



Designing an Online Train Ticket Booking Website Using the Design Thinking Method

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Abstract

The increasing demand for train services in Indonesia has highlighted significant challenges in conventional ticket reservation systems, including long queues, limited customer time, scheduling errors, and rapid ticket depletion during peak periods. This study aims to develop and evaluate a digital train ticket reservation application designed to streamline booking processes, improve user experience, and provide real-time access to ticket availability, pricing, and schedules. The research employs a user-centered Design Thinking approach to guide the development of key functional modules, including login, train and route management, schedule creation, order processing, and user profile management. Results demonstrate that the application successfully integrates these functionalities into a unified platform, reducing operational inefficiencies, minimizing user errors, and enabling users to book tickets conveniently from multiple devices. The system enhances administrative oversight through centralized order reporting and data management, while improving overall service reliability and user satisfaction. These findings imply that human-centered digital platforms can transform traditional public transportation services by increasing operational efficiency, scalability, and customer convenience. Furthermore, the study identifies areas for future improvement, such as incorporating predictive analytics for demand forecasting, dynamic seat allocation, and extended accessibility features to accommodate diverse user needs. The results provide practical insights for railway operators seeking to implement adaptive, reliable, and user-friendly ticket reservation systems, underscoring the value of integrating technology, usability, and real-time information in public transport services.

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1. Introduction

In the current era, technological development holds a critical role worldwide. Information technology is crucial for integrating communication and computing, which becomes a necessity in the information age. The internet, as a vast information network, and e-commerce, as a digital business alternative, drive many organizations and companies to implement information systems designed to help users

manage information within offices, companies, or other institutions. One of the most essential manifestations of this technology is applications, which have become the backbone of many modern businesses. A prime example is train ticket reservation systems, where tickets serve not only as proof of purchase but also as a critical part of administrative procedures in rail transportation.

Despite the convenience offered by applications, the train ticket booking process still poses significant challenges: long queues at stations, limited time for customers, and poor transparency in pricing for future travel dates. To mitigate these issues, PT Kereta Api (Persero) in North Sumatra has developed a mobile application that simplifies booking, accelerates transactions, and offers real-time information on ticket prices and schedules. Nevertheless, additional problems remain, such as user errors in selecting schedules or routes, as well as rapid ticket depletion during peak seasons or holidays.

To address these challenges, the user interface of this application is being designed using the Design Thinking method, which fosters innovative solutions grounded in a deep understanding of user needs and pain points. The designed application enables users to book tickets anytime and anywhere without visiting station counters, integrates schedule search, booking, and payment in one platform, and is accessible on both smartphones and laptops with a consistent, user-friendly interface.

Empirical data supports the urgency of improving this system. According to the Indonesian Statistics Bureau (BPS), the number of train passengers in October 2023 reached 33.6 million—a 6.57% increase compared to September 2023—and from January to October 2023, cumulative ridership reached 303.6 million, up by 37.76% from the same period in the previous year (Badan Pusat Statistik [BPS], 2023). These figures underscore the rapidly increasing demand for train services and highlight the need for a more efficient and user-centric booking platform.

However, existing solutions like the KAI Access application still exhibit notable weaknesses. Studies have reported low user satisfaction (Nugraha, Pratama, & Faroqi, 2024), navigational difficulties and usability problems (Musyaffa, 2023), and service-quality gaps across dimensions such as reliability, responsiveness, and empathy (Khoiriyah, 2025). Additionally, evaluations using the System Usability Scale (SUS) identified significant usability issues (Sidrotul Muntaha, 2024), while research using the User Experience Questionnaire (UEQ) revealed that, despite generally positive impressions, aspects such as dependability and novelty remain suboptimal (Aulia & Muntaha, 2024).

Therefore, even though the digitalization effort via KAI Access exists, there remains a clear research gap: how to design a train ticket booking interface that is more reliable, fast, and stable, particularly during high-load periods, while addressing usability and service-quality shortcomings. This study, employing the Design Thinking method, positions itself innovatively by focusing on improving both UX and UI, filling the gaps left by previous research, and proposing more user-centered and adaptive solutions to meet the growing volume and evolving needs of train service users.

2. Research Methodology

This stage involved studying the basic theories that support the research, searching for, and collecting the necessary data. To collect the required data, the author used several techniques.

A. Field Research

In this research process, the author conducted field research using the following process:

1. Direct Observation

The researcher conducted direct observations at PT. KAI North Sumatra to obtain data related to the research.

2. Interviews

The researcher met directly with the sales department to obtain more comprehensive data regarding the ticket ordering process at PT. KAI North Sumatra. The interview was conducted with Customer Service Staff, namely Mrs. Rita Dewi.

B. Library Research

In this method, the author cites several sources related to the implementation of this thesis, including books and scientific journals.

C. Research Methodology

This research will go through several stages. These stages can be modeled using a Fishbone diagram. The stages used in this research are as follows:

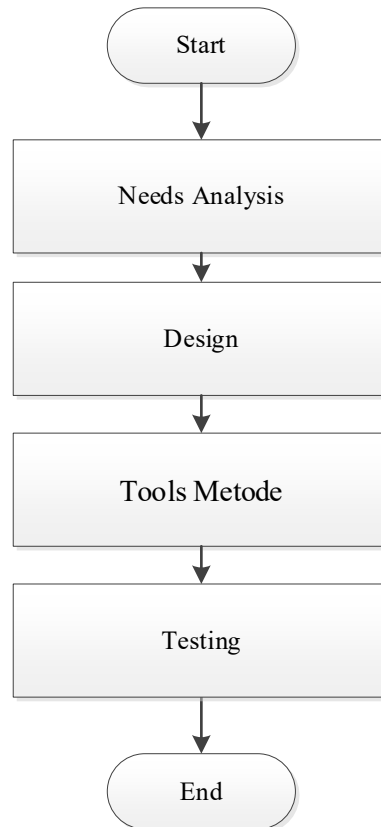


Figure 1. Research Methodology Diagram

Description:

1. Needs Analysis

Contains the elements that must be included in the design results to be able to solve the existing problems according to the objectives. This stage analyzes the requirements needed to achieve the research objective, namely train ticket reservation data.

2. System Design

This stage is the actual stage in developing a system. Computer use will be maximized in this stage. The purpose of testing is to identify errors in the system and then correct them. The system design used in theory is UML modeling, namely use case diagrams, class diagrams, activity diagrams, and sequence diagrams.

3. Tools

Coding is the translation of the design into a computer-recognizable language. This is performed by a programmer who will translate the transactions requested by the user. In this stage, the researcher used a web browser and PHP. The researcher used computer/laptop hardware. The database used was MySQL.

4. Testing

This research conducted program trials using black box (interface) testing, a software test that examines the application's functionality against its internal structure or operation. Specific knowledge of the application code/internal structure and general programming knowledge is not required; testing is conducted for each designed hardware block. At this stage, the researchers tested the system using theoretical and practical testing. Theoretical testing was conducted using black box testing, and practical testing was conducted using localhost.

5. Results

At this stage, the research was completed. The result is an online train ticket booking application.

3. Results and Discussion

Tickets are needed as proof that a passenger has actually purchased a train ticket. Train ticket reservations also face challenges. To address these challenges, conventional ticket reservations often involve queues at stations, limited time for customers, and the inability to process information about departure prices or previous dates. PT Kereta Api (Persero) North Sumatra has provided a solution by using an application designed to simplify ticket reservations, expedite the transaction process, and provide quickly accessible information about ticket prices and schedules. Other challenges encountered in the train ticket reservation process include errors in schedule or route selection, and ticket shortages. Train tickets for specific dates or routes often sell out quickly, especially during the holiday season or busy days. This can create difficulties for users who want to book tickets at specific times, as well as limited ticket availability. To address these issues, a user interface can be designed as a digital platform for the train ticket reservation application. A use case is depicted as a horizontal ellipse in a UML use case diagram, as seen in Figure 2:

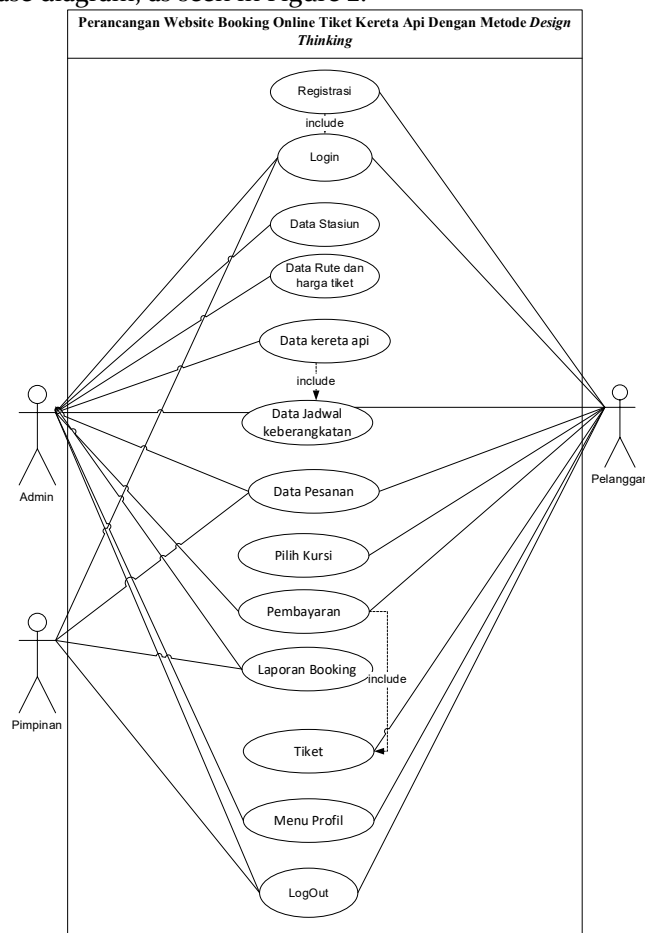


Figure 2. Use Case Diagram

3.2. Hasil

3.2. Results

1. Login Menu Display

The Login Display is the first display to appear when the program is run. It functions as an input form for the program administrator's username and password. The login display is shown in Figure 3:

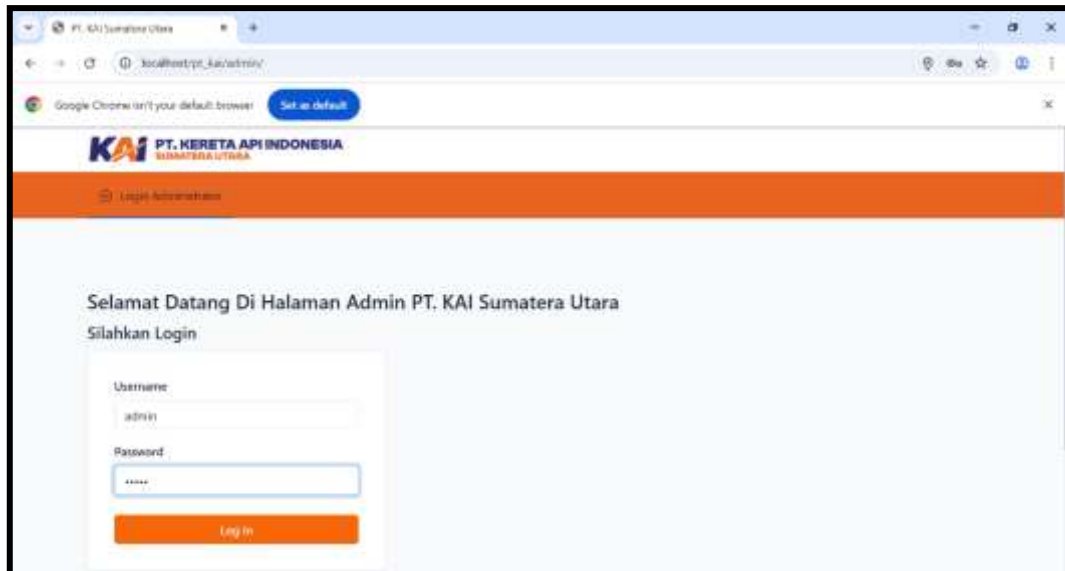


Figure 3. Login Form Display

2. Train Data Form Display

This form displays the train data options. Selecting a train will display the train data. A display of the train data form can be seen in Figure 4:

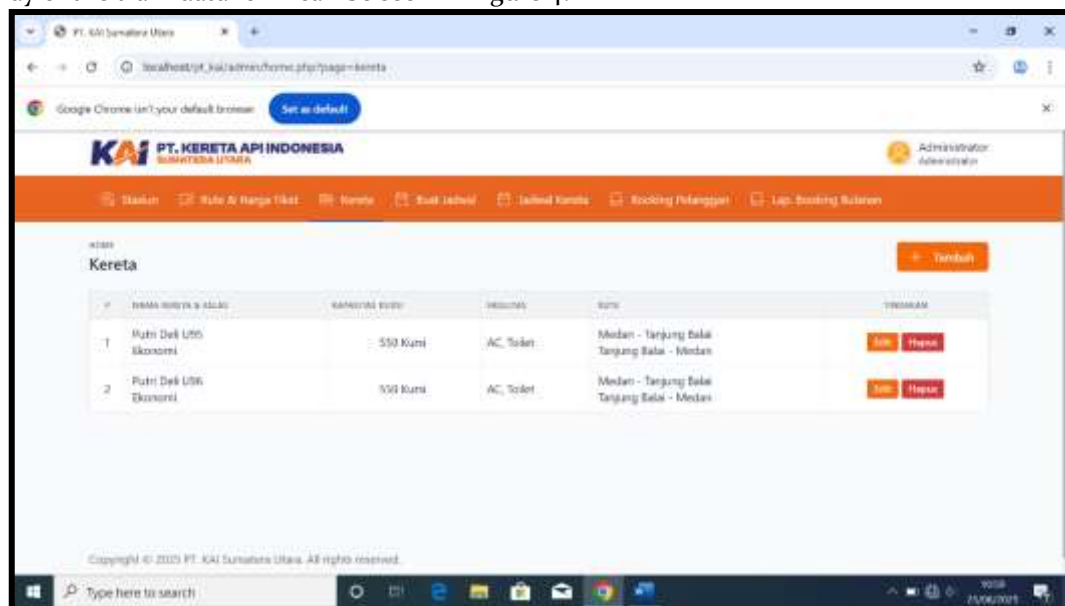


Figure 4. Train Form Display

3. Train Route Form Display

This form displays the train route data options. Selecting a train route will display the train route data. A display of the train route form can be seen in Figure 5.

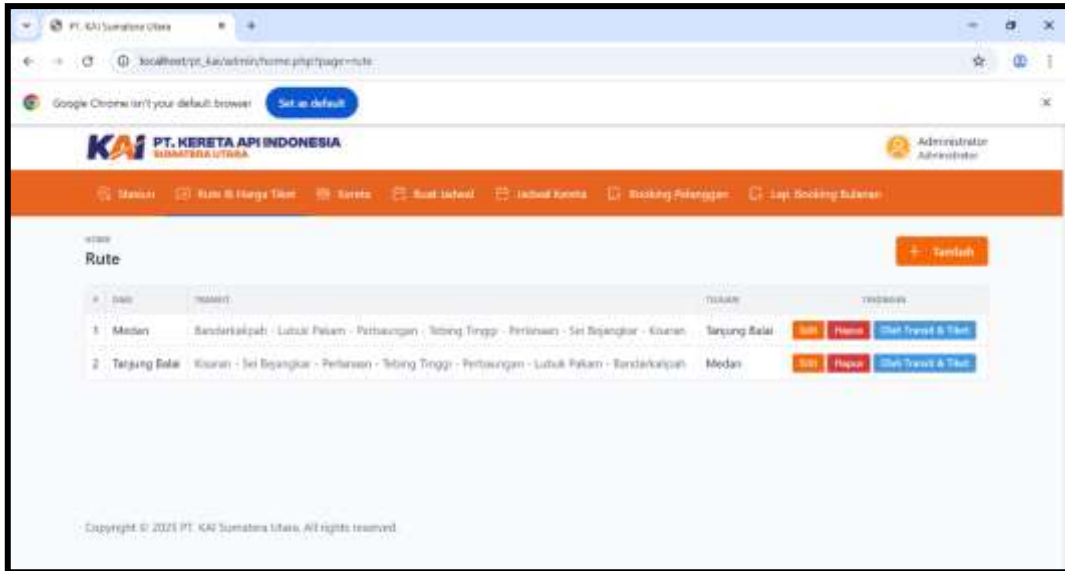


Figure 5. Train Route Form Display

4. Route Input Form Display

This form displays the user's data options. Selecting a train route will display the train route data. An image of the Train Route Input Data Form can be seen in Figure 6:

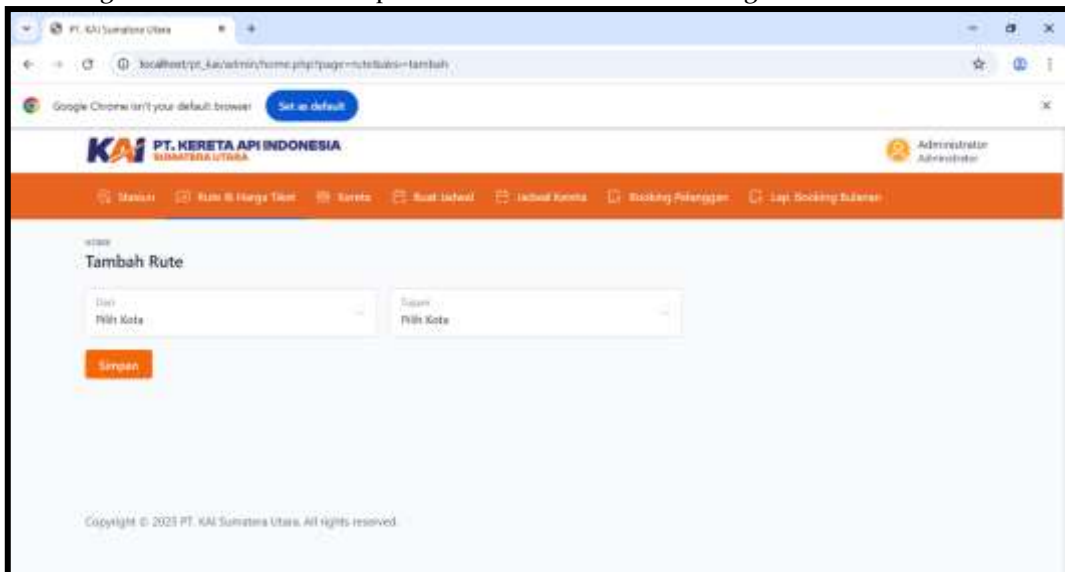


Figure 6. Train Route Input Form

5. Transit Processing Form

This form displays transit processing data options. Selecting transit input data will display the transit input data. The transit input data form can be seen in Figure 7:

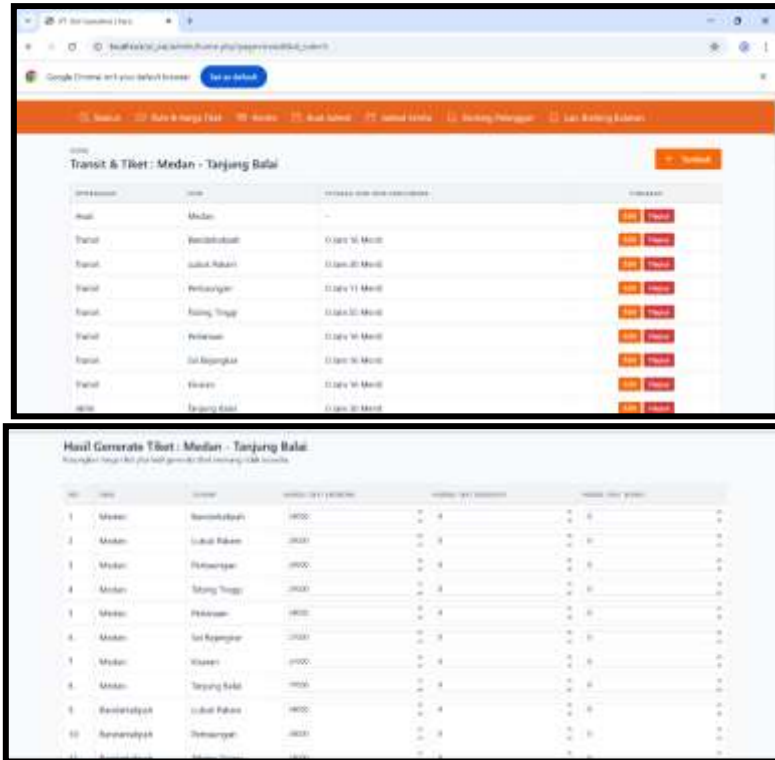


Figure 7. Transit Input Form

6. Station Form

This form displays station data options. Selecting a station will display the station input data. The station input data form can be seen in Figure 8:



Figure 8. Station Form

7. Train Schedule Form

This form displays train schedule data options. Selecting a train schedule will display the train schedule data. The train schedule data form can be seen in Figure 9:

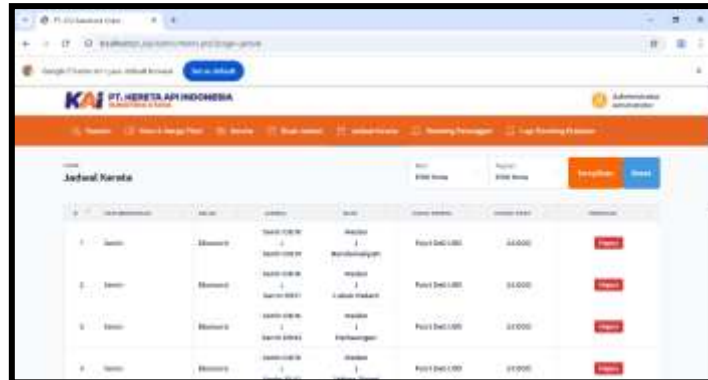


Figure 9. Train Schedule Form

8. Create Schedule Form

This form displays user data options. Selecting create schedule data will display the schedule data. An image of the schedule creation data form can be seen in Figure 10:

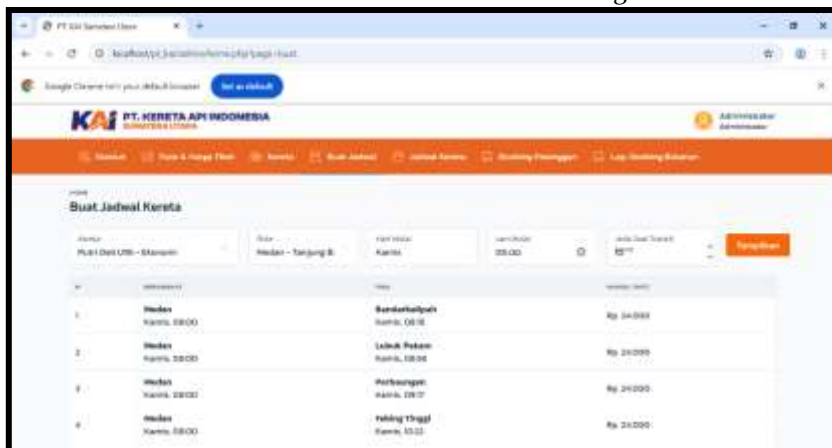


Figure 10. Schedule Creation Form

9. Order Form

This form displays user data options. Selecting an order will display the order data. An image of the order data form can be seen in Figure 11:

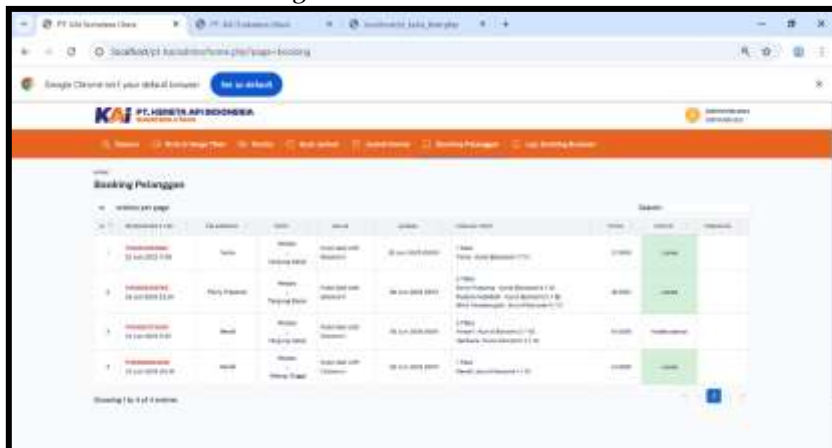
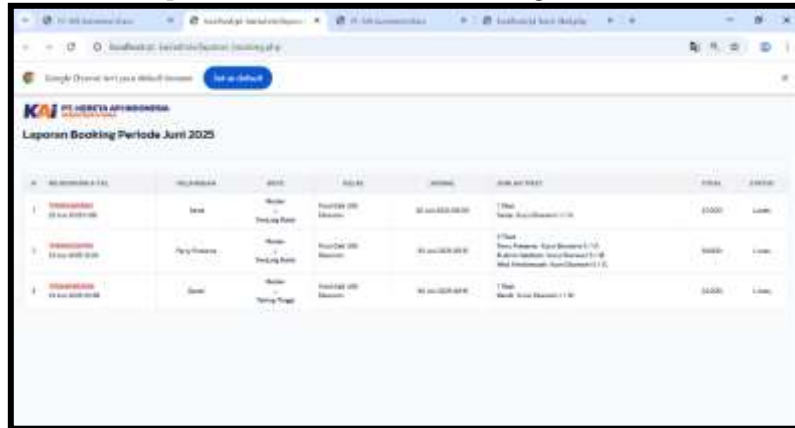


Figure 11. Order Form

10. Order Report Data Form

This form displays order report data options. Selecting an order will display the order report data. An image of the order report data form can be seen in Figure 12:

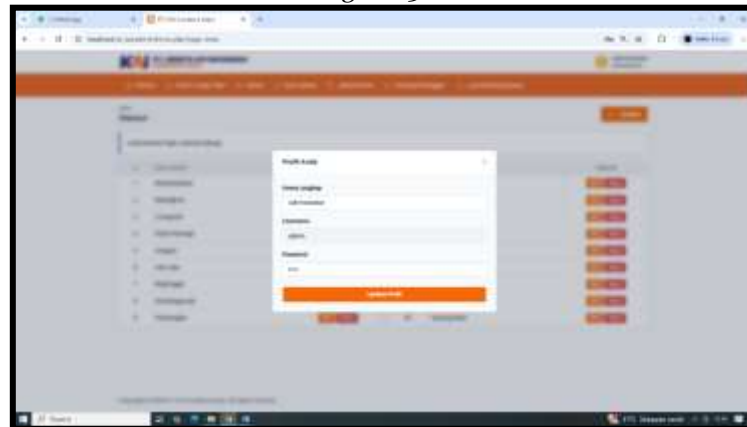


The screenshot shows a web application interface for 'KAI MELAYU APRIORITAS'. The main heading is 'Laporan Booking Periode Juni 2025'. Below this is a table with columns for 'No', 'No. Booking', 'Nama', 'Jenis', 'Kategori', 'Status', 'Jumlah', and 'Aksi'. The table contains three rows of data, each representing a different booking entry with details like 'Tipe', 'Masa Berlaku', and 'Status'.

Figure 12. Order Report Form

11. Profile Data Form

This form displays profile data options. Selecting an item will display the profile data. An image of the profile data form can be seen in Figure 13:



The screenshot shows a web application interface with a sidebar menu on the left. A modal window titled 'Profile Data' is open in the center, containing several input fields for user information, including 'Nama Lengkap', 'Email', 'No. HP', and 'Alamat'. There are 'Save' and 'Cancel' buttons at the bottom of the modal.

Figure 13. Profile Form

Discussions

The results of this study demonstrate that the implementation of a digital train ticket reservation application can significantly streamline the ticket booking process, address common operational challenges, and improve user accessibility. The Login Menu, as the first interface encountered by administrators, ensures secure access through credential verification, establishing a foundation for data integrity and system security. Subsequent displays, including the Train Data Form and Train Route Form, provide structured access to train and route information, allowing users to view and select desired travel options accurately. The Route Input Form and Transit Processing Form further facilitate the input and management of user and transit data, ensuring that operational workflows are systematically documented and processed. Similarly, the Station Form, Train Schedule Form, and Create Schedule Form allow both administrators and users to manage and access schedule information efficiently, reducing errors in route selection and scheduling that are common in conventional booking systems. The Order Form and Order Report Data Form consolidate transaction data and reporting capabilities, providing transparency and enabling administrative oversight for both user transactions and system performance. Additionally, the Profile Data Form allows users to manage

personal information securely, enhancing personalization and overall user experience. Collectively, these modules demonstrate that the application integrates multiple functionalities into a unified platform, facilitating real-time access to schedules, ticket availability, and prices, while minimizing common user frustrations such as long queues, rapid ticket depletion, and manual errors. By automating and centralizing data input and processing, the system not only increases operational efficiency but also enhances customer satisfaction by providing a reliable, user-friendly interface accessible on various devices. The design of this application, informed by comprehensive use-case analysis, underscores the potential of digital platforms to transform traditional service processes in public transportation, highlighting the importance of human-centered design in addressing user needs, system reliability, and service scalability. This study confirms that integrating security, data management, and real-time interactivity within a cohesive digital framework can serve as a model for other transport operators seeking to enhance service quality, operational efficiency, and overall user experience.

4. Conclusion

This study demonstrates that the implementation of a digital train ticket reservation application, structured through modular forms including login, train data, route, schedule, order, and profile management, effectively streamlines the ticket booking process, minimizes user errors, and enhances real-time access to ticket availability, pricing, and schedules. The findings indicate that integrating multiple functionalities into a unified, user-centered platform not only increases operational efficiency for the railway operator but also significantly improves the overall user experience by reducing traditional challenges such as long queues, rapid ticket depletion, and scheduling errors. These results have practical implications for public transportation services, suggesting that human-centered digital platforms can serve as effective solutions for improving service quality, scalability, and customer satisfaction. However, this study has several limitations. The current application design was evaluated primarily based on functional modules and interface usability, without extensive quantitative analysis of user behavior, system performance under peak loads, or longitudinal impacts on customer satisfaction. Additionally, while the system addresses operational inefficiencies, it does not yet incorporate predictive analytics for demand forecasting or dynamic seat allocation, which could further optimize booking efficiency. Future research should focus on integrating advanced data analytics, performance testing under high-demand scenarios, and comprehensive user experience evaluation through large-scale field testing. Incorporating artificial intelligence or machine learning techniques for predictive modeling could enhance system responsiveness and resource allocation. Furthermore, cross-platform interoperability and enhanced accessibility features should be explored to ensure equitable access for diverse user groups. By addressing these areas, subsequent studies can extend the current work, providing more robust, adaptive, and scalable digital solutions for train ticket reservation systems, thereby reinforcing the applicability of human-centered design principles in large-scale public transportation services.

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