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Web-Based Motorcycle Spare Part Stock Management Information System at Geleng Classic Shop

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Abstract: Advances in information technology have encouraged businesses to adopt more effective inventory management systems. Geleng Classic Store still managed motorcycle spare part inventory manually using record books, resulting in recording errors, delays in updating information, inconsistencies between physical and recorded stock, and difficulties in monitoring inventory. These problems affected the efficiency of stock management and the availability of spare parts. This research aimed to design and develop a web-based inventory information system to support spare part stock management at a small and medium-sized enterprise. The system was developed using the waterfall model within the System Development Life Cycle (SDLC), consisting of requirements analysis, system design, implementation, testing, and maintenance. The system was developed using the Laravel framework, PHP programming language, and MySQL database, with the First In, First Out (FIFO) method applied to inventory management. The developed system provides computerized recording of incoming and outgoing goods, real-time stock monitoring, minimum stock notifications, and role-based access according to user requirements. PIECES analysis indicated improvements in the management of performance, information, economics, control, efficiency, and service compared with the previous manual system. Black-box testing of ten main system features showed that all tested functions produced the expected results. The implementation of FIFO prioritizes older stock for release, supporting more orderly stock rotation and reducing the possibility of older items remaining in storage for extended periods. The developed system therefore provides a practical tool for supporting motorcycle spare part inventory management at Geleng Classic Store.

Keywords: Information System; Inventory Management; Motorcycle Spare Parts; FIFO; Waterfall.

1. Introduction

Information technology has become an important part of inventory management in businesses that handle multiple products and stock transactions. In motorcycle spare part businesses, accurate stock information is needed to record incoming and outgoing goods, monitor available inventory, and support procurement decisions, since manual inventory recording can make these activities more difficult when stock information must be recorded and checked repeatedly. Previous research has reported that web-based inventory information systems can support more accurate stock recording, reduce the time required to manage inventory information, and provide more structured data for business operations (Ramdhani, 2024; Triana *et al.*, 2024). Toko Geleng Classic, a business that sells classic motorcycle spare parts and has been operating since 2019, illustrates these difficulties directly: the store currently manages its stock using manual record books, a process that creates difficulties in tracing stock records, inconsistencies between physical stock and recorded data, and the possibility of data loss due to unstructured recording. Stock checking also requires employees to inspect the warehouse directly, which takes time and can affect daily operational activities, and these problems become more critical when the store needs to determine the availability of particular spare parts or identify items that need to be reordered.

Poor inventory management can affect product availability through both stock shortages and excess stock, so the management of incoming, stored, and outgoing goods requires accurate and accessible information (Asyadana & Nudin, 2024). Errors in stock records can also make it difficult to determine procurement priorities and monitor stock movements, and previous research has shown that the use of web-based information systems can provide more structured inventory records and support more accurate warehouse management compared with manual recording (Susanto & Purnomo, 2023), indicating that computerized inventory management can be applied to address problems associated with manual stock recording. One inventory management method that can be applied to control the sequence of stock release is First In, First Out (FIFO), which prioritizes items that entered the inventory earlier for release before items that entered later (Mutaqin & Sulianta, 2023). This method can support more orderly stock rotation because older inventory is given priority when goods are released, and in the context of spare part inventory, the application of FIFO can help the store manage the order in which available stock is issued; however, the implementation of an inventory system also needs to consider other operational requirements, such as real-time stock monitoring and notifications when stock reaches a predefined minimum level.

Several previous studies have developed web-based inventory systems using different development methods and inventory management approaches. Farhan and Ghani (2025), for example, developed a web-based inventory system using the waterfall model to record incoming and outgoing transactions, monitor stock, and generate reports, while Antika *et al*. (2025) used the same model to develop a system for managing goods data, stock monitoring, purchases, sales, and reporting. Other studies have applied FIFO to inventory systems, including the system developed by Sekti *et al*. (2024) and the stock management system developed by Sadiah *et al*. (2024). Effenti *et al*. (2025) developed a web-based motorcycle spare part stock management system using the Activity Based Costing method, while Sulistyowati *et al*. (2025) developed a motorcycle spare part stock management system based on FIFO. These studies show that web-based systems and inventory management methods have been applied to different business and organizational settings, with some focusing primarily on recording transactions and monitoring stock, and others applying particular inventory methods or addressing larger organizational settings.

Although previous studies have addressed web-based inventory management and FIFO-based stock control, differences remain in the combination of features and operational requirements applied to each system. The system developed in this research addresses the operational requirements of Toko Geleng Classic by combining FIFO-based stock management with real-time stock monitoring and minimum stock notifications, not to claim that FIFO has not been used in previous motorcycle spare part inventory systems, but to combine these functions according to the stock management needs identified at the research site. Based on these problems and the findings from previous studies, this research develops a web-based stock management information system for Toko Geleng Classic using the FIFO method, supporting the recording of incoming and outgoing goods, real-time stock monitoring, and minimum stock notifications. The system is developed using the waterfall model within the System Development Life Cycle (SDLC), implemented with Laravel, PHP, and MySQL, and evaluated through PIECES analysis and black-box testing to examine the differences between the previous manual process and the developed system and to verify whether the implemented functions operate according to the specified requirements.

2. Related Work

Previous studies have developed web-based inventory information systems using different methods and technological approaches to support stock recording, monitoring, and reporting. Istini (2025), for instance, developed a website-based inventory information system for a grocery store using the waterfall method and the CodeIgniter framework, designed to support stock recording and reduce errors in data entry. Sekti *et al*. (2024) took a different approach by applying the First In, First Out (FIFO) method in a web-based stock information system for Toko Suncare to manage incoming and outgoing goods, and Sadiah *et al*. (2024) applied the same method in a stock management system at Toko Plastik BIMIU to support stock rotation and warehouse management. These studies indicate that web-based systems and FIFO can be applied to improve the organization of inventory records and the management of stock movements.

Other studies have focused on real-time monitoring and inventory management in different organizational settings. Wiguna and Putra (2025) developed a web-based stock information system for the HSSE warehouse of PT Kilang Pertamina Internasional using the Rapid Application Development (RAD) method, supporting digital stock recording and real-time inventory information, while Effenti *et al*. (2025) developed a web-based motorcycle spare part stock management information system using the Activity Based Costing (ABC) method, with a focus on improving stock recording and providing real-time stock information. Pratama and Sulaksono (2025) similarly developed a web-based inventory system for PT Armada Tunasjaya to support stock management across company branches and provide real-time reporting. These studies demonstrate that real-time inventory information can support stock monitoring in organizations with different operational requirements.

Research has also addressed spare part inventory management using different development approaches. Gafar and Nurfaizal (2026) developed a website-based spare part inventory information system using the Extreme Programming (XP) method to support inventory recording and reporting, while Adam *et al*. (2025) developed a website-based stock information system to support the recording and reporting of incoming and outgoing goods. Sulistyowati *et al*. (2025) developed a motorcycle spare part stock management system based on the FIFO method, and this study is particularly relevant because it demonstrates that FIFO has already been applied to motorcycle spare part inventory management. The research gap addressed in the present study therefore lies not in the use of FIFO for spare parts, but in combining FIFO-based stock management with real-time stock monitoring and minimum stock threshold notifications within a system designed for the operational needs of a small motorcycle spare part business. Taken together, the studies reviewed above show that web-based inventory systems have been applied to support stock recording, monitoring, reporting, and inventory control, and that FIFO has been used to manage stock rotation in several retail and spare part settings, although the combination of these functions varies across studies. The present research develops a web-based inventory information system for Toko Geleng Classic by combining the FIFO method with real-time stock monitoring and minimum stock notifications, intended to provide structured information on incoming and outgoing goods, support monitoring of available stock, and provide notifications when stock reaches the defined minimum level, in accordance with the inventory management requirements identified at Toko Geleng Classic.

3. Methodology

3.1 Research Stages

This research used a descriptive approach to identify the existing stock management process and the requirements for developing a web-based inventory information system at Toko Geleng Classic. Data were collected through a literature study, direct observation, and interviews. Literature Study. A literature study was conducted by reviewing scientific articles and other relevant academic sources related to web-based inventory information systems, motorcycle spare part stock management, the First In, First Out (FIFO) method, and system development methods. The literature was used as a theoretical basis for determining the inventory management approach and the system development process. Observation. Direct observation was conducted at Toko Geleng Classic to examine and document the existing stock management process. The observed data consisted of 30 types of goods, 30 incoming stock transactions, and 10 outgoing stock transactions recorded up to May 2026. The observation focused on the recording of incoming and outgoing goods, stock checking, stock information management, and the problems encountered in the existing manual process. Interview. Interviews were conducted directly with the store owner to obtain information about the existing stock management workflow, problems associated with manual recording, and the functional requirements of the proposed system. The interview results were used to identify the system requirements and determine the features needed to support the store's inventory management activities.

3.2 Stock Management Method

The stock management method applied in this research is the First In, First Out (FIFO) method. FIFO is an inventory management method in which items that enter the inventory first are prioritized for release or sale first. The method supports orderly stock rotation by ensuring that older inventory is released before more recently received inventory (Mutaqin & Sulianta, 2023). The selection of an inventory management method should consider the characteristics and operational requirements of the business (Hudin & Riyanto, 2024). In this research, FIFO is applied to manage the sequence of outgoing spare parts based on the order in which the items enter the inventory. The method is intended to support more orderly stock rotation and reduce the possibility of older items remaining in storage for an extended period. The system also provides minimum stock notifications to support inventory monitoring and procurement decisions.

3.3 System Development Method

This research applies the Waterfall model as the system development model within the System Development Life Cycle (SDLC). SDLC consists of a series of stages used to analyze, design, develop, test, and maintain an information system (Chumaeroh & Dari, 2023). The Waterfall model follows a sequential development process in which each stage is completed before the next stage begins (Pryatama & Rukhviyanti, 2025).

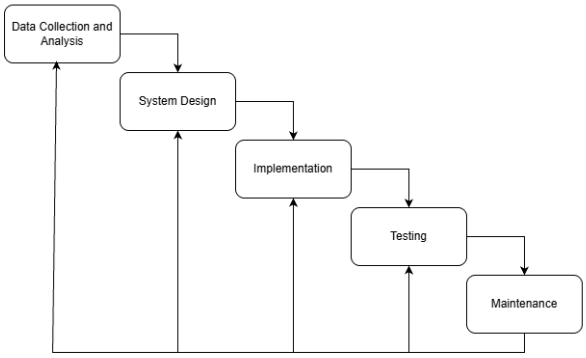

Figure 1. Waterfall Model

The stages of the Waterfall model applied in this research are described as follows.

1) Data Collection and Analysis
The initial stage involved collecting and analyzing information about the existing inventory management process. PIECES analysis was used to identify problems and system requirements based on six aspects: performance, information, economics, control, efficiency, and service (Fikri *et al.*, 2025). The analysis was supported by direct observation and interviews with the store owner. The results were used as a basis for identifying problems in the existing manual process and determining the functional requirements of the proposed system.
2) System Design
The system design stage involved designing the system processes, database structure, and user interface. Unified Modeling Language (UML) was used to describe the system workflow and interactions between users and system functions, while the Entity Relationship Diagram (ERD) was used to describe the relationships among database entities. The user interface was also designed based on the identified functional requirements.
3) Implementation
The implementation stage involved developing the system using the Laravel framework and PHP programming language. MySQL was used as the database management system to store inventory, transaction, report, and user data. Visual Studio Code was used as the development environment.
4) Testing
The developed system was tested using the black-box testing method to verify whether the implemented functions produced the expected outputs based on the specified inputs. The testing focused on the functional requirements of the system without examining the internal program code. The tested functions included user authentication, item management, incoming and outgoing stock transactions, stock monitoring, reporting, and other implemented inventory management functions. Feedback from the store owner was also considered to identify functional adjustments required before the system was finalized.
5) Maintenance
The maintenance stage was defined to address errors, operational problems, and other system issues that may occur after implementation. Maintenance activities include checking system functionality and

correcting identified errors to ensure that the system can continue to operate according to the required functions.

4. Result and Discussion

4.1 Results

4.1.1 PIECES Analysis

The PIECES analysis identified several weaknesses in the existing manual stock management process, particularly in performance, information accuracy, control, efficiency, and service. The comparison between the existing system and the developed system is presented in Table 1.

Table 1. PIECES Analysis

PIECES Aspect	Old System	New System
Performance	Stock recording was carried out manually in books, resulting in slower processing and delays in updating stock information.	Stock management is supported by item codes, real-time data updates, and a stock movement graph.
Information	Stock information could be inaccurate, the exact stock quantity was difficult to determine, and reports were prepared manually.	Stock information is stored in a database and can be accessed and displayed in real-time.
Economy	The use of paper and stationery generated recurring recording costs, while recording errors could potentially cause financial losses.	The system reduces the need for paper-based stock recording and may reduce stationery-related operational costs.
Control	There were no clear access restrictions or activity records, which increased the possibility of recording errors and unauthorized data changes.	The system provides role-based access for Admin, Supplier, and Owner, as well as activity logs to support stock control.
Efficiency	Searching for stock, supplier, and report data required considerable time because records had to be checked manually.	Stock information can be searched using predefined item codes, making data retrieval more convenient.
Service	Customer service could be affected by delays in obtaining accurate stock information.	Real-time stock information and minimum stock notifications support faster access to inventory information and stock monitoring.

4.1.2 System Design

The use case diagram describes the interaction between users and the developed stock management information system. It identifies the functions available to each actor according to their respective access rights. The system consists of three main actors: Admin, Supplier, and Owner.

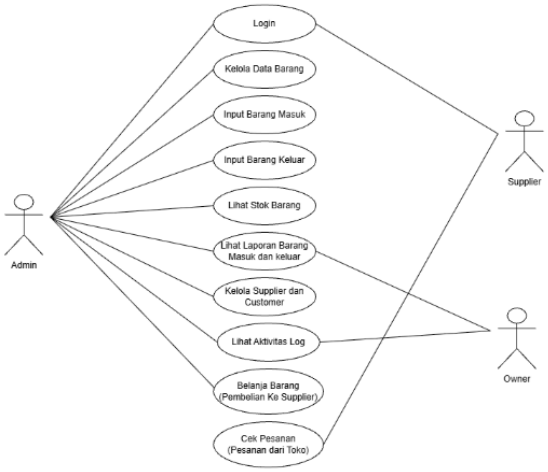

Figure 2. Use Case Diagram

Figure 2 illustrates the relationships between the three actors and the system. The Admin has the primary operational access, including managing product, supplier, customer, and user data, recording incoming and

outgoing goods, purchasing goods from suppliers, viewing stock information, and monitoring user activities. The Supplier can check orders submitted by the store, while the Owner can access reports and activity logs to monitor inventory conditions and system activities. The activity diagram describes the sequence of activities performed by the Admin and the system during inventory management.

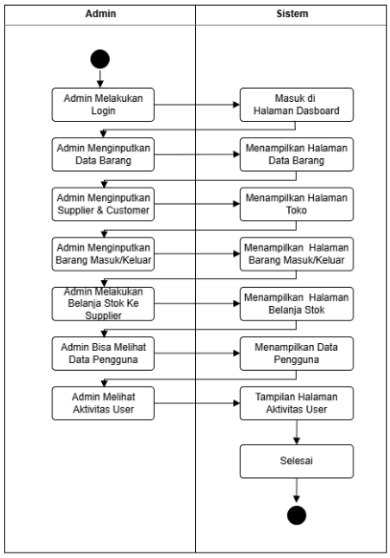

Figure 3. Activity Diagram

Figure 3 illustrates the workflow beginning with the Admin logging into the system and continuing with product, supplier, and customer data management, incoming and outgoing stock recording, stock purchasing from suppliers, user management, and activity monitoring. The process ends after the required inventory management activities have been completed. The Entity Relationship Diagram (ERD) describes the relationships among the data entities used in the stock management system. The ERD was used as a basis for organizing the database structure and defining the relationships among the required data.

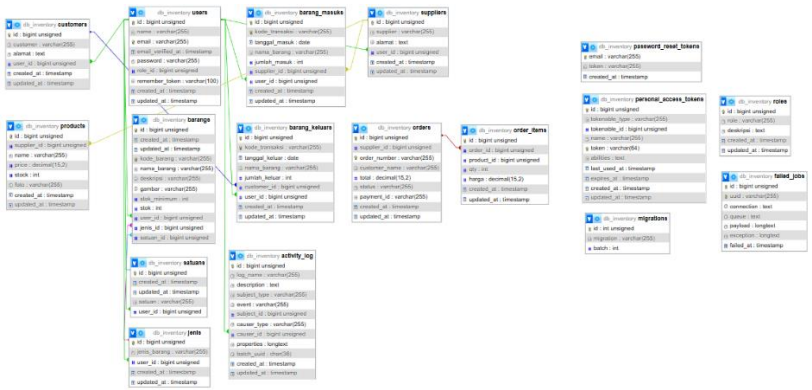

Figure 4. Entity Relationship Diagram

Figure 4 presents the database structure of the developed system. The database contains several related entities, including users, products, categories, suppliers, incoming goods transactions, outgoing goods transactions, and supporting report data. Each entity contains attributes and primary keys used to identify records and establish relationships among the database tables.

4.1.3 Implementation

The implementation stage resulted in several interfaces that support the main activities of the stock management system. The developed interfaces include user authentication, inventory monitoring, product and supplier management, customer management, stock transactions, stock purchasing, user management, and activity monitoring. The following figures present the main interfaces implemented in the system. The login and dashboard interfaces represent the initial interaction between users and the stock management system. The login interface controls access according to the user's role, while the dashboard provides an overview of the current inventory and system activities.

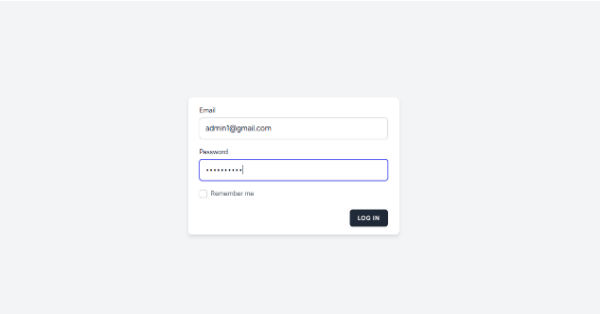

Figure 5. Login Interface

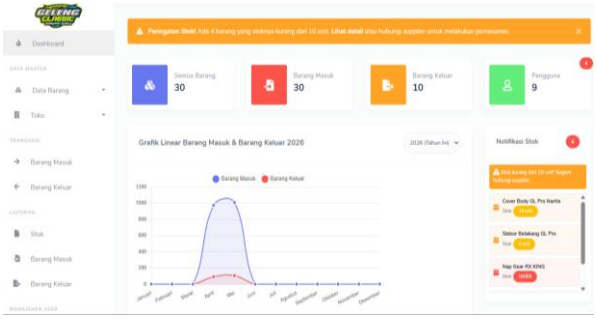

Figure 6. Dashboard Interface

Figure 5 presents the login interface used by Admin, Supplier, and Owner to access the stock management system. Users are required to enter a valid email address and password, while the functions available after login are determined by the assigned user role. Figure 6 presents the main dashboard of the system, which provides information on incoming and outgoing goods, stock conditions, stock movement graphs, stock notifications, and user information to support inventory monitoring. The product and supplier management interfaces support the administration of master data required for inventory operations. Product data are used to identify and monitor available spare parts, while supplier data are used to manage information related to product procurement.

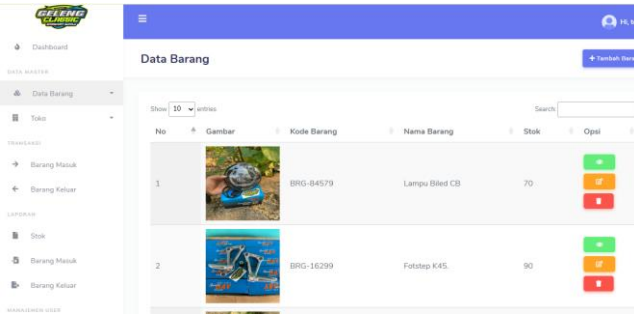

Figure 7. Product Data Management Interface

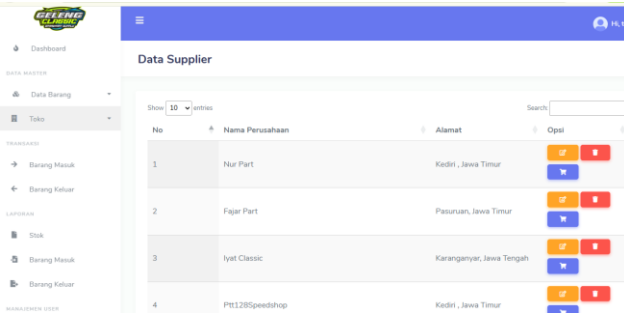

Figure 8. Supplier Management Interface

Figure 7 presents the product data management interface, which allows the Admin to add, edit, delete, and monitor product information and stock data. Figure 8 presents the supplier management interface, which allows the Admin to view, add, edit, and delete supplier information required for the inventory management process. The customer management and incoming goods interfaces support two important activities in the inventory management process. Customer data are required for recording information related to customers, while incoming goods data are used to record stock additions received by the store.

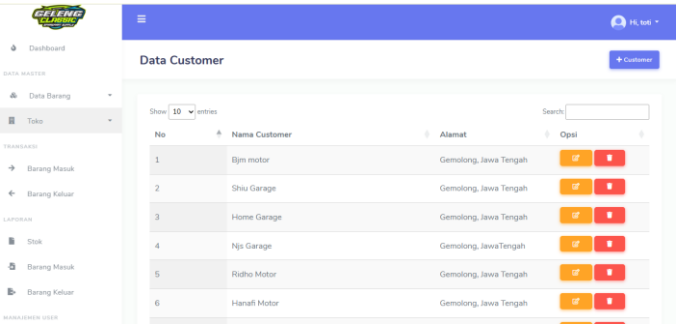

Figure 9. Customer Management Interface

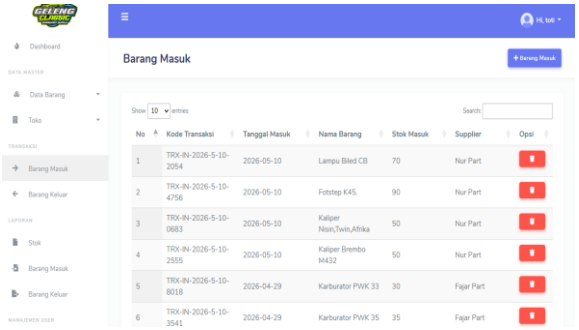

Figure 10. Incoming Goods Interface

Figure 9 presents the customer management interface used to store and manage customer information, including customer names and addresses. The interface provides functions for adding, editing, and deleting customer records. Figure 10 presents the incoming goods interface used to record goods entering the store. The recorded information includes transaction codes, entry dates, product names, quantities, and supplier information. These interfaces support the organization and monitoring of customer and incoming stock data. The outgoing goods and stock purchase interfaces support stock distribution and procurement activities. The outgoing goods interface is used to record products released from the store, while the stock purchase interface supports the process of selecting and ordering products from suppliers.

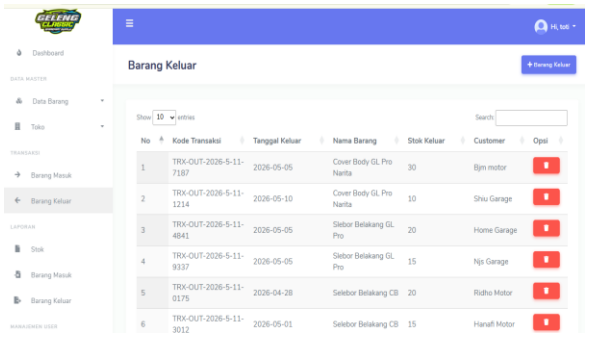

Figure 11. Outgoing Goods Interface

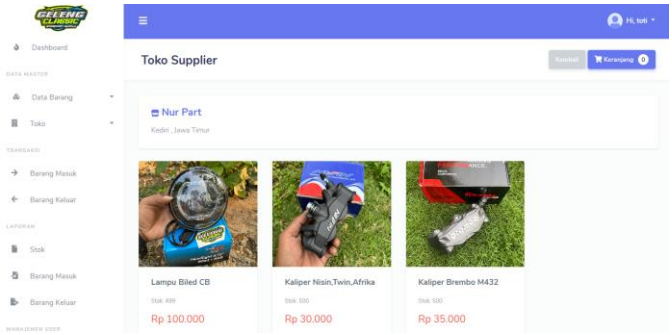

Figure 12. Stock Purchase from Supplier Interface

Figure 11 presents the outgoing goods interface used to record goods released from the store. The recorded information includes transaction codes, exit dates, product names, quantities, and customer information. Figure 12 presents the stock purchase interface used to view products offered by suppliers and place stock orders. The interface displays product information, including product names, images, and prices, to support the Admin in selecting and purchasing the required stock. The user data management and user activity interfaces support user administration and monitoring of activities performed within the system. User data management is used to control user accounts and their assigned roles, while the activity interface provides a record of actions performed by system users.

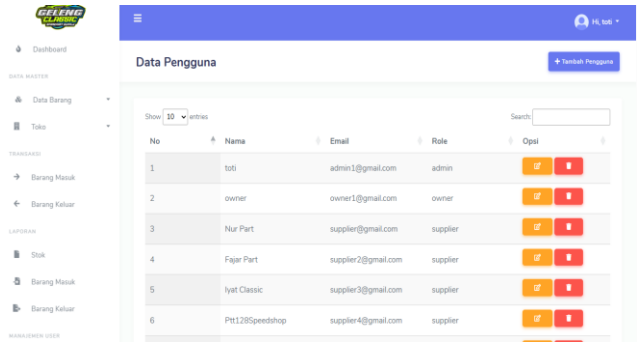

Figure 13. User Data Management Interface

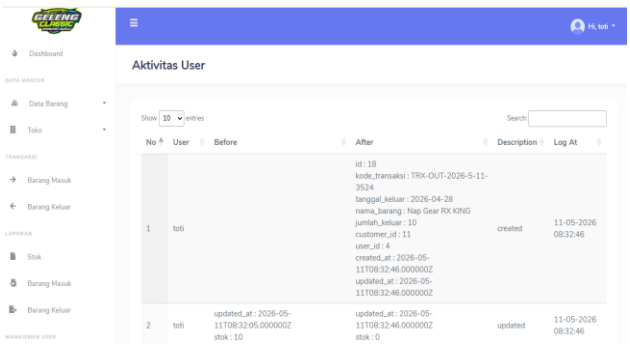

Figure 14. User Activity Interface

Figure 13 presents the user data management interface used by the Admin to manage system user information, including names, email addresses, and assigned roles. The available roles include Admin, Owner, and Supplier. Figure 14 presents the user activity interface, which records activities performed within the system. The interface provides information about the user who performed an activity, the type of activity, the affected data, and the time the activity was performed. These features support user administration and activity monitoring within the stock management system.

4.1.4 Testing

Black-box testing was conducted to verify whether the implemented system functions produced the expected outputs based on the specified input scenarios. The testing focused on the functional requirements of the system without examining the internal program code.

Table 2. Black-box Testing

No.	Feature Tested	Testing Scenario	Expected Result	Result
1	System Login	The user enters the correct email and password and clicks the login button.	The system verifies the account and directs the user to the dashboard according to the assigned role.	Successful
2	Dashboard	The Admin opens the main page after login.	The dashboard displays incoming goods, outgoing goods, stock information, stock graphs, notifications, and user information.	Successful
3	Product Data Management	The Admin adds, edits, and deletes motorcycle spare part data.	Product data are saved, updated, or deleted according to the selected action.	Successful

4	Supplier Management	The Admin views, adds, edits, and deletes supplier data.	Supplier data are saved and updated correctly.	Successful
5	Customer Management	The Admin adds and edits customer data.	Customer data are saved and can be managed through the system.	Successful
6	Incoming Goods	The Admin records incoming goods by selecting the product, quantity, date, and supplier.	The incoming transaction is recorded and the stock quantity is updated accordingly.	Successful
7	Outgoing Goods	The Admin records outgoing goods by selecting the product, quantity, date, and customer.	The outgoing transaction is recorded and the stock quantity is reduced according to the quantity released.	Successful
8	Stock Purchase from Supplier	The Admin selects products from the supplier catalog and places an order.	The order is recorded successfully by the system.	Successful
9	User Data Management	The Admin adds, edits, and deletes user accounts.	User data are saved and access rights correspond to the assigned role.	Successful
10	User Activity	The Admin or Owner opens the user activity history page.	The system displays the recorded user activities, including the user, activity, and time.	Successful

4.2 Discussion

The developed web-based motorcycle spare part stock management information system was designed to address the problems identified in the previous manual stock management process. The implementation of the First In, First Out (FIFO) method organizes the release of inventory according to the order in which goods enter the stock, supporting stock rotation by prioritizing older inventory before more recently received inventory. The PIECES analysis indicates differences between the previous manual process and the developed system across the six evaluated aspects: in terms of performance, the system provides item-based stock recording, real-time data updates, and stock movement information; in terms of information, inventory data are stored in a database and can be accessed through the system rather than being recorded only in physical books; from the economic aspect, the system reduces the dependence on paper-based recording, although the actual amount of cost savings was not quantitatively measured in this study; in terms of control, role-based access and activity logs provide mechanisms for managing user permissions and recording system activities; and the efficiency and service aspects are supported by item-based data retrieval, real-time stock information, and minimum stock notifications. These findings align with Sekti *et al*. (2024), who applied FIFO to a stock management system at Toko Suncare to support inventory control, and with Sulistyowati *et al*. (2025), who applied FIFO to a motorcycle spare part stock management system to address stock discrepancies associated with manual recording. The present system differs from these studies in combining FIFO-based stock management with real-time stock monitoring and minimum stock notifications, a combination intended to address the operational requirements identified at Toko Geleng Classic.

The black-box testing results showed that all ten tested functions produced the expected outputs under the specified test scenarios, covering login, dashboard access, product management, supplier management, customer management, incoming and outgoing goods recording, stock purchasing from suppliers, user management, and activity monitoring. The test data consisted of 30 types of goods, 30 incoming stock transactions, and 10 outgoing stock transactions. These results confirm that the implemented functions operated as specified, although they indicate functional success only for the tested scenarios and do not establish the absence of errors under all possible operating conditions.

From a practical perspective, the system provides a centralized mechanism for recording and accessing inventory information at Toko Geleng Classic, while real-time stock information and minimum stock notifications support inventory monitoring and provide information for procurement decisions; role-based access further distinguishes operational and monitoring functions among Admin, Supplier, and Owner roles. These benefits should nonetheless be interpreted within several boundaries: because the system was implemented and tested only at a single store with specific operational characteristics, the findings cannot be directly generalized to other motorcycle spare part businesses without further evaluation; the system also does not yet include advanced functions such as stock demand prediction or financial system integration; and the testing data were limited to the operational data available at Toko Geleng Classic. Taken together, the system offers a practical approach for managing motorcycle spare part inventory at Toko Geleng Classic by combining FIFO-based stock management, real-time stock monitoring, and minimum stock notifications, while broader

evaluation using larger datasets and more diverse transaction conditions is still needed to measure improvements in processing time, operational cost, stock accuracy, and service performance.

5. Conclusion and Recommendations

This research developed a web-based motorcycle spare part stock management information system for Toko Geleng Classic using the First In, First Out (FIFO) method, addressing problems in the previous manual stock management process, particularly difficulties in recording, retrieving, and monitoring inventory information. The developed system provides functions for managing product, supplier, customer, and user data, recording incoming and outgoing goods, purchasing stock from suppliers, monitoring stock movements, and providing minimum stock notifications. The FIFO method organizes stock release according to the order in which goods enter the inventory, supporting stock rotation by prioritizing older inventory before more recently received stock; however, this study did not quantitatively measure changes in stock age, product damage, or inventory turnover, so the effect of FIFO on inventory quality cannot be directly quantified.

The PIECES analysis indicated differences in performance, information, economy, control, efficiency, and service compared with the previous manual process, identified through a descriptive comparison between the old and new systems rather than through quantitative measurements of processing time, operational costs, or error rates; the results should therefore be interpreted as functional improvements rather than statistically measured improvements. Black-box testing conducted on ten main system functions, namely login, dashboard, product management, supplier management, customer management, incoming goods, outgoing goods, stock purchasing, user management, and activity monitoring, produced the expected outputs under the specified test scenarios, indicating that the implemented functions operated according to the defined functional requirements. The main contribution of this research lies in combining FIFO-based stock management with real-time stock monitoring and minimum stock notifications within a system designed according to the operational requirements identified at Toko Geleng Classic and implemented using the Laravel framework, PHP, and MySQL, providing a centralized system for recording and monitoring motorcycle spare part inventory.

These findings are subject to several limitations. The system was implemented and tested at only one store with specific operational characteristics, limiting the generalizability of the findings to other business contexts, and the testing data were restricted to the operational data available at Toko Geleng Classic, consisting of 30 types of goods, 30 incoming stock transactions, and 10 outgoing stock transactions; the system's performance with larger datasets and more diverse transaction conditions has therefore not yet been evaluated. The system also does not currently provide advanced analytical functions such as stock demand prediction or integration with financial reporting. Future research can extend the system by incorporating stock demand prediction based on historical inventory data to support procurement planning, testing the system at multiple motorcycle spare part businesses with different operational characteristics and larger transaction volumes to evaluate its generalizability, integrating accounting or financial reporting modules to support business owners in monitoring inventory-related financial information, and developing a mobile application to provide more flexible access for users who manage inventory activities outside the store.

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