

KostKu: Integrating Search, Maps, and Digital Payments in a Web–Android Boarding House System for Kudus Regency (Case Study: Kudus Regency)

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Abstract

Although boarding house information systems are widely available, integrated platforms tailored to search and rental needs in Kudus Regency remain limited. This study aims to design and develop KostKu, a boarding house search and rental information system accessible through a website and an Android application. A research and development (R&D) approach was employed using a prototyping method comprising requirements gathering, preliminary design, iterative prototype evaluation, testing, and implementation. The system was developed using Next.js, React, Tailwind CSS, Supabase, Leaflet, and Capacitor. KostKu supports three user roles and integrates search and filtering based on multiple criteria, interactive maps, booking, payment processing through Midtrans, reviews, favorites, and administrative verification of boarding houses and owners. Black-box testing confirmed that the main functional scenarios operated according to specifications. These findings demonstrate the functional integration of boarding house search and rental services across web and Android platforms. KostKu provides a practical means of streamlining accommodation searches and rental processes for tenants and boarding house owners, contributing to the development of integrated accommodation information systems.

Keywords: Boarding House Search; Accommodation Information Systems; Android Applications; Digital Payments; Kudus Regency

INTRODUCTION

The rapid development of information technology has transformed the way people obtain information and conduct everyday activities, including the search for temporary accommodation. The demand for rental rooms and boarding houses is particularly relevant in areas with significant educational and industrial activities, where students and workers from outside the region require accessible and reliable accommodation information (Purwanto & Ujianto, 2025). Kudus Regency represents such a context, with educational institutions and industrial activities generating demand for temporary housing. Nevertheless, the search for boarding houses is still commonly conducted through conventional methods, such as asking friends, visiting neighborhoods directly, or relying on physical rental signs (Br Siregar et al., 2024). These practices are relatively inefficient because prospective tenants must spend considerable time and effort obtaining information that may be incomplete, particularly regarding rental prices, available rooms, facilities, location, and distance from their destination.

This condition indicates that the main challenge is not merely the availability of boarding-house information, but also the ability to present such information in a structured, accessible, and comparable form. The quality of information provided through a digital platform is an important consideration because users require information that is relevant, complete, timely, and accurate when making decisions (Fetris & Erlianti, 2026). A digital information system can provide an alternative by allowing prospective tenants to search for accommodation without having to visit each location physically (Gunawan et al., 2025). For property owners, digitalization can also expand their potential market because property information can reach prospective tenants beyond their immediate personal networks. Therefore, a boarding-house platform should not function merely as an information catalogue, but should facilitate interaction between prospective tenants and property owners through an integrated digital environment.

Previous studies have demonstrated the potential of information technology to support boarding-house searches. Nizar (2021) developed a digital-based boarding-house search system intended to assist users in obtaining suitable accommodation information. Similarly, Yusma et al. (2021) demonstrated the use of a digital system to improve the accessibility of boarding-house information. Setiawan et al. (2021) further developed a boarding-house search system that organized accommodation information in a more

systematic manner. These studies indicate that digital platforms can reduce users' dependence on conventional approaches and improve the efficiency of accommodation searches.

Location-based functionality has subsequently become an important component of digital accommodation systems. Yuliadi et al. (2021) demonstrated the use of mapping technology to provide users with more informative accommodation-location information. This approach is particularly relevant because proximity to universities or workplaces is an important consideration when selecting a boarding house. Meanwhile, Maulana et al. (2024) incorporated booking functionality into an accommodation system, allowing interactions between prospective tenants and property providers to be conducted more efficiently. More recently, Budiarti et al. (2026) developed a web-based information system for room booking and homestay management at Homestay Banyak 57 in Kudus Regency. Their system integrated room data, reservations, and financial transactions and demonstrated that digital integration could improve data-management accuracy and service efficiency. This study further confirms the relevance of developing digital accommodation services within the Kudus context.

Digital transformation also creates requirements related to security, transparency, and the reliability of transactions and data management. Supriyati et al. (2025) explained that emerging distributed technologies, particularly blockchain and distributed applications, provide opportunities to improve transparency, security, efficiency, and interoperability across digital ecosystems. Although blockchain is not implemented as the core technology in the present study, these developments demonstrate the broader direction of digital systems toward more secure and reliable technology-based services.

However, a significant research gap remains in terms of feature integration and contextual implementation. Hasridayana et al. (2023) and Pribadi et al. (2024) developed digital accommodation systems with functionalities that facilitate searching and booking. Nevertheless, previous studies generally emphasized particular functions, such as searching, mapping, booking, or payment, rather than integrating these components into a comprehensive multiplatform ecosystem. Setiadi & Ulum (2024) also demonstrated the application of digital technology to accommodation-search systems, but the integration of web and Android platforms through a single codebase has not been adequately addressed. More recent studies by Ibrahim et al. (2025) and Hasanah et al. (2025) further demonstrate

the development of digital accommodation platforms, yet their implementations do not specifically address the accommodation-search context of Kudus Regency.

This gap is particularly relevant because accommodation preferences vary among user groups. University students may prioritize proximity to campus, affordability, facilities, and the surrounding environment, whereas industrial workers may place greater emphasis on accessibility to workplaces, room availability, and booking flexibility. Consequently, an effective accommodation platform should support multi-criteria searching rather than relying on a single search parameter. Furthermore, because the system involves prospective tenants, property owners, and administrators, an appropriate access-control mechanism is required to ensure that each user can access data and functions according to their respective roles.

The novelty of this study lies in the development of KostKu, an integrated accommodation platform that combines multi-criteria search, interactive mapping, room booking, and digital payment within a system accessible through both the web and Android applications. The platform is developed using Next.js, Supabase with Row Level Security (RLS), Leaflet, and Capacitor, enabling the web and Android versions to be developed from a single codebase rather than through two independent development processes. This approach is intended not only to improve development efficiency but also to provide a more consistent user experience across platforms. Supabase and its RLS mechanism support role-based data management, while Leaflet provides an interactive representation of accommodation locations.

Conceptually, the study positions the information system as an integrated technological environment that connects users, data, processes, and technology to produce useful and accessible information. KostKu is therefore designed not simply as a digital directory, but as an ecosystem connecting three primary user roles: prospective tenants, property owners, and administrators. The integration of Midtrans further enables booking and payment to be conducted within a structured digital process, allowing users to proceed from accommodation discovery to reservation without relying on separate services. This integrated approach is expected to address the fragmentation of functions identified in previous accommodation-search systems.

Accordingly, this study focuses on the design and development of KostKu as an integrated boarding-house search and booking system for Kudus Regency. The primary objective is to develop a multiplatform system capable of presenting structured

accommodation information, supporting multi-criteria searches, displaying locations through interactive maps, facilitating booking and digital payment, and managing access rights for prospective tenants, property owners, and administrators. Beyond its practical contribution, the study is also intended to provide technical documentation of the technologies and architectural approach employed, thereby offering a reference for the development of similar digital accommodation systems in other regional contexts.

The introduction should be written descriptively, logically, systematically, and coherently. It should clearly explain the scholarly rationale for conducting the study, position the study within relevant previous research, and highlight the contribution it intends to offer. At a minimum, the introduction should include the following five main components.

METHODS

This study employed a Research and Development (R&D) approach using the Prototyping method for system development. The R&D approach was adopted because the study focused on producing an information system for boarding-house search and rental services in Kabupaten Kudus. Prototyping was selected because user requirements, particularly those concerning interface design, search workflows, and system interaction, could be validated through an operational prototype and refined iteratively (Kustanto et al., 2024). This approach enables user requirements to be progressively translated into system specifications through repeated development cycles before full implementation (Kendall & Kendall, 2024). The development process was conducted from July to August 2026 at the Informatics Engineering Department of Universitas Muria Kudus (UMK), with system testing focused on the Kabupaten Kudus area.

The research design consisted of five interconnected stages: requirements identification, rapid design and prototype development, iterative evaluation and refinement, functional testing, and implementation (Nurmalasari et al., 2024). During requirements identification, the study examined the needs of prospective tenants, including searches based on location, price, room type, and facilities, as well as the needs of property owners to promote and manage their listings. An initial prototype was subsequently developed with a homepage, search and filtering interface, and boarding-house detail page. The prototype was progressively transformed into an application using Next.js and React, supported by Tailwind CSS, Supabase, interactive mapping, Midtrans-based booking and payment, owner and

administrator dashboards, and data synchronization with Google Sheets. Functional testing was subsequently conducted through black-box procedures and program-logic tracing, while the implementation stage involved distributing the web application to Android devices through Capacitor.

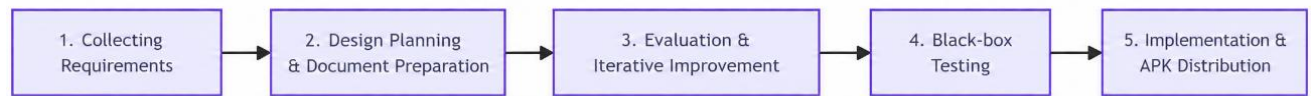


Figure 1. KostKu System Development Stages

The functional indicators consisted of multi-criteria boarding-house search and filtering based on location, price, room type, and facilities, interactive location visualization, booking submission and management, Midtrans-based payment, review and favorite functions, and role-based access involving prospective tenants, property owners, and administrators. These indicators served as the basis for defining the system's functional requirements and evaluating its implementation. To translate the requirements into a systematic system design, Unified Modeling Language (UML) was employed through use case diagrams, class diagrams, and activity diagrams (Narulita et al., 2024). UML modeling was used to represent functional requirements, data structures, and system workflows, thereby establishing consistency between user needs and the resulting implementation (Tegarden et al., 2025).

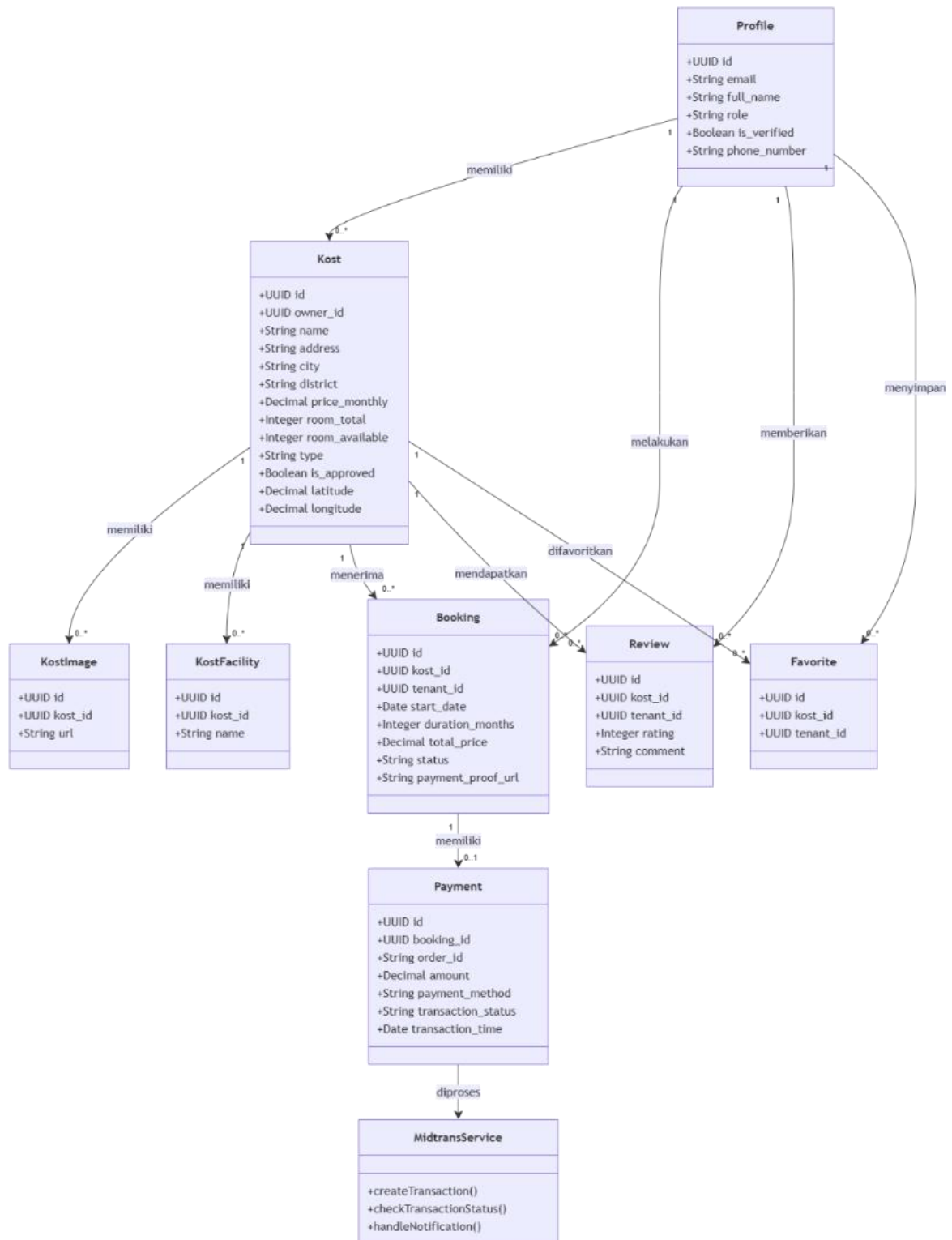


Figure 2. KostKu Class Diagram

Figure 2. KostKu Class Diagram shows the main class structures and relationships among entities supporting the management of users, boarding houses, facilities, bookings, reviews, and favorites.

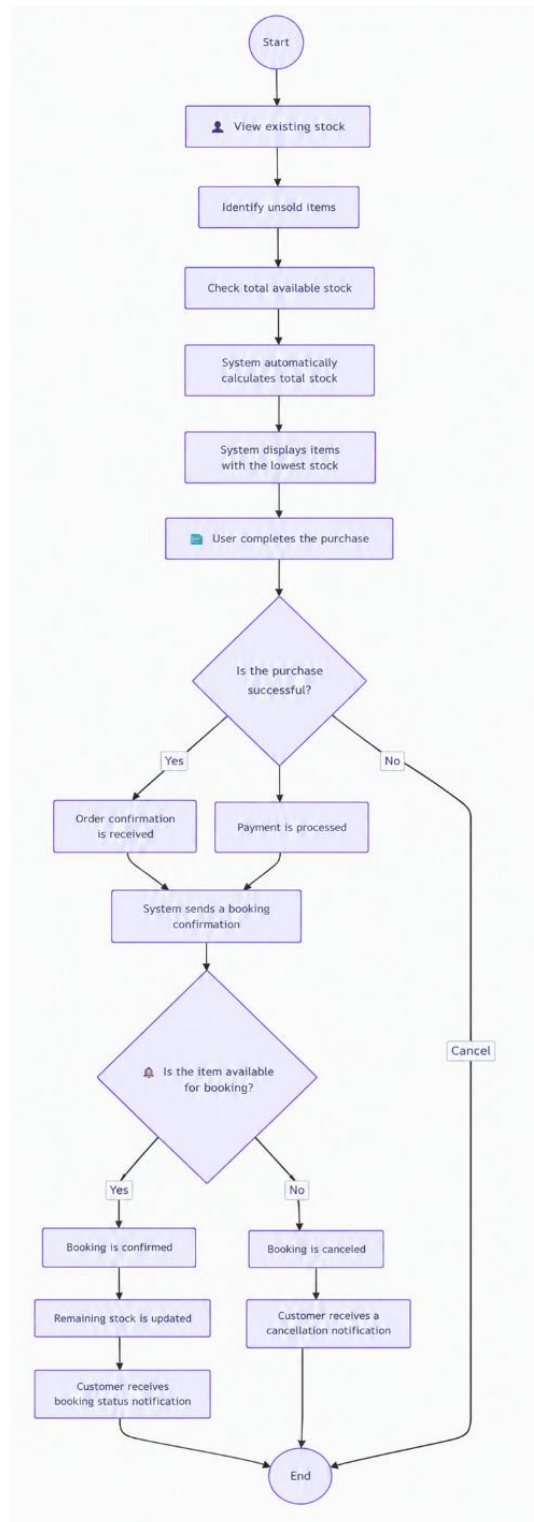


Figure 3. Booking and Midtrans Payment Activity Diagram

Figure 3. Booking and Midtrans Payment Activity Diagram shows the booking process, beginning with the selection of a boarding house, move-in date, and rental duration, followed by automatic total price calculation and payment through Midtrans until the booking status is stored in the system.

Based on this design, KostKu was developed as a web application that can be distributed across multiple platforms from a single codebase. The interface layer was developed using Next.js and React with Tailwind CSS, while Leaflet was used for interactive location visualization. The service and data layer used Supabase, which provides PostgreSQL, user authentication, and Row Level Security (RLS). External services included Midtrans for payment processing and Google Apps Script for synchronizing administrative data with Google Sheets. For Android distribution, the statically exported web application was packaged using Capacitor into an Android project and installable APK.

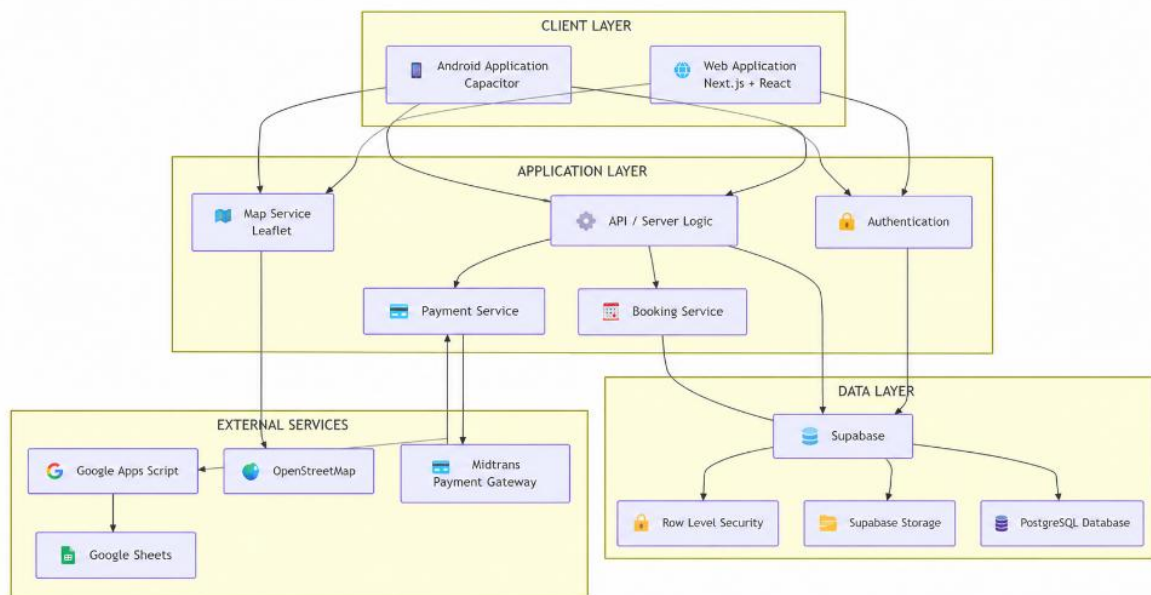


Figure 4. KostKu System Architecture

Figure 4. KostKu System Architecture shows that KostKu integrates the interface layer, database and service layer, external services, interactive mapping, payment processing, data synchronization, and Android distribution within a single system architecture.

The study did not involve human participants as a research sample because its primary focus was software product development and functional validation. The testing dataset consisted of 42 sample boarding-house listings distributed across Bae, Kudus City, and areas surrounding IAIN Kudus. These records were used to evaluate search, filtering, location mapping, listing management, booking, and transaction functions. The tenant, owner, and administrator accounts used during testing were specifically created for testing purposes and did not contain personal information belonging to actual users.

The research instruments consisted of functional requirements, UML models, database specifications, testing scenarios, and code-tracing procedures. Data collection was conducted through requirements identification, system modeling, prototype development, development documentation, and functional testing of the principal system functions (Cahyaningrum & Yulianto, 2025). Black-box testing was performed by comparing system inputs and outputs against predetermined testing scenarios (Mardiati & Saputra, 2025). Because the study did not employ questionnaires or respondent-based measurement instruments, statistical validity and reliability tests were not applied. Instead, system consistency was assessed through the conformity of program logic, functional outputs, system specifications, and database access policies.

Data analysis was conducted through technical and descriptive examination of each principal functional scenario by comparing actual results with expected outputs (Aurelius, 2026). The analysis aimed to determine whether the implemented functions conformed to the predefined system requirements and design (Rosa et al., 2026). After the principal functions had been verified, the web application was statically exported and integrated with an Android project through Capacitor to generate an installable APK. Overall, the methodological process was designed to develop and validate KostKu as an integrated boarding-house search and rental system accessible through the web and distributable to Android devices.

RESULTS

System Interface Implementation

The results show that KostKu was successfully implemented as a web-based boarding house search and rental information system that can also be distributed as an Android application through an APK file. The system provides search features based on location, room type, price, and facilities, as well as sorting options based on listing recency and price. Search results are presented through a boarding house list and an interactive map using Leaflet. Only boarding houses approved by the administrator are displayed in the public search results.



Figure 5. KostKu Home Page (Android/APK Version)

Figure 5. KostKu Home Page (Android/APK Version) shows that the home page provides an area search bar, room type options, and a search button to facilitate users in finding boarding houses according to their needs.



Figure 6. User Login Page

Figure 6. User Login Page shows that the system provides a login page for tenants, boarding house owners, and administrators using Supabase authentication.

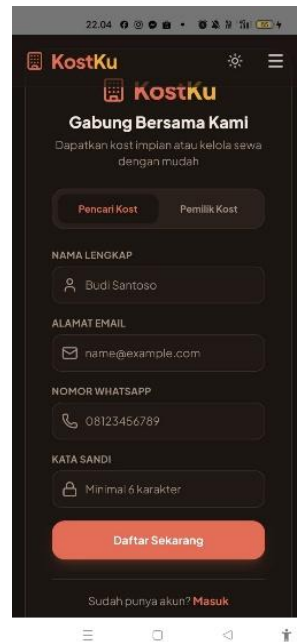


Figure 7. Account Registration Page

Figure 7. Account Registration Page shows that users can register as tenants or boarding house owners, while owner accounts require administrator verification before they can manage listings.

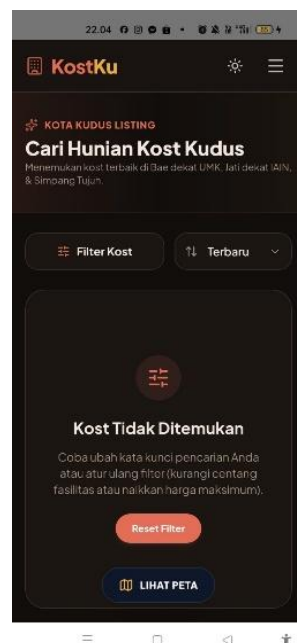


Figure 8. Boarding House Search Page

Figure 8. Boarding House Search Page shows that users can filter boarding houses based on specific criteria and access an interactive map to view their locations.

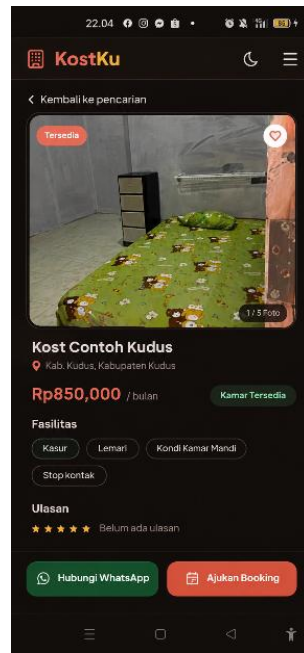


Figure 9. Example of Boarding House Listing Photos

Figure 9. Example of Boarding House Listing Photos shows that the boarding house detail page provides information including photos, room type, price, facilities, room availability, reviews, favorites, WhatsApp contact, and booking submission.

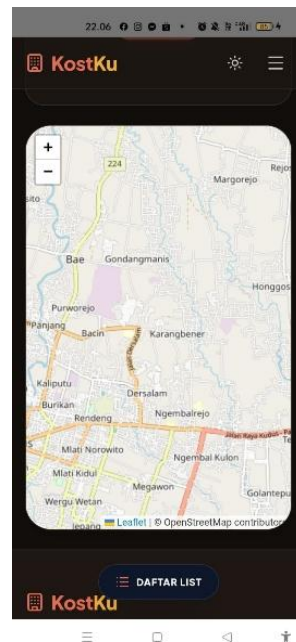


Figure 10. KostKu Interactive Map

Figure 10. KostKu Interactive Map shows that the Leaflet-based interactive map displays boarding house locations through markers containing the boarding house name,

room type, rental price, and a link to the detail page. This feature enables users to compare boarding house locations more easily based on their geographic positions.

The system also implements a booking process consisting of move-in date and rental duration selection for 1–12 months, with the total payment calculated automatically. Payments are processed through the Midtrans payment gateway using QRIS/GoPay, Virtual Account, and credit/debit card options. After payment is processed, the booking is stored with an initial “pending” status for owner review. Once approved by the owner, the status changes to “approved” and the number of available rooms is automatically reduced.

In addition to user-side functions, KostKu provides owner and administrator dashboards. Owners can manage listings and incoming bookings, while administrators can verify boarding houses and user accounts. The system also provides Google Apps Script Web App integration with Google Sheets to synchronize registration, listing, and transaction data in real time. The test dataset consists of 42 boarding house listings located in Kudus Regency, including Bae District, Kudus City, and areas surrounding IAIN Kudus.

System Testing

System testing was conducted using black-box testing through program logic tracing across the main system functions. The testing covered registration, login, search, filtering, interactive maps, booking, reviews, administrator verification, and WhatsApp contact functions. The results are presented in Table 1.

Table 1. Black-Box Testing Results

No	Testing Scenario	Expected Result	Conclusion
1	Account registration as Tenant	A profile is automatically created with the “tenant” role and is_verified set to true	Passed
2	Account registration as Owner	A profile is created with the “owner” role and is_verified set to false until verified by the administrator	Passed
3	Login with incorrect credentials	The system displays an error message and does not establish a session	Passed
4	Search using a district keyword	Only approved boarding houses matching the name, address, city, or district are displayed	Passed
5	Room type filter	The results display only boarding houses matching the selected room type	Passed
6	Maximum price filter	Boarding houses with prices above the selected maximum value are hidden	Passed
7	Combined facility filter	Only boarding houses that provide all selected facilities are displayed	Passed

No	Testing Scenario	Expected Result	Conclusion
8	Interactive map in search results	Markers are displayed for boarding houses with valid coordinates, and pop-ups contain photos, prices, and links to the detail page	Passed
9	Booking for a boarding house with no available rooms	The booking submission button is automatically disabled	Passed
10	Booking submission (date and duration)	The total price is calculated automatically and the initial status is stored as “pending”	Passed
11	Owner approves booking	The status changes to “approved” and the number of available rooms is reduced by one	Passed
12	Submit a review without logging in	The system prevents submission and prompts the user to log in	Passed
13	Administrator approves a new boarding house	The <code>is_approved</code> field is set to true, allowing the boarding house to appear in public search results	Passed
14	Contact Owner via WhatsApp button	A <code>wa.me</code> link opens with a pre-filled message template	Passed

Source: Compiled by the researcher (2026)

Table 1. Black-Box Testing shows that all 14 testing scenarios produced outputs consistent with the expected results. This indicates that the main functions of KostKu operated according to the system design. The testing was limited to black-box testing based on program logic tracing; therefore, user acceptance testing (UAT) remains necessary for further research.

DISCUSSION

The findings demonstrate that the KostKu system successfully integrates several essential requirements for boarding-house search and management into a single platform accessible through both the web and Android devices. The integration encompasses multi-criteria search, interactive mapping, booking, payment through Midtrans, and role-based system management. This finding suggests that the effectiveness of the system is not determined merely by the availability of individual features, but by the extent to which those features are connected into a coherent service flow. For prospective tenants, such integration reduces the need to move between separate information sources to identify a property, examine its location, check relevant characteristics, and proceed with a reservation. The system therefore addresses the central objective of the study by providing a more structured digital mechanism for boarding-house discovery while extending the process toward transaction management within the same environment.

The successful results of the black-box testing further indicate that the major functional components have operated according to their intended specifications. This finding is important because functional validity provides an initial indication that the system design has been successfully translated into operational features. The multi-criteria search, for instance, provides users with greater flexibility in narrowing available options according to their specific preferences. Meanwhile, the interactive map adds a spatial dimension to the search process by allowing users to understand the geographical position of a boarding house in relation to their intended destination. Such integration is particularly relevant because accommodation decisions are influenced not only by textual attributes such as price and facilities, but also by location. Accordingly, the contribution of KostKu can be interpreted as the integration of attribute-based and location-based information within a single search experience rather than merely the provision of a digital property directory.

From a technical perspective, the implementation of Next.js, Supabase, and Capacitor through a Prototyping approach indicates that a single-codebase development strategy can provide an efficient foundation for delivering a system across multiple platforms. Capacitor enables the web-oriented application to be distributed within an Android environment without requiring the entire application to be independently redeveloped. This architecture potentially simplifies maintenance because the principal application logic can be managed through a relatively unified development environment. Supabase further supports database management and authentication, while the implementation of Row Level Security strengthens the system's access-control mechanism. This security model is particularly significant because authorization should not depend solely on restrictions presented through the user interface. Instead, access rules must also be enforced at the data layer so that users can only interact with information corresponding to their assigned roles.

The role-based structure implemented in KostKu consequently represents more than a simple separation of menus or interfaces. It constitutes part of the system's broader data-governance mechanism. Prospective tenants require access to accommodation information and booking functions, property owners require facilities for managing their listings, and administrators require broader authority to supervise and manage system data. Separating these permissions contributes to a more organized workflow while reducing the possibility of unauthorized data access. The integration with Google Sheets also extends the system beyond a tenant-facing search application by providing an additional mechanism for administrative monitoring and data management. This finding indicates that the information

needs surrounding boarding-house services involve not only front-end search functionality but also administrative processes that support the sustainability of the information system.

The findings are consistent with previous research emphasizing location information and mobile accessibility as important components of accommodation-search systems. Ibrahim et al. (2025) highlighted the relevance of location information and mobile access for students seeking accommodation. The similarity suggests that users in the student accommodation context require a system capable of presenting spatial information through devices that are readily available in everyday use. Nevertheless, KostKu extends this approach by connecting location information with multi-criteria search, booking procedures, and digital payment. The contribution of the present study therefore goes beyond improving access to accommodation information. It establishes a more continuous service pathway in which users can progress from property discovery to reservation within the same digital platform.

The findings are also compatible with Hasanah et al. (2025), who demonstrated that information systems can reduce the time required to search for boarding-house accommodation. In the present study, efficiency should not be interpreted solely as a reduction in information-search time, but also as a reduction in the number of separate steps users must undertake. A platform that combines structured search, location information, booking, and payment may reduce users' dependence on conventional search practices and fragmented communication channels. However, the differences between KostKu and previous systems indicate an expansion of functionality. Rather than concentrating primarily on information retrieval, the proposed system connects the discovery stage with subsequent transactional activities, thereby broadening the functional scope of accommodation information systems.

This distinction should also be understood in relation to the system-development context and the needs that the research seeks to address. Kendall & Kendall (2024) emphasize the importance of aligning information-system development with user requirements and the problems that a proposed solution is expected to address. In this study, the Prototyping approach provides an iterative development framework through which system components can be progressively aligned with the needs of prospective tenants, property owners, and administrators. The methodological value of this approach therefore extends beyond technical implementation because it supports the translation of practical

requirements into concrete system functions. The resulting system can consequently be understood as a product of both technological design and contextual problem identification.

Theoretically, this study contributes to the development of accommodation information systems by demonstrating the potential integration of criteria-based search, geographic information, digital transactions, and role-based management within a multiplatform environment. This contribution broadens the conceptualization of accommodation systems from digital catalogues toward integrated service platforms capable of supporting a more complete user journey. Practically, KostKu offers potential benefits for students, incoming workers, boarding-house owners, and administrators in Kabupaten Kudus. Prospective tenants gain a more structured search mechanism, property owners gain a broader promotional channel, and administrators obtain additional facilities for data monitoring and management. Methodologically, the documented implementation of Next.js, Supabase, Capacitor, interactive mapping, and payment integration can provide a useful development reference for comparable information-system projects.

Despite these contributions, the findings should be interpreted in light of several limitations. The prototype currently relies on a mock dataset consisting of 42 boarding-house listings, which cannot fully represent the diversity and dynamics of actual accommodation data in Kabupaten Kudus. The Midtrans integration also remains open to further development toward production keys and automated payment reconciliation. More importantly, User Acceptance Testing (UAT) involving actual prospective tenants and boarding-house owners has not yet been conducted. Consequently, user acceptance, perceived ease of use, satisfaction, and actual user experience cannot yet be established empirically. The successful black-box testing should therefore be interpreted as evidence of functional conformity rather than definitive evidence of real-world usability. Future research should conduct UAT with representative users, strengthen the payment gateway and automated reconciliation mechanisms, introduce push notifications for booking-status updates, and consider extending the application to iOS. These developments would allow future studies to move beyond functional validation toward empirical evaluation of usability, acceptance, and real-world implementation.

CONCLUSION

This study developed KostKu as an integrated information system for boarding-house search and rental services designed to address the needs of prospective tenants and property owners in Kabupaten Kudus. The system was developed using a Prototyping approach with Next.js, React, Tailwind CSS, and Supabase, while Capacitor was employed to support Android distribution. The resulting system integrates multi-criteria boarding-house search and filtering, interactive location mapping, booking procedures, Midtrans-based payment processing, review and favorite features, and role-based management involving prospective tenants, property owners, and administrators. The implementation of Row Level Security at the database layer further enables access control to be enforced according to the responsibilities assigned to each user role. The black-box testing results confirmed that the principal functional scenarios examined operated in accordance with the specified design. These findings indicate that the study successfully achieved its primary objective of developing an integrated platform that supports the search and rental of boarding-house accommodation within a unified digital environment.

The principal contribution of this study lies in the technical development and documentation of a single multiplatform system that consolidates accommodation search, geographic information, booking, digital payment, user interaction, and role-based data governance. This integrated approach provides practical value by reducing fragmentation across the accommodation-search process while offering a broader digital channel for boarding-house owners to present their properties. From a broader perspective, KostKu demonstrates how a single application architecture can accommodate interconnected functions that are often implemented separately in comparable local accommodation systems. Nevertheless, the current findings primarily establish functional feasibility and do not yet provide empirical evidence regarding user acceptance or real-world user experience. Future research should therefore conduct User Acceptance Testing involving prospective tenants and property owners in Kabupaten Kudus, strengthen the Midtrans integration within a production environment, and introduce additional mechanisms such as booking-status notifications. Extending the system to iOS should also be considered to broaden accessibility and support wider implementation of the proposed accommodation platform.

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