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Website Technology Implementation in Stock Management for Enhanced Operational Efficiency: Bismika Tani Case Study

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Abstract

This study develops a web-based Stock and Sales Management Information System to improve accuracy, speed up transactions, and support real-time reporting in the retail sector. This system includes recording incoming and outgoing stock, product registration, sales recording, and report generation, and applies the Just-In-Time (JIT) concept to reduce excess stock and storage costs. Developed using the Waterfall method, the design uses UML, and is implemented with PHP Native and MySQL. Usability testing using the System Usability Scale (SUS) obtained a total sco re of 815 from 9 respondents, with an average of 90.56, categorized as "Excellent" with a value of "A", indicating that the system is very user-friendly and efficient. The real-time reporting feature increases transparency and makes it easier for store owners to monitor stock and transactions. Overall, this system offers a practical and effective solution for retail businesses in managing stock and sales optimally.

Kata kunci: *Data Transparency; Just-In-Time; MySQL; Operational Efficiency; PHP Native*

Abstrak

Penelitian ini mengembangkan Sistem Informasi Manajemen Stok dan Penjualan berbasis web untuk meningkatkan akurasi, mempercepat transaksi, dan mendukung pelaporan real-time di sektor ritel. Sistem ini meliputi pencatatan stok masuk dan keluar, registrasi produk, pencatatan penjualan, dan pembuatan laporan, serta menerapkan konsep *Just-In-Time* (JIT) untuk mengurangi kelebihan stok dan biaya penyimpanan. Dikembangkan menggunakan metode *Waterfall*, perancangan menggunakan UML, dan diimplementasikan dengan *PHP Native* dan MySQL. Pengujian usability menggunakan *System Usability Scale* (SUS) memperoleh skor total 815 dari 9 responden, dengan rata-rata 90,56, dikategorikan "Sangat Baik" dengan nilai "A", yang menunjukkan bahwa sistem sangat ramah pengguna dan efisien. Fitur pelaporan *real-time* meningkatkan transparansi dan memudahkan pemilik toko untuk memantau stok dan transaksi. Secara keseluruhan, sistem ini menawarkan solusi praktis dan efektif bagi bisnis ritel dalam mengelola stok dan penjualan secara optimal.

Kata Kunci: *Transparansi Data; Just-In-Time; MySQL; Efisiensi Operasional; PHP Native*

1. Introduction

Bismika Tani is an agricultural supply store in Pucakwangi, Central Java, offering high-quality equipment, fertilizers, superior seeds, and crop protection products. Amid rapid technological advancements, various business sectors have undergone significant transformations, including the trade of agricultural products, particularly in stock management and sales [1]. Bismika Tani, an agricultural supply store, still relies on manual stock recording using notebooks or non-integrated applications, leading to data inaccuracies, monitoring delays, and potential loss of crucial information.

The manual processes at Bismika Tani hinder real-time stock monitoring, causing inefficiencies and customer service issues, thus highlighting the need for an integrated system to automate stock and sales management effectively. Relevant studies provide a crucial foundation and context for the development of the stock and sales management system at Bismika Tani. Research conducted by Rahkmah and Devi, titled *"Web-Based Stock Inventory Information System at Putra Gresik Store,"* employed a qualitative research method with the

Waterfall development model. This study facilitated structured and controlled stock management [1].

Research by Santoso and Santoso developed a desktop-based inventory management system using the Waterfall method and Blackbox Testing, which improved stock management efficiency, but unlike the present study, their system was designed for an importer company and not web-based [2]. Furthermore, research by Furthermore, research by Pratama and Rusliyawati (2023), titled *"Analysis and Design of a Web-Based Inventory Information System,"* applied the Waterfall model using PHP and MySQL technologies. The system testing demonstrated a 100% validity rate and enhanced the management of incoming and outgoing stock data [3]. A study by Wicaksono and Widodo (2020) developed a web-based inventory system using SDLC, PHP, and MySQL that improved inventory efficiency and enabled real-time tracking of stock-outs, though it focused only on inventory, unlike the present study which also integrates sales transactions and real-time reporting [4]. Lastly, research by Anaziah and Pasaribu (2021) developed a web-based inventory information system using the R&D method with PHP, MySQL, and Apache, effectively reducing stock record errors and improving inventory accuracy [5].

To overcome existing cpp.lenges, a web-based stock and sales management system is needed to efficiently and accurately optimize inventory management through integrated record-keeping, real-time monitoring, and comprehensive reporting that supports informed and timely decision-making. Several studies, including Rahkmah and Devi (2021), show that the development method greatly affects system flexibility, with their Waterfall-based PHP system focusing only on stock recording without integrating sales transactions [1]. Meanwhile, Santoso and Santoso utilized the same methodology but developed a desktop-based system, which is less flexible compared to web-based systems [2]. Wicaksono and Widodo adopted the System Development Life Cycle (SDLC) approach with web-based PHP; however, their system only handled stock management without real-time reporting [4]. This research develops a web-based stock and sales management system tailored for Bismika Tani, integrating real-time transaction data, automatic stock recording, and an easy-to-use interface to enhance efficiency, accuracy, and business strategy optimization compared to previous studies.

2. RESEARCH METHOD

The research methodology employed in this study follows a qualitative approach. This approach aims to understand existing processes, identify user needs, and analyze problems to design a more efficient and accurate system [6]. The following are the research method stages used:

2.1 Data Collection Methods

This research was conducted at Bismika Tani in Sokopuluhan Village, Pucakwangi District, Pati Regency, utilizing various data collection methods, including direct observation to analyze needs and problems firsthand by examining stock inventory and sales data, as well as interviews with Mr. Arif Munfaat, the owner, to gain deeper insights into stock management and sales processes, identify existing issues, validate data, and understand user perspectives [7] [8] [9].

2.2 System Development Method

Thi This study employs the Waterfall method a linear and sequential approach best suited for systems with fixed requirements and minimal changes due to its compatibility with the project's stable needs, clear initial requirements, ease of testing, and straightforward maintenance [10], despite the existence of more flexible alternatives like Agile that better accommodate evolving system requirements [11]. The following are the steps involved in the Waterfall method:

1) Requirement
   In this planning phase, developers conduct observations at Bismika Tani and interviews with users to gather data on the system requirements to be developed. The results of this needs analysis include the system functionality that must be present, namely:
   a. The system must be able to manage product inventory data in real-time.
   b. Users must be able to order products through the application with a variety of payment method options.

c. The application must provide sales and stock reports automatically to make it easier for managers to make decisions.
d. The system must have a notification feature for users when stock is running low or there is a new promotion.

2) Design
At this stage, the developer designs the overall system. System design includes identifying hardware and software requirements, as well as determining the system architecture to be used. In this section, the entire system design or plan is presented, including system flowcharts, hardware and software technical specifications, and user interface designs. In addition, the selection of technology used, database structure, and communication protocols that support the smooth operation of the system are also presented..

3) Implementation
At this stage, developers perform comprehensive system testing to ensure that all technical requirements have been met. The tests performed include unit tests, system tests, and user acceptance tests to identify and fix errors that may occur in the application. The main focus in this phase is to ensure the smoothness and performance of the system based on the predetermined test scenarios, which will be further explained in chapter 4 (System Testing).

4) Verification
In this phase, developers perform thorough validation and testing of the system. Testing includes unit testing, system testing, and user acceptance testing to ensure that all requirements have been met. The goal of this phase is to find and fix any errors in the system.

5) Maintenance
In this phase, software that has been developed enters the operational and maintenance phase, marking the end of the Waterfall method. This phase includes fixing errors that were not detected in the previous stage and ensuring that the software remains stable and functions well in the long term. However, in this study, the Maintenance phase has not been implemented, because this study focuses more on the software development and testing stages before the maintenance stage is carried out.

2.3 Research Flow Diagram Use Case Research Method

1) Use Case Diagram

A Use Case Diagram is a UML component that visualizes system-user interactions through horizontal ellipses, representing system functions that provide value to the actor [15]. The Use Case Diagram depicts the relationship between actors and use cases, clearly illustrating the system's functionality in a structured way [16].

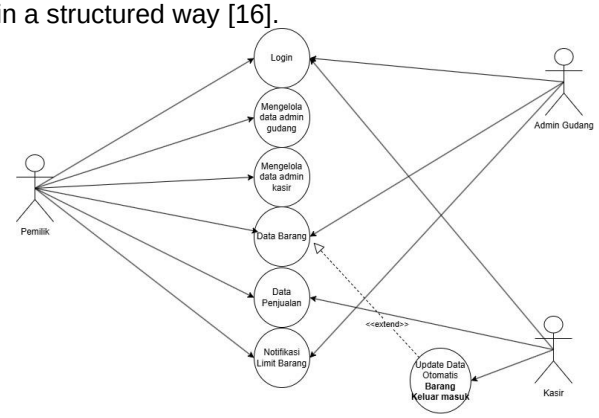

Figure 1. Use Case Diagram

This Use Case Diagram shows how actors interact with the web-based system for managing goods and sales data. It involves three main actors: the Owner, Warehouse Admin, and Cashier. Each actor has specific roles and access levels within the system.

2) Activity Diagram

The Activity Diagram visualizes the system's workflow by depicting a series of activities, objects, conditions, and events, illustrating the behavior and processes during execution [17].

The following is the explanation of the Activity Diagram above:

a. Owner
- Accesses the OwnerMenu after logging in.
- Can manage users, products, and view financial reports.
- Receives stock low notifications via LimitNotification.

b. Warehouse Admin
- Accesses the WarehouseAdminMenu after logging in.
- Receives notifications for low stock.
- Can add stock, update stock data, and delete products.

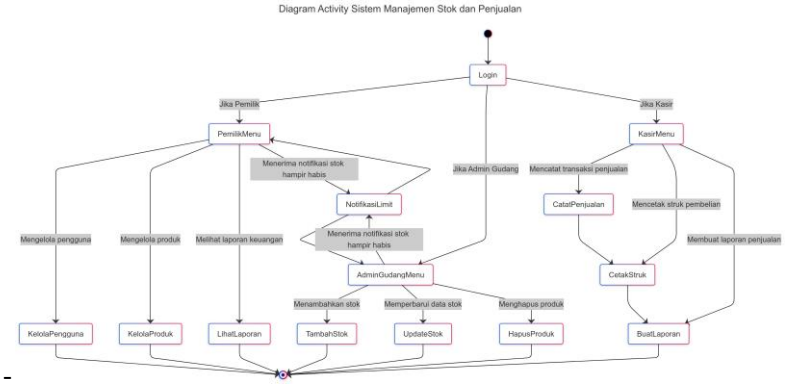

Figure 2. Activity Diagram

c. Cashier
- Accesses the CashierMenu after logging in.
- Can perform sales transactions through SalesRecord.
- Can print purchase receipts and generate sales reports.

3) Sequence Diagram

A Sequence Diagram in UML visualizes interactions between objects in a system over time, highlighting the sequence of messages exchanged to understand how they collaborate in a process or function [19].

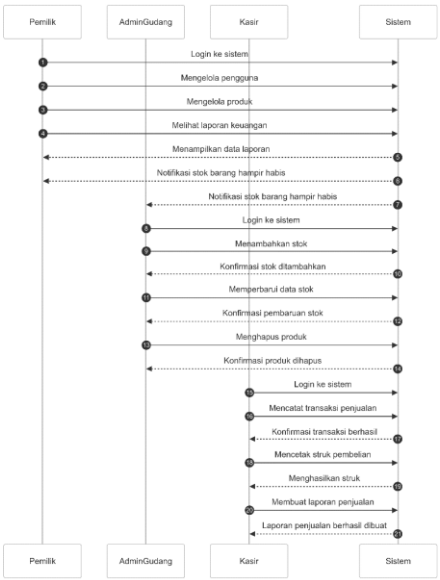

Figure 3. Sequence Diagram

This diagram illustrates the communication flow between actors (Owner, Warehouse Admin, and Cashier). Below are the process flows:

a. Owner
- Manage Warehouse Admin Data → Warehouse Admin Data
  The owner adds or edits information about the warehouse admin in the system.
- Manage Cashier Data → Cashier Data

The owner adds or edits information about the cashier in the system.

- View Financial Report → Financial Report
  The owner can view reports related to financial transactions, including sales and purchases.
- Receive Stock Limit Notification → Stock Notification
  The owner receives a warning when stock levels approach the minimum threshold.

b. Warehouse Admin

The warehouse admin is responsible for managing stock and performing the following activities:

- Add Stock → Item Data
  The warehouse admin inputs new items or adds stock to existing items.
- Update Stock Data → Item Data
  The warehouse admin updates the information about available stock.
- Delete Product → Item Data
  The warehouse admin can remove products that are no longer available from the system.
- Receive Stock Limit Notification → Stock Notification
  The warehouse admin receives a warning when stock levels are low.

c. Cashier

The cashier is responsible for managing transactions and sales reports with the following activities:

- Record Sales Transaction → Sales Record The cashier records customer purchase transactions.
- Print Purchase Receipt → Purchase Receipt
  The cashier prints a receipt as proof of the purchase transaction.
- Generate Sales Report → Sales Report
  The cashier prepares sales reports to be saved in the system.

3. Result And Discussion

3.1 Implementation

1) **Owner Features**

This feature provides full access to the owner to manage all aspects of the application system, including managing warehouse admin data, managing cashier data, accessing product data, and accessing sales data.

a. Owner Dashboard

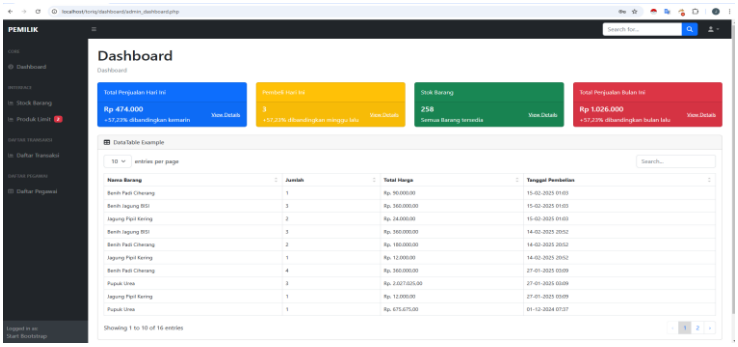

Figure 4. Owner Dashboard

The main dashboard, specifically designed for owners, presents stock summaries, sales data, and key managerial features, each with a clear function providing real-time overviews, enabling interactive data management, and supporting strategic decision-making through selectable categories that allow users to view, modify, or add information seamlessly.

b. Employee Data Management Menu

This page is used to manage Warehouse Admin and Cashier employee data, allowing the owner to view, add, edit, or delete employee data. On this interface, users can select a specific employee to view their details, update information such as job title or work shift, and

delete data that is no longer relevant. The operating mechanism involves selecting the options available in the menu for each function, with confirmation of changes to maintain data accuracy.

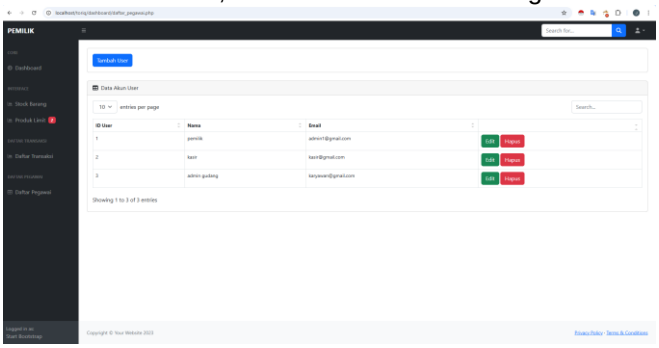

Figure 5. Employee Data Management Menu

c. Product Management Menu

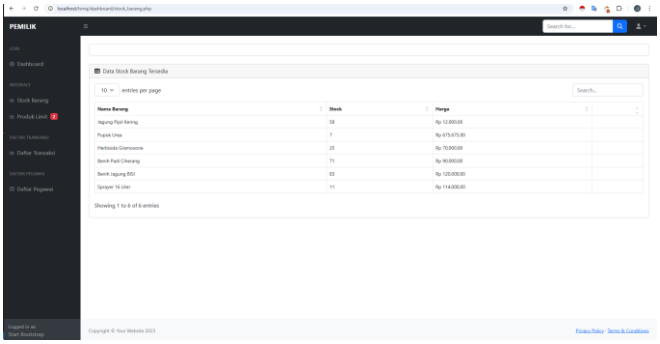

Figure 6. Product Management Menu

This page enables the owner to efficiently manage product data within the web-based stock and sales system by providing features to display, add, edit, and delete product information such as name, price, and stock quantity through an intuitive interface that supports easy selection and updating of product availability.

d. Product Limit Menu

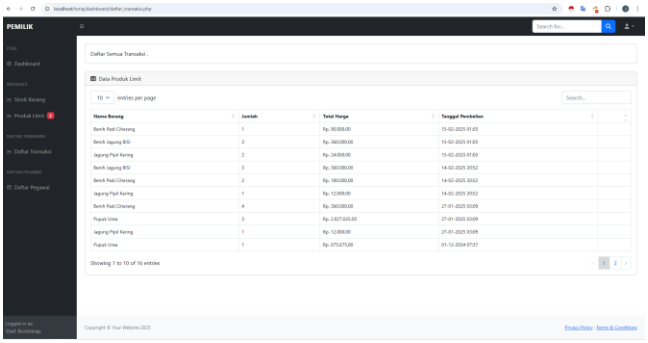

Figure 7. Owner's Product Limit Menu

This menu allows owners to easily identify low-stock products, making it easier and more efficient to refill stocks. Its operating mechanism includes providing indicators or notifications for products that reach the minimum stock limit, which helps owners to immediately take restocking actions more quickly and on time.

e. Transaction List Menu

This menu enables owners to monitor performance and analyze business trends more effectively by selecting specific time ranges, filtering transaction data by category or payment status, and accessing customizable, downloadable, or printable sales reports

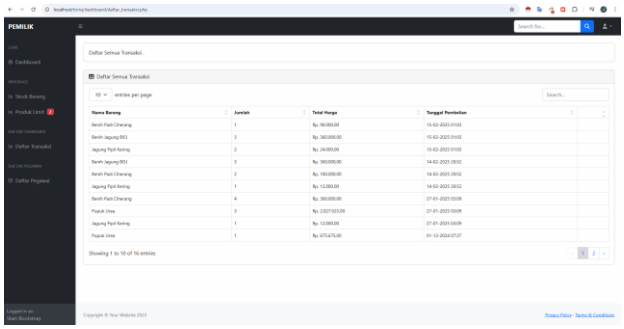

Figure 8. Transaction List Menu

2) Warehouse Admin Features

This feature enables the Warehouse Admin to systematically manage and monitor product stock data, ensuring more accurate and efficient stock recording and monitoring in the warehouse.

a. Warehouse Admin Dashboard

This page displays statistical data such as product quantity, remaining stock, and product limit notifications. There are buttons that direct users to other features for Warehouse Administrators. Each interface object, such as stock indicators and notification buttons, serves to monitor product status and facilitate navigation between features, ensuring smooth warehouse management operations.

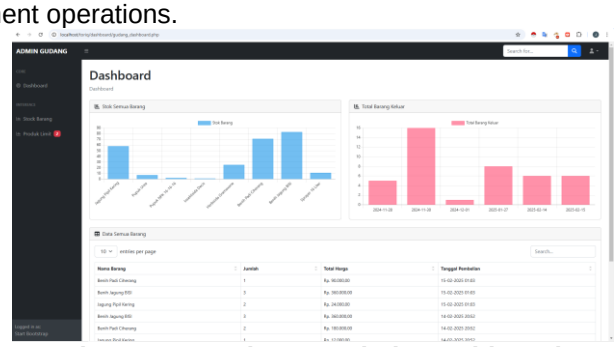

Figure 9. Warehouse Admin Dashboard

b. Product Data Management Menu

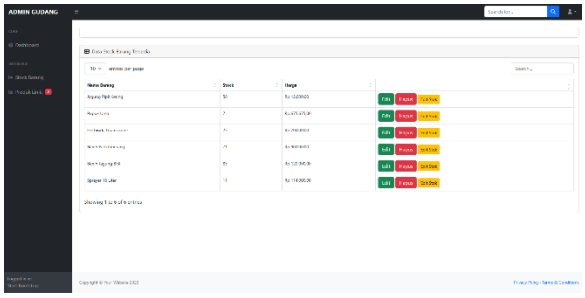

Figure 10. Product Stock Menu

This page displays a table of product data with details such as product code, product name, and stock quantity. Each row of data is equipped with options to add, edit, or delete product information. These options allow users to update product stock or manage product data directly through this interface.

3) Cashier Features

This feature allows cashiers to view sales data, check product availability, generate sales reports, and create sales receipts.

This page presents real-time transaction statistics such as daily sales, customer count, product stock, and monthly sales comparisons through interactive charts and intuitive interface elements designed to streamline transaction management and provide direct, user-friendly access to key features like product settings and data navigation.

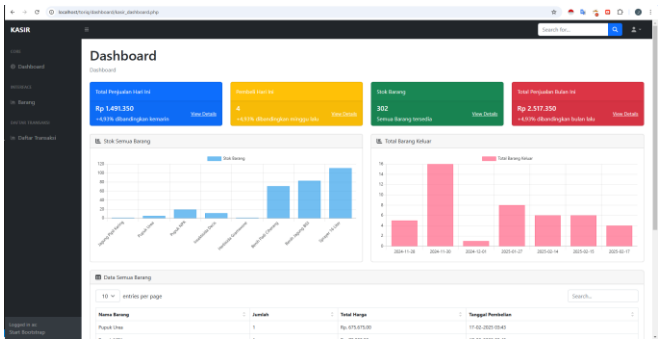

Figure 12. Cashier Dashboard

4) Sales Receipt Menu

This interface feature allows the cashier to generate and print a sales receipt for customers after a purchase transaction. It functions to document the transaction and serve as proof of payment for the customer. Additionally, when this button is operated, the system automatically deducts the purchased item's quantity from the inventory, ensuring real-time stock updates

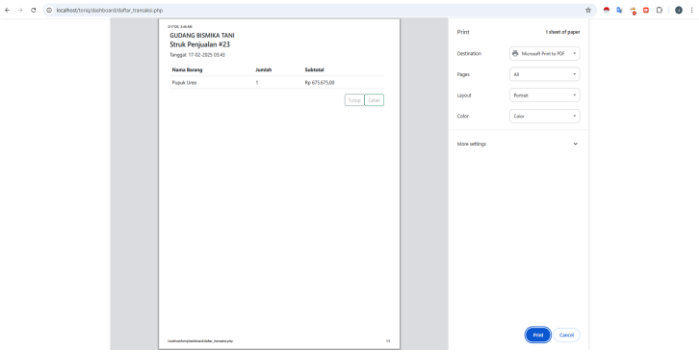

Figure 13. Print Sales Receipt

5) Sales Report Menu

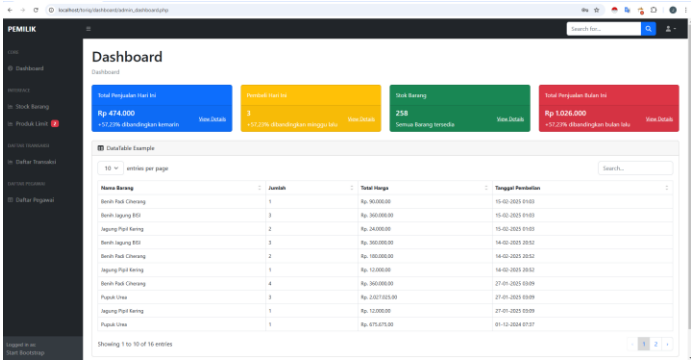

Figure 14. Sales Report Menu

This page displays the Sales Report menu which is used to generate daily, weekly, and monthly sales reports. Users can select a specific time range through the calendar option and then press the "Generate" button to display the report in graphical or tabular form. This feature can also be accessed by business owners, but with limited access rights that only allow monitoring of sales data without being able to change or delete reports.

3.2 System Testing

The research uses a questionnaire distributed to three respondent groups one owner, three warehouse admins, and five cashiers to assess the system's effectiveness and user understanding, with data collected via accessible Google Forms for convenient, online responses [20]. Additionally, this method facilitates faster and more efficient data processing and analysis. Table 2 presents the testing instruments used in the usability survey conducted by the researcher.

Table 2. Usability Survey Questions

[1] No	[1] Question	[1] Scale
[1] 1	[2] I find this system easy to use.	[2] 1-5
[1] 2	[3] I find this system too complicated.	[3] 1-5
[1] 3	[4] I think this system is easy to use.	[4] 1-5
[1] 4	[5] I think I need technical support to use this system.	[5] 1-5
[1] 5	[6] I find the various functions in this system well integrated.	[6] 1-5
[1] 6	[7] I think there are too many inconsistencies in this system.	[7] 1-5
[1] 7	[8] I imagine most people would learn to use this system quickly.	[8] 1-5
[1] 8	[9] I find this system very difficult to use.	[9] 1-5
[1] 9	[10]I feel very confident using this system.	[10]1-5
[1] 10	[11]I need to learn a lot before I can use this system.	[11]1-5

The usability survey is calculated using a 5-point Likert scale, where scores from items 1, 2, 3, 4, 5, 8, and 10 are subtracted by 1, and scores from items 6, 7, and 9 are subtracted by 5, with the final result summed and multiplied by 2.5. Below is the formula for calculating the average System Usability Scale (SUS) score:

$\bar{x}=\frac{\sum x}{n}$ ..... (1)

Explanation:

- $\bar{x}$= Average score
- $\sum x$ = Total SUS score
- n = Number of respondents
- P = Question number
- R = Respondent

Table 3. Respondents' Answer List

[1] No	[1] Pertanyaan									
	[2] P1	**[1] P2**	**[1] P3**	**[1] P4**	**[1] P5**	**[1] P6**	**[1] P7**	**[1] P8**	**[1] P9**	**[1] P10**
[1] R1	[3] 5	[2] 2	[2] 5	[2] 2	[2] 5	[2] 2	[2] 4	[2] 1	[2] 5	[2] 2
[1] R2	[4] 5	[3] 1	[3] 5	[3] 2	[3] 5	[3] 1	[3] 5	[3] 1	[3] 5	[3] 2
[1] R3	[5] 4	[4] 2	[4] 5	[4] 2	[4] 5	[4] 2	[4] 4	[4] 1	[4] 5	[4] 2
[1] R4	[6] 5	[5] 2	[5] 5	[5] 1	[5] 5	[5] 2	[5] 5	[5] 1	[5] 5	[5] 1
[1] R5	[7] 5	[6] 1	[6] 5	[6] 2	[6] 5	[6] 1	[6] 5	[6] 1	[6] 5	[6] 2
[1] R6	[8] 4	[7] 1	[7] 5	[7] 2	[7] 5	[7] 1	[7] 4	[7] 1	[7] 5	[7] 2
[1] R7	[9] 5	[8] 2	[8] 5	[8] 2	[8] 5	[8] 2	[8] 4	[8] 1	[8] 5	[8] 2
[1] R8	[10]5	[9] 1	[9] 5	[9] 2	[9] 5	[9] 1	[9] 5	[9] 1	[9] 5	[9] 2
[1] R9	[11]4	[10]2	[10]5	[10]2	[10]5	[10]2	[10]4	[10]1	[10]5	[10]2

SUS Score Calculation Method:

The system's usability was measured using the System Usability Scale (SUS) method, where a total score of 815 from 9 respondents resulted in an average SUS score of 90.56.

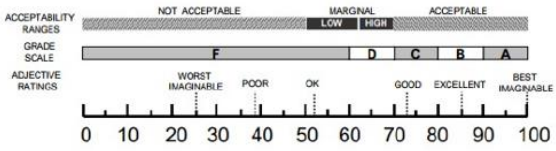

Figure 15. System Usability Scale

Based on the image, the usability test results are grouped into 5 categories in the following table:

Table 4. SUS Score Grade

[1] SUS Score	[1] Grade	[1] Adjective Rating
[2] > 80	[2] A	[2] Very good
[3] 60 - 80	[3] B	[3] Good
[4] 68	[4] C	[4] Fair
[5] 51 - 68	[5] D	[5] Poor
[6] < 51	[6] E	[6] Very poor

This study develops a web-based stock and sales management system to improve efficiency, accuracy, and data security, replacing the outdated manual process with a more systematic, automated, and accessible approach.

Table 5. Comparison of Results from Previous Studies

[1] Aspect	[1] Before the Study	[1] After the Study
[2] Inventory Management	• Inventory is manually recorded in books or Excel • Prone to recording and calculation errors	• Inventory is managed automatically in a database • The recording process is more accurate and real-time
[3] Inventory Monitoring	• Difficult to quickly determine inventory levels • Physical checks are required	• The system displays real-time inventory data • Notifications when stock is low
[4] Sales Data Management	• Transactions are recorded manually • Prone to input errors	• Transactions are automatically recorded in the system • Reduces recording errors
[5] Time Efficiency	• Inventory and sales recording processes take a long time	• The system speeds up inventory and transaction recording
[6] Data Security	• Data is prone to loss, corruption, or mixing up	• Data is stored in a database with better security
[7] Sales Reporting	• Reports are manually compiled, time-consuming, and error-prone	• Reports are automatically generated with accurate and fast results
[8] Information Access	• Must search through manual records to view inventory and sales	• Inventory and sales information can be accessed directly through the system

The research results show that the stock and sales management system has a very good level of usability based on the System Usability Scale (SUS) method. From a survey of 9 respondents, the total score of 815 results in an average of 90.56, falling into the "Excellent" category with a grade of "A". This score reflects that the system is easy to use, efficient, and meets the needs, providing a comfortable experience for users, making it suitable for implementation in inventory and sales management.

3.3 Discussion

This study develops a web-based stock and sales management system to replace manual processes that are prone to recording errors and data loss. This system provides key features for owners, such as a dashboard with a real-time stock summary, current sales data, and full access to manage employee data, products, and transaction reports. The "Product Limit" feature provides automatic notification when stock reaches the minimum limit, allowing owners to immediately restock. All features are operated through an intuitive interface that facilitates interaction without requiring special technical skills. Similar research by Parameswari [20] developed a web-based stock monitoring application which succeeded in increasing efficiency and accuracy in stock management. This system was developed using the waterfall method and implemented with the Laravel framework, showing a significant improvement in the process of recording and reporting stock.

The implementation of a special dashboard for warehouse admins and cashiers has been proven to increase operational efficiency and accuracy in stock and transaction management. This dashboard allows warehouse admins to monitor product quantities in real-

time and receive automatic notifications when stock approaches the minimum limit, thereby minimizing the risk of running out of stock and manual input errors. Research by Palaun Jaya [21], shows that a similar system has succeeded in increasing efficiency and effectiveness in monitoring and managing stock.

Usability testing using the System Usability Scale (SUS) method on nine respondents consisting of one owner, three warehouse admins, and five cashiers was conducted via Google Forms for easy online access. The survey instrument included ten Likert scale questions 1–5 that assessed aspects such as ease of use, function integration, and need for technical support. The results showed a total SUS score of 815, resulting in an average of 90.56, which is included in the "A" or "Very Good" category. This finding is in line with research by Lupita Dyayu [22], who evaluated the PeduliLindungi application using the SUS method and found that the SUS score can reflect the level of user satisfaction and acceptance of the system. In the study, the SUS score was used to assess various usability metrics, including learnability, efficiency, error rate, and satisfaction, which provide a comprehensive picture of the user experience.

Compared to the process before the implementation of the new system where recording was still manual using books/Excel so that it was prone to errors and slow, this system has been proven to increase the accuracy of inventory and transaction recording because everything is automated in a centralized database with better security. The reporting process is fast & error-free; access to inventory/sales information can now be done at any time without having to look for physical documents; low stock notifications prevent sudden stock shortages; and the user experience is rated very good based on a high SUS score (>80). This proves that digital solutions like this are worthy of being widely implemented in small-medium scale retail businesses for long-term operational efficiency. A study by Angellin, Oetama, and Amri [23] shows that digitalizing business processes can reduce recording errors, speed up reporting, and facilitate real-time data access through a secure centralized database. These results are in line with research by Susila and Sri Arsa [24], which found that a web-based self-ordering system with a high SUS score can increase efficiency and reduce errors in running their business.

4. Conclusion

Based on the research titled " Website Technology Implementation in Stock Management for Enhanced Operational Efficiency: Bismika Tani Case Study," several conclusions can be drawn regarding the effectiveness of the developed system. One of the main achievements of this study is the improvement in the efficiency of stock and sales management. This web-based system is designed to address issues with manual recording, which was previously prone to input errors, delayed information, and a lack of transparency in reporting. With the automatic recording feature for incoming and outgoing stock, the store owner can now monitor stock in real-time, thereby reducing the risks of overstocking or stock shortages that could impact business operations. Furthermore, the implementation of the Just-In-Time Inventory (JIT) concept has proven to be effective in optimizing stock availability. With this system, the owner can control the quantity of goods stored more accurately, reduce storage costs, and ensure product availability according to market demand. In terms of accessibility and transparency, this system provides real-time reporting features that allow the store owner to monitor stock and transactions more accurately. With automatic reports accessible anytime, decision-making becomes faster and more precise, reducing reliance on time-consuming and error-prone manual records. Data security and accuracy are also key advantages of this system. With data storage based on a MySQL database, the risk of data loss or corruption can be minimized. Additionally, the role-based access feature ensures that only authorized users can access certain information, thus maintaining the integrity and security of business data. From the System Usability Scale (SUS) testing, this system scored 90.56, placing it in the "Excellent" category with a grade of "A." This score indicates that the developed system is highly usable, easy to use, and meets user needs. Overall, this study demonstrates that the implementation of a web-based stock management system using the Waterfall methodology has enhanced operational efficiency, accuracy in recording, and data transparency in managing stock and sales at Bismika Tani. With the developed features, this system can serve as a relevant and practical solution to increase productivity and business effectiveness in the retail sector, especially in agriculture.

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