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Implementation of a Web-Based Boarding House and Rental Search and Booking Information System Using the Waterfall Method

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ABSTRACT

The rapid development of information technology has increased the need for a more efficient and structured housing search system for students. This study aims to develop an integrated web-based information system for searching and booking boarding houses and rental properties in accordance with user requirements. The development method employed is the Waterfall model, which consists of the stages of Requirement Analysis, System Design, Implementation, and Testing. Data were collected through observations of Facebook social media, questionnaires distributed to 81 students, and interviews with 10 boarding house owners. The system was developed using PHP with the Laravel framework and a MySQL database. System testing was conducted using Black-box Testing and User Acceptance Testing (UAT) involving 20 respondents, resulting in a user satisfaction rate of 87.4%. The findings indicate that the developed system enhances the efficiency of housing searches and facilitates the online booking process. With a structured approach grounded in empirical needs, the system is considered effective and feasible as a web-based solution for searching and booking boarding houses.

1. INTRODUCTION

The development of web-based information technology has driven significant transformation in the provision of information services, including in the temporary housing sector such as boarding houses and rental properties. The increasing number of students in educational cities demands the availability of housing information that is fast, accurate, and easily accessible online. However, the practice of searching for boarding houses is still largely conducted manually through social media platforms or informal recommendations, which often leads to time inefficiency and limited information validity. This condition highlights the need for an integrated information system capable of bridging the needs of students as housing seekers with boarding house owners in a more systematic and transparent manner (Yusma et al., 2021).

Several previous studies have examined the development of web-based boarding house search and booking information systems. Yusma et al. (2021) developed a web-based boarding house search system using the Waterfall method to enhance accessibility and housing promotion. Another study by Nurhalizah et al. (Saksena et al., 2023) focused on a boarding house search system based on proximity to campus areas, while Putri et al. (Trivema Montalili & Rohman, 2024) emphasized the design of a website-based boarding room booking system supported by UML diagrams and functional testing. Although these studies demonstrate the effectiveness of web-based systems in facilitating housing searches, most of them concentrate on specific functions separately and have not fully integrated the search and booking processes into a comprehensive and unified system.

2. LITERATURE REVIEW

Based on this review, the scientific novelty of this study lies in the development of an integrated web-based information system for searching and booking boarding houses and

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rental properties designed in accordance with students' needs. The Waterfall method was employed to ensure that each stage of system development was conducted in a structured and well-documented manner. The research problem focuses on how to design and implement a system capable of improving the efficiency of housing searches and facilitating the booking transaction process for students. Accordingly, the objective of this study is to produce an effective, user-friendly web-based information system that is relevant to the context of student housing needs.

Research on web-based information systems for searching and booking boarding houses and rental properties has progressed in line with the increasing demand among students for efficient and structured access to housing. The design of web-based information systems requires a clear conceptual framework to ensure that each system component is consistently and systematically integrated. Previous studies have demonstrated that the use of system architecture frameworks, such as the Zachman Framework, can assist in comprehensively mapping business requirements, processes, data, and technology in web-based information system development (Sagita & Sembiring, 2022).

Furthermore, several studies indicate that the Waterfall method remains relevant for housing information system development due to its systematic and controllable workflow. Yusma et al. and Nurhalizah et al. emphasize that web-based boarding house search systems improve information accuracy and accelerate the search process, particularly in campus environments. Meanwhile, studies by Putri and Ramadhani (2025) and Montalili and Rohman (2024) expanded the focus by incorporating room booking features and functional system testing, demonstrating improved user convenience.

Nevertheless, most of these studies primarily emphasize either search or booking functions in a partial manner and generally employ limited data collection approaches confined to a single method. In addition, the use of social media platforms such as Facebook as a source for observing user needs has not been extensively examined in a systematic way. This condition reveals a research gap in the development of systems that fully integrate search and booking features through a mixed-method approach with user requirement validation grounded in empirical data.

In line with this, research published in the Smart Techno journal also indicates that the development of web-based information systems using the Waterfall method significantly enhances system efficiency and stability. Agustina and Gunanto (2026) reported an increase in work efficiency of up to 74.8%, with a 100% success rate in Black Box testing. These findings reinforce that a structured development approach is not only methodologically relevant but also capable of producing effective and measurable systems. Therefore, this study adopts a similar approach by emphasizing feature integration, user requirement validation, and comprehensive system testing.

Table 1. Comparison of Previous Studies

Researcher	Year	Research Focus	Method	Limitations
Yusma et al.	2021	Web-based boarding house search system	Waterfall	Focused solely on the search feature; not yet integrated with a booking system
Saksena et al.	2023	Boarding house search system based on proximity to campus areas	Web-based development	Did not integrate a reservation system
Putri & Ramadhani	2025	Website-based boarding room booking system	UML & Functional Testing	Focused primarily on booking; search features not yet optimized
Montalili & Rohman	2024	Web-based boarding room booking application	Waterfall	Did not integrate user needs analysis based on empirical data

Based on Table 1, it can be observed that most previous studies have focused on developing either the search or booking functionality separately. In addition, user requirements analysis has generally not been based on a comprehensive combination of quantitative and qualitative data. This study integrates both search and booking features into a unified system and validates user requirements through questionnaires distributed to 81 students and interviews conducted with 10 boarding house owners. Therefore, this research contributes by providing an integrated system developed based on empirically validated user needs.

To strengthen the research context, the following definitions of key terms directly related to the object of this study are presented.

Boarding House (*Kosan*)

A boarding house (indekos) is a type of rental accommodation consisting of rooms leased for a specific period based on an agreement between the owner and the tenant, including a mutually agreed rental price. Boarding houses typically provide shared facilities such as external bathrooms, kitchens, or common areas and are generally rented on a monthly basis (Silviana, 2022).

Rental House (*Kontrakan*)

A rental house (kontrakan) refers to a residential property leased for a specified period under an agreement between the owner and the tenant. Rental houses are often preferred by newcomers who require more independent living arrangements, such as workers or groups of students (Anggi Yulia Fani, 2022).

System

A system is an integrated entity composed of various interconnected elements or components that interact and collaborate to achieve a specific objective. These elements may include individuals, objects, processes, or variables that are organized and unified within a structured framework.

Information

Information is processed data that carries meaning and provides value to its recipient. It may take the form of descriptions, statements, ideas, or symbols presented in various formats that can be seen, heard, or read. Information assists recipients in understanding situations, making decisions, and acting effectively.

Social Media

Social media refers to platforms that facilitate user engagement in collaborative activities, content sharing, and community formation. Users not only receive information but also actively participate in digital communication processes (Oktaviani et al., 2023).

Design Using Figma Prototype

A prototype is an early version of software used to demonstrate concepts, explore various design alternatives, and identify potential problems along with their solutions (Andini et al., 2023).

Boarding House/Rental Booking Information System

A web-based management system for boarding houses provides features such as property search, room booking, and administrative backend functionalities, including owner verification, tenant management, and Google Maps integration (Rivaldi et al., 2021).

3. METHOD

This study employs a Research and Development (R&D) approach using the Waterfall software development model. The R&D approach was selected because this research

produces a web-based information system as a product, which is subsequently validated through user testing. The Waterfall model was chosen as it provides a structured and systematically documented sequence of system development stages. The research stages consist of Requirement Analysis, System Design, Implementation, and System Testing.

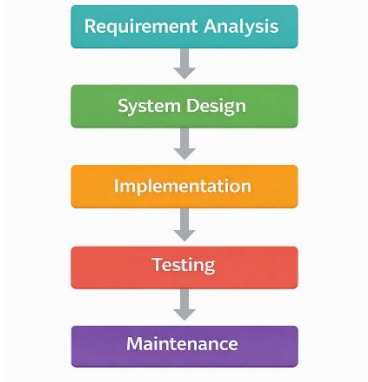

Figure 1. Stages of the Research Method

The Waterfall model was selected because it provides a structured and sequential approach to system development, beginning with Requirement Analysis, followed by System Design, Implementation, Testing, and Maintenance (Listiyan & Subhiyakto, 2021). Each phase must be completed before proceeding to the next, ensuring that the development process is systematic and well-documented. The five stages of the Waterfall method applied in this study are described as follows.

Requirement Analysis

This stage represents the initial phase of system development, during which user requirements were identified from students as end users and boarding house owners as service providers. Data were collected through online observations of Facebook groups, documentation of boarding house listings, questionnaires distributed to students, and interviews with boarding house owners located near the campus. This stage aimed to identify the required features, issues encountered in the boarding house search process, and limitations of conventional systems.

Data collection was conducted through an online questionnaire involving 81 students from Nusa Putra University, using a 5-point Likert scale to measure user needs and preferences. In addition, interviews were conducted with 10 boarding house owners to identify requirements from the service provider perspective. Observations of local Facebook groups used for boarding house searches were also carried out to understand information presentation patterns and common challenges.

Based on the analysis results, system requirements were classified into functional and non-functional requirements as follows:

Functional Requirements:

1) The system shall display a list of boarding houses based on location and price.
2) The system shall provide facility-based filtering features.
3) The system shall display real-time room availability status.
4) The system shall process booking or reservation transactions.
5) The system shall provide an administrative dashboard for administrators and partners to manage data.
6) The system shall provide user authentication for students, partners, and administrators.

Non-Functional Requirements:

1) The system shall be web-based and responsive.
2) The system response time shall be less than 3 seconds.
3) The system shall implement authentication and input validation mechanisms.
4) The database shall be integrated and stable.

All identified requirements were documented in the form of a Software Requirements Specification (SRS), Use Case Diagrams, Activity Diagrams, and an Entity Relationship Diagram (ERD), which served as the foundation for the system design phase.

System Design

This stage aims to translate the results of the requirements analysis into a system model ready for implementation. The design process was carried out using Unified Modeling Language (UML) as a standard software modeling tool to systematically represent the system's structure and behavior. The diagrams utilized in this stage include:

1) Use Case Diagram, to illustrate the interactions between actors and the system
2) Activity Diagram, to model business process workflows
3) Flowchart, to visualize system logic and
4) Entity Relationship Diagram (ERD), to design the database structure and relationships.

In addition to logical design, this stage also included user interface (UI) design using Figma to ensure usability and alignment with user requirements. The output of this phase consisted of logical and visual design documents that served as the foundation for the implementation stage.

System Implementation

The implementation stage was carried out based on the system design developed in the previous phase. The system was developed as a web-based application using PHP with the Laravel framework (MVC architecture), supported by MySQL as the database management system. The user interface was built using HTML, CSS, and JavaScript, while prototype design was created using Figma. The development process was conducted in a localhost environment.

During this stage, all functional requirements were integrated, including user authentication (administrator, partner, and student), boarding house search functionality without login, property data management by partners, real-time room availability updates (available/full), as well as reservation and booking confirmation features. Laravel was selected due to its support for structured development, enhanced security features, and ease of data management and system feature implementation.

System Testing

System testing was conducted using the Black-box Testing method to ensure that each feature functioned according to the requirements defined in the analysis phase. Testing was performed based on usage scenarios involving administrators, partners, and students as end users.

Table 2. Boarding House Data Management Feature Testing

Requirement	Test Scenario	Test Result	Conclusion
Add Boarding House Data	Enter name, price, address, facilities, upload photo, then click save	Data successfully stored in the database	Valid
Form Validation	Leave required fields empty	System displays validation message	Valid
Price Validation	Enter alphabetic characters in the price field	System rejects non-numeric input	Valid
Edit Boarding House Data	Modify price, facilities, and photo	Data successfully updated according to input	Valid
Delete Boarding House Data	Click delete and confirm	Data deleted and no longer displayed in the list	Valid

Table 2 indicates that the testing results demonstrate that the boarding house data management features function in accordance with the specified requirements, including proper form validation and data updates without errors.

Table 3. Search Feature Testing

Requirement	Test Scenario	Test Result	Conclusion
Boarding House Search	Enter a keyword and click search	System displays boarding houses that match the keyword	Valid
Search with No Results	Enter an unavailable keyword	System displays the message “Data not found”	Valid

Table 3 explains that the search feature is capable of displaying data accurately based on the parameters entered by users, while consistently maintaining the system-defined order of results.

Table 4. Detail and Reservation Feature Testing

Requirement	Test Scenario	Test Result	Conclusion
Boarding House Detail	Click on a selected boarding house listing	The system displays photos, price, description, facilities, and location	Valid
Boarding House Reservation	Click “Proceed to Payment,” enter the date, and upload proof of payment	Data successfully stored and status changes to “Booked”	Valid
Reservation Validation	Submit the form with incomplete data	The system displays a validation message and rejects incomplete input	Valid
Edit Boarding House Data	Modify price, facilities, and photo with invalid input	The system displays an error message	Valid

Table 4 demonstrates that the reservation process functions properly, with data successfully stored in the database and the system effectively performing input validation to prevent transaction errors.

User Acceptance Test (UAT)

In addition to functional testing, a User Acceptance Test (UAT) was conducted involving approximately 20 students using a 5-point Likert scale. The results indicate a user satisfaction rate of 87.4%, suggesting that the system is considered feasible and acceptable as a web-based solution for searching and booking boarding houses.

Furthermore, each stage of the Waterfall model implemented in this study produced systematically documented outputs. The Requirement Analysis stage resulted in a Software Requirements Specification (SRS) document, encompassing both functional and non-functional requirements derived from questionnaire responses and interviews. The System Design stage produced system models, including Use Case Diagrams, Activity Diagrams, Flowcharts, and an Entity Relationship Diagram (ERD), representing the system’s structure and workflow. The Implementation stage generated an integrated web-based information system developed using PHP with the Laravel framework and a MySQL database. The Testing stage produced documented results of Black-box Testing and User Acceptance Testing (UAT), indicating a user acceptance rate of 87.4%.

Thus, each phase of the Waterfall model yielded measurable and well-documented outputs, providing evidence of the validity and rigor of the system development process.

4. RESULT AND DISCUSSION

Analysis of Testing and Implementation Results

The results of functional testing using the Black-box Testing method indicate that all major system features including boarding house data management, search, filtering, property details, and reservation operate in accordance with the specified requirements. No logical errors or process failures were identified in the executed test scenarios. Furthermore, the results of the User Acceptance Test (UAT) involving 20 respondents show a user satisfaction rate of 87.4%. This score indicates that the system is considered user-friendly, informative, and capable of meeting students' needs in searching for and booking accommodation online. The location- and price-based filtering feature was identified as the most helpful component in accelerating the housing search process.

Compared to previous studies, which tended to focus separately on either search or booking functionalities, the system developed in this study integrates both functions within a single platform. This integration enhances process efficiency and minimizes misinformation, which frequently occurs in manual search methods conducted through social media platforms. Therefore, the implementation results demonstrate that the Waterfall approach applied in this study successfully produced a structured and stable system aligned with empirically validated user requirements.

Flowchart of the Search and Booking System

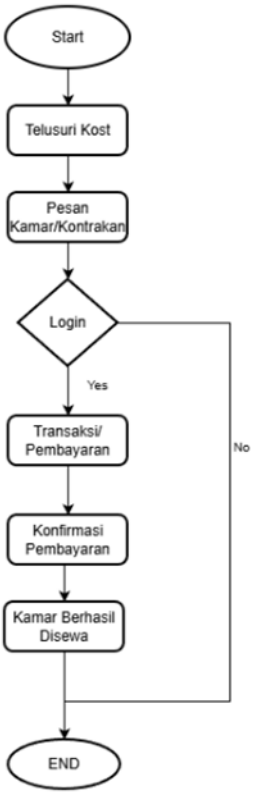

Figure 2. Flowchart of the Search and Booking System

This flowchart illustrates the main process flow of users searching for boarding house or rental property information through the system. The process begins on the homepage, where users can perform a search using specific filters such as location, price, and facilities. Users can then view detailed information about a selected property and proceed with the reservation process if it meets their preferences. The workflow continues until the reservation data are stored in the database and a notification is sent to the partner (property owner).

Use Case Diagram

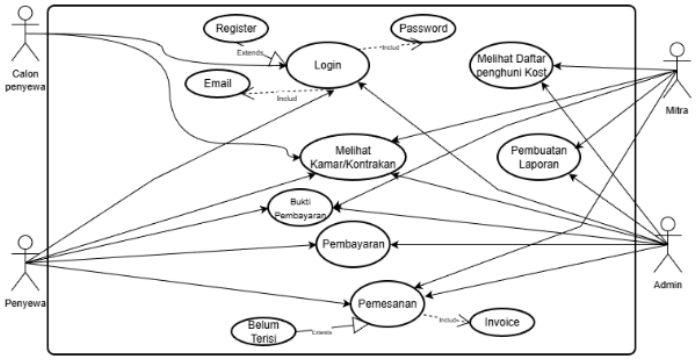

Figure 3. Use Case Diagram

This diagram illustrates the roles and interactions between the actors Students/Users, Partners/Owners, and Administrators and the system. The use cases include activities such as login, registration, managing boarding house or rental property data, booking accommodation, and confirming reservations. The diagram provides a functional overview of the system from the users' perspective.

Activity Diagram of the Reservation/Booking Process

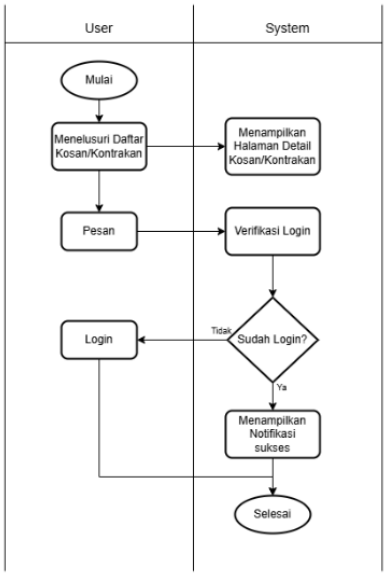

Figure 4. Booking Activity Diagram

This diagram illustrates the workflow when a student makes a reservation for a boarding house or rental property. After selecting a property, the user completes the reservation form → the system stores the booking request in the database → a notification is sent to the administrator → the administrator reviews and confirms the request.

Activity Diagram of Boarding House/Rental Data Entry by Partner/Owner

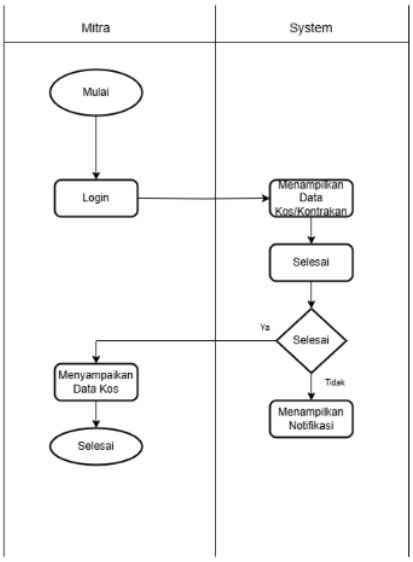

Figure 5. Activity Diagram of Boarding House/Rental Data Entry by Partner/Owner

This diagram illustrates the process by which partners add or update property data within the system. The partner logs in → accesses the dashboard → completes the boarding house/rental data entry form → saves the data to the database → and the data become available for display to users.

Activity Diagram of Login and Registration

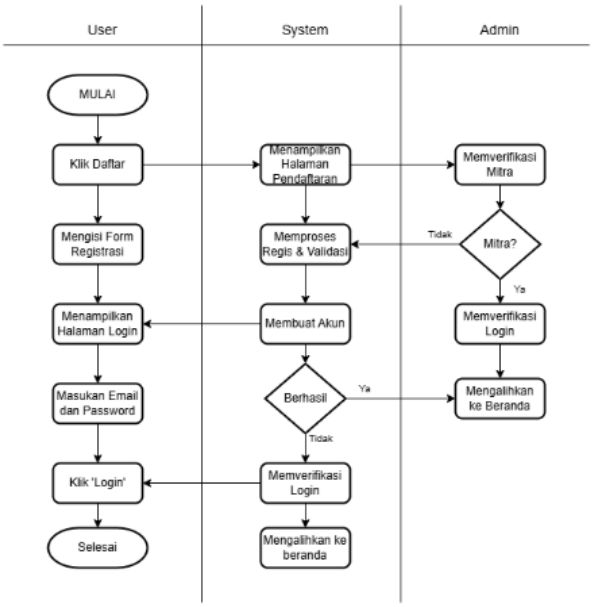

Figure 6. Activity Diagram of Login and Registration

This diagram explains the sequence of activities performed by users during the login and account registration processes. Users fill in the login or registration form → the system verifies the submitted data → and grants access to the dashboard according to the user's role (student/user, partner/owner, or administrator).

Main Page (Boarding House/Rental Search)

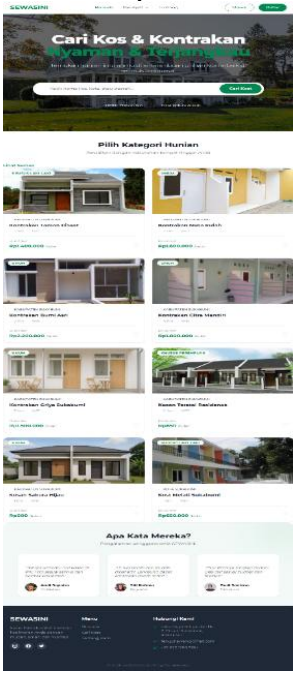

Figure 7. Main Page

The main page serves as the initial interface of the system and functions as the central hub for information and user navigation. This page provides search features for boarding houses or rental properties based on location, price, and facilities, as well as a list of available accommodations. The main page is designed to be accessible without requiring user login, thereby enabling prospective tenants to obtain preliminary housing information quickly and efficiently.

Boarding House/Rental Detail Page

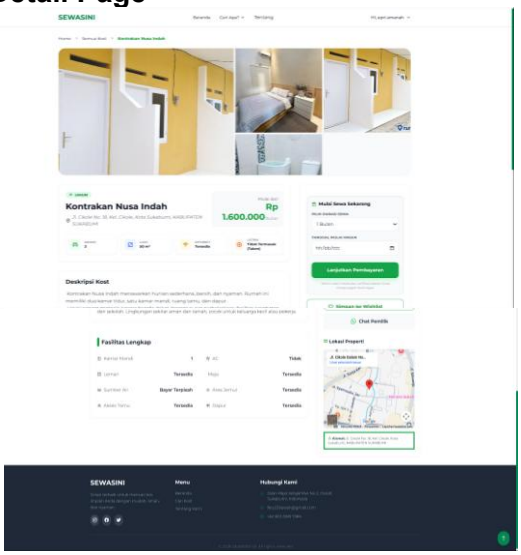

Figure 8. Boarding House/Rental Detail Page

The boarding house/rental detail page presents comprehensive information regarding the selected property, including the property name, location, rental price, facilities, photos, room availability status, and owner information. This page assists users in evaluating the accommodation before proceeding to the booking or reservation process.

Booking/Reservation Page

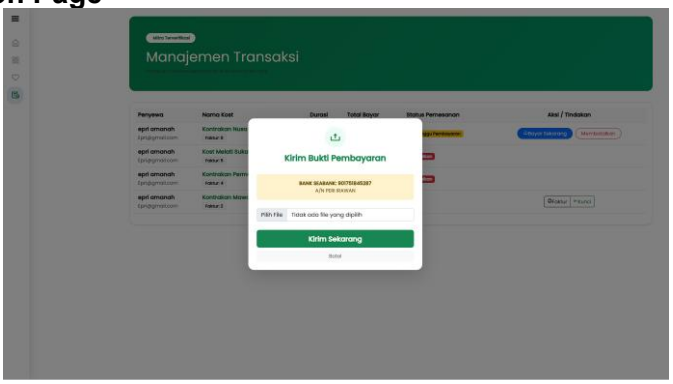

Figure 9. Booking/Reservation Page

The booking and reservation page is used by users to complete the boarding house or rental reservation process. On this page, users enter booking details, select the rental duration, and proceed to the payment process. The system then stores the reservation data in the database and sends a notification to the relevant party for further confirmation.

Admin, Partner, and User Dashboards

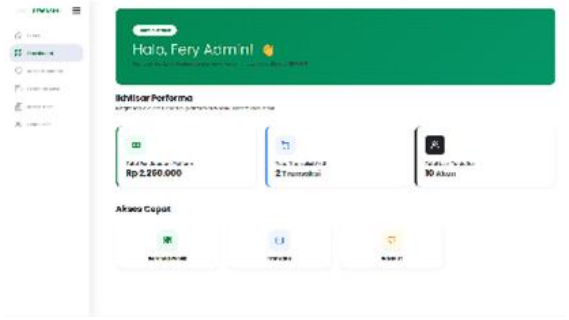

Figure 10. Admin Dashboard

Admin Dashboard

The admin dashboard functions as the central control panel for managing all system data, including user data, boarding house/rental property data, booking transactions, and system activity monitoring. The administrator also has access to verify data and view summary statistics, such as the total number of properties, registered users, and completed transactions.

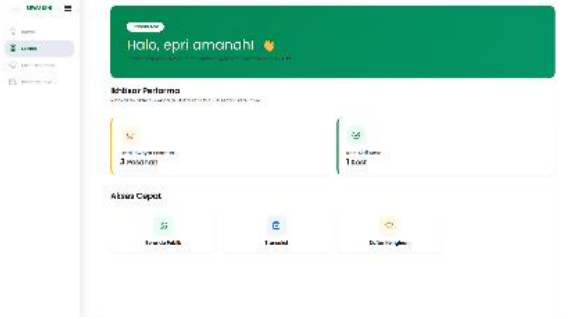

Figure 11. Partner Dashboard

Partner Dashboard (Boarding House/Rental Owner)

The partner dashboard is used by boarding house or rental property owners to manage their listed accommodations. Available features include adding and updating property data, managing room availability, viewing reservation lists, and monitoring the payment status of tenants.

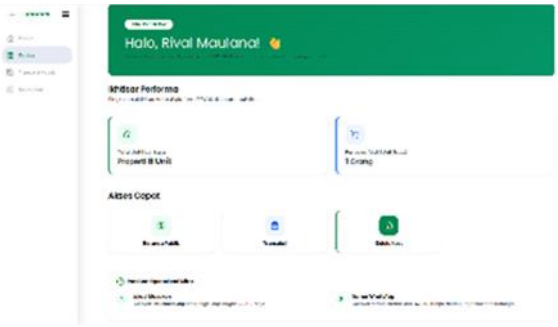

Figure 12. User Dashboard

User Dashboard (Student)

The user dashboard serves as the central activity hub for students in managing their reservations. Through this dashboard, users can view their booking history, reservation status, payment details, and access information regarding the boarding house or rental property they have reserved.

5. CONCLUSION

This study successfully implemented a web-based information system for searching and booking boarding houses and rental properties using the Waterfall method in a structured and well-documented manner. The developed system integrates the processes of property search, accommodation information presentation, and online booking within a single platform, thereby addressing the issues of limited information and inefficiencies in the housing search process experienced by students. Based on the results of functional testing and user acceptance evaluation, all major system features operate in accordance with the specified requirements, are user-friendly, and effectively support interactions among students, property partners, and administrators. These findings indicate that the implementation of a web-based information system can enhance efficiency, accuracy, and convenience in managing student housing.

It is recommended that future system development incorporate integrated online payment features, automated notifications via messaging applications, and enhanced user data security mechanisms. Furthermore, subsequent research may expand the scope of respondents and research locations to obtain a broader representation of user needs. The application of alternative development methodologies or more in-depth system performance testing is also suggested to further improve system quality and scalability in the future.

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