who do not adhere to these principles have little prospect of gaining the tenants' trust or setting themselves apart from their competitors favorably.

2. Communicate early and often

Constant communication is necessary for customer-focused property management. It may take place through organized or casual meetings, one-on-one discussions, phone calls, or email exchanges, but what's most essential is that the communication methods take the interests of the tenants into consideration. Tenants should be able to voice their concerns as easily as possible. Therefore, more direct encounters with property management staff must be supplemented with support lines with extended hours and online monitoring options. Property managers run a serious reputational risk if they fail to keep up these lines of communication.

3. View all interactions with tenants as opportunities

When property managers see every interaction with tenants as an opportunity to learn what contributes to or detracts from their satisfaction, they have the best chance of enhancing the standard of the customer support they offer.

4. Deliver value-for-money in a transparent manner

In all circumstances, it's crucial to make sure tenants understand and value what they are receiving in exchange for their money, but maybe never more so than when landlords add service fees to the rent. Property

management that prioritizes the needs of the customer can be hindered by tenant disputes brought on by poorly explained service costs. To prevent this, property managers should talk to renters about service options and explain the cost consequences.

Options for Managing Rental Properties

In research from Rohde, investors in real estate are never without options, and managing a rental property is no exception. There are three methods of property management that landlords might use (2022).

1. **Self-property management**

   Self-management of a rental property is a common choice for landlords with spare time. Owners who are reluctant to delegate may find that self-property management is a good choice. On the other hand, management duties can become too much to handle, and breaking fair housing and landlord-tenant rules can result in a lawsuit against a landlord.

2. **Pay for fixed management services**

   Landlords can choose the services they want to outsource from a variety of property management providers. For instance, many managers provide a "rental only" plan to aid a do-it-yourself landlord in marketing and showing a vacant property, screening a potential renter, and concluding a lease. Pay-as-you-go property management may be effective for some landlords, but it can be challenging if the owner has a full-time job or lives out of state.

3. **Hire a full-time property manager**

Avoiding doing things yourself is the third alternative. It can be worth the monthly charge to hire a competent local property manager to handle day-to-day concerns including tenant communication, maintenance and repairs, and legal difficulties. Property management businesses often charge a monthly fee equal to 8% of the monthly rent. Many landlords consider that to be a small price to pay to avoid the hassles of self-managing a property.

Rental Management System

A rental house management system is often necessary because renting a home is a significant aspect of modern society. The goal of a rental management system is to create a system that will be advantageous to both tenants and property owners while improving the effectiveness of the home search and rental process. A virtual system where homeowners may quickly discover tenants and vice versa with the pre-determined agreement exists for their rental purpose properties(Rathore et al., 2021).

Purpose of Rental Management System

In research from Fortin, A property management system's purpose is to offer instructions on how to set up an appropriate framework for managing real estate holdings in order to achieve the property owners' shared short- and long-term goals while also taking into account the reason the property is kept. The main activities include negotiating reasonable terms for leases and lettings, starting and negotiating rent reviews and lease renewals, overseeing property maintenance, and enforcing lease restrictions (2021).

Common Features of Rental Management System

According to HiRUM Software Solutions (2022), the key features of a good management system include:

1. **Reservation Management & Front Desk Operations Management**

   Managing online direct reservations from guests, including recording, tracking, and collecting payments, is possible with the help of a good property management system.

2. **Channel Management**

   The maximum occupancy depends on the rooms being listed as widely as possible, so integration with a channel manager to manage yield management, revenue, and online channels is a crucial feature of a good property management system.

3. **Mobile Apps**

   It has never been more crucial to manage your business while on the go. With the help of a mobile property management application, managing properties from anywhere with convenience is possible.

4. **Marketing Support**

   The chance of filling rooms and increasing direct bookings are best if it is ensured that the property is effectively marketed and connected to as many tools as is practical.

5. **CRM & Guest Communication**

   One of the property management system's main features is that it enables property owners to communicate with visitors and send them expert automated emails before and after their stay.

6. **Accounting and Revenue Management**

In addition to integrating many other things, many systems also integrate point of sale, telephone charges, daily and monthly banking, and frequently trust accounting.

Advantages of a Rental Management System

Using a property management system has many benefits, whether it's for a large hotel in a crowded market or a little residence in a picturesque small town. You'll be able to organize your business more effectively, provide your personnel thorough training, and guarantee that visitors have a relaxing experience (TEC Team, 2022).

1. **Maintenance Management & Tracking**, your usual maintenance duties won't get neglected thanks to maintenance management and scheduling solutions. All open maintenance work orders ought to be seen clearly so that you can schedule them in correctly. Many renters will just take a photograph of their problem and send it to you due to the advent of mobile technology, notably the simplicity with which photos can be sent and received.
2. **Tenant Applications & Screenings**, with tools like reference checking services, background checks, and renter histories that show you whether a candidate can be relied upon to pay their rent on time, many PMS solutions assist you in weeding out less-qualified candidates. If there is any information that applies to a potential landlord, background screening tools that are built into some software or accessible through third-party integrations may raise red flags.
3. **Online Payments**, your time spent pursuing unpaid rent will decrease the more convenient you make it for your tenants to pay rent on time. Since

tenants can pay their rent online while lounging in the comfort of their own homes, this method of rent collection is the most convenient.

4. **Contact Management**, landlords will all agree that it requires a large team to efficiently manage a property, and that lengthy contact lists can easily devolve into a disorganized mess. You can better organize your contacts and spend less time looking up emails and phone numbers thanks to comprehensive contact management options.
5. **Advertising & Marketing**, a thorough advertising and marketing module will help you spread the word about your openings because it's difficult to keep your buildings occupied if no one knows about them. Through the use of website management tools and social media integration, you can present your rental information in a way that is both understandable and clear to a wider audience.
6. **Financial Management**, property management is no exception to the rule that successful business owners need to exercise strict financial discipline. The best property management apps will assist you in increasing revenue while lowering expenses.

Programming Languages

A programming language is a vocabulary structure and set of guidelines used to give instructions to a machine. It is employed to create computer programs, scripts, and other sets of instructions. The majority of formal programming languages are text-based, though they can also be graphical. The description of a programming language is usually split into the two components of syntax (form) and semantics (meaning). Different types of programming languages exist, including declarative languages, which are written in a way that it describes what you want to achieve,

imperative languages, where code is written by how you want to complete a task, and procedural languages, which adhere to a set of instructions in a systematic way.

JavaScript

One of the most popular languages, JavaScript or JS in short is a programming or scripting language used to develop complex features on a web page; features such as interactive web content, game development, mobile application development and artificial intelligence. Invented by Brendan Eich in 1995, where it was believed to be developed in 10 days and later called Mocha. As time passed, JavaScript would have different "flavors" such as Plain, Vanilla and Pure JS. A JavaScript standard called ECMAScript was created to guarantee browser compatibility for web pages.

JavaScript's versatility and wide range of applications make it a valuable addition for a developer's tech stack. While originally intended for front-end development nowadays, it supports server-side development where it processed the data used by the front end by utilizing libraries and frameworks which provided more opportunities to create more dynamic and versatile web applications.

Framework

In programming, a framework is a collection of tools used to create well-organized, dependable programs and systems. Also known as libraries, they contain pre-written JavaScript code that allows for easier development of JavaScript-based applications. Although JavaScript frameworks are not required to create reliable web applications, they do offer a template for handling common programming patterns. You don't have to start from scratch with every feature every time you create an application. You can instead expand on an already-existing feature set. Modern front-end web development is not complete without JavaScript

frameworks, which give programmers tried-and-true tools for creating scalable, dynamic web applications.

React.js

React is a well-known open-source front-end JavaScript library created by Facebook. React is wide in style among developer communities attributable to its simplicity and straightforward however effective developing process. It is urging the formation of reusable User Interface parts, which exhibit information that progresses after some time. It expeditiously updates through rendering the precious parts to the read of every state and makes the information changes within the application. ReactJS came and it altered the way web applications are created. In ReactJS, each component deals with its state and makes them to the UIs. With this idea of components rather than layouts in JavaScript, a lot of information can without much of a stretch be passed to the application and along these lines helps in keeping the state out of the DOM.

In any case, React isn't an MVC structure as Angular seems to be. It is served as a chief library. That is, ReactJS does exclude state administrators, switches, and API directors in the central library. It might resemble an impediment for React engineers, yet this is simply the best in making a site as code is straightforward with all parts and different things. What makes react so beneficial for building UIs is that data is either gotten from a section's parent component, or it's contained in the portion itself. (Rawat, Mahajan 2020)

Express.js

Express, a framework that acts as a light layer atop the Node.js web server, making it more pleasant to develop Node.js applications.

Express is philosophically similar to jQuery. People want to add dynamic content to their web pages, but the vanilla browser APIs can be verbose, confusing, and limited in features. Developers often have to write boilerplate code, and a lot of it. jQuery exists to cut down on this boilerplate code by simplifying the APIs of the browser and adding helpful new features. That's basically it.

Like jQuery, Express aims to be extensible. It's hands-off about most parts of your applications' decisions and is easily extended with third-party libraries. Throughout this book and your Express career, you'll have to make decisions about your applications' architectures, and you'll extend Express with a bevy of powerful-third party modules.

Express is a framework, which means you'll have to build up your app the Express way. Express by itself probably doesn't do everything you need, and you'll likely find yourself with a large number of other libraries that you integrate into your Express applications(Hahn, 2016).

Database

In computing, a database is a structured collection of data that is electronically accessible and stored. Any type of data can be stored, maintained, and accessed using databases. They gather data on individuals, locations, or objects. It is gathered in one location so that it can be seen and examined. Large databases are hosted on computer clusters or cloud storage, whereas small databases can be stored on a file system. A database is controlled by a database management system (DBMS). Businesses utilize databases to perform informed business decisions such as improving business processes by analyzing these stored data to expand their business and gain revenue; keeping track of customer information like name, email addresses and user behavior often used for content recommendation to improve their user experience; and storing

personal data, personal cloud storage, for instance, enables users to store media, like photos, in a controlled cloud.

The varieties of databases are numerous. They can be categorized based on the sort of content, here are some database paradigms:

- ✓ **Relational** database is a collection of structured data stored in one or more tables of rows and columns. It uses Structured Query Language (SQL) that allows users to access and store data in a database.
- ✓ **Key-value pair** which is structured like a JavaScript object. It has a set of keys that are unique and points to some value.
- ✓ **Document oriented,** also known as no-SQL database, are unstructured collections of data and does not required schema where we have documents that contain key-value pairs.

MongoDB

MongoDB is a document oriented database. It's schema-free, which contains Database, Collection, and Document. One Database can have multiple Collections. Each Collection is a collection of Documents. Collection can be created at any time, without predefined. It can also contains records with different schema documents, which means one record of a document has 3 attributes, and the next record in the document may has 10 attributes. The type of the property can be any basic data types, such as numbers, strings, dates, etc., or an array or hash, and even a sub-document. (Using MongoDB to Implement Textbook Management System Instead of MySQL, 2011).

Review of Related Studies

In relation to the development of the web-based program, the researchers made a thorough study of different deployed system which uses similar concept of Marlyn’s House Rental

RAY

According to RAY Labs (2021), an apartment management system is a system that simplifies property manager’s everyday responsibilities by providing online management solutions. Such systems enable the management of buildings or flats, the collection of rent, the gathering of tenant information, and the monitoring of critical KPIs during rentals. The apartment management system attempts to provide the full procedure in digital format to make property manager’s professional lives easier.

RAY is a fully featured apartment management solution that digitizes and simplifies apartment and tenant management operations. RAY not only has all of the previously described functions that are vital to any apartment management system, but it also includes additional features that place it among the top systems available. Its functionality includes unit ad tenant administration, operations management, dues and payments, maintenance, and services, and much more. All of RAY's features complement one another to offer an exceptional user experience that genuinely simplifies apartment manager’s work (RAY Labs, 2021).

Folio Plus

A management system under the company Jinisys Software Incorporation (2008), Folio Plus Hotel Management System is a hotel management system software that handles all aspects of hotel marketing, sales, and management. At the beginning of a program, the software might send out marketing emails to guests, enticing them with unique features. Guests may then sign up for reservations online, while the system manages all room assignments automatically. Users may check in visitors, log all of their food and beverage purchases, conduct checkouts, and compute final bills when they arrive. Finally, the platform may directly link with a variety of SAP systems to improve accounting, event management, and other function(Anonymous, 2018).

Opera Hotel Management System

According to Protel (2020), the Opera Hotel Management System is a property management system solution suitable for hotels of all sizes and types. It automates fundamental front-office functions including scheduling, check-in, and check-out, saving time and reducing human error. It also gives extensive information on employees and procedures in the facility. This enables you to detect inefficient procedures and processes and take immediate action to remedy any problems that may arise.

Hotelogix

Hotelogix is a property management system that organizes appointments, improves housekeeping management, and provides the front desk with the capabilities needed to handle day-to-day activities. It is also a revenue management tool that

provides local market demand statistics, occupancy estimates, rate suggestions, and competition rate intelligence. It is an online reputation management tool that allows you to keep on top of what is being written about your hotel online and respond accordingly (Anonymous, 2020).

Review of Related System

This section includes various works of concepts, and ideas that were viewed significant to establish the fundamentals of this research.

Rental Properties

A property management system (PMS) is a central online system that controls day-to-day activities such as organizing, scheduling, account management, occupancy management, and much more. They are the ideal organizers for companies wishing to automate their labor and enhance productivity. Most professional property management companies use a PMS solution to run their business as well as possible (What is a Property Management System, 2021).

Tenant Satisfaction

Tenant satisfaction is an important indication of competitiveness in industrial property development. Among the three elements that contribute to tenant satisfaction in industrial buildings, facility management is the most important. Tenant retention and referral are the ultimate outcomes of tenant satisfaction. The study's overall findings may aid real estate developers in better managing buildings, renting them out, and retaining renters (Seetharaman et al., 2017).

Managing Leased Real Property

Managing leased real estate contains a number of modules that enhance system operations and the user interface. The production schedule for multi-unit residential units is one subsystem. The move-in/move-out subsystem detects vacant apartments that are being turned over to become rent-ready (Property Management System and Related Methods - Google Patents, 2018).

Rental House Management System

A rental house management system may help rental managers streamline their job and make it more effective and productive. The system presents three forms when a user logs in: a housing form, a rent payment form, and a tenant registration form. There are many command buttons on each form, including new, save, cancel, delete, next, previous, and exit (Gommans et al., 2014).

1. **System's User Interface**

   HTML and CSS are used to create the user interface for this system. The system has three users: the system administrator, the manager, and the tenant. As a result, this approach may make it simpler for landlords to handle their data digitally. It may also assist landlords in advertising their rental units (Rental House Management System: Thesis Documentation Abstract and Table of Contents, 2020).

2. **Development**

   Prospective tenants have a legitimate expectation that the institution will offer adequate facilities in terms of housing and logistics development should include online registration, payment, and booking for tenants (Lubis et al., 2018).

3. **Web Application**

This web application enables users to register certain houses or flats in order to find the best rental house or property. Using the search view, we may also find your future rental in your selected area. Property Management supports us in keeping a database of various properties and agents' information up to date. Agents may also obtain portal-updated information from anywhere in the globe (Shriram & Nandhakumar, 2019).

4. **Design and Execution**

The system employs the Django framework, which implements the separation layer and the logical layer, and can complete the rental information browsing, querying, input, editing, management, and other tasks. The system was designed in such a way that it has the most user-friendly interface possible. Each form is specifically designed so that users can easily go through validation and search for property, and house owners can easily post their property details (Rathore et al., 2021).

Conceptual Framework

The conceptual frameworks is presented in figure 2.1 presents the input, process and output of the developed system.

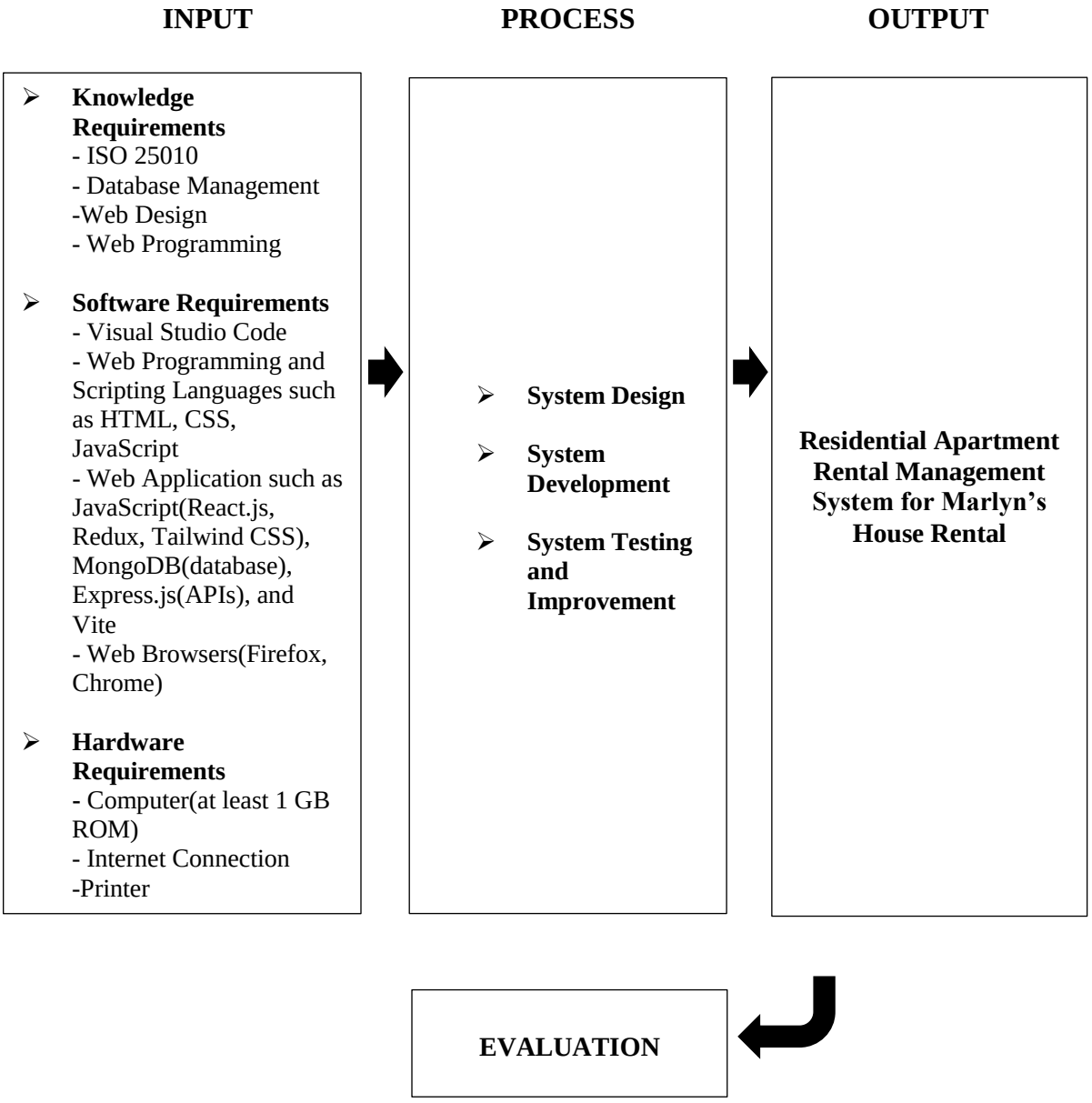

Figure 2.1. *Conceptual Model of the Study*

Input

The input requirements is divided into three major phases: knowledge requirements, software requirements and hardware requirements. Knowledge requirements refers to the understanding and comprehension. Software Requirements refers to the needed tools essential in order for the output be developed; it includes Visual Studio Code, Web Programming/Scripting Languages, Web Application, Database, APIs, Web Browsers, Text Editor, Operating System. Lastly, Hardware Requirements refers to the minimum needed for the development of the system, it includes: Computer that is at least 2 GB RAM/1 GB ROM and Internet Connection.

Process

The process phase identifies the steps of the developed system. It includes the System Design, System Development, System Testing and Implementing, and Evaluation. The System Design refers to the whole or general feature and function of the system and the concept of the dveloped system. In System Development it pertains to creation of the house rental ranagement system in step-by-step process. The System Testing and Implementing is to the continued sustenance or maintenance and also it refers to the actual execution of the system. Lastly, is the Evaluationwhich refers to the deteremined ratings of the respondents regarding in proposed house rental management system.

Output

The software and hardware requirements under the input and process will be used to develop a website named, "Residential Apartment Rental Management System for Marlyn's House Rental".

Operational Definition of Terms

This section discusses the terminologies of the technical terms used in this research paper.

Administrator refers to the landowner who will be managing the system.

Previous Reading displayed number of the past electricity and water meter.

Latest Reading displayed number of the current electricity and water meter.

Due Date refers to the deadline of the tenant's bills.

Single Family House (SFH) a residence built for one family.

CHAPTER 3

METHODOLOGY

This chapter contains the Project Design, the Project Development, the Operation and Testing Procedure and Evaluation Procedures employed in the conduct study.

System Development Model

Methodologies for developing systems are used to illustrate the steps that will be taken to create the proposed system. Waterfall is the chosen approach for this project.

The waterfall model It is made up of the procedures that will be followed by the programmer when the system is being built. As its name implies, the waterfall model operates in a sequential fashion. A developer must complete one phase before moving on to the next. A feasibility investigation, design, execution, testing, and upkeep are all parts of the process. This model's simplicity makes it straightforward to implement and comprehend. Analysts and end-users move in a linear fashion from one stage to the next with waterfall development. As the project progresses through its phases, the sponsor is given more extensive deliverables for approval. When a phase receives sponsorship approval, it concludes and a new one starts.

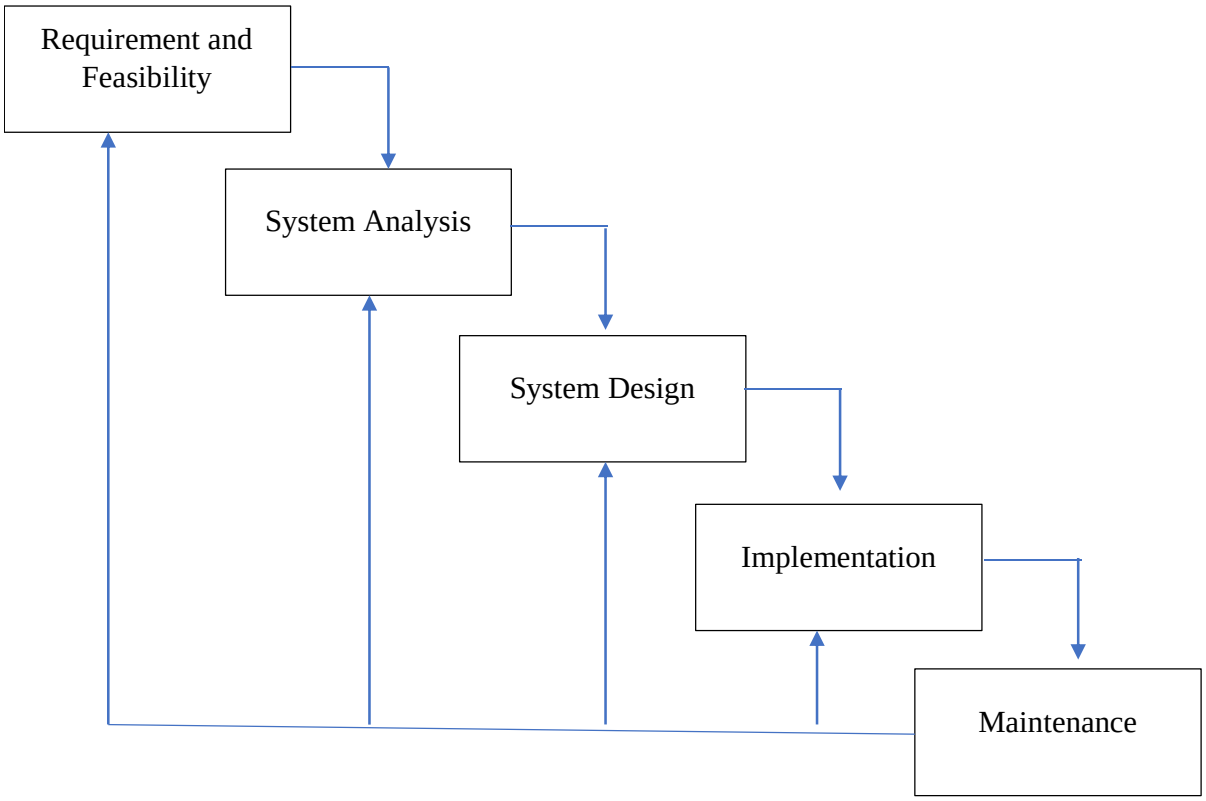

Figure 3.1: Waterfall Model

Feasibility study

Here, the researchers plan to investigate by way of interviews, observations, and participant observation to learn about the present system and the issues encountered by consumers (tenants) inside this system. The researchers will figure out if the proposed system will work on a technological, economic, and social level by looking at the information I have collected.

Requirements and analysis

This is when the researchers learn more about the client's requirements and outline the issues the system is meant to address. The researchers also discuss the nature of the customer's company, the product's intended use, and any relevant compatibility issues. The researchers will make a list of what is needed, including software like the programming language and database model and hardware like laptops, printers, and so on.

Design

At this point, the researchers create a high-level blueprint for the whole system, from its infrastructure to its user interface and database design. The researchers will find any problems at this level and fix them before going on. The result of this phase is the design specification, which is used in the next step, which is called execution.

Coding/Implementation

At this point, the researchers start writing code in accordance with the design requirement(s). One or more product components, coded in accordance with a set of standards, then tested, debugged, and integrated to meet the needs of the system architecture, are the result of this phase.

Testing

At this point, the researchers will be making sure that both the parts and the entire system are rigorously tested to guarantee they're error-free and up to snuff with what the client needs. Tests conducted by or on behalf of the client will include both unit testing of individual code modules and system testing of the overall solution. Before proceeding to the next phase, the researchers will see to it that any issues discovered are resolved. At this point, the researchers will also oversee writing, revising, and putting out documentation about the product.

Installation

Completed once the product has passed all necessary tests and been given the go-ahead for market release. The system is ready for deployment at the client's location.

Maintenance

This step follows the installation process. It entails adjusting the system to boost efficiency. Such alterations are either instigated by the user or are the consequence of a previously unknown problem being found and fixed. Any such updates are recorded for posterity's sake and future reference.

Project Design

The system developed an automated payment system that was designed to solve the common problems that the landowners encounters. This system will also lessen the error of works by transforming manual transactions into online transactions. Entity Relationship Diagram (ERD) and Use-Case Diagram are all components of a system's design

Use Case Diagram

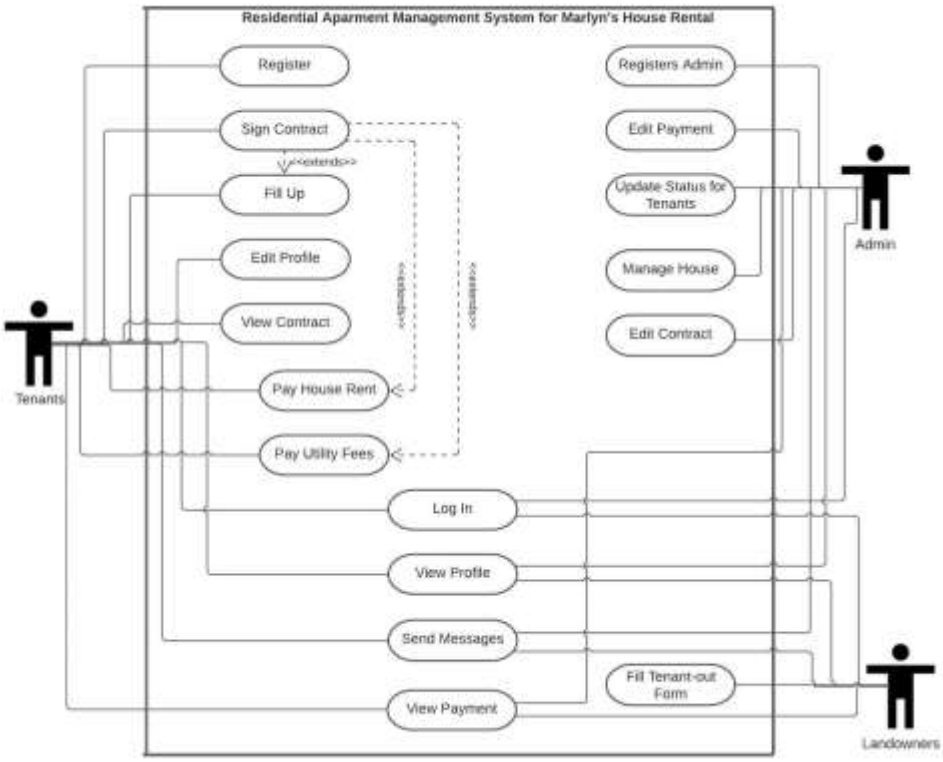

Figure 3.2: Use-Case Diagram

In Figure 3.2, it illustrates the fuctional flow of the proposed diagram for the House Rental Management System. It states what the admin, landowner and tenants can view after signing in.

Entity Relationship Diagram (ERD)

Figure 3.3 illustrates the Entity Relationship Diagram which contains four entities which are TENANTS, DETAILS, HOUSE and LANDOWNER. This will show the relationship between entities; each entities have their own attributes. In other words, the entity-relationship diagram illustrates the logical structure of databases. All these attributes shown in the diagram are required to interact with the website.

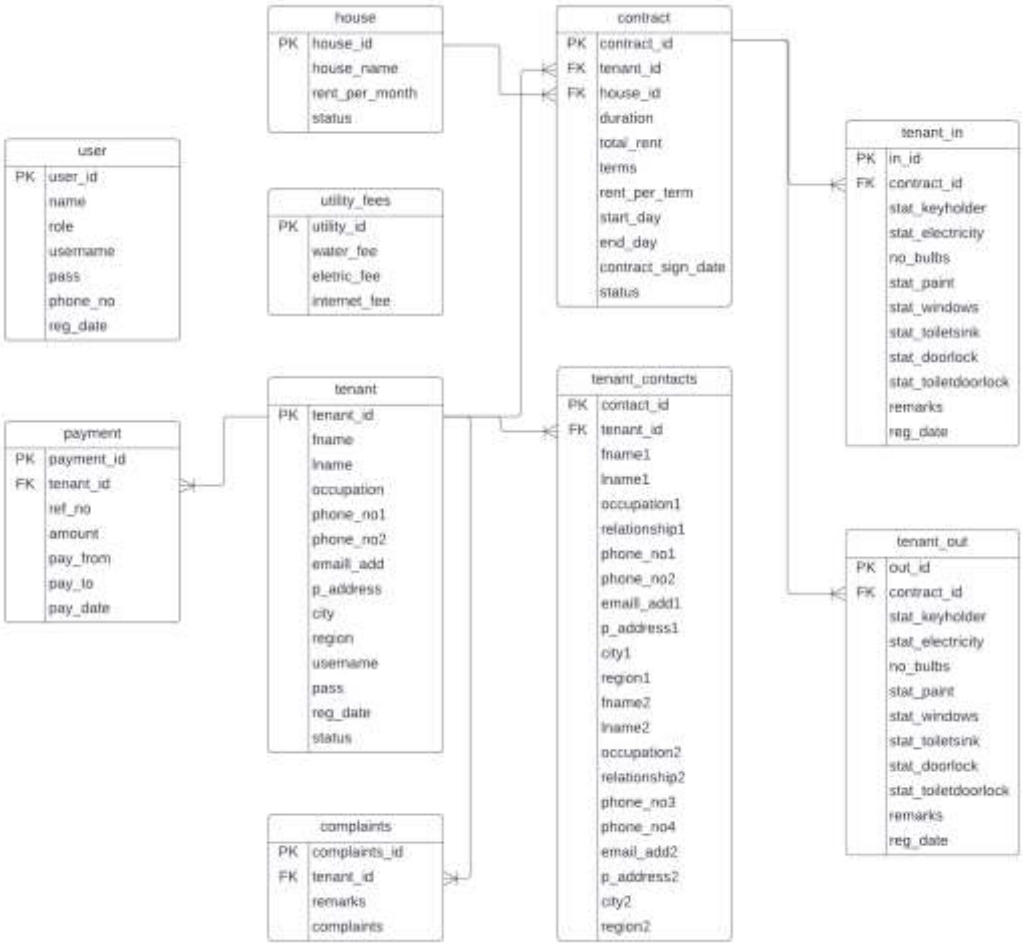

Figure 3.3: Entity Relationship Diagram

Data Dictionary

Table 1.

Data Dictionary for user table

Column	Data Type	Description
user_id	int(11)	Primary key for User account
name	varchar(50)	User Registered Name
role	varchar(50)	User Role
username	varchar(255)	User Username
pass	varchar(255)	User Password
phone_no	int(11)	User Contact Number
reg_date	date	User Registration Date

Table 1 shows the data dictionary for the user table. The table consist user_id, name, role, username, pass, phone_no and reg_date.

Table 2.

Data dictionary for house table

Column	Data Type	Description
house_id	int(11)	Primary key for Apartment Unit
house_name	varchar(50)	Apartment Unit
rent_per_month	int(11)	Apartment Rent per Month

status	varchar(50)	Apartment Status

Table 2 shows the data dictionary for apartment table which contains the house_id, house_name, rent_per_month and status.

Table 3.

Data dictionary for tenant table

Column	Data Type	Description
tenant_id	int(11)	Primary key for Tenant
fname	varchar(50)	Tenant First Name
lname	varchar(50)	Tenant Last Name
occupation	varchar(50)	Tenant Occupation
phone_no	int(11)	Tenant Mobile Number 1
phone_no2	int(11)	Tenant Mobile Number 2
email_add	varchar(50)	Tenant Email Address
p_address	varchar(50)	Tenant Previous Address
city	varchar(50)	Tenant City
region	varchar(50)	Tenant Region
username	varchar(50)	Tenant Username
pass	varchar(50)	Tenant Password
reg_date	date	Tenant Registration Date
status	varchar(50)	Tenant Status

Table 3 shows the data dictionary for tenant table, it contains the tenant_id,

fname, lname, occupation, phone_no, phone_no2, email_add, p_address, city, region, username, pass, reg_date and status.

Table 4.

Data Dictionary for contract table

Column	Data Type	Description
contract_id	int(11)	Primary key for Contract
tenant_id	int(11)	Foreign Key to access Tenant
house_id	int(11)	Foreign Key to access Apartment Unit
duration_month	date	Duration of Contract
terms	int(11)	Number of Terms
total_rent	int(11)	Total Rent Cost
rent_per_term	int(11)	Rent Cost Per Term
start_day	date	Start of Contract
end_day	date	End of Contract
contract_sign_date	date	Day of Contract Signing
status	varchar(50)	Contract Status

Table 4 shows the data dictionary for the contract table. The table consist contract_id, tenant_id, house_id, duration_month, terms, total_rent, rent_per_term, start_day, end_day, contract_sign_date and status.

Table 5.

Data Dictionary for payment table

Column	Data Type	Description
payment_id	int(11)	Primary key for Payment
tenant_id	int(11)	Foreign Key to access Tenant
ref_no	int(11)	Reference Number for Payment
amount	int(11)	Amount of Payment
payment_from	date	Starting Date of Payment
payment_to	date	Payment Up To Date
pay_date	date	Day of Payment

Table 5 shows the data dictionary for payment table which contains the payment_id, tenant_id, ref_no, amount, payment_from, payment_to and pay_date.

Table 6.

Data Dictionary for tenant_in table

Column	Data Type	Description
in_id	int(11)	Primary Key for Tenant In Form
contract_id	int(11)	Foreign Key to access Contract
stat_keyholder	varchar(50)	Key Holder Status Grading
stat_electricity	varchar(50)	Electricity Status Grading
no_bulbs	varchar(50)	Bulb Count Grading

stat_paint	varchar(50)	Paint Grading
stat_windows	varchar(50)	Window Status Grading
stat_toiletsink	varchar(50)	Toilet Sink Status Grading
stat_doorlock	varchar(50)	Door Lock Status Grading
stat_toiletdoorlock	varchar(50)	Toilet Door Lock Status Grading
remarks	varchar(50)	Remarks
reg_date	date	Form Registration Date

Table 6 shows the data dictionary for tenant-in form table, it contains the in_id, contract_id, stat_keyholder, stat_electricity, no_bulbs, stat_paint, stat_windows, stat_toiletsink, stat_doorlock, stat_toiletdoorlock, remarks and reg_date.

Table 7.

Data Dictionary for tenant_out table

Column	Data Type	Description
out_id	int(11)	Primary Key for Tenant Out Form
contract_id	int(11)	Foreign Key to access Contract
stat_keyholder	varchar(50)	Key Holder Status Grading
stat_electricity	varchar(50)	Electricity Status Grading
no_bulbs	varchar(50)	Bulb Count Grading
stat_paint	varchar(50)	Paint Grading

stat_windows	varchar(50)	Window Status Grading
stat_toiletsink	varchar(50)	Toilet Sink Status Grading
stat_doorlock	varchar(50)	Door Lock Status Grading
stat_toiletdoorlock	varchar(50)	Toilet Door Lock Status Grading
remarks	varchar(50)	Remarks
reg_date	date	Form Registration Date

Table 7 shows the data dictionary for tenant-in form table, it contains the out_id, contract_id, stat_keyholder, stat_electricity, no_bulbs, stat_paint, stat_windows, stat_toiletsink, stat_doorlock, stat_toiletdoorlock, remarks and reg_date.

Table 8.

Data Dictionary for contacts table

Column	Data Type	Description
contact_id	int(11)	Primary Key for Contact
tenant_id	int(11)	Foreign Key to access Tenant
fname1	varchar(50)	First Contact First Name
lname1	varchar(50)	First Contract Last Name
occupation1	varchar(50)	First Contact Occupation
relationship1	varchar(50)	First Contact Relationship
phone_no1	int(11)	Contact Number for First Contact
phone_no2	int(11)	Backup Contact Number

		for First Contact
email_add1	varchar(50)	First Contact Email Address
p_address1	varchar(50)	Permanent Address
city1	varchar(50)	Contact Residential City
region1	varchar(50)	Contact Residential Region
fname2	varchar(50)	Second Contact First Name
lname2	varchar(50)	Second Contract Last Name
occupation2	varchar(50)	Second Contact Occupation
relationship2	varchar(50)	Second Contact Relationship
phone_no3	int(11)	Contact Number for Second Contact
phone_no4	int(11)	Backup Contact Number for Second Contact
email_add2	varchar(50)	Second Contact Email Address
p_address2	varchar(50)	Permanent Address
city2	varchar(50)	Contact Residential City
region2	varchar(50)	Contact Residential Region

Table 8 shows the data dictionary for the contract table. The table consist contact_id, tenant_id, fname1, lname1, occupation1, relationship1, phone_no1, phone_no2, email_add1, p_address1, city1, region1, fname2, lname2, occupation2, relationship2, phone_no3, phone_no4, email_add2, p_address2, city2 and region2.

Table 9.

Data Dictionary for complaints table

Column	Data Type	Description
compaint_id	int(11)	Primary key for Payment
tenant_id	int(11)	Foreign Key to access Tenant
remarks	varchar(255)	Complaint Feedback
complaint_date	date	Date of Complaint

Table 9 shows the data dictionary for tenant-in form table, it contains the complaint_id, tenant_id, remarks and complaint_date.

Table 10.

Data Dictionary for utility fees table

Column	Data Type	Description
electricity_fee	int(11)	Monthly Electricity Fee
water_fee	int(11)	Monthly Water Fee
internet_fee	int(11)	Monthly Internet Fee

Table 8 shows the data dictionary for the contract table. The table consist electricity_fee, water_fee and internet_fee.

Operation and Testing Procedure

For the operation and testing, the following are steps undertaken to check the system's performance:

Table 1.

Testing Procedure for Functional Suitability

MODULE	PROCEDURES	RESULT
Tenant Module	1. Click tenant tab 2. Display tenant information 3. Display tenant's contact 4. Display tenant-in details 5. Display tenant-out details 6. Click tenant information 7. Click edit tenant information 8. Fill up the required input fields 9. Click edit button	
Registration Module	1. Click registration button 2. Fill up required input fields 3. Click Submit registration	
Listings Module	1. Display available apartments 2. Click the desired apartment 3. Fill up required input fields 4. Click Submit inquiry	
Financial Process Management Module	1. Display of Gross Sales 2. Display of Cost of Operating Expenses 3. Display of Net Income 4. Display of Operation Budget Management 5. Display of Revenue and Expense Recognition	

	6. Click print button to print a hard copy of the invoice	
Asset Management Module	1. Display of Fixed Assets Management 2. Display of Asset Depreciation Management 3. Click print button to print a hard copy of the invoice	
Requirements Module	1. Click Requirements 2. Click Self-Employed / Employed / Business 3. Click add Business Permit / DTI / BIR 2316 / BIR 1701 / Certificate of Employment 4. Click NBI to add NBI Clearance 5. Click Identification Card 6. Click add UMID/ TIN ID/ Philhealth ID/ Driver License/ Postal ID/ Passport ID/ National ID (Front and Back)	
Maintenance Module	1. Click Maintenance in the navigation bar 2. Click create a Maintenance ticket 3. Fill up the required input fields 4. Click submit	
Complaint Module	1. Click Complaint in the Navigation bar 2. Click Create a Complaint Ticket 3. Fill up the required input fields 4. Click submit	
Point of Sales Module	1. Click Mode of Payment 2. Click Add of Receipt of Payment 3. Display the Acknowledgment Receipt 4. Click print button to print a hard copy of the invoice	
Billing Module	1. Click Bills in the navigation bar 2. Display the tenant's water bill 3. Display the tenant's electricity bill	

	4. Display the tenant's internet bill 5. Display the tenant's cost of rent 6. Display the tenant's total bill 7. Click print button to print a hard copy of the invoice	
Apartment Module	1. Click Create/View/Update/Delete Apartment 2. Click Create/View/Update/Delete the size of the apartment details 3. Click Create/View/Update/Delete the price of the apartment 4. Click Create/View/Update/Delete the Single-family homes 5. Click Create/View/Update/Delete the Multi-family homes	
Document Generator Module	1. View the lease of contract 2. View the acknowledgement receipt 3. Click print button to print a hard copy of the desired document	
Tenant-in form Module	1. Click tenant-in form tab 2. Fill up the required input fields 3. Click Submit form	
Tenant-out form Module	1. Click tenant-in form tab 2. Fill up the required input fields 3. Click Submit form	
Change Password Module	1. Click change password tab 2. Input old password 3. Input new password 4. Repeat new password 5. Click change password button	

Messaging Module	1. Click messaging tab 2. Input recipient username 3. Input message body 4. Click send message button	
Contract Module	1. Click contract tab 2. Display contract information 3. Display edit contract information 4. Fill up the required input fields 5. Click edit button	
Dashboard Module	1. Click dashboard tab 2. Display total number of tenants 3. Display total number of apartments 4. Display total income 5. Display all active contracts	
Profile Module	1. Click profile tab 2. Display personal information 3. Display contact information 4. Display payment information 5. Display contract	

Evaluation

Evaluation Model

The study will use the ISO 25010 software quality standardization. The software quality criteria are Functional Suitability, Usability, Reliability, etc.

Functional Suitability

Refers to how successfully a system or product can do the necessary tasks to satisfy both stated and implied needs.

Usability

Refers to how well a method or product can be applied to fulfill particular goals successfully, effectively, and satisfactorily.

Reliability

Refers to how well a system, item, or component carries out specific tasks in particular circumstances.

Performance Efficiency

Refers to the relationship between performance and resource usage. Security refers to how successfully a system or product shields data and information against security flaws.

Compatibility

Refers to how well a product, system, or component can share a hardware or software environment and still exchange information and carry out its necessary functions.

Maintainability

Refers to how well a system or product can be altered to enhance, correct, or adjust to environmental changes as well as user needs.

Portability

Refers to the degree to which a system, item, or component can be moved from one setting to another.

Table 2.

Likert Scale

Scale	Range	Interpretation
5	4.51 – 5.00	Excellent / Highly Acceptable
4	3.51 – 4.50	Very Good / Very Acceptable
3	2.51 – 3.50	Good / Acceptable
2	1.51 – 2.50	Fair / Fairly Acceptable
1	1.00 – 1.50	Poor / Not Acceptable

This study uses the Likert scale as shown in table 2. The application's evaluation will be completed based on the range within which the mean average falls. The scale range and its qualitative interpretation are shown.

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