

IMPLEMENTATION OF A WEB-BASED SALES INFORMATION SYSTEM TO IMPROVE OPERATIONAL EFFICIENCY IN MICRO, SMALL, AND MEDIUM ENTERPRISES (MSMES)

Nurul Syarifa¹

¹Pendidikan Matematika, Tarbiyah dan Ilmu Keguruan, Universitas Islam Negeri Sjech M. Djamil
Djambek Bukittinggi,
Email: nurul0808199@gmail.com¹

ABSTRACT

Information and Communication Technology (ICT) has significantly influenced the digital transformation of business processes, particularly in Micro, Small, and Medium Enterprises (MSMEs). This study aims to design and implement a web-based sales information system to improve operational efficiency and data accuracy in managing sales transactions. The research employs the Waterfall model as a system development approach, which includes requirements analysis, system design, implementation, testing, and maintenance. The developed system provides features such as product management, sales transaction processing, and automated report generation that can be accessed in real-time. The results indicate that the implementation of the web-based sales information system enhances the efficiency of data processing, reduces human errors, and improves the accuracy and accessibility of sales reports. Furthermore, the system supports better decision-making by providing structured and up-to-date information. Therefore, the proposed system can be an effective solution for MSMEs in optimizing their business operations through the utilization of ICT.

Keywords: Web-based Sales Information System, Information and Communication Technology (ICT), Micro, Small and Medium Enterprises (MSMEs), Waterfall Model, System Development, Sales Management, Digital Transformation..

1 INTRODUCTION

The rapid advancement of Information and Communication Technology (ICT) has fundamentally transformed the way organizations conduct business activities in the digital era. ICT plays a crucial role in facilitating the collection, processing, storage, and dissemination of information, enabling organizations to operate more efficiently and competitively. In particular, Micro, Small, and Medium Enterprises (MSMEs) are increasingly encouraged to adopt digital technologies to improve their operational performance and sustain their growth in a highly competitive market environment.

Despite the significant benefits offered by ICT, many MSMEs still rely on conventional methods in managing their sales processes, such as manual record-keeping using notebooks or basic spreadsheet applications. These traditional approaches often result in several operational challenges, including data inconsistency, duplication of records, delays in report generation, and a high likelihood of human error. Such limitations can negatively affect business performance, especially in terms of decision-making, inventory control, and financial reporting.

The urgency of implementing a web-based sales information system is driven by the need to address these challenges and enhance operational efficiency. A web-based system provides a centralized platform that integrates various business processes, allowing users to manage product data, record transactions, and generate reports in real time. Moreover, web-based applications offer flexibility and accessibility, as they can be accessed anytime and anywhere through internet-connected devices. This capability is particularly beneficial for MSMEs that require efficient and scalable solutions without significant investment in infrastructure.

From a theoretical perspective, a sales information system is a component of a broader management information system that supports organizational decision-making by providing accurate and timely information. According to previous studies, the implementation of computerized information systems can significantly improve data accuracy, reduce processing

time, and enhance overall organizational productivity [1]. Furthermore, web-based systems have been proven to increase user satisfaction due to their ease of use, accessibility, and integration capabilities with other digital platforms [2].

In addition, the adoption of ICT in business operations is closely related to digital transformation initiatives, which aim to leverage technology to create value and improve business processes. MSMEs that successfully adopt digital systems are more likely to achieve better performance, increased competitiveness, and improved customer service. However, the successful implementation of such systems requires proper planning, design, and evaluation to ensure that the system meets user requirements and organizational needs.

Based on the problems and opportunities identified, this study proposes the design and implementation of a web-based sales information system to improve operational efficiency in MSMEs. The objectives of this study are: (1) to analyze the existing sales management processes in MSMEs, (2) to design a web-based system that addresses the identified problems, (3) to implement the system using an appropriate development method, and (4) to evaluate the effectiveness of the system in improving efficiency and accuracy in sales data management.

The expected outcome of this research is the development of a reliable and user-friendly sales information system that can assist MSMEs in managing their business operations more effectively. Furthermore, this study is expected to contribute to the existing body of knowledge in the field of ICT by providing practical insights into the implementation of web-based systems in small business environments.

2 RESEARCH METHOD

This study employs a quantitative and system development approach to design and implement a web-based sales information system aimed at improving operational efficiency in Micro, Small, and Medium Enterprises (MSMEs). The research design consists of several stages, including problem identification, data collection, system development, and system evaluation. The object of this study is the sales management process within an MSME that still utilizes manual recording methods.

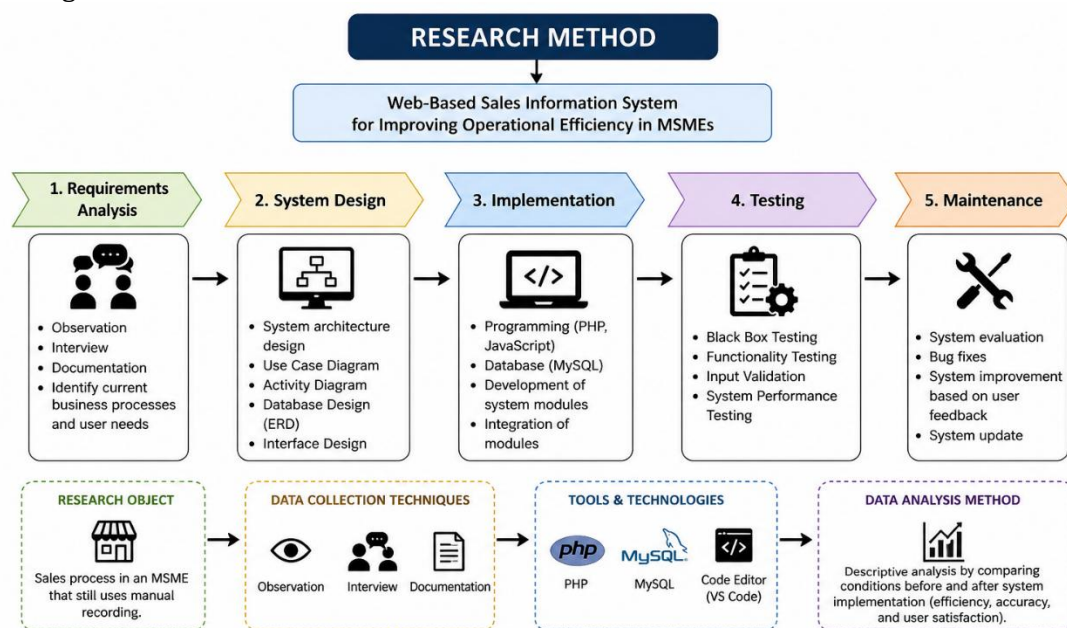


Image 1 Research Methodology Framework

The system development method used in this research is the Waterfall model, which is a structured and sequential software development approach. The stages of the Waterfall model include requirements analysis, system design, implementation, testing, and maintenance. In the requirements analysis phase, data related to existing business processes are collected and analyzed to identify system needs. The system design phase involves creating system architecture

and modeling using Unified Modeling Language (UML), such as use case diagrams and activity diagrams. The implementation phase focuses on developing the system using web-based programming languages such as PHP and JavaScript, with MySQL as the database management system. The testing phase is conducted using Black Box Testing to ensure that all system functionalities operate according to the specified requirements. Finally, the maintenance phase involves system improvements and updates based on user feedback.

The research was conducted at an MSME engaged in retail sales, where the existing system is still manual and not integrated. Data collection techniques used in this study include observation, interviews, and documentation. Observation is carried out to understand the current workflow of sales transactions. Interviews are conducted with business owners and staff to gather detailed information regarding system requirements and challenges faced. Documentation is used to collect supporting data such as sales records and transaction reports.

The main tools used in this research include a computer or laptop for system development, a web server environment (such as XAMPP), a code editor, and a web browser for testing. Additional tools include UML modeling software to assist in system design.

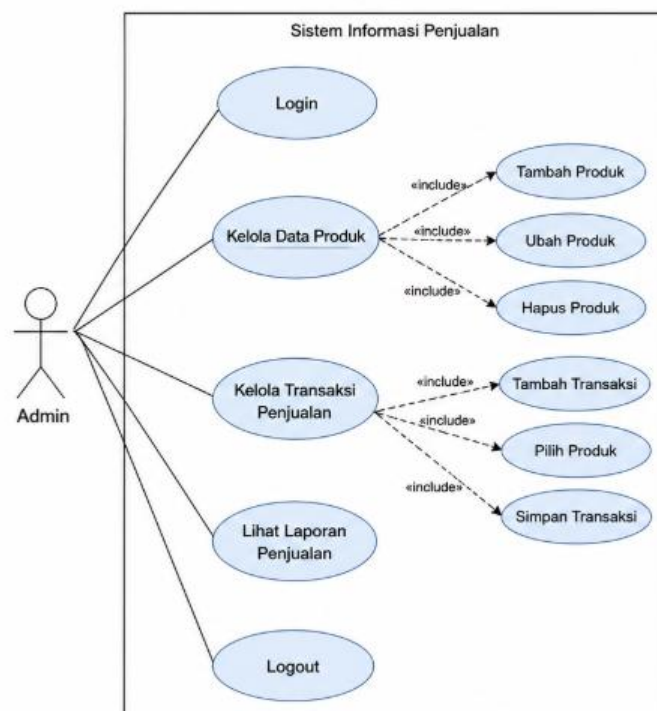
The operational definition of variables in this study includes operational efficiency as the dependent variable, which is measured based on processing time, accuracy of data, and ease of report generation. The independent variable is the implementation of the web-based sales information system.

The data analysis method used is descriptive analysis, which compares the conditions before and after system implementation. The effectiveness of the system is evaluated based on improvements in efficiency, reduction of errors, and user satisfaction. The results of the analysis are then used to determine whether the proposed system successfully addresses the identified problems and meets the research objectives..

3 RESULT AND DISCUSSION

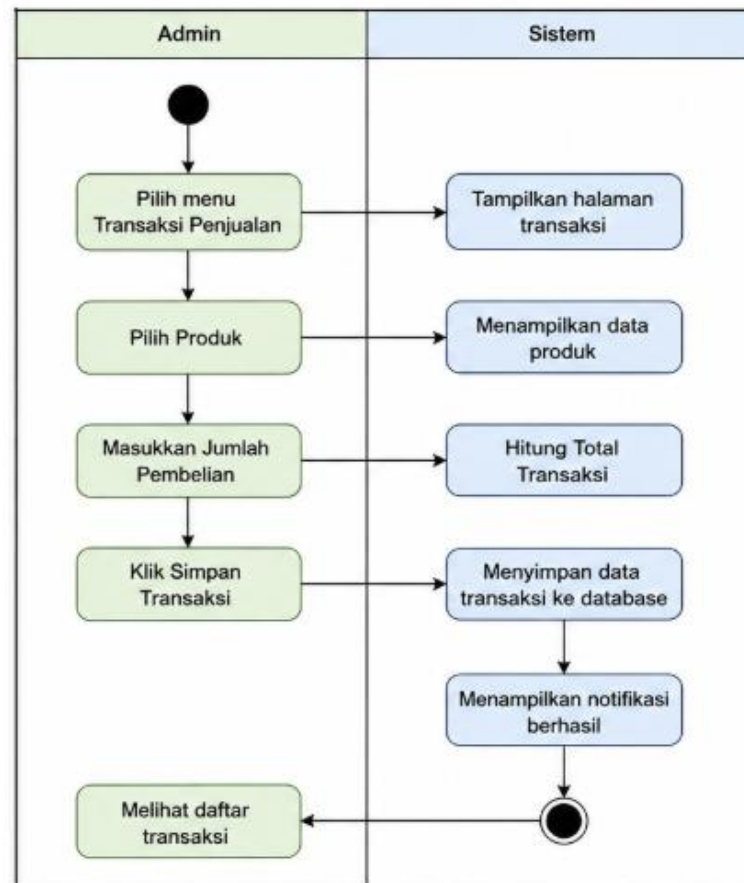
3.1 System Implementation Results

Prior to the system implementation phase, the system design was developed using Unified Modeling Language (UML) to represent the structure and workflow of the proposed system. UML serves as a visual modeling tool that facilitates the development process and provides a clear representation of the interaction between users and the system.



Gambar 2 Use Case Diagram of the System

Figure 2 illustrates the use case diagram of the web-based sales information system. The diagram identifies a primary actor, namely the administrator, who performs several key activities such as managing product data, processing sales transactions, and generating reports. This diagram provides an overview of the system functionalities and the interactions between the user and the system.



Gambar 3 Activity Diagram of Sales Transactions

Figure 3 presents the activity diagram of the sales transaction process. The diagram describes the sequence of activities, starting from product selection, input of purchase quantity, to the system processing and storing transaction data. This diagram helps in understanding the detailed workflow of the system operations.

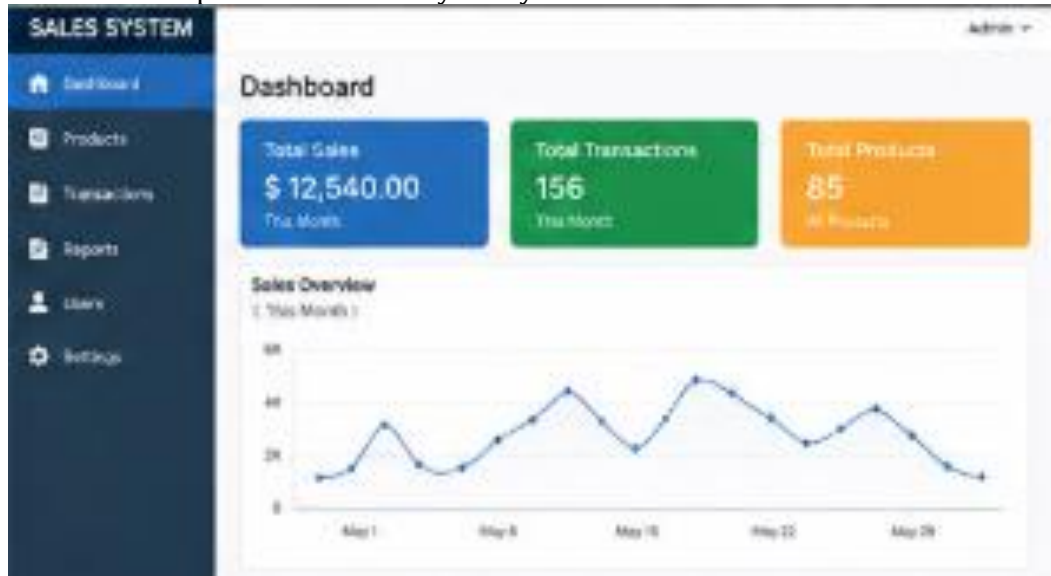
3.2 Implementation

Following the system design phase using UML, the web-based sales information system was implemented in accordance with the predefined design specifications. The purpose of this implementation is to develop a functional system that can be directly utilized by users to manage sales data effectively and efficiently.

The system consists of several integrated modules, including the dashboard, product management, sales transaction, and reporting modules. Each module is designed to support specific business processes and collectively enhance the overall operational performance of Micro, Small, and Medium Enterprises (MSMEs).

1. Implementasi Dashboard

The dashboard serves as the main interface displayed after the user successfully logs into the system. This module provides a summary of key sales-related information.



Gambar 4 System Dashboard

Figure 4 illustrates the dashboard interface, which presents information such as total transactions, total revenue, and the number of available products. Additionally, the dashboard may include graphical representations of sales data to facilitate quick and intuitive understanding of business performance.

2. Product Management Implementation

The product management module is designed to manage all product-related data within the system. This module enables users to perform Create, Read, Update, and Delete (CRUD) operations on product data.

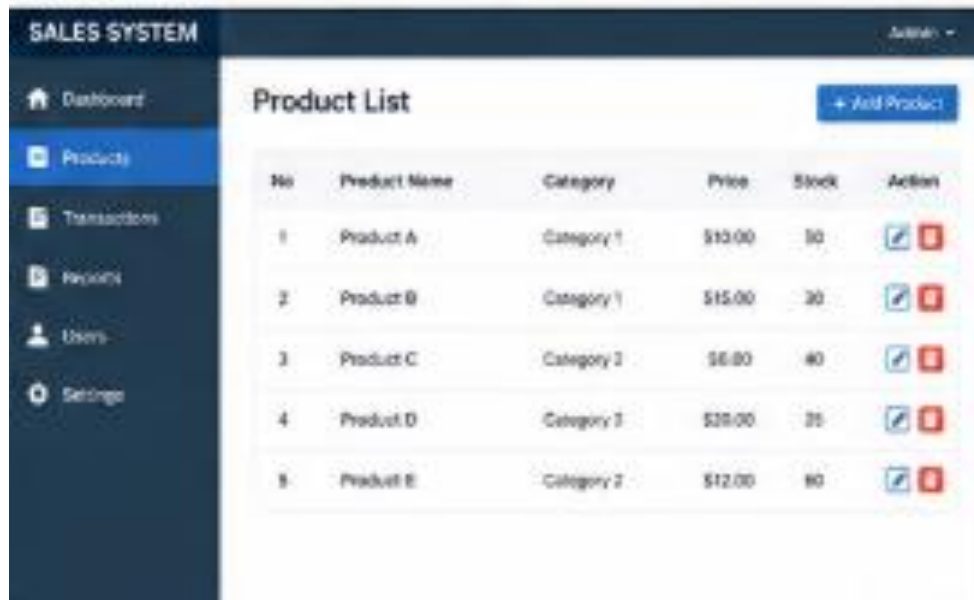
No	Product Name	Category	Price	Stock	Action
1	Product A	Category 1	\$10.00	50	 
2	Product B	Category 1	\$15.00	30	 
3	Product C	Category 2	\$6.00	40	 
4	Product D	Category 2	\$20.00	25	 
5	Product E	Category 2	\$12.00	60	 

Gambar 5 Product Management Interface

Figure 5 shows the product management interface, where users can view and manage product data, including product name, price, and stock information. This module ensures that product data is maintained accurately and consistently.

3. Sales Transaction Implementation

The sales transaction module is responsible for recording all sales activities within the system. It is designed to ensure efficiency and accuracy in transaction processing.



No	Product Name	Category	Price	Stock	Action
1	Product A	Category 1	\$13.00	50	 
2	Product B	Category 1	\$15.00	30	 
3	Product C	Category 2	\$6.80	40	 
4	Product D	Category 2	\$28.00	25	 
5	Product E	Category 2	\$12.00	60	 

Gambar 6 Sales Transaction Interface

Figure 6 presents the sales transaction interface, where users can select products, input purchase quantities, and automatically calculate the total transaction value. Once the transaction is completed, the data is stored directly in the system database, ensuring data consistency and reliability.

3.3 System Testing Results

System testing was conducted to evaluate the functionality and reliability of the web-based sales information system. The testing process used the Black Box Testing method, which focuses on examining the system's functionality without considering the internal code structure. This method is applied to ensure that each feature operates according to the specified requirements and produces the expected output.

The testing process involved several key aspects, including input validation, process execution, and output verification. Each system function was tested using predefined test scenarios to determine whether the system responds correctly to various user inputs. The main modules tested in this study include the login module, product management module, sales transaction module, and report generation module.

The login function was tested to ensure that the system correctly validates user credentials. The results show that the system successfully authenticates valid users and restricts access for invalid login attempts. This indicates that the authentication mechanism works properly and enhances system security.

The product management module was tested to verify that users can perform data operations such as adding, editing, and deleting product information. The results indicate that all operations are executed correctly, and the system updates the database in real time without errors. This ensures that product data remains accurate and up to date.

The sales transaction module was evaluated by simulating transaction processes, including selecting products, entering quantities, and saving transaction data. The system was able to

process transactions accurately and automatically calculate the total cost. This demonstrates that the transaction module effectively reduces manual calculation errors and improves efficiency.

The report generation module was tested to ensure that the system can produce accurate and real-time reports based on transaction data. The results show that the reports are generated correctly and can be accessed instantly, allowing users to monitor business performance effectively..

Table 1 Table Name

No	Feature	Result Description
1	Login Function	Successfully validates user credentials
2	Product Management	Data can be added, edited, and deleted
3	Sales Transaction	Transactions are recorded accurately
4	Report Generation	Reports are generated in real time

Overall, the testing results indicate that all system functionalities operate as expected without any significant errors. Each module has been verified and meets the system requirements. Therefore, it can be concluded that the developed system is reliable, functional, and suitable for implementation in real-world MSME environments.

3.3 Discussion

The implementation of the web-based sales information system has demonstrated significant improvements in operational efficiency compared to the previous manual system. Prior to the implementation, the sales recording process was carried out manually, which required more time and was prone to errors. After the system was implemented, the time required to record transactions and generate reports was reduced considerably due to automation and real-time data processing. This indicates that the system successfully streamlines business processes and minimizes delays in daily operations.

In terms of data accuracy, the system shows a notable improvement as it reduces human errors commonly associated with manual data entry. The automated calculation feature in the transaction module ensures that all totals are computed correctly, while the database system guarantees that all data is stored consistently and securely. As a result, the reliability of sales data has increased, which is essential for accurate reporting and business evaluation.

From an operational perspective, the system provides better data organization and accessibility. All data is stored in a centralized database, allowing users to retrieve information quickly and efficiently. Business owners can access sales data and reports at any time and from any location, which significantly enhances flexibility in managing business activities. This ease of access supports faster and more accurate decision-making, especially in determining sales strategies and monitoring business performance.

Furthermore, the system enhances transparency and accountability in data management. Every transaction is recorded systematically and can be traced back when needed, which facilitates monitoring and auditing processes. This is particularly important for MSMEs that require proper documentation of business activities for financial tracking and reporting purposes. The integration of various modules, such as product management, transaction processing, and reporting, into a single system also reduces data redundancy and improves overall workflow efficiency.

The findings of this study are consistent with previous research [1], which states that the adoption of information systems can significantly improve productivity and operational efficiency. The use of web-based technology also aligns with the concept of digital transformation, where businesses leverage technology to enhance performance and competitiveness in the digital era. For MSMEs, the adoption of such systems is crucial in order to remain competitive and adapt to the rapid development of technology.

In addition, the implementation of this system provides practical benefits for business owners, particularly in simplifying complex processes and reducing administrative workload. Tasks that previously required manual calculations and record-keeping can now be completed automatically, allowing users to focus on more strategic activities such as business planning and customer service.

However, despite the advantages offered by the system, there are still some limitations that need to be addressed. The current system does not yet include advanced analytical features such as sales forecasting or trend analysis. Additionally, the system is limited to web-based access and has not been optimized for mobile platforms. These limitations provide opportunities for further development in future research.

Overall, the results of this study demonstrate that the adoption of Information and Communication Technology (ICT) through a web-based sales information system can provide significant benefits for MSMEs. The system not only improves efficiency and accuracy but also enhances effectiveness in managing sales operations, thereby supporting sustainable business growth in the digital era.

4 CONCLUSION

Based on the results and discussion of this study, it can be concluded that the implementation of a web-based sales information system has successfully improved the operational efficiency of Micro, Small, and Medium Enterprises (MSMEs). The system effectively replaces manual processes with a more structured and integrated digital approach, resulting in faster transaction processing, improved data accuracy, and more efficient report generation.

The developed system, which includes modules such as product management, sales transactions, and reporting, has proven to function properly based on the results of system testing. All features operate according to the specified requirements, indicating that the system is reliable and suitable for real-world implementation. In addition, the use of real-time data processing enables business owners to access up-to-date information, which supports better and faster decision-making.

The findings of this study imply that the adoption of Information and Communication Technology (ICT) plays a crucial role in enhancing business performance, particularly for MSMEs. By utilizing a web-based system, businesses can improve efficiency, reduce human errors, and optimize data management processes. This also supports digital transformation efforts in small and medium enterprises, allowing them to remain competitive in the modern business environment.

However, this study is limited to the development of a sales information system without incorporating advanced analytical features or integration with external platforms. Therefore, future research is recommended to enhance the system by adding functionalities such as mobile application support, digital payment integration, and data analytics using data mining techniques. These improvements are expected to further optimize system performance and provide greater value for business operations.

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