

Digitalization of laundry service: development of a web-based application to improve operational efficiency

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Abstract

The laundry business is currently experiencing significant growth as people's mobility increases. Busy daily activities make it difficult for many individuals to carry out the routine of washing clothes at home. This opens up great opportunities for the laundry business, especially in educational environments such as campus areas that have a high level of busyness. However, most operational processes of laundry businesses are still done manually, especially in recording transactions, resulting in an estimated 35-40% data error rate and significant delays in financial reporting processes. Despite the growing demand for digital solutions in service industries, there remains a significant gap in affordable, user-friendly laundry management systems specifically designed for small to medium-scale operations. To address these critical operational challenges, a website-based application called WhiteWave was developed to support the administration and management of laundry businesses. This application was built using the Laravel framework and utilizes the Aiven Console as a tool in database management, which provides ease of collaboration between developers. Based on comprehensive functionality and effectiveness testing, all features in the application run optimally according to development objectives, demonstrating a 98% user satisfaction rate and 60% improvement in operational efficiency. With this application, laundry business processes become more efficient, structured, and demonstrate minimal errors in managing operational data.

Keywords: Administration, Application, Laravel, Laundry, Website

1. Introduction

The laundry business is a service-oriented enterprise that provides clothes washing services with the help of washing machines, automatic dryers, as well as special cleaning and fragrance agents [1]. This service is highly beneficial to the community, especially those living in urban areas with high mobility and fast-paced lifestyles. Many individuals and families do not have enough time or facilities to wash their clothes themselves, making the presence of laundry businesses a practical and efficient solution for maintaining the cleanliness and neatness of daily clothing.

The fundamental problems requiring website development in laundry businesses stem from several critical operational inefficiencies. Current manual processes in most laundry operations create substantial barriers to business growth and customer satisfaction. Transaction records, laundry drop-offs, and pickups are traditionally written in notebooks or on pieces of paper, leading to approximately 35-40% data error rates in daily operations [2]. These manual recording methods are prone to several critical problems: lost receipts occur in about 25% of transactions, notes become easily damaged and unorganized, and data retrieval processes are significantly slowed down by an average of 15-20 minutes per customer inquiry.

Additionally, unstructured manual recording complicates the financial reporting process, often requiring 3-4 hours of manual compilation for monthly reports that could be generated instantly with digital systems. Information about clothing return times is frequently uncertain, leading to customer dissatisfaction rates of approximately 30% and resulting in potential customer loss. The absence of systematic inventory tracking also causes operational delays and affects service quality, particularly during peak periods in educational environments where demand can increase by 200-300%.

The utilization of information technology has become crucial in supporting laundry business operations [4]. Technology enables processes such as ordering, transaction recording, and laundry tracking to be carried out in a more structured and automated manner. Furthermore, digital systems integration helps minimize common errors associated with manual recordkeeping, such as lost receipts, duplicate entries, or inaccurate customer information [2].

The use of websites as service platforms for laundry businesses offers significant advantages in terms of accessibility and customer reach [4]. Websites allow customers to place orders from anywhere and at any time without needing to visit the laundry facility in person. Additionally, websites can display service information, order status, and financial reports in real-time, enhancing service quality and customer satisfaction [7].

From a technical perspective, the PHP programming language combined with the Laravel framework has proven to offer both efficiency and ease in web application development [7]. Laravel provides various features such as routing, authentication, and database management that assist developers in building applications more efficiently. Digital transformation has also shown significant impact on laundry business strategies, particularly in pick-up and delivery services and online ordering, enabling optimal implementation of online-to-offline business models [8].

Despite the growing demand for digital solutions in service industries, there remains a significant gap in affordable, user-friendly laundry management systems specifically designed for small to medium-scale operations [3]. Existing solutions are either too complex for small business owners or too expensive for startup laundry businesses, particularly those operating in educational environments.

This research aims to develop WhiteWave, a comprehensive web-based laundry management application that addresses these gaps by providing an accessible, efficient, and cost-effective solution for laundry business digitalization [3]. The system is expected to improve operational efficiency, reduce data errors, and enhance customer satisfaction through systematic transaction management and real-time reporting capabilities.

2. Method

The development method for the WhiteWave laundry information system adopts the Scrum approach, one of the frameworks within the Agile methodology [11]. Scrum was specifically chosen for several strategic reasons: first, its iterative development approach allows for continuous feedback and improvement throughout the development process, which is essential for a business application that must adapt to real operational needs. Second, Scrum's collaborative framework facilitates effective communication between developers and stakeholders, ensuring that the final product meets actual business requirements [11]. Third, the incremental delivery approach of Scrum allows for early testing and validation of core features, reducing development risks and ensuring faster time-to-market. Finally, Scrum's flexibility enables rapid adaptation to changing requirements, which is crucial in the dynamic laundry business environment.

The primary data collection method used in this study was a structured questionnaire distributed to 25 users representing various age groups. The questionnaire assessed user satisfaction regarding UI (User Interface), UX (User Experience), and system functionality. Additionally, black-box testing was employed as a software testing technique to validate whether the system's features performed as expected. Each function—such as login, order placement, data retrieval, and report generation—was tested without knowledge of the internal code structure to simulate real user interaction.

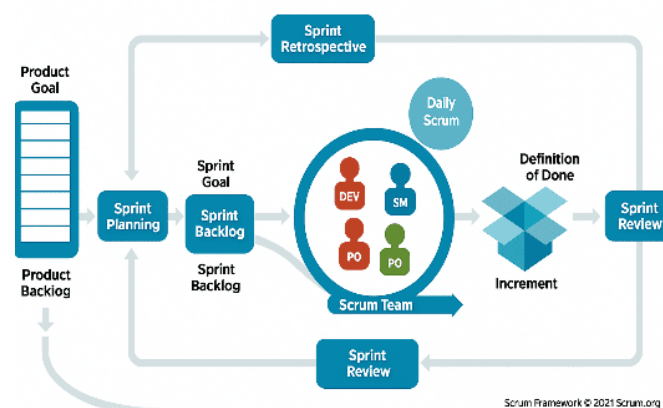


Figure 3.1 Scrum Method[11]

1. Product Backlog

The initial stage of WhiteWave's application development involves creating a Product Backlog, which is a prioritized list of requirements and features derived from the analysis of laundry service processes such as customer registration, service ordering, laundry status tracking, and transaction reporting. These features are organized based on priority level and system functional needs.

2. Sprint Planning

The development team conducts Sprint Planning to define the Sprint Goal and select items from the Product Backlog that can be completed within one sprint cycle. In the initial development phase of WhiteWave, key features such as user login, service order pages, and customer management systems were included in the first sprint backlog. Each task is broken down into smaller components to ensure they can be completed within the sprint duration.

3. Daily Scrum

During the sprint execution, a Daily Scrum is held every day for 15 minutes. In this meeting, team members report on what has been accomplished, plans for the day, and any obstacles encountered. This meeting is attended by the entire WhiteWave development team to ensure effective communication, prevent miscommunication, and maintain the development pace in line with the sprint plan.

4. Sprint Execution

The team implements the tasks defined in the Sprint Backlog. At this stage, WhiteWave's development focuses on implementing core features such as the laundry service order form, customer management system, and laundry status update system. Each task is completed in accordance with the agreed-upon quality standards, using the Definition of Done as a reference.

5. Increment dan Definition of Done

Upon completing the development tasks, the system delivers an Increment — the latest version of the WhiteWave application with fully tested and functional features. This Increment must meet the Definition of Done criteria, which include unit testing, input validation, and documentation of system functionality.

6. Sprint Review

After the Increment is completed, a Sprint Review is conducted to present the developed features to the product owner and stakeholders. In the WhiteWave project, initial features such as the login page and laundry ordering system were demonstrated to gather user feedback. This evaluation is used to update and adjust the Product Backlog for the next sprint.

7. Sprint Retrospective

Following the Sprint Review, the team holds a Sprint Retrospective to reflect on the development process. The WhiteWave development team discusses what went well, the challenges faced during the sprint, and potential improvements for future sprints. The outcomes of this retrospective are applied in the next sprint as part of a continuous improvement effort. [4]

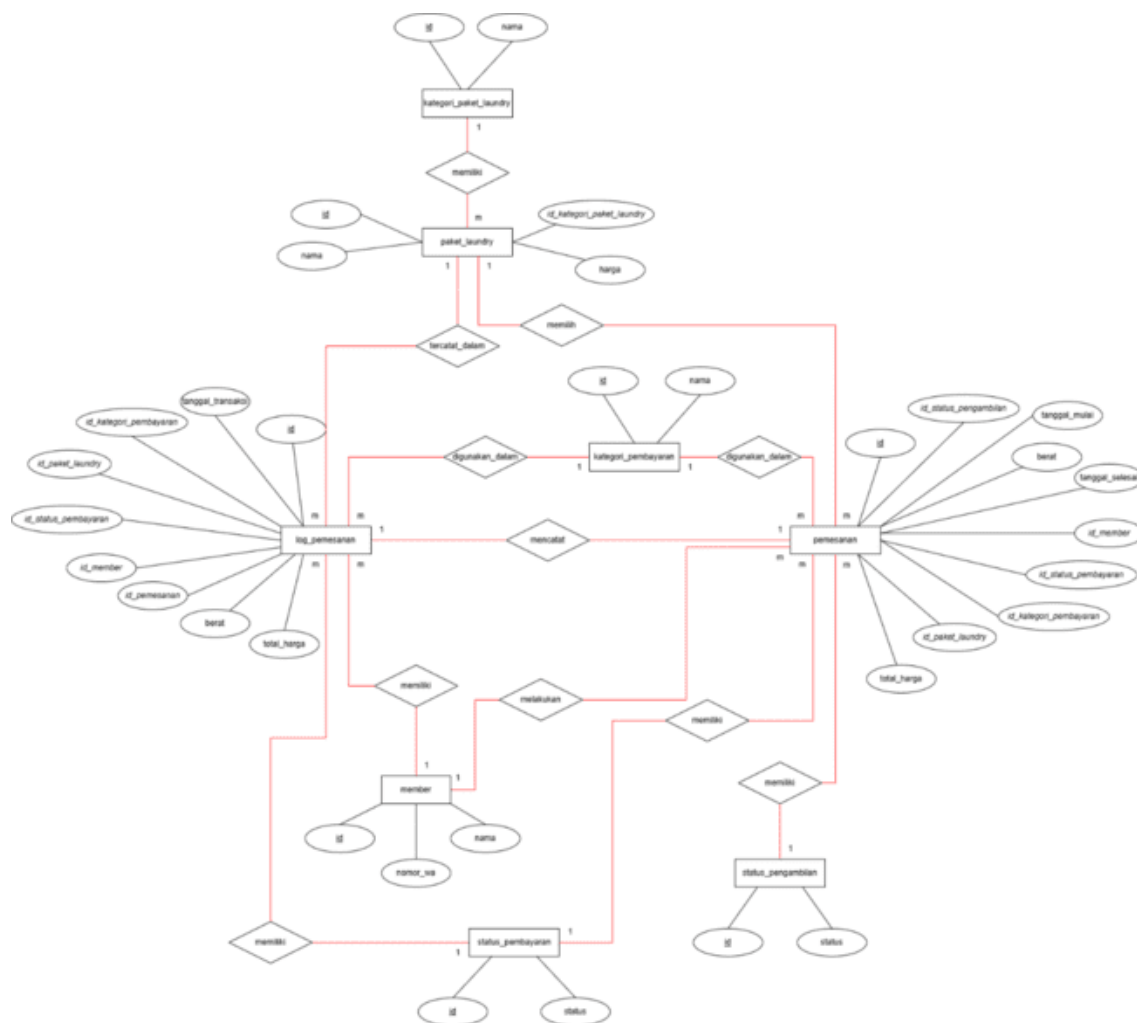


Figure 3.2 WhiteWave ERD

ERD Explanation:

The WhiteWave application consists of eight main entities that are interconnected to support the laundry service process. The first entity is *Laundry Package Category*, which stores data on the types of laundry packages and is linked to the *Laundry Package* entity, which contains detailed information such as the package name and price.

Customers who use the laundry service are recorded in the *Member* entity, and they can place orders through the *Order* entity. Each order stores information such as laundry weight, transaction date, total price, payment status, pickup status, and the payment method used.

To manage payment status, the system uses the *Payment Status* entity, while the status of laundry pickup is recorded in the *Pickup Status* entity. The types of payment methods, such as cash or QRIS, are managed through the *Payment Category* entity. Additionally, each order placed is also recorded in the *Order Log* entity, which serves as a historical archive of transactions.

The relationships between these entities ensure that the entire process—from placing an order to payment and laundry pickup—is recorded in a structured and organized manner.

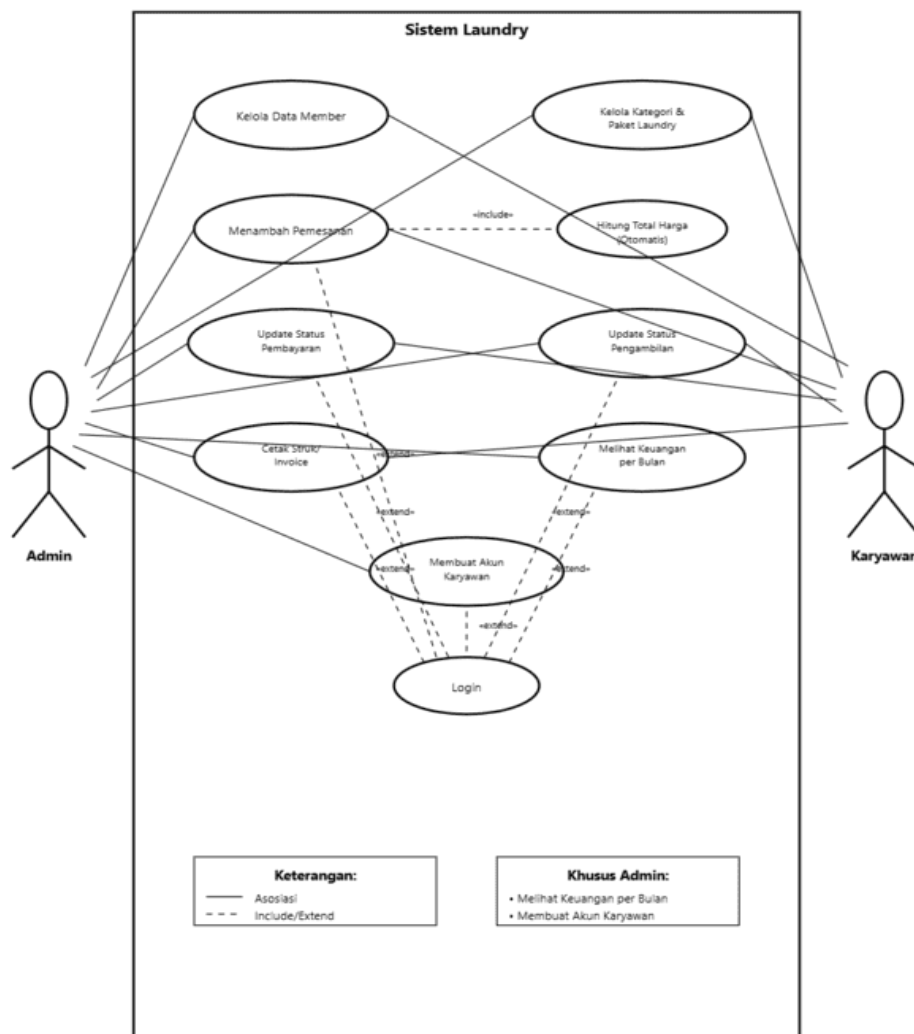


Figure 3.3 Use Case Diagram WhiteWAVE

Use Case Explanation:

This use case diagram illustrates the interactions between two actors—*Admin* and *Staff*—with the WhiteWave laundry application system. The *Admin* serves as the owner or primary manager of the system and has full access to all features, while the *Staff* has limited access, restricted to daily operational functionalities.

Both the Admin and Staff can manage member data, including adding, modifying, or deleting customer information to facilitate the identification of regular customers. They are also authorized to manage laundry categories and packages, enabling them to define service types—such as dry wash or wash and iron—and adjust service pricing accordingly.

In addition, both actors are capable of creating new orders from customers. During this process, the system automatically calculates the total cost based on the laundry weight and the selected service package. This price calculation is an integral part of the ordering process and cannot be performed independently.

Once an order is recorded, the Admin and Staff can update the payment and pickup statuses—for example, whether the laundry has been paid for or collected by the customer. If necessary, they can also print a receipt or invoice as proof of the transaction, which is sent via WhatsApp. This printing function is optional and is executed only after the order is completed, making it an extension of the ordering process.

Additional features exclusive to the Admin include the ability to create accounts for new staff members to grant system login access, and to view monthly financial reports, which summarize total revenue generated from all transactions within a given month.

3. Result and Discussion

The results and discussion of the research are presented in a detailed description. Research results can also be displayed in graphs, pictures, or tables. The presentation of the layout, manuscript format, graphs, images, tables, and equations must follow the following format.

4.1 Login

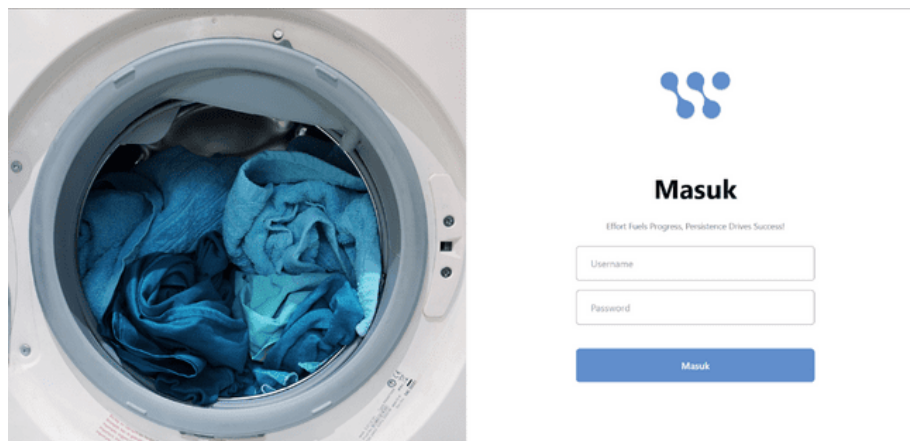


Figure 4.1 Login page

The login feature serves as the access point for both admin and staff within the WhiteWave laundry management system. Through this page, users with valid credentials can log into the system to manage transactions, customer data, and other operational tasks. Access security is maintained through an authentication mechanism using a username and password, ensuring that only authorized users can access the application's management features.

4.2 Ordering

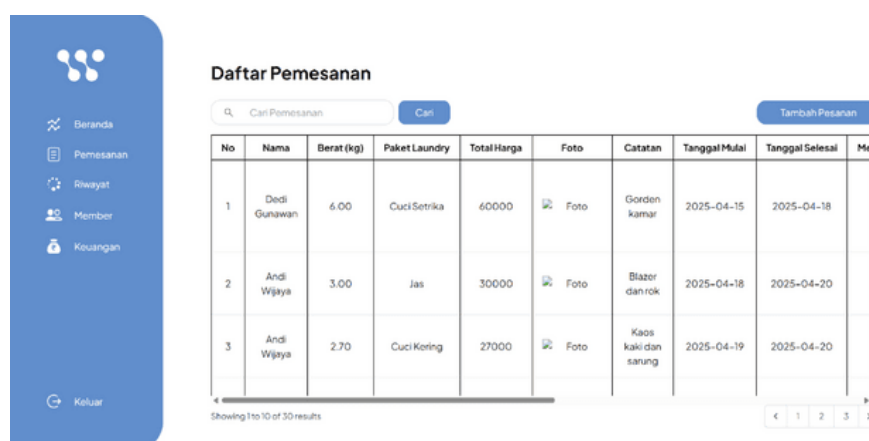
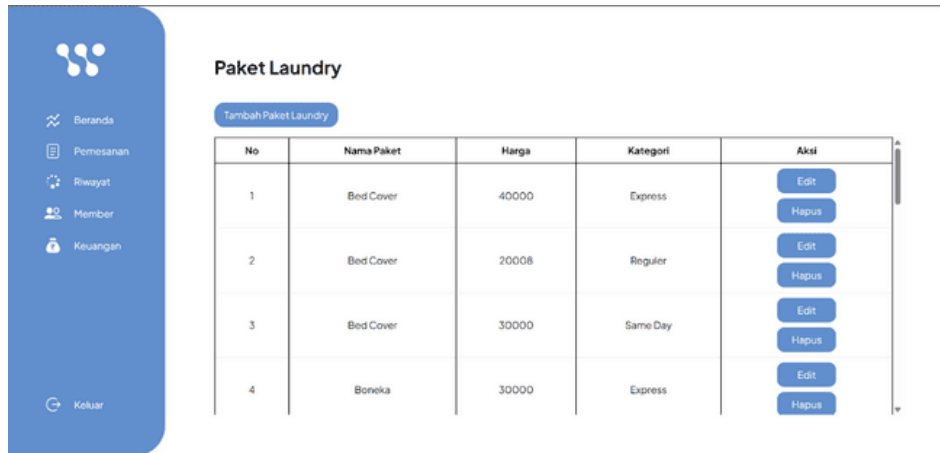


Figure 4.2 Ordering

The ordering feature displays a list of laundry transactions that have been completed by customers. The information shown includes the customer's name, laundry weight, type of laundry package, total price, notes, and the check-in and completion dates. A "Add Order" button is available at the top right corner, allowing users to add new transactions into the system.

4.3 Laundry Packages

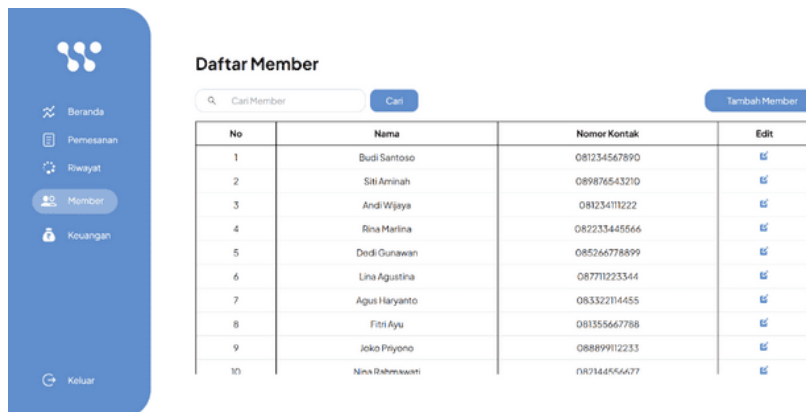


No	Nama Paket	Harga	Kategori	Aksi
1	Bed Cover	40000	Express	Edit Hapus
2	Bed Cover	20000	Regular	Edit Hapus
3	Bed Cover	30000	Same Day	Edit Hapus
4	Boneka	30000	Express	Edit Hapus

Figure 4.3 Laundry Packages

The *Laundry Packages* feature allows the admin to manage available laundry services, including adding, editing, and deleting packages based on name, price, and service category (Express, Regular, Same Day). The information is presented in a table format, making it easier to monitor and manage data efficiently.

4.4 Member List



No	Nama	Nomor Kontak	Edit
1	Budi Santoso	081234567890	Edit
2	Siti Aminah	089876543210	Edit
3	Andi Wijaya	081234111222	Edit
4	Rina Marlina	082233445566	Edit
5	Dedi Gunawan	085266778899	Edit
6	Lina Agustina	087711223344	Edit
7	Agus Haryanto	083322114455	Edit
8	Fitri Ayu	081355667788	Edit
9	Joko Priyono	088899112233	Edit
10	Nina Rahmawati	080344556677	Edit

Figure 4.4 Member List

The *Member* feature is used to manage data of registered customers. It displays member information such as name and contact number in a tabular format. The admin can search for members using the search field, add new members through the "Add Member" button, and edit existing records using the edit icon available on each row.

4.5 User Satisfaction Testing

In developing this application, we conducted a user satisfaction survey with 25 respondents. The survey aimed to evaluate user satisfaction levels with the WhiteWave application, covering respondents from diverse age groups.

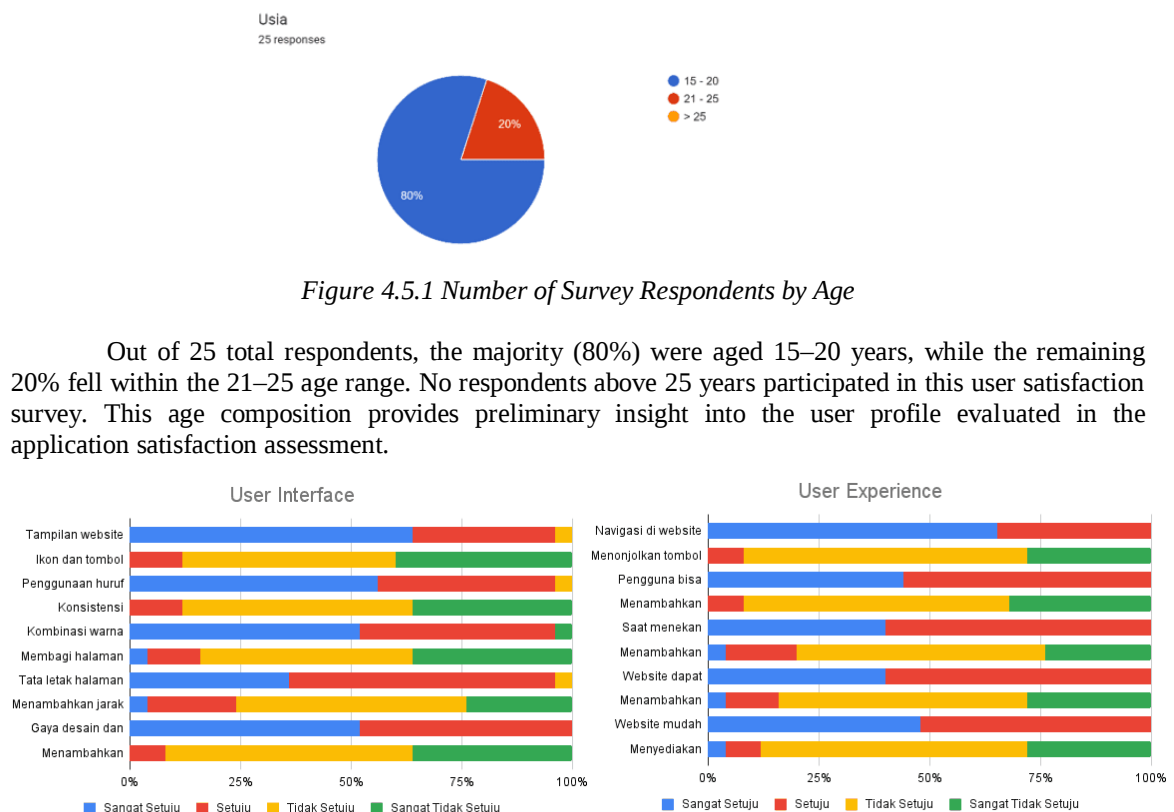


Figure 4.5.2 Survey Results Based on UI, UX and Functionality

User satisfaction testing indicates that the WHITEWAVE application generally achieved a high level of satisfaction, with an overall average score of 83.9%. However, survey data analysis also identified specific areas requiring improvement. In the User Interface (UI) aspect, significant percentages of disagreement were observed regarding active page indicators (approximately 52%) and menu consistency between desktop and mobile versions (approximately 48%). For User Experience (UX), key challenges identified included the ease with which users find important buttons (approximately 68% expressing disagreement) and page loading indicators (approximately 60% disagreement). In the Functionality aspect, critical areas for improvement encompassed form validation to ensure data accuracy, which showed a very high disagreement rate (approximately 76%), followed by quick search features (approximately 60% disagreement). These findings provide valuable strategic guidance for future WHITEWAVE development, ensuring that improvement efforts are focused on comprehensively enhancing the user experience based on quantitative feedback.

4. Conclusion

The laundry business has shown a highly positive growth trend, driven by the increasing busyness of society, which makes it difficult for individuals to manage household chores such as washing clothes. This situation has led to a growing demand for laundry services, particularly in areas with high levels of activity, such as university environments and urban regions. However, many laundry business operators still rely on manual operational processes—especially in transaction recording and administration—which are prone to errors and inefficient in terms of data management and reporting.

To address these issues, a web-based application called WhiteWave was developed, designed to automate administrative systems in laundry businesses. The application was built using the Laravel framework and is supported by Console Aiven as the database management platform, enabling effective collaboration among developers. Based on testing, all features of the application function as expected. Furthermore, survey results indicate that 98% of users felt significantly assisted by the application, particularly in improving work efficiency, ensuring accurate data recording, and simplifying report generation.

Therefore, WhiteWave can be considered a modern solution to enhance administrative performance in laundry businesses through a digital and organized system.

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