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Booking System for Permai Seri Homestay with One Time Password (OTP) and Inactive User Data Deletion

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Abstract

This project develops a secure, user-friendly booking system for Permai Seri Homestay in Ampang, Selangor, to replace the current methods using Facebook and WhatsApp, which lack security and efficient guest data management. The system includes One-Time Password (OTP) authentication, data deletion for inactive users. Built using the Agile Model, it features components for both customers and owners, including booking and house management. The system improves booking security, maintains an active user base, and enhances data protection. In conclusion, the project successfully creates a secure, efficient booking system that simplifies operations and safeguards guest information for Permai Seri Homestay.

1. Introduction

Permai Seri Homestay, located in Ampang, Selangor, has been relying on social media platforms like Facebook and messaging apps like WhatsApp for guest bookings. While these methods have sufficed in the past, they present significant challenges. The homestay's owner currently manages bookings manually, often through WhatsApp, which may not provide adequate security for guest data. This traditional approach exposes sensitive customer information to potential security risks and increases the chances of errors due to the lack of a formalized booking system. Additionally, the absence of a structured booking system limits operational efficiency, making it difficult for the owner to manage the booking and ensure seamless guest interactions.

This project aims to address these issues by developing a web-based booking system that integrates security measures like One-Time Password (OTP) authentication and inactive user data deletion. These features will enhance the protection of guest data, ensure a more organized and secure booking process, and improve the overall guest experience. By implementing a system that includes OTP authentication, the booking system will add an extra layer of protection, reducing the likelihood of unauthorized access [1]. The inactive user data deletion feature will help keep the system clean by automatically removing inactive accounts, thereby improving data security and storage efficiency.

The system will streamline Permai Seri Homestay's operations, enabling the owner to efficiently manage bookings and guest interactions while ensuring a secure platform for guests to make bookings. The system will feature modules for both users and owners, with the user side allowing for easy booking and profile management, and the owner side providing tools for booking management, house management, customer management, and expense tracking. Furthermore, the system will include strong security modules such as secure login, OTP verification, password hashing and automated account deactivation after prolonged inactivity.

The expected outcome of this project is a more efficient, secure, and user-friendly booking system that not only protects guest data but also improves the homestay's operational efficiency. By modernizing the booking process, the homestay will be able to offer a seamless and reliable service that enhances customer satisfaction and supports the owner's business growth.

The rest of this paper is organized as follows: Section 2 provides the literature review, discussing previous work and current applications. Section 3 explains the methodology used to develop the system. Section 4 presents analysis and design of the project. Section 5 present implementation and result of testing. Finally, Section 6 wraps up the paper, offering conclusions and suggestions for future improvements.

2. Literature Review

This section explains the role of homestays in Malaysia's tourism industry, the importance of booking systems for homestays, and the various security measures involved in enhancing the booking system. It covers the use of One-Time Password (OTP) for system authentication, data protection practices, including the deletion of inactive accounts, and a comparison between existing booking systems at Soupon Mangrove Homestay, Paddy House Homestay, Grand Lexis Port Dickson, and the booking system for Permai Seri Homestay. The comparison includes aspects like functionality, performance, user interface, security, strengths, and limitations.

2.1 The Role of Homestays and Booking Systems in Malaysia's Tourism

Tourism plays an important role in Malaysia's economy, with millions of visitors attracted to its rich culture, beautiful landscapes, and vibrant cities every year. As the tourism industry grows, other sectors, including hospitality, have also expanded. Homestays are a key part of this growth, providing tourists with an authentic Malaysian experience. These homestays allow guests to engage with local customs, food, and daily life, offering a unique cultural exchange.

Homestays stand out from traditional hotels by offering a more personal and intimate experience. Guests are typically welcomed by locals who share insights into the area's culture and way of life, making it a memorable and enriching stay [2]. Additionally, homestays are often more affordable than hotels, making them a good choice for budget-conscious travelers [3]. Overall, homestays provide good value for travelers who seek authentic experience, lower costs, and a closer connection to the local culture.

In the hospitality industry, booking systems have become essential for efficiently managing bookings. These systems often include online booking options, real-time availability, automated confirmations, secure payments, and customer relationship management (CRM). Incorporating such features into the Permai Seri Homestay booking system can simplify the booking process, enhance communication, and improve data security. Additionally, real-time availability can help prevent double bookings and ensure a smoother experience for both guests and homestay owners.

The use of booking systems has greatly improved the efficiency and guest satisfaction of homestays in Malaysia [4]. With online booking, customers can reserve rooms at any time and from anywhere, making it easier for homestays to attract more guests [5]. Instant booking confirmations and real-time availability reduce wait times and uncertainties, leading to higher guest satisfaction [6]. This convenience encourages guests to choose homestays that offer easy, secure booking options, which in turn boosts customer loyalty.

In conclusion, booking systems have transformed the homestay industry in Malaysia by improving accessibility, streamlining operations, and enhancing the guest experience. These systems help homestay owners optimize pricing and inventory management, providing valuable insights into booking trends and guest preferences [3]. Overall, booking systems make the process faster, more accurate, and enjoyable for both guests and owners, leading to greater business success.

2.2 Security Measures for Enhancing Booking System

This section explains the security measures used to make the Permai Seri Homestay booking system safer. It covers how authentication works, including the use of One-Time Password (OTP) to verify users. It also discusses data protection, ensuring guest information stays private and secure. Another security feature is the automatic deletion of inactive accounts to reduce risk and minimize database storage.

2.2.1 One Time Password (OTP) for System Authentication

Authentication is the process of verifying the identity of a user or entity attempting to access a system or resource. For many reasons, the online booking system of Permai Seri Homestay needs authentication. First, it makes sure that only allowed users can get into the system. This keeps private guest data like contact information safe. Second, strong authentication measures stop fraud and illegal access, which protects against things like identity theft or cancelling bookings. Third, a safe authentication system helps people trust, which makes the guest happier and more likely to come back. Overall, identification is necessary to make sure that the Permai Seri Homestay booking system is safe, private, and reliable.

Authentication is a critical aspect of any online system, and the implementation of multi-factor authentication, such as One-Time Password (OTP) verification, significantly enhances security. Users that utilize OTP authentication must provide a special code in addition to normal login credentials. This code is usually sent

to user via email, SMS, or an authenticator app. This extra level of security, which demands actual possession of the device or account linked to the OTP distribution method, reduces the possibility of unwanted access. Multi-factor authentication is crucial for enhancing security measures since it effectively prevents a variety of assaults and addresses authentication issues [7]. Booking system for Permai Seri Homestay can improve user account security and shield critical guest data from potential compromises by utilizing OTP authentication. Fig. 1 shows the flow of the OTP authentication process within a system.

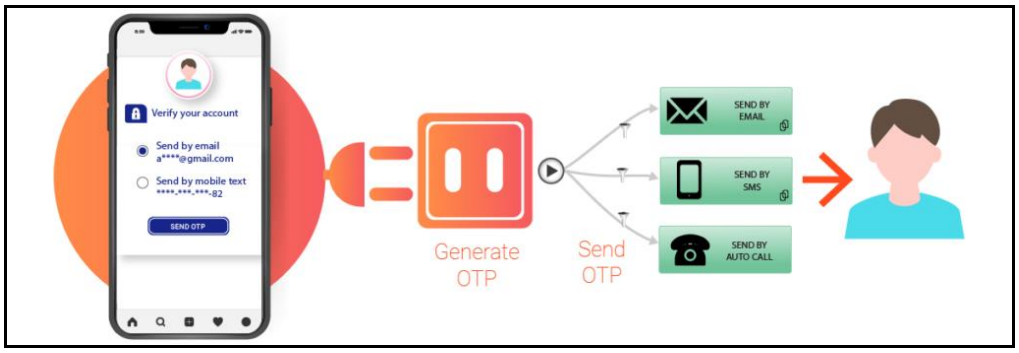

Fig. 1 *One-Time Password flow*

2.3 Data Protection for the System

Data safety means keeping private data from getting into the wrong hands or being used in the wrong way. This is very important for Permai Seri Homestay's booking system. It protects guest privacy by keeping the personal and financial information safe, which helps keep the trustworthiness. In the end, strong data protection measures improve safety, boost customer trust, and shield the homestay's honesty when dealing with guest data.

2.3.1 Data Deletion for Inactive User

The purpose of the data deletion feature is to improve security by removing inactive user accounts from the system automatically after a certain amount of time. Regularly doing this lowers the chance of someone getting into idle accounts without permission, which can lead to security breaches. By having a policy for regularly deleting defunct accounts, the homestay can keep guest data safer. This is because hackers will have a smaller target to attack. By regularly deleting accounts that aren't being used is an important security measure that helps keep data safe and stops people from getting into private data without permission [8]. This method not only makes security stronger, but it also helps businesses follow data protection rules by making sure that personal information that is no longer needed is not kept around for too long.

2.4 Study of Related System

This section provides analysis of existing booking systems used by different homestays and compares them with the new booking system for Permai Seri Homestay. It checks how each system works, what they do well, and where they need improvement. By comparing the systems at Soupon Mangrove Homestay, Paddy House Homestay, and Grand Lexis Port Dickson with the booking system for Permai Seri Homestay, this section helps us see what's missing in the current systems. It also shows what we can learn from them to make the new system better, with improved features and stronger security. The goal is to create a system that solves problems found in the current systems and works well for everyone.

2.4.1 Soupon Mangrove Homestay

The Soupon Mangrove Homestay mostly uses old-fashioned ways to handle bookings and guests. Guests can email or call to make an appointment, and the homestay manages bookings by keeping records by hand. This way of doing things often causes problems like double plans, lost bookings, and trouble keeping track of who is available. Additionally, guests may find it difficult to book stays without a formal web booking system, which could result in a loss of business. It's also hard to keep correct records and keep data safe because there aren't many automated processes. So, even though the homestay offers a one-of-a-kind and real experience, its booking system is slow and does not have current safety features. Fig. 2 shows the booking section for Saupon Mangrove.

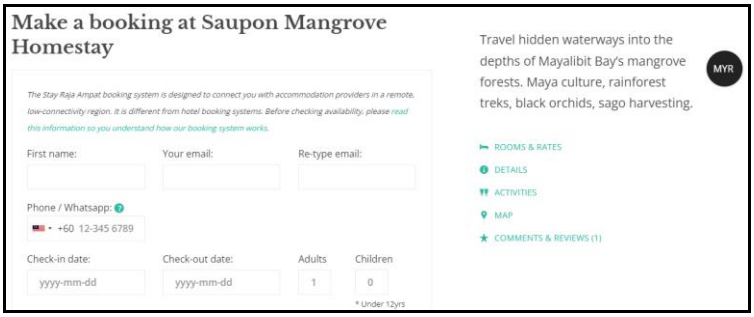

Fig. 2 *Saupon Mangrove booking section*

2.4.2 Paddy House Homestay

The paddy house homestay operates using a traditional method for managing bookings. The system offers a WhatsApp link for booking and communicating, but it keeps track of guest information and appointments by hand. Even though this method is simple, it can go wrong because of things like overbooking and misunderstandings. When reservations are made through WhatsApp, there are also big security risks because private guest information isn't properly protected and there's no safe way to store or encrypt this data. This old-fashioned method shows how much we need a more advanced booking system that can make booking easier, protect data better, and help handle guests better. Fig. 3 shows Paddy House Homestay booking section.

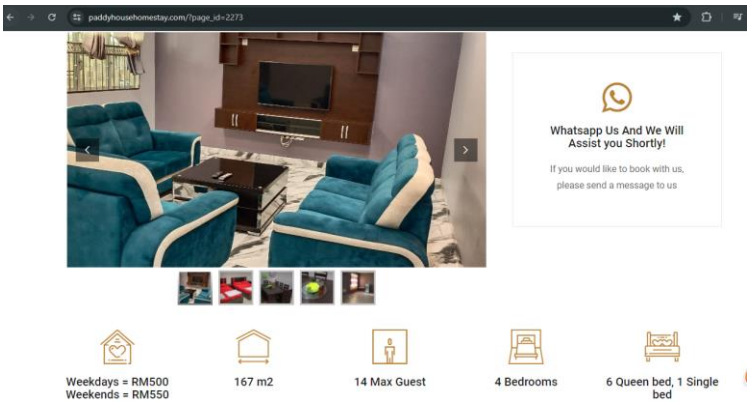

Fig. 3 *Paddy House Homestay booking section*

2.4.3 Grand Lexis Port Dickson (PD)

Grand Lexis PD uses an advanced online booking system that lets people book in real time and handles payments safely. This system is made to handle a lot of bookings quickly and easily, and it gives guests an easy-to-use interface to see what is available, make plans, and keep track of booking. Even though the system has a lot of advanced features, it still has problems, like going down sometimes during busy booking times and needing to be updated all the time to fix security holes. Basic security measures are already built into the system, but adding more advanced features like OTP login and hashed password storage could make the data of guests even safer. Because it depends on a very complicated system, it needs ongoing technical help and maintenance to make sure it works well and is safe. Fig. 4 shows the booking section for Grand Lexis Port Dickson (PD).

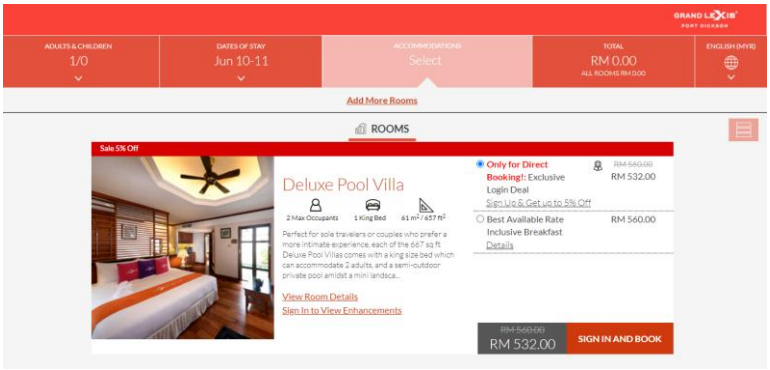

Fig. 4 *Grand Lexis Port Dickson (PD) booking section*

2.5 Comparison of Existing System and Booking System for Permai Seri Homestay

The comparison of the booking systems for Soupon Mangrove Homestay, Paddy House Homestay, Grand Lexis PD, and the system for Permai Seri Homestay covers various aspects such as functionality, performance, user interface, security, strength and limitation. Table 1 shows the comparison between the existing system and the booking system for Permai Seri Homestay.

Table 1*: Comparison between existing system and booking system for Permai Seri Homestay*

Features/System	Saupon Mangrove	Paddy House Homestay	Grand Lexis Port Dickson (PD)	Booking System for Permai Seri Homestay
Functionality	Standard booking functionality	Standard booking functionality	Fully integrated Booking system	Standard booking functionality
Performance	Fast loading time for multimedia content	Moderate response time for bookings and inquiries	High performance, well optimized for large traffic	Optimized for smooth owner and user experience
User Interface	Clear and easy to navigate	User-friendly and clean design	Modern design, feature-rich	Clean and intuitive design for users and owner
Security	Must fill out a form to send booking request (ensuring data protection)	Direct payment to owner through Whatsapp	Advanced protection for user data and transactions	Implement one time password and automatic inactive user account deletion
Strength	Low-cost option, good for local tourism	Direct support from owner	Real-time availability and booking system	Real-time availability and booking system
Limitation	Limited features, lacks advanced booking options	Limited scalability	Higher price point, premium target	New system, may require updates or improvements and only use dummy payment gateway

3. Methodology

Agile models are made up of plan, design, develop, test, deploy and review phases. Agile development is similar to building a house sequentially rather than all at once. Developing small functionalities in each iterative will reduce the complexity of the overall software [9]. It's a flexible approach to software development where work is done in small phases, getting better as it goes. For instance, when developing a new system, an initial version may be made available, customer feedback could be obtained, and the system would then be continuously improved based on user input. In this manner, it is guaranteed that the product is continuously improved. The Agile model shown in Fig. 5 is being applied in the development of this project, guiding the process through its iterative phases of planning, design, development, testing, deployment, and review.

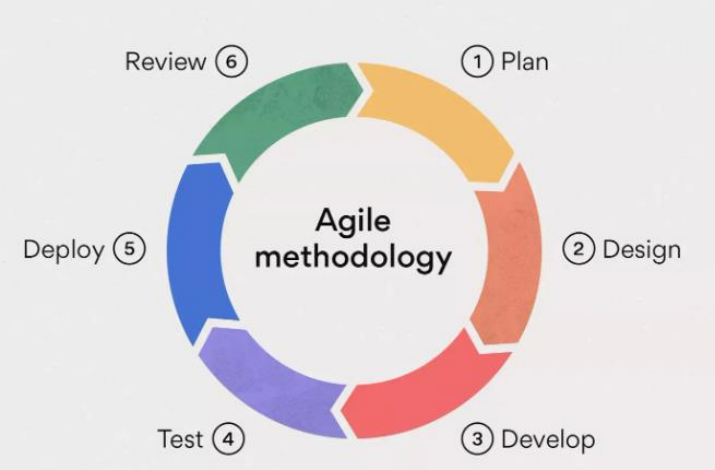

Fig. 5 *Agile Model*

3.1 Planning Phase

Planning for the Booking System for Permai Seri Homestay involved setting clear goals, scope, and deliverables. The team worked closely with the homestay owner and potential users to gather requirements, ensuring the system meets their needs. These needs included managing bookings, tracking house availability, and simplifying admin tasks. The team documented everything to guide the development process and ensure the system's design and features align with these goals. This careful planning helped create a strong base for building a system that works effectively for Permai Seri Homestay.

3.2 Design Phase

The Design Phase focused on two key areas which are user interface design and system implementation design. The user interface was specifically designed to be clean and user-friendly, allowing guests to easily check room availability and make bookings. Wireframes were developed to visualize the user flow and ensure seamless navigation. On the technical side, the implementation design included the creation of data flow diagrams and entity-relationship diagrams to guide the development of the backend system. These diagrams clarified how data would flow through the system, from user inquiries to booking confirmations, and illustrated how components such as the booking process and house availability tracking, integrate seamlessly within the system. Additionally, a database schema was designed to manage user accounts, bookings, and track house availability in real time, ensuring efficient backend operations.

3.3 Development Phase

Upon completion of the design phase, the Development Phase began. The system was built according to detailed designs. The development team focused on implementing the frontend, creating a user-friendly interface that allowed guests to easily check house availability, and make the booking directly using the system. The OTP-based verification process was integrated to ensure secure user login and booking. On the backend, a system was developed to track house availability in real time and automatically send booking confirmations. Tools such as Context Diagrams, Data Flow Diagrams, and Flowcharts were used throughout the development process to ensure that each component of the system aligned with the overall goals. The code was regularly reviewed to ensure it followed to best practices, optimized for performance, and addressed any issues that arose during development.

3.4 Testing Phase

During the Testing Phase, various tests were conducted to ensure that the Booking System for Permai Seri Homestay met the required functional, security, and usability standards. Functional testing was performed to verify that all features, including booking management and house availability tracking functioned as expected. Security testing identified potential vulnerabilities, particularly in the user authentication process and personal data protection. Interface testing assessed the system's ease of use, ensuring that the booking process was user-friendly and intuitive for users. These tests were critical in identifying and resolving any issues, ensuring the system was stable, secure, and ready for deployment.

3.5 Deployment Phase

Following successful testing, the Deployment Phase began. During this phase, the Booking System for Permai Seri Homestay was made available for daily use. The system was handed over to the homestay owner, who received training on how to manage bookings and operate the system effectively. Detailed documentation was provided to assist with system navigation and management. Post-deployment support was available to address any issues and gather feedback for potential adjustments. This phase ensured that the system was running smoothly and that the client was equipped to use it efficiently for daily operations.

3.6 Review Phase

The Review Phase focused on evaluating the performance of the Booking System based on functional and non-functional test reports. These reports were analyzed to identify any remaining issues or areas for improvement. If any bugs or performance issues were detected, they were resolved during this phase. Necessary updates were implemented to ensure the system met the required quality standards. The Review Phase was essential for refining the system, ensuring that it was reliable, secure, and ready for full deployment to the client.

4. Analysis and Design

This section covers the design and analysis of the Booking System for Permai Seri Homestay, focusing on system requirements, structure, and user interface. Functional and non-functional requirements were defined to guide

the system's development, ensuring secure authentication, efficient house and booking management, and ease of use. A structured approach was used in system analysis, employing tools like context diagrams, data flow diagrams, and entity-relationship diagrams to illustrate data movement and system interaction. Additionally, the system design included flowcharts and ERDs to plan the system's structure and database relationships. User interface design emphasized ease of navigation and a responsive, user-friendly experience for both customers and owners.

4.1 Requirement Analysis

In this section, the functional and non-functional requirements for the Booking System for Permai Seri Homestay are discussed. This process helps to define what the system is supposed to do (functional requirements) and how the system should perform (nonfunctional requirements).

4.1.1 Functional Requirement

The functional requirements describe the specific behaviors and functionalities the system must exhibit to meet the needs of the users and stakeholders. Table 2 shows the functional requirements for the Booking System for Permai Seri Homestay.

Table 2*: Functional requirement booking system for Permai Seri Homestay*

No	Functional Requirement	Functionalities
1.	User Authentication Management	• Allow customer to login and validate OTP. • Allow customer and owner reset password. • Allow customer and owner to manage profile.
2.	House Management	• Allow owner to add, edit, delete house listing. • Allow owner to manage house closure.
3.	Booking Management	• Allow owner and customer to check house availability. • Allow customer to make new booking. • Allow customer view booking details. • Allow system to send booking confirmation via email.
4.	Expenses Management	• Allow owner to add, edit, delete expenses. • Allow owner to track monthly expenses details.
5.	Review and Feedback	• Allow customer to add and edit review.
6.	Search and Filter	• Allow customer to search houses by date preferences. • Allow customer to filter houses by availability..
7.	Reporting	• Allow owner to track business reports

4.1.2 Non-Functional Requirement

Non-functional requirements define the quality attributes, system performance, and constraints within which the system must operate. These requirements ensure that the system functions efficiently, securely, and is user-friendly. Table 3 shows the nonfunctional categories relevant to the Booking System for Permai Seri Homestay.

Table 3*: Non-functional requirement booking system for Permai Seri Homestay*

No	Requirement	Description
1.	Performance	The system should provide fast response time for user action such as making bookings.
2.	Usability	The user interface should be easy to navigate, even for non-technical users
3.	Security	• It must ensure secure authentication methods such as one-time password. • Role-based access control should be implemented to prevent unauthorized access to the owner's dashboard and critical data.
4.	Maintainability	• The system should be designed for maintenance and updates to ensure long term sustainability.

4.2 System Analysis

This section explains how the system analysis for the Booking System for Permai Seri Homestay is done using a structured approach. This method focuses on understanding the system's components, how it works together, and how to design an effective system. To prepare this, tools like data flow diagrams (DFD), entity-relationship diagrams (ERD), and context diagrams are used. These tools help show how data moves through the system and how different parts of the system interact with each other.

4.2.1 Context Diagram

A Context Diagram provides a high-level overview of the entire system, showing the system as a single process and its interactions with external entities such as users and owner and the system. It defines the scope of the system and identifies the main data exchanges between the system and external actors. Fig. 6 shows the context diagram Booking System for Permai Seri Homestay.

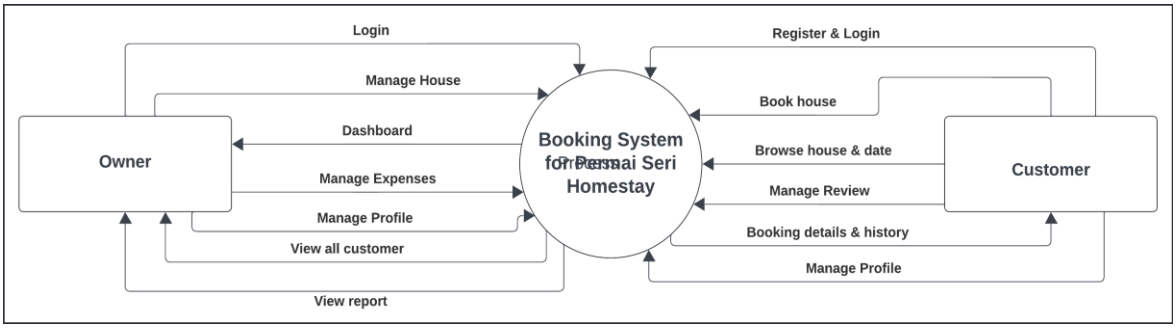

Fig. 6 *Context Diagram Booking System for Permai Seri Homestay*

4.2.2 Data Flow Diagram Level 0

The Data Flow Diagram Level 0 gives an overview of the entire system. It shows the main parts of the system and how information flows in and out. Fig. 7 shows the data flow diagram level 0 for Permai Seri Homestay booking system.

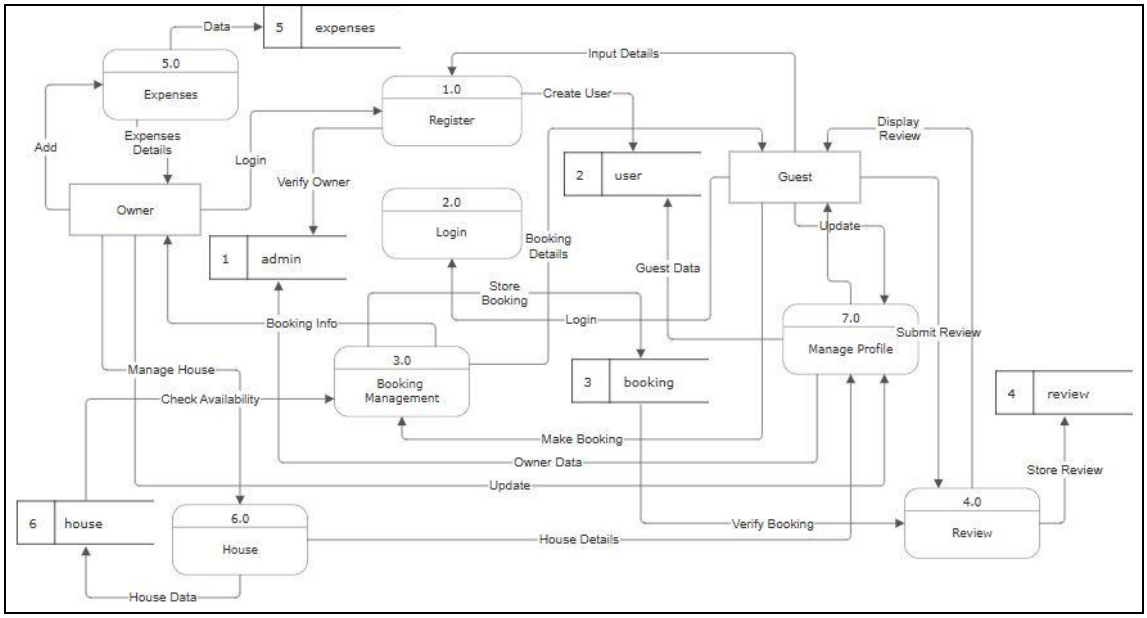

Fig. 7 *Data Flow Diagram level 0 for Permai Seri Homestay booking system*

4.2.3 Data Flow Diagram Level 1

A Data Flow Diagram (DFD) Level 1 provides a more detailed view of how data flows through the system. It builds on the context diagram by breaking down the high-level processes into sub-processes. Each process is broken into more specific actions, showing where data originates, how it is processed, and where it is sent. In the Booking System for Permai Seri Homestay, Level 1 could represent processes like register, login, booking, review, expenses, house manage, and profile as shown in Fig. 8.

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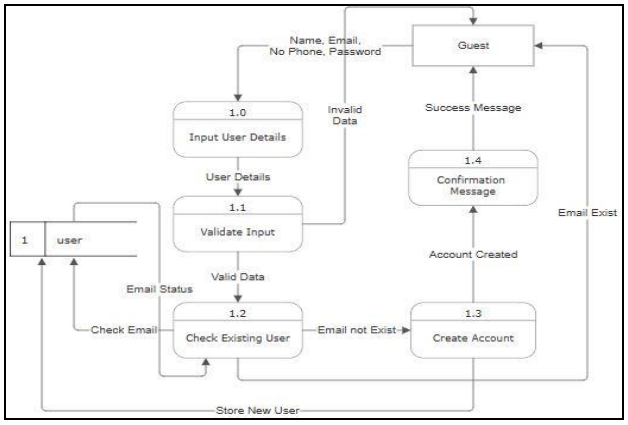

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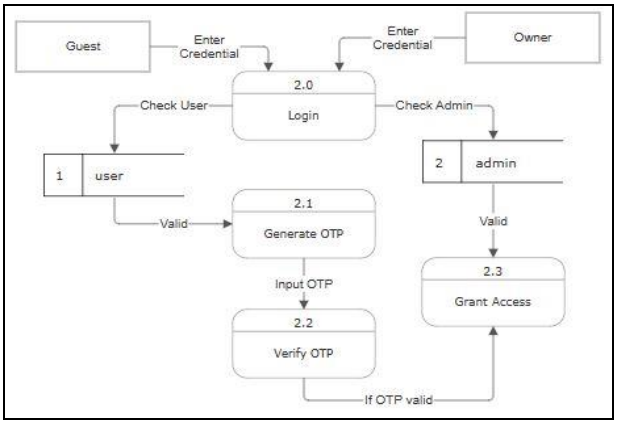

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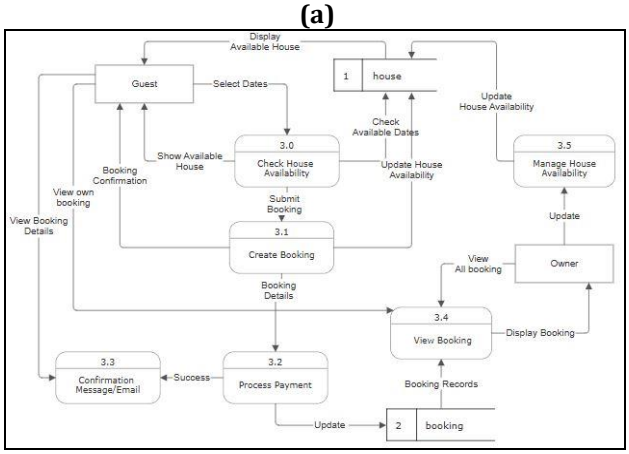

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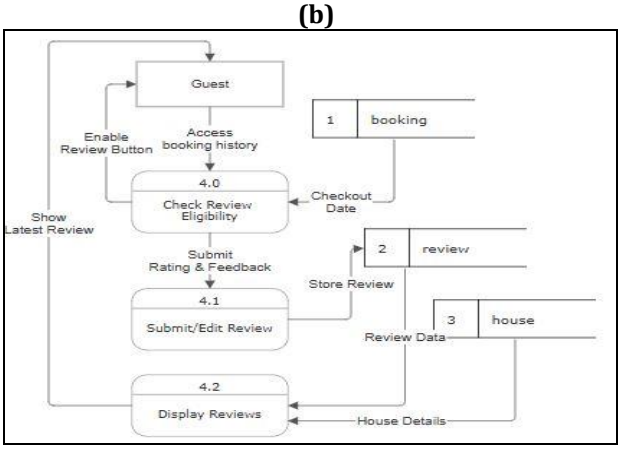

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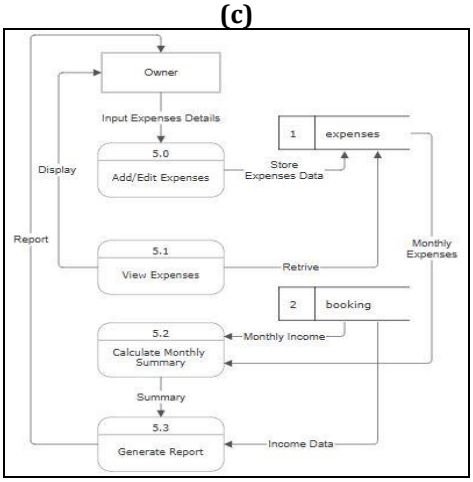

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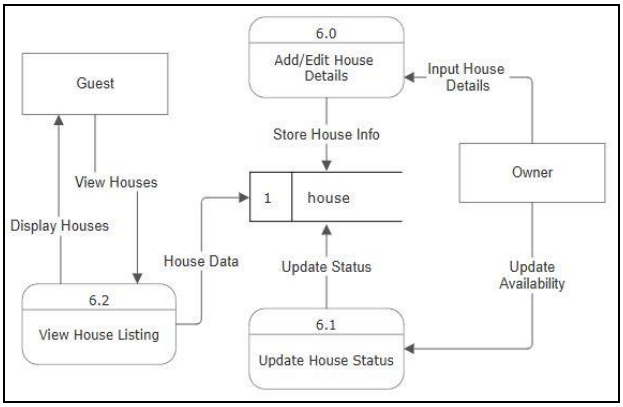

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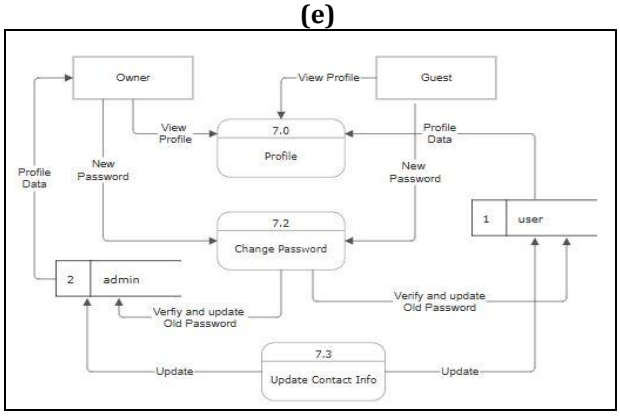


(g)

Fig. 8 *Data Flow Diagram level 1: Register Process(a) Login Process(b) Booking Process(c) Review Process (d) Expenses Process (e) Manage House Process (f) Profile Process(g)*

4.3 System Design

This section explains how the Booking System for Permai Seri Homestay is structured and how it works. It provides a detailed plan for building the system, ensuring all parts function well together. This phase focuses on designing the system's components, such as the user interface, database, and system processes.

4.3.1 Flowchart

The flowchart provides a clear graphical representation of the processes within the Booking System for Permai Seri Homestay. It demonstrates how various tasks are performed step by step, ensuring that all operations flow smoothly. Fig. 9 shows the flowchart of booking system for Permai Seri Homestay.

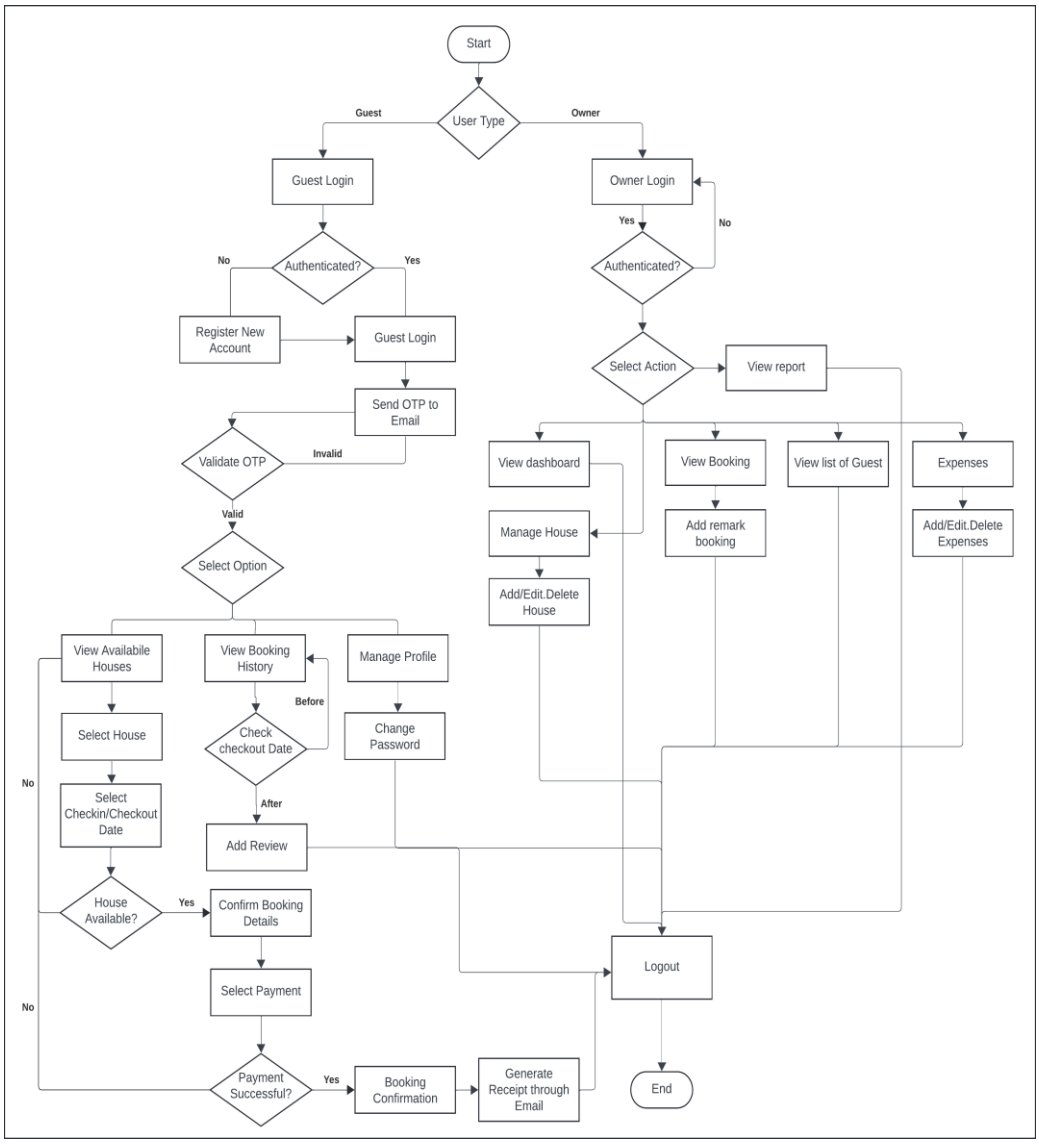


Fig. 9 *Flowchart booking system for Permai Seri Homestay*

4.3.2 Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) visually represents the database structure. It shows the relationships between entities, which are objects or data items in the system. The ERD is essential for understanding how data is interconnected and helps developers create the database schema. Fig. 10 illustrates the ERD for the Booking System for Permai Seri Homestay, highlighting the entities and relationships.

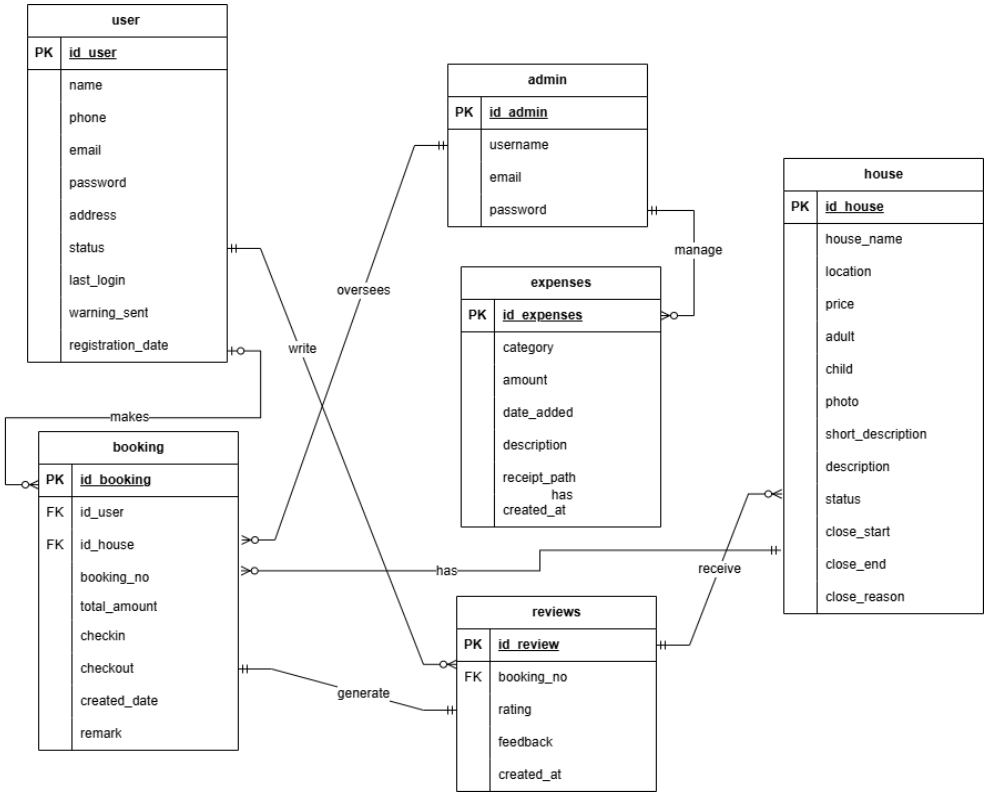


Fig. 10 *Entity Relationship Diagram booking system for Permai Seri Homestay*

4.4 User Interface

This section focuses on creating intuitive and user-friendly interfaces that enable efficient interaction between users and the booking system for Permai Seri Homestay. This involves designing graphical user interfaces that are visually appealing, responsive, and easy to navigate [10]. By prioritizing user needs and usability principles, interface design plays a crucial role in enhancing user satisfaction and overall reservation system performance.

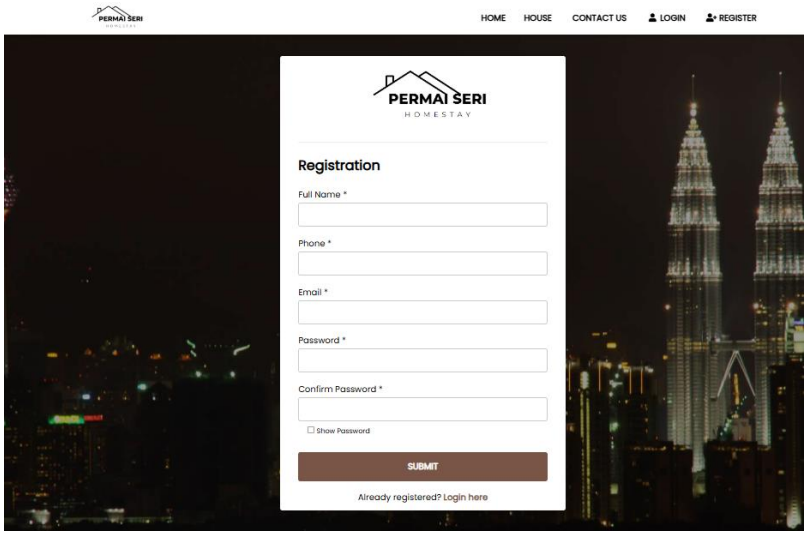
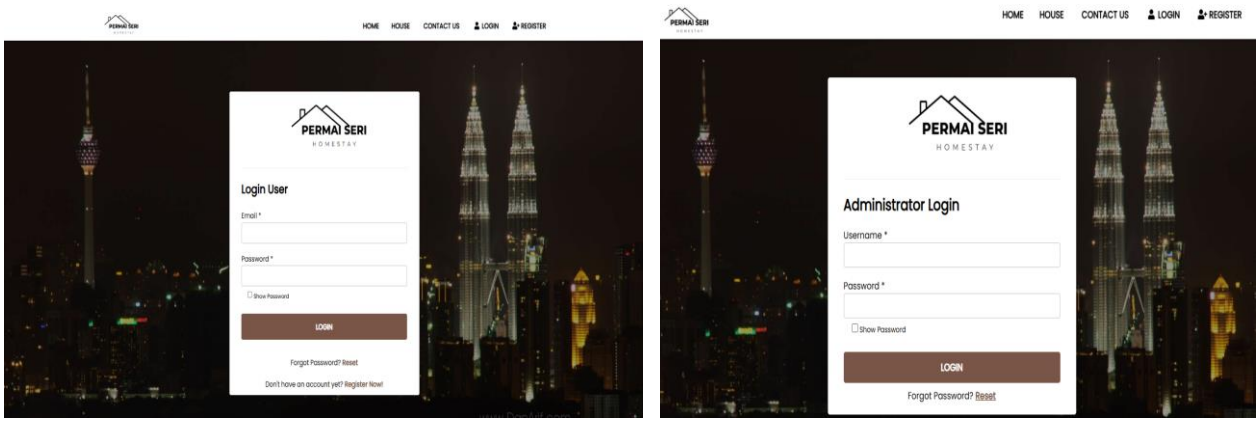


Fig. 11 *Registration Interface*

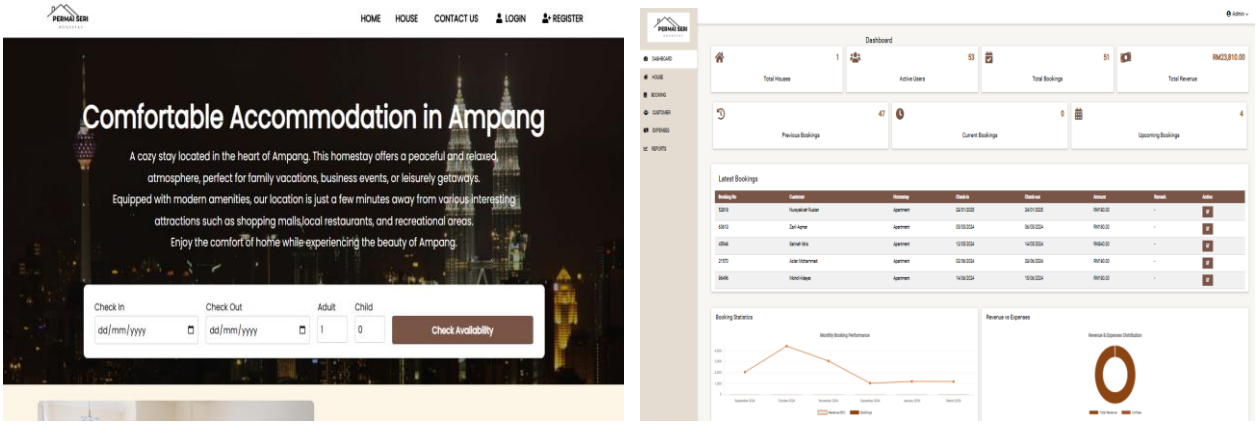
Fig. 11 shows the registration interface for Permai Seri Homestay facilitates new user account creation. The form comprises mandatory fields for personal and contact information, alongside security measures such as password confirmation and visibility toggle. A submission button finalizes the process, while a hyperlink redirects existing users to the login page, enhancing navigational efficiency



(a) **(b)**

Fig. 12 *Login Interface: User(a) Owner (b)*

Fig. 12 (a) shows the user login interface for Permai Seri Homestay enables authenticated access for registered users. The form comprises mandatory fields for email and password, added by security measures such as a visibility toggle to verify entered credentials. A login button finalizes authentication, while hyperlinks for password recovery and new account registration enhance navigational efficiency and user autonomy. While Fig. 12(b) shows the administrator login interface for Permai Seri Homestay restricts access to authorized personnel. The form requires a username and password, with a password visibility toggle to ensure input accuracy. A dedicated login button completes the process, and a password reset link supports account recovery, emphasizing security through the exclusion of public registration options. Both interfaces prioritize role-specific functionality and streamlined access.



(a) **(b)**

Fig. 13 *Dashboard Interface: User(a) Owner (b)*

Fig. 13 (a) shows the guest dashboard for Permai Seri Homestay makes it easy for guests to check availability. The dashboard provides a clear overview of the homestay's amenities and highlights its location benefits. Guests can use the simple form to select their check-in and check-out dates, as well as the number of guests (adults and children). Once the selections are made, the "Check Availability" button allows users to quickly see available booking options that match their preferences. While Fig. 13(b) shows the admin dashboard for Permai Seri Homestay puts all the necessary tools in one place for smooth operations. It displays key metrics like total bookings and revenue, helping administrators keep track of the homestay's performance. The interface also includes detailed tables with active and upcoming reservations, as well as visual trends showing booking patterns. Key features like status indicators and date filters help streamline day-to-day tasks, making it easier for admins to manage bookings and make informed decisions. Both dashboards are designed with their specific users in mind, ensuring ease of use for guests and efficiency for administrators.

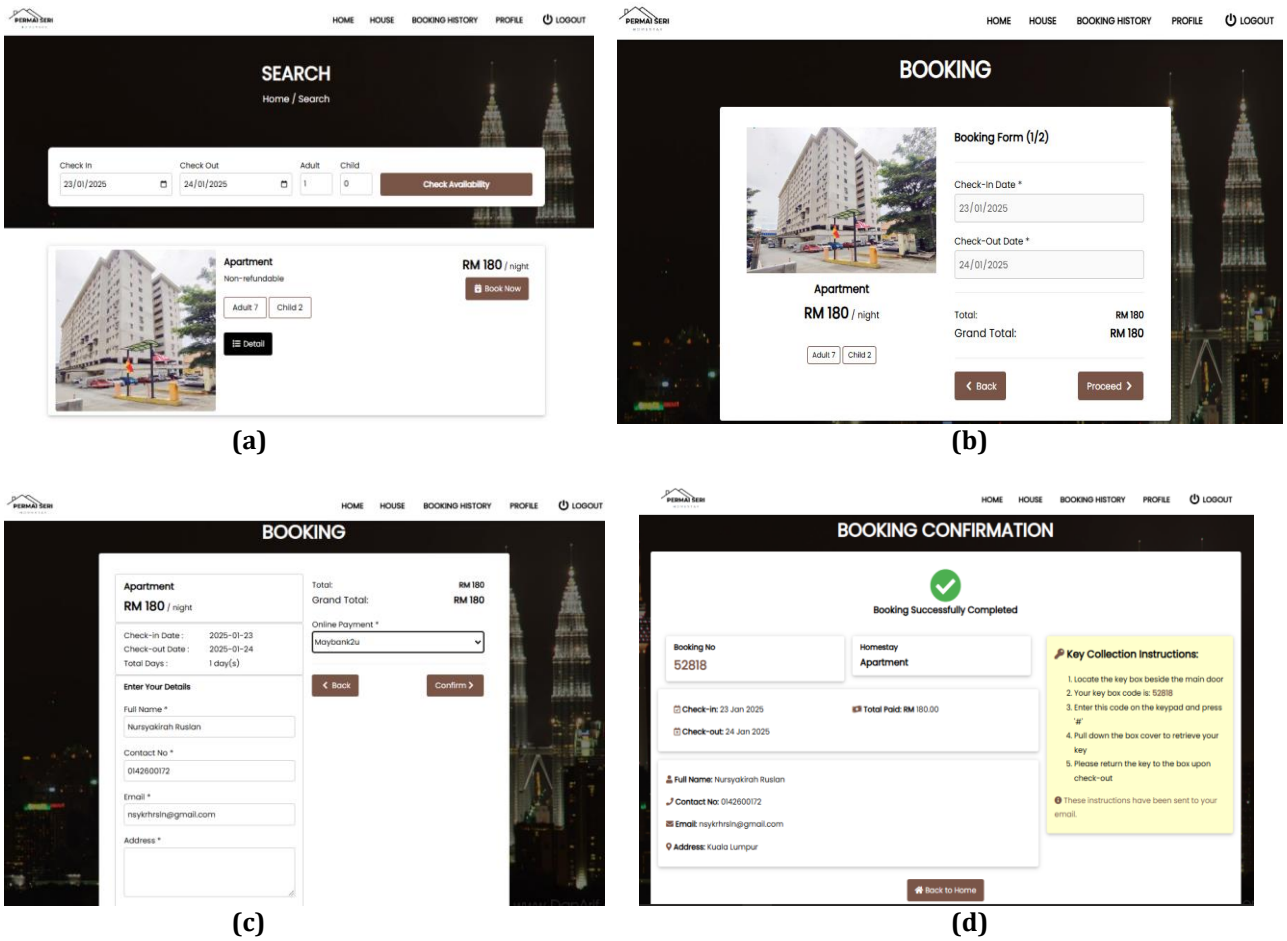


Fig. 14 *Booking Interface: List House(a) Booking Details (b) Confirm Form(c) Booking Confirmation(d)*

Fig. 14 shows the booking search interface for Permai Seri Homestay makes finding accommodation simple by allowing users to input their check-in/check-out dates and the number of guests (adults/children). A "Check Availability" button initiates the search, displaying available apartment options along with pricing. Users can then select "Details" to review more information or click "Book Now" to proceed with the booking, streamlining the initial booking process. Once the options are selected, the Booking Form Interface takes users through a multi-step process. The first step confirms the dates, apartment choice, and total costs, with navigation buttons like "Proceed" and "Back" for smooth transitions. The second step gathers necessary personal details (name, contact, email) and payment information, ensuring secure processing. Once everything is complete, users can finalize the booking by clicking "Confirm," with persistent links to Booking History and Profile for easy account management. The Booking Confirmation Interface follows the reservation process, confirming successful bookings with a unique booking number, payment summary, and key collection instructions. An automated email is sent with the details, ensuring guests are prepared for their stay. The interface also displayed guest information and check-in/check-out dates, minimizing confusion and providing clear, practical guidance for a seamless guest experience.

5. Implementation and Testing

This section covers the implementation and testing of the booking system for Permai Seri Homestay, ensuring security and usability. Technical issues were addressed, and thorough testing was conducted to ensure functionality and reliability, preparing the system for deployment.

5.1 Implement One Time Password (OTP)

Fig. 15 (a) shows the "OTP Verification" interface is designed for secure user authentication. Fig. 15(b) shows the code segment is part of a process to generate and send a One-Time Password (OTP) for user verification while Fig. 15(c) is the code sesegment thatses PHPMailer to send an OTP via email for user verification. It sets up an SMTP connection with Gmail, providing authentication details like username and password. SMTP secure specifies the use of STARTTLS encryption, which upgrades the connection to a secure one, ensuring that the email content is encrypted during transmission.

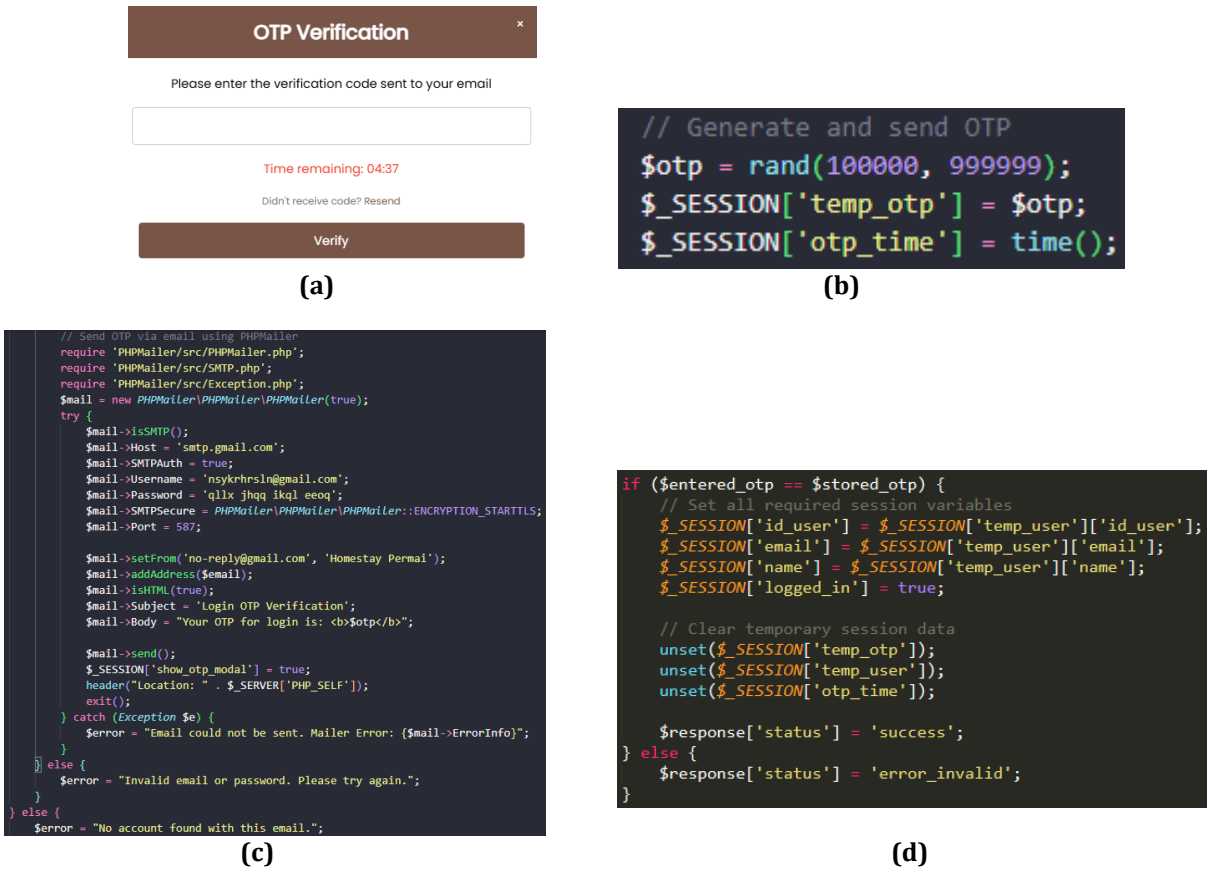


Fig. 15 *OTP Interface(a) Code Segment to generate random OTP (b) Code Segment using PHPMailer(c) Code Segment to verify OTP*

The OTP verification system for PERMAI SERI HOMESTAY integrates both frontend interfaces and backend logic to ensure secure user authentication. The process begins with OTP Generation in Fig. 15(b), where the `rand(100000, 999999)` function generates a 6-digit numeric OTP, ensuring both uniqueness and unpredictability. The generated OTP, along with its creation timestamp, is stored in PHP session variables (`$_SESSION['temp_otp']` and `$_SESSION['otp_time']`) for temporary validation. In the OTP Delivery process in Fig. 15(c), SMTP settings such as 'smtp.gmail.com' and port 587 configure PHPMailer to deliver the OTP securely through Gmail. The generated OTP is embedded in the email body (`$mail->Body = "Your OTP is: <b>$otp</b>"`), linking the backend code to the user's inbox. The OTP Interface in Fig. 15(a) displays a countdown timer to enforce a time-bound validity period, limiting the OTP's usability and enhancing security. It also includes a Resend Link, which allows users to regenerate and resend the OTP if the initial delivery fails, linked to the backend logic in Fig. 15(b) and 15(c). Finally, in the OTP Validation process in Fig. 15(d), the user-input OTP is compared with the session-stored value (`$_SESSION['temp_otp']`). Upon successful validation, user credentials are stored in the session (`$_SESSION['logged_in'] = true`), granting access to the system. After validation, Session Cleanup (`unset($_SESSION['temp_otp'])`) ensures that the temporary OTP data is removed to prevent reuse or any potential security breaches.

5.2 Implement Data Deletion

As shown in Fig. 16, the function manages user inactivity in the system. It first identifies users who have not logged in for 90 days and have not received a warning email, sending them a notification. Then, it targets users inactive for 97 days (90 days plus a 7-day grace period) for deletion. Before removing these users, their details are logged for record-keeping. This process helps maintain an active user base and manage database resources efficiently.

```php
function checkInactiveUsers($con)
{
    // Send warning emails to users inactive for 90 days
    $warningSQL = "SELECT * FROM user
                   WHERE last_login < DATE_SUB(NOW(), INTERVAL 90 DAYS)
                   AND warning_sent = 0";
    $warningResult = mysqli_query($con, $warningSQL);

    while ($user = mysqli_fetch_assoc($warningResult)) {
        sendWarningEmail($user['email'], $con);
    }

    // Delete users inactive for 90 + 7 DAYS
    $deleteSQL = "SELECT * FROM user
                  WHERE last_login < DATE_SUB(NOW(), INTERVAL 97 DAYS)";
    $deleteResult = mysqli_query($con, $deleteSQL);

    while ($user = mysqli_fetch_assoc($deleteResult)) {
        // Log user details before deletion
        logDeletedUser($user);

        // Delete the user
        mysqli_query($con, "DELETE FROM user WHERE id_user = {$user['id_user']}");
    }
}
```

(a)

53	Rahmat Othman	01254896575	quattoddeisoisu-8320@yopmail.com	2024-12-26 17:41:54	Active
54	Izzati	0142600172	nsykrhrsln@gmail.com	2024-12-13 02:45:48	Inactive

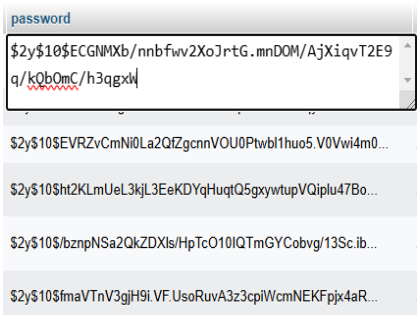
(b)

Fig. 16 *Code Segment for account deletion(a) Interface of active and inactive user (b)*

Fig. 16 (a) shows the checkInactiveUsers function automates the management of inactive-user accounts for Permai Seri Homestay through a structured two-phase process designed to balance user engagement and data hygiene. When triggered, the system first identifies users who have not logged in for 90 days using an SQL query that compares their last_login date to the current date minus 90 days (`DATE_SUB(NOW(), INTERVAL 90 DAY`), while the `warning_sent = 0` flag ensures warnings are only dispatched once. For these users, the function sends a reactivation prompt via `sendWarningEmail($user['email'], $con)`, aiming to re-engage them. If inactivity persists for an additional 7 days (97 days total), the system escalates by permanently deleting the account. Before removal, critical details like user IDs and emails are archived using `logDeleteUser($user)` for auditing, followed by a DELETE query to erase the record.

5.3 Implement Hashed Password

A hashed password is a password that has been turned into a random string of characters using a special formula as shown in Fig. 17. This makes it safe because even if someone sees the hash, they can't easily figure out the original password. It keeps user accounts secure



(a)

```php
$password = password_hash($data['password'], PASSWORD_DEFAULT);
```

(b)

Fig. 17 *Password Hashed in Database(a) Code Segment for Hashed Password(b)*

Fig. 17 shows the `password_hash($data['password'], PASSWORD_DEFAULT)` function in Permai Seri Homestay's system plays a critical role in safeguarding user credentials by converting plain-text passwords into secure, irreversible hashes. Using PHP's built-in `PASSWORD_DEFAULT` algorithm (currently bcrypt), this

function automatically generates a unique salt for each password, ensuring that even identical passwords produce distinct hash values. This approach thwarts common attacks like rainbow table breaches or password guessing. The resulting hash—stored in the `$password` variable is then saved to the database instead of the raw password, ensuring sensitive data remains protected even if the database is compromised. For verification during login, the system uses `password_verify()`, which compares the user's input against this stored hash without exposing the original password. This implementation adheres to modern security standards, prioritizing user privacy and system integrity while minimizing vulnerabilities associated with credential storage.

5.4 Implement Session and Access Control

Access control ensures secure system management for both users and admins. Fig. 18 demonstrates how user sessions are validated by retrieving session variables to confirm an active login. This process ensures that authenticated user data is securely accessible during their session.

```php
if (isset($_SESSION['id_user'])) {
  $id_user = $_SESSION['id_user'];
  $email = $_SESSION['email'];
  $name = $_SESSION['name'];
}
```

(a)

```php
if (!isset($_SESSION['admin_id'])) {
  header("Location: admin.php");
  exit();
}
```

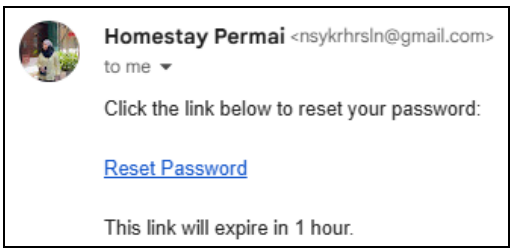
(b)

Fig. 18 *Access Control for User(a) Access Control for Owner(b)*

Permai Seri Homestay's session management and access control system ensures secure, role-specific navigation by leveraging PHP sessions to track user activity. When a user logs in, unique identifier (id_user), email, and name are stored in session variables (e.g., `$_SESSION['id_user']`), allowing personalized interactions like displaying their name and persistent authentication across pages. For administrators, a separate session variable `($_SESSION['admin_id'])` restricts access to privileged features; if detected, the system immediately redirects them to the admin dashboard using `header("Location: admin.php")` while the `exit()` function breaks further code execution to prevent unauthorized access. Regular users, identified by `$_SESSION['id_user']`, are granted access to standard features but blocked from admin pages. This role-based separation ensures security, while session checks on every protected page validate active logins, redirecting unauthenticated visitors to appropriate interfaces. Sessions are destroyed on logout, erasing credentials and invalidating access, which combined with minimal data storage in sessions to reduces exposure risks. This streamlined approach balances user convenience with robust security, maintaining clear boundaries between guest, and administrator roles.

5.5 Implement Site Request Forgery (CSRF) for Reset Password

Fig. 19 shows the code generates a secure token for session management, such as password reset functionality. This approach ensures the token is cryptographically secure, reducing the risk of token prediction or forgery



(a)

```php
$token = bin2hex(random_bytes(32));
$_SESSION['reset_token'] = $token;
```

(b)

Fig. 19 *Email to Reset Password using Link(a) Code Segment implement CSRF(b)*

Fig. 19 shows the password reset system for Permai Seri Homestay incorporates CSRF (Cross-Site Request Forgery) protection to safeguard against unauthorized account changes. When a user requests a password reset, the system generates a cryptographically secure token using PHP's `random_bytes(32)`, which produces a 32-byte random string converted to a hexadecimal format via bin2hex(). This unique token is stored in the user's session `($_SESSION['reset_token'])` ensuring it remains tied to their active session and inaccessible to external parties. The token is then embedded into a password reset link sent via email (e.g., "Reset Password"), accompanied by a 1-hour expiration notice to limit its usability window. When the user clicks the link, the system validates the submitted token against the session-stored value with a match confirms

the request's legitimacy, while a mismatch or expired token blocks the action, thwarting CSRF attacks. By combining unpredictability (via cryptographically strong tokens), session binding, and time sensitivity, the system minimizes risks of token interception or reuse. For added security, future enhancements could enforce single-use tokens and HTTPS encryption to further shield data during transmission. This layered approach balances usability with robust protection, ensuring only authorized users can reset passwords while neutralizing potential exploits.

5.6 Testing

This section outlines the testing processes undertaken to ensure the functionality, reliability, and security of the Booking System for Permai Seri Homestay. It describes the testing methodologies applied, test cases executed, and results obtained to validate the system's performance. Table 4 outlines the different categories of tests conducted on the Booking System for Permai Seri Homestay. It includes tests for input validation, functionality, and error handling to ensure the system operates correctly and securely. Each test category focuses on specific aspects of the system, such as ensuring proper data format, verifying correct functionality, and checking system responses to invalid data.

Table 4 *Test Category*

Test Category	Description
1	These tests ensure that user inputs meet the required format, length, and completeness for form fields.
2	These tests verify the proper execution of specific functions to ensure that the expected workflows occur as designed.
3	These tests focus on how the system reacts to invalid data or exceptional cases to check whether the system displays appropriate error messages or handles the scenario gracefully.

Table 5 summarizes the results of the testing plan, comparing expected and actual outcomes for each test case. It provides a clear view of how the system performed during testing, including user input validation, login and booking functionality, and error handling. The table demonstrates that the system behaved as expected, with error messages displayed when necessary and actions such as account creation, OTP verification, and booking confirmation functioning properly.

Table 5 *Testing Plan Result*

Test Category	Description	Expected Output	Actual Output
1	Validate Full Name field (empty)	Display error message: "Full name is required."	Error message displayed
	Validate email format (e.g., "kyra@email")	Display error message: "Invalid email format."	Error message displayed
	Validate password strength (e.g., "qwerty123")	Display "Password must be at least 8 characters. Password must contain at least one uppercase letter. Password must contain at least one number. Password must contain at least one special character (e.g., @, #, $, %, etc.)	Error message displayed
2	User registration with valid data	Account created and offer redirect to login page	Account created
	Login with valid email and password	Proceed to OTP verification popup	Redirect to OTP verification popup
	Booking confirmation	Send email with booking details	Email confirmation sent
	Search house by invalid date range	Display error message: "No Available Homestay. Try different dates."	Error message displayed
3	Invalid OTP entered during login	Display error message "Invalid OTP, please try again"	Error message displayed
	Duplicate email registration	Display "Email already registered. Please use a different email." error message	Error message displayed

6. Conclusion and Future Work

In conclusion, the development of the Booking System for Permai Seri Homestay has successfully met its objectives by providing a structured design approach, integrating OTP authentication for secure logins, and implementing automatic account deletion to optimize data storage. Functional testing validated the system's effectiveness, ensuring key features work as intended. However, certain limitations, such as device compatibility, reliance on a dummy payment gateway, and dependence on stable internet connections, were identified. Future work will focus on addressing these limitations by integrating a real payment gateway, developing a mobile app for enhanced accessibility, improving system performance, and incorporating advanced security measures. These enhancements will further elevate the system's usability, reliability, and overall user experience.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *N. Ruslan, N. Rahim;* ***data collection:*** *N. Ruslan, N. Rahim;* ***analysis and interpretation of results:*** *N. Ruslan, N. Rahim****; draft manuscript preparation:*** *N. Ruslan, N. Rahim authors reviewed the results and approved the final version of the manuscript.*

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