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Dual Hub Platform (DHP): A secure and intelligent business and accommodation system

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Abstract

Digital book systems are increasingly being used, which has changed the access to accommodation and workspace reservation services. However, most existing platforms are limited to a single service domain, leading to fragmented user experiences, difficulties in managing multiple accounts and inefficient booking processes. This paper presents DualHubPlatform (DHP), a web based platform that provides accommodation booking and business-space reservation in a system. The platform was built to offer a secure, scalable, and easy-to-use environment with property listing, booking management, messaging, wallet transactions, identity verification and review management. Development was done with the Agile software development methodology, utilizing HTML5, CSS3, JavaScript, PHP 8, MySQL 8, Tailwind CSS, and Leaflet.js. A three-tier client-server architecture was used with presentation, application and data layers. Functional and usability testing was employed to test system reliability, responsiveness, booking accuracy and security performance. Results showed that the platform successfully supported integrated booking operations, secure authentication, wallet-based payments, real-time messaging, interactive maps, and role-based access control. The study demonstrates the potential of integrated booking platforms to improve service accessibility, user convenience, and operational efficiency while reducing fragmentation between accommodation and workspace reservation services.

Keywords: Integrated Platform; Booking System; Web Application; Accommodation Platform; Workspace Reservation

1. Introduction

Digital technologies have significantly transformed the delivery of accommodation, workspace, and reservation services. Contemporary booking platforms enable users to search, compare, and reserve services through web and mobile technologies, thereby improving accessibility and convenience [1], [2]. Advancements in cloud computing, mobile connectivity, and platform-based business models have further accelerated the adoption of digital booking services by supporting real-time transactions and user interactions [3].

Despite these developments, most booking platforms operate within a single service domain, focusing either on accommodation booking or workspace reservation. As a result, users frequently navigate multiple systems to satisfy related accommodation and professional workspace requirements. This fragmentation often leads to duplicated account management, inconsistent user experiences, and inefficient booking processes.

The growing prevalence of remote work, freelancing, entrepreneurship, and digital nomadism has increased the demand for integrated environments that support both living and working needs [4]. Existing accommodation platforms rarely provide workspace reservation capabilities, while workspace platforms generally lack accommodation

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services. Consequently, users are often required to rely on disconnected platforms to manage related activities [5], [6], [7].

In addition to service fragmentation, many booking systems face challenges associated with secure communication, identity verification, payment management, recommendation support, and transaction efficiency. These limitations can affect user trust, operational effectiveness, and overall usability [8], [9], [10].

To address these challenges, this study presents DualHubPlatform (DHP), an integrated web-based booking platform designed to support accommodation booking and workspace reservation within a unified environment. The platform incorporates secure authentication, wallet-based transactions, property verification, messaging functionality, review management, and location-based discovery features. The study aims to improve service integration, booking management, usability, and secure digital interactions among guests, hosts, and administrators.

The specific objectives of this study are to:

- Design an integrated booking platform for accommodation and workspace reservations.
- Implement secure authentication and role-based access control.
- Develop booking, messaging, and wallet transaction functionalities.
- Improve user interaction through responsive and user-centered interfaces.
- Evaluate the performance and usability of the developed platform.

2. Literature Review

Online booking platforms have become essential components of modern digital service delivery. Accommodation booking systems provide remote access to lodging services, whereas workspace reservation systems facilitate flexible office and co-working space management. Previous studies have highlighted the convenience offered by accommodation booking platforms but have also noted their limited focus on integrated workspace functionality [1].

Research on co-working environments has emphasized their growing importance in supporting entrepreneurship, remote work, and flexible professional activities [2]. Similarly, studies on digital work ecosystems have reported increasing demand for environments that combine living and working requirements within a single service framework [3], [11], [12].

From a technical perspective, modern web applications commonly employ layered architectures comprising presentation, application, and data layers [4]. Such architectures contribute to improved maintainability, scalability, and modularity. Security mechanisms, including authentication, session management, and protected communication processes, also play a critical role in safeguarding user information and maintaining trust in online systems [5].

Although PHP and MySQL remain widely adopted technologies for web application development because of their flexibility and scalability, many existing booking platforms do not provide integrated messaging, wallet transactions, location-based support, and unified service management. This gap motivated the development of DualHubPlatform as a unified solution for accommodation booking and workspace reservation.

3. Methodology

The study adopted a design-and-build research methodology combined with a system development approach. Existing booking platforms were examined to identify functional limitations and user requirements, which informed the development of the proposed solution.

An Agile software development methodology was employed to support iterative implementation, continuous testing, and incremental refinement of system components.

Data were collected from both primary and secondary sources. Primary data were obtained through an online questionnaire administered using Google Forms to users familiar with accommodation and workspace booking platforms. The survey sought to identify challenges associated with existing systems, user expectations, and requirements for an integrated booking platform. A total of 145 responses were collected and analyzed using descriptive statistical techniques.

Secondary data were obtained from scholarly publications, textbooks, conference papers, and existing digital booking platforms. These sources provided theoretical and technical foundations for system design and implementation.

The system was developed using HTML5, CSS3, JavaScript, PHP 8.x, MySQL 8.x, Tailwind CSS, Leaflet.js, PDO Prepared Statements, XAMPP Local Server, and Railway Cloud Hosting. The platform adopted a client–server architecture based on a three-tier structure comprising presentation, application, and data layers.

The collected data was analyzed and the demographics are presented in the figures below:

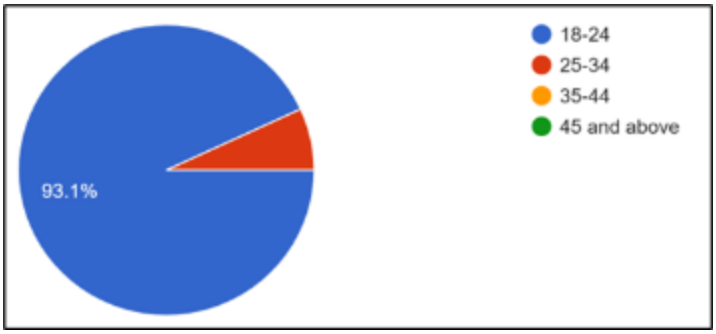

Figure 1 Age Distribution of Respondents

Figure 1 depicts the age distribution of the respondents of which only the class range of 18 - 24 and 25-34; 93.1% of the respondents' age is between 18-24. This shows that the younger generation responded more to the questionnaire and they are more likely to use web systems for accommodation and business purposes.

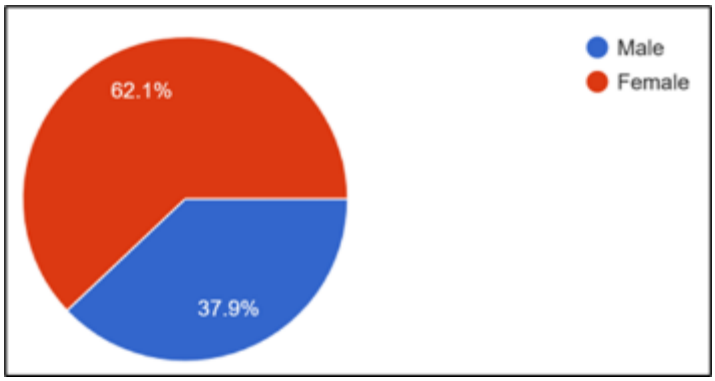

Figure 2 Respondents Gender Distribution

The respondents' gender were not evenly distributed as shown in figure 2 having the males as 37.9% and the females 62.1%. This indicates that most of the respondents are female and one can infer that females are more likely to use web applications for the purpose of business and accommodation.

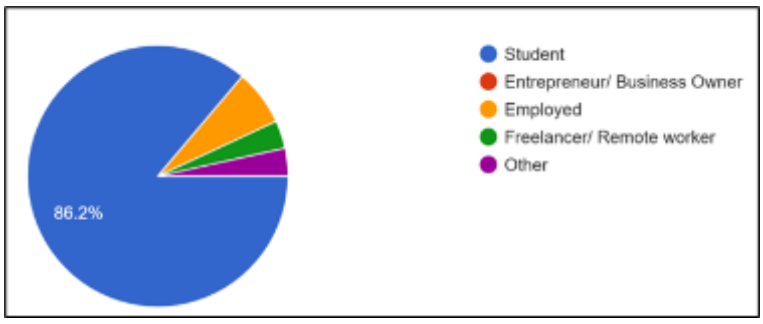

Figure 3 Occupation Distribution of Respondents

The occupation of the respondents was taken into consideration as illustrated in figure 3. Students are mostly the respondents with a percentage of 86.2, freelancers/remote workers and others share the same percentage of 3.45 each while the employed respondents doubled the percentage of 3.45 being 6.9%.

The data collected also reveal situations of the existing platforms, users experience and their expectations. These are depicted in the figures below:

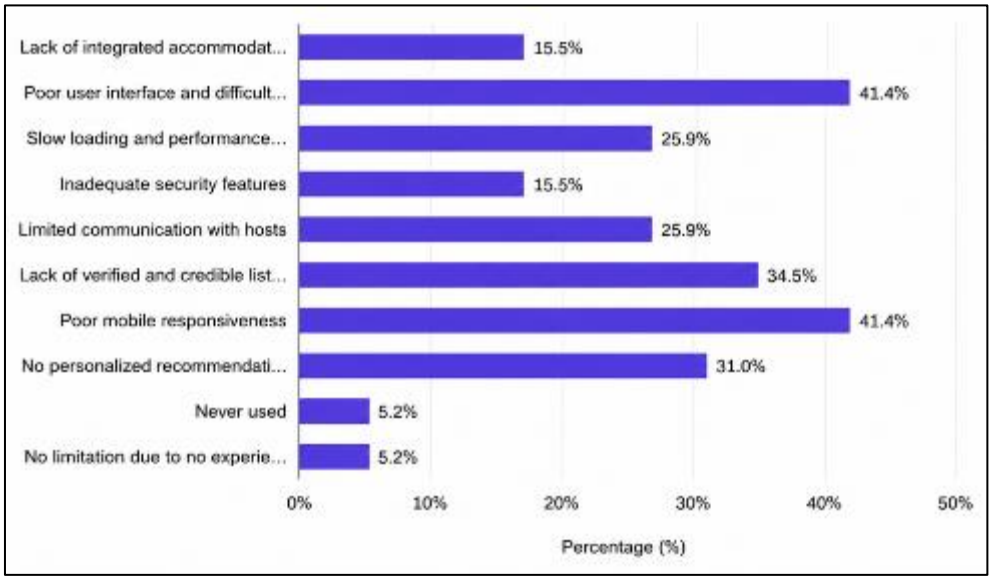

Figure 4 Limitations of Existing Platforms

The existing systems notably AirBnB and Booking.com, were said to have some limitations as identified by the respondents. The questions asked and the percentage of respondents answers is depicted in figure 4. The questions asked are as follows:

- Lack of integrated accommodation and workspace booking
- Poor user interface and difficult navigation
- Slow loading and performance issues
- Inadequate security features
- Limited communication with hosts
- Lack of verified and credible listing
- Poor mobile responsiveness
- No personalized recommendations

Three (3) percent of the respondents selected the others option with an answer that the haven't used the existing system, hence they have no experience or limitation with respect to the existing system. Poor mobile responsiveness and poor user interface/difficult navigation topped the respondents answer as the limitation to the existing systems, both having a percentage of 27.6%.

A vital requirement to ascertain the necessity of the new system is the question asked to the respondents: Would it be helpful to you to have a platform that combines accommodation and business-space booking. Figure 5 depicts that 65.5% of the respondents affirmed that it is needful to integrate business and accommodation space book; 6.9% of the respondents are of the opinion that it will not be helpful to integrate both accommodation booking and business-space booking systems together; 27.6% of the respondents are undecided with respect to the question.

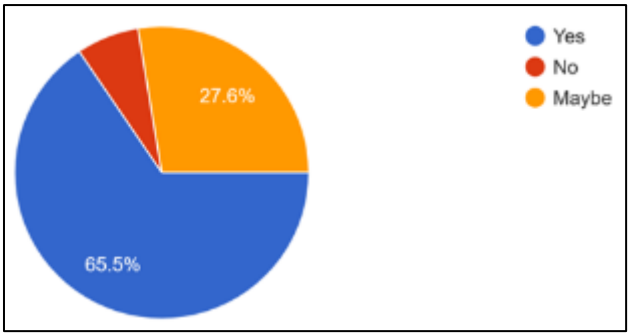

Figure 5 Respondents Distribution of Integrated Platform Need

Security being an essential factor in web systems and other information systems, the respondents were asked about their expectation of security when booking on platforms as shown in figure 6. 51.7% of respondents agreed that security is very important; 27.6% of the respondents agreed that security is important; 10.3% of respondents were neutral; 6.9% and 3.4% of the respondents agreed that security is not very important and not important respectively. Hence, 10.3% of respondents did not agree that security is important, 10.3% of the respondents were neutral and 79.4% of the respondents agreed that security is important.

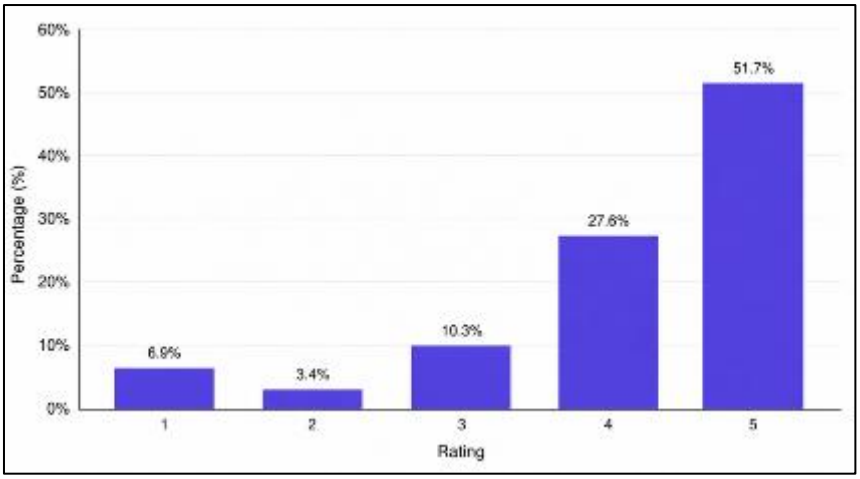

Figure 6 Respondents Security Expectations of Integrated Platform

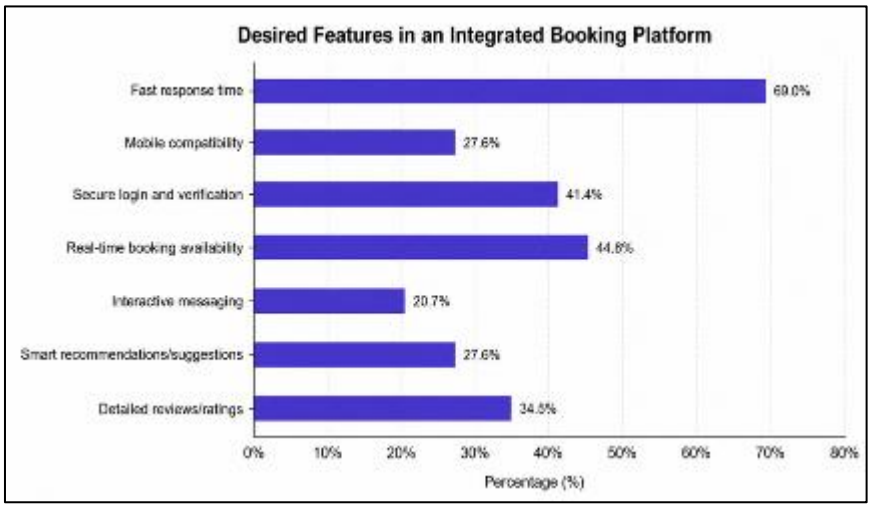

Figure 7 Respondents Requirements for Integrated Platform

The need to have a secure and scalable system made the researchers ask the respondents on what security features they expect and table 1 depicts the respondents response. This question was a multiple response question.

Table 1 Security Requirements of Respondents

Security Feature	Count	Percentage (%)
Secure password authentication	60	41.4
Two factor authentication (OTP/TOTP)	50	34.5
Encrypted Messaging	50	34.5
Role based access control	10	6.9
Verified user/host identity	30	20.7
Fraud detection measures	45	31.0
Secure payment processing	45	31.0
Data privacy protection	50	34.5

Non-function requirements were taken into consideration in the development of this system and most of the respondents stated that fast response time matters to them, having a percentage of 69%. The other non-functional requirements that top the list are: Real-time booking availability (44.8%), Secure login and verification (41.4%), and Detailed reviews/ratings (34.5%) as shown in figure 7.

3.1. System Development Environment

The system was developed using HTML5, CSS3 and JavaScript for the frontend, PHP (for logic) and MySQL Server (as database) for the backend. In addition to the use of native CSS, Tailwind framework was used. Leaflet.js which is an open source JavaScript library was used for interactive maps alongside the listing of accommodations and workspace. The platform adopted a client-server architecture with a three-tier web architecture.

4. Results

4.1. System Overview

The implemented DualHubPlatform successfully integrated accommodation booking and workspace reservation services into a unified environment. The system supported:

- User registration and authentication
- Role switching between guest and host
- Property listing and management
- Booking management
- Wallet transactions
- Messaging system
- Reviews and ratings
- Interactive map integration
- Identity verification (for Know Your Customer - KYC)
- Notification support

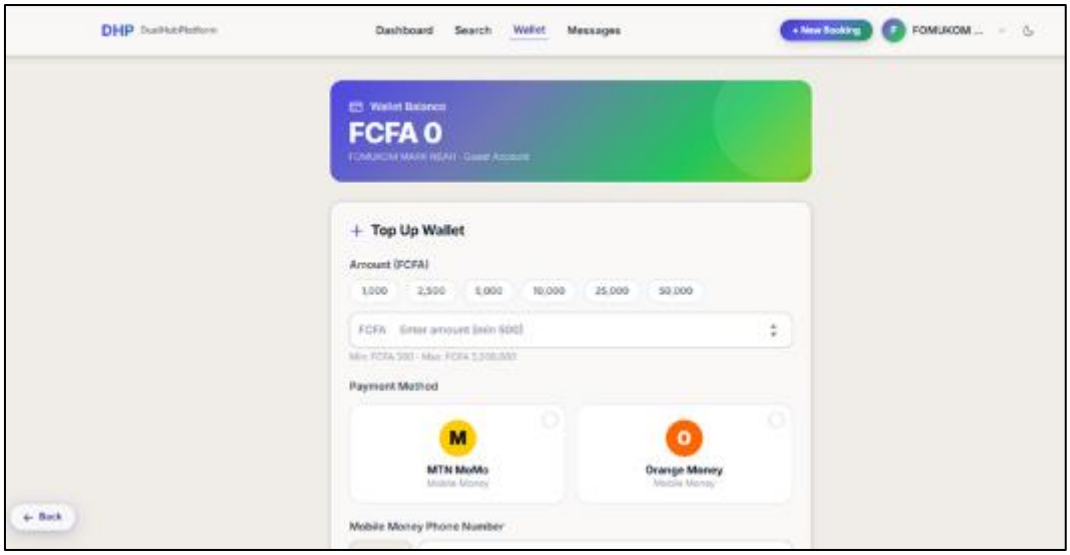

Figure 7 User Wallet Transaction page

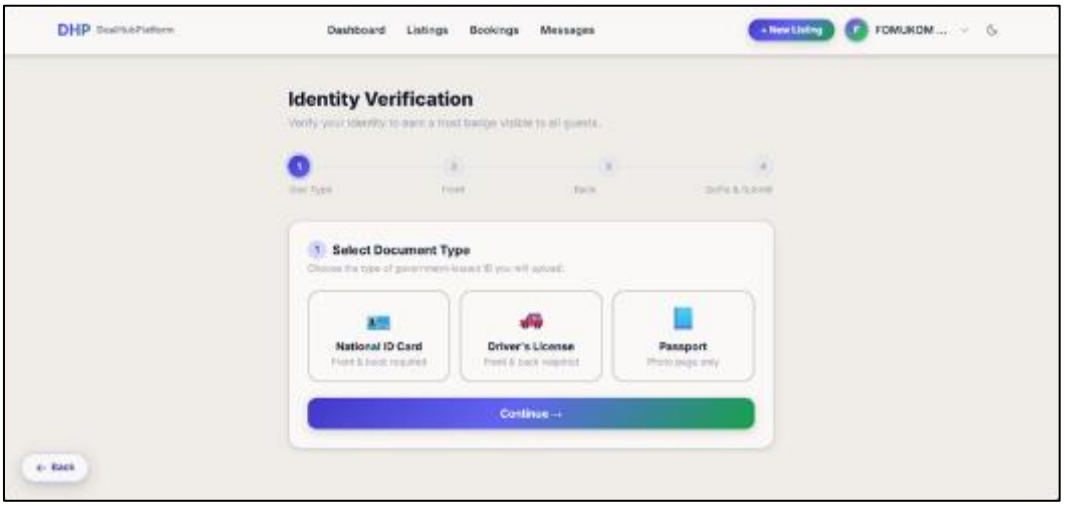

Figure 8 DHP KYC

4.2. System Architecture

The three-tier architecture and functions adopted by the platform are:

- Presentation Layer - this layer was implemented using HTML5, CSS3, Tailwind CSS, and JavaScript to provide responsive user interfaces.
- Application Layer - PHP version 8 was used for the implementation of this layer, handling business logic, authentication, session management, booking operations, and API interactions.
- Data Layer - Implemented using MySQL server for relational data storage and transaction management.

4.3. Database Structure

The database consisted of multiple interconnected tables such as users, properties, bookings, messages, reviews, favourites, wallet_transactions, notifications, property_images. The entity-relationship diagram of the database is depicted in figure 9.

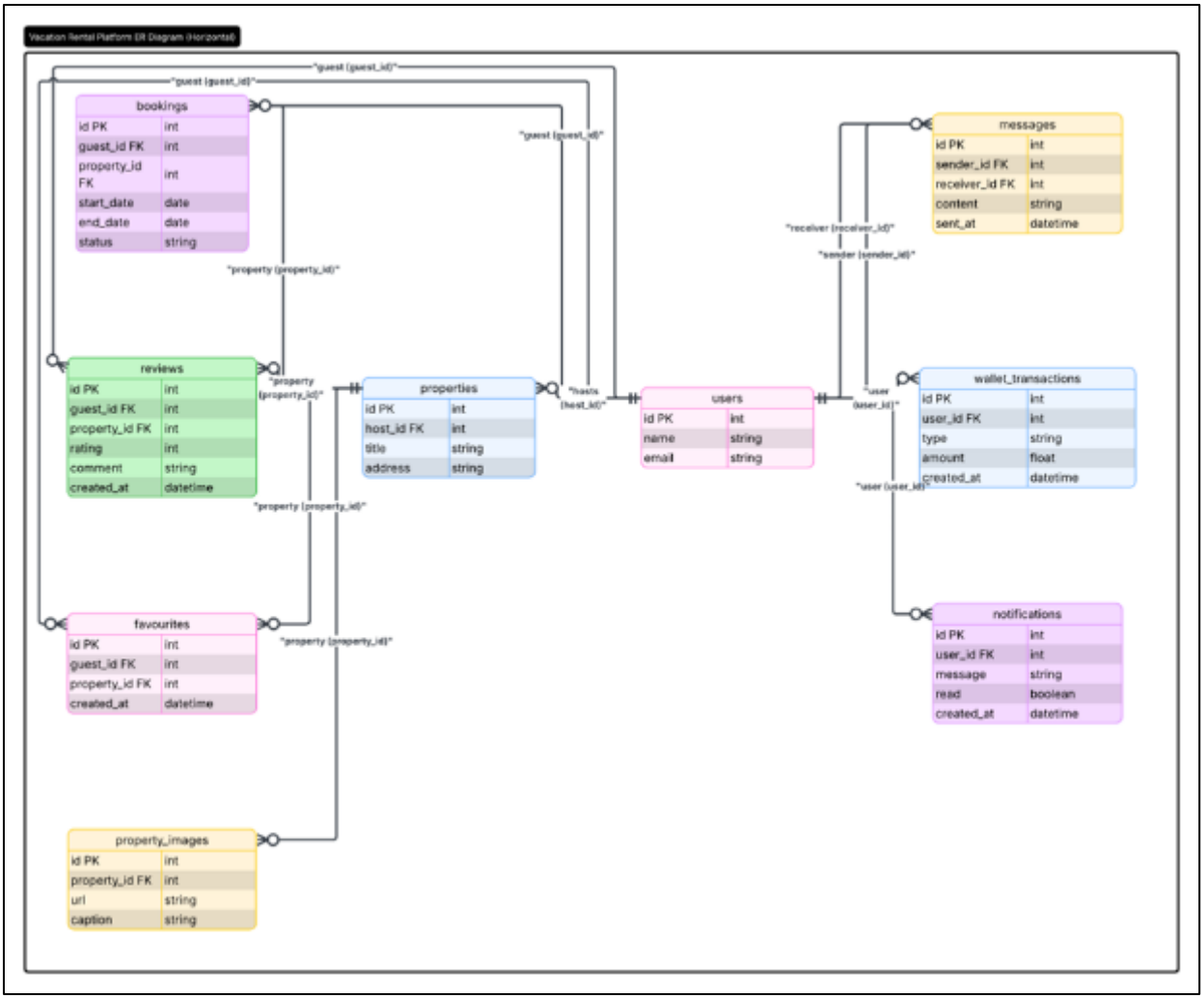

Figure 9 Database ER diagram

4.4. Functional Testing Results

Table 2 Test Cases and Results

Test Case	Expected Outcome	Result
User authentication	New user account created	Passed
Login authentication	Secure user login	Passed
Property booking	Booking successfully processed	Passed
Wallet payment	Balance deducted correctly	Passed
Messaging system	Messages delivered correctly	Passed
Review submission	Review saved successfully	Passed

DHP was tested as a system which was based on functionality, security performance, usability, responsiveness, and system reliability. The test suite for DHP having different test cases as shown in table 2, were executed by the authors on the localhost as well as on the online host. The system was hosted on railway - an intelligent cloud provider; and the database is Railway MySQL. The url is https://dhp-production.up.railway.app/

4.5. Performance Evaluation

The developed platform (DHP) demonstrated the following with respect to performance:

- Fast page rendering
- Secure session management
- Responsive mobile-friendly interfaces
- Accurate booking calculations
- Efficient database query execution
- Stable cloud deployment performance

Table 3 Comparison of Existing System and DHP

Feature	Existing latforms	DualHubPlatform
Accommodation Booking	Available	Available
Workspace Booking	Limited	Fully Supported
Integrated Services	Mostly Absent	Fully Integrated
Secure Messaging	Limited	Available
Interactive Maps	Partial	Advanced
Wallet Transactions	Limited	Supported
Dark Mode	Rare	Supported
Real-Time Notifications	Limited	Available

Airbnb and Booking.com were used as the existing systems and a comparison was made with the developed system as depicted by table 3. The advantages of DHP over the existing systems are majorly in the integrated services and workspace booking.

5. Discussion

The results demonstrate that integrated dual-service booking systems can significantly improve user convenience by centralizing accommodation and workspace reservation services within a unified platform. The implementation of secure authentication, wallet transactions, and role-based access control improved trust and system reliability.

Compared to existing standalone booking systems, DHP provided enhanced service integration, centralized management, and improved communication workflows through its messaging and notification systems.

The integration of interactive maps, favourites, reviews, and identity verification further enhanced user trust and usability. The use of Agile development methodology also supported modular system refinement and efficient implementation.

Despite the successful implementation, certain limitations were identified. The current platform does not yet support AI-driven recommendation systems, advanced analytics, or full real-time chat technologies such as WebSockets. Additionally, payment gateway integrations remain limited to simulated wallet operations.

Nevertheless, the developed system provides a strong foundation for future intelligent and scalable integrated booking platforms.

6. Conclusion

This study successfully designed and implemented DualHubPlatform (DHP), a secure integrated booking system that combines accommodation booking and workspace reservation functionalities within a unified web-based platform. The system addressed major limitations identified in existing booking platforms, including fragmented services, weak communication systems, and limited integrated management features.

The developed platform demonstrated effective booking management, secure authentication, wallet-based transactions, messaging, reviews, identity verification, and responsive interfaces. The findings indicate that integrated booking platforms can improve operational efficiency, enhance user experience, and support modern digital booking environments.

The project contributes to the growing field of integrated digital service platforms and provides a scalable foundation for future intelligent booking systems.

Recommendations / Future Work

Future improvements to DualHubPlatform may include:

- AI-powered personalized recommendations
- Real-time chat systems using WebSockets
- Advanced fraud detection mechanisms
- Integration of external payment gateways
- Mobile application development
- Machine learning-based investment analytics
- Multi-language and multi-currency support
- Advanced analytics dashboards for hosts and administrators

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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