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# DEVELOPMENT AND USABILITY EVALUATION OF A WEB-BASED SALES AND INVENTORY MANAGEMENT INFORMATION SYSTEM FOR MSMES USING RAPID APPLICATION DEVELOPMENT

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***ABSTRACT***

*Micro, Small, and Medium Enterprises (MSMEs) commonly face operational challenges in managing sales transactions and inventory records because of manual recording, non-integrated data, stock discrepancies, and delayed report preparation. This study aims to develop a web-based sales and inventory management information system for MSMEs using the Rapid Application Development (RAD) method and to evaluate its usability using the System Usability Scale (SUS). The RAD method was implemented through requirements planning, user design, rapid construction, and cutover stages, enabling iterative refinement based on user needs and feedback. The developed system includes dashboard monitoring, product management, customer and supplier management, sales and purchase transactions, automatic stock updates, inventory monitoring, low-stock detection, report generation, and user access management. System functionality was evaluated using black-box testing involving 20 test scenarios. The results showed that all tested functions were valid, resulting in a functional validity score of 100%. Usability evaluation was conducted using SUS with 15 respondents. The average SUS score was 85.33, indicating that the system was acceptable and had good usability. These findings show that the developed system can support MSMEs in improving transaction recording, inventory accuracy, stock monitoring, and report preparation. Therefore, integrating RAD-based development and SUS-based evaluation can produce a functional and usable information system for MSME sales and inventory management.*

***Keywords:*** *Sales and inventory management, MSMEs, web-based information system, Rapid Application Development, System Usability Scale.*

## INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play an important role in economic development because they contribute to employment creation, local business growth, and community-based economic activities. However, many MSMEs still face operational limitations in managing daily business processes, particularly in sales recording, inventory monitoring, and report preparation. In many small businesses, sales and stock data are still recorded manually or through non-integrated tools such as

notebooks and spreadsheets. This condition may lead to data duplication, recording errors, delayed reporting, stock discrepancies, and difficulties in obtaining real-time business information. Recent empirical evidence also shows that SMEs still face challenges in inventory control, systematic recording, and digital information management, especially when business data are managed using manual or non-integrated tools (Alam et al., 2024; Nazaruddin et al., 2024).

Sales and inventory management are two closely related business processes. Every sales transaction directly affects stock quantity, while inventory availability influences the ability of a business to fulfill customer demand. Poor inventory management may cause stock discrepancies, stockouts, excessive inventory, and inaccurate business reports. For SMEs, effective inventory management is essential because inventory represents a significant operational resource and directly affects business efficiency, customer service, competitiveness, and financial performance (Akindipe, 2014; Alam et al., 2024; Atnafu & Balda, 2018; Rajeev, 2008). Therefore, an integrated information system is needed to ensure that sales transactions and inventory data are recorded consistently and accurately.

The use of information systems can help MSMEs improve the efficiency and reliability of business operations. A web-based information system offers several advantages for MSMEs, including accessibility through web browsers, centralized data management, easier maintenance, and the ability to support multiple users with different access rights. Compared with manual records, spreadsheets, or separate transaction applications, the proposed system offers a more integrated solution because it connects sales transactions, purchase transactions, product data, stock movement records, low-stock detection, role-based access management, and report generation within a single web-based platform. Through this system, every sales transaction can automatically reduce product stock, every purchase transaction can automatically increase stock quantity, and business owners can monitor inventory and sales reports more efficiently. This is important because timely and accurate information can support business decision-making and reduce dependence on manual records.

Despite the potential benefits of information systems, MSMEs often require solutions that are simple, affordable, and aligned with their actual business processes. Complex enterprise systems may not be suitable for small businesses because they require high implementation costs, advanced technical skills, and significant organizational adjustment. Therefore, system development for MSMEs should consider ease of use, functional relevance, flexibility, and user acceptance. In this context, user involvement becomes an important factor in ensuring that the developed system reflects actual operational needs. User participation in software development can improve requirement accuracy, reduce misunderstanding between developers and users, and increase user satisfaction with the final system (Bano et al., 2017).

This study uses Rapid Application Development (RAD) as the system development method. RAD is considered appropriate because it emphasizes rapid prototyping, iterative development, and continuous user feedback. Unlike traditional linear development

models, RAD allows users to evaluate early prototypes and provide feedback before the system is finalized. This approach is suitable for MSMEs because their business processes are often informal, dynamic, and not fully documented. Previous research has shown that RAD is associated with accelerated information system development, intensive user involvement, and prototype-based refinement (Beynon-Davies et al., 1999). Therefore, RAD can support the development of a sales and inventory management system that is more responsive to user needs.

From a research perspective, this study is positioned within the design science research paradigm. Design science research in information systems emphasizes the development and evaluation of artifacts intended to solve practical problems in an organizational context (Hevner et al., 2004). In addition, design science research provides a structured process for identifying problems, defining solution objectives, designing and developing artifacts, demonstrating their use, evaluating their performance, and communicating the results (Peffers et al., 2007). This paradigm is relevant because the main output of this study is a functional information system artifact designed to improve sales and inventory management in MSMEs.

In addition to functional development, system usability is an important aspect that must be evaluated. A system that is functionally complete may still fail to support users if it is difficult to learn, confusing to operate, or inconsistent with user expectations. Usability evaluation is especially important for MSMEs because users may have different levels of digital literacy and limited experience with information systems. Therefore, the developed system must not only process sales and inventory data correctly, but also provide a user interface that is easy to understand and efficient to use.

This study evaluates system usability using the System Usability Scale (SUS). SUS is a widely used usability evaluation instrument consisting of ten statements measured using a five-point Likert scale. It produces a usability score ranging from 0 to 100 and can be used to assess users' perceived usability after interacting with a system (Bangor et al., 2008; Lewis, 2018). SUS is suitable for this study because it is practical, easy to administer, and applicable to various types of interactive systems. In the context of MSMEs, SUS can provide a quantitative measure of whether the developed sales and inventory management system is acceptable from the users' perspective.

Several previous studies have discussed the development of sales systems, inventory systems, and web-based business applications. However, many studies focus primarily on system implementation and functional testing, while usability evaluation is often treated as a secondary component. In addition, previous systems are often presented as separate transaction or inventory applications without clearly explaining the integration between sales transaction processing, purchase recording, automatic stock updates, inventory monitoring, low-stock detection, role-based access, and usability measurement in a unified research framework. Therefore, the novelty of this study lies in the development of an integrated web-based sales and inventory management information system for MSMEs by combining RAD-based iterative development and SUS-based usability evaluation. Unlike previous studies that mainly emphasize implementation or

functional testing, this study combines integrated sales and inventory automation, black-box functional validation, and quantitative usability evaluation in one research framework.

The success of an information system is not only determined by its technical functions, but also by system quality, information quality, user satisfaction, and perceived benefits (DeLone & McLean, 2003). In addition, users' perceived usefulness and perceived ease of use influence the acceptance of information technology (Davis, 1989). Therefore, the main contribution of this study is the development of an integrated web-based information system that supports sales recording, purchase recording, product management, automatic stock updates, low-stock monitoring, role-based access management, and report generation for MSMEs. The study also contributes methodologically by combining RAD-based development with SUS-based usability evaluation. This combination ensures that the system is not only developed based on user needs but also evaluated from the perspective of user experience.

Based on the background described above, this study aims to develop a web-based sales and inventory management information system for MSMEs using the Rapid Application Development method and to evaluate its usability using the System Usability Scale. The research focuses on two main questions: first, how can a web-based sales and inventory management information system be developed to support MSME operations; and second, how usable is the developed system based on user evaluation using SUS? Practically, the developed system is expected to help MSME owners and staff reduce manual recording errors, improve inventory accuracy, monitor low-stock products, accelerate report preparation, and support operational decision-making through more accurate, integrated, and accessible business information.

## RESEARCH METHOD

### Research Design

This study adopted an applied research design using a design science orientation. The main objective was to develop and evaluate an information system artifact in the form of a web-based sales and inventory management system for Micro, Small, and Medium Enterprises (MSMEs). Design science research is appropriate for information system studies because it emphasizes the construction, implementation, and evaluation of artifacts designed to solve real organizational problems (Hevner et al., 2004; Peffers et al., 2007).

The development method used in this study was Rapid Application Development (RAD). RAD was selected because it supports iterative system development, rapid prototyping, active user involvement, and continuous refinement based on feedback. Compared with linear development models such as the waterfall model, RAD is more suitable for this study because the system requirements of MSMEs are often dynamic, informal, and not fully documented at the beginning of development. RAD allows users to evaluate early prototypes, provide feedback, and validate functional requirements before final implementation. This approach is also more appropriate for a relatively

focused business application because it enables faster development while maintaining user participation throughout the process. Previous research has shown that RAD is associated with accelerated system development, prototype-based design, and intensive user participation (Beynon-Davies et al., 1999). User involvement is also important in software development because it can improve requirement accuracy, user satisfaction, and system acceptance (Bano et al., 2017).

The usability of the developed system was evaluated using the System Usability Scale (SUS). SUS was selected because it is a standardized, practical, and widely used instrument for measuring users' perceived usability after interacting with an information system. The instrument consists of ten statements measured using a five-point Likert scale and produces a usability score ranging from 0 to 100 (Bangor et al., 2008; Lewis, 2018). SUS is appropriate for this study because it can be applied to various types of interactive systems and remains useful for usability evaluation involving a relatively small number of respondents (Orfanou et al., 2015). Therefore, SUS was used to determine whether the developed web-based sales and inventory management system was acceptable and usable from the perspective of MSME users. The overall research framework is presented in Figure 1.


Figure 1. Research framework of the web-based sales and inventory management information system for MSMEs

**Research Object and Context**

The object of this study was the sales and inventory management process in MSMEs. The system was designed to support product data management, sales transactions, purchase transactions, stock monitoring, stock movement history, and business report generation. In many MSMEs, these activities are still performed manually or using non-integrated tools such as notebooks, spreadsheets, or separate transaction records.

The main problem identified in the existing process was the lack of integration between sales transactions and inventory records. Sales data were often not automatically connected to stock data, causing inconsistencies between recorded stock and actual stock. In addition, business owners experienced difficulties in preparing sales reports, monitoring low-stock products, identifying fast-moving items, and evaluating business performance in real time.

Inventory management is a critical activity for small and medium enterprises because inaccurate stock control may cause stockouts, excessive inventory, inefficient resource use, and reduced operational performance (Akindipe, 2014; Alam et al., 2024; Atnafu & Balda, 2018; Rajeev, 2008). Therefore, a web-based sales and inventory management system is expected to improve transaction accuracy, stock control, report accessibility, and decision-making support for MSMEs.

**Research Stages**

The research was conducted through six main stages: preliminary study, requirement analysis, system design, RAD-based development, system testing, and usability evaluation. The preliminary study was conducted to identify current problems in sales and inventory management. Requirement analysis was conducted to define functional and non-functional requirements. System design was conducted to model the proposed system architecture, database structure, user interaction, and transaction workflow.

The development stage followed the RAD model, which consists of requirements planning, user design, rapid construction, and cutover. After development, the system was tested using black-box testing to ensure that each feature produced the expected output. Finally, usability evaluation was conducted using the SUS questionnaire after users interacted directly with the system. The RAD stages used in this study are presented in Figure 2.

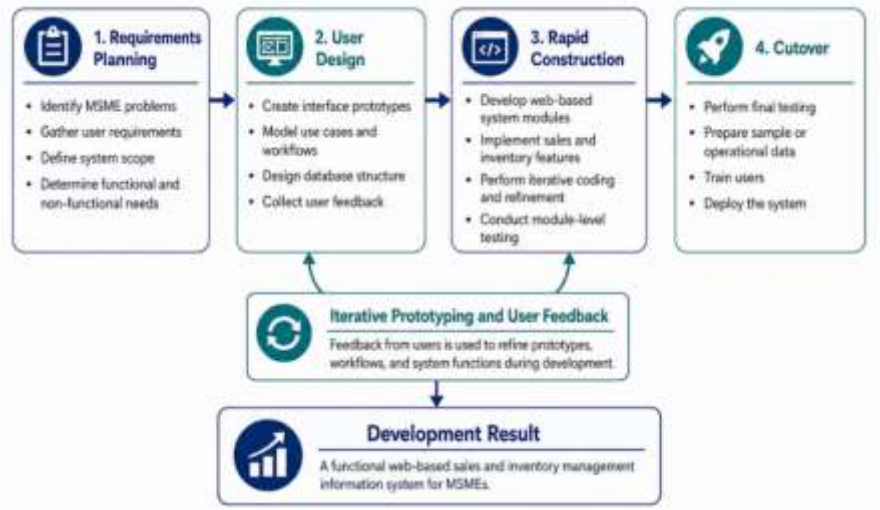


Figure 2. Rapid Application Development stages used in the development of the web-based sales and inventory management system

**Data Collection Techniques**

Data were collected through observation, interviews, document analysis, system testing, and questionnaires. Observation was used to understand the actual business process, especially how sales transactions were recorded, how stock was updated, and how reports were generated. Interviews were conducted with MSME owners or operational staff to identify user needs, business constraints, expected features, and operational problems.

Document analysis was conducted by examining existing business records, such as product lists, sales notes, purchase records, inventory records, supplier data, and sales reports. This analysis was used to design the database structure and define the relationship between sales, purchases, and inventory data.

Questionnaires were used during the usability evaluation stage to collect users' perceived usability after interacting with the developed system. The evaluation involved 15 respondents representing the main system users, including MSME owners, cashiers or sales administrators, inventory administrators, and system administrators. The respondents were selected purposively because they were directly involved in sales recording, inventory management, report preparation, or system administration activities. Before completing the questionnaire, respondents were asked to perform several system usage scenarios, including logging into the system, adding product data, recording sales transactions, recording purchase transactions, checking inventory, viewing low-stock items, and generating sales reports. The questionnaire instrument was based on the standard System Usability Scale (SUS), which consists of ten items with alternating positive and negative statements. Before data collection, the questionnaire was reviewed to ensure item clarity, relevance, and suitability to the context of MSME sales and inventory management. This review aimed to ensure that each statement could be clearly understood by respondents and that the instrument was appropriate for measuring perceived usability after users interacted with the developed system.

**System Design**

The system was designed as a web-based application consisting of a presentation layer, an application logic layer, and a database layer. The presentation layer provides the user interface that allows users to access system features through a web browser. The application logic layer handles transaction processing, data validation, authentication, stock calculation, and report generation. The database layer stores user data, product data, transaction data, inventory data, and report data. The proposed system architecture is presented in Figure 3.

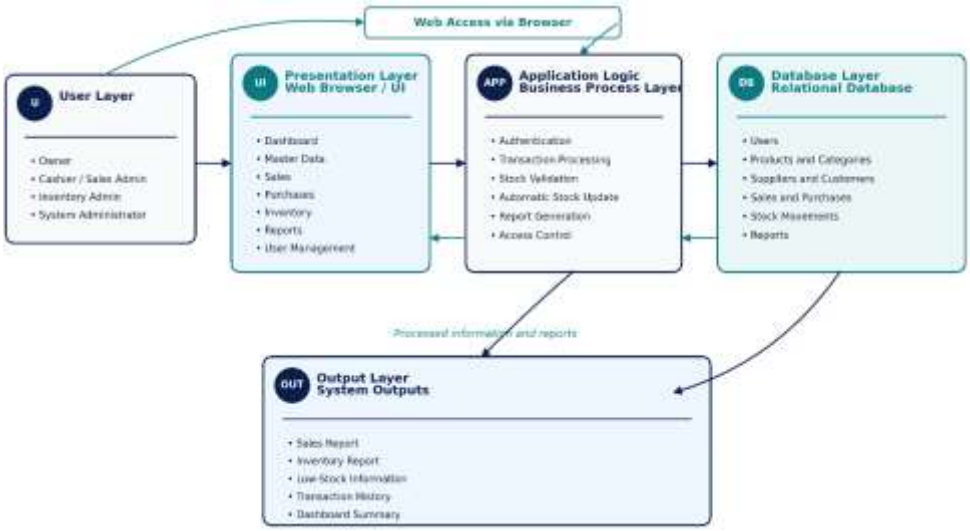


Figure 3. Proposed architecture of the web-based sales and inventory management information system

The main users of the system consisted of the owner, cashier or sales administrator, inventory administrator, and system administrator. The owner can access dashboard summaries and business reports. The cashier or sales administrator can record sales transactions. The inventory administrator can manage product data, purchase data, and stock adjustments. The system administrator can manage users and access rights. The interaction between users and system features is presented in Figure 4.

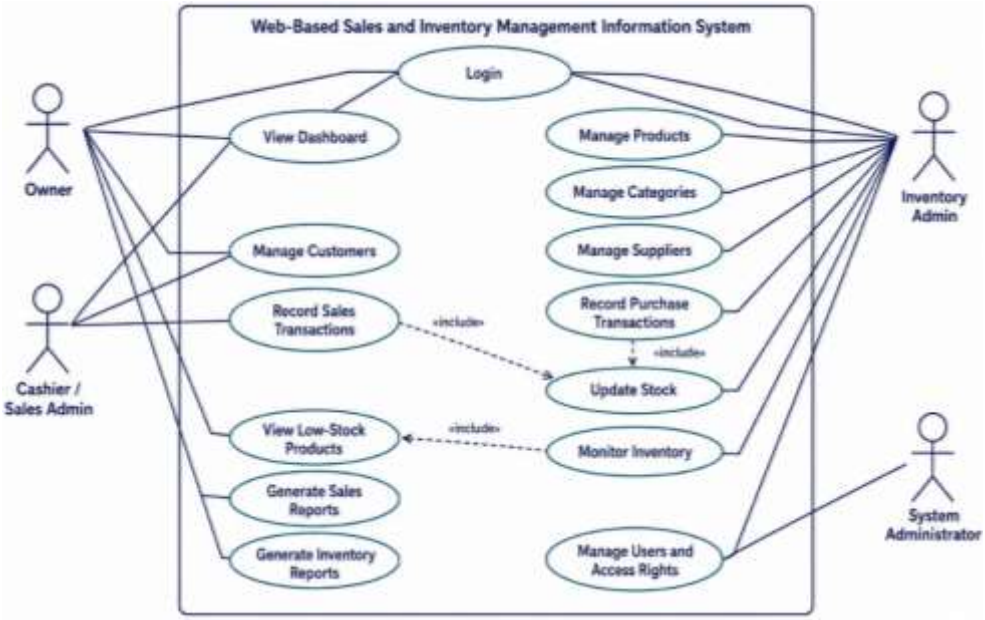


Figure 4. Use case diagram of the web-based sales and inventory management information system

The database design consisted of several main entities, including users, products, categories, suppliers, customers, sales, sales details, purchases, purchase details, stock movements, and stock adjustments. The relationship between sales and inventory was designed to ensure that every sales transaction automatically reduces product stock, while every purchase transaction automatically increases product stock. The database relationship design is presented in Figure 5.

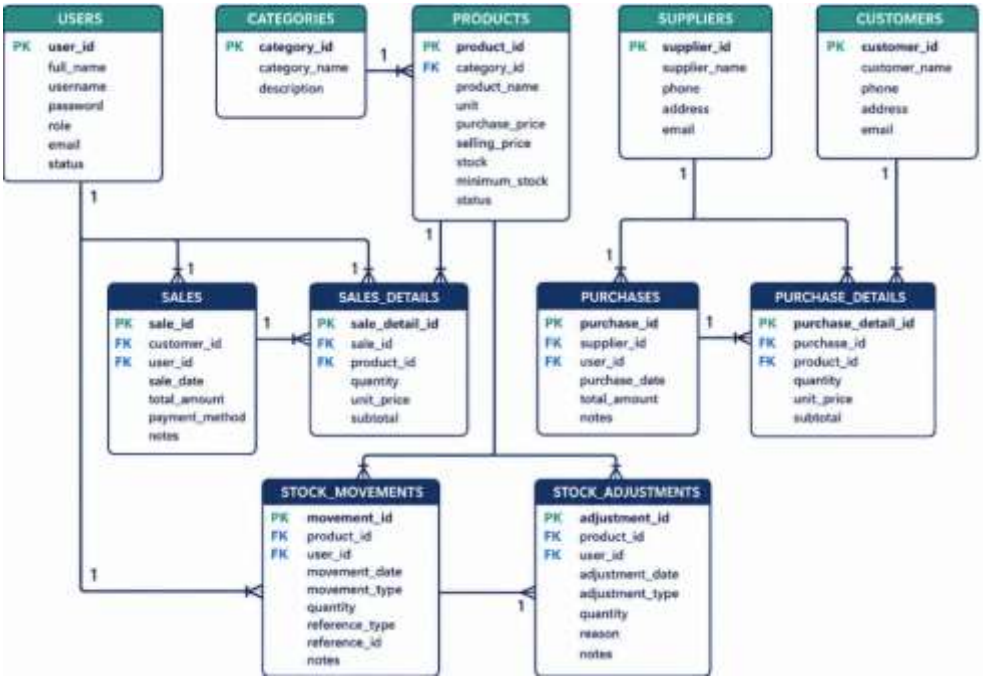


Figure 5. Entity relationship diagram of the proposed sales and inventory management database

**Rapid Application Development Procedure**

**Requirements Planning**

The requirements planning phase aimed to identify system problems, user needs, business rules, and system scope. At this stage, the existing sales and inventory process was analyzed to identify weaknesses such as duplicate recording, delayed reporting, stock discrepancies, and the absence of automatic stock updates after sales transactions.

The functional requirements of the system included user authentication, product data management, category management, supplier management, customer management, sales transaction processing, purchase transaction processing, stock movement recording, low-stock monitoring, report generation, and user access control.

The non-functional requirements included usability, data accuracy, security, accessibility, browser compatibility, database integrity, and maintainability. Since the system was intended for MSME users, the interface was designed to be simple, consistent, and easy to learn.

**User Design**

The user design phase focused on designing system models and interface prototypes. The models included use case diagrams, activity diagrams, database design, and interface layouts. User involvement was emphasized in this phase to ensure that the proposed design matched real business needs. Active user participation in system development is important because it helps developers understand actual work practices and reduces the gap between user expectations and system implementation (Bano et al., 2017).

The interface prototype was designed with a simple navigation structure. The main menus consisted of dashboard, master data, sales, purchases, inventory, reports, and user management. The dashboard displayed essential business information such as total sales, number of products, low-stock products, recent transactions, and inventory summary.

**Rapid Construction**

The rapid construction phase involved the implementation of the system based on the approved design. The system was developed as a web-based application to support daily transaction recording and inventory monitoring. The sales module was designed as the core module because sales transactions directly affect stock quantity.

In the sales module, users can select products, enter quantities, calculate transaction totals, save sales data, and generate transaction records. Before a transaction is saved, the system validates product availability and stock sufficiency. If the available stock is insufficient, the system displays a warning and prevents the transaction from being completed. The sales transaction and automatic stock update workflow is presented in Figure 6.

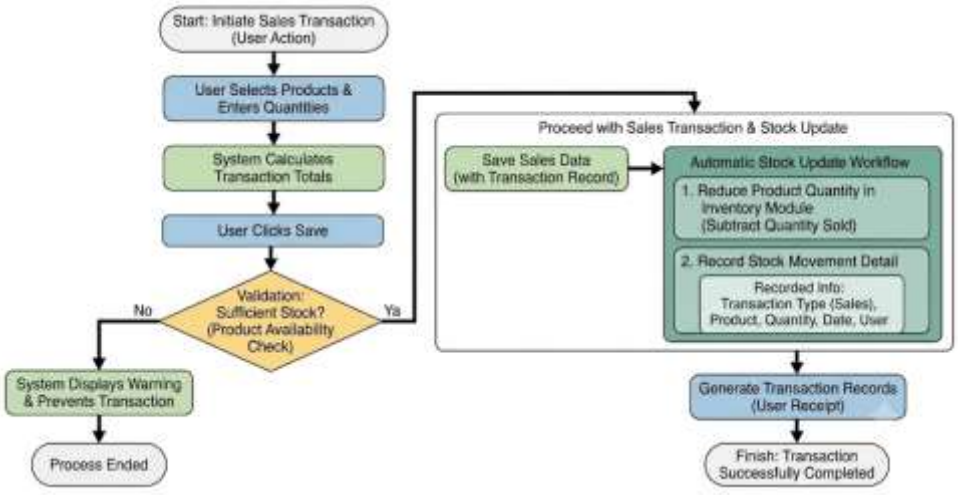


Figure 6. Sales transaction and automatic stock update workflow in the proposed system

The inventory module records all stock changes caused by sales, purchases, and manual adjustments. Every stock movement is stored with information about transaction

type, product, quantity, date, and user. This feature improves traceability because users can identify the source of each stock change.

**Cutover**

The cutover phase consisted of final testing, sample data preparation, user training, and system implementation. Before the system was implemented, sample product data, supplier data, customer data, and transaction data were entered into the system to ensure that all modules worked properly.

User training was conducted to introduce the main features of the system, including product management, sales recording, purchase recording, inventory monitoring, and report generation. User feedback during this phase was used to improve menu labels, validation messages, report formats, and interface consistency.

**System Testing**

Black-box testing was used to evaluate whether each system function produced outputs consistent with predefined requirements without examining the internal source code. This testing approach is suitable for validating system functionality from the input-output perspective (Alshamaa & Saleem, 2025). The tested modules included login, product management, supplier management, customer management, sales transactions, purchase transactions, stock updates, inventory reports, sales reports, and user access control.

Each test scenario consisted of input data, expected output, actual output, and test status. A function was considered valid if the actual output matched the expected output. For example, in the sales transaction module, the system was tested to ensure that product stock decreased automatically after a sales transaction was saved. The system was also tested to ensure that transactions could not be processed when the requested quantity exceeded available stock.

**Usability Evaluation Using System Usability Scale**

Usability evaluation was conducted using the System Usability Scale. SUS was used because it provides a practical and standardized method for evaluating users' perceived usability after interacting with a system. SUS consists of ten statements with alternating positive and negative wording, rated using a five-point Likert scale (Bangor et al., 2008; Lewis, 2018).

Before completing the SUS questionnaire, respondents were asked to perform several task scenarios. These scenarios included logging into the system, adding product data, recording sales transactions, checking inventory, viewing low-stock products, and generating sales reports. This procedure ensured that the usability evaluation was based on actual user interaction with the system. The SUS-based usability evaluation procedure is presented in Figure 7.

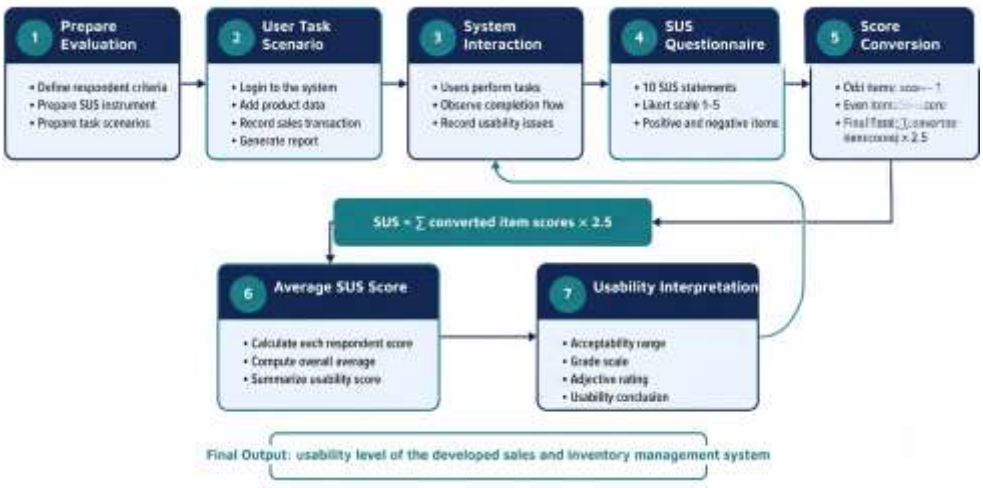


Figure 7. SUS-based usability evaluation procedure for the web-based sales and inventory management system

The SUS score was calculated using the standard scoring procedure. For odd-numbered items, the score contribution was calculated by subtracting 1 from the user's response. For even-numbered items, the score contribution was calculated by subtracting the user's response from 5. The total converted score was then multiplied by 2.5 to obtain the SUS score.

The formula for odd-numbered items is:

$$S_i = X_i - 1$$

The formula for even-numbered items is:

$$S_i = 5 - X_i$$

The final SUS score for each respondent is:

$$SUS = \left( \sum_{i=1}^{10} S_i \right) \times 2.5$$

where $(X_i)$ represents the respondent's score for item $(i)$, and $(S_i)$ represents the converted score for item (i). The average SUS score was calculated by dividing the total SUS score by the number of respondents:

$$\overline{SUS} = \frac{\sum_{j=1}^{n} SUS_j}{n}$$

The final SUS score was interpreted using usability acceptability and adjective rating categories. A higher SUS score indicates better perceived usability. Previous studies have shown that SUS can be used across various interactive systems and is useful for interpreting perceived usability in a simple numerical form (Bangor et al., 2008; Kortum & Bangor, 2013; Orfanou et al., 2015).

### Data Analysis

The data analysis consisted of qualitative and quantitative analysis. Qualitative analysis was used to interpret observation results, interview findings, user feedback, and system improvement notes during the RAD process. The qualitative findings were grouped into business problems, user requirements, system features, interface improvements, and operational constraints.

Quantitative analysis was used to analyze the SUS questionnaire results. Each respondent's answers were converted into SUS scores using the standard SUS formula. The average SUS score was then interpreted to determine the usability level of the developed system. In addition, the results of black-box testing were analyzed descriptively by comparing expected outputs and actual outputs.

### Research Validity

Several strategies were applied to improve the validity of the research process. First, requirement validation was conducted by involving users during requirements planning and user design. Second, functional validation was conducted through black-box testing. Third, usability validation was conducted using SUS after users directly interacted with the system. Fourth, data validation was implemented through input validation, transaction validation, relational database constraints, and stock movement records.

These validation strategies were used to ensure that the developed system was not only technically functional but also aligned with the operational needs of MSMEs.

## RESULTS AND DISCUSSION

### Result

### Results of System Development

The main result of this study is a web-based sales and inventory management information system designed to support MSME business operations. The system was developed using the Rapid Application Development (RAD) approach, which enabled iterative refinement based on user needs and feedback. The developed system consists of several main modules, including dashboard, master data management, sales transaction, purchase transaction, inventory monitoring, stock movement recording, report generation, and user management.

The system was designed to integrate sales and inventory processes. In the previous manual or semi-manual process, sales records and stock records were often managed separately, which increased the possibility of data inconsistency. In the developed system, every sales transaction automatically reduces product stock, while every purchase transaction automatically increases stock quantity. This mechanism helps users maintain more accurate inventory data and reduces the need for repeated manual stock calculations.

The overall research framework, RAD development process, system architecture, use case diagram, database design, and usability evaluation procedure are presented in Figures 1 to 7. These figures show how the system was developed, how users interact

with the system, how data are organized, and how usability evaluation was conducted. The main modules of the developed system are summarized in Table 1.

Table 1. Main modules of the developed system

| No. | Module | Main Function | User |
|---|---|---|---|
| 1 | Login | Authenticates users before accessing the system | All users |
| 2 | Dashboard | Displays sales summary, inventory summary, and low-stock information | Owner, admin |
| 3 | Product Management | Manages product data, categories, prices, stock, and minimum stock | Inventory admin |
| 4 | Supplier Management | Manages supplier data used in purchase transactions | Inventory admin |
| 5 | Customer Management | Manages customer data used in sales transactions | Cashier, sales admin |
| 6 | Sales Transaction | Records sales transactions and automatically updates stock | Cashier, sales admin |
| 7 | Purchase Transaction | Records purchase transactions and automatically updates stock | Inventory admin |
| 8 | Inventory Monitoring | Displays current stock, stock history, and low-stock products | Owner, inventory admin |
| 9 | Report Generation | Generates sales, purchase, and inventory reports | Owner, admin |
| 10 | User Management | Manages users, roles, and access rights | System administrator |

**System Interface Results**

The system interface was designed to be simple, structured, and easy to understand because the target users are MSME actors with different levels of digital literacy. The interface design emphasizes clear navigation, consistent menu placement, readable data presentation, and direct access to the main business functions. The main interface views of the developed web-based sales and inventory management information system are presented in Figure 8.

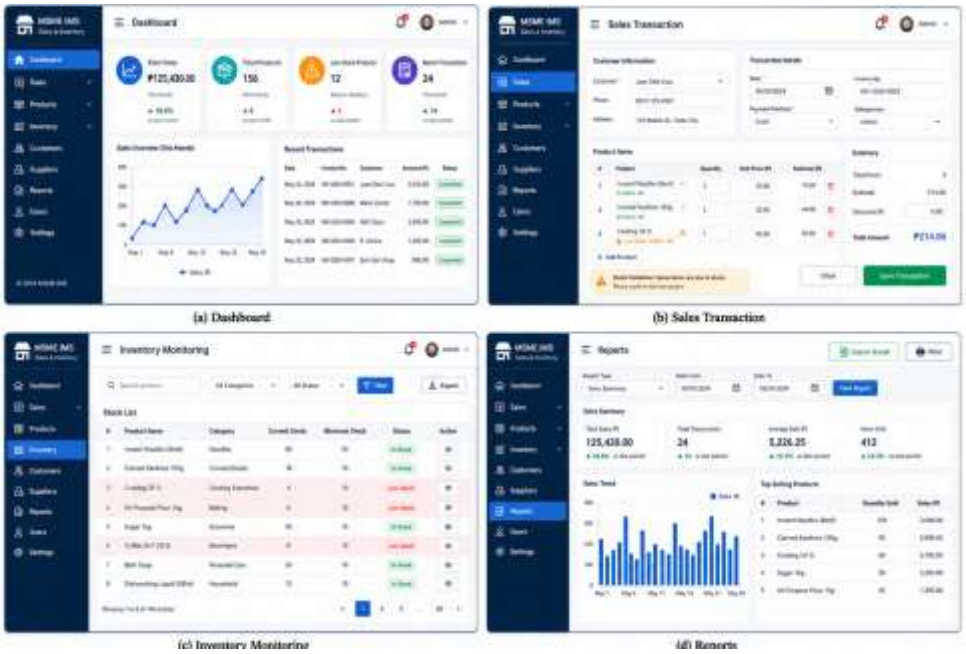


Figure 8. Combined interface views of the web-based sales and inventory management information system

As shown in Figure 8(a), the dashboard page serves as the main information center of the system. This page displays important business summaries, including total sales, total products, low-stock products, and recent transactions. In addition, the dashboard provides a sales overview chart and a recent transaction table to help business owners monitor operational conditions quickly. Through this interface, users do not need to manually check separate transaction records because the main business information is presented in one integrated page.

Figure 8(b) shows the sales transaction interface. This interface was developed to support daily sales recording activities. Users can select customer data, input transaction details, choose products, enter quantities, calculate subtotals, and save transactions. The system also provides stock validation before the transaction is stored. If the selected product has low stock or the requested quantity exceeds the available stock, the system displays a warning message. This feature is important to reduce transaction errors, prevent negative stock, and ensure that sales records are directly connected to inventory data.

Figure 8(c) presents the inventory monitoring interface. This page displays product stock information in a structured table consisting of product name, category, current stock, minimum stock, and stock status. Products with stock below the minimum threshold are marked as low-stock items, making them easier to identify. The interface also provides search, filter, and export features to help users monitor inventory conditions more efficiently. This feature supports inventory administrators in identifying products that require restocking.

Figure 8(d) shows the report interface. This module allows users to generate business reports based on selected report types and date periods. The report page provides sales summaries, transaction totals, average sales, items sold, sales trends, and top-selling

products. This information can support MSME owners in evaluating sales performance, monitoring product movement, and making operational decisions. The availability of real-time reports is expected to reduce delays in business evaluation and improve the accuracy of decision-making.

Overall, the interface results indicate that the developed system provides the main features required for MSME sales and inventory management. The dashboard supports business monitoring, the sales transaction interface supports transaction recording and stock validation, the inventory monitoring interface supports stock control, and the report interface supports business analysis. Therefore, the system interface is expected to improve operational efficiency and reduce dependence on manual records.

**Database Design Results**

The database was designed using a relational database model. The main entities include users, categories, products, suppliers, customers, sales, sales details, purchases, purchase details, stock movements, and stock adjustments. The entity relationship diagram is presented in Figure 5.

The products table is connected to categories, sales details, purchase details, stock movements, and stock adjustments. This structure enables the system to track each product across sales, purchases, and inventory changes. The sales table is connected to customers and users, while the sales details table records the products included in each sales transaction. Similarly, the purchases table is connected to suppliers and users, while the purchase details table records the purchased products.

The stock movements table plays an important role in inventory traceability. Every change in stock quantity is recorded with movement type, quantity, date, user, and reference information. This design allows users to identify whether stock changes originate from sales transactions, purchase transactions, or manual adjustments. Therefore, the database design supports not only transaction recording but also inventory accountability.

**Black-Box Testing Results**

Black-box testing was conducted to evaluate whether each system function produced outputs consistent with the predefined requirements. This testing focused on the input-process-output behavior of the system without examining the internal source code. The tested modules included login, dashboard, product management, customer management, supplier management, sales transactions, purchase transactions, inventory monitoring, report generation, and user management. The detailed results of the black-box testing are presented in Table 2.

Table 2. Black-box testing results

| No. | Tested Module | Test Scenario | Expected Result | Actual Result | Status |
|---|---|---|---|---|---|
| 1 | Login | User enters valid username and password | System displays dashboard page | Dashboard page was displayed | Valid |
| 2 | Login | User enters invalid username or password | System displays error notification | Error notification was displayed | Valid |
| 3 | Dashboard | User opens dashboard page | System displays sales summary, inventory summary, and low-stock information | Dashboard summary was displayed correctly | Valid |
| 4 | Product Management | Admin adds new product data | Product data are stored in the database | Product data were stored successfully | Valid |
| 5 | Product Management | Admin edits existing product data | Product data are updated in the database | Product data were updated successfully | Valid |
| 6 | Product Management | Admin deletes inactive product data | Product status is changed or product data are removed | Product data were processed successfully | Valid |
| 7 | Category Management | Admin adds product category | Category data are stored in the database | Category data were stored successfully | Valid |
| 8 | Supplier Management | Admin adds supplier data | Supplier data are stored in the database | Supplier data were stored successfully | Valid |
| 9 | Customer Management | Cashier adds customer data | Customer data are stored in the database | Customer data were stored successfully | Valid |
| 10 | Sales Transaction | User records sales with sufficient stock | Transaction is saved and stock decreases automatically | Transaction was saved and stock decreased | Valid |
| 11 | Sales Transaction | User records sales exceeding available stock | System rejects transaction and displays stock warning | Transaction was rejected and warning was displayed | Valid |
| 12 | Purchase Transaction | User records purchase transaction | Transaction is saved and stock increases automatically | Transaction was saved and stock increased | Valid |
| 13 | Inventory Monitoring | User opens inventory page | System displays current stock data | Current stock data were displayed | Valid |
| 14 | Low-Stock Monitoring | User views low-stock products | System displays products below minimum stock | Low-stock product list was displayed | Valid |
| 15 | Stock Movement | User views stock movement history | System displays stock movement records | Stock movement records were displayed | Valid |

| | | | | | |
|---|---|---|---|---|---|
| 16 | Sales Report | User generates sales report by period | System displays sales report based on selected period | Sales report was displayed correctly | Valid |
| 17 | Inventory Report | User generates inventory report | System displays inventory report | Inventory report was displayed correctly | Valid |
| 18 | User Management | Administrator adds a new user account | User account is stored with the selected role | User account was stored successfully | Valid |
| 19 | Access Control | User accesses unauthorized menu | System restricts access based on user role | Unauthorized access was restricted | Valid |
| 20 | Logout | User clicks logout button | System ends session and returns to login page | User returned to login page | Valid |

Based on Table 2, all 20 test scenarios were categorized as valid. This indicates that the main system features functioned according to the expected requirements. To strengthen the interpretation of the black-box testing results, several quantitative functional performance indicators were calculated from the testing results. The quantitative summary of the black-box testing results is presented in Table 3.

Table 3. Quantitative summary of black-box testing results

| No. | Indicator | Result |
|---|---|---|
| 1 | Number of tested modules | 10 modules |
| 2 | Number of test scenarios | 20 scenarios |
| 3 | Valid test scenarios | 20 scenarios |
| 4 | Failed test scenarios | 0 scenarios |
| 5 | Functional validity score | 100% |
| 6 | Failure rate | 0% |
| 7 | Automatic stock update validation | Valid |
| 8 | Access control validation | Valid |

As shown in Table 3, the system was tested across 10 main modules with 20 test scenarios. All scenarios produced outputs that matched the expected results, resulting in 20 valid scenarios, 0 failed scenarios, a functional validity score of 100%, and a failure rate of 0%. These results indicate that the developed system performed consistently in processing user authentication, master data management, sales transactions, purchase transactions, automatic stock updates, inventory monitoring, report generation, and user access control. The automatic stock update feature worked properly in both sales and purchase transactions. In addition, the access control feature successfully restricted users from accessing menus outside their assigned roles. The percentage of valid test results was calculated as follows:

$$Functional\ validity = \frac{20}{20} \times 100\% = 100\%$$

The failure rate was calculated as follows:

$$Failure\ rate = \frac{0}{20} \times 100\% = 0\%$$

Thus, the developed system can be considered functionally feasible for supporting sales and inventory management activities in MSMEs.

**SUS Evaluation Results**

Usability evaluation was conducted using the System Usability Scale (SUS). The evaluation involved 15 respondents consisting of MSME owners, cashiers or sales administrators, inventory administrators, and system administrators. Before completing the questionnaire, respondents were asked to perform several task scenarios, including logging into the system, adding product data, recording sales transactions, recording purchase transactions, checking inventory, viewing low-stock items, and generating sales reports.

The SUS questionnaire consisted of ten items using a five-point Likert scale. Items 1, 3, 5, 7, and 9 were positive statements, while items 2, 4, 6, 8, and 10 were negative statements. The SUS score was calculated by converting each response and multiplying the total converted score by 2.5. The SUS questionnaire response data obtained from 15 respondents are presented in Table 4.

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Table 4. SUS questionnaire response data

| Respondent | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | SUS Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R1 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 75.0 |
| R2 | 5 | 1 | 4 | 2 | 5 | 1 | 4 | 2 | 5 | 1 | 90.0 |
| R3 | 4 | 2 | 5 | 1 | 4 | 2 | 4 | 2 | 4 | 2 | 80.0 |
| R4 | 5 | 2 | 4 | 1 | 5 | 2 | 5 | 1 | 4 | 2 | 87.5 |
| R5 | 4 | 1 | 4 | 2 | 4 | 2 | 5 | 1 | 4 | 2 | 82.5 |
| R6 | 5 | 1 | 5 | 1 | 4 | 1 | 5 | 1 | 5 | 1 | 97.5 |
| R7 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 75.0 |
| R8 | 5 | 2 | 5 | 1 | 5 | 1 | 4 | 2 | 5 | 1 | 92.5 |
| R9 | 4 | 2 | 4 | 1 | 5 | 2 | 4 | 2 | 4 | 2 | 80.0 |
| R10 | 5 | 1 | 4 | 2 | 4 | 1 | 5 | 1 | 5 | 2 | 90.0 |
| R11 | 4 | 2 | 5 | 2 | 4 | 2 | 4 | 1 | 4 | 2 | 80.0 |
| R12 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 100.0 |
| R13 | 4 | 2 | 4 | 2 | 5 | 2 | 4 | 2 | 4 | 1 | 80.0 |
| R14 | 5 | 2 | 4 | 1 | 4 | 2 | 5 | 2 | 4 | 2 | 82.5 |
| R15 | 4 | 1 | 5 | 2 | 4 | 1 | 5 | 1 | 4 | 2 | 87.5 |
| Average | | | | | | | | | | | 85.33 |

The average SUS score obtained from 15 respondents was 85.33. This score is above the commonly used acceptable usability threshold and indicates that the developed system has a good level of user-perceived usability. Based on the SUS interpretation, the score falls within the good usability category. This result indicates that users generally perceived the developed system as easy to learn, easy to operate, understandable, and suitable for supporting MSME sales and inventory management activities. To provide a

clearer interpretation of the usability level, the distribution of SUS scores is presented in Table 5.

Table 5. Distribution of SUS scores

| Score Range | Category | Number of Respondents | Percentage |
|---|---|---|---|
| < 51 | Poor / Unacceptable | 0 | 0.00% |
| 51–68 | Marginal | 0 | 0.00% |
| 68–80 | Acceptable | 4 | 26.67% |
| 80–90 | Good | 7 | 46.67% |
| > 90 | Excellent | 4 | 26.67% |
| Total | | 15 | 100.00% |

Based on Table 5, most respondents gave SUS scores above 80. A total of 7 respondents, or 46.67%, rated the system in the good category, while 4 respondents, or 26.67%, rated it in the excellent category. In addition, no respondent gave a score below the acceptable threshold. This distribution indicates that the developed system was considered usable by the majority of users and that the interface, navigation, transaction workflow, stock monitoring, and report generation features were generally easy to understand and operate.

**Discussion**

The results show that the developed web-based sales and inventory management information system is functionally feasible and usable. The black-box testing results showed that all tested modules produced outputs consistent with the expected results. This indicates that the system can perform core business functions, including product management, sales recording, purchase recording, stock updates, inventory monitoring, and report generation. This result is consistent with the principle of black-box testing, which evaluates system behavior from the input-output perspective without examining the internal source code (Alshamaa & Saleem, 2025). In addition, these findings support previous studies emphasizing that inventory management and information system support are important for SMEs because accurate stock control, systematic recording, and timely information can improve operational efficiency and business performance (Alam et al., 2024; Nazaruddin et al., 2024).

The automatic stock update feature is one of the most important functions of the system. When users record sales transactions, the system automatically decreases product stock. Conversely, when users record purchase transactions, the system automatically increases product stock. This feature reduces the possibility of manual calculation errors and helps maintain inventory accuracy. Compared with manual recording or spreadsheet-based practices, the developed system provides a more integrated transaction mechanism because sales and purchase data are directly connected to inventory records. This finding supports previous studies showing that digital platforms and information management can help SMEs automate operational processes, improve data-based decision-making,

and strengthen competitiveness in changing business environments (Nazaruddin et al., 2024).

The system also provides low-stock monitoring. This feature allows users to identify products whose stock has reached or fallen below the minimum stock level. For MSMEs, this function is important because stockouts may disrupt sales activities and reduce customer satisfaction. Through low-stock information, business owners and inventory administrators can make faster restocking decisions. This finding is in line with Alam et al. (2024), who emphasized that inventory management systems are important for SMEs to support stock control and operational continuity. In this study, low-stock monitoring extends the function of the system beyond transaction recording because it provides early information that can support preventive inventory decisions.

The report generation feature also supports business decision-making. Users can generate sales reports and inventory reports based on selected periods. This feature helps business owners monitor sales performance, evaluate product movement, and identify inventory conditions without manually compiling transaction records. Therefore, the system improves both operational efficiency and information accessibility. From the perspective of SME digitalization, this finding supports the argument that digital platforms assist SMEs in extending market reach, automating operations, improving information management, and supporting better decision-making (Nazaruddin et al., 2024).

The SUS evaluation result showed an average score of 85.33, which indicates that the system has a good level of usability and is above the acceptable usability threshold. This result suggests that the interface design, navigation structure, transaction workflow, stock monitoring, and reporting features were generally understandable and usable for the respondents. Since MSME users may have different levels of digital literacy, the high SUS score indicates that the system design is appropriate for its target users. This interpretation is supported by previous SUS studies showing that SUS can be used as a practical measure of perceived usability in information system evaluation (Bangor et al., 2008; Lewis, 2018; Yani et al., 2025). In practical terms, the SUS result implies that users can interact with the system without major usability barriers, especially when performing essential tasks such as recording sales, checking inventory, identifying low-stock products, and generating reports.

The combination of RAD and SUS was useful in this study. RAD supported the development process through iterative prototyping and user feedback, while SUS provided a quantitative measure of user perception after system interaction. Compared with previous studies that focus mainly on system implementation or functional testing, this study provides a more complete evaluation by combining functional feasibility and user-perceived usability. This approach is important because a system that works technically may still fail to support MSME users if the interface, workflow, and information presentation are difficult to understand. Therefore, the combination of RAD and SUS ensures that the system is not only developed according to user needs but also evaluated from the perspective of user experience.

The novelty of this study lies in the development and evaluation of an integrated web-based sales and inventory management information system for MSMEs by combining RAD-based iterative development and SUS-based usability evaluation in one research framework. Previous studies have often discussed sales systems, inventory systems, or usability evaluation separately. In contrast, this study integrates sales transactions, purchase transactions, automatic stock updates, low-stock detection, stock movement recording, report generation, role-based access, black-box testing, and SUS evaluation. This contribution is important because the system is not only designed as a technical artifact but also evaluated as a usable business support tool for MSME operations.

The broader implication of this study is that the developed system can support MSME digital transformation at the operational level. Digital transformation in MSMEs is not limited to adopting advanced technologies, but also includes improving daily business processes through digitization, data integration, automation, and continuous improvement. Kahveci (2025) emphasized that SME digital transformation requires digital awareness, digital strategy and roadmap, digital adoption and implementation, and continuous improvement. In this context, the developed system can become an initial digital foundation for MSMEs by helping them move from manual records to integrated digital records, from delayed reporting to faster information access, and from reactive stock checking to more proactive inventory monitoring. Therefore, the system can support MSMEs in building digital capability gradually and sustainably.

However, the results should still be interpreted carefully. Although the usability evaluation was conducted using actual responses from 15 respondents, the study was limited to MSME users involved in the developed system context. Therefore, the findings may not fully represent the usability perception of MSMEs from different business sectors, operational scales, or digital literacy levels. Future implementation should involve a larger and more diverse group of MSME users to obtain broader usability evidence and identify additional improvement needs. Future studies can also expand the evaluation by adding performance indicators such as task completion time, error rate, report generation time, transaction processing speed, and user satisfaction across different MSME sectors.

**Summary of Findings**

The results of this study indicate that the developed system successfully supports the main processes of sales and inventory management in MSMEs. Black-box testing showed that all 20 test scenarios across 10 main modules were valid, resulting in a functional validity score of 100% and a failure rate of 0%. This means that the system features worked according to the expected requirements, particularly in user authentication, product management, sales transactions, purchase transactions, automatic stock updates, inventory monitoring, report generation, and access control.

The SUS evaluation produced an average score of 85.33, indicating that the system is above the acceptable usability threshold and falls within the good usability category.

This score shows that users perceived the system as easy to learn, understandable, consistent, and suitable for supporting daily MSME operations. These findings suggest that the developed web-based sales and inventory management information system is both functionally feasible and usable for MSME users.

## CONCLUSION

This study developed a web-based sales and inventory management information system for MSMEs using the Rapid Application Development (RAD) method and evaluated its usability using the System Usability Scale (SUS). The developed system provides several main features, including dashboard monitoring, product management, customer and supplier management, sales transactions, purchase transactions, automatic stock updates, inventory monitoring, low-stock detection, report generation, and user access management. The implementation results show that the system can integrate sales and inventory processes into a single web-based platform, where every sales transaction automatically reduces product stock and every purchase transaction automatically increases stock quantity. This mechanism helps reduce manual recording errors, prevents stock discrepancies, and improves inventory data accuracy, while the reporting feature supports MSME owners in monitoring sales performance, inventory conditions, and product movement more efficiently. Black-box testing showed that all tested functions worked according to the expected requirements, with 20 test scenarios declared valid and a functional validity score of 100%, indicating that the system is functionally feasible to support sales and inventory management activities in MSMEs. The usability evaluation using SUS produced an average score of 85.33, indicating that the system falls into the acceptable category with good usability and is perceived by users as easy to use, understandable, and suitable for supporting daily MSME operations. Therefore, the combination of RAD and SUS was effective in producing a system that is both functionally appropriate and usable from the user perspective. Overall, the developed system can help MSMEs improve transaction recording, inventory control, stock monitoring, and report preparation, while reducing dependence on manual records and providing more accurate information for business decision-making. However, this study still has several limitations because the system was developed based on relatively general MSME sales and inventory processes, so further adaptation may be required for specific business sectors. Future studies can expand the system by adding barcode scanning, QR code-based product identification, multi-branch inventory management, financial reporting, mobile application integration, and more comprehensive security testing.

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