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Logistics Departure Scheduling Information System Using The Fifo (First In, First Out) Method at CV. RAS

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Abstract

CV. RAS is a trucking transportation company that provides goods delivery services to various destinations. Currently, logistics scheduling is performed manually, leading to scheduling conflicts, recording errors, and delivery delays that reduce operational efficiency. This study aims to design and develop a web-based logistics scheduling information system implementing the First in First Out (FIFO) method to improve logistics management. The research adopted the Research and Development approach using the Waterfall software development model, consisting of requirements analysis, system design, implementation, testing, and maintenance. The FIFO method schedules deliveries according to the sequence of incoming shipment requests, ensuring fair and systematic processing. The developed web-based system simplifies scheduling, data management, and monitoring of logistics activities. System evaluation confirmed that all functional features operated as expected. The results demonstrate that the proposed system effectively minimizes scheduling conflicts, improves data accuracy, enhances operational efficiency, and supports better decision-making for logistics scheduling at CV. RAS.

Keywords: *Information System; Logistics Scheduling; FIFO; Web-Based System.*

Abstrak

CV. RAS adalah perusahaan angkutan truk yang menyediakan layanan pengiriman barang ke berbagai tujuan. Saat ini, penjadwalan logistik dilakukan secara manual, yang mengakibatkan konflik penjadwalan, kesalahan pencatatan, dan keterlambatan pengiriman yang menurunkan efisiensi operasional. Penelitian ini bertujuan untuk merancang dan mengembangkan sistem informasi penjadwalan logistik berbasis web yang menerapkan metode First in First Out (FIFO) guna meningkatkan manajemen logistik. Penelitian ini mengadopsi pendekatan dengan model pengembangan perangkat lunak Waterfall, yang terdiri dari analisis kebutuhan, perancangan sistem, implementasi, pengujian, dan pemeliharaan. Metode FIFO menjadwalkan pengiriman sesuai urutan permintaan pengiriman yang masuk, sehingga memastikan pemrosesan yang adil dan sistematis. Sistem berbasis web yang dikembangkan ini menyederhanakan penjadwalan, pengelolaan data, dan pemantauan aktivitas logistik. Evaluasi sistem memastikan bahwa semua fitur fungsional beroperasi sesuai harapan. Hasil penelitian menunjukkan bahwa sistem yang diusulkan secara efektif meminimalkan konflik penjadwalan, meningkatkan akurasi data, meningkatkan efisiensi operasional, dan mendukung pengambilan keputusan yang lebih baik dalam penjadwalan logistik di CV. RAS.

***Kata-kata kunci**:*

1. Introduction

The development of information technology in today's digital age has had a significant impact on various aspects of human life, including the business and industrial sectors **[1].** The use of information technology is no longer limited to data storage alone but has evolved into a primary tool for helping companies manage resources, streamline operational processes, and improve efficiency and accuracy in decision-making. One of the most widely used forms of information technology in the industrial sector is web-based information systems, which enable operational activities to be carried out in an integrated, fast, and accessible manner anytime and anywhere **[2].**

CV. RAS is a company engaged in the trucking industry that provides freight transportation services to various regions. In carrying out its activities, the company operates a fleet of trucks with a fairly tight delivery schedule, encompassing the process of receiving shipment requests from customers, determining departure schedules, planning routes, and managing driver and vehicle data. All of these activities require an effective scheduling system to ensure that deliveries are made on time and according to priority. However, the logistics scheduling process at CV. RAS is still carried out manually through entries in ledgers or simple worksheets **[3].**

These conditions often lead to various problems, such as overlapping delivery schedules among trucks, errors in recording departure and arrival times, and inefficiency in managing the queue of trucks ready to depart. Furthermore, delays in goods delivery due to irregular schedules can also reduce customer satisfaction. Therefore, a logistics scheduling information system is needed to help companies manage and monitor truck departure schedules automatically, systematically, and in a structured manner.

To address these issues, this study applies the FIFO (First In – First Out) method as an approach to the logistics scheduling process. The FIFO method is a principle stating that the entity first to enter the queue will be the first to be served or processed **[4].** In the context of logistics and transportation, this method can be applied to determine the order of truck departures based on the time of the request or the time the shipment data is entered. Thus, the truck that first receives an order or records a shipment request will be scheduled to depart first **[5].**

The application of the FIFO method is closely related to the challenges faced by CV. RAS. Through this approach, the company can avoid scheduling irregularities and ensure that the delivery process is carried out fairly and systematically according to the order of requests. In addition, the FIFO method can help optimize the use of the truck fleet, reduce driver wait times, and improve the overall effectiveness of logistics management. In a web-based information system, this method can be implemented through an algorithm that sorts data based on the time of first entry, allowing the system to automatically manage the scheduling and delivery processes **[6]**.

Several previous studies have also demonstrated the effectiveness of the FIFO method in logistics and distribution management systems. [7] in their study titled "Application of the FIFO Method in a Web-Based Logistics Management Information System," found that the FIFO method can improve distribution consistency and reduce delivery wait times. Research by Anggoro [8] titled "Implementation of the FIFO Method for Transportation Fleet Scheduling Systems" shows that FIFO-based systems help companies optimize departure schedules and avoid schedule conflicts between vehicles. Furthermore, Camdra Pamungkas [9] in their study "Logistics Scheduling Information System Using the FIFO Method," demonstrated that this method can reduce scheduling errors by up to 40% and accelerate the operational decision-making process.

Although various previous studies have demonstrated the effectiveness of the FIFO method in web-based logistics and scheduling systems—such as in warehouse management, retail distribution, and fleet queuing—most of these studies still focus on the general context of distribution or inventory and have not specifically examined the application of FIFO to truck fleet departure scheduling with the operational characteristics of a specific company. Furthermore, previous studies have primarily addressed aspects of improving efficiency and reducing delays, without directly linking them to issues such as schedule overlaps, recording errors, and departure queues that occur in manual systems, as experienced by CV. RAS. Therefore, there remains a research gap in the development of a web-based logistics scheduling information system that contextually integrates the FIFO method to manage the sequence of requests and fleet departures according to the company's operational conditions; thus, this study is necessary to provide a solution that is more practical, measurable, and tailored to field requirements.

Based on the above discussion, it can be concluded that there are still limitations in the development of web-based logistics scheduling information systems. Although various previous studies have discussed the application of the FIFO method in logistics and distribution systems, most of these studies still focus on inventory management, warehousing, or general goods distribution, and have not thoroughly examined the application of the FIFO method in scheduling truck fleet departures with dynamic operational characteristics and tight delivery schedules. Furthermore, previous studies have not specifically integrated the FIFO method into a scheduling information system designed to address issues such as schedule overlaps, errors in recording departure and arrival times, and fleet queue management—which is still performed manually. Therefore, this study focuses on the design and development of a web-based logistics scheduling information system that applies the FIFO method contextually in accordance with the operational needs of CV. RAS, with the expectation that it will provide a more structured, practical, and relevant solution to real-world problems.

2. Method

2.1 Research and Development (R&D)

Based on the above discussion, it can be concluded that there are still limitations in the development of web-based logistics scheduling information systems. Although various previous studies have discussed the application of the FIFO method in logistics and distribution systems, most of these studies still focus on inventory management, warehousing, or general goods distribution, and have not thoroughly examined the application of the FIFO method in scheduling truck fleet departures with dynamic operational characteristics and tight delivery schedules. Furthermore, previous studies have not specifically integrated the FIFO method into a scheduling information system designed to address issues such as schedule overlaps, errors in recording departure and arrival times, and fleet queue management—which is still performed manually. Therefore, this study focuses on the design and development of a web-based logistics scheduling information system that applies the FIFO method contextually in accordance with the operational needs of CV. RAS, with the expectation that it will provide a more structured, practical, and relevant solution to real-world problems.

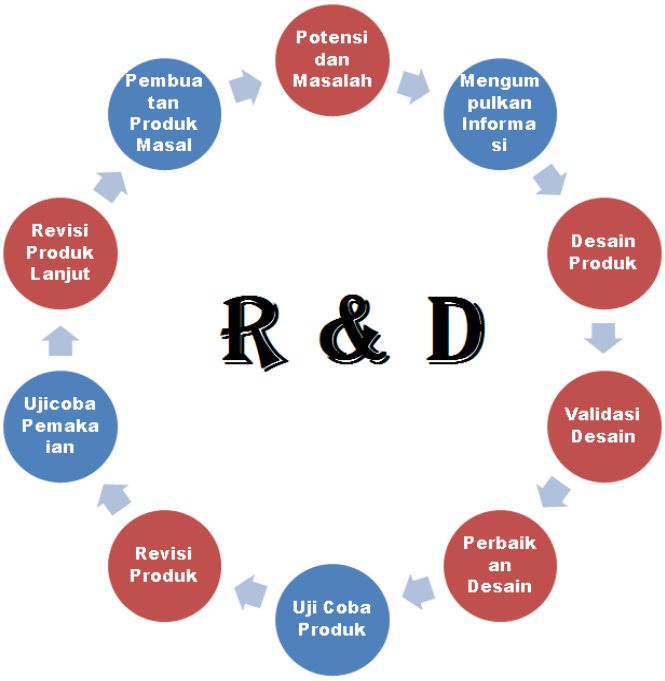

Figure 1. R&D Diagram

The stages of the R&D (Research and Development) research method are as follows:

a. Potential and Issues

This stage involves identifying the potential for utilizing information technology as well as

the problems occurring in the logistics scheduling process at CV. RAS, particularly regarding the management of truck departure queues, which is still done manually and thus has the potential to cause schedule overlaps and delivery delays.

b. Gathering Information

In this stage, the researcher conducted observations, interviews, and a literature review to gather information regarding the current scheduling workflow, fleet data, driver data, shipment request data, and user requirements as the basis for system development.

c. Product Design

The product design phase involved designing a web-based logistics scheduling information system that implements the FIFO method, including the design of system workflows, databases, and user interfaces using UML modeling.

d. Design Validation

The system design was then validated through discussions with relevant parties, such as the academic advisor and company representatives, to ensure that the system design met the operational needs of CV. RAS.

e. Design Refinement

This phase involved refining the system design based on the validation results—including process workflows, database structure, and user interface—to better align the system with user needs.

f. Product Testing

The finished product will be tested once production is complete.

g. Product Revision

Following the initial testing, changes are made to the product due to incomplete test data.

h. Field Testing

After product testing and revisions, the product is tested again. Testing is conducted in a real-world environment to evaluate the product's shortcomings.

i. Further Product Revisions

Issues related to underutilization or overutilization in the real-world environment are resolved, although product updates are required to activate the system.

j. Product Implementation

This stage marks the final implementation of the web-based logistics scheduling information

system that has been developed and revised. The system is implemented in the work environment of CV. RAS and used by the relevant users, namely administrators, the operations department, and management. At this stage, the system is used to assist in the data collection process for trucks, drivers, and delivery requests, as well as in scheduling fleet departures using the FIFO method, thereby providing tangible support for the company's operational activities.

The system development method the author used to develop the system is the waterfall method. This system development method is suitable for this research in the system development process because its development stages are sequential, starting from the analysis stage through to the system implementation stage. Each step is carried out one by one without skipping ahead to the next step or returning to a previous step. In this method, following the concept of a waterfall, each step is carried out without repeating any previous steps [10]. The steps of the Waterfall method are as follows:

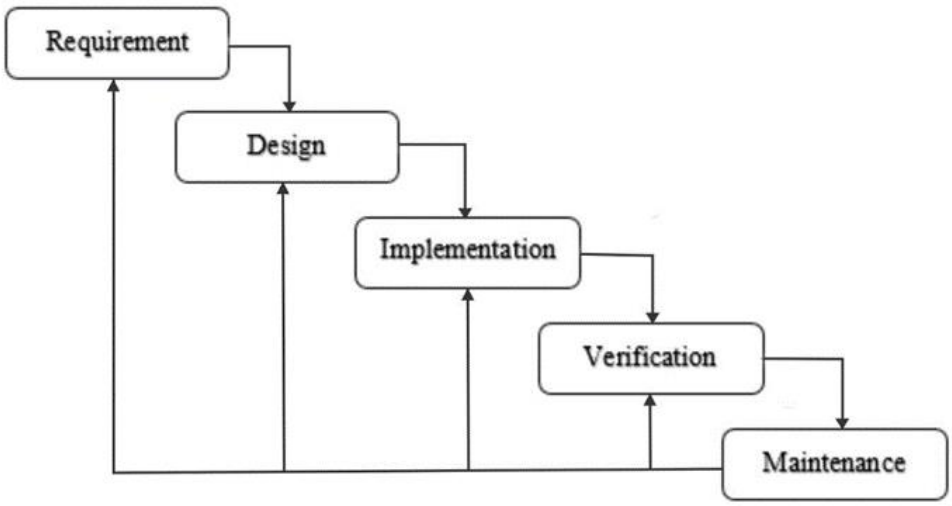

Figure 1. Kerangka Waterfall (Wahid Abdul, 2020)

The waterfall model consists of several phases that outline the steps involved in the process, from planning until the system is ready for use.

a. Requirements (Requirements Analysis)

   In this phase, system requirements are gathered through observation, interviews, and literature reviews. This activity aims to obtain data and information regarding the scheduling process for the truck fleet at CV. RAS, so that user requirements for the information system to be developed can be clearly identified.

b. Design (System Design)\

This stage involves the process of designing the system based on the analyzed requirements. The design is carried out using UML (Unified Modeling Language), which includes use case diagrams, class diagrams, sequence diagrams, and activity diagrams. Additionally, the design encompasses a web-based system interface designed to be user-friendly, enabling users to easily manage and view the fleet's departure schedules.

c. Implementation (System Implementation)

At this stage, the system design is implemented as a web-based application through a coding process using programming languages such as PHP and HTML, as well as MySQL as the database for storing fleet data, departure requests, and schedules.

d. Verification (System Testing)

The verification stage is conducted to ensure that the developed system operates in accordance with the established requirements and specifications. Testing is performed to identify and correct any errors or deficiencies in the system.

e. Maintenance (System Maintenance)

The maintenance phase is carried out after the system is put into use to ensure it continues to function properly. Additionally, this phase aims to make improvements and enhancements to the system if new needs or issues arise during its use.

3. Results and Discussion

3.1 Need Analisys

The requirements analysis phase was conducted to identify user needs and system requirements for the system to be developed at CV. RAS. Based on the results of observations and interviews, it was found that the logistics scheduling process is still carried out manually using records in notebooks or simple documents. This situation has led to several problems, such as overlapping delivery schedules, errors in recording fleet and driver data, difficulties in monitoring delivery status, and delays in preparing operational reports. Therefore, a web-based information system is needed that can integrate all logistics scheduling processes centrally and in real time.

The developed system has three main user types: administrators, operations staff, and management. Administrators are responsible for managing user data, driver data, and truck fleet

data. Operations staff are responsible for managing shipment request data, processing shipment queues, and scheduling fleet departures. Management monitors operational activities through dashboards and shipment reports. In addition to functional requirements, the system must also meet non-functional requirements such as ease of use, secure access via a login mechanism, and the ability to store data using an integrated database.

Based on these needs, the logistics scheduling information system is designed to manage fleet data, driver data, and shipment request data; process shipment queues using the FIFO method; create departure schedules; and generate reports automatically, thereby helping to improve the effectiveness and efficiency of the company's logistics processe

3.2 Implementation of the FIFO Algorithm

The FIFO (First In First Out) method is applied in the logistics scheduling information system to determine the order of fleet departures based on the time delivery requests are received. The basic principle of the FIFO method is that data entering the system first will be processed before data that enters later. The application of this method aims to create a scheduling process that is orderly, fair, and consistent with the sequence of shipment requests received by the company.

In the developed system, every shipping request entered by the operations department is stored in the database along with a timestamp. This data is then placed into a FIFO queue. The system checks the available queue. If the queue still contains data, the system retrieves the data at the front of the queue to process it into a delivery schedule. Once the schedule is successfully created, the data is removed from the queue, and the system proceeds to the next item until the entire queue has been processed.

The application of the FIFO method in this study reduces the likelihood of overlapping fleet departure schedules because all delivery requests are processed based on the order in which the data was received. Additionally, this method helps the company improve the efficiency of fleet and driver management because the scheduling process is automated and does not require manual sorting by operational staff.

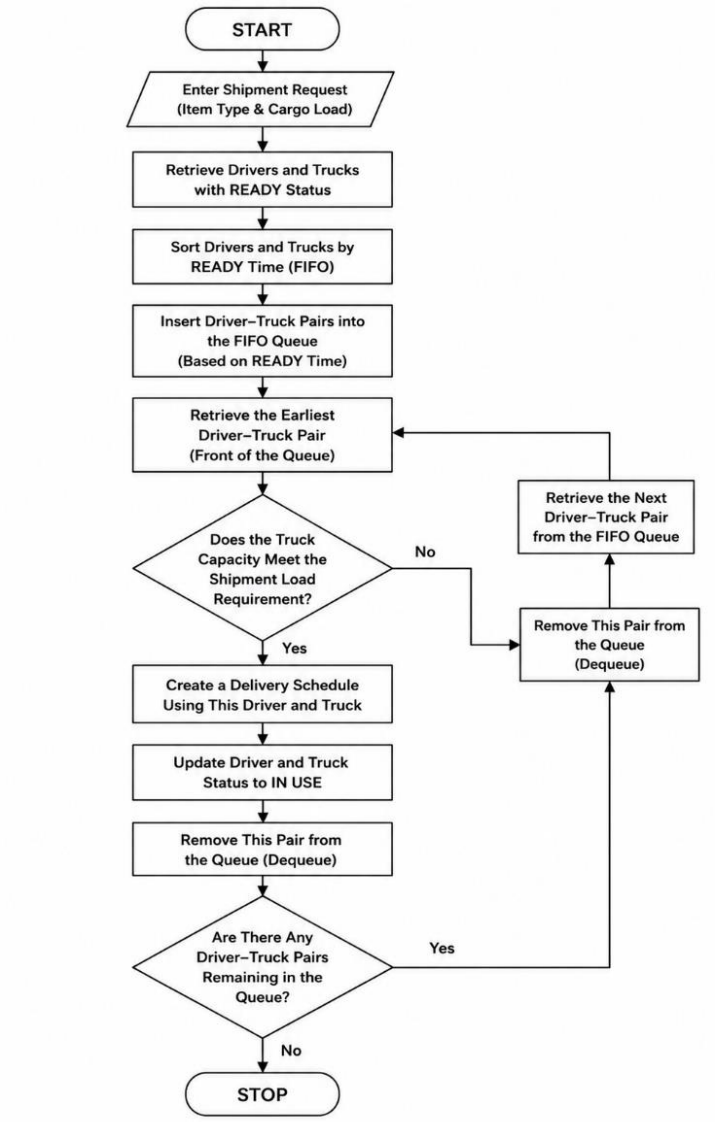

Figure 3. Flowchart of the Implementation of the FIFO Method in Logistics Delivery Scheduling

Figure 3 illustrates the flow of the First In First Out (FIFO) method in the logistics delivery scheduling process. The process begins with the input of delivery request data containing information on the type of goods and the cargo to be shipped. The system then retrieves data on drivers and trucks that are marked as "ready" and sorts them based on the earliest readiness time using the FIFO method. The driver-truck pair at the top of the queue is selected to verify whether the truck's capacity matches the requested cargo. If the truck's capacity is insufficient, that pair is removed from the queue, and the system checks the next pair in FIFO order. If the truck's capacity is sufficient, the system will create a delivery schedule, update the driver's and truck's status to "in use," and remove the pair from the queue. This process is repeated until all driver-truck pairs in the queue have been processed or there are no more available resources. With this

mechanism, fleet selection is conducted systematically based on readiness time and the vehicle's capacity matching delivery requirements.

3.3 Use Case Diagram

A Use Case Diagram is used to illustrate the relationships between actors and the functions available in the Logistics Scheduling Information System. This diagram shows the access rights and activities that each user can perform according to their role in the system.

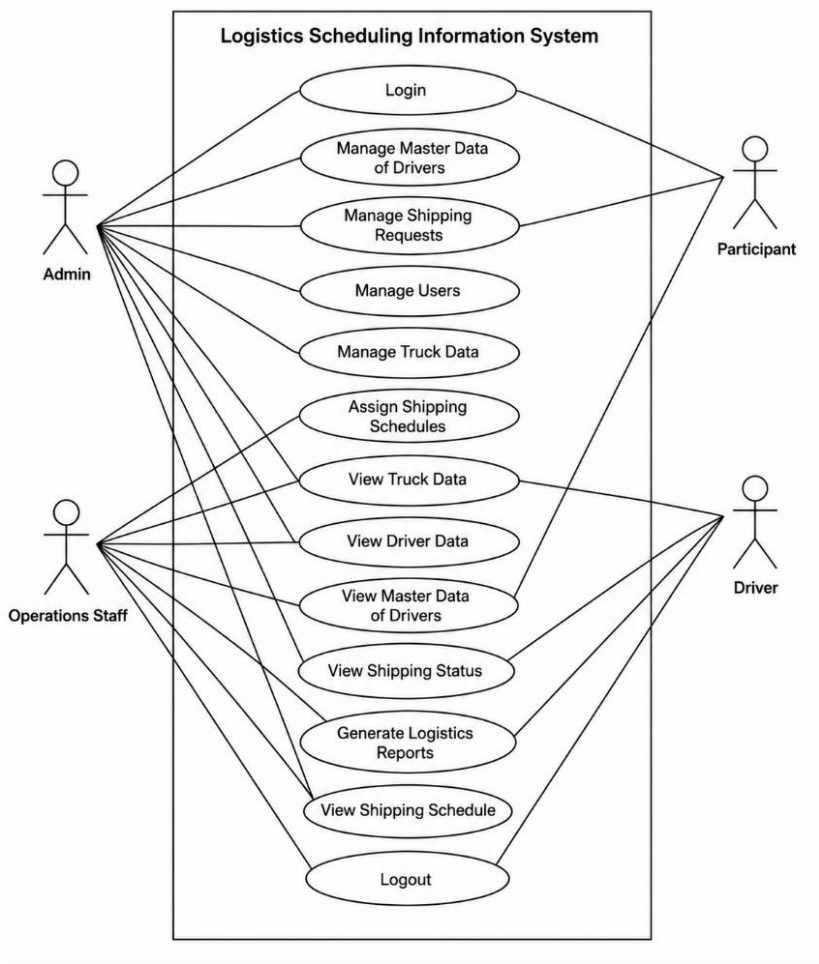

Figure 4. Use Case Diagram

Figure 4 shows the Use Case Diagram for the Logistics Scheduling Information System, which involves four actors: Admin, Operations, Management, and Driver. The Admin is responsible for managing driver data, truck data, and user data, as well as creating delivery schedules. The Operations team manages delivery requests and views data that supports the scheduling process. Management can monitor delivery schedules and logistics activity reports, while Drivers are responsible for viewing delivery schedules and updating delivery statuses. All actors have the ability to log in and log out in accordance with their respective access rights within the system.

3.4 System Implementation

System implementation is the stage of applying the design results into a web-based application that users can access according to their respective access rights. The logistics scheduling information system consists of several main pages that support the management of fleet data, driver data, delivery requests, scheduling using the FIFO method, and the generation of logistics reports.

1. Login Page

The login page is used to authenticate users before they access the features available in the system.

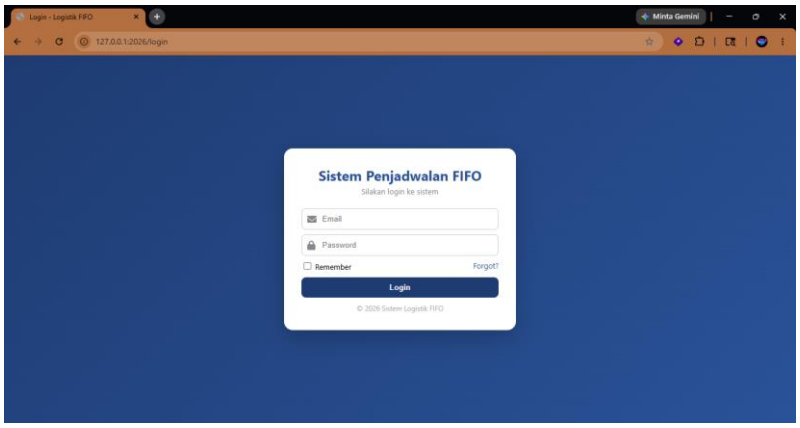

Figure 5. Login Page

As shown in Figure 5, users are required to enter a username and password that have been registered in the system. The login process aims to maintain data security and restrict user access according to their assigned access rights.

2. Driver Data Page

The driver data page is used to manage the data of drivers registered with the company.

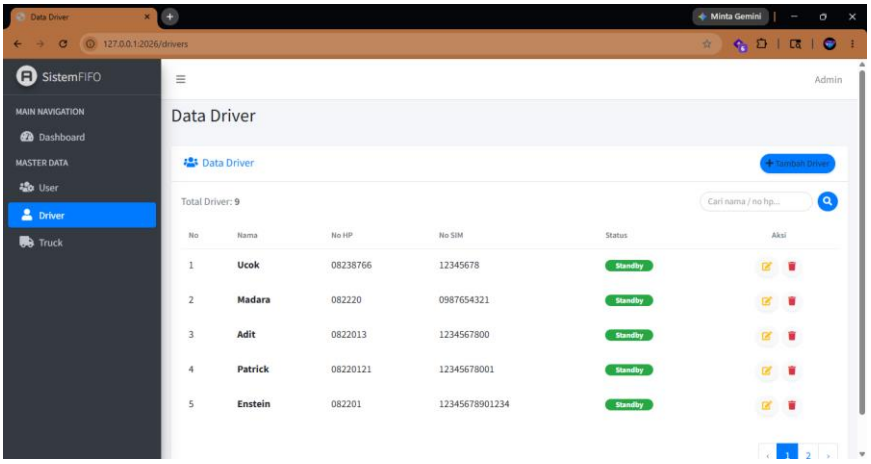

Figure 6. Driver Data Page

As shown in Figure 6, the system provides features for managing driver data, including the storage of identification and other supporting information required for the goods delivery process.

4. Truck Data Page

The Truck Data page is used to manage information about the vehicle fleet used in the goods distribution process.

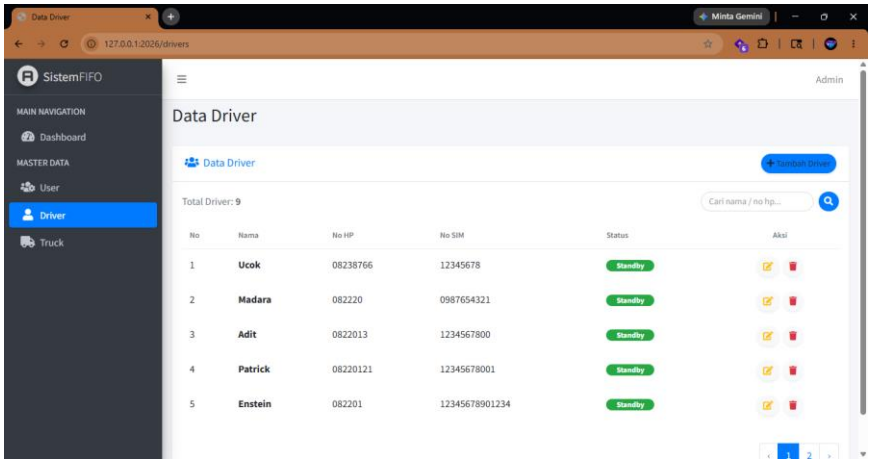

Figure 7. Truck Data Page

As shown in **Figure 7**, administrators can manage truck fleet data—including adding, modifying, and deleting vehicle records—to facilitate monitoring of the available fleet.

4. Shipping Request Page

The shipment request page is used to record shipment data entered into the system.

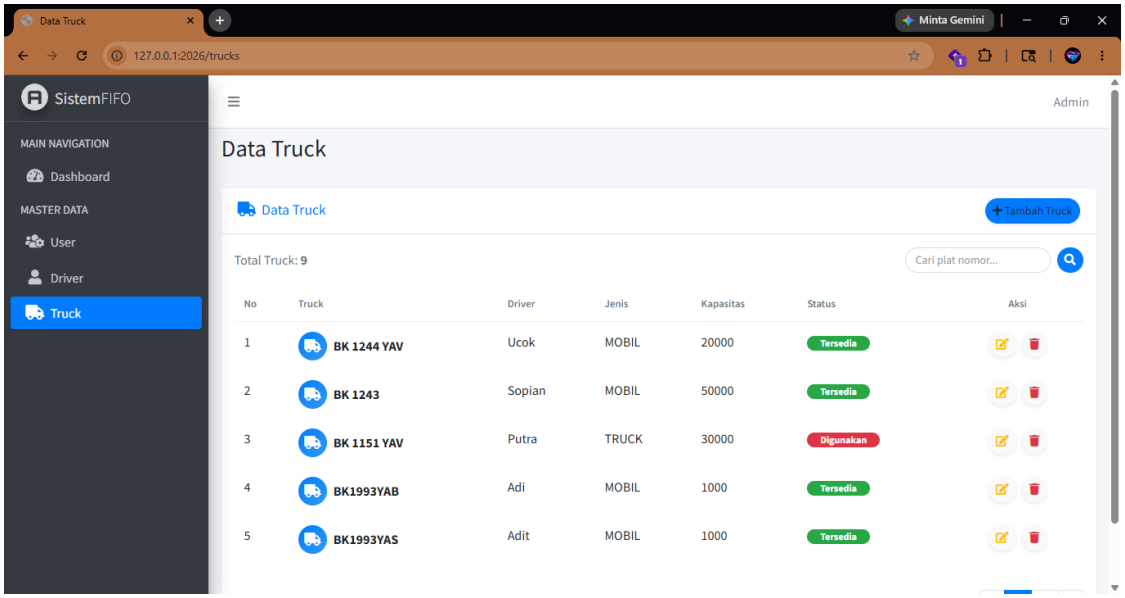

Figure 8. Shipment Request Page

As shown in **Figure 8,** the shipment request data entered will serve as the basis for queue formation and shipment scheduling using the FIFO method.

5. Driver FIFO Queue Page

The driver FIFO queue page is the primary implementation of the FIFO method in the system. As shown in **Figure 9**, the system automatically sorts delivery data based on the time the request was received, so that deliveries received first will be processed first in accordance with the FIFO (First In First Out) principle.

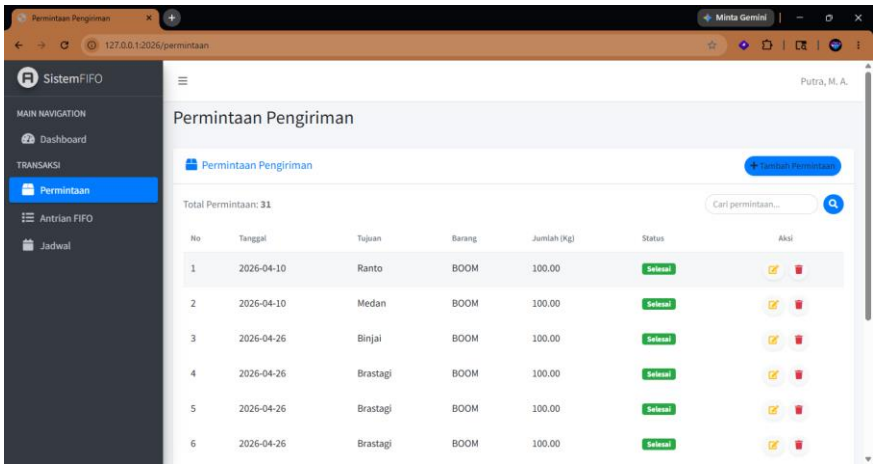

Figure 9. FIFO Delivery Schedule Page

As shown in **Figure 9**, the delivery schedule is automatically generated based on the FIFO queue order, making the distribution process more organized and reducing the likelihood of delivery schedule conflicts.

6. FIFO Delivery Schedule Page

The FIFO delivery schedule page is used to display the fleet scheduling results based on the established queue order.

7. Shipping Report Page

The shipping report page is used to present a summary of completed shipping activities.

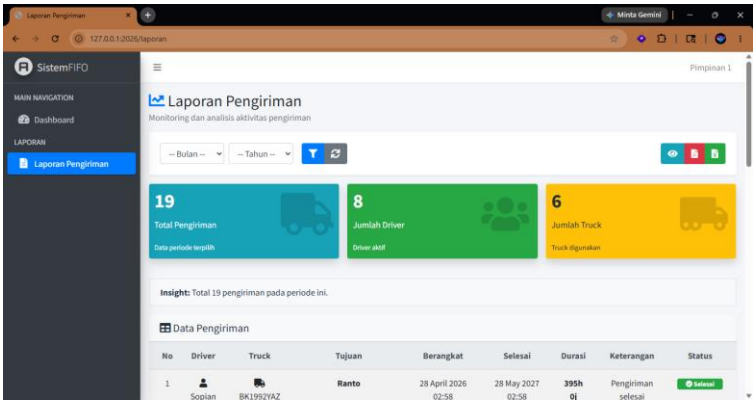

Figure 10. Shipping Report Page

In **Figure 10** above, the system provides a shipping report that can be used to evaluate and document the company's logistics activities.

3.5 System Testing

System testing was conducted using the Black Box Testing method to ensure that all functions within the Logistics Scheduling Information System operate in accordance with user requirements. Testing was conducted by evaluating each feature based on expected inputs and outputs without directly examining the program's structure. The test results were used to determine whether the system's functions were operating properly and in line with the system's development objectives **[11].**

Table 1. Black Box Testing Results

No	Fitur yang Diuji	Skenario Pengujian	Status
1	Login	Memasukkan username dan password yang valid	Berhasil
2	Login	Memasukkan username atau password yang salah	Berhasil
3	Data User	Menambah data pengguna baru	Berhasil
4	Data User	Mengubah data pengguna	Berhasil
5	Data User	Menghapus data pengguna	Berhasil
6	Data Driver	Menambah data driver	Berhasil
7	Data Driver	Mengubah data driver	Berhasil
8	Data Truck	Menambah data armada truk	Berhasil
9	Data Truck	Mengubah data armada truk	Berhasil
10	Permintaan Pengiriman	Menambahkan data permintaan pengiriman	Berhasil
11	Antrian FIFO	Memproses data pengiriman berdasarkan waktu masuk	Berhasil
12	Jadwal Pengiriman FIFO	Membentuk jadwal pengiriman	Berhasil
13	Status Pengiriman	Memperbarui status pengiriman	Berhasil
14	Laporan Pengiriman	Menampilkan laporan pengiriman	Berhasil
15	Logout	Menekan tombol logout	Berhasil

Based on the results of the black-box testing in Table 1, all features of the Logistics Scheduling Information System functioned as designed. The entire process—from managing user data, driver data, and fleet data, to handling delivery requests, scheduling using the FIFO method, and generating reports—can be executed without any functional errors. Thus, the developed system has met user needs and is ready for use to support logistics operations at CV. RAS.

5. Conclusion

Based on the results of the research conducted, it can be concluded that a web-based Logistics Scheduling Information System using the FIFO (First In First Out) method was successfully designed and implemented at CV. RAS to help manage the shipping scheduling process more effectively and in a more structured manner. The application of the FIFO method is able to sort delivery requests based on the time they were received, thereby making the fleet scheduling process more organized, reducing the risk of schedule overlaps, and simplifying the management of delivery data. Test results using the Black Box Testing method indicate that all system features function in accordance with user needs. For future development, the system could be enhanced with real-time vehicle location tracking, delivery schedule notifications, and integration with GPS technology to optimize fleet monitoring and logistics decision-making.

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