

GIS-BASED REAL ESTATE AND PROPERTY MANAGEMENT SYSTEM



A Capstone Project Presented to the Faculty of
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St. Michael's College
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By

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Abstract

This study focuses on the creating and execution of a Geographic Information System (GIS)-based real estate and property management system. The study's primary concerns are the rising complexity of property management and the need for practical solutions to quicken processes. With the incorporation of GIS technology, the system provides geographic data with property details to allow for detailed visualization and analysis. This study begins with evaluating the current real estate and property management processes, pointing out common flaws, and suggesting a GIS-based solution. The system has capabilities which includes data integration, geographic mapping enabling property owners to make more precise decisions. In this study, a software evaluating tool was used to measure usability through a modified survey questionnaire based on the System Usability Scale (SUS). The system made an overall mean score of 4.04, or "Good". Meaning, 75% of real estate owners and their clients said they were happy with how easy it was to use the system. The conclusion highlights how crucial it is to continuously update, check and improve the system in order to keep it user-friendly and functional.

181 words

Keywords: spatial mapping, geographic information system



DEDICATION

This endeavor requires a tremendous amount of effort and personal sacrifice. I dedicate this research to individuals who have inspired me and provided crucial support to carry my efforts ahead. Their support was steadfast, and it played an important part in making this project a reality.

I would want to express my gratitude to the dean, teachers and staff of St. Michael's College in Iligan City for their outstanding devotion despite the difficulties experienced throughout the project's development. This mission's accomplishment is a tribute to everyone's efforts that persevered through the challenges the researchers faced.

With sincere appreciation, this effort is dedicated to our helpful adviser, their counsel, discernment, and unfailing support have been crucial in priceless contributions to our academic path, and your commitment and support have had a lasting effect.

-*Jo Nian*



DEDICATION

I want to express my heartfelt gratitude for your unwavering support and encouragement throughout my journey as an IT student.

Firstly, I want to express my gratitude to God for accompanying us on this journey, for giving us daily inspiration and understanding. This thesis study is dedicated to everyone who has supported me from the beginning to the end, especially my parents and partner, who have helped me stay positive when things are difficult and my son, without whom I wouldn't have the courage to complete my studies.

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-Jan Merchael



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-Jo Nian Ladaga & Jan Merchael Rafe



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LIST OF ACRONYMS AND ABBREVIATIONS

GIS	Geographic Information System
REO	Real Estate Owner
DFD	Data Flow Diagram
ERD	Entity-Relationship Diagram
IT	Information Technology
SUS	System Usability Scale
PHP	Hypertext Preprocessor
MYSQL	My Structured Query Language
NDRC	New Day Realty Corporation



Chapter 1

THE PROBLEM AND ITS SETTING

Introduction

Real estate agency is incomplete without having an excellent real estate agent who not only possesses good communication skills but also utilizes tools that can make work easier and to avoid clients' dissatisfaction. Consumers of real estate agencies complained about a variety of issues, including poor communication, overpriced properties, inaccurate information from agents, failure to deliver necessary items, pressuring of clients, delays, missed deadlines, bullying, inaccurate information from agents, and improper maintenance of the properties under their supervision. To experience customer satisfaction, retention, and successful businesses, real estate agents need to maintain high standards of customer service (Araloyin, 2021). With these problems, real estate agents must equip digital tools to avoid customer disappointment.

In today's society, technology has had a profound impact on the real estate industry, particularly with the emergence of Geographic Information System (GIS)-based real estate and property management systems. These technological solutions have revolutionized the way properties are listed, managed, and accessed, significantly affecting the lives of individuals involved in the real estate



sector (Ahmed et al., 2021). Real estate developers are now better equipped to provide clients smooth and practical experiences thanks to technology improvements (Lumina Homes, 2023). In the Philippines, property management is an essential component of real estate ownership. Tenant management, upkeep, and financial management are just a few of the daily operations that property owners who lack the time or experience to handle their properties can entrust to property managers.

Geographic Information Systems (GIS) are thought to be the most precise and fascinating technology. A unique kind of information system, geographic information systems use databases with spatially organized features as their data source and offer methods for gathering, storing, retrieving, analyzing, and displaying geographic data. Another way to define geographic information systems is as a tool for efficiently and quickly storing, retrieving, and combining non-spatial and spatial data (Ahmed, 2021).

Northern Mindanao is home to the highly urbanized coastal city of Iligan City. 813.37 square kilometers, or 314.04 square miles, make up the city's land area (City Profile, 2022). There are lots of properties or real estates in Iligan City that are for sale and available. These properties are somehow located in rural areas where it is not costly. Also, there are real estates situated in urban areas that offer greater convenience. In addition, subdivisions are one of the common real estate



in Iligan City. Despite the increasing sales of real estate in Iligan City there is still a huge problem. One of which is that, not having a specific and organized website necessary for clients that are searching for properties or real estate in the said area. Sellers or agents usually posted the available properties in social media having incomplete information about the property. Thus, this will lead to clients confusion and can leave potential buyers unsure of the property. Real estate clients are skeptical in buying potential properties. Hence, this study aims to develop a real estate and property management system using GIS to provide detailed information of properties in Iligan City and give clients the convenience and ease of locating and getting information of real estates and properties in the said area.

Statement of the Problem

The researchers found out the following problems based on observation and/ or interview conducted are as follows;

1. Clients are having difficulty in location and finding accurate information of real estate properties which is tiresome and time consuming.
2. Clients are experiencing trouble when attempting to view the physical property, leading to inconvenience and frustration.



3. Clients are having difficulty managing their real estate properties which are unorganized and confusing.

Objectives of the Study

The objective of this study is to develop a GIS-based real estate and property management system. Specifically, this study aims to;

1. Design a system that will map out real estates which will help clients look at the real estate properties online instead of visiting on-site.
2. Create a system that provides accurate real estate information, allowing clients to save significant time and effort in their search.
3. Test and evaluate the developed system that will help real estate owners organize and manage properties.

Scope and Limitation of the Study

This study focuses on the GIS-based real estate and property management located in Iligan City, a web-based application using PHP with MySQL database. The system has a number of features that provide users to view a number of properties and bring convenience to clients and exposure to real estate owners. The researchers will focus on residential properties such as houses in subdivisions.



To be more precise, the system contains all client and real estate owner information. The Real Estate Owner has to provide a large amount of residential property details which includes the name of the property, description, pricing details, locations, number of images to set its features. Every real estate owner can put up their properties and manage their posted property in order to update their status. The system only contains residential area property. Last but not least, a clean and simple dashboard is presented with various color combinations for a greater client experience.

Significance of the Study

Clients. Full access to the real estate information, minimizes time and effort investment. Navigate the real estate market effectively

Real Estate Owners. Efficient property management thus, increases competitive advantage. Maximize the exposure of the posted properties.

Future Researchers. Opportunities to build on existing knowledge and address the industry needs. Explore long-term impact of GIS-technology based on the real estate industry.



Definition of Terms

This section explains the important keywords discussed throughout this study, as well as contextual information about how the researchers use those keywords in this study.

GIS. Geographic Information System, used by the researchers in developing details real estate properties in Iligan City.

Real Estate. Comprises land along with any structures attached to it. This includes houses in residential areas such as subdivision.

Real Estate Management System. A software application or platform designed to assist in the management and administration of real estate properties, including tasks such as property listing, tenant management, lease agreements, financial tracking, and reporting.

Real Estate Owners. A legal entity who holds title to a parcel of real property in the system.

User Management. The system allows administrators to manage user accounts and permissions, granting different levels of access to agents, brokers, and other personnel involved in the real estate listing management process.



Chapter 2

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter deals with the review of related literature and studies. The purpose of the study of research works done in the same field is to understand what type of study has been done and what exactly has been explored before the present research work started. The study of related literature and research work is very essential and important as it provides the researcher proper guidelines. This chapter also includes a synthesis of the literature and studies that helps the researcher collect ideas and information.

Related Literature

Real estate may be broken down into four main categories for the purposes of professional property management: residential, commercial, industrial, and land property to which each of these groups requires a particular set of knowledge and abilities from the manager (Rohde, 2020). Due to the different characteristics of real estate, professionals must be equipped with expertise and approaches to effectively manage specific real estate properties. According to Palm (2013) real estate management has two strategic pathways to consider, the first step is to decide whether to employ its own frontline people or outsource this service. The second step is to determine how the leasing task should be addressed.



Manual real estate management is labor-intensive, time-consuming, and prone to loss of client information and document damage. Complex jobs and tasks are automated by real estate management systems (Gallenero et al., 2022). Managing real estate requires a lot of time and effort. In addition, there is a risk of losing client information and other important documents. However, implementing a real estate management system can handle complicated works therefore reduce risk and improve efficiency in real estate. For this reason, managing real estate in an efficient and proper manner can lead to financial gains which in turn boosts the organization's competence.

Professionals such as developers and investors can access valuable data in the real estate industry through Geographic Information Systems (GIS). These include the quality of the property and the geographic peculiarities of the land. Thus, applying GIS technology in real estate can perfectly help the client in finding its desired property and acquire significant details about it (Kvartalnyi, 2022). In the context of real estate, GIS plays an important role because it provides information or details to clients, investors and experts about land quality, property boundaries and other geographical characteristics. Through GIS in real estate it helps professionals to thoroughly analyze land attributes aiding them in identifying properties that match with clients' needs.



For real estate management system, Geographic Information System (GIS) is suitable to use, because it has the capability to process geospatial and non-spatial information or data on a single platform. GIS is an open source and available, making this technology affordable and popular in a variety of applications. Therefore, developing an existing non-GIS based system to a GIS based property management system is a must (Paul et al., 2019). Genuinely, GIS has many advantages in estate property management systems. It has the capability to handle location- based and attribute- based data effectively in one platform thus, improving decision-making and efficiency. Nevertheless, it is important to remember that even though GIS offers positive benefits, its effectiveness also depends on system integration, data quality and how users know how to use it.

For the people who participate in the real estate industry, lack of comprehensive information and unclear transactions creates many problems. Many technologies and methods including Spatial Data Infrastructures (SDIs), Web services and Web GIS were used in this solution (Baros, 2018). By implementing these technologies which utilize the internet to access geospatial and analysis through web-based interfaces, the real estate industry aims to provide people with access to better information that they can trust so they can make smarter choices and enhance the effectiveness of real-estate business operations.



Related Studies

Finding the best location for a residential property at the best value is the foundation of real estate industry. Real estate agents and prospective homeowners can find ideal locations by analyzing location data such as area demographics, aerial photos and surrounding amenities, based on personal preferences.

In the year 2020, Giurgiu and colleagues proposed developing prototype called (iMoPal), it centers on creating software application in an online real estate platform for property management. Also it has a rating system for tenants and landlords to meet the needs of the real estate market. The study found that the iMoPal application reduces the time required to search for the desired home.

Due to geospatial nature of real estate, its numerous associated attributes and the importance of location in determining the appropriateness of a property, GIS technology is well suited in this field (Laban, 2017). Geographic Information System (GIS) is definitely the appropriate technology in the field of real estate for it provides location in assessing property suitability. GIS serves as an important tool that allows the real estate industry to virtually represent and map the different sites of a specific property.



Geographic Information System (GIS) is an essential tool for urban planning and management. The increasing use of GIS in urban planning and design opens up additional chances for qualitative and quantitative studies, strengthening decision-making approaches and knowledge-based decision-making process which makes sustainable development is defined as development that meets current demands while not jeopardizing future generations' ability to fulfill their own needs (Sulochana Shekhar & Kumar, 2023). GIS is highly beneficial in real estate, it helps real estate experts understand how a certain location affects a particular property. This is also significant especially helping clients buy and sell houses as well as figuring out property values and analyzing the real estate market.

GIS supports the real estate industry by assisting with site and location merit analysis, mapping and modeling. The authors Xue et al. calculated and incorporated three accessibility guides: accessibility on foot, by bus and buy subway, into the factors that influence property price. Also, four machine algorithms are used to predict real estate prices across the city, yielding accurate prediction results. It is said that using GIS in real estate is definitely an advantage, it is an asset that enables the real estate industry to evaluate the benefits of one area in contrast to another. GIS technology aids real estate sectors to analyze market trends for a successful real estate business.



It's not just about finding the best site. A piece of land's worth is determined by its surrounding amenities and level of popularity. The assets' location data and the attributes holding their specific details are comprised of the spatial data (Balaji & Muthukannan, 2020). For land assets, the Geographic Information System approach is effective. One of the number one priorities in real estate is the location of the property. Thus, to meet this demand effectively, real estate relies on GIS technology. Moreover, implementing GIS technology in real estate allows clients to visualize the property properly with specific information about it thus, providing clients a clearer picture of a specific property that meets their preferences.

Since real estate is primarily a spatial discipline, the real estate industry is especially well-positioned to benefit from the explosion of web mapping technologies. A web-based mapping program was created to carry out basic spatial analysis operation where every procedure is carried out by the Google Map API and displayed on the users website, the program uses open source technologies, which are not limited by the large GIS vendors typical what-you-see-is-what-you-get business model (Bowlin, 2015). Using GIS technology for managing property makes it easier to organize and handle details about the property. Hence, this enables clients to compare their preferences among the properties being presented in the real estate web based application.



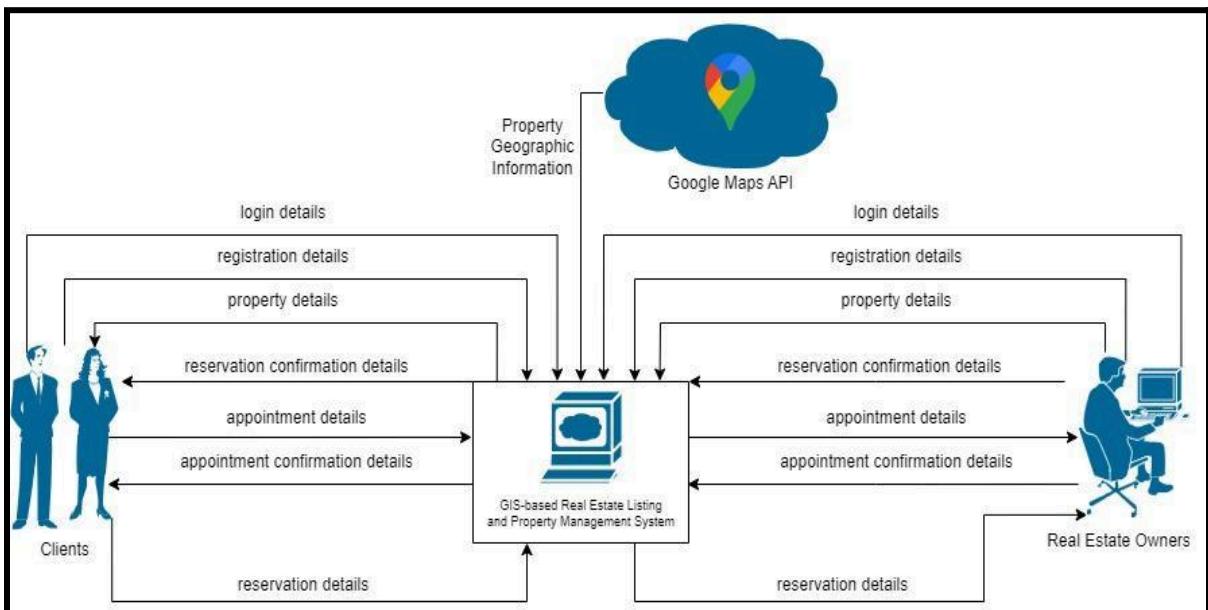
Chapter 3

RESEARCH METHODS

This chapter describes and explains the methodology deployed in this study, specifically the diagrams that will be utilized to develop the system.

Conceptual Framework

Figure 1. Conceptual Framework



The conceptual framework shows the inputs and outputs of the GIS-Based Real Estate and Property Management System and its environment by showing the entities that interact with it.



The Client entity represents the user of the system that can view a property in the system, clients can choose what property they want and their details will be stored and they can pick an appointment to when they will visit the property on site, Once appointment have been confirmed the client can visit the property according to the date and time. And after looking on site if a client likes the property they can reserve it.

The Real Estate Owner entity sees all the real estate properties and the appointments that are stored in the system and also this entity has an account in order to access such reports to avoid minor and major problems.



Data Flow Diagram

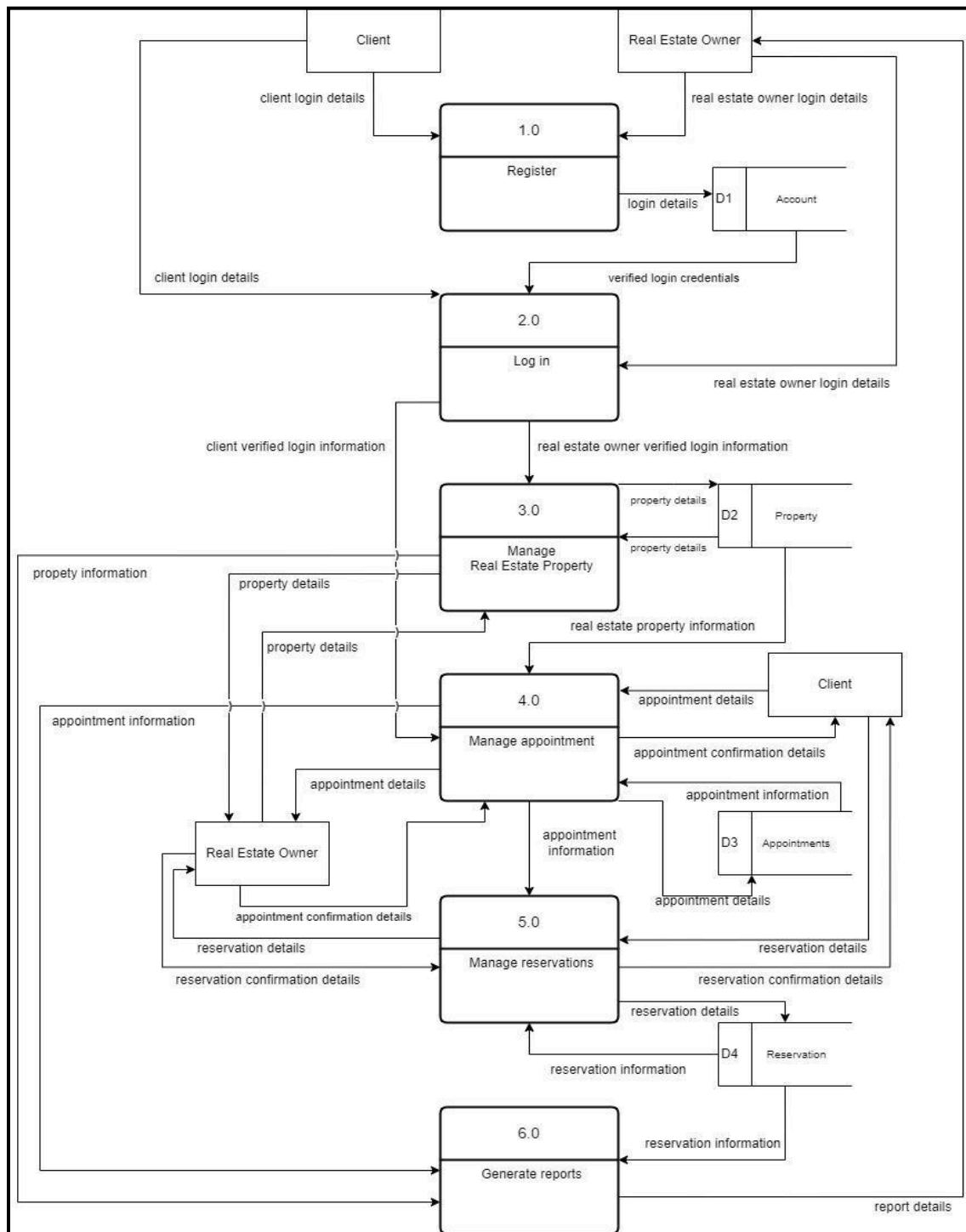


Figure 2. Level 0 Data Flow Diagram



In Process 1.0, the client and real estate owner registers to the system in order to access the system using their respective login credentials, entering their usernames and passwords to initiate Process 2.0. In Process 2.0, after the registration, this is where the client and real estate owner will input their login credentials to enter the system. However, if the client and real estate owner already has an account they can skip the registration process and login directly to the system. In Process 3.0, the client views the real estate properties and allows the client to add their property listing and the Real estate owner oversees the listed real estate properties, editing their details as needed and saving changes to the property database, subsequently presenting the updated property list to the client.

That leads us to Process 4.0 enables an appointment where the client can look at the property on-site according to the time and date set on the appointment, the appointment information will then be checked and is up for confirmation by a real estate owner. During Process 5.0, a client can reserve a real estate property if they have a liking for it, to which a real estate owner will then confirm the reserved property to the client and the reserved real estate property will be stored in the database. Lastly Process 6.0, this is where it generates all reports of the properties, appointments, and reservations details, the report details will be sent to the real estate owner.

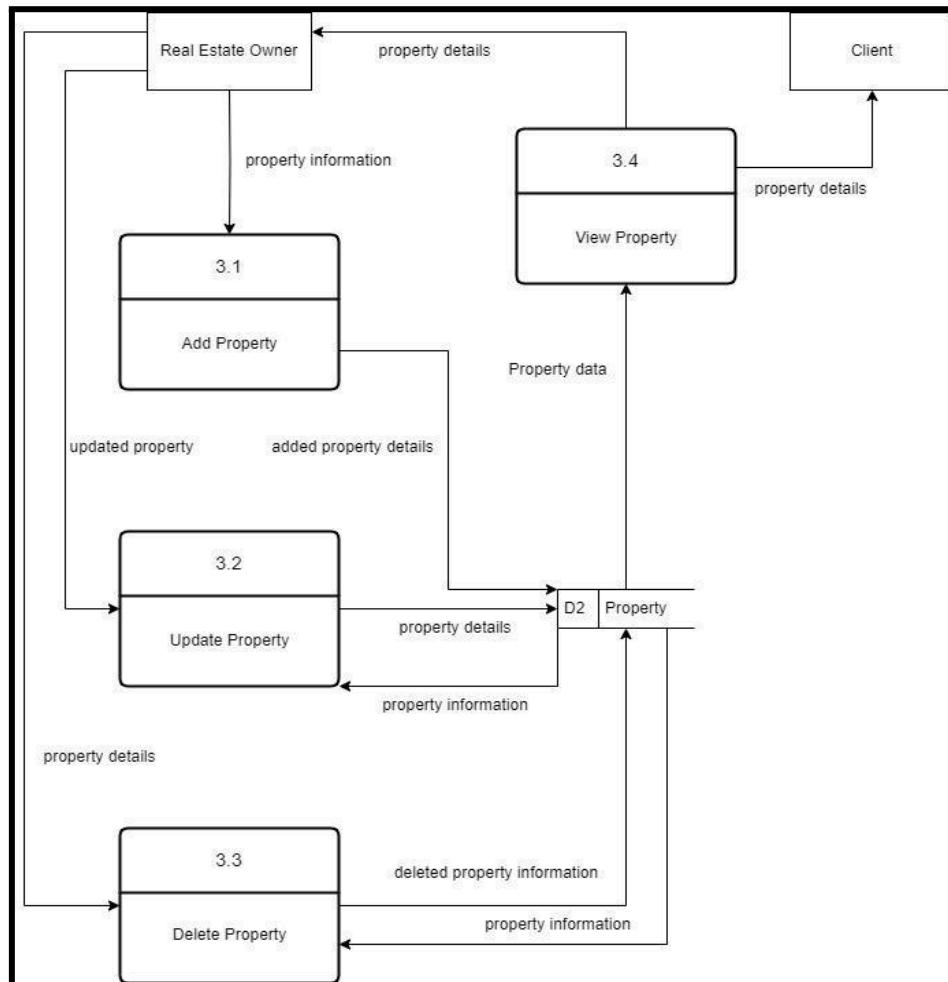


Figure 2.1 Level 1 Data Flow Diagram

In Process 3.1 The real estate owner will be able to add a property. In Process 3.2 The real estate owner can update a property. At Process 3.3 it is where the real estate owner can delete a property. The property's information will be stored in the Property database after that in Process 3.4 the real estate owner views the overall property details.

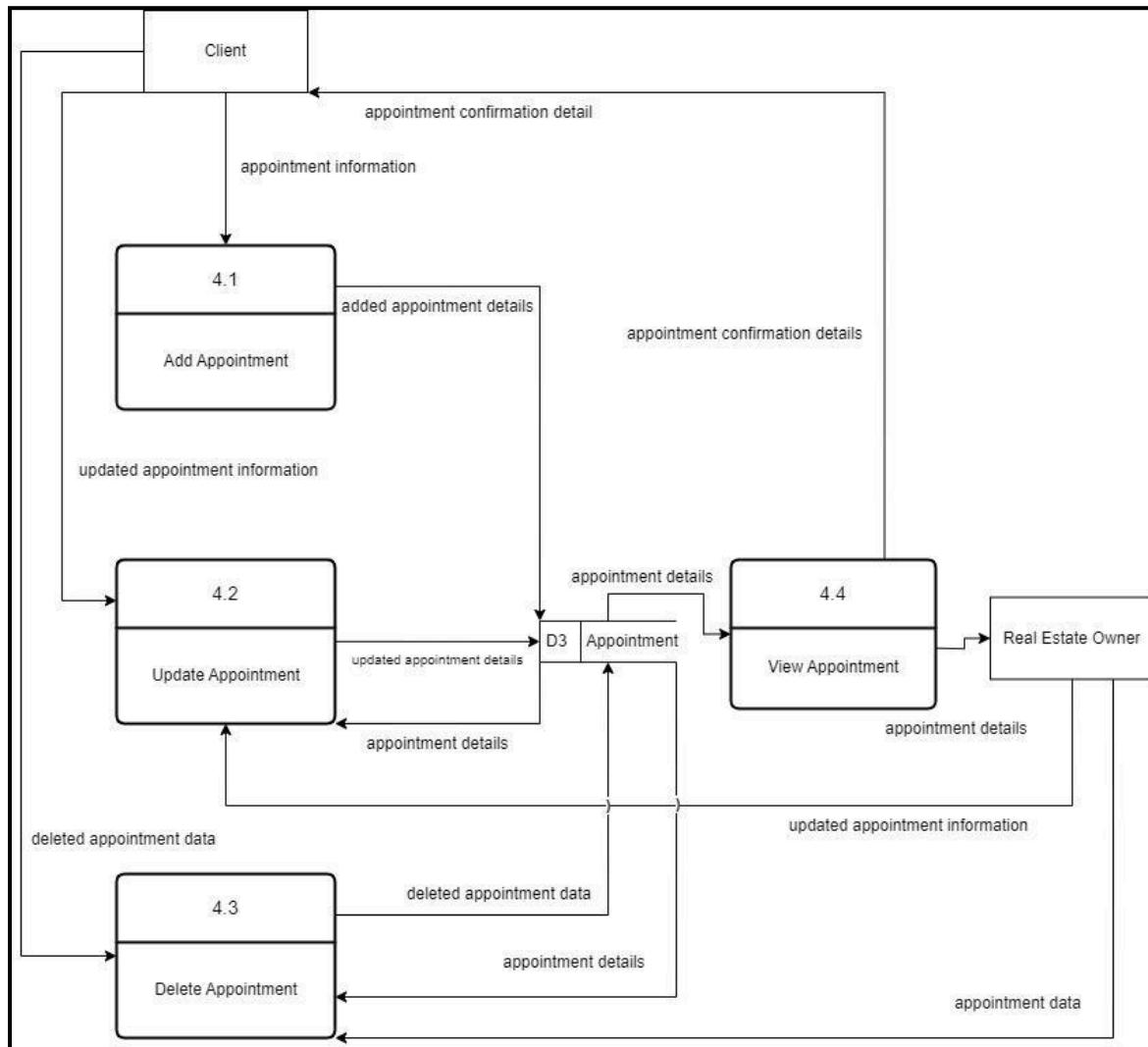


Figure 2.2 Level 1 Data Flow Diagram

In Process 4.1 The client will be able to add an appointment and in Process 4.2 The client can update their appointment as well delete their appointment at Process 4.3. The data in 4.1, 4.2, & 4.3 will be stored in the database Appointment then in Process 4.4 where the client can view their appointments and the real estate owner will be able to view the clients' appointments and can update then confirm their appointments.

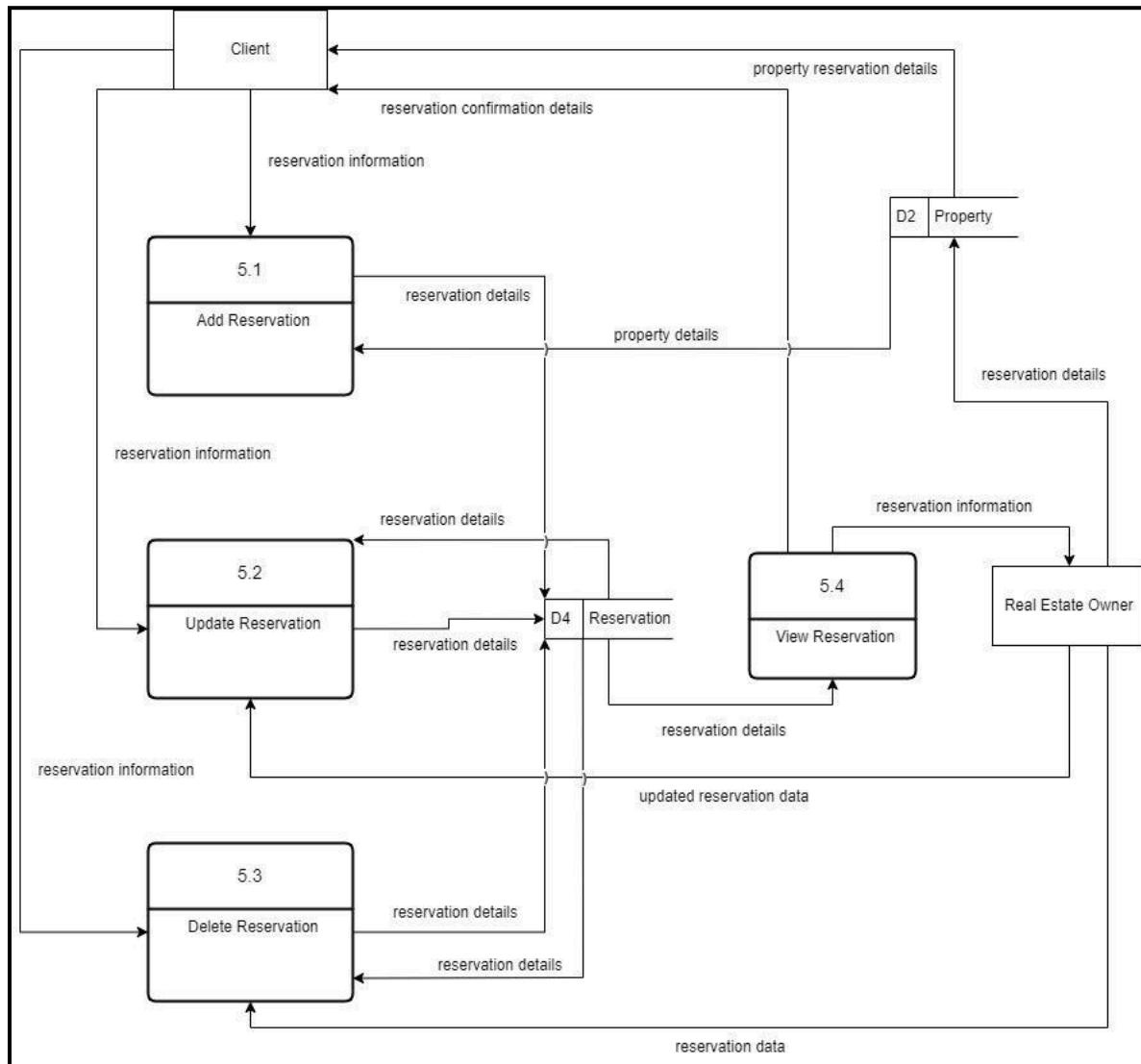


Figure 2.3 Level 1 Data Flow Diagram

In Processes 5.1, 5.2, and 5.3 The client can add, update and delete their reservations on a property and those details will then be stored in the database Reservation then in Process 5.4 The real estate owner will be able to view the reservations and can also update the reservation details to confirm it along with the property database to check if the property available or not.



Entity Relationship Diagram

An Entity Relationship Diagram (ER Diagram) pictorially explains the relationship between entities to be stored in a database. Fundamentally, the ER Diagram is a structural design of the database. It acts as a framework created with specialized symbols for the purpose of defining the relationship between the database entities. ER diagram is created based on three principal components: entities, attributes, and relationships.

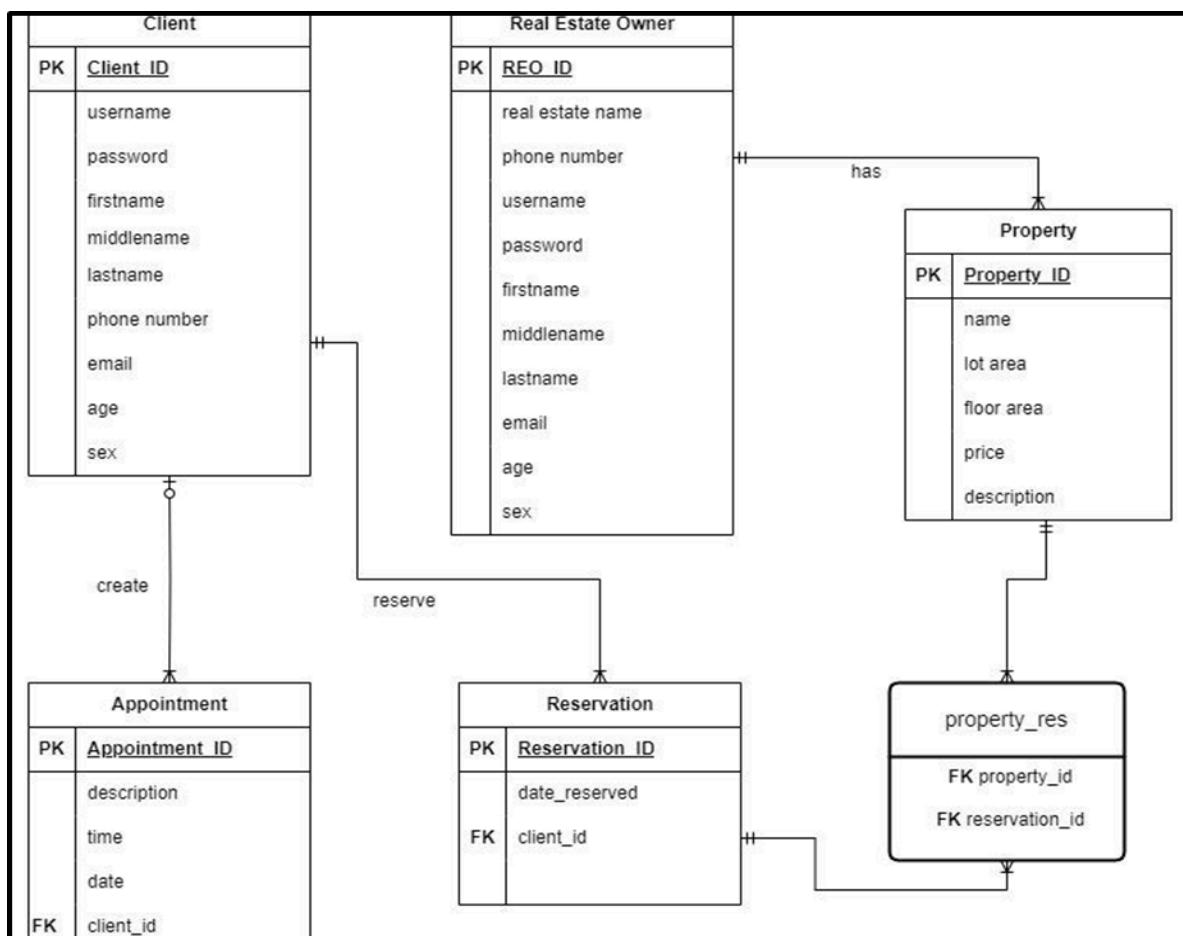


Figure 3. Entity Relationship Diagram



Figure 3 shows the Entity Relationship diagram. There are (5) entities namely, Real Estate Owner, Client, Property, Appointment, and Reservation. The Real Estate Owner manages the property listed on the system. The Client in the system has a property, the client can also create an appointment then sets a date and time in order to go on-site and look at a property. Another, if a client likes a property the client can reserve the property.

Data Gathering Procedures

The researchers will conduct an interview with the individuals or groups that are experts in real estate. These are real estate agents & owners which will provide valuable insights regarding property posting and management. Researchers will also conduct an interview with real estate property owners, this can help understand their perspectives on listing their properties and interacting with real estate professionals. In order to conduct the interview, the researchers will create a questionnaire that real estate brokers, agents, and property owners can utilize to provide information for the creation of a GIS-based real estate listing and property management system. Researchers will make use of the information from the interview in order to develop GIS-based real estate system, in which they test it and evaluate it on real estate owners. Researchers will gather suggestions and procure adjustments from their respondents to further enhance and optimize the system. Respondents are given survey questionnaires that are made to assess the



system's functionalities. The usage of the surveys will be to determine users' feedback and get information on how useful the system can be.

Respondents of the Study

The primary informants in this study are the clients and real estate owners who will be actively involved in providing the necessary requirements and feedback. They will play a crucial role in testing and evaluating the system's performance. Their input will be instrumental in shaping the development and improvement of the system.

Table 1.
Respondents of the Study

Respondents	Frequency	Percentage
Real Estate Owners	5	16.67%
Clients	25	83.33%
Total	30	100%

Testing Procedures

In the conduct of the study, the study will utilize a researcher-designed questionnaire. The formulation of the questionnaire is adapted from the System Usability Scale by Brooke (1986), it may be used to measure a wide range of systems and applications, including digital items such as mobile apps, digital



kiosks, computers, and machines (Will, 2017). An overview of the usability (or lack thereof) of websites, software, hardware, mobile devices, and other technical applications is provided by this model, which is a 10-item Likert scale questionnaire.

Table 2.

System Usability Scale (SUS) Score Interpretation Table

Range of Mean	Descriptive Rating
4.21-5.00	Excellent
3.41-4.20	Good
2.61-3.40	Average
1.81-2.60	Satisfactory
1.00-1.80	Poor

Table 2 shows the SUS Score interpretation table. The interpretation table categorizes the SUS scores into five ranges of mean, each associated with a descriptive rating. If the mean falls between the ranges of 4.21 to 5.00, it is considered to have excellent usability. Users are generally happy with their experience and think the system is very useful. This range shows that the system's usability is highly regarded. The mean range of 3.41 to 4.20 with a descriptive rating of “Good” denotes good usability. Although there are some small areas for improvement, users believe the system to be useful and efficient. All things considered, the system is regarded as user-friendly and largely satisfies users'



expectations. The mean range of 2.61 to 3.40 with a descriptive rating of "Average" is considered to have average usability. Users may find the system acceptable, but there is room for enhancement. The system may have some usability issues or areas where the user experience could be improved. A mean score falling within 1.81 to 2.60 indicates that the system's usability is subpar but still acceptable. It's possible for users to run into serious problems when utilizing the system, so it has to be improved in order to improve user experience overall. A mean score between 1.00 to 1.80 is deemed to have low usability. It is anticipated that users will experience significant discontent with the system. The system needs to be significantly revised and improved in order to increase its effectiveness and usability.



CHAPTER 4

RESULTS AND DISCUSSION

This chapter covers the testing results and discussions including the graphical user interface of the developed system. Each part of the system will be discussed thoroughly in this chapter to have a clearer-understanding of the system and the functions that it offers.

Description of Prototype

The description prototype contains the explanation on how things work on system pages.

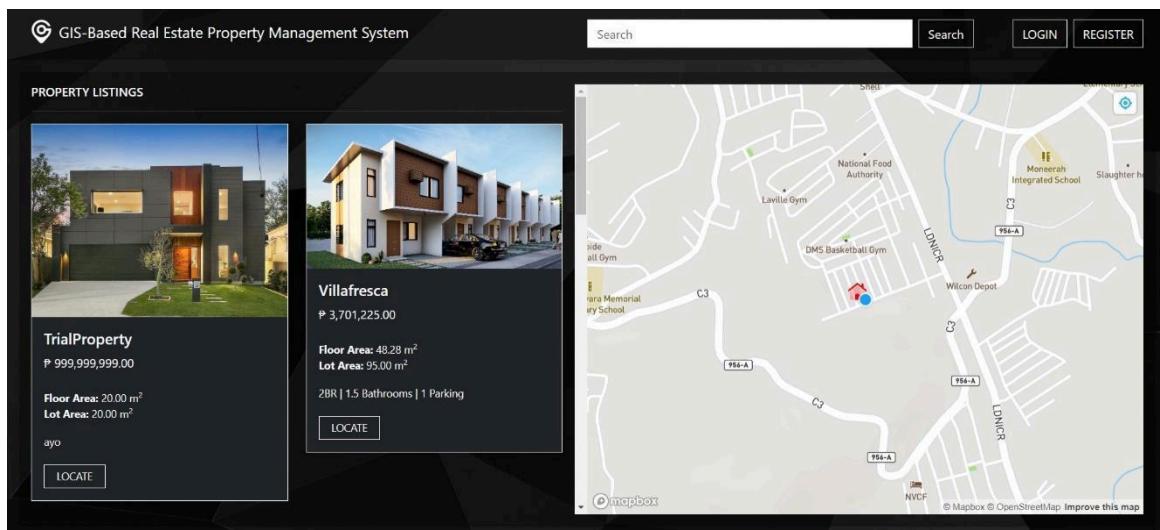


Figure 4.1 Log in Page



This Figure 4.1 shows the Login Interface where Client and Real Estate Owner can log-in using the username and password to use the system can also register the system if a user is new.

The screenshot displays the 'REGISTER' form overlaid on a map of a residential area. The map shows streets like 'Shell', 'LONCR', and 'LONCK', with landmarks such as 'National Food Authority', 'Moneerah Integrated School', and 'Wilson Depot'. A red pin marks a specific location. On the left, there's a sidebar titled 'PROPERTY LISTINGS' featuring a thumbnail of a modern house labeled 'TrialProperty' with a price of ₱ 999,999,999.00, and details about floor and lot area. The main form has fields for Type (Client selected), Name, Username, Password, Confirm Password, Age, Sex, Email, and Contact. Buttons include 'LOCATE' and 'Register'.

Figure 4.2 Client & Real Estate Owner Registration Form

This Figure 4.2 shows the Registration Form for the Real Estate Owner and Client. Each user can fill out the following information needed to have an account into the system.

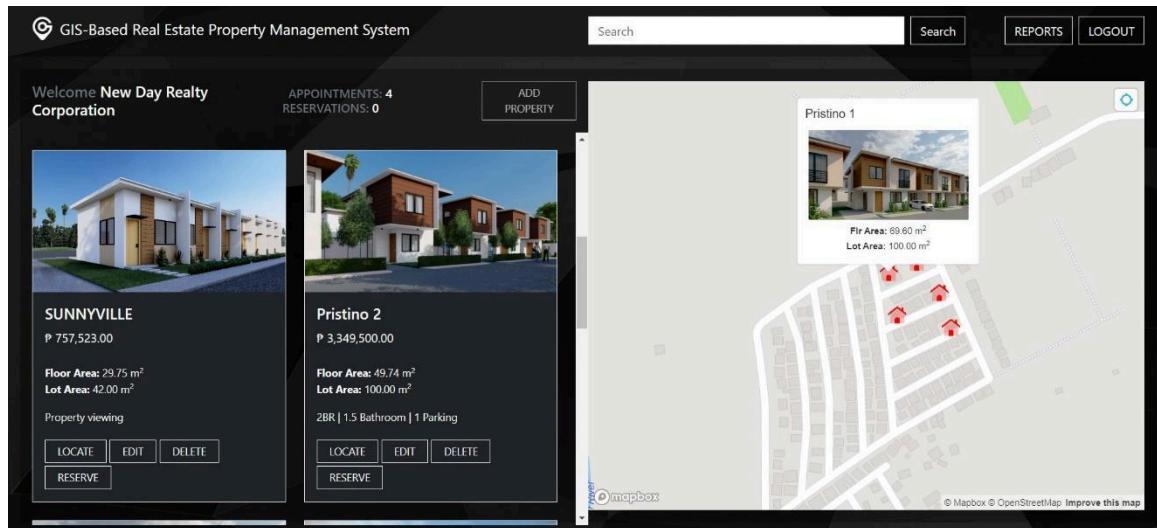


Figure 4.3 Real Estate Owner Dashboard

This Figure 4.3 shows the Dashboard for the Real Estate Owner. Each Real Estate Owner can add property details on the GIS map in the system. Also can edit, locate, and reserve their added properties if a client wants the property.

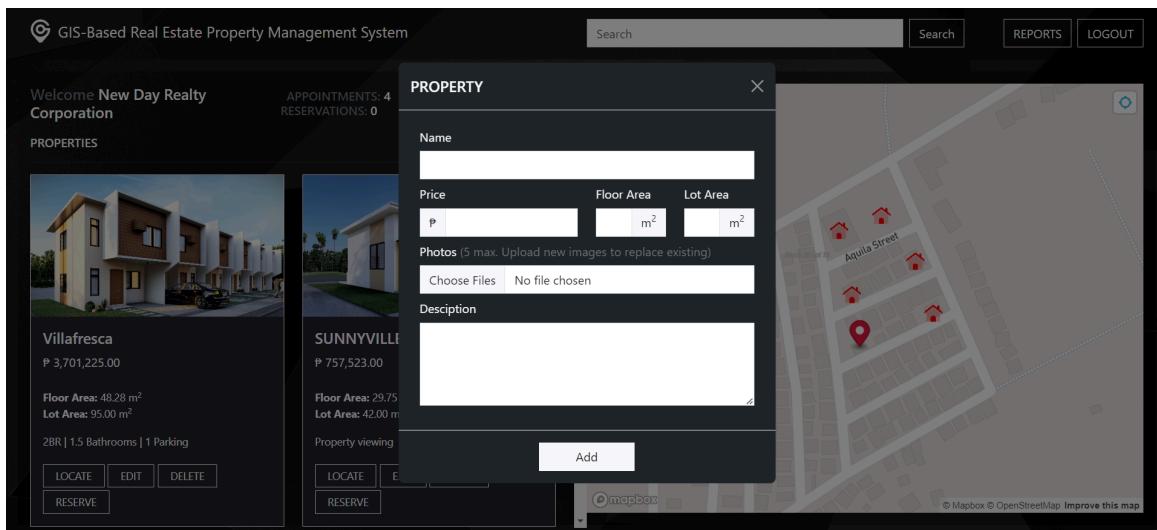


Figure 4.4 REO Property Form



This Figure 4.4 shows the Dashboard for the Real Estate Owner property form. Each Real Estate Owner can add images and property details on the GIS map in the system.

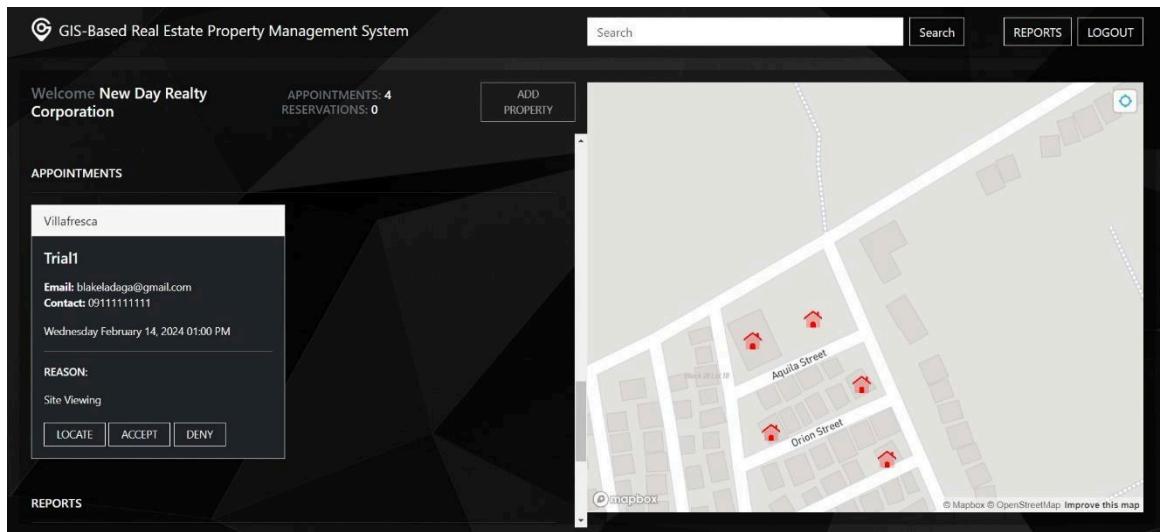


Figure 4.5 REO Appointments

This Figure 4.5 shows the appointments requested by the client, The Real Estate Owner will be able to view all appointments and can locate, accept or deny the property.

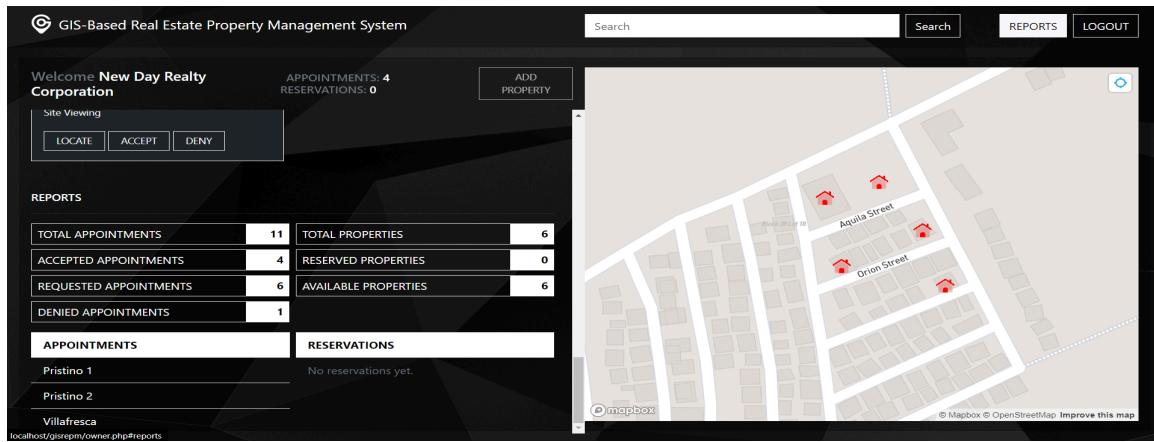


Figure 4.6 REO Reports

This Figure 4.6 shows the total appointments, accepted appointment, requested appointments, and denied appointments in which, you can see once a requested appointment is accepted or denied it will then be added in the report, as for the total properties are the properties that is been added by the Real Estate Owner and it is shown the reserved properties and the available properties.

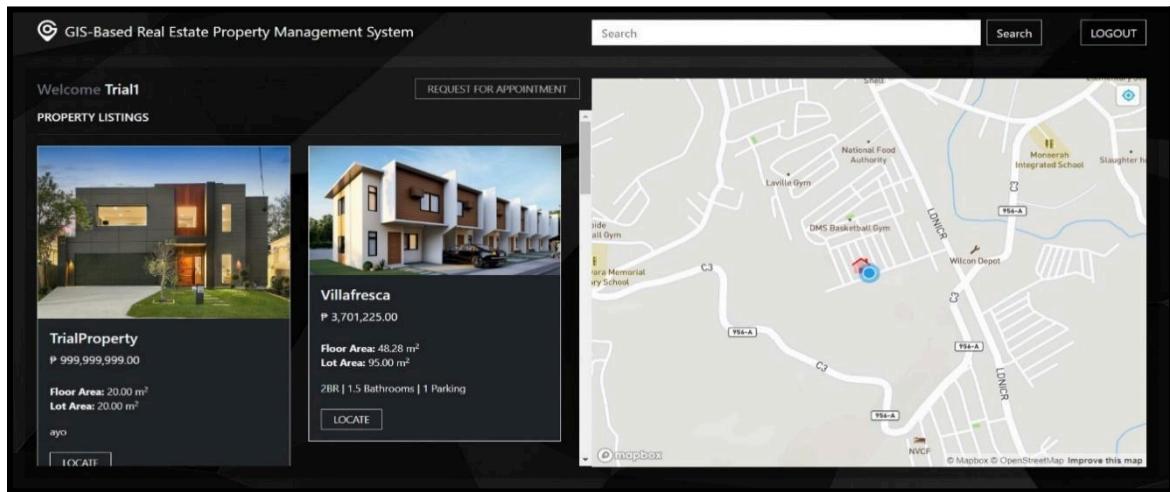


Figure 4.7 Client Dashboard



This Figure 4.7 shows the Dashboard for the Client. The nearest property from where the clients' location will be shown on the property listings. Each client can request an appointment on their selected property on the GIS map in the system.

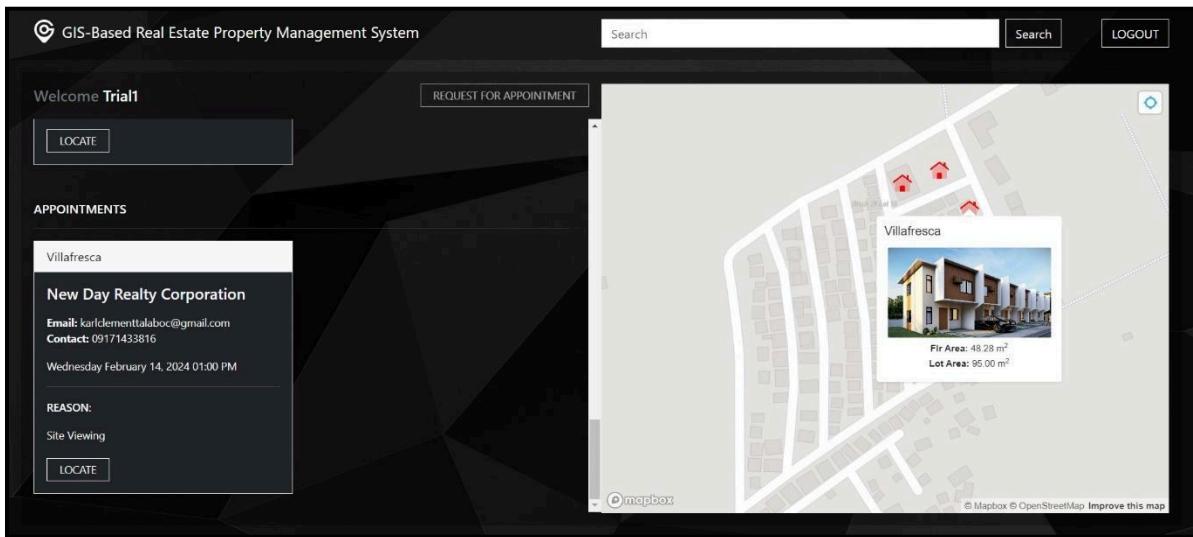


Figure 4.8 Client Appointments

This Figure 4.8 shows the all appointments of the client and its details. The email of the real estate owner and their contact number is shown. The date, time and reason is also indicated in the appointment form.



The screenshot shows a web-based real estate management system. At the top, there is a header with a location icon, the text "GIS-Based Real Estate Property Management System", a search bar, and a "LOGOUT" button. Below the header, a dark sidebar on the left displays "Welcome Trial", a "LOCATE" button, and a section titled "APPOINTMENTS" showing "Villafresca" and "New Day Realty Corporation" with their contact information and a note about a site visit on Wednesday, February 14, 2024, at 01:00 PM. A modal window titled "APPOINTMENT REQUEST" is open in the center. It contains fields for "Date" (set to 2024-02-15), "Time" (set to 02:00 PM), and "Reason of Appointment" (set to "site visiting"). There is also an "Add" button at the bottom right of the modal. In the background, a map of a residential area is visible, showing properties labeled "Villafresca" and "Monticello". One property in Monticello has a thumbnail image and dimensions: "Fir Area: 50.00 m²" and "Lot Area: 50.00 m²". The map includes a copyright notice: "© Mapbox © OpenStreetMap Improve this map".

Figure 4.9 Client Appointment Request Form

This Figure 4.9 shows the client appointment request form, this is where the client will select a property that interests them on the GIS map. The form includes the date and time and the reason of appointment. The added appointment form will then be shown on the clients' appointment category.



System Testing



Figure 4.10 New Day Realty Corporation Head Admin

The NDRC Head Admin is seen in figure 4.10, The proponents demonstrated the system's operations and functionality so that others might learn about the created system.



Figure 4.11 New Day Realty Corporation Head Engr.



The NDRC Head of Engineering is seen in figure 4.11 with their account dashboard shown. Using their computers, accessing and viewing the GIS Map posted real estate properties, as shown in this image.

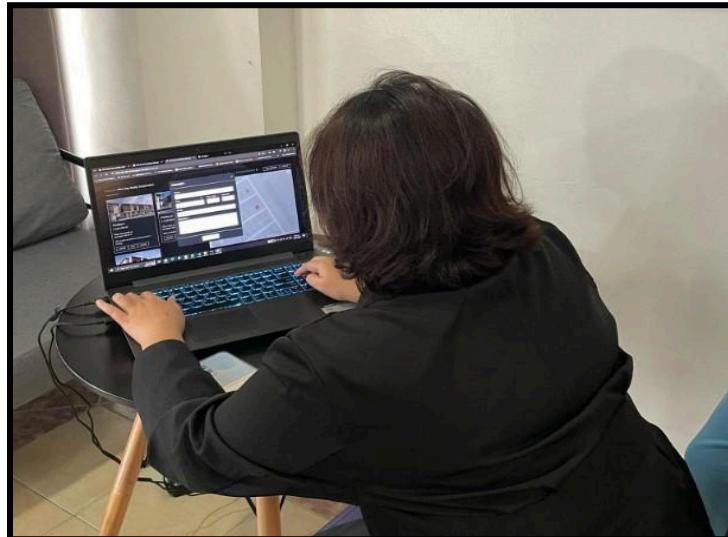


Figure 4.12 New Day Realty Corporation Head of Sales

The NDRC Staff is seen in picture 4.12 testing the interface that was created specifically for them. The office staff is accessing its account and filling up the details to post a real estate property, as shown in this image.

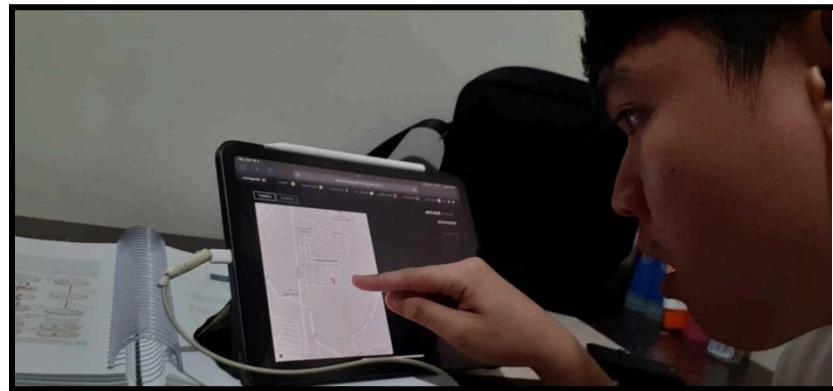


Figure 4.13 Client

A Client is seen in picture 4.13 testing the interface that was created specifically for them. The Client is accessing its account and is selecting a real estate property for reservation and appointment, as shown in this image.

Validating System Usability

A software evaluation procedure was used to measure the extent of perceptions of usability of the developed system. Furthermore, the system is evaluated using a survey questionnaire adapted from the System Usability Scale (SUS) as a tool to measure perceived ease-of-use, system satisfactions and subscales of usability and learnability.



Table 3.

Usability of the Client and REO Satisfaction Survey System

Indicators	Mean
I think that I would like to use this system frequently.	4.80
I found this system unnecessarily complex.	2.47
I thought the system was easy to use.	4.58
I think that I would need the support of a technical person to be able to use this system.	2.23
I found the various functions in this system were well integrated.	4.20
I thought there was too much inconsistency in this system.	2.20
I would imagine that most people would learn to use this system very quickly.	4.33
I found the system very cumbersome to use.	2.63
I felt very confident using the system.	4.83
I needed to learn a lot of things before I could get going with this system.	3.35
Aggregate Mean	4.04

Table 3 shows the usability of the real estate owner and client satisfaction survey system. The first statement "I think that I would like to use this frequently" with a rating of 4.8 expresses a strong desire to use the system frequently, indicating high satisfaction and positive experiences. This is a crucial indicator of user satisfaction and potential long-term engagement. Some users



found the system a bit complex with a mean of 2.47, but overall usability is deemed acceptable. A significant number of users (4.58) generally find the system easy to use, contributing to excellent usability. This suggest that the system's user interface and functionalities are contributing to a positive user experience. Some users would need the support of a technical person to be able to use this system (2.23). Which indicate a moderate need for technical support to which is suggesting potential areas for improvement but not major issues. Users generally felt that various functions in the system were well integrated (4.2). This implies a well-thought-out layout and smooth transitions between various elements. Some users perceive a degree of inconsistency (2.2). This doesn't point to any significant problems, only more space for development in terms of guaranteeing a more consistent user experience. Users believe that the system is easily learnable (4.33). This positive perception suggest a relatively short learning curve for users. A low learning curve is ideal for user acceptability and broad adoption. The eight statement "I found the system very cumbersome to use" with a rating of 2.63 indicate possible inefficiencies in the workflow or architecture of the system. A high degree of confidence (4.83) is shown by users when utilizing the system, which adds to its good usability rating. This favorable opinion suggests that consumers engage with the system with a sense of competence and security. Some users think that they need to learn a lot first before they can use the system (3.35). This suggests that users believe the system to be adequately accessible and



that, although some learning is required, it is not excessive. The aggregate mean of 4.04 for the Client and REO Satisfaction Survey System indicates a generally positive user experience, ranking "Good" on the System Usability Scale showing GIS technology an effective approach not only it helps Real Estate Owners analyze the real estate market this is also significant in helping clients to visualize the property properly providing a clearer picture of a specific property that meets their preferences (Sulochana Shekhar & Kumar, 2023). The result proves that using GIS technology for managing property makes it easier to organize and handle details about the property (Bowlin, 2015). Users that demonstrate significant faith in the system and a willingness to utilize it regularly highlight its user-friendly features, Geographic Information System is definitely the appropriate technology in the field of real estate for it provides location in assessing property suitability (Laban, 2017). However, there is a little perception of a need for technical assistance, and some users find some sections to be a bit contradictory or perplexing. In spite of the systems generally high usability ratings, fixing these specific problems might enhance the overall user experience. Continuous improvements to these components will make it easier to maintain high ratings of the system's usability.



CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents the summary of findings, the conclusions of the study, and recommendations.

Summary of Findings

1. Utilizing Geographic Information System that connects data to a map in order to develop a system called GIS-Based Real Estate and Property Management System. The creation of the said system that permits online property viewing was the study's main objective, and it was successfully completed. Thanks to meticulous design and development, the technology offers users wishing to remotely explore real estate sites a seamless experience. Users indicated a high desire (Mean: 4.8) to use the system often for virtual property tours, pointing to a significant change in the way users of web platforms. Even if a small percentage of users think the system is a little complicated (Mean: 2.47), overall usability is considered satisfactory and in line with the goal of giving customers a convenient substitute for in-person property inspections. The good user involvement with the online viewing portion indicates the system's effectiveness in revolutionizing the conventional real estate discovery process, even though there may be room for improvement in terms of streamlining the



user interface and navigation, thus the online mapping tool will be progressively enhanced and optimized in the future to boost user satisfaction and encourage system acceptance as the preferred method of seeing properties.

2. The second goal focused on creating a system that offers accurate real estate data, and it was effectively completed. Users are guaranteed access to accurate and current information about real estate properties because of the system's big database and strong search features. The system is straightforward to use, according to a sizable portion of users (Mean: 4.58), claiming that it offers precise and user-friendly real estate data. The study's objective of increasing real estate market efficiency is in line with this simplicity of use, since it enables consumers to save a substantial amount of time and effort in their property search. The system meets the goal of delivering accurate and user-friendly real estate information, as indicated by the outstanding usability rating, which also indicates that the system's features and user interface significantly impact the user experience. Maintaining the relevance and dependability of the system will depend on its capacity to adjust and integrate new data sources as the real estate market continues to change. The system's value as a reliable resource in the real estate sector will further increased by regular updates and data quality checks that guarantee users can on the information it provides.



3. Positive outcomes were obtained from the system's testing and evaluation, which satisfies the third goal of helping real estate owners organize and manage their properties. Property management professionals and owners can speed up duties like selling properties, upholding contracts, and providing upkeep by utilizing technology. Users showed a high level of confidence (mean: 4.83) in using the system, indicating that it is successful in supporting property management tasks. While there is a sense of a need for technical help (mean: 2.23) and some inconsistency (mean: 2.2) in particular parts of the system, the overall good user experience indicates that the system successfully contributes to property organization and administration. The preceding chapter reported the results of the system tests as well as the anticipated user interface design. It describes and illustrates a variety of system elements, such as pages related to surveys and the login process. Using a survey questionnaire modified from the System Usability Scale (SUS), a software evaluation technique is used to assess the system's usability.



Conclusion

The developed system called GIS-Based Real Estate and Property Management System delivered its functionalities as an expected result. The system appears to be accurate in locating real estate properties, especially the findings from the Client and REO Satisfaction Survey System highlight a generally positive user experience, with an Aggregate Mean of 4.04 placing it within the "Good" level on the System Usability Scale. Both the Real Estate Owners and their clientele have a favorable opinion on their user experience of the system. However, some users consider certain features of the system as slightly difficult or inconsistent, and there is a high need for technical support. In conclusion, despite the optimistic findings, eliminating usability issues and proactively updating the system in response to user feedback will make it more efficient and user-friendly overall. Sustained user happiness and effective system adoption will necessitate ongoing monitoring and enhancement.



Recommendations

Based on the conclusions drawn, the following are the researchers' recommendations.

1. The researchers recommend including a feature in the system that lets the client view papers pertaining to real estate, such as permits and deeds.
2. The researchers suggest in putting a chat bot feature to the system so that the clients and real estate property owners will be able to talk their transactions and ask specific questions about the property.
3. Cellphones are very hand mobile devices, the researchers recommends developing a unique mobile application for the GIS-based Real Estate and Property Management System. The mobile application will make the system accessible, giving it an edge thus allowing people to engage with the system with ease.
4. In real estate transactions and details are very sensitive data by nature, therefore it is recommended that a tight data security measures must be implemented throughout the entire system. Consistent security protocols are a must, to protect the property owners and client data.



REFERENCES

- Araloyin, F.M. (2021). *A Study of Consumers' Complaints against Real Estate Agents in Lagos Metropolis.* (n.d.). Semantics Scholar. Retrieved January 28, 2024, from <https://pdfs.semanticscholar.org/f36d/060109efa8b8f8dae77f7763fa31fc5cab94.pdf>
- Ahmed, A. M., Alez, R. H. A., & Babu, B. (2015). Internet-Based Geographical Information Systems for the Real Estate Marketing. *IOSR Journal of Computer Engineering (IOSR-JCE)*, 17(2), 51-55.
- Ahmed, K. J. (2021). Uses and Applications of Geographic Information Systems. *Saudi Journal of Civil Engineering*, 5(2), 18-25. <https://doi.org/10.36348/sjce.2021.v05i02.001>
- Balaji, L., & Muthiah Muthukannan. (2020, December 3). *Land use Land cover studies and its effects on Valuation using GIS Techniques in Madurai Town Planning...* ResearchGate; IOP Publishing. https://www.researchgate.net/publication/347465147_Land_use_Land_cover_studies_and_its_effects_on_Valuation_using_GIS_Techniques_in_Madurai_Town_Planning_Area_Tamilnadu_India
- Baros, T. (2018). *The Application of the Web Based System by Integrating Web GIS Tools and The SDI for The Real Estate Management and Mapping.* International conference on Contemporary Theory and Practice in Construction / Међународна конференција Савремена теорија и пракса у градитељству, 13, Article 13. <https://doi.org/10.7251/STP1813805B>
- Bowlin, E. (2015). Digital Commons @ DU Digital Commons @ DU Geography and the Environment: Graduate Student Capstones Geography and the Environment Utilizing Web-Based GIS Applications for Spatial Analysis of Real Estate Appraisal Data Estate Appraisal Data. <https://doi.org/10.56902/ETDCRP.2015.2>
- City Profile. (2022). <https://www.iligan.gov.ph/knowiligan/cityprofile?1807583460>
- Gallenero, R. C., Flores, J. M., Gundran, R. M., Rosario, J. V., Ubaldo, G. F., Solomo, M. V. S., Fernando-Raguro, Ma. C., & Lagman, A. C. (2022). *Occupy – Real-Estate Management System with Sales Analysis Customer Segmentation.* 2022 IEEE 14th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and



Control, Environment, and Management (HNICEM), 1-5.
<https://doi.org/10.1109/HNICEM57413.2022.10109621>

Giurgiu, H.V., Prostean, G., Diaconescu, A. (2020). *Software Application Development for Real Estate Activities.* file:///C:/Users/my%20hp/Downloads/Software_application_development_for_real_estate_a.pdf

Lumina Homes (n.d.). *Importance of Technology for Real Estate Developers.* Retrieved July 3, 2023, from <https://www.lumina.com.ph/news-and-blogs/blogs/importance-of-technology-for-real-estate-developers/>

Kvartalnyi, N. (2022, July 28). *GIS in Real Estate: Benefits for Property Industry* | Inoxoft. <https://inoxoft.com/blog/how-to-get-benefits-with-applying-gis-technologies-in-real-estate-industry/>

Laban, K. N. (2017). *Integrating Gis and Real Estate Management Systems to Market and Manage Facilities on the Web.*

Paul, A., Mal, P., Gulgulia, P. K., Srivastava, Y. K., & Chowdary, V. M. (2019). *Spatial progression of estate property management system with customized freeware GIS.* *International Journal of Information Technology*, 11(2), 341–344. <https://doi.org/10.1007/s41870-018-0135-y>

Palm, P. (2013), "Strategies in real estate management: two strategic pathways", *Property Management*, Vol. 31 No. 4, pp. 311-325. <https://doi.org/10.1108/PM-10-2012-0034>

Rohde, J. (n.d.). *What are the four types of real estate?* Retrieved July 11, 2023, from <https://learn.roofstock.com/blog/4-types-of-real-estate>

Sulochana Shekhar, & Kumar, D. (2023). *Geoinformatics for Sustainable Urban Development.* CRC Press. <https://www.taylorfrancis.com/books/edit/10.1201/9781003331001/geoinformatics-sustainable-urban-development-sulochana-shekhar-dee-pak-kumar>



Will, T. (2017, May 31). *Measuring and Interpreting System Usability Scale (SUS)*.
UIUX Trend.
<https://uiuxtrend.com/measuring-system-usability-scale-sus/>

Xue, C., Ju, Y., Li, S., & Liu, Q. (2020, August 10). *Research on Accurate House Price Analysis by Using GIS Technology and Transport Accessibility: A Case...*
ResearchGate; MDPI.

Appendix A. Gantt Chart





Appendix B. Permission Letter



St. Michael's College of Iligan, Inc.
Iligan City, 9200 Philippines
College of Computer Studies



January 8, 2024

Karl Clement M. Talaboc
Head of Engineering
New Day Realty Corporation
GF Celadon Bldg., Ubaldo Laya Avenue, Palao, Iligan City

Dear Sir,

Praised be Jesus and Mary! We hope you are doing well.

We, the College of Computer Studies students taking Bachelor of Science in Information Technology (BSIT) at St. Michael's College, are currently conducting a capstone project entitled "**GIS-Based Real Estate and Property Management System**". This project will be considered a research collaboration with NDRC. Using geographic information system, a branch of technical geography, this project will analyze feedback from customers and determine whether it is negative or positive.

We intend to deliver a presentation showcasing the testing phase of our capstone project to you. Please let us know your availability, and we will make the necessary arrangements accordingly.

Your consideration of this humble request will be highly appreciated. Rest assured that all information that will be gathered will be treated with strict confidentiality. Should you have further concerns and clarifications, please let us know through our emails: jn.ladaga@my.smciligan.edu.ph or jm.rafe@my.smciligan.edu.ph.

Thank you very much.

Sincerely,

Jo Nian F. Ladaga
Researcher

Jan Michael A. Rafe
Researcher

Noted by:

Jerome O. Abilay, MSIT
Research Adviser

Edsel B. Monterola, Ph.D.
CCS Dean



Appendix C. Presentation of Prototype





Appendix D. System Usability Scale (SUS) Questionnaire

System Usability Scale

© Digital Equipment Corporation, 1986.

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

Strongly disagree					Strongly agree
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	
<input type="text"/>					
1	2	3	4	5	



Appendix E. Certificate of Similarity





Curriculum Vitae

Ladaga, Jo Nian T.

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PERSONAL INFORMATION

Date of Birth: September 23, 2001

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Father's Name: Ireneo A. Ladaga

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EDUCATIONAL BACKGROUND

- Tertiary

Bachelor of Science in Information Technology
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- Senior High

Corpus Christi Parochial School
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- Secondary

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- Elementary

F. Margaret Ann Learning Center Inc.
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SPECIAL SKILLS

- Basic knowledge in Programming Language (JavaScript, HTML, PHP)
 - Basic knowledge in website developing using WordPress
 - Basic knowledge in networking
 - Basic knowledge in cordova mobile app development
-

SEMINAR ATTENDED

- Adobe Illustrator Essentials: Navigating The Basics For Beginners – Sept 23, 2023
- Iligan ICT Fair 2022: Startup Ecosystem, Why Branding is Important to Business, Social Media Management, and Build Websites with No Codes – October 22, 2022
- Optimization Technique Prediction Model Through Modified Crossover Operator - October 27, 2023



Curriculum Vitae

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PERSONAL INFORMATION

Date of Birth:	January 22, 1998
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Sex:	Male
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Religion:	Roman Catholic
Language:	Filipino, Cebuano, English
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Mother's Name:	Mercedita A. Rafe

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- Secondary

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Mahayahay, Iligan City

S.Y. 2010-2014

- Elementary

Abuno Elementary School

Abuno, Iligan City

S.Y. 2004-2010

SPECIAL SKILLS

- Basic knowledge in Programming Language (JavaScript, HTML, PHP)
 - Basic knowledge in website developing using WordPress
 - Basic knowledge in networking
 - Basic knowledge in cordova mobile app development
-

SEMINAR ATTENDED

- CHED Consultative Session with the Industry during IBPAP-PSIA Tour de Tech(Mindanao Regions): The Information Technology and Software Roadshow Initiative- November 14, 2023
- Optimization Technique Prediction Model Trough Modified Crossover Operator- October 27, 2023
- Adobe Illustrator Essentials: Navigation the Basics for Beginners- September 23, 2023