DEVELOPMENT OF AN INFORMATION SYSTEM FOR EFFICIENT RECORD MANAGEMENT AT KARLAVILLE PARKHOMES PHASE 1 – BRGY. HUGO PEREZ, TRECE MARTIRES CITY, CAVITE

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ABSTRACT

Information systems play a crucial role in enhancing community-level operations by improving the efficiency and accessibility of data. The study aimed to revolutionize the monitoring of monthly dues at Karlaville Parkhomes Phase 1 through the development of a web-based information system, providing precise and timely information essential for streamlined operations. Evaluation results indicated excellent and very good ratings across all assessed criteria. Based on the ISO 25010 standards, this means the system excels in functionality, suitability, performance efficiency, reliability, and security. Specifically, the system effectively meets user requirements, operates efficiently under expected conditions, maintains consistent performance without failures, and ensures data protection and secure access. These high ratings affirm the system's alignment with user needs and objectives, demonstrating its effectiveness and reliability in practical applications. The target beneficiaries are encouraged to adopt the web-based information system to enhance their monthly dues monitoring and overall community management. By utilizing this system, homeowners, officers, and guests can experience improved efficiency, reliability, and security in their operations. Regular training sessions to maximize the system's benefits and ensure seamless integration into daily activities and adoption of this innovative solution to streamline processes and elevate the standard of community management is recommended

Keywords: *agile method, development research, homeowners, information system*

INTRODUCTION

Information systems (IS) have become essential tools worldwide, enabling organizations to streamline operations, enhance decision-making, and improve service delivery. Nationally, the adoption of IS has transformed various sectors, including healthcare and finance, driving efficiency and fostering innovation. At the regional level, communities have increasingly leveraged IS to address local challenges, ensuring more effective resource management and service provision.

Karlaville Parkhomes Phase 1, located in Barangay Hugo Perez, Trece Martires City, Cavite, is a spacious residential subdivision where families can purchase homes through the PAG-IBIG Fund. Although the barangay distributes funds among the various Hugo Perez subdivisions, it faces challenges in meeting the demands of each subdivision. To improve the safety and well-being of its residents, the Karlaville community established a Homeowners Association (HOA), with appointed officers responsible for collecting monthly dues. These dues are essential for funding projects and events within the subdivision. Chen (2021) explains that HOA fees are monthly contributions required by homeowners' associations, typically used for property maintenance and enhancements. While condominium owners are commonly required to pay HOA fees, some single-family homeowners in subdivisions may also be subject to these fees. The study by Johnson (2021) highlights the critical role of accurate fee collection and record-keeping in the financial management of homeowners' associations. Johnson emphasizes the importance of implementing effective systems to

streamline fee collection processes, ensuring that every payment is properly recorded. This not only enhances financial transparency but also contributes to the community's overall well-being, as these fees are vital for funding various community projects and improvements.

However, issues with record-keeping have arisen. Residents have complained of paying their dues, only to find no record of their payments, making it difficult for the assigned officer to maintain accurate records. The records are disorganized due to unpaid dues from previous years, complicating the retrieval of essential information.
Implementing a digital system could significantly improve record-keeping, enhance security, and reduce the risk of lost files. With the appropriate backup systems in place, administrators can ensure the secure storage of resident data and facilitate quick data recovery in the event of data loss. Therefore, subdivision authorities must recognize the limitations of manual record-keeping and seek solutions that improve the efficiency and effectiveness of community management. The objective of this study is to develop an IS for Karlaville Parkhomes Phase 1 that will simplify the monthly fee encoding process and improve data retrieval. This system aims to address the current record-keeping issues, ensuring accurate, secure, and easily accessible records, ultimately enhancing the overall management and transparency of the homeowners' association.

METHODOLOGY

Requirement Analysis

The requirement analysis for the project began with consultations with the primary stakeholders—the officers and homeowners of Karlaville Parkhomes. The system was developed for Karlaville Parkhomes Phase 1, located in Brgy. Hugo Perez, Trece Martires City, Cavite, during the academic year 2022 -2023. PHP, Bootstrap, JavaScript, CSS, HTML, and MySQL were utilized as the core technologies for building the system.

At the time of the analysis, homeowners' officers manually managed the records of monthly dues transactions. A village officer in charge recorded payment details in a logbook after collecting personal data from homeowners responsible for the dues. This logbook contained records for approximately 900 homeowners. The manual process was identified as inefficient, error-prone, and time-consuming, prompting the need for an automated system to improve record-keeping and streamline the management of monthly dues.

Requirement Documentation

In contrast to the existing manual record-keeping system, the newly developed information system offers a far more efficient solution for managing homeowners' information and monthly fees. The previous method, which relied on a logbook for handwritten records, was replaced by a web-based platform. This platform facilitates the automated encoding and retrieval of transaction data, ensuring more efficient record management. It also provides secure storage for the data, allowing both homeowners and officers to easily retrieve necessary information.

Functional Requirements

The information system for Karlaville Parkhomes Phase 1 consists of several modules, each designed to address specific requirements for system users. The following outlines the modules that were developed and implemented:

Account Module. This module requires users to log in with a username and password. Full system privileges were granted only to the administrator. Officers, such as the HOA president and the officer responsible for managing monthly dues, can view and update records, track paid and unpaid homeowners, and generate statistical reports in Excel format. Homeowners have exclusive access to their payment history and personal information, while guests are restricted to viewing only the public -facing interface for inquiries.

Homeowner Module. Homeowners can view their transaction history and pending dues. Once an officer updated the payment records, the system automatically sent payment details to the homeowner's registered Gmail account, along with a link to their personal interface. Here, homeowners

could review all past and pending transactions.

Guest Module. This module allowed non-residents to access basic subdivision information. It restricts account creation and detailed access to official residents only, ensuring privacy and security for users.

Officer Module. Officers, such as secretaries and treasurers, are granted limited access to information. While they can view necessary records, they are not allowed to update or alter any data, ensuring that only authorized users can modify the system's information.

Non-Functional Requirements
Software Design

The design of the system focused on ensuring ease of use, security, and efficiency. A context diagram was created to map out the components of the system, with particular attention to the user experience for both officers and homeowners. The stakeholders of the system included subdivision management, residents, and external funding sources. The design aimed to satisfy the critical needs of officers by prioritizing the accurate tracking and management of homeowner payments. The information component of the system provided real-time updates on payments and outstanding balances, making it easier for officers to track and manage homeowner transactions. This was a key feature of the system, as it ensured that the officers could oversee all records effectively.

The payment component, while important for homeowners, was less critical for officers. It primarily focused on enabling homeowners to make and track their payments in a streamlined and efficient manner.

Figure 1 provides a clear visual representation of the system's architecture, highlighting the importance of the information component for officers and the payment component's role in ensuring smooth monthly dues management for homeowners.

This system will streamline the process and ensure

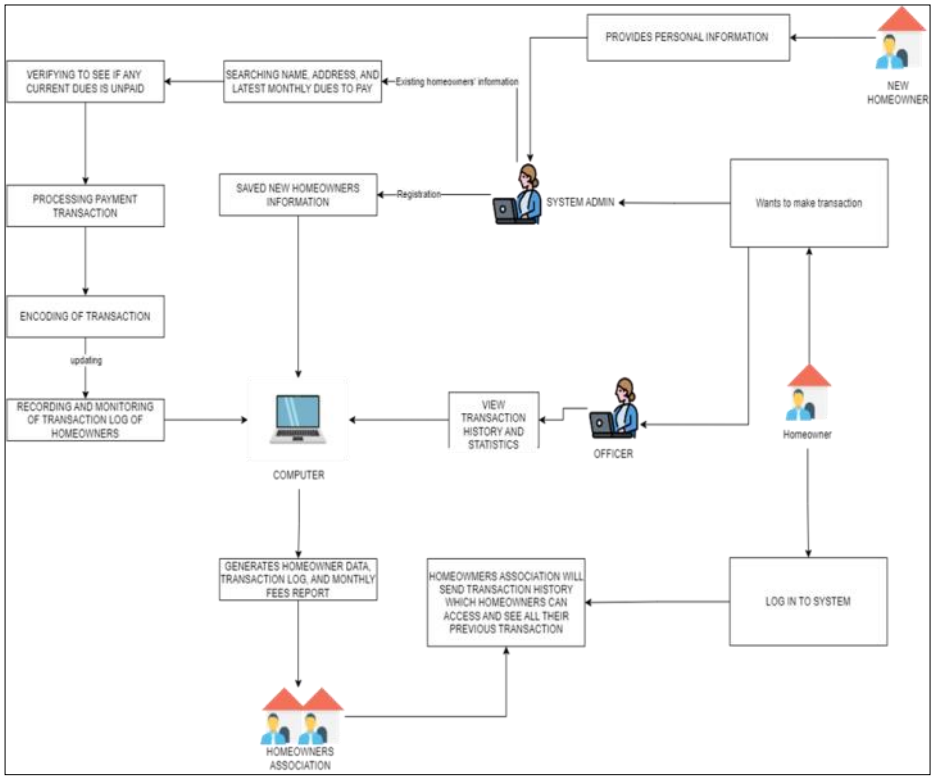

Figure 1. System architecture of an information system in Karlaville Parkhomes Phase 1, Trece Martires City, Cavite

that all data remains accurate through the use of an information system. Once the names of the homeowners residing in Karlaville Parkhomes Phase 1 are registered, they will be able to easily search for a unit owner or the most recent resident when collecting contributions for monthly dues. Homeowners simply need to enter the name into the search bar, and the system will automatically display the relevant results, showing the months for which payments have been made. In case residents have any questions or concerns about their payments, the system will provide a complete history of all recent transactions. The transaction history will automatically update once a payment is made, ensuring that the information remains current and accurate.

The development of the Information System for Karlaville Parkhomes Phase 1 followed an Agile methodology, which emphasized flexibility, collaboration, and responsiveness to user needs throughout the project lifecycle (Kumar & Bhatia, 2012). This approach was essential in adapting to evolving requirements and ensuring the system met the practical needs of both homeowners and officers.

Requirement Definition

The process began with the requirement definition phase, where the goals, objectives, and necessary features of the system were established. The researchers worked closely with the officers and homeowners of Karlaville Parkhomes Phase 1 to identify key beneficiaries and gather input on system needs. The project timeline and budget were also defined at this stage, ensuring that the development process was structured and aligned with the available resources.

Prioritizing features was a key focus of the Agile process. A list of user stories and features was created, reflecting the most critical functionalities needed for the system. This list was continuously updated as new requirements emerged, ensuring that development remained aligned with user priorities and real-world needs.

Development and Planning Phases

The project was divided into development cycles, each lasting between two to four weeks. During each cycle, the development team held planning sessions to decide on specific tasks and user stories to focus on. The goal of each cycle was to produce a working increment of the system that could be tested, reviewed, and improved.

Key actions in the development cycle included:

Feature Development: The development team focused on coding and integrating new features as defined in the user stories. These features were designed to address the pain points identified during the requirement definition phase, such as automating payment tracking and improving record management for homeowners and officers.

Testing: After each development cycle, the system underwent rigorous testing. This included tests for system functionality, scalability, usability, and performance. The system was tested on personal computers and laptops to ensure cross-platform compatibility. Any issues discovered during the testing phase were logged and addressed in subsequent cycles.

Iterative Approach and Deployment

Following the completion of each development cycle, the system entered the deployment phase. During this phase, the system was deployed for real-world use, and feedback was actively gathered from users, including HOA officers and homeowners. This feedback was essential for understanding the real-world performance of the system and for identifying areas of improvement.

The review and release phase followed the initial deployment. The system was continuously evaluated and improved based on user feedback, with new features, upgrades, and bug fixes being introduced in subsequent development cycles. The iterative nature of the Agile methodology allowed for rapid adjustments and continuous improvements, ensuring that the system remained responsive to users' needs.

In contrast to the limitations of the traditional waterfall model, this iterative approach enabled prompt issue resolution, feature enhancements, and

system refinements. The team used regular retrospectives to assess the development process, identify challenges, and determine areas for improvement in future cycles.

Data Analysis Plan

The data collection process focused on evaluating the effectiveness of the system in addressing the challenges faced by HOA officers in managing monthly dues. A survey questionnaire was used as the primary instrument for gathering feedback from the HOA officers.

Study Population. The researchers selected four HOA officers, responsible for monitoring monthly dues, as the study participants. These officers were chosen through random sampling, ensuring unbiased selection and adequate representation of the target population. This sample size was deemed appropriate, given the small number of officers involved.

Survey Design. The questionnaire consisted of three main sections:

Challenges. Identifying the problems faced by officers when collecting and managing monthly dues.

Resident Information. Gathering demographic data on the number of homeowners and their payment patterns.

System Evaluation. The ISO 25010 evaluation form was used by the researchers to assess the system. This standard includes the following requirements: functional suitability, performance efficiency, usability, reliability, and security. The system evaluation comprised of two parts: technical and non-technical.

The system was evaluated by 105 respondents, consisting of ten (10) IT professionals, fifteen (15) homeowner officers, and eighty (80) residents of Karlaville Parkhomes Phase 1. The participants assessed the system using a numerical rating scale ranging from 1 to 5. A rating of 5 represents excellence, indicating that the system fully meets and significantly surpasses most expectations. A rating of 4 corresponds to "very good," signifying that the system fully meets all expectations and exceeds several of them. A rating of 3 is considered "good," meaning the system fully meets all expectations. A rating of 2 suggests "fair," implying the system does not fully meet all expectations. Lastly, a rating of 1 signifies "poor," indicating the system fails to meet expectations to a significant extent in multiple areas.

To determine the overall assessment, the researchers calculated the mean score for each question and compared it to specific weighted mean values. A score between 4.51 and 5.00 indicates excellence, signifying the system exceeds most expectations. A score between 3.51 and 4.50 is considered very good, meeting or surpassing all expectations. A score between 2.51 and 3.50 is good, fully satisfying the requirements. A score between 1.51 and 2.50 is fair, not entirely meeting all expectations, and a score of 1.50 or lower is poor, falling short in multiple areas.

Data Analysis

The data obtained from the system evaluation questionnaire were analyzed using descriptive statistics, including sample mean and sample standard deviation, to calculate average scores and assess the variability of the responses.

Frequency counts and percentage distributions were calculated to analyze the demographic data and understand the distribution of responses from the officers.

The results of the data analysis provided a comprehensive view of the system's effectiveness in addressing the officers' challenges with traditional record-keeping. The feedback also highlighted areas for further system improvement, such as the introduction of additional features and the refinement of existing functionalities.

The system underwent continuous updates based on the feedback obtained from both the testing phases and post-deployment reviews. Each development cycle involved an evaluation of the newly implemented features and the integration of user feedback, ensuring that the system was continuously optimized and refined. This iterative development approach facilitated consistent progress and allowed

the team to respond effectively to emerging needs and changing requirements.

RESULTS

System Development

Design of the System

The design of the proposed information system for Karlaville Parkhomes Phase 1 was carefully developed to address the identified problems and meet the stakeholders' needs effectively. The design prototype included a user-friendly interface with intuitive navigation, ensuring ease of use for both officers and homeowners. Flowcharts were used to depict the system's workflow, outlining the processes involved in data encoding, record retrieval, and report generation. Additionally, diagrams illustrated the database structure and the relationships between different modules within the system. This comprehensive design ensured that the system was organized, efficient, and capable of fulfilling its intended purpose.

Development of the Information System

Selective screenshots of the developed information system are provided to showcase the progress made during the development phase. These screenshots highlight key modules such as the Account Module, Homeowner Module, Guest Module, and Officer Module, each designed to fulfill specific functions within the system. These modules demonstrate the integration of HTML, PHP, Bootstrap, CSS, and MySQL, resulting in a robust and user-friendly platform. The development process focused on implementing features that streamlined data encoding, record management, and information retrieval, ensuring accuracy and efficiency in managing monthly dues.

Test Cases of the Developed Information System

The testing phase involved executing test cases to evaluate the functionality and performance of the developed information system. Test cases were conducted for each module, including the Account Module, Homeowner Module, Guest Module, and Officer Module. These test cases aimed to verify various functionalities such as user authentication, data display, form submission, and navigation. While some test cases yielded successful results, others identified areas for improvement, such as authentication failures and display errors. Overall, the testing process provided valuable insights for refining the system and ensuring its effectiveness and accuracy in addressing the stakeholders' needs.

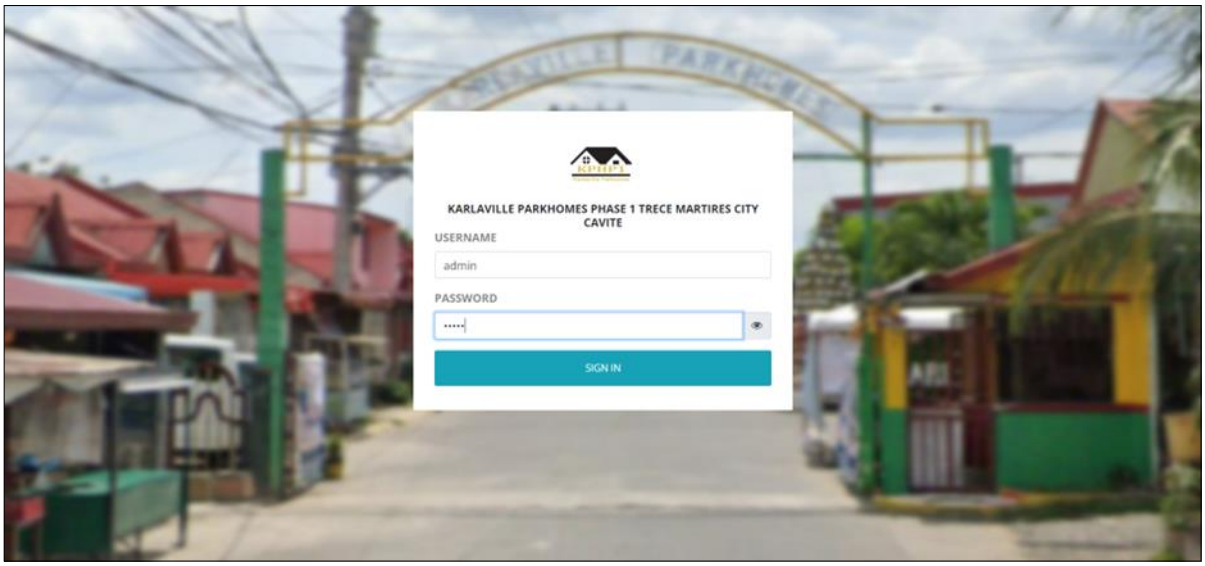

Figure 2. Login page

System Overview

The Information System for Karlaville Parkhomes Phase 1 is a web-based system designed to provide efficient data encoding and record retrieval for organizing and managing homeowners' information. The system was developed to improve the accuracy and efficiency of managing monthly dues, offering a streamlined process for both officers and residents.

Figure 2 shows the login page of the system, where the system administrator (admin officer) and homeowner officer can log in to their respective accounts.

Figure 3 shows the Admin Management (or Account Management) page, where only administrators have the privilege to add accounts, regardless of whether the role is designated for officers or administrators

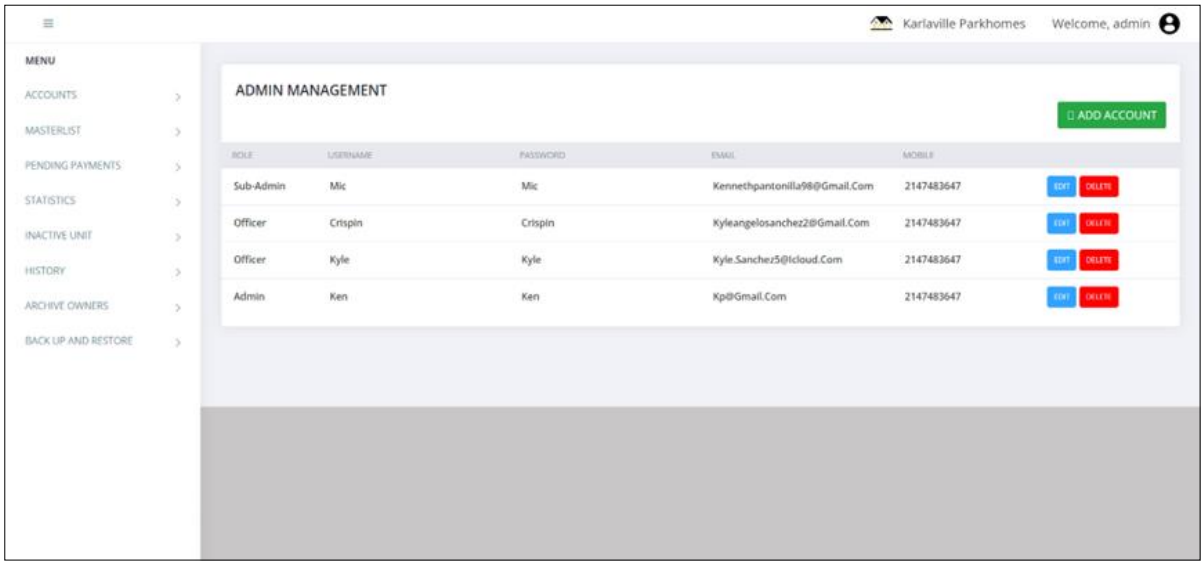

Figure 3. Admin management page

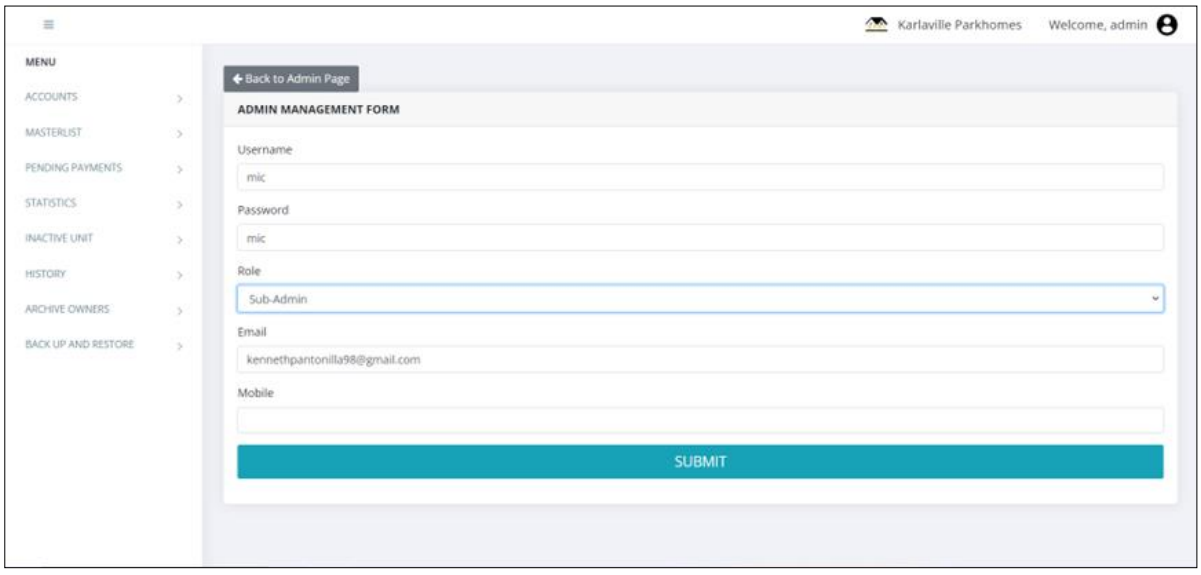

Figure 4. Admin management page

within the system. Additionally, Figure 4 displays the current access level assigned to each account, providing a clear overview of their permissions.

Figure 5 is accessible only to the System Administrator and displays all records of homeowners, including their names, addresses, latest payments, amounts, and statuses. Administrators and officers can easily mark homeowners as inactive using a dedicated button.

Figure 6 shows the List of Pending Payment Page, which is accessible to both system administrators and homeowners' officers. This page lists homeowners with outstanding and unsettled payments, making it easy to track and manage them within the system.

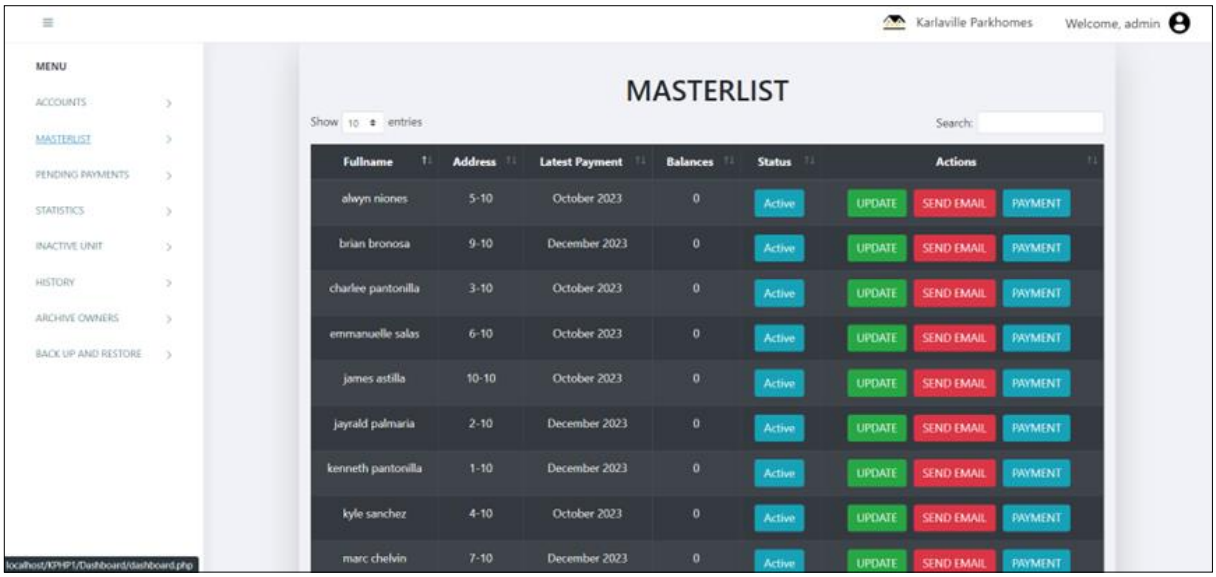

Figure 5. Masterlist page

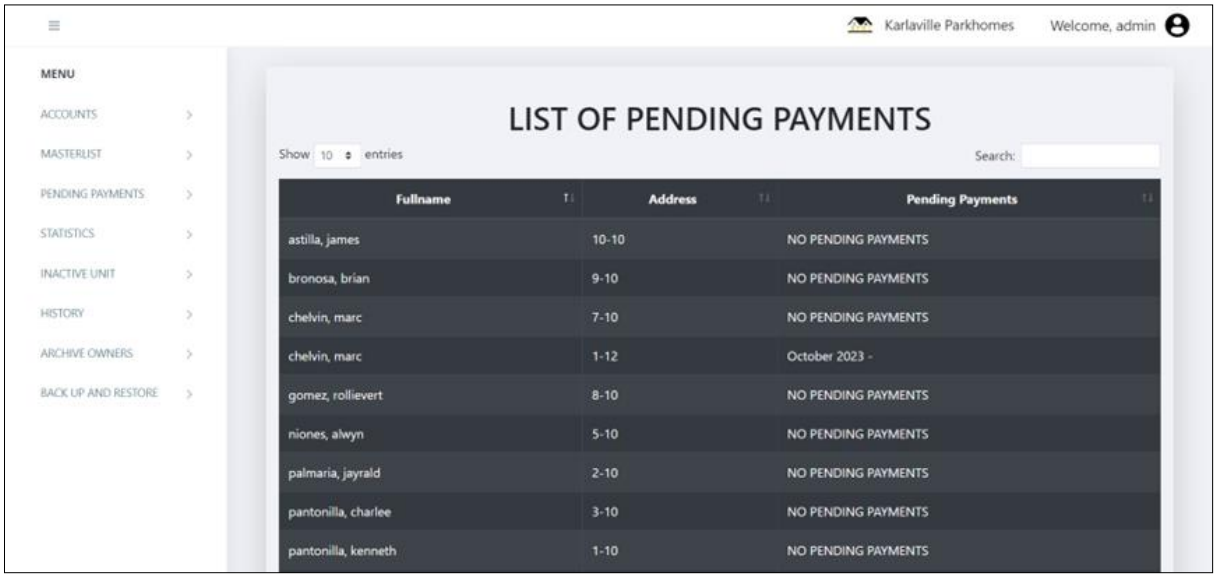

Figure 6. List of pending payment page

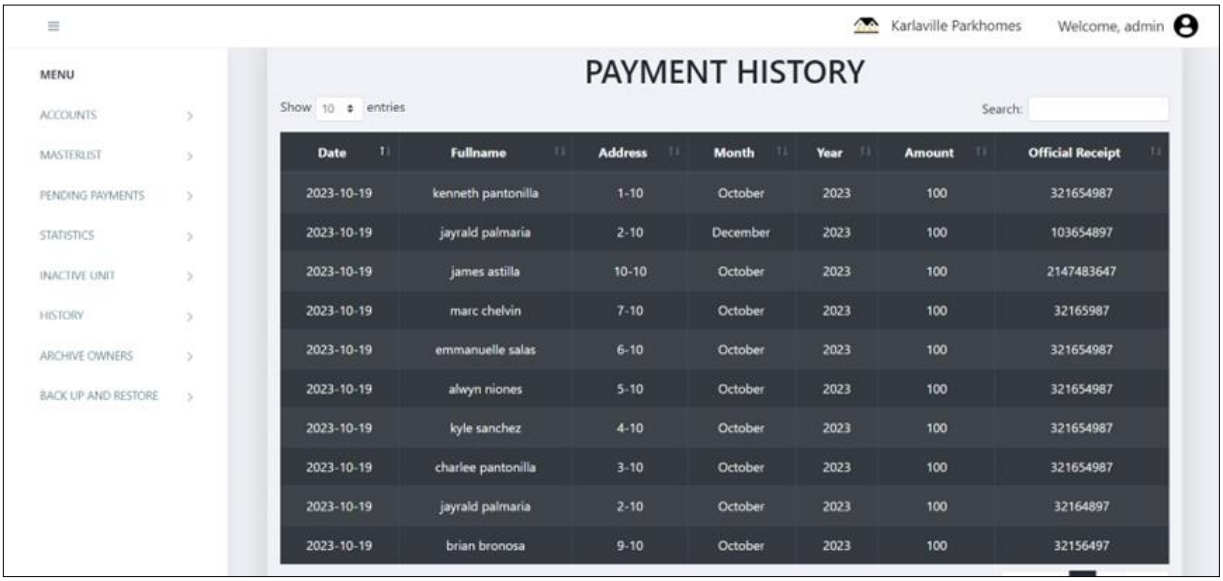

Figure 7. Payment history page

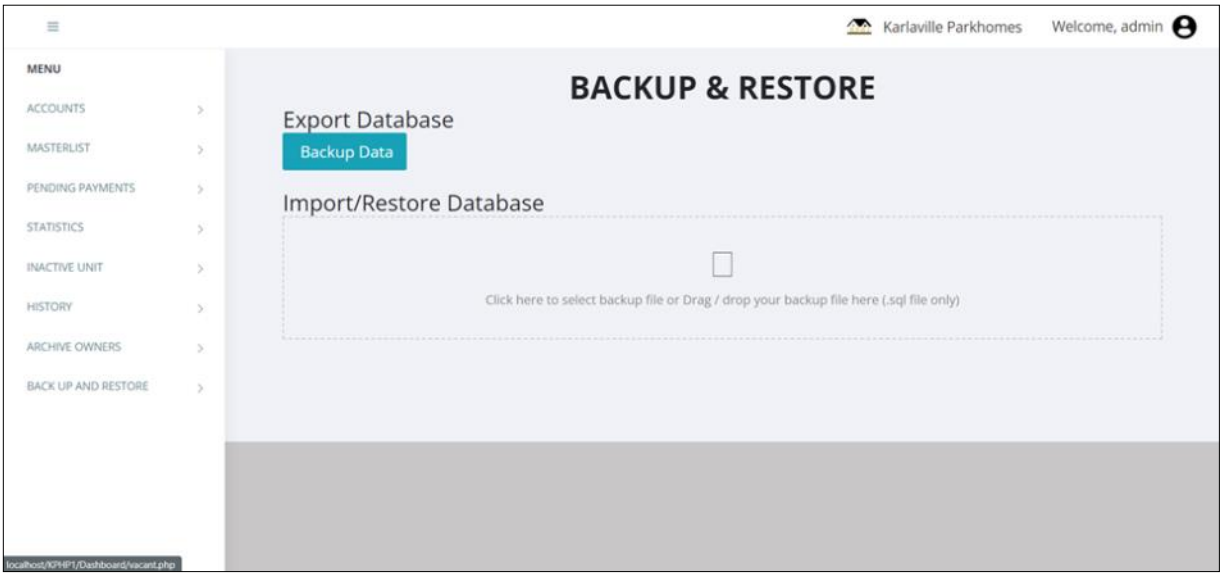

Figure 8. Backup and restore page

Figure 7 shows the Payment History Page which presents a comprehensive list of all payment transaction records. This page serves as a valuable resource for reviewing the complete payment history within the system, offering transparency and accessibility to relevant financial data.

Figure 8 shows the Back Up and Restore Page, a crucial section where administrators can manage data backups and perform data restoration when necessary. This feature ensures the system's data integrity and allows for the recovery of important information in the event of unexpected data loss or system issues.

Information Technology (IT) Experts (Technical)

both officers and homeowners revealed a generally favorable evaluation across various indicators. According to IT experts, the system's functional suitability was rated very good overall ($\bar{x}$ = 4.16, SD = 0.3008), with specific scores for functional completeness ($\bar{x}$ = 4.00, SD = 0.471), correctness ($\bar{x}$ = 4.10, SD = 0.567), and appropriateness ($\bar{x}$ = 4.40, SD = 0.699). Performance efficiency received an excellent rating ($\bar{x}$ = 4.33, SD = 0.663), with notable scores in time behavior ($\bar{x}$ = 4.50, SD = 0.527), resource utilization ($\bar{x}$ = 4.20, SD = 0.788), and capacity ($\bar{x}$ = 4.30, SD = 0.674). Usability was rated very good overall ($\bar{x}$ = 3.90, SD = 0.9669), with individual aspects like learnability ($\bar{x}$ = 4.10, SD = 0.8755) and operability ($\bar{x}$ = 4.10, SD = 1.1005) performing well. However, user interface aesthetics received a lower score ($\bar{x}$ = 3.40, SD = 1.2649). Reliability was also rated very good ($\bar{x}$ = 4.175, SD = 0.8990), with high marks for recoverability ($\bar{x}$ = 4.50, SD = 0.7071). Security was rated very good ($\bar{x}$ = 3.80, SD = 0.9166), with accountability ($\bar{x}$ = 4.00, SD = 0.9428) and authenticity ($\bar{x}$ = 4.00, SD = 0.6666) also receiving favorable evaluations.

Karlaville Parkhomes Phase 1 officers provided an excellent overall rating for functional suitability ($\bar{x}$ = 4.688, SD = 0.4912), performance efficiency ($\bar{x}$ = 4.111, SD = 1.0355), usability ($\bar{x}$ = 4.293, SD = 0.8834), reliability ($\bar{x}$ = 4.566, SD = 0.7877), and security ($\bar{x}$ = 4.64, SD = 0.5933). They rated all sub-indicators of functional suitability as excellent, with functional completeness achieving a perfect score ($\bar{x}$ = 5.00, SD = 0). Performance efficiency was also highly rated, particularly in resource utilization ($\bar{x}$ = 4.266, SD = 0.8837). Usability indicators such as appropriateness recognizability ($\bar{x}$ = 4.60, SD = 0.6324) and learnability ($\bar{x}$ = 4.40, SD = 0.7367) were rated excellent, although user interface aesthetics received slightly lower ratings ($\bar{x}$ = 4.066, SD = 1.0328). Reliability and security indicators were uniformly rated excellent.

Karlaville Parkhomes Phase 1 homeowners echoed the officers' positive evaluations, giving the system an overall excellent rating for functional suitability ($\bar{x}$ = 4.7916, SD = 0.4349), performance efficiency ($\bar{x}$ = 4.495, SD = 0.6673), usability ($\bar{x}$ = 4.697, SD = 0.5505), reliability ($\bar{x}$ = 4.615, SD = 0.5681), and security ($\bar{x}$ = 4.64, SD = 0.5933). Each sub-indicator for functional suitability received excellent ratings, with both completeness and correctness achieving the same high mean score ($\bar{x}$ = 4.825, SD = 0.4141). Performance efficiency indicators, including time behavior ($\bar{x}$ = 4.437, SD = 0.6721) and resource utilization ($\bar{x}$ = 4.512, SD = 0.6559), were also highly rated. Usability aspects, such as appropriateness recognizability ($\bar{x}$ = 4.712, SD = 0.5556) and operability ($\bar{x}$ = 4.712, SD = 0.5323), performed excellently, as did reliability indicators like recoverability ($\bar{x}$ = 4.712, SD = 0.5080). Security was similarly well-regarded, particularly in integrity ($\bar{x}$ = 4.687, SD = 0.5178) and non-repudiation ($\bar{x}$ = 4.733, SD = 0.4577).

DISCUSSION

The results of the system assessment for Karlaville Parkhomes Phase 1, conducted by IT experts, officers, and homeowners, have significant implications for the field of Information Technology, particularly in residential community management systems. The high ratings across all evaluation metrics suggest that the system is highly functional, efficient, user-friendly, reliable, and secure. These findings align with existing literature that emphasizes the importance of these factors in the successful implementation of technology systems.

Firstly, the system's high functional suitability, particularly in terms of functional completeness and correctness, indicates that the system meets the essential requirements and operates correctly under specified conditions. This is consistent with the findings of Fitriana et al. (2020), who highlight that functional completeness and correctness are critical to user satisfaction and system acceptance in software engineering.

The excellent performance efficiency ratings, particularly in resource utilization and time behavior, underscore the system's capability to handle multiple tasks efficiently without consuming excessive resources. This aligns with the research by Kappeler and Helbing (2019), which discusses the significance of performance efficiency in enhancing system scalability and responsiveness, particularly in real-time applications such as community management systems.

Usability, as rated by the stakeholders, was highly praised, which is crucial for the widespread adoption of the system. Nielsen (2012) asserts that usability is a key determinant in the user experience and the overall success of technology implementations. The system's ease of learning and operability ensures that even users with minimal technical expertise can navigate and use the system effectively, thereby increasing user engagement and satisfaction.

The very high reliability ratings, especially in recoverability, indicate that the system is dependable and capable of maintaining its performance levels even in adverse conditions. This finding is supported by the work of Avizienis et al. (2004), who state that reliability is a cornerstone of trustworthy computing and is essential for maintaining user trust and system integrity over time.

In terms of security, the positive evaluations emphasize the system's robustness against unauthorized access and data breaches, which is increasingly critical in today's digital landscape. This is corroborated by the research of Viega and McGraw (2001), which underscores that security measures such as authentication and accountability are fundamental to protecting sensitive information and ensuring user privacy.

These high ratings across multiple dimensions reflect well on the system's overall design and implementation, showcasing its potential as a model for future residential community management systems. Furthermore, the findings suggest that such systems can significantly enhance community administration by streamlining operations, improving communication, and fostering a secure and efficient environment.

To innovate further in this field, future systems could integrate advanced technologies such as artificial intelligence (AI) and machine learning (ML) to predict maintenance needs and optimize resource allocation. Studies by Kumar et al. (2021) suggest that AI and ML can greatly enhance the efficiency and predictive capabilities of management systems, providing proactive solutions to potential issues before they escalate.

Moreover, incorporating Internet of Things (IoT) technology can further improve system functionality by enabling real-time monitoring and management of community resources, as suggested by Atzori et al. (2010). IoT can facilitate more dynamic and responsive management practices, enhancing overall operational efficiency and resident satisfaction.

CONCLUSION

The implementation of the Information System for Karlaville Parkhomes Phase 1 has significantly improved the efficiency of data encoding, record management, and report generation processes. The system successfully addresses the identified challenges, providing both homeowners and officers with a user-friendly platform to monitor monthly dues and manage homeowner information effectively. The evaluation results, which fall within the "very good" to "excellent" performance range according to the ISO 25010 standards, highlight the system's alignment with user needs and its ability to surpass expectations.

From a practical standpoint, the system facilitates the management of subdivision operations, enhancing the overall administration of homeowner information and reducing conflicts related to payment records. By digitizing monitoring and management processes, the system ensures accuracy and reliability in tracking payments, addressing concerns about missing or inaccurate data. Furthermore, the technical aspects of the study emphasize the successful integration and testing processes, confirming the system's functionality and reliability on both computers and smartphones.

RECOMMENDATION/S

Based on these findings, several recommendations for further enhancement of the system are proposed. These include implementing an online appointment scheduling feature for homeowners' convenience, integrating notification alerts for upcoming due dates to encourage timely payments, and developing clear procedures for addressing outstanding balances. These features would not only streamline workflows and improve homeowner satisfaction but also promote transparency and efficiency in managing outstanding debts.

To further enhance the performance of the system, the following recommendations are made for future researchers and developers:

1. **Full Utilization of the System.** The client is encouraged to fully utilize the system to streamline operations and improve overall efficiency in managing homeowner information and monitoring monthly dues.
2. **Feature Expansion.** Future developers may consider adding features such as online appointment scheduling and notification alerts for due dates to further enhance the user experience and address evolving needs.
3. **Debt Resolution Procedures.** Transparent procedures for addressing outstanding balances should be incorporated to ensure efficient debt resolution and promote financial transparency within the community.

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