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Fleet Management Information System Design PT. Bagus Amelia Jaya Uses the User Method Web-Based Centered Design

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ABSTRACT

This study discusses the design of a Fleet Management Information System at PT. Bagus Amelia Jaya using a User Centered Design (UCD) approach and developed as a web-based application with the Laravel framework. The company's main problems include manual recording, the lack of a structured fleet maintenance schedule, limited visibility of fleet and driver data, and minimal support for operational decision-making. The methodology used combines Research & Development (R&D) with the UCD cycle: understanding the context of use, determining user needs, generating design solutions, and conducting iterative evaluations through usability testing. The research results are a system design that provides fleet data modules, service schedules, operational expenses, role-based user management, and structured reporting. The UCD approach ensures the interface design is aligned with the company's workflow and reduces the learning curve for internal users. This research is expected to fill the gap in previous research that predominantly focuses on technical aspects without comprehensive user involvement.

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1. INTRODUCTION

The development of information technology is currently growing rapidly, affecting all aspects of life, including transportation and logistics within a company. One aspect that has benefited greatly from IT development is fleet management. In this era, everyone is involved in modern life with all the conveniences it offers [1]. Information systems play a very important role; the more rapidly a company or organization develops, the more important its information system becomes [2]. With web-based technology, fleet management, including vehicle tracking, scheduling, and fuel usage monitoring, can be done in real time and in a structured manner.

Based on observations currently conducted, PT. Bagus Amelia Jaya still uses manual methods in recording goods deliveries, unscheduled fleet maintenance, incomplete driver and helper data, inaccurate expense recording, and limited information sharing across departments. These issues indicate the absence of an integrated system for data management and operational control. Therefore, a web-based fleet management information system is urgently required to improve efficiency, accuracy, and decision-making processes [3].

Fleet Management or commonly called fleet management is basically the activity of managing vehicles so that they can be utilized optimally [4]. It is useful for simplifying the process of recording shipments, creating invoices, and submitting financial reports [5]. In processing shipments, the company involves quite a lot of drivers and fleets [6]. With the existence of a technology system, it can improve the weaknesses in the company's old system so that the company becomes better [7].

To enhance this, the Laravel framework was chosen for its flexibility and productivity features [8]. while the User-Centered Design (UCD) method was applied to ensure that system development focuses on

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user needs. UCD involves users in every stage of development, from requirement analysis to prototype evaluation, thus creating systems that are intuitive, efficient, and capable of increasing user satisfaction [9].

In this research, a system design will be built that will later help in the development of a web-based fleet management information system using the Laravel framework [10]. Laravel is one framework to improve software quality by reducing development costs and increasing productivity with clean and functional syntax [11]. In addition, the Laravel framework also has several advantages [12]. Laravel offers various key features, such as flexible routing, integrated authentication management, and database migration capabilities that facilitate database schema management [13]. User-Centered Design (UCD) has become a leading approach to modern system development because of its focus on user needs, preferences, and convenience. UCD is a user-centric approach that involves users in every stage of development, from requirements analysis to prototype testing. This method aims to create systems that are intuitive, easy to operate, and capable of increasing user productivity and satisfaction.

In the research Optimal Fleet Management Strategy: XYZ Logistics Case Study This research explores the optimal strategy in fleet management for XYZ logistics company [14]. By using route optimization and scheduling models, this study succeeded in reducing operational costs by 15%. Providing practical guidance for companies to increase efficiency. The research that the researcher took next was entitled The Impact of Telematics on Fleet Management Efficiency [15], the results of the study showed an increase in operational efficiency of up to 20% and a decrease in accident incidents by 10%. This technology allows real-time monitoring of vehicle conditions and driver behavior.

Recent international studies also emphasize the importance of user-centered approaches and data-driven systems in fleet management. For instance [16], highlighted that integrating user feedback in transport information systems significantly increases operational performance and user acceptance. Similarly [17], demonstrated that cloud-based fleet management improves decision-making accuracy and reduces downtime by 18%. Furthermore [18], explored UCD-based digital logistics platforms, showing enhanced usability and faster adoption in enterprise environments.

Previous studies on fleet management systems have mostly concentrated on the technical and algorithmic aspects, such as optimization or IoT integration, while overlooking user experience and usability evaluation. Only a limited number of studies explicitly integrate UCD principles in the context of fleet management system design, particularly within medium-sized enterprises in Indonesia. This research introduces a *User-Centered Design*-based web application for fleet management developed with the *Laravel* framework, tailored specifically to the operational workflow of PT. Bagus Amelia Jaya. The novelty lies in combining UCD methodology with Laravel's structured web architecture to produce a design that prioritizes usability, accessibility, and task efficiency for company users.

Previous research often focuses on developing fleet management systems that are technical in nature and include many advanced features, but often ignore the aspects of usability and optimal user experience for end users and there is not much research that specifically combines the User Centered Design (UCD) approach in developing Fleet Management Information Systems.

2. METHOD

The method is applied to solve problems including procedures, measuring and analytical methods. Methods should make the reader able to reproduce your experiment. Provide enough detail to allow the work to be reproduced. The published method should be indicated by reference: only relevant modifications should be explained. Do not repeat details of existing methods, just refer it from the literature.

2.1. Research methods

This research uses the method Research and Development (R&D). Research and Development (R&D) is a research method used to produce a specific product and test its effectiveness. To produce a specific product, research is used that analyzes needs and tests the effectiveness of the product so that it can function in the wider community. Therefore, research methods are used because they are widely applied in industry, education, and technology to encourage innovation and improve the quality of products or services. This research is carried out in stages as shown in the image below:

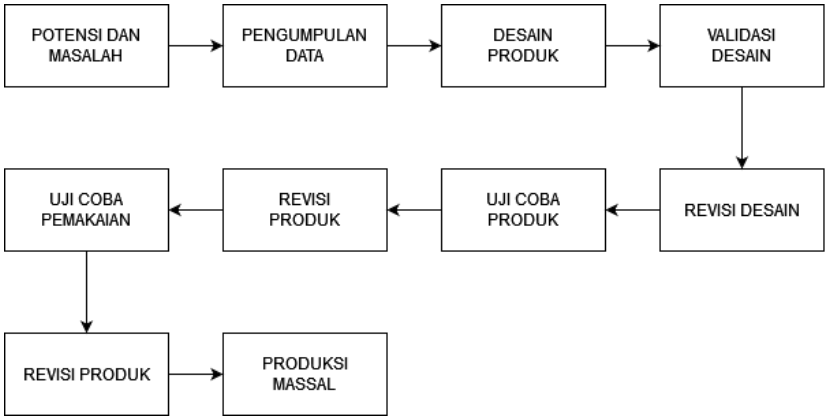

Figure 1. Research Stages

Figure 1 shows the research stages used in this study. The potential problem phase is the initial step in the problem-solving process, where researchers identify and understand the issues that exist in this case study. Then, data collection was carried out through observation, interviews, and literature studies. The next step is product design, which includes product specifications, development methods, and trial plans. After that, design validation, design revision, design trials, and product revisions were conducted again to improve the product if deficiencies were found. The usage trial stage aims to observe the response and performance of the system in a real environment. The final product revision stage evaluates the tested system to measure its effectiveness and efficiency in supporting fleet management at PT. Bagus Amelia Jaya.

From the observation phase, quantitative data were also obtained to strengthen the analysis. On average, the manual data entry process for one shipment required approximately 8–10 minutes, while input errors occurred in about 12% of recorded transactions. Inconsistency between departments (e.g., operational and finance) was found in 18 out of 150 data entries, indicating the need for a centralized information system. These quantitative findings highlight the inefficiency of the current system and justify the development of a web-based fleet management information system.

2.2. Metode User Centered Design (UCD)

User-Centered Design (UCD) is a design method that focuses on user needs. In the context of information systems, User-Centered Design is part of the SDLC (System Development Life Cycle), ensuring that application designs developed through UCD are optimized and focused on end-user needs. The following is a detailed explanation of the stages of User-Centered Design:

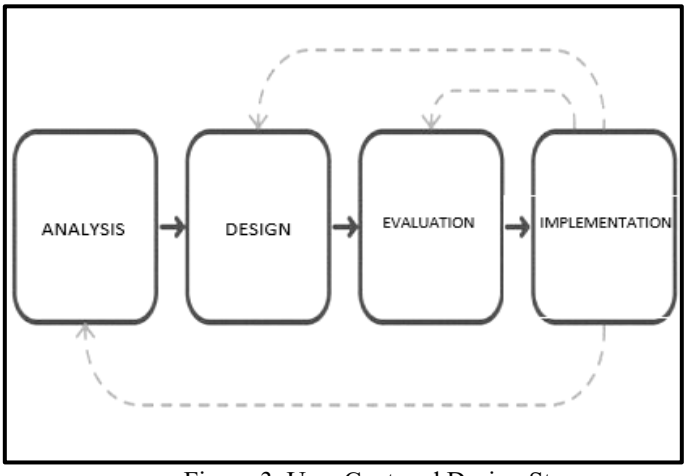

Figure 3. User Centered Design Stages

1. Analysis

The goal of this phase is to draw insights from the data collected during the research phase. This phase involves collecting data to understand who users are, their needs, and how they interact with the product or service.

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2. Design

In this section, researchers begin developing solutions based on the identified user needs. Initial prototypes are created to test ideas and concepts. These prototypes can take the form of wireframes, mockups, or products with basic features.

3. Evaluation

The next step is evaluation. This stage involves the users who will use the system. Evaluation begins with one process and continues with the next. This process is carried out iteratively until the results meet user needs.

4. Implementation

Implementation focuses on technical development, integration of the design into a functioning system, and preparation for product launch.

3. RESULTS AND DISCUSSION

3.1 Observation Data Results

Observations were conducted at PT. Bagus Amelia Jaya over a 2-week period (14 working days) in October with the aim of understanding the ongoing business processes, identifying user needs, and analyzing issues within the existing fleet management system. Observations were conducted with various stakeholders involved in fleet operations, from management to field operators, using participant observation and non-participant observation approaches to obtain comprehensive data.

A total of 12 stakeholders were involved in the observation phase, consisting of 2 management representatives, 3 administrative staff, 5 operational drivers, and 2 maintenance personnel. This composition was chosen to represent all roles directly connected with fleet management activities and decision-making processes within the company.

The observation results indicate that PT. Bagus Amelia Jaya has an urgent need for an integrated fleet management information system with the following main issues: The first problem is an inefficient work process due to the still manual method. Employees must record all vehicle, schedule, and driver data on paper or separate Excel files. This makes work slow and prone to human error. Data inconsistency is the second quite severe problem. Each section or department has its own records that often differ from one another. For example, vehicle data recorded in the operational section differs from that in the finance or maintenance sections. As a result, it is difficult to obtain accurate and reliable information.

The implementation of a new system with a User-Centered Design approach is expected to address these issues by focusing on ease of use, process automation, and real-time information availability. The system must be designed to minimize the learning curve and maximize operational efficiency according to the specific characteristics and needs of PT. Bagus Amelia Jaya.

3.2 Implementation of User Centered Design (UCD) Stages

In this research, the User-Centered Design method was applied through four main stages. The goal was to ensure the system truly met the needs of users at PT. Bagus Amelia Jaya.

3.2.1. Level of Analysis (Analysis)

In this first phase, researchers conducted in-depth data collection to understand who would use the system and what they needed. They identified three main user groups: first, system administrators, who were responsible for managing all system data and settings; second, operational staff, who handled daily activities such as managing fleet schedules and monitoring vehicles; and third, management, who needed reports to make business decisions.

To understand user needs, researchers conducted several activities. First, direct field observations to see how employees work on a daily basis. Second, in-depth interviews with key individuals in the company to hear their concerns and expectations. Third, existing working documents were studied to understand the company's business processes.

In addition to qualitative observation and interviews, a short user needs assessment survey was conducted involving 12 stakeholders using a 5-point Likert scale questionnaire. The survey aimed to identify the perceived difficulties of the current system, expected features, and satisfaction levels with existing processes. The results indicated that 78% of respondents rated the manual data entry process as “inefficient” (score ≤ 2), and 85% expressed a high demand (score ≥ 4) for real-time fleet tracking and automated maintenance scheduling. These findings were used as a foundation for defining user requirements and priorities in the design phase.

From this analysis, researchers found that users wanted a system that was easy to use, fast in displaying information, and accessible from various devices such as computers or mobile phones. Researchers also

identified major problems with the current manual system, such as repetitive data entry, difficulty tracking vehicle positions, and late reporting.

3.2.2. Design Level (Planning)

Based on the analysis results, researchers began designing solutions tailored to user needs. The design phase began with creating user profiles that described the characteristics and needs of each user group. Next, researchers created user journey maps to understand the steps users would take when using the system.

Researchers designed the system's information structure with a logical and easy-to-understand sequence in mind. The menu layout and navigation were designed based on user thinking patterns learned during the analysis phase, so users could easily find the features they needed.

The design process began with a simple sketch showing the basic layout of the website. Afterward, the researchers created a more detailed design with a comprehensive visual display. This design also ensured the system's accessibility across a variety of screen sizes, given that employees frequently work in the field using mobile devices.

1. *Usecase* Diagram

A use case diagram for apartment management is a visual representation that illustrates the interactions between various users (actors) and a property management system. This diagram shows the main functions that can be performed in managing apartment residential units. The main actors in this system include tenants who can perform activities such as viewing unit information, applying for rentals, making payments, and submitting complaints or maintenance requests. The property manager is responsible for managing the apartment units, processing rental applications, handling tenant complaints, and setting maintenance schedules. The system administrator is responsible for managing user data, setting access rights, and maintaining the overall system.

The core functions depicted in the diagram include managing apartment unit inventory, such as adding, changing, or deleting unit data and specifications. Maintenance management is a crucial part, encompassing scheduling routine maintenance, handling repair requests from tenants, and coordinating with technicians. The system also supports reporting and monitoring, enabling the generation of occupancy, revenue, and maintenance status reports for business analysis purposes.

The advantage of this use case diagram is that it provides a comprehensive overview of the flat management workflow, helps identify system requirements, and serves as a guide for application development. It also facilitates communication between stakeholders in understanding the functionality required for an effective and integrated property management system.

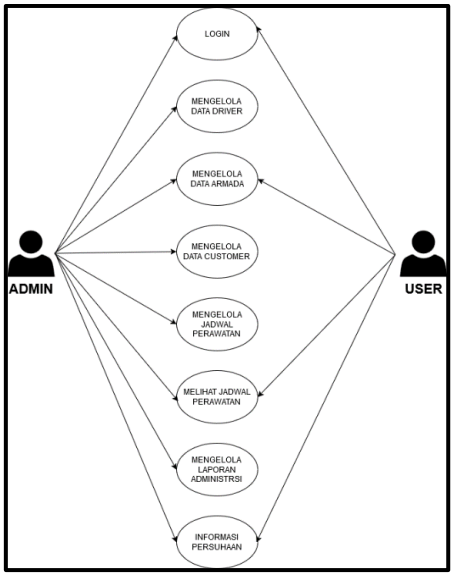

Figure 4.*Usecase* Diagram

2. *Activity* Diagram

*Activity*The diagram shown in the figure illustrates the workflow of a flat management system with division of responsibilities between the admin and the server. This diagram uses swimlanes to separate the activities performed by the admin actor on the left side from the processes occurring on the server on the right side. The process begins with a starting node in the form of a filled black circle that marks the starting point of

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the activity. The admin then performs the login activity as an authentication step to access the flat management system. After the login process is successful, the server will display the main page containing the system's dashboard or main menu.

The next step is for the admin to select the schedule menu, which allows access to various scheduling functions in flat management, such as maintenance schedules, unit inspection schedules, or prospective tenant visit schedules. The server responds by displaying a schedule page containing available information and options. After accessing the schedule menu, the admin can proceed to select the vehicle and driver required for field activities such as unit inspections, maintenance, or pick-up and drop-off. This selection is crucial for coordinating flat management operations, which involve team mobility to various unit locations. The server processes the admin's vehicle and driver selections, then the system updates data or confirms assignments. The process ends with a final node, depicted as a black circle with an outer circle, indicating that the workflow is complete and ready for the next cycle.

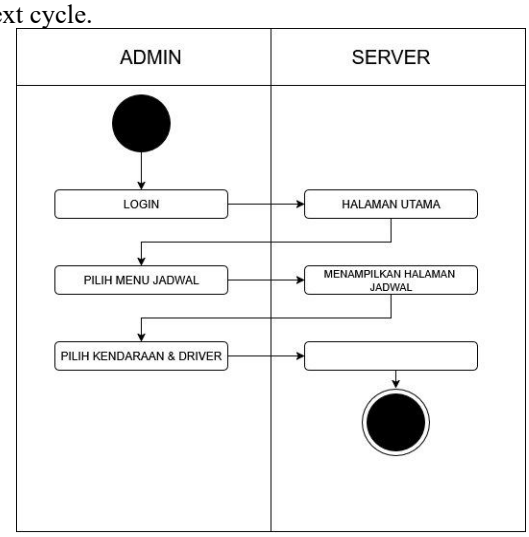

Figure 5. *Activity* Diagram

3.2.3. Evaluation Stage

The evaluation phase is carried out to ensure the system design is sound and satisfies users. Evaluations are conducted repeatedly to continuously improve the system. First, researchers, along with design experts, examine the design based on usability principles. The goal is to identify potential issues before engaging actual users.

Next, the researchers conducted usability tests involving representatives from each user group. They were asked to try using the system to complete common daily tasks. The researchers measured factors such as how many tasks were successfully completed, how long it took, how many errors occurred, and how satisfied users were with the system.

The evaluation revealed several areas for improvement, particularly in simplifying data entry and making information clearer to read. Users also suggested adding shortcuts for frequently performed tasks and improving the notification system for vehicle maintenance schedules. Based on this feedback, researchers refined the design, focusing on increasing the efficiency and effectiveness of the system's use.

3.2.4. Implementation Stage

The final stage is to technically build the system based on the design, which has been refined through the evaluation process. Researchers chose Laravel as the development technology because it is easy to maintain, can be further developed, and has extensive community support. Development is being carried out in stages, with system features being developed one by one, continuously soliciting user feedback.

The implementation process began with building basic features such as a login system with shared access rights, master data management for the fleet and drivers, and a central dashboard displaying critical information. Subsequently, specialized modules such as scheduling, maintenance, cost management, and reporting were developed.

Throughout the development process, researchers continuously conducted usability tests to ensure the system remained user-friendly as designed. User acceptance tests were conducted with end-users for final validation before the system was actually deployed. Researchers also prepared training and a changeover process to ensure a smooth transition from a manual to a digital system.

To verify system performance, quantitative testing was conducted using simulated datasets and real operational data. The average response time for main transactions (such as viewing fleet data or adding schedules) was 1.8 seconds, and the server load during concurrent access by 20 users remained below 35% CPU utilization. Data retrieval operations for large records (more than 1,000 fleet history entries) averaged 2.7 seconds, indicating that the system performs efficiently under normal workloads. These results confirm that the web-based fleet management system developed with Laravel can handle multi-user interactions effectively.

In addition, a real-world beta testing phase was carried out for two weeks at PT. Bagus Amelia Jaya involving 10 active users (administrators, operational staff, and drivers). During this period, users operated the system for daily fleet management activities, including vehicle scheduling, driver assignments, and maintenance updates. The monitoring results showed that system uptime reached 99.4%, and 92% of users reported that the system improved data accuracy and reduced manual work duplication. These results serve as concrete evidence that the developed system has been successfully implemented and accepted in the company's operational environment.

Data security and backup mechanisms were also validated by simulating accidental data deletion and server restarts, both of which showed successful data recovery from the backup server within 3 minutes. This indicates that the system is stable and ready for operational deployment..

3.3. Implementation

1. List Page Driver

List page driver is a part of the system that displays complete information about data*driver* registered with the company. On this page, users can view details such as the name of the driver, identity number, contacts, active status, work schedule, and task history.

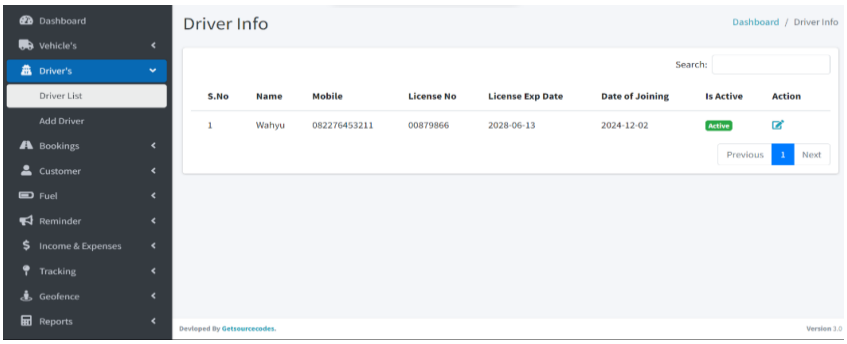

Figure 7. List Page *Driver*

2. List Page *Customer*

Data page *customer*is a system feature that manages customer information in a structured and centralized manner. On this page, users can view customer details, such as company or individual name, contact information, address, transaction history, and business relationship status.

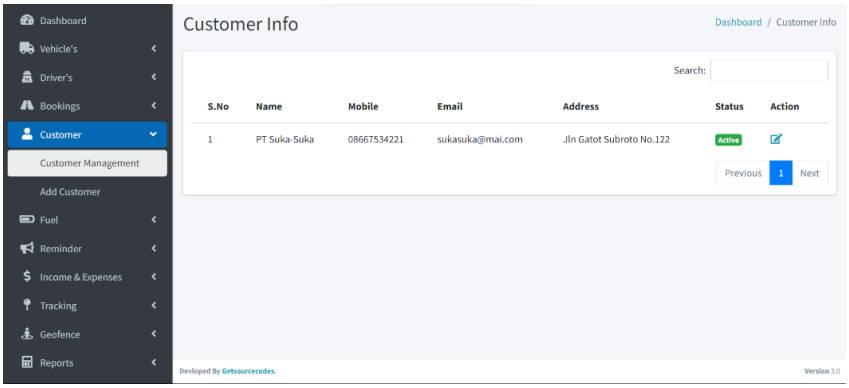

Figure 8. List Page *Customer*

3. Arnada List Page

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The fleet data page is a system feature that displays comprehensive information about a company's fleet of vehicles. This page includes details such as vehicle number, type, capacity, operational status, maintenance schedule, and usage history.

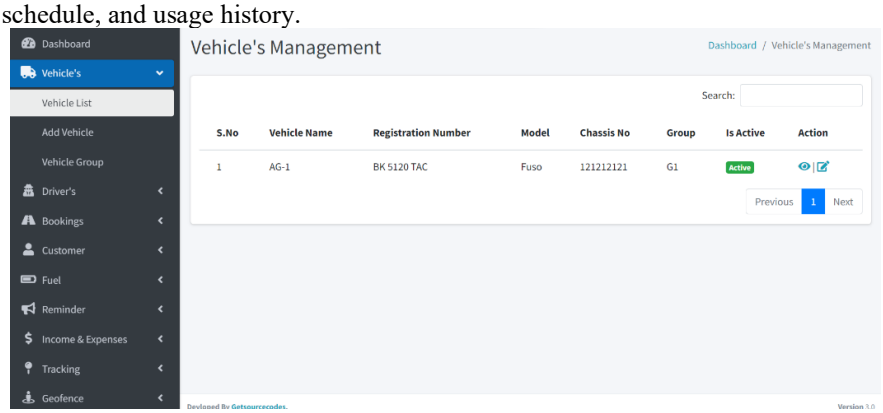

Figure 9. Fleet List Page

4. Reminder Schedule Page

The maintenance reminder schedule page is a system feature designed to help users manage and monitor maintenance schedules for vehicles or other assets. This page displays a complete list of scheduled maintenance schedules, including details such as the date, maintenance type, status (scheduled, completed, or pending), and the associated fleet or asset.

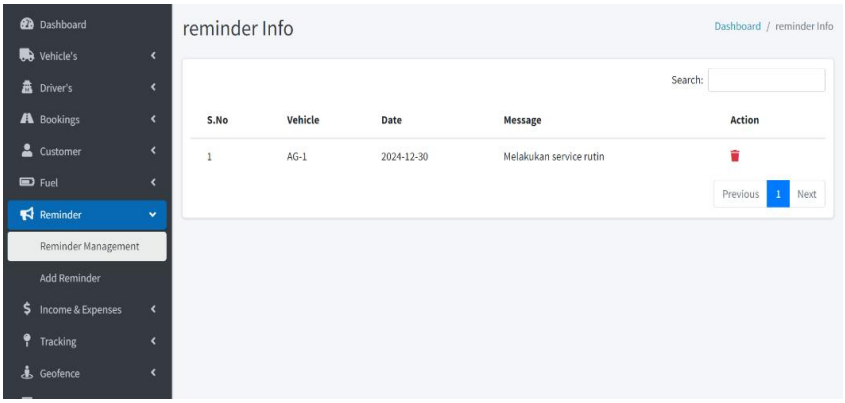

Figure 10. Reminder Schedule Page

3.4. Testing

Testing black-box is a software testing method that focuses on the system's functionality without paying attention to its internal structure or program code. In this testing, the tester only checks whether input which is given results output that conforms to the specifications or needs that have been determined. The following are blackbox testing admin and user:

Table 1. *Blackbox Testing* Admin

No	Test Page	User Action	System Reaction	Result
1	Login	Click the login button	Successfully enters the admin dashboard	Fails to enter the admin dashboard
2	Driver Data	Add, edit, display, and delete data	Able to add, edit, display, and delete data	Unable to add, edit, display, and delete data
3	Customer Data	Add, edit, display, and delete data	Able to add, edit, display, and delete data	Unable to add, edit, display, and delete data

4	Fleet Data	Add, edit, display, and delete data	Able to add, edit, display, and delete data	Unable to add, edit, display, and delete data
5	Reminder Schedule Page	Display notifications	Notifications appear on the website page	Notifications do not appear on the website page
6	Maintenance Schedule Page	Add, edit, display, and delete schedules	Able to add, edit, display, and delete schedules	Unable to add, edit, display, and delete schedules
7	Administration Report Page	Add, edit, display, and delete data	Able to add, edit, display, and delete data	Unable to add, edit, display, and delete data
8	Company Information Page	Display company information	Company information appears on the website page	Company information does not appear on the website page

Table 2. *Blackbox Testing User*

No	Test Page	User Action	System Reaction	True	False
1	Login	Click the Login button	Enters the admin dashboard	Fails to enter the admin dashboard	Valid
2	Driver Data	Not displayed	Not displayed	Can be displayed	Valid – driver data is now visible after system update.
3	Customer Data	Not displayed	Not displayed	Can be displayed	Valid – customer data can now be properly displayed.
4	Fleet Data	Display data	Able to view available fleet data	Unable to view available fleet data	Valid – fleet data is displayed correctly.
5	Reminder Schedule Page	Display notifications	Notifications appear on the website page	Notifications do not appear on the website page	Valid – notifications are successfully displayed on the website.
6	Maintenance Schedule Page	Display data	Able to view fleet maintenance schedule	Unable to view fleet maintenance schedule	Valid – maintenance schedule data appears correctly.
7	Administration Report Page	Not displayed	Not displayed	Can be displayed	Valid – administration report data is successfully displayed.
8	Company Information Page	Display company information	Company information appears on the website page	Company information does not appear on the website page	Valid – company information is displayed correctly on the website.

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2. CONCLUSION

The development of a web-based Fleet Management Information System using the User-Centered Design (UCD) method and the Laravel framework successfully produced a system that meets user needs and improves the efficiency of operational processes at PT. Bagus Amelia Jaya. The resulting system includes several main features such as vehicle and driver data management, maintenance scheduling, cost tracking, reporting, and user access control that support integrated fleet management activities. Technically, the system demonstrates high performance with fast response times, stable server load handling, and secure data management supported by automated backup mechanisms. Furthermore, this research provides a foundation for future development by integrating Internet of Things (IoT) devices for real-time vehicle monitoring and implementing predictive analytics to optimize maintenance schedules and operational decision-making.

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