

Streamlining Real Estate Management in the Philippines: Developing a Web-Based Solution for Day-to-Day Operations

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Abstract— In this paper, a web-based application for managing real estate in the Philippines is created. The goal is to create an online platform for landlords and tenants of apartments, dormitories, and similar properties to handle their day-to-day operations. The system will allow managers to track payments and communicate with tenants, tenants will be able to view their transactions and pay bills while managers will be able to keep track of those transactions. The system aims to enable contactless property management for all parties involved.

I. INTRODUCTION

A. Background of the Study

Given how technology is continuously being developed and innovated, e-commerce has become the way to go when it comes to managing certain businesses. [4] Several online management systems have been invented in the past two decades, however, even up to this day, most real estates do not have their own management systems here in the Philippines. There has been a consistent rise in the real estate market, even generating nearly 126 billion Philippine pesos as of the second quarter of 2021[1], but there has been no significant management system specifically designed for real estate management that focuses on the maintenance, daily operations, and monthly rentals and not on sales here in the Philippines.

B. Statement of the Problem

For a long time, apartments, dormitories, or even condominiums here in the Philippines did not have an automated or even a systematic management system for managing their day-to-day operations. The traditional way of managing real estate properties is through personal visits and manual listing of due dates. To achieve a systematic management system, landlords or property owners have to avail the services of property management companies.

This study will focus on creating a system wherein an interface will be provided for both the landlords and the tenants, this interface includes a system that keeps track of the due dates of the tenants, whether or not the tenant has already paid for a certain month, and certain day-to-day advisories that the landlord would like to announce to the tenants.

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C. Objectives

The main objective of the study is to develop a property management system application for Filipino landlords that will help process the required operations and transactions between the landlords and tenants. This study specifically aims to:

- 1) To develop a property management application: Create a web-based platform tailored for Filipino landlords and tenants, aiming to streamline day-to-day operations and enhance the management of rental properties, focusing on apartments, dormitories, and similar real estate assets.
- 2) To enable landlord-tenant interactions: Enable landlords to manage property-related tasks, including rent tracking, making announcements, and communicating with tenants. Simultaneously, empower tenants with an interface to monitor payments, and receive notifications or announcements from property managers.
- 3) To implement iterative development: Employ an iterative development approach, soliciting feedback from a group of landlords and tenants to refine and improve the application's functionality, usability, and overall effectiveness before full-scale implementation.

D. Significance of the Study

This study will help manage the day-to-day operations of apartment complexes, dormitories, and other real estate properties that involve different transactions with and managing tenants.

E. Scope and Limitation

This study will only focus on creating an application that focuses on the day-to-day operations management of real estate, monthly maintenance, and miscellaneous operations and not on the sales aspect of real estate management. This study will not include exclusive payment gateway systems.

II. REVIEW OF RELATED LITERATURE

There are already existing management systems that occurred in the past decade that exist on the internet used for real estate, however, none of these are accessible in the Philippines. The only accessible management system here in the Philippines is the property management system. Property Management System is a software that simplifies administrative and reservation administration work for hotels. Front-desk operations, reservations, channel management, housekeeping,

rate and occupancy management, and payment processing are its usual tasks. What about condominiums, apartments, and dormitories, what sort of management system are we going to use to manage them?

Creating an application specifically suited for condominiums, apartments, and dormitories are relatively unexplored in the Philippines, where there are currently no applications designed specifically for this type of management. However, doing and building the application is not as hard as one would usually envision. We can retrace the tenants' due dates on the same way certain existing applications keep track of our subscriptions but we can implement it without the payment gateway systems. For instance, Several subscription management apps have a push notifications feature used for when it is time to pay the bills [2], we can use the same algorithm to keep track of the tenants' due or payment dates.

Similar to how hotel management systems do some of their day-to-day operations, we can adapt some parts of hotel management systems and integrate them as a part of our own property management system. To ensure you choose the right solution for your apartment, look for the following features: a. Drag and Drop Calendar, b. Automated Communications, c. Synchronized Rates and Availability Updates, d. Housekeeping features [2]. We can adapt features b and c to ensure smoother day-to-day operation assistance. Similar to how we are going to solve objective a, we will do the same for the second objective since we already have existing software for hotel management systems, we can integrate the chosen features and integrate them as our own to create an application that assists with the property's day-to-day operations [2].

Launching a real estate management system involves following the law, making smart IT decisions, checking technical setup, having enough funds, and ensuring people are willing to use it[5]. To track tenant payments in the system, a good billing setup is necessary[3]. Since these systems are not widely used in the Philippines yet, it's important for the application to demonstrate how it simplifies work, especially for older property owners who might find it more appealing[6]. The system needs to be user-friendly and show that it makes managing properties easier/contactless for everyone involved. Also, we should take into account that a vast majority of apartment/real estate property owners are a part of the older generation [7].

III. MATERIALS AND METHODS

A. Streamlined Process

1. Requirements Gathering

Define user needs: Gather detailed requirements from landlords and tenants to understand their needs and pain points. Prioritize features: Identify essential functionalities such as rent tracking, making announcements, and tenant communication. 2. Design and Prototyping Prototype development: Develop a basic prototype to demonstrate the flow and interaction within the application. 3. Development Backend setup: Set up the database (MySQL) and server (Express, Node.js) for storing and managing application data. Frontend development: Code the user interface using React and Javascript with

CSS features, for responsiveness and accessibility. 4. Feature Implementation Develop manager-specific features: Implement functionalities like bill assignment, transaction viewing, announcement making, and sending messages. Build tenant-specific features: Create features such as bill payment, sending messages, announcement viewing, and transaction viewing. 5. Testing and Debugging

Functional testing: Verify each feature's functionality, ensuring they work as intended and meet user requirements. Debugging and refinement: Address any bugs or issues identified during testing and refine the application accordingly. 6. User Feedback Integration

User testing: Gather feedback from landlords and tenants through usability testing to improve application usability. Iterate based on feedback: Implement changes based on user suggestions to enhance user experience and functionality. 7. Security and Compliance

Data security: Ensure robust security measures to protect sensitive user information and comply with data privacy regulations. Legal compliance: Ensure the application complies with relevant laws and regulations concerning real estate management systems. 8. Deployment and Launch

Deployment planning: Choose a suitable hosting platform and deploy the application on a reliable web server accessible to users. Launch strategy: Plan a strategy and communicate the application launch to targeted users.

9. User Training and Support

Training resources: Develop user guides and documentations to help landlords and tenants navigate and utilize the application. Support system: Establish a support mechanism to address user queries, and issues.

B. System Requirements and Specifications

A. Development Tools

The application will be developed on a machine with the following specifications:

- **Operating System:** Windows 10 64-bit
- **Processor:** 10th Generation Intel Core i7-10510U
- **Memory:** 16GB DDR4 RAM
- **Storage:** 1TB HDD

The following software development tools and technology stack will be used for the development of the system:

1) Environment

- **Visual Studio Code:** A feature-rich source code editor that will serve as the main environment for developing the application.

2) Technologies

- **HTML, CSS, JavaScript:** Core web technologies used for the front-end development of the application.
- **ExpressJS and NodeJS:** JavaScript frameworks used for the back-end development.
- **MongoDB Cloud and MongoDB:** Database technologies used through a setup called MERN (MongoDB, Express.js, React, Node.js).

Other necessary software includes:

- **Web Browsers:** Mozilla Firefox, Google Chrome, Microsoft Edge (for testing and running the application).

- **IDEs:** Visual Studio Code.

The application will be coded using the above technologies and tools. The project is expected to be completed by May 2024.

C. Types of Users

The application will have two types of users, the manager, and the tenant. Manager users will have access to the data stored which will show all the previous transactions of all tenant users that are under the manager's jurisdiction. Manager users will also have access to all features but will still have some exclusive ones for manager users such as Create Bills, Create Announcements, and Mark Bill as paid. Tenant users on the other hand, will only have access to their previous transactions and two other features, Pay Bills and Create Messages. Pay Bills is a feature that will allow the tenant to submit payment for existing bills, and Create Messages is a feature that would allow the tenant to privately message his/her manager.

Manager User Features	
Create Messages - for messaging tenants privately.	
Create Announcements - for posting notices or announcements to be received by the tenants under his/her management.	
View Transactions - for accessing previous transactions made by tenants under his/her jurisdiction.	
Create Bill - for assigning billing statements to tenants under his/her jurisdiction.	

TABLE I
MANAGER USER FEATURES

Tenant User Features	
Pay Bill - submitting payment by adding a payment reference number to a bill.	
Create Messages - for privately messaging managers.	
View Transactions - to access previous transactions made by the user.	

TABLE II
TENANT USER FEATURES

IV. RESULTS AND DISCUSSION

A. Application

After running the application, users will be directed to the home page, where they will be asked whether to login (if they already have an existing account) or signup (for first-time users). As shown in Figure 5 below.

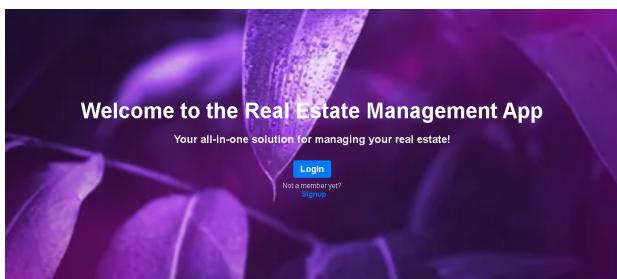


Fig. 1. Home

After clicking signup, users will be asked to sign up wherein they will choose to be a tenant or a manager user as seen in the figure below.

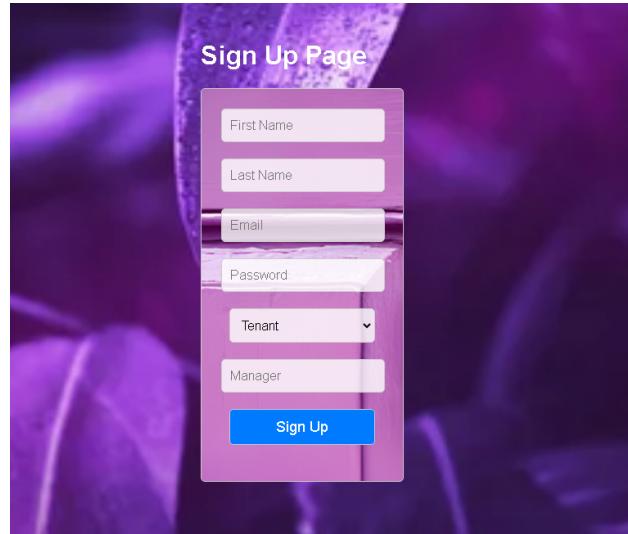


Fig. 2. Signup

Once a successful signup is achieved, users will be redirected to the login page where they will enter their login credentials.

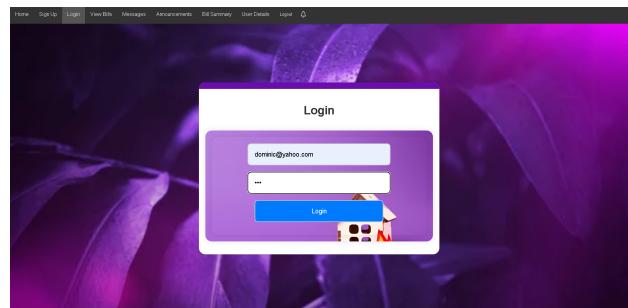


Fig. 3. Login

If the login is successful, users will be sent to the bills section of the application.

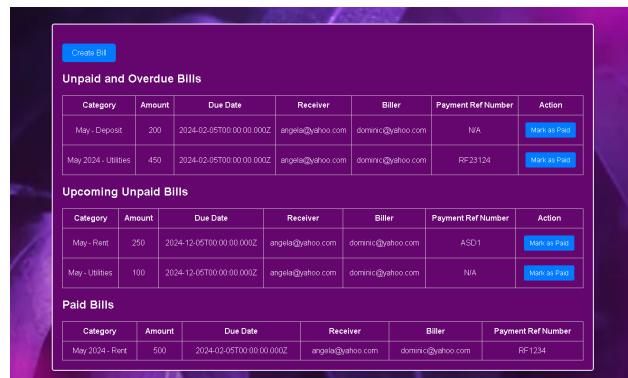


Fig. 4. View Transactions(Manager)

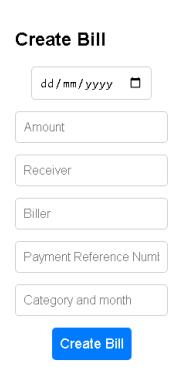
If the user is a tenant, they have an option to submit a

PaymentReferenceNumber to the bill of their choice if they want to submit a request to mark that bill as paid.

Unpaid and Overdue Bills					
Category	Amount	Due Date	Receiver	Biller	Payment Ref Number
May - Deposit	300	2024-02-05T00:00:00Z	angela@yahoo.com	dominic@yahoo.com	<input type="text"/> <input type="button" value="Submit Payment"/>
May 2024 - Utilities	450	2024-02-05T00:00:00Z	angela@yahoo.com	dominic@yahoo.com	<input type="text"/> <input type="button" value="Submit Payment"/>
Upcoming Unpaid Bills					
Category	Amount	Due Date	Receiver	Biller	Payment Ref Number
May - Rent	250	2024-12-05T00:00:00Z	angela@yahoo.com	dominic@yahoo.com	<input type="text"/> <input type="button" value="Submit Payment"/>
May - Utilities	100	2024-12-05T00:00:00Z	angela@yahoo.com	dominic@yahoo.com	<input type="text"/> <input type="button" value="Submit Payment"/>
Paid Bills					
Category	Amount	Due Date	Receiver	Biller	Payment Ref Number
May 2024 - Rent	500	2024-02-05T00:00:00Z	angela@yahoo.com	dominic@yahoo.com	RF1234

Fig. 5. View Transactions(Tenant)

Depending on their user type, users will either be able to mark bills as paid or submit payment. Only manager-type users can create bills as shown in Figure 8



The Create Bill form contains fields for Date (dd/mm/yyyy), Amount, Receiver, Biller, Payment Reference Num, and Category and month. A blue 'Create Bill' button is at the bottom.

Fig. 6. Create Bill

A notification will be created for a user if:

- 1) A bill has been created, and they are marked as the receiver.
- 2) A message has been sent to them.
- 3) A bill, where they are the biller, has received a request to be marked as paid.



Fig. 7. Notifications

Regardless of the user type, users have the option to create a private message and send it to a receiver of their choice.

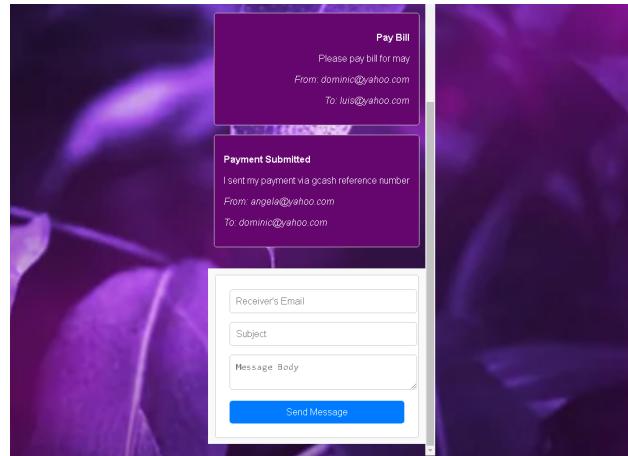


Fig. 8. Messages

Only manager-type users will be able to create an announcement while both user types can view those announcements. Refer to Figure 9 and Figure 13 below.

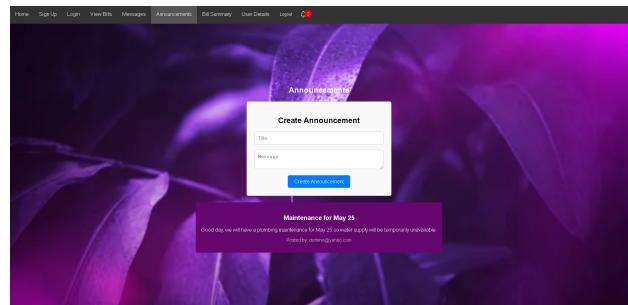


Fig. 9. Announcement (Manager)

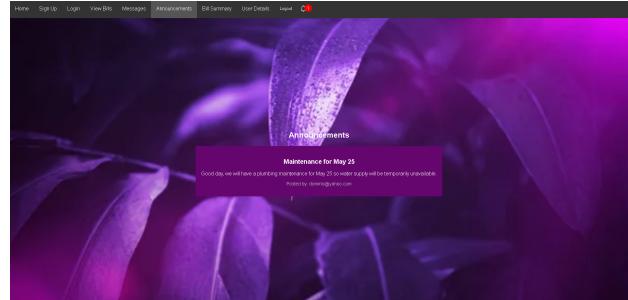


Fig. 10. Announcement (Tenant)

If users would like to view an analysis or summary of all their transactions regardless of their user type, they can access the Bill Summary section.

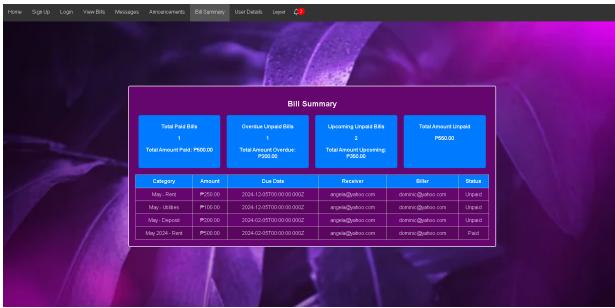


Fig. 11. Bill Summary (Manager)

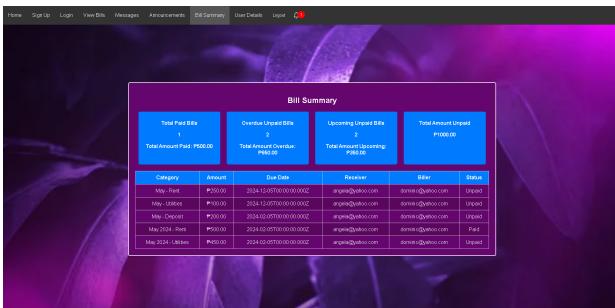


Fig. 12. Bill Summary (Tenant)

Lastly, users can view their user details by accessing the User Details section.

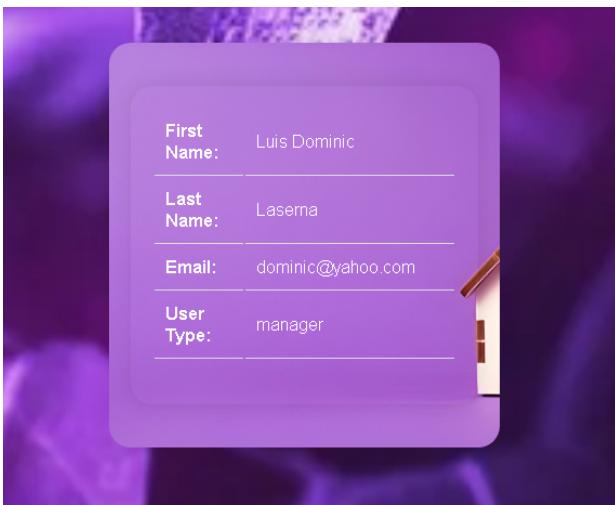


Fig. 13. User Details

B. Testing and Deployment

After the final deployment of our application, we sought to evaluate its usability through the System Usability Scale (SUS). Ten respondents were selected to use the application and provide feedback on their experience. The SUS is a widely used questionnaire for assessing the perceived usability of systems, providing valuable insights into users' attitudes towards the usability of a system. Participants were asked to rate their level of agreement with a series of statements regarding their experience with the application. Below are the SUS questions and their corresponding responses.

SYSTEM USABILITY SCALE (SUS) QUESTIONS

- 1) I think that I would like to use this system frequently.
- 2) I found the system unnecessarily complex.
- 3) I thought the system was easy to use.
- 4) I think that I would need the support of a technical person to be able to use this system.
- 5) I found the various functions in this system were well integrated.
- 6) I thought there was too much inconsistency in this system.
- 7) I would imagine that most people would learn to use this system very quickly.
- 8) I found the system very cumbersome to use.
- 9) I felt very confident using the system.
- 10) I needed to learn a lot of things before I could get going with this system.

After deploying our application on Render, ten respondents accessed the website hosted by Render and evaluated its usability using the System Usability Scale (SUS) on a scale of 1-5. Render is a cloud platform that simplifies the deployment and scaling of applications while SUS is a widely used questionnaire for assessing the perceived usability of systems. The scores range from 1 to 5, with higher scores indicating better usability.

Below are the SUS scores provided by the respondents:

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	3	2	4	5	3	3	5	4	5	5
2	2	3	4	2	5	2	5	2	3	2
3	4	3	4	4	2	4	4	3	4	4
4	5	4	3	5	5	5	3	5	5	5
5	5	4	3	5	5	4	3	5	5	5
6	3	5	3	5	4	5	3	5	3	5
7	5	3	4	5	5	3	5	5	2	5
8	3	5	5	5	3	5	5	3	5	5
9	5	3	4	5	5	5	4	3	5	4
10	3	5	5	5	5	5	3	5	5	5
Mean Score	3.8	3.7	4.0	4.9	4.0	4.2	4.0	4.2	4.6	4.6

TABLE III
SYSTEM USABILITY SCALE (SUS) SCORES FOR EACH RESPONDENT

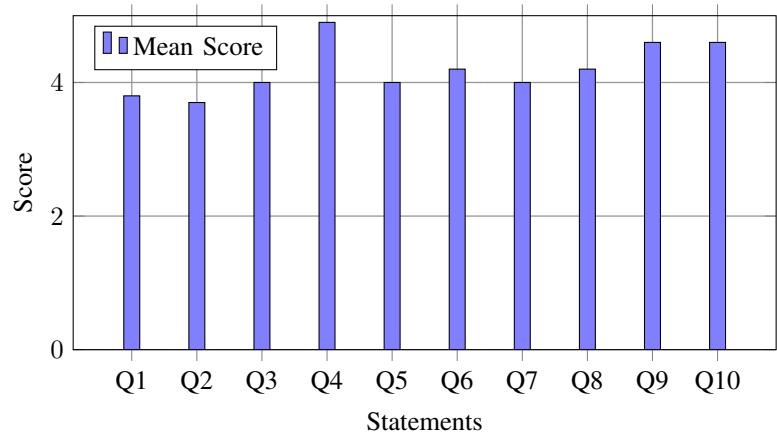


Fig. 14. Mean Scores of Each Statement

Overall, users expressed comfort with using the application and appreciated how it integrated the day-to-day operations of

real estate. During the survey, respondents were specifically asked to provide feedback on which features they believed could be improved within the application. The feedback gathered from users was instrumental in identifying key areas for enhancement, including suggestions for UI refinement, such as simplifying menu structures and optimizing layout designs, as well as recommendations for enhancing the payment system to ensure smoother transactions and improved reliability. Despite these suggestions, users expressed that they think the app is promising and ready for deployment, demonstrating its potential to significantly improve their real estate management operations.

V. CONCLUSION AND FUTURE WORK

In conclusion, the development of the real estate management web application has successfully met its objectives of streamlining and integrating the day-to-day operations of real estate management for both landlords and tenants. The application has effectively provided functionalities such as managing rental payments, tracking property maintenance requests, and facilitating communication between landlords and tenants. Through user feedback and usability testing, the application has been validated as a valuable tool, with users expressing overall satisfaction with its functionality. The app's ability to make real estate management processes contactless has been particularly appreciated.

For future work, several enhancements are recommended to further improve the application's usability and effectiveness. A key area for development is the integration of an exclusive payment gateway system. This feature would provide a more seamless and secure transaction process, enhancing user experience and reliability. Additionally, ongoing refinement of the user interface based on user feedback will ensure the application remains user-friendly and intuitive. These improvements will enable the app to better meet the dynamic needs of its users and solidify its position as a comprehensive tool for real estate management.

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