



Extreme Programming Method for Efficient and User-Friendly Web-Based Photo Studio Reservations: Pilvi Project Case

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Abstract: The rapid advancement of information technology has driven the digitalization of service-based industries, including photography services. Pilvi Project, a photo studio providing services such as graduation and identification photography, currently relies on manual reservations via WhatsApp. This approach leads to several problems, including scheduling conflicts, inefficient booking management, and limited accessibility to service and availability information for customers. This study aims to design and develop a web-based photo studio reservation system that addresses these issues by improving booking efficiency, information transparency, and service management. The system was developed using the Extreme Programming (XP) methodology due to its iterative, flexible nature and suitability for rapidly evolving user requirements. The proposed system includes features such as user registration and authentication, real-time studio availability-based reservations, service package selection, and administrative data management. The main contribution of this study is the implementation of an integrated reservation platform that streamlines the booking process and reduces manual coordination between customers and administrators. System evaluation was conducted through black-box testing and user questionnaires. The testing results showed that all functional features operated correctly according to specifications. User feedback indicated positive responses regarding usability and user experience, while an evaluation by the Pilvi Project team confirmed that the system successfully met operational needs and improved the overall reservation process.

.Keywords: Reservation System, Photo Studio, Extreme Programming, Website

1. INTRODUCING

The rapid advancement of information and digital technology has significantly transformed various service sectors, including Indonesia's photography industry. The increasing demand for visual documentation for personal, academic, and commercial purposes has encouraged photography businesses to adopt more efficient and technology-driven service models. According to a report by the Ministry of Tourism and Creative Economy (Kemenparekraf), the creative economy contributed more than 5.45% to Indonesia's national GDP in 2022, with the photography sub-sector gaining increased attention due to the growth of social media platforms and the demand for high-quality visual content. This development highlights the need for innovation in managing photography services to remain competitive and responsive to customer expectations.

A photo studio plays a central role in meeting this demand by providing a dedicated space equipped with professional photography tools, lighting systems, and customizable backdrops to support various photography needs [1]. As customer demand grows, photo studios are required not only to deliver high-quality images but also to provide efficient service management, particularly in handling reservations and scheduling.

Pilvi Project is a professional photo studio offering services such as CV photography, graduation photos, and personal portraits. While the studio focuses on producing high-quality images for individuals and businesses, it faces significant challenges in managing its reservation process. Currently, booking





requests are handled manually via WhatsApp, requiring studio administrators to process messages individually. This practice often leads to scheduling conflicts, delayed confirmations, and booking errors, particularly when multiple customers request the same time slot. Furthermore, customers have limited access to information regarding available service packages, pricing, and studio availability, as such information can only be obtained by directly contacting the studio or visiting the location. These limitations reduce operational efficiency and may negatively affect customer satisfaction and interest.

Several previous studies have highlighted the importance of implementing information systems to improve reservation management in photography services. Research conducted on Hey Studio Foto demonstrated that a reservation system can assist studio managers in organizing schedules more effectively and reducing booking conflicts [2]. Similarly, other studies have shown that web-based reservation systems enable customers to access service information, make reservations, confirm payments, and reschedule sessions more conveniently [3]. The implementation of a reservation system in FotoSandiri.studio also proved to enhance operational efficiency by replacing manual WhatsApp-based booking processes with an integrated system [4].

Although these studies confirm the benefits of reservation systems for photography services, many focus primarily on system implementation outcomes and provide limited discussion on the use of agile development methodologies that support adaptability to evolving user requirements. This indicates a research gap in exploring how agile methods, particularly Extreme Programming (XP), can be applied to develop a flexible and user-centered photo studio reservation system.

To address this gap, this research proposes the development of a web-based photo studio reservation system for Pilvi Project using the Extreme Programming (XP) methodology. XP is an agile software development approach that emphasizes close user involvement, iterative development cycles, continuous testing, and rapid adaptation to changing requirements [5], [6]. Previous research has shown that the application of XP in developing photography service booking systems results in flexible and responsive systems that align closely with user needs [7].

The objective of this study is to design and implement a web-based reservation system that improves booking efficiency, minimizes scheduling conflicts, and enhances access to service information for customers. Additionally, this research aims to demonstrate that the application of the XP methodology can reduce development risks through continuous evaluation and testing at each iteration [8]. The expected contribution of this study is the provision of an adaptable and scalable reservation system that supports both operational management and customer satisfaction in the photo studio service sector..

2. RESEARCH METHODOLOGY

This section explains the research methods used in the development of the photo studio reservation system, including data sources, research flow, and software development methodology.

2.1 Data Sources

To obtain data relevant to this research, data collection was carried out through the following methods:

- a. Observation/Field Survey – Direct observation and recording of information related to the location of the Pilvi Project photo studio.
- b. Documentation – Data collected in the form [9] of photographs taken at the studio, including various photography setups and sample works produced by the Pilvi Project photo studio.
- c. Interview – Conducting direct interviews with the owner [10] of the Pilvi Project photo studio to gather information for this research.
- d. Literature Study – Data obtained from journals and literature studies relevant to the research topic, used as references [11].

2.2 Research Stages



The research flowchart provides an overview of the research stages, starting from problem identification to implementation and testing. The following is the research flowchart illustrating the entire process in this study :

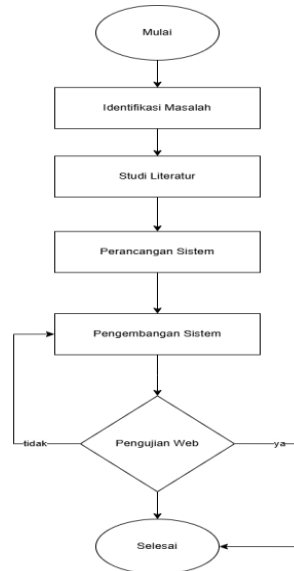


Figure 1. Research Stages Flowchart

2.3 System Development Method

In this research, the system development method used is Extreme Programming (XP), which consists of four main stages: Planning, Design, Coding, and Testing [12].

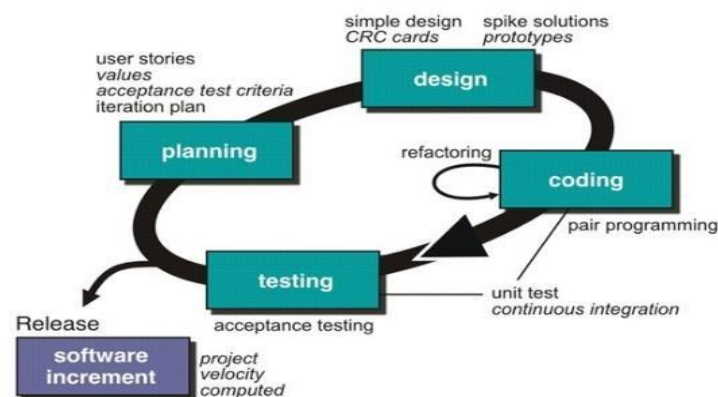


Figure 2. System Development Method

1. Planning

At this stage, the researcher conducts interviews with users and staff of Pilvi Project to identify the main needs and necessary features for the system [13]. User stories are also defined based on the identified requirements during this phase [14].

2. Design



The development of a web-based reservation system for Pilvi Project aims to create a design that is simple, flexible, and easily expandable, with a strong focus on meeting user needs. This design begins with UML modeling and class diagrams to provide an overview, system flow, and database design [15].

3. Coding

In this stage, the system is built according to user and system requirements outlined in the planning phase, as well as based on the workflow and system interface designed in the previous stage. The author uses native PHP programming language and MySQL (My Structured Query Language) database to build the system [16]. Additionally, code refactoring, which involves improving the code structure without altering its functionality, is also performed during this stage.

4. Testing

The developed features will be tested through acceptance testing based on acceptance criteria and black-box testing [17]. Furthermore, testing is conducted by involving actual users, including potential customers and studio management staff, to obtain direct feedback regarding ease of use and whether the existing features meet their needs [18].

3. RESULT AND DISCUSSIONS

3.1. Implementation Of Extreme Programming

The following are the stages of implementation Extreme Programming for the development of a web-based Photo Studio reservation system for Pilvi Project.

3.1.1 Planning

Planning is the first stage in the Extreme Programming methodology. In this stage, there are two main points that serve as the reference in this study: user stories and acceptance test criteria. At this stage, the Pilvi Project owner (as the product owner) and users described their needs for the system, outlining their requirements through user stories.

Table 1. User Stories

No.	Role	User Story
US1	User	As a user, I want to view the availability of the photo studio so that I can choose a suitable schedule for a photo session.
US2	User	As a user, I want to register and log in to the system so that I can access the photo studio reservation features.
US3	User	As a user, I want to book the photo studio based on my needs, such as selecting a service package, duration, and date..
US4	Admin	As an admin, I want to add, edit, and delete user or studio data so that the information remains accurate and up to date.
US5	Admin	As an admin, I want to manage booking data so that all orders are properly recorded and the studio can be managed more efficiently.

Acceptance criteria are the conditions that must be met for a user story to be considered complete and accepted by the user[19]. These criteria serve as a guideline to ensure that the developed feature fulfills the functionality and user expectations defined during the planning stage.





Table 2. Acceptance Criteria for User Stories

No.	Role	User Story	Acceptance Criteria
US1	User	As a user, I want to view the availability of the photo studio so that I can choose a suitable schedule for a photo session.	a. Criteria 1: Studio List The list of photo studios is displayed with complete information, including studio availability status, rental prices, available facilities, packages, and schedule availability.
US2	User	As a user, I want to register and log in to the system so that I can access the photo studio reservation features.	a. Criteria 1: The registration form requires users to enter their name, email, phone number, username, password, and other relevant information. b. Criteria 2: Users can log in to the system using a valid username and password.
US3	User	As a user, I want to book the photo studio based on my needs, such as selecting a service package, duration, and date..	a. Criteria 1: Users can select an available studio, enter the date and time, choose a package, and the system can confirm the booking.
US4	Admin	As an admin, I want to add, edit, and delete user or studio data so that the information remains accurate and up to date.	a. Criteria 1: Admin dapat mengedit, menghapus, dan menambahkan informasi studio foto b. Criteri 2: Admin dapat mengedit, menghapus dan menambahkan pengguna
US5	Admin	As an admin, I want to manage booking data so that all orders are properly recorded and the studio can be managed more efficiently.	a. Criteria 1: The admin can view the list of transactions and reservations. b. Criteria 2: The admin can confirm studio bookings and update the reservationstatus. c. Criteria 3: The admin can manage payment statuses (pending, verified, orcanceled). d. Criteria 4: The admin can send notifications to users regarding booking and payment statuses.

3.1.2 Design

The system design in this study includes several components to illustrate the structure and functionality of the application includes use case diagram, sequence diagram, activity diagram, class diagram and interface design.



1. Use case

Use case is used to describe the system’s functionality in a way that is easy to understand, both for developers and for clients or end users.

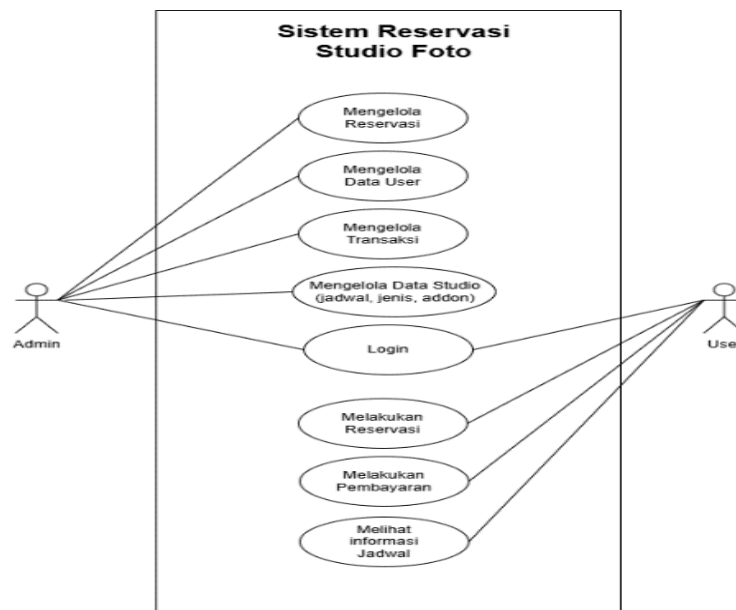


Figure 3. Usecase System

2. Sequence Diagram

The purpose of a sequence diagram is to describe the flow of interactions between objects or components in a system over time [20]. The diagram Figure 4 illustrates the sequence of actions performed by a user when accessing the website, logging in, making a reservation, completing payment, and logging out.

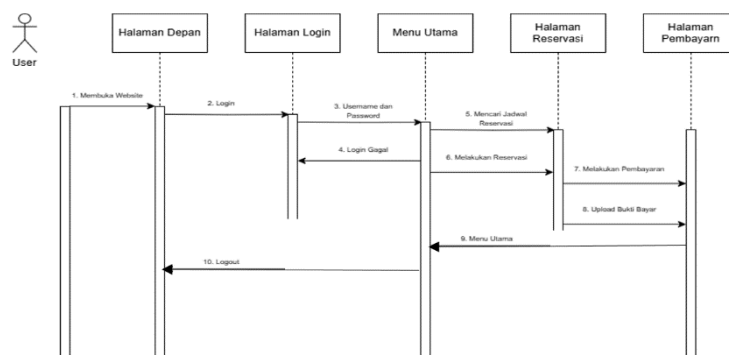


Figure 4. Sequence Diagram Login User

3. Activity Diagram

This activity diagram illustrates the login process for an admin. The process begins when the admin opens the login page. The system then displays the login interface. The admin enters their email and password, and the system validates the credentials. If the credentials are valid, the admin is redirected to the main menu. If not, the login attempt is rejected and the admin remains on the login page.

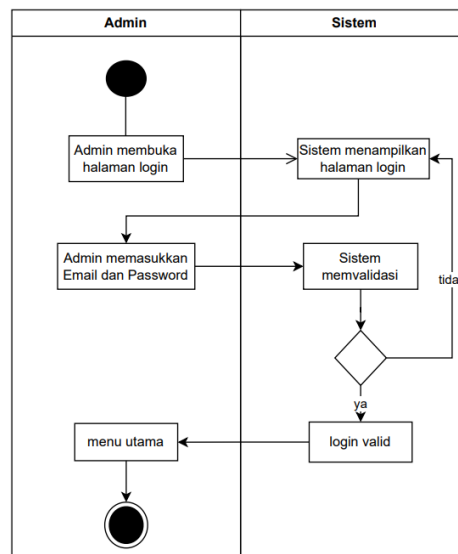


Figure 5. Activity Diagram Login Admin

4. Class Diagram

The class diagram illustrates the structure and relationships between various entities within the photo studio reservation system. It defines the data model used to manage users, reservations, payments, schedules, addons, reviews, and other related components. The diagram shows how these entities interact through attributes, methods, and associations, serving as a blueprint for database design and system development.

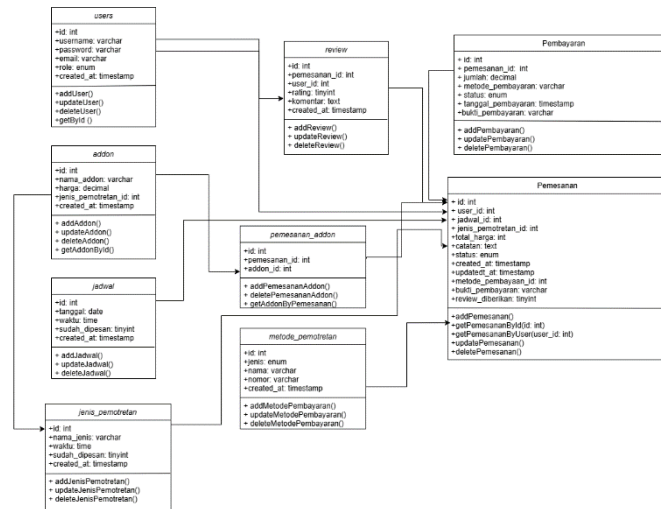


Figure 6. Class Diagram

In this research, a prototype display was created, illustrating the main features to be designed. This aims to meet user needs and simplify the system's implementation process. This prototype serves as a visual reference for developing the Pilvi Project photo studio reservation system. The design of this system prototype is presented as follows:

Figure 7 describes the login page, which serves as the initial access point for both users and administrators to enter the system, ensuring that only registered users are able to make reservations. Following this is the main page, which presents a brief overview of the Pilvi Project and provides navigation to several menus such as home, about us, gallery, pricelist, and reservation. This page is designed to help users easily understand the available services and directly navigate to the reservation feature when needed. Subsequently, there is the reservation page, which contains a booking form for photo sessions. On this page, users can select their preferred schedule and photo package before proceeding with the reservation process.

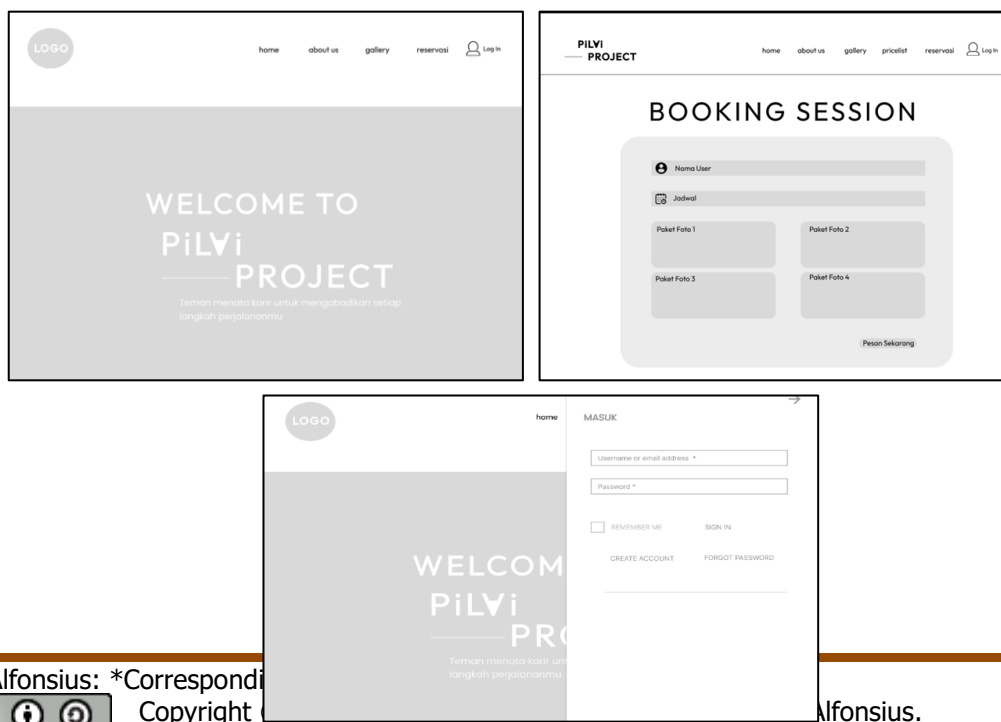


Figure 7. Prototype of the main page, login page, and reservation page

Figure 8 shows the prototype of the admin dashboard page, which is designed as the main interface for administrators. The page displays a summary of key data such as total schedules, total users, total bookings, and total revenue. In addition, there is a navigation menu on the left side that helps admins access various system management features.

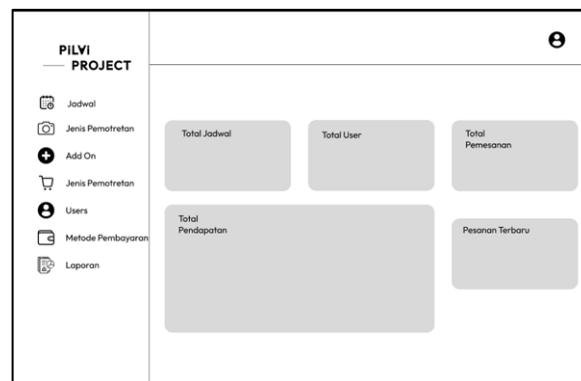


Figure 8. Prototype of Dashboard Admin Page

3.1.3 Coding

The coding stage is the process of implementing the system design into actual program code. At this stage, the reservation system for the Pilvi Project photo studio has been developed using the PHP programming language and a MySQL database. The implementation follows the previously designed prototypes and system architecture. Additionally, code refactoring is performed during this stage to improve the structure and readability of the code without changing its functionality.

3.1.4 Implementation Design

This stage involves implementing the design results, taking the previously created prototype and coding it to display a functional website.

In Figure 9, the interface for logging in and registering an account on the Pilvi Project reservation system is presented. The "login" page on the right side provides fields for entering a username and password, along with a "login" button and a link for new users to "create an account." Meanwhile, the "create account" (registration) page, also on the right side, features a form requesting input for a username, password, email, and phone number, ending with a "register" button. Both interfaces serve to facilitate the user authentication process in order to access the photo studio reservation features.

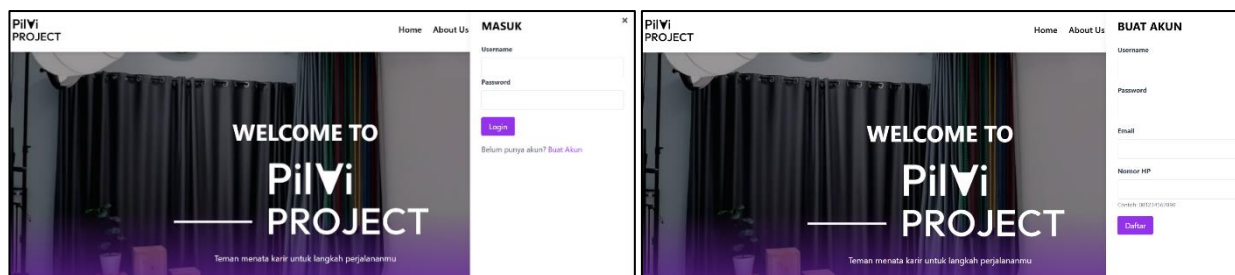


Figure 9. Login Page and Sign Up Page



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The main page displays the identity of Pilvi Project as a photo studio, complete with its slogan and navigation menu including Home, About Us, Pricelist, Gallery, Reservation, and Order History. The About Us page contains a brief overview of the studio, its vision, and team photos to introduce Pilvi Project to visitors. Meanwhile, the Pricelist page presents a list of available photo packages along with prices and service details to help users choose according to their needs.

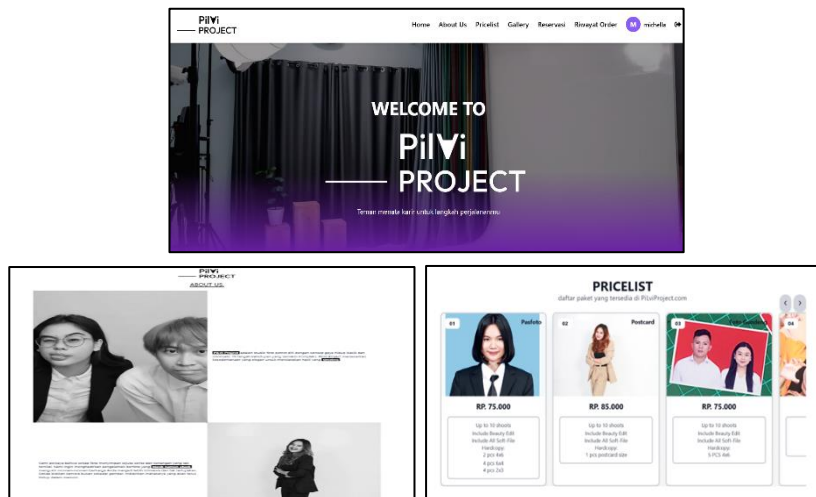


Figure 10. Main Page, About Us Page and Pricelist Page

The reservation page allows users to select the desired date, available time slots, and type of photo session as needed. Next, the order history page displays a list of previous bookings made by the user, including status, date, and payment details.

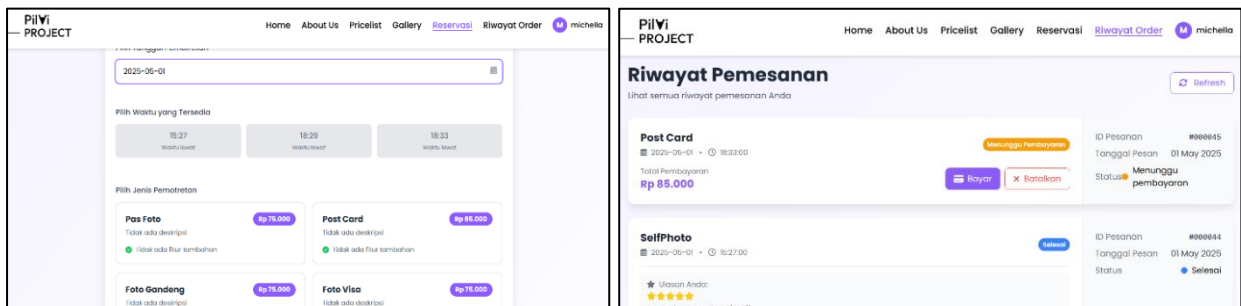
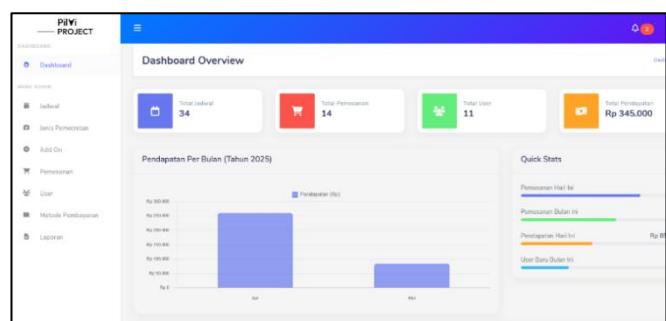


Figure 11. Reservation Page and Order History Page

Figure 12 shows the payment page on the Pilvi Project website, which appears after users complete the service booking process. This page displays three stages of the reservation flow: Booking, Payment, and Completion. Next the admin dashboard page on the Pilvi Project website, which is designed to provide administrators with access to monitor and manage the system's operational data.

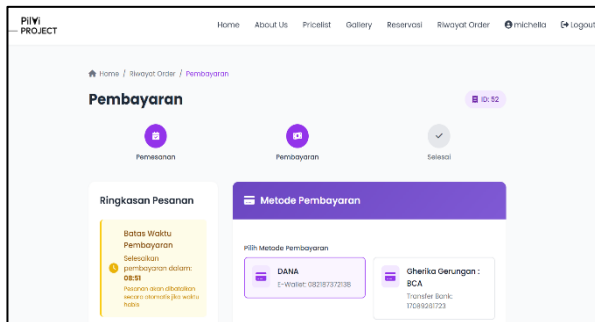


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Figure 12. History Order Page and Admin Dashboard Page



data management within the system.

Figure 13 presents the user data page on the Piivi Project website, which allows administrators to view account information of all registered users. The subsequent page is the schedule management page, designed to manage and organize service booking schedules. Both pages are equipped with CRUD (Create, Read, Update, Delete) functionalities to facilitate efficient

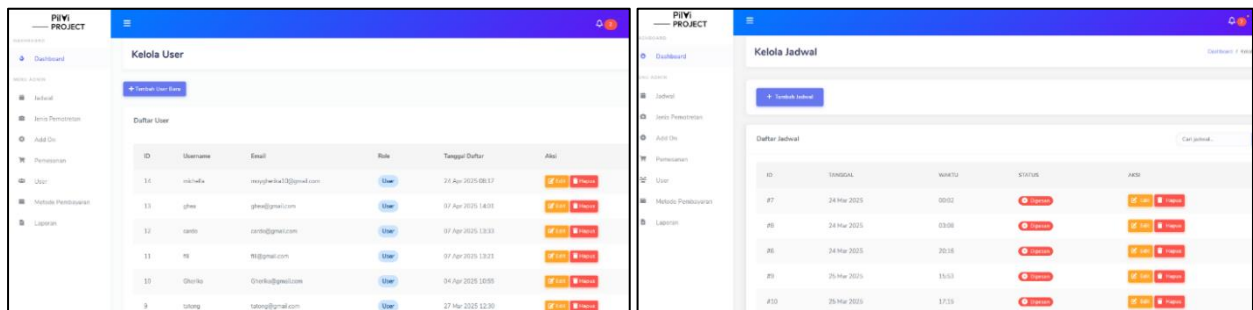


Figure 13. Admin's User data page and Schedule Page

Figure 14 displays the booking page on the Piivi Project website, showing all booking data made by users. This page also presents the latest booking status, such as whether the payment for the booking has been made or not.

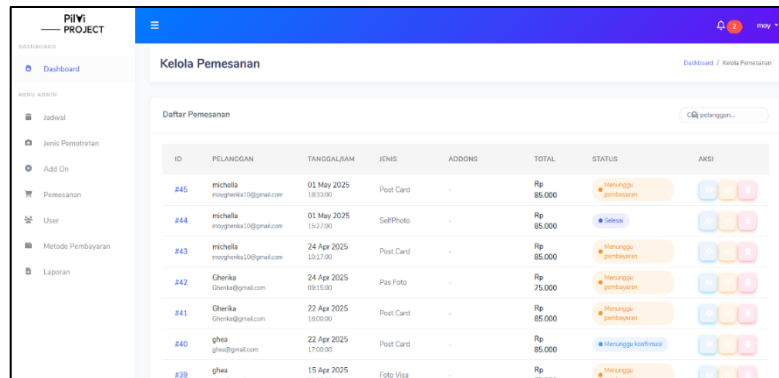


Figure 14. Admin Booking Page

Refactoring refers to the process of restructuring existing source code without altering its external behavior [21]. Its primary objective is to enhance code quality, thereby improving readability, maintainability, and extensibility for future development.

Figures 15 and 16 show the differences in the user login code before and after refactoring. In the refactored version, improvements were made using an object-oriented approach by encapsulating the login process within a class for better organization and reusability. Additionally, the logic was separated into more focused methods such as authentication, session handling, and redirection, along with the addition of methods for sanitizing user input.



Figure 15. Before Refactoring Login User

Figure 16. After Refactoring Login User

3.1.5 Testing

Testing is a systematic process carried out to evaluate and ensure that a system or software component This process activities aimed at correcting errors or software is used by released.

Black Box non-conforming interface errors, performance initialization and process is evaluating the system's internal structure, to ensure correctly. In Table 3, Black the login page for both Admin scenarios were executed using the Black Box method.

```
    $user = $result->fetch_assoc();
}
if ($user && password_verify($password, $user['password'])) {
    // Login berhasil, simpan data user ke session
    $SESSION['user_id'] = $user['id']; // Simpan user_id
    $SESSION['username'] = $user['username']; // Simpan username
    $SESSION['email'] = $user['email']; // Simpan email untuk notifikasi
    $SESSION['role'] = $user['role']; // Simpan role
}
// Redirect berdasarkan role dengan parameter login_success
if ($user['role'] === 'admin') {
    header("Location: admin/dashboard.php?login_success=1"); // Redirect ke halaman admin
} else {
    // Tampilkan pesan alert untuk login sukses
    $SESSION['login_success'] = true;
    header("Location: index.php?login_success=1"); // Redirect ke halaman utama untuk user biasa
}
exit();
} else {
    // Login gagal, arahkan ke halaman utama dengan parameter login_failed
    header("Location: index.php?login_failed=1");
    exit();
}
```

functions as intended. involves various detecting and bugs before the end users or officially

testing aims to identify functionalities, data structure issues, problems, as well as termination faults. This conducted by

output without examining its that the system operates Box testing was conducted on and Customer users. Various within the system and tested

```
PHP
if ($_SERVER["REQUEST_METHOD"] == "POST") {
    if ($result->num_rows == 0) {
        exit();
    }
    $user = $result->fetch_assoc();
}
// Proses login dengan pengecekan password dan login sukses
if ($user && password_verify($password, $user['password'])) {
    $SESSION['user_id'] = $user['id'];
    $SESSION['username'] = $user['username'];
    $SESSION['email'] = $user['email'];
    $SESSION['role'] = $user['role'];
}
// Redirect berdasarkan role dengan parameter login_success
if ($user['role'] === 'admin') {
    redirect('admin/dashboard.php', ['login_success' => 1]); // redirect admin
}
// arahkan user ke halaman login user biasa
$SESSION['login_success'] = true;
redirect('index.php', ['login_success' => 1]);
} else {
    redirect('index.php', ['login_failed' => 1]);
}
$stmt->close();
$conn->close();
```



Table 3. Blackbox Testing on Login Page

No.	Scenario	Number of Test Cases	Expected Result	Test Result
1	The entered email and password are correct	Entering a valid email and password	The system should display the main page	Successfully redirected to the main page
2	Email and password are not entered	Not entering email and password	The system should display an error message	The system displayed an error message
3	The entered email and password are incorrect	Entering an invalid email and password	The system should display an error message	The system displayed an error message
4	Email is correct but password is incorrect	Entering a valid email and wrong password	The system should display an error message	The system displayed an error message
5	Email is incorrect but password is correct	Entering an invalid email and correct password	The system should display an error message	The system displayed an error message
6	Both email and password are incorrect	Entering both an invalid email and password	The system should display an error message	The system displayed an error message

Login testing was conducted using the Blackbox Testing method to ensure that the system correctly responds to the input of email and password. Six testing scenarios were performed, ranging from correct input to various combinations of incorrect input. The test results show that when the correct email and password are entered, the system successfully redirects to the main page. Conversely, if either or both inputs are incorrect or left empty, the system consistently displays an error message. Based on these results, it can be concluded that the login feature functions as intended and input validation has been properly implemented.

4. CONCLUSION

Based on the results of this study, a web-based photo studio reservation system for Pilvi Project has been successfully designed and developed by applying the Extreme Programming (XP) method. The implementation of XP supports user-centered system development and allows for continuous improvements throughout the development process. This system provides convenience for users to make reservations through a web platform and assists administrators in systematically managing schedules, services, and packages. Thus, the system is able to replace the manual reservation process and enhance the quality of service offered by Pilvi Project.





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