

# Design of a Web-Based Point of Sale System for Transaction Recording at Sumber Rejeki Store

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**Abstract.** The use of manual transaction recording in Micro, Small, and Medium Enterprises (MSMEs) often causes data inaccuracies, inefficient transaction processes, and difficulties in inventory monitoring. Toko Sumber Rejeki Karangbener Kudus is an MSME that still applies handwritten sales records, leading to limited transaction documentation and delayed reporting. This study aims to design a web-based Point of Sale (POS) system to support sales transactions, inventory management, and sales reporting. The study employs a Research and Development (R&D) approach using the Waterfall model. Data were collected through observation of transaction activities, interviews with the store owner, and a literature review related to POS systems and MSME digitalization. System design was carried out using structured modeling, including use case diagrams, activity diagrams, data flow diagrams, entity relationship diagrams, sequence diagrams, and user interface design. The developed system provides role-based access for cashiers, administrators, and owners. Cashiers handle sales transactions and cash sessions, administrators manage product and stock data, and owners monitor sales reports. The proposed system is expected to reduce recording errors, streamline transaction processes, and improve data organization, serving as a practical solution for MSMEs transitioning from manual to digital transaction recording.

**Keywords:** Point of Sale System, Transaction Recording, Inventory Management, MSMEs

## 1 Introduction

In the digital era, the use of information technology has become essential for improving operational efficiency and transaction accuracy. However, many Micro, Small, and Medium Enterprises (MSMEs) still rely on manual recording methods such as handwritten notes and paper receipts. This practice increases the risk of calculation errors, delays financial reporting, and limits data transparency.

In Indonesian micro-scale retail businesses, manual bookkeeping remains common due to limited technological adoption and simple organizational structures. This condition represents a broader digital transformation challenge rather than an isolated operational issue. The lack of structured transaction recording may hinder financial control, slow decision-making, and reduce competitiveness in an increasingly digital market. These issues are evident at Toko Sumber Rejeki Karangbener Kudus, where manual transaction recording results in incomplete documentation, slower service, and difficulties in monitoring stock availability.

Previous studies have shown that the digitalization of transaction recording through Point of Sale (POS) systems can significantly enhance operational efficiency and accuracy in MSMEs. For instance, Yuliana and Ronal developed a web- and mobile-based POS system for MSMEs and found that the system improved transaction recording efficiency, simplified inventory management, and produced more accurate financial reports compared to manual recording methods [1]. Furthermore, a study by Mulyani et al. on transaction digitalization in MSMEs using POS applications demonstrated that the adoption of digital systems for recording product data, sales transactions, and sales reports effectively met user needs while improving data accuracy and storage efficiency [2]. Other research has also emphasized the important role of POS systems in addressing manual recording issues in food-related MSMEs, where the implementation of POS applications was proven to improve transaction data accuracy and enhance user experience during the transaction process [3].

However, most prior research focuses primarily on transaction automation and inventory features, with limited discussion on structured internal control mechanisms tailored to micro-scale retail environments. In small MSMEs with minimal staff separation, the absence of systematic cash reconciliation and role-based monitoring increases the risk of discrepancies between recorded transactions and physical cash balances.

This study is conceptually grounded in the Technology Acceptance Model (TAM), which explains that perceived usefulness and perceived ease of use influence system adoption. In the MSME context, digital transformation depends not only on technical functionality but also on user readiness and perceived system benefits. Therefore, user satisfaction evaluation is used as an empirical indicator of perceived usefulness and ease of use [4].

Therefore, this research aims to design a web-based POS system for Toko Sumber Rejeki Karangbener Kudus that integrates sales transaction recording, inventory management, reporting, and structured cash session

control. The system incorporates role-based access and a cash-closing mechanism that records opening balances, transaction totals, payment classifications, and final reconciliation results accessible to the owner. By integrating operational automation with internal control features, this study extends previous POS research beyond technical efficiency toward governance-oriented system design.

The proposed system is expected to reduce recording errors, accelerate transaction processing, and support better financial monitoring and data-driven decision-making in micro-scale MSMEs.

## 2 Methods

### 2.1 Research Methodology

This study uses a Research and Development (R&D) approach aimed at developing and validating an information system based on user needs. The approach was chosen to provide an implementable solution in addition to problem analysis. Requirements analysis was carried out qualitatively through observations and interviews to examine manual transaction recording practices among MSMEs and identify related issues. [5]. The data collection techniques used in this study include:

- a. Observation  
Observation was conducted on transaction and sales recording activities to identify existing workflows and issues, including recording errors and delays in sales data reporting [6].
- b. Interview  
Interviews were conducted with the MSME owner or manager to obtain more in-depth information regarding system requirements, challenges faced in daily operations, and expectations for improving transaction efficiency. This method provides direct insight into user needs, which serves as the foundation for system design [7].
- c. Literature Review  
The literature review was conducted by examining scientific journals, books, and previous studies related to Point of Sale (POS) systems, sales management, software development, and the Waterfall development model. This review aims to strengthen the theoretical foundation of the research and serve as a reference during the system development process [8].

### 2.2 System Development Method (Waterfall)

This study adopts the Waterfall model, a sequential software development approach in which each phase is carried out in order. The model is selected because the system requirements are clearly defined from the initial stage and suit the nature of the developed system. The Waterfall model was chosen because the system requirements were clearly defined from initial observations and interviews. In small-scale MSMEs with relatively stable operational processes, a structured sequential development approach is considered more appropriate than iterative or highly dynamic methodologies.

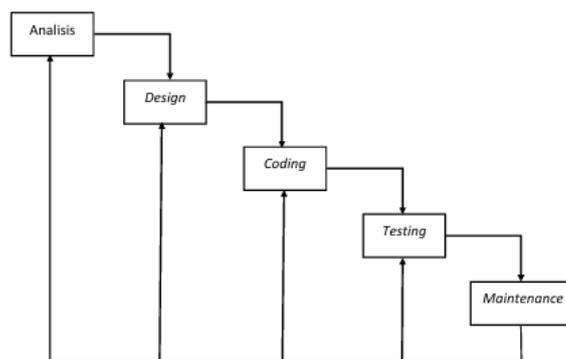


Figure 1. Waterfall Method

The stages of system development using the Waterfall model are as follows:

- a. Requirements Analysis  
The requirements analysis stage identifies existing process issues and determines suitable solutions, while defining system requirements to support the development of an effective and efficient system [9].
- b. System Design  
At this stage, the system is designed by defining hardware requirements and specifications, as well as establishing the overall system architecture [10].

- c. **Implementation (Coding)**  
 During the implementation phase, the system design is converted into executable source code. Developers build functional software components based on the defined specifications to meet the established requirements [11]
- d. **Testing**  
 After implementation, the system is tested to ensure that all functions operate as specified. Functional and integration testing are conducted to detect defects and verify system behavior, ensuring reliability before deployment [12].
- e. **Maintenance**  
 Maintenance is performed after deployment to ensure the system operates properly and remains efficient. This phase includes fixing errors, accommodating changes in user requirements, and applying updates to maintain system stability and long-term usability [13]

### 3 Results and Discussion

The proposed POS system focuses on sales transactions, inventory management, purchasing, cash reconciliation, reporting, and user management. Advanced accounting and multi-branch features are excluded to maintain feasibility and suitability for micro-scale MSMEs.

#### 3.1 System Planning

- a. **Use Case Diagram**

The use case diagram represents the relationships between actors and system functions to clarify functional requirements. In this study, it is used to describe user interactions in a structured way, helping developers identify actor roles and permitted system actions. [14].

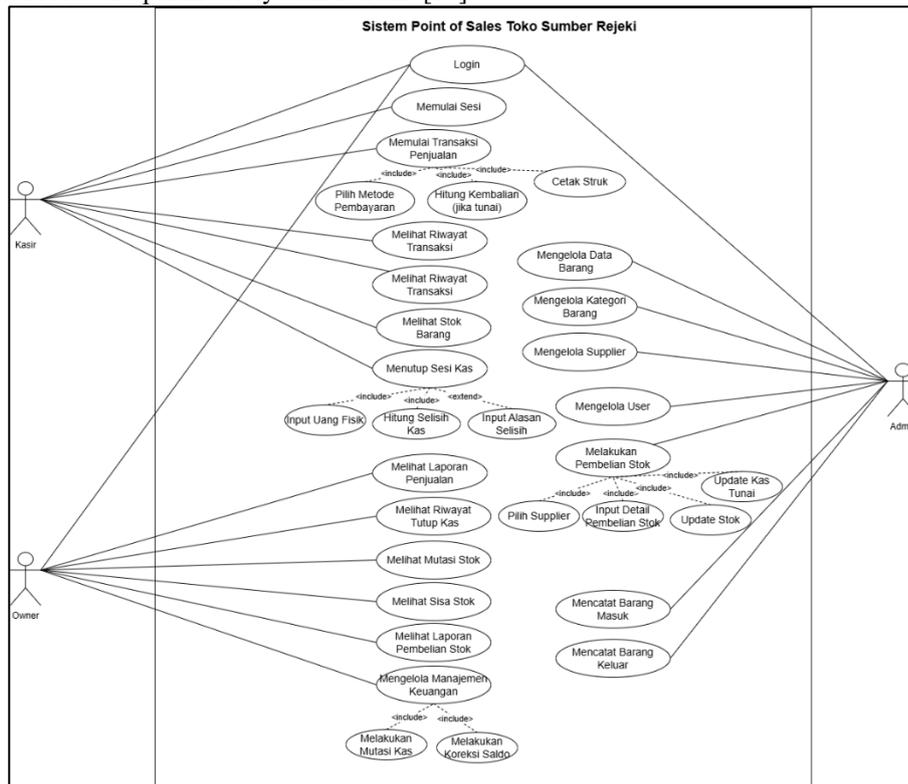


Figure 2. Use Case Diagram

Figure 2 presents the Use Case Diagram of the Point of Sales system for Toko Sumber Rejeki, involving three main actors: Cashier, Admin, and Owner. The Cashier handles sales operations and cash session activities, the Admin manages data, stock, and purchasing processes, while the Owner focuses on monitoring reports and financial management. This role separation ensures clear responsibilities and enhances data security within the system.

b. Activity Diagram

An activity diagram illustrates the flow of system processes, including activity sequences and decision paths. This representation helps explain complex workflows in a clear and structured manner for readers and developers [14].

1. Activity Diagram Login

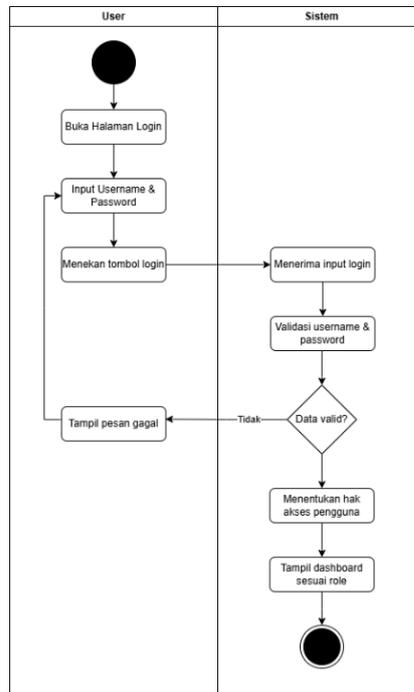
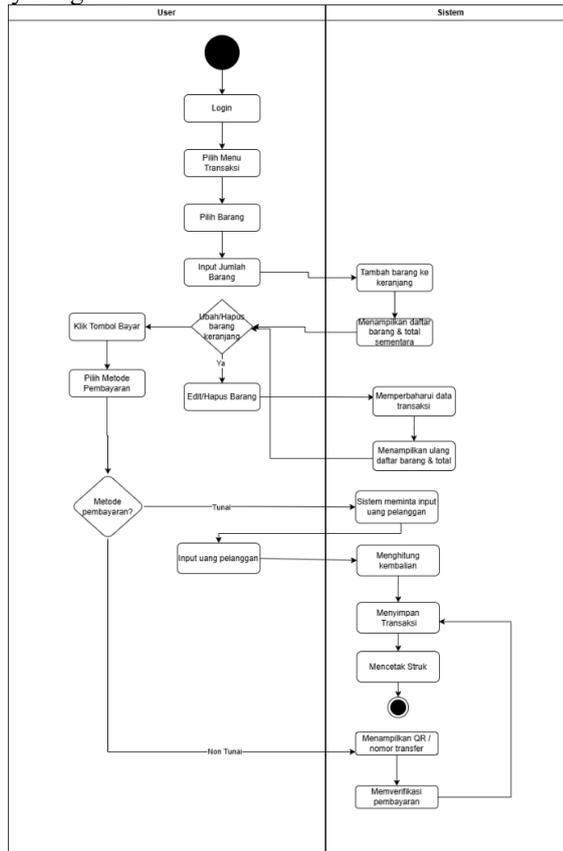


Figure 3. Activity Diagram Login

Figure 3 present the login activity diagram illustrates the user authentication flow between the User and System swimlanes. The process includes credential input, validation, error handling for invalid data, and successful access to role-based dashboards.

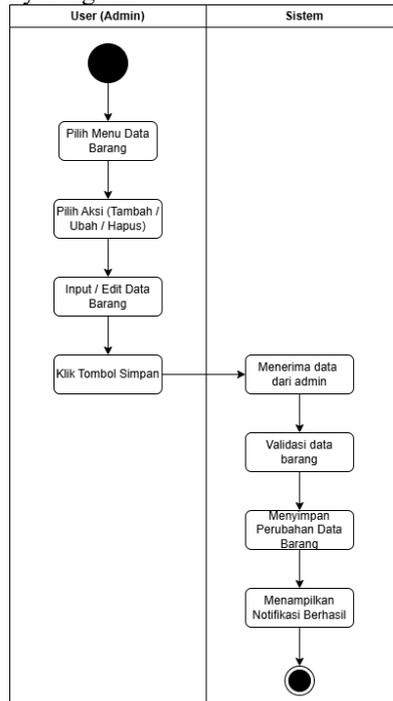
## 2. Sales Transaction Activity Diagram



**Figure 4.** Sales Transaction Activity Diagram

Figure 4 presents the sales transaction activity diagram shows the interaction between the cashier and the system, covering item selection, cart processing, and payment completion. The cashier performs input and decision-making activities, while the system handles calculations, payment validation, transaction storage, and receipt generation. Separate flows for cash and non-cash payments ensure accurate processing based on the selected payment method.

### 3. Product Data Management Activity Diagram



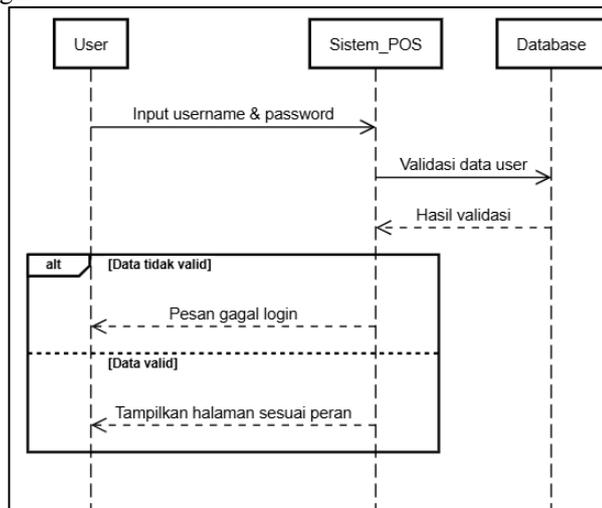
**Figure 5.** Product Data Management Activity Diagram

Figure 5 presents the product data management activity diagram illustrates the admin’s workflow in managing item data, including selecting actions, inputting or updating data, and saving changes. The system validates the data, stores updates, and displays a confirmation of successful processing.

#### c. Sequence Diagram

A sequence diagram depicts time-ordered interactions between system components, illustrating communication flows during feature execution and clarifying system logic for structured development [15].

##### 1. Sequence Diagram Login



**Figure 6.** Sequence Diagram Login

The login sequence diagram illustrates interactions between the user, POS system, and database during authentication. User credentials are validated, resulting in either an error message or access to a role-based interface.

2. Sequence Diagram of Sales Transactions

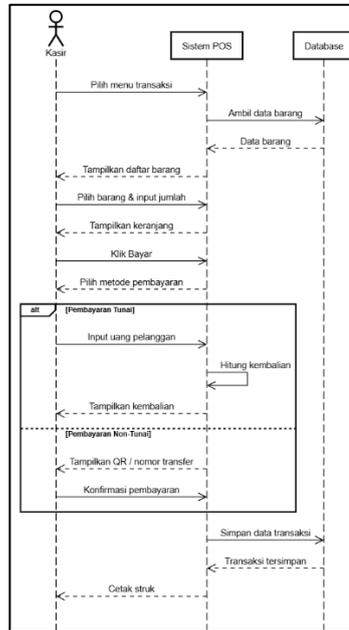


Figure 7. Sequence Diagram of Sales Transactions

Figure 10 presents the sales transaction sequence diagram shows the interaction between the cashier, POS system, and database in processing a sale. The system handles item selection, payment processing, transaction storage, and receipt generation

3. Sequence Diagram of Product Data Management

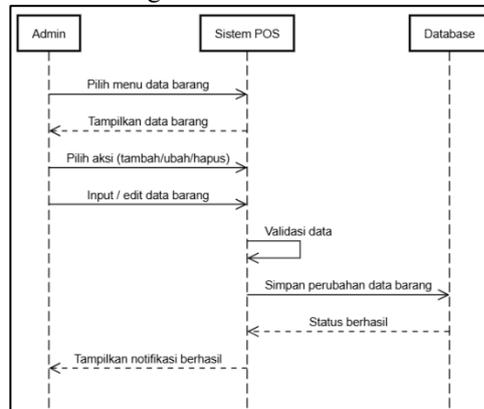


Figure 8. Sequence Diagram of Product Data Management

The product data management sequence diagram illustrates interactions between the Admin, POS system, and database. The system validates and saves item data changes, then provides confirmation to the admin.

### 3.2 User Interface

#### 3.2.1 Login Page

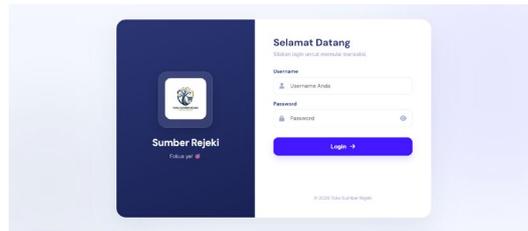


Figure 9. Login Page

The login page serves as the entry point to the Point of Sales system by verifying user credentials and role-based access. This process ensures data security and records system activities according to the authorized user.

#### 3.2.2 Cashier Dashboard

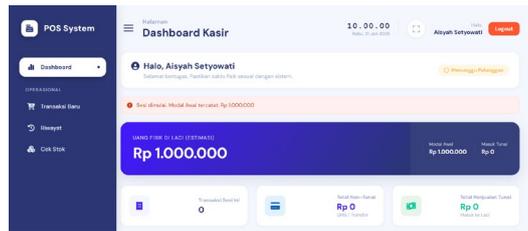


Figure 10. Cashier Dashboard

The cashier dashboard displays a summary of the current session, including cash balance estimates, transaction totals, and cash and non-cash payments. It also provides a “Count & Close Cash” feature to finalize cash handling at the end of the session.

#### 3.2.3 Sales Transaction Page

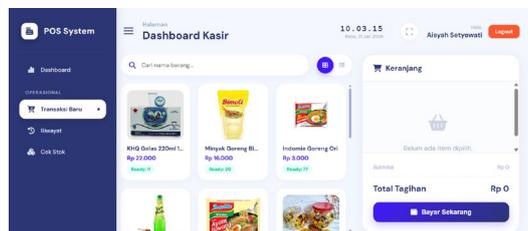


Figure 11. Sales Transaction Page

The new transaction page allows the cashier to process sales by selecting products via the item list or search feature. Selected items are added to the cart with real-time total calculations, after which payment is completed through the checkout function.

#### 3.2.4 Cash Closing Confirmation Interface

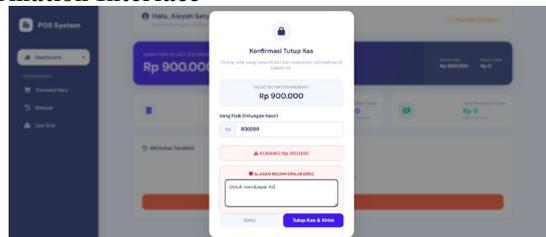


Figure 12. Cash Closing Confirmation Interface

The cash closing feature is triggered when the cashier selects the “Close Cash” option, displaying the system-calculated balance and requiring the cashier to manually input the actual physical cash amount. If the values match, the system marks the status as balanced; however, if a discrepancy is detected, the cashier must provide a reason before submission. Once confirmed, the cash closing summary is automatically sent to the owner via WhatsApp to support monitoring and internal control.

### 3.2.5 Product Data Management Page (Admin)

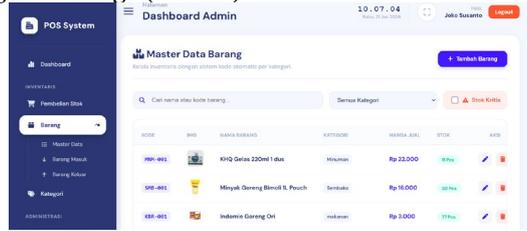


Figure 13. Product Data Management Page

This page is used to manage inventory data, including product details, categories, prices, and stock levels. It provides search and filter features, stock alerts, and options to add, update, or delete items for efficient inventory control.

### 3.2.6 Sales Report Page (Owner)

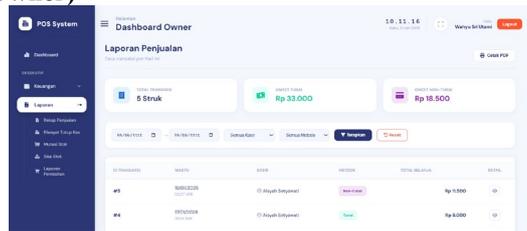


Figure 14. Sales Report Page

The sales report page presents detailed transaction data for a selected period, including transaction totals, cash and non-cash revenue, and complete sales records. Filtering features by date, cashier, and payment method support efficient data analysis.

## 3.3 System Testing

### 3.3.1 Blackbox Testing

Black box testing was conducted to ensure that each core function of the system operates according to the specified requirements. The testing focused on user interaction without examining the internal program code. Based on the testing results, all main features functioned properly and produced outputs consistent with expected results.

Table 1. Black Box Testing Results

No	Feature	Test Scenario	Expected Result	Test Result
1	Login	User enters valid username and password	System grants access and redirects user to the dashboard based on assigned role	Valid
2	Cash Transaction	Cashier adds items and selects cash payment	System calculates total amount, change, and records the transaction	Valid
3	Non-Cash Transaction	Cashier selects QRIS or bank transfer as payment method	System displays payment details and records the transaction successfully	Valid
4	Cash Closing	Cashier inputs physical cash balance at the end of shift	System compares physical balance with system balance and displays discrepancy status	Valid
5	Stock Purchase	Admin inputs supplier and purchase data	System increases stock quantity and updates cash balance automatically	Valid
6	User Management	Admin adds or edits user data	System saves user data and applies role-based access correctly	Valid

### 3.3.2 User Acceptance Testing (UAT)

System effectiveness was evaluated based on functional reliability through Black Box Testing and perceived usability through User Acceptance Testing (UAT). Although quantitative operational metrics

such as transaction processing time were not experimentally measured, user-based evaluation reflects practical system performance in real operational scenarios.

User Acceptance Testing (UAT) was conducted to evaluate the extent to which the developed system meets user requirements. This testing method was used to measure user satisfaction and comfort when interacting with the system and resolving operational tasks. The evaluation began by defining a weighted scoring scale, as presented in Table 2.

**Table 2. Scoring Criteria**

Scale	Description	Score	Percentage Range
SP	Very Satisfied	5	80-100%
P	Satisfied	4	60-79%
C	Fairly Satisfied	3	40-59%
TP	Dissatisfied	2	20-39%
STP	Very Dissatisfied	1	0-19%

The percentage score was calculated using the following formula:

$$P = \frac{s}{s_{max}} \times 100\%$$

Where:

P = Percentage value

s = Total score obtained (sum of frequency multiplied by the Likert score)

$s_{max}$  = Maximum possible score (highest Likert score × number of respondents)

The UAT questionnaire consisted of 10 questions:

- a. Q1: How satisfied are you with the overall ease of use of the system?
- b. Q2: How satisfied are you with the interface design and menu layout of the system?
- c. Q3: How satisfied are you with the login process and role-based access control of the system?
- d. Q4: How satisfied are you with the ease of conducting sales transactions?
- e. Q5: How satisfied are you with the system’s ability to reduce recording errors compared to manual methods?
- f. Q6: How satisfied are you with the clarity of transaction information displayed by the system?
- g. Q7: How satisfied are you with the cash closing feature in reconciling system balance and physical cash?
- h. Q8: How satisfied are you with the ease of monitoring and managing stock?
- i. Q9: How satisfied are you with the clarity and completeness of the generated reports?
- j. Q10: How satisfied are you with the purchase management feature?

User Acceptance Testing (UAT) was conducted involving 15 respondents, consisting of 3 participants from the store and 12 external participants. Prior to testing, respondents were given a brief system introduction session to ensure familiarity with the interface and functions. This step was necessary considering varying levels of digital literacy among MSME users and to reduce potential resistance to technological adoption. This evaluation aimed to determine the feasibility level of the developed system before its full implementation.

**Table 3. Table User Acceptance Testing**

No	Questions	Rating					Score	Presentase
		STP	TP	C	P	SP		
1	Q1	0	0	3	4	8	65	86%
2	Q2	0	0	3	5	7	64	85%
3	Q3	0	0	0	10	5	65	86%
4	Q4	0	0	3	7	5	62	82%
5	Q5	0	0	1	9	5	64	85%
6	Q6	0	0	1	10	4	63	84%
7	Q7	0	0	4	5	6	62	82%
8	Q8	0	0	2	5	8	66	88%
9	Q9	0	0	2	7	6	64	85%
10	Q10	0	0	4	6	5	61	81%

The overall UAT percentage was calculated as 
$$\frac{86\%+85\%+86\%+82\%+85\%+84\%+82\%+88\%+85\%+81\%}{10} = 84,4\%$$
 Based on the predefined scoring criteria, this result falls into the “Very Satisfied” category, indicating that the system is well accepted by users.

## 4 Conclusion

Based on the results of the system design and implementation, it can be concluded that the web-based Point of Sale system is able to support sales transaction recording, inventory management, and sales reporting at Toko Sumber Rejeki Karangbener Kudus. The system provides structured workflows through role-based access for cashiers, administrators, and owners, allowing each user to perform tasks according to their responsibilities. By digitizing transaction and inventory data, the system helps minimize manual recording errors, simplifies stock monitoring, and improves the availability of sales information. Although the system was developed for a specific retail store, its modular architecture allows further customization and implementation in other MSMEs with similar operational characteristics. The use of widely supported web technologies also facilitates long-term maintenance and scalability. Therefore, the developed POS system can be utilized as an effective tool to support daily operational activities in MSMEs. From an academic perspective, this study contributes to the discourse on MSME digital transformation by demonstrating the integration of operational automation and internal control mechanisms within a structured system development framework. It provides empirical evidence on usability-based evaluation in micro-scale retail environments.

## 5 Acknowledgments

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