

Designing A Website-Based Transaction and Inventory Information System for Workshops (Case Study Sialogo Motor Workshop)

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Abstract

Sialogo Motor Workshop is an automotive business whose day-to-day operations require the regular management of transaction data and stock records. Until now, the recording of data on goods, stock, sales transactions, service transactions and reports has been carried out manually, which has often led to recording errors, slow data retrieval, difficulties in monitoring stock levels, and inaccurate reports. The aim of this research is to design and develop a web-based Workshop Transaction and Inventory Information System for Sialogo Motor Workshop, in order to manage data on items, categories, incoming stock, outgoing stock, service transactions, sales transactions and reports in a more structured manner. The system was developed using the Waterfall methodology, employing the programming languages PHP, HTML and JavaScript, the CodeIgniter framework, Bootstrap and a MySQL database. System testing was carried out using two methods namely Black Box Testing and usability testing. The results of the Black Box Testing carried out on 37 scenarios showed that all the functions tested operated as expected. Meanwhile, the results of the usability testing carried out on the owner of Sialogo Motor Workshop as a system user showed a usability rating of 90 %, which falls into the 'very good' category. The results of this study indicate that the system is suitable for use, easy to operate, and can help Sialogo Motor Workshop to manage its transactions and stock more efficiently and accurately.

Keywords: Information Systems, Transactions, Workshop Inventory, Black Box Testing, Usability Testing.

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1. INTRODUCING

Technological developments have accelerated the progress of information systems and digital transformation across various sectors. Over the past few decades, information systems have played an important role in improving the efficiency, effectiveness, and competitiveness of organisations in areas such as business, government, education, and healthcare [1]. The adoption of information technology enables data processing and transaction recording to be carried out more efficiently and accurately, thereby reducing errors that may occur through manual processes. The implementation of computer-based information systems has therefore become increasingly important in supporting business activities, particularly in sales and service operations [2]. In the workshop sector, information systems can support the management of operational data, transactions, inventory, and services in a more structured manner.

A motorcycle workshop requires accurate and efficient management of operational data because its activities involve service transactions, spare parts sales, and inventory management. A workshop is a place where motorcycles are repaired or modified to ensure that they function properly [3]. Information systems can support workshop operations by facilitating the processing and management of data required for daily activities [4]. Sialogo Motor Workshop is a business that provides motorcycle servicing and sells spare parts. In its current business processes, data management is still performed manually. Sales transaction recording takes considerable time because data are entered manually, and errors in recording may cause sales data to become inaccurate. In addition, checking, updating, and

searching for spare parts also takes considerable time because stock information must be checked directly in the warehouse. The process of preparing reports also requires considerable time, which can reduce the efficiency of workshop operations [5].

Several studies have previously developed information systems to support workshop-related activities [6]. developed a sales, purchasing, and spare parts inventory information system for the Tiga Putra Motor Workshop in Garut and reported that a web-based information system could improve the efficiency of transaction and inventory data management [7]. developed a motorcycle service information system for Arif Motor Workshop that facilitated data searching and report generation. Other studies have also addressed workshop services, sales, and spare parts management through web-based information systems [2],[3],[8]. These studies indicate that the implementation of information systems can support workshop activities by improving data management, transaction processing, inventory management, and reporting.

Although previous studies have shown the benefits of information systems for workshop operations, most systems focus on specific activities, such as service management, sales, or spare parts inventory. An integrated system that combines transaction and inventory management is still needed to support stock monitoring, incoming and outgoing goods, and transaction reporting. At Sialogo Motor Workshop, these activities still rely on manual recording and direct warehouse checking, making information management less efficient.

To address these problems, this study proposes a website-based workshop transaction and inventory information system for Sialogo Motor Workshop. The system integrates product management, incoming and outgoing goods, service and sales transactions, stock monitoring, and reporting. It also provides automatic outgoing-goods records, stock notifications, dashboard graphs, and weekly and monthly reports that can be exported to PDF and Excel or printed directly.

Therefore, this study aims to develop an integrated system that assists the Workshop Owner in managing transactions, monitoring spare parts inventory, recording goods, and generating reports. The system is developed using the Waterfall method and implemented with PHP, CodeIgniter 4, HTML, JavaScript, Bootstrap, and MySQL.

2. RESEARCH METHODOLOGY

This study employs the Waterfall method to develop a web-based transaction and inventory information system for Sialogo Motor Workshop. The Waterfall method is a systematic and sequential software development approach consisting of requirements analysis, system design, implementation, testing, and maintenance [1]. The research was conducted at Sialogo Motor Workshop as the main location for data collection and system implementation.

2.1. Research Time and Location

This research commenced in February and continued until its completion, from the proposal drafting stage through to the writing of the final thesis. The research will be carried out at the Sialogo Motor Workshop, located at Jl. Krida 13, Malalayang Satu Timur, Malalayang Sub-district, Manado City, North Sulawesi.

2.2. Research Stages

The research stages executed in this study follow a systematic engineering sequence to ensure that the developed software artifact meets both technical specifications and operational requirements. The structured workflow applied in this study is illustrated in Figure 1.

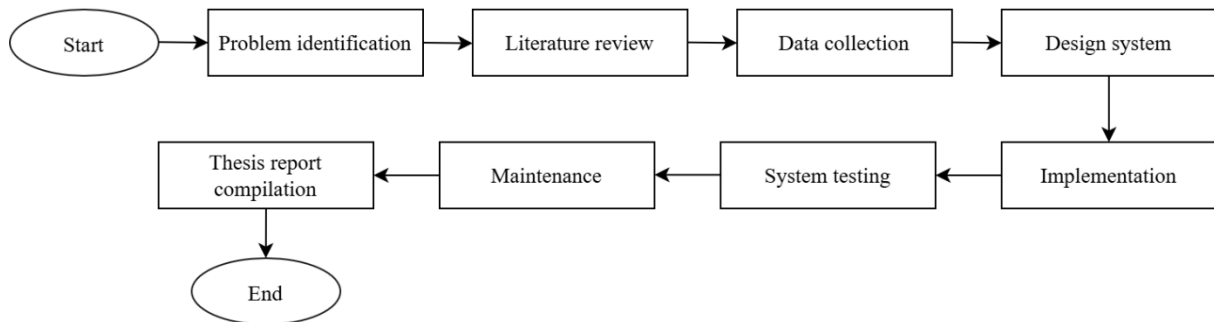


Figure 1. Research Stages

2.3. Design System

System design is the process of defining the structure, processes, and interactions of a system to meet user requirements and provide a clear basis for implementation [9]. After analyzing the system requirements, the system was designed by defining its structure, processes, and interactions. The system design in this research utilized the Unified Modelling Language (UML) to model the system requirements and processes in a structured manner. The UML models used in this research are as follows :

1. Use Case Diagram illustrates the interactions between the actor and system, including the function that can be performed by the actor.
2. Activity Diagram describes the flow of activities and processes carried out within the system.
3. Class Diagram represents the structure of the system, including classes, attributes, methods, and relationships between classes.

2.4. Data collection

Data collection techniques are the steps taken to obtain the information required for the research. The methods used to obtain the data required for this study are as follows :

1. Interview
An interview was conducted with the owner of sialogo motor workshop to obtain information about the existing service and sales processes, as well as stock management. The interview results were used to identify the functional requirements of the proposed system.
2. Observation
Observation was conducted directly at sialogo motor workshop to understand the actual service, sales and stock management processes. The observation were used to complement and verify the interview results and ensure that the collected information accurately reflected the workshop's operational processes.
3. Literature review
Literature review was conducted by examining relevant books, scientific journal, previous studies, and reliable online sources. This method was used to strengthen the theoretical foundation and support the analysis of system requirements in this study.

2.5. System development methodology

The system development methodology used in this study is the Waterfall method, which consists of sequential and structured stages [10]. The stages applied are as follows :

1. Analysis
System requirements were identified through observation, interviews, and literature review to determine the functional and non-functional requirements of sialogo motor workshop.
2. System Design
The system was designed using Unified Modelling Language (UML), including Use Case Diagram, Activity Diagram, and Class Diagram, to represent the system structure, processes, and interactions.

3. Implementation

The system was implemented using the Model View Controller (MVC) architecture with CodeIgniter, PHP, and MySQL, HTML, CSS, Bootstrap, and JavaScript were used to develop the user interface.

4. Testing

System testing was conducted using Black-Box Testing to verify the functionality of each feature and usability testing through a questionnaire to evaluate the system's ease of use from the user's perspective.

5. Maintenance

The maintenance stage involves fixing errors and making adjustments or improvements based on user needs after the system is implemented.

3. RESULT AND DISCUSSIONS

3.1. System Analysis and Design

The system analysis and design were conducted based on the requirements identified through observation, interviews, and literature review. These activities were carried out to understand the existing business processes and determine the functional requirements of the proposed system. The system was designed using Unified Modelling Language (UML) to represent its functionality, workflow, and structural components [11]. The UML models used in this study consist of the Use Case Diagram, Activity Diagram, and Class Diagram [12]. These diagrams provide a clear representation of the interaction between users and the system, the flow of activities in each process, and the relationships among the system components

3.1.1 Uses Case Diagram

A use case diagram illustrates the functional requirements and interactions between actors and a system, focusing on what the system does rather than how it performs its functions [13]. In this study, the workshop owner is the main actor with access to product categories, products, goods received, service and sales transactions, and transaction and stock reports. The interaction between the workshop owner and the system is presented in Fig 1.

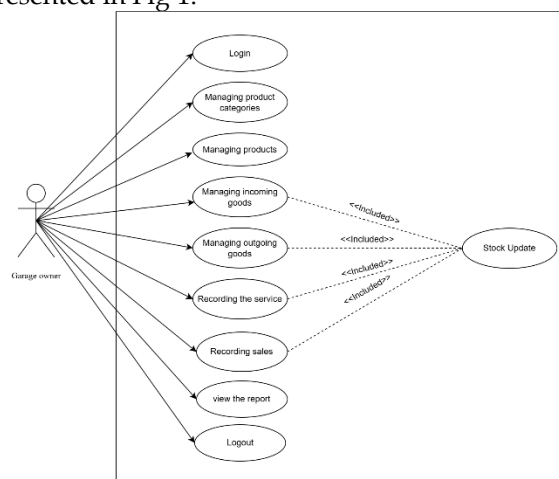


Figure 2. Uses case diagram

3.1.2 Activity Diagram

The activity diagram describes the workflow of activities performed by the Workshop Owner when using the system [14]. The main processes represented include login, service transactions, sales transactions, and report generation. Each activity diagram illustrates the sequence of actions and system responses for the corresponding process. The activity diagrams are presented in Fig 3-5.

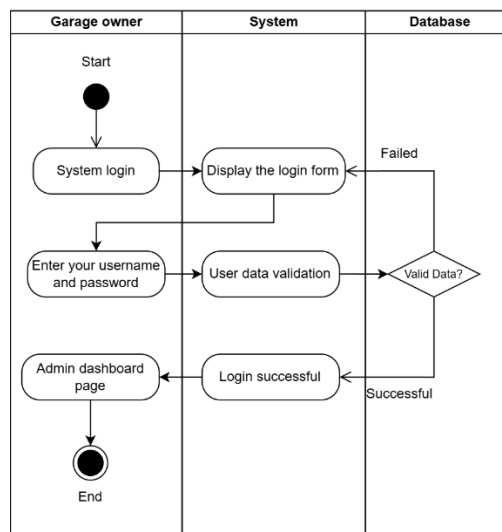


Figure 3. Activity diagram login

The login activity diagram illustrates the authentication process of the workshop owner. The process begins when the user enters a username and password, which are then verified by the system against the database. If the credentials are valid, the user is redirected to the dashboard; otherwise, an error message is displayed. The login process is presented in Fig 3.

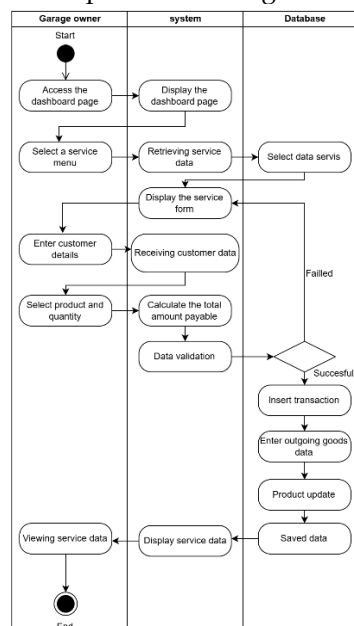


Figure 4. Activity diagram service

The Service Transaction Activity Diagram illustrates the process of managing service transactions at Sialogo Motor Workshop. The process begins when the Workshop Owner enters the customer and vehicle information, selects the required service and spare parts, and records the transaction. The system calculates the total payment and saves the transaction data to the database. The service transaction process is presented in Fig 4.

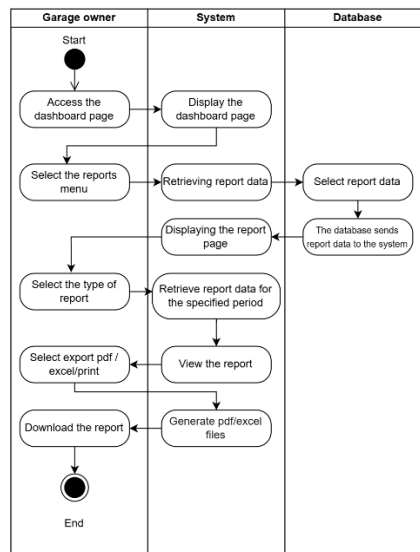


Figure 5. Activity diagram report

The report activity diagram illustrates the process of generating transaction and stock reports. the workshop owner selects the required reporting period, and the system displays the corresponding transaction, revenue, service cost, and stock information. The report can then be printed or exported as needed. The report generation process is presented in Figure 5.

3.1.3 Class Diagram

The class diagram illustrates the static structure of the workshop transaction and inventory information system, including its main classes, attributes, methods, and relationships [10]. It serves as a reference for representing the data structure and system functions during the development process. The class diagram is presented in Fig 6.

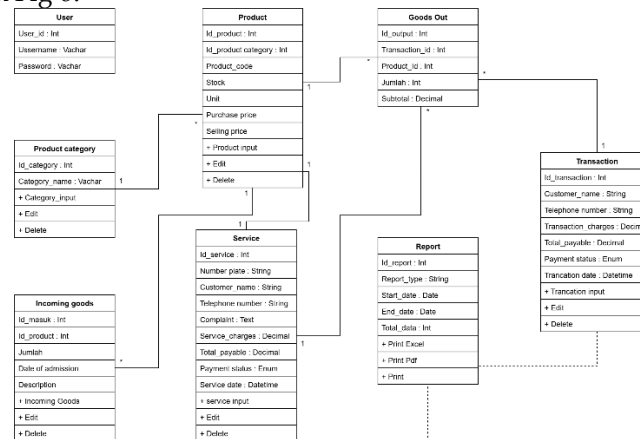


Figure 6. Class diagram

3.2. System Implementation

The Sialogo Motor Workshop Transaction and Inventory Information System was implemented using the Model-View-Controller (MVC) architecture through the CodeIgniter 4 framework. PHP was used for application development, while HTML, CSS, Bootstrap, and JavaScript were used to develop the user interface. MySQL was used as the database management system for storing user, product, stock, sales, and service transaction data. The Model manages data and database operations, the View provides the user interface, and the Controller manages the application logic and communication between the Model and View [14],[15]. The implementation integrates these components into a web-

based system that supports the workshop's daily operational activities. The implemented system consists of several interconnected features, including login, dashboard, product category management, product management, goods received, service transactions, sales transactions, and transaction and stock reports. The main implementation results are presented through the following inter

3.2.1 Login Page

The Login Page provides an authentication mechanism for the Workshop Owner. The user enters a registered username and password, which are verified against the database before access to the system is granted. The Login Page is presented in Fig 7

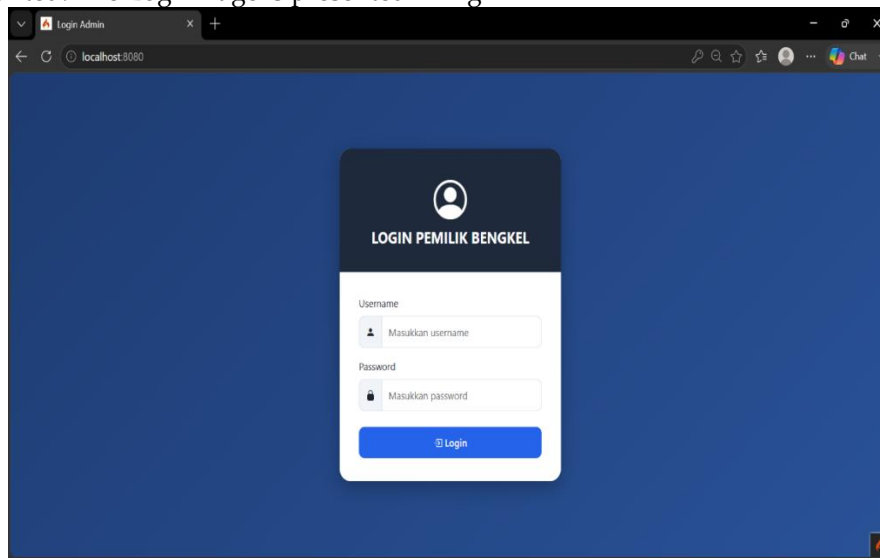


Figure 7. Login page

3.2.2 Dashboard page

The Dashboard page provides an overview of workshop activities and inventory conditions after the Workshop Owner successfully logs into the system. It displays summary information, including the total number of products, incoming goods, outgoing goods, and service transactions. The dashboard also provides a graph of stock movements and a low stock notification when the product stock falls below five units. The Dashboard interface is presented in Figure 8

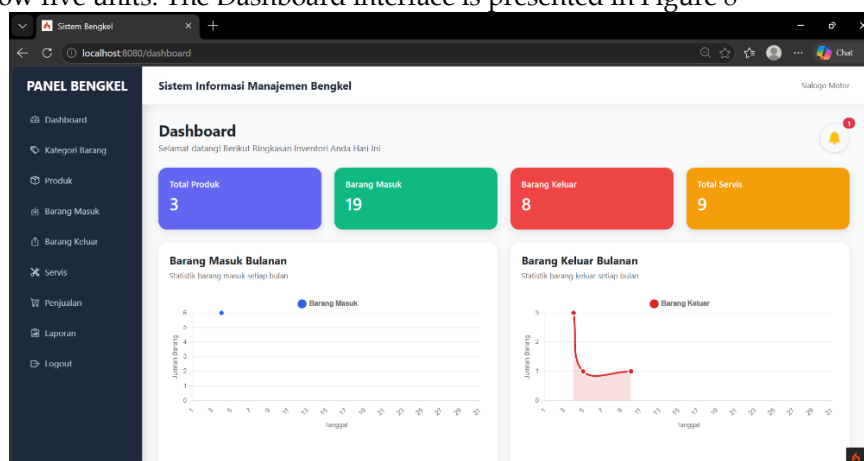


Figure 8. Dashboard page

3.2.3 Service page

The service page is used to record vehicle service transactions. The service form includes the customer's name, registration number, telephone number, complaint, spare parts, stock, quantity, price, subtotal, service charge, payment status and grand total. Subtotals and grand totals are calculated

automatically based on the spare parts used and the service charges. Once the transaction has been saved, the spare parts stock will be reduced automatically and recorded on the goods issued page. This page also features a service data table to display saved service transactions. The service page is shown in Fig 9.

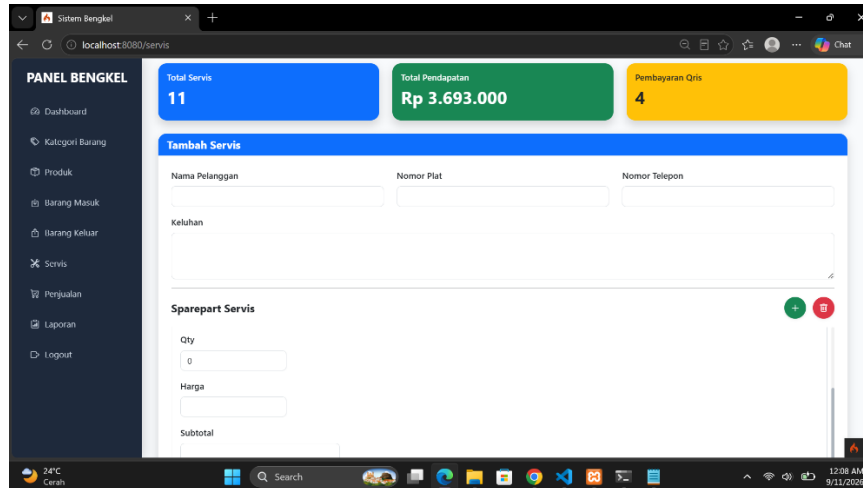


Figure 9. Service page

3.2.4 Report page

The reports page is used to view and manage workshop transaction reports. This page features a period filter, as well as information on total revenue, service revenue, sales revenue and total service costs. In addition, there is a transaction report table displaying the date, invoice, transaction type, customer, registration number, service charge, total payable, and payment status. Reports can also be exported in Excel and PDF formats and printed. The Report Page display is shown in Fig 10.

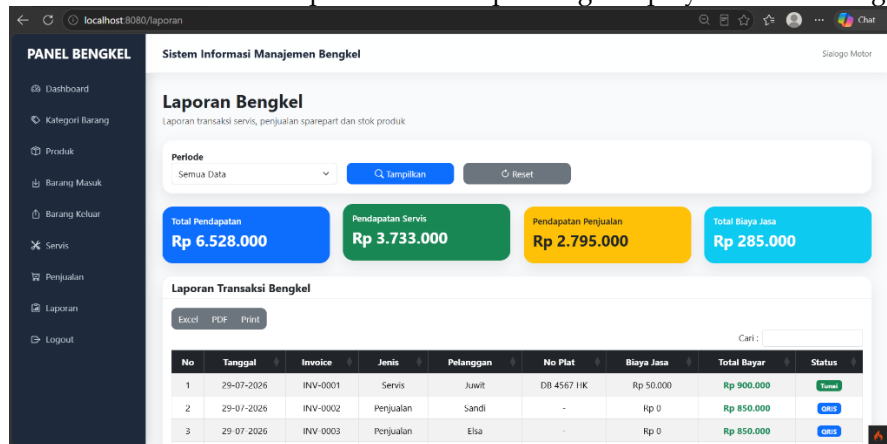


Figure 10. Report page

3.3 System testing

System testing was carried out to determine whether the sialogo motor workshop for transactions and stock at sialogo motor workshop, which has been developed, can function in accordance with the specified requirements and objectives. The testing aims to ensure that every feature of the system operates properly, produces outputs that correspond to user inputs, and is easy to use in supporting the workshop's operational activities. In this study, system testing was carried out using two methods: Black Box testing and Usability testing.

3.3.1 Black Box testing

To ensure that the Sialogo Motor Workshop Transaction and Inventory Information System functions according to its specified requirements, functional testing was conducted using the Black Box Testing method. Black Box Testing is a software testing method that evaluates system functionality based on specified requirements without examining the internal structure or source code [16]. A total of 37 test scenarios were conducted, covering the main system features, including login, category and product management, incoming goods, outgoing goods, service transactions, sales transactions, and reports. Each test scenario was evaluated by comparing the expected output with the actual output produced by the system. The testing results showed that all 37 scenarios were successfully completed, achieving a functional testing success rate of 100%. A summary of the Black Box Testing results is presented in Table 1. However, these results only demonstrate that the tested system functions operate according to their specified requirements. They do not provide sufficient evidence that the developed system improves operational efficiency or reduces recording errors compared with the previous manual process. Further evaluation involving quantitative comparisons of transaction processing time, stock retrieval time, report generation time, and recording accuracy is required to determine the system's operational impact.

Table 1. Black Box Testing Results

No	Feature	Test Scenarios	Input	Expected Output	Test Results
1.	Login	Enter login credentials	Username and password	System verifies credentials and provides access to the dashboard	Successful
2.	Dashboard	Access dashboard	Click Dashboard menu	System displays product, stock, service, and stock movement information	Successful
3.	Product Categories	Manage category data	Category name and selected category	Category data is saved, updated, or deleted correctly	Successful
4.	Products	Manage product data	Product code, name, category, stock, and price	Product data is saved, updated, or deleted correctly	Successful
5.	Incoming Goods	Record incoming goods	Product, quantity, date, and purchase price	Data is saved and product stock increases automatically	Successful
6.	Outgoing Goods	Record outgoing goods	Product and quantity	Outgoing goods are recorded and product stock decreases automatically	Successful
7.	Service	Process service transactions and invoice	Customer, vehicle, spare parts, quantity, service fee, and payment status	Transaction is saved, total is calculated, stock is updated, and service invoice is displayed	Successful
8.	Sales	Process sales transactions and invoice	Buyer, products, quantity, price, and payment status	Sales transaction is saved, total is calculated, stock is updated, and sales invoice is displayed	Successful
9.	Reports	View, filter, export, and print reports	Select report period (All Data, Weekly, or Monthly), then	System displays transaction and stock reports according to the selected period and	Successful

10.	Log out	End user session	click Excel, PDF, or Print Click Logout button	successfully exports or prints the report System ends the session and returns to the login page	Successful
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3.3.2 Usability testing

Usability testing was conducted to evaluate the ease of use of the Sialogo Motor Workshop Transaction and Inventory Information System. Usability testing evaluates the user experience when interacting with a system, including the ease of understanding and using its features [17]. The evaluation involved one respondent, namely the workshop owner, who is the primary user of the developed system. The respondent was selected because the system was specifically designed to support the workshop owner's operational activities. The evaluation was conducted after the respondent had observed and interacted with the system's interface. A questionnaire consisting of eight statements was used to collect the respondent's assessment of the system. The questionnaire employed a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The responses were analyzed by calculating the total score obtained and comparing it with the maximum possible score. The evaluation was limited to one respondent and the system features explored during the testing session. Therefore, the results represent the workshop owner's initial assessment and cannot be generalized to a broader population of users. Further usability testing involving additional respondents and more comprehensive interactions with the system is recommended. The questionnaire statements are presented in Table 2.

Table 2. Usability testing statements

No	Statements
1.	The system was easy to learn and use right from the first time I used it.
2.	The menus and features available are easy to understand.
3.	The system makes it easier for me to manage product and category data.
4.	The system makes it easier for me to manage incoming and outgoing goods.
5.	The system makes it easier for me to carry out sales and service transactions.
6.	The system makes it easy for me to track and monitor stock levels.
7.	The system makes it easy for me to view and generate transaction reports
8.	Overall, the system is easy to use and meets the workshop's operational needs.

Table 3. Summary of Usability test result

Response	Number	Score	Number x Score
Strongly Agree	5	5	25
Agree	2	4	8
Fairly Agree	1	3	3
Disagree	0	2	0
Strongly Disagree	0	1	0
Total	8		36

The usability percentage was calculated by dividing the total score obtained from the questionnaire by the maximum possible score and multiplying the result by 100%, as shown in Equation (1).

The questionnaire consisted of eight statements evaluated by one respondent using a five-point Likert scale. The total score obtained was 36, while the maximum possible score was 40 (8 × 5). Therefore, the usability percentage was calculated as follows:

$$\text{Percentage} = \frac{\text{Total score achieved}}{\text{Maximum score}} \times 100 \% = \frac{36}{40} \times 100 \% = 90 \%$$

Based on the usability testing results, the questionnaire obtained a total score of 36 out of a maximum possible score of 40, resulting in a usability percentage of 90%. This result indicates that the workshop owner provided a positive initial assessment of the system's usability after observing and interacting with its interface. However, the evaluation involved only one respondent and was limited to the features explored during the testing session. Consequently, the result reflects the workshop owner's individual assessment and does not establish the system's usability for a broader population of users or demonstrate improvements in operational efficiency. Further evaluation involving additional respondents and more comprehensive testing is recommended.

3.4 Discussion

Based on the analysis, design, implementation, and testing conducted, the Sialogo Motor Workshop Transaction and Inventory Information System was successfully developed to support the management of workshop data and transactions that were previously recorded manually. The results of Black-Box Testing show that all tested features, including login, category and product management, incoming and outgoing goods, service transactions, sales transactions, reports, and logout, produced outputs according to the expected results. No errors were identified in the tested processes, indicating that the developed system meets the specified functional requirements and can support transaction and inventory management activities at Sialogo Motor Workshop.

Usability Testing was conducted using an eight-item questionnaire with a five-point Likert scale and involved the workshop owner as the primary user of the system. The testing resulted in a total score of 36 out of a maximum score of 40, producing a usability percentage of 90%, which indicates a very good level of usability. The results show that the system is easy to learn and use and facilitates product and category management, stock monitoring, service and sales transactions, and report generation. Since the system is specifically designed for use by the workshop owner as the sole user, the usability result represents the intended user's assessment, although its generalizability is limited to a single respondent. Overall, the testing results indicate that the system is functionally valid, easy to use, and aligned with the research objectives in supporting the operational activities of Sialogo Motor Workshop.

4. CONCLUSION

Based on the research, design, implementation, and testing conducted, the Sialogo Motor Workshop Transaction and Inventory Information System was successfully designed and developed to support the management of workshop transactions and inventory. The developed system provides features for managing product and category data, recording incoming and outgoing goods, processing service and sales transactions, monitoring stock, and generating transaction reports. The Black Box Testing results showed that all 37 test scenarios were successfully completed, achieving a functional testing success rate of 100%. Furthermore, usability testing involving the workshop owner resulted in a usability score of 90%, reflecting a positive initial assessment of the system's usability. These results indicate that the tested system functions operate according to their specified requirements and that the workshop owner provided positive feedback after interacting with the system's interface.

However, this research has several limitations. The developed system was specifically designed for Sialogo Motor Workshop and implements a single-user model. The usability evaluation involved only one respondent and was limited to the system features explored during the testing session. Therefore, the usability results cannot be generalized to a broader population of users. Furthermore, the system's impact on operational efficiency and recording accuracy has not been quantitatively evaluated. Future research is recommended to conduct quantitative comparisons between manual and computerized processes, involving transaction processing time, stock retrieval time, report generation time, and recording accuracy. Further development may also include multi-user and role-based access, improved data security and backup mechanisms, integration of online payment services, and usability testing involving additional respondents.

CREDIT AUTHOR STATEMENT

Suhandri S.: Conceptualization, Methodology, Software, Investigation, Data Curation, Formal Analysis, Validation, Writing – Original Draft, Writing – Review & Editing. **Benny Pinontoan:** Supervision, Validation, Writing – Review & Editing. **Wisard Kalengkongan:** Supervision, Validation, Writing – Review & Editing.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors used ChatGPT to improve the clarity and language of this manuscript. The authors reviewed and edited the AI-assisted content and take full responsibility for the final content of the manuscript.

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