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Digital transformation of warehouse management through web-based information system at CV. Al Salam

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ABSTRACT

Effective and efficient inventory management is crucial for the operational success of trading companies. CV. Al Salam, engaged in fabric trading in Sukoharjo, faces significant challenges in managing fabric stocks at their main warehouse. Currently, inventory management at CV. Al Salam is done manually, often leading to issues such as recording errors and document piles. This research aims to develop a web-based warehouse information system using technologies like PHP, MySQL, and JavaScript to address these challenges. The system is expected to provide real-time stock monitoring, automated restock notifications, and an interactive dashboard for data analysis. The Waterfall development method is employed, covering requirements analysis, design, development, and testing phases. Testing results show the system functions according to specifications with a 100% success rate, enhancing recording accuracy and speeding up reporting and goods distribution processes. The research findings indicate that this system successfully improves operational efficiency at CV. Al Salam by reducing recording errors and accelerating the reporting and distribution processes.

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1. INTRODUCTION

Effective and efficient inventory management is a crucial element in the operations of trading companies. CV. Al Salam, which deals in fabric trading in Sukoharjo, faces significant challenges in managing fabric stock in their main warehouse. Various types of fabrics, including cotton, silk, and denim, are stored in this warehouse with varying demands and stocks (Maulana et al., 2023). Currently, stock management at CV. Al Salam is still done manually, using records in books or local computers. This method often leads to various problems, including recording errors and piles of product request documents from various outlets (Chowdhury et al., 2023) (Ekakitie et al., 2022).

These issues frequently result in stock report inaccuracies, errors in product shipments, and difficulties in managing inventory (Rudianto & Achyani, 2020) (Simatupang, 2017) (Rybalko O. M., Varlamova I. S., 2020). Consequently, the company risks operational inefficiency and potential financial losses due to the inability to meet market demand promptly (Luthfi Makarim et al., 2022). Therefore, a more modern and efficient solution is needed to address these issues (Bangsa & Bangsa, 2021) (Isti Prabawani et al., 2023). According to research conducted by Johari & Sari in 2021 (Setyadi et al., 2024), good inventory management heavily relies on an effective information system. A computerized information system can improve accuracy and efficiency in inventory management, minimize recording errors, and expedite the reporting and distribution process (Aulia et al., 2023) (Taufik, 2021). Thus, the implementation of a web-based warehouse information system at CV. Al Salam becomes highly relevant.

A web-based information system is expected to provide various conveniences, such as real-time stock monitoring, automatic restock notifications, and interactive dashboards for data analysis (Angellin et al., 2023) (Alamksyah et al., 2023). This technology enables the company to be more responsive to market demand changes and optimize inventory managemen (Surbakti & Selly, 2023). y leveraging information technology, CV. Al Salam can enhance operational efficiency and reduce the risk of errors in stock management (Canco, 2022) [11]. To overcome the existing challenges, this research will develop a web-based warehouse information system using technologies such as PHP, MySQL, and JavaScript (Mbunda et al., 2021) (Sahputra et al., 2022). The development method used is Waterfall, which allows for rapid and iterative system development in line with evolving business needs (Marwan, 2023) (Agustin, 2023). With this method, system development can be carried out more efficiently and in accordance with the company's dynamics (Purwati et al., 2023).

This research aims to design and implement an effective and efficient web-based warehouse information system for CV. Al Salam. The specific objectives of this research are to improve the quality of inventory management by providing accurate and real-time data on stock levels, optimize resource management through efficient tracking and allocation of warehouse resources, and enhance customer experience by reducing order processing times and improving service reliability (Chen et al., 2022) (Ran, 2021). With this system, it is hoped that CV. Al Salam can be more competitive in facing the increasingly dynamic market. The results of this research are expected to make a significant contribution to enhancing the efficiency and accuracy of stock management and serve as a reference for other companies facing similar problems.

2. RESEARCH METHOD

Types and Sources of Data

The author will use the following types of data sources in this research: a) Primary Data, primary data is information obtained directly from original sources without processing or compiling and is acquired through searches from sources or respondents who are the focus of the research. In this study, primary data is obtained through direct observation at CV. Al Salam Sukoharjo; b) Secondary Data, secondary data is information obtained indirectly from the research object. These sources may come from references or websites related to the subject being researched by the author.

Data Collection Methods

The researcher will use the following methods to collect data: a) Literature Study, this research uses a literature study to collect data through books, the internet, and related literature, with a systematic, objective, analytical, and critical process of data collection, recording, and management, as well as analyzing secondary data from various sources such as books, journals, articles, and websites to obtain objective results; b) Observation, the method of data collection through direct observation at the research location is the main foundation of all scientific knowledge. The observation process is crucial because scientists can only conduct research based on data, which are observed facts. The author collects data by making direct observations at CV. Al Salam Sukoharjo; c) Interview, interviews are data collection techniques where the researcher conducts face-to-face question-and-answer sessions with subjects using systematically prepared questionnaires to obtain clear information. The author collects data by interviewing warehouse employees at CV. Al Salam Sukoharjo.

System Development Method

This research will use the waterfall method. This method is a linear and sequential software development model, where each stage must be completed before moving on to the next. This model is widely used in software development due to its simplicity and ability to provide a clear structure during the development process (Satria & Ardiansyah, 2023). The stages used in this method include requirements analysis, design, development, and testing (Damanik & Suendri, 2023) (Wahyuni, 2023). Below is a diagram of the waterfall method.

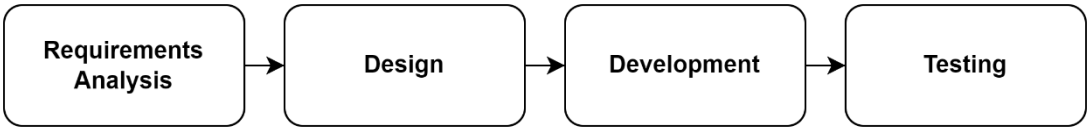

Figure 1. Waterfall methode

1. Requirements Analysis, in this stage, the system requirements needed by CV. Al Salam are identified and documented. This includes an in-depth understanding of the existing business processes, problems faced, and the features required in the warehouse information system. This information is gathered through interviews and document analysis.
2. Design, this stage involves designing the architecture and detailed specifications of the web-based warehouse information system. This includes database design, user interface, and business process flow diagrams. The researcher will create a blueprint at this stage as a guide in system development.
3. Development, at this stage, the designed warehouse information system is transformed into executable code. Development is carried out based on the specifications determined in the design stage, using PHP, JavaScript programming languages, and MySQL database.
4. Testing, after development is complete, the software undergoes a series of tests using the black-box testing method to ensure the system functions according to the specified requirements. Testing includes unit testing to ensure each part of the code works correctly, integration testing to ensure the modules work well together, system testing to verify the overall system, and acceptance testing involving end-users to ensure the system meets their needs. The testing results are documented in a test report, which includes all identified issues and the corrections made.

3. RESULTS AND DISCUSSIONS

Requirements Analysis

Based on interviews and observations with the warehouse staff of CV. Al Salam Sukoharjo, several key requirements have been identified for a system that can automatically record every transaction to reduce stock errors and speed up the reporting process. The system is also expected to generate real-time transaction and revenue reports. The available features at each access level will be tailored to the specific needs of each feature. The system will have two access levels: admin and manager. Below are the identified requirements for each access level, illustrated through a use case diagram in Figure 2.

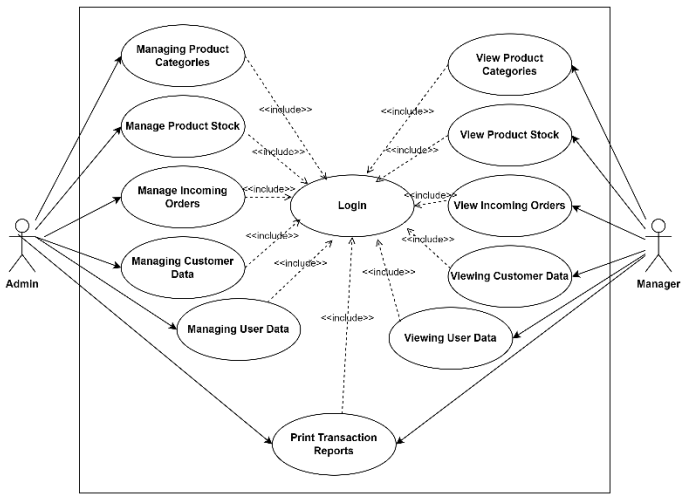

Figure 2. Usecase diagram

The author creates an activity diagram that illustrates the flow of the Web-Based Warehouse Information System based on the analysis requirements. The activity diagram can be seen in Figure 3.

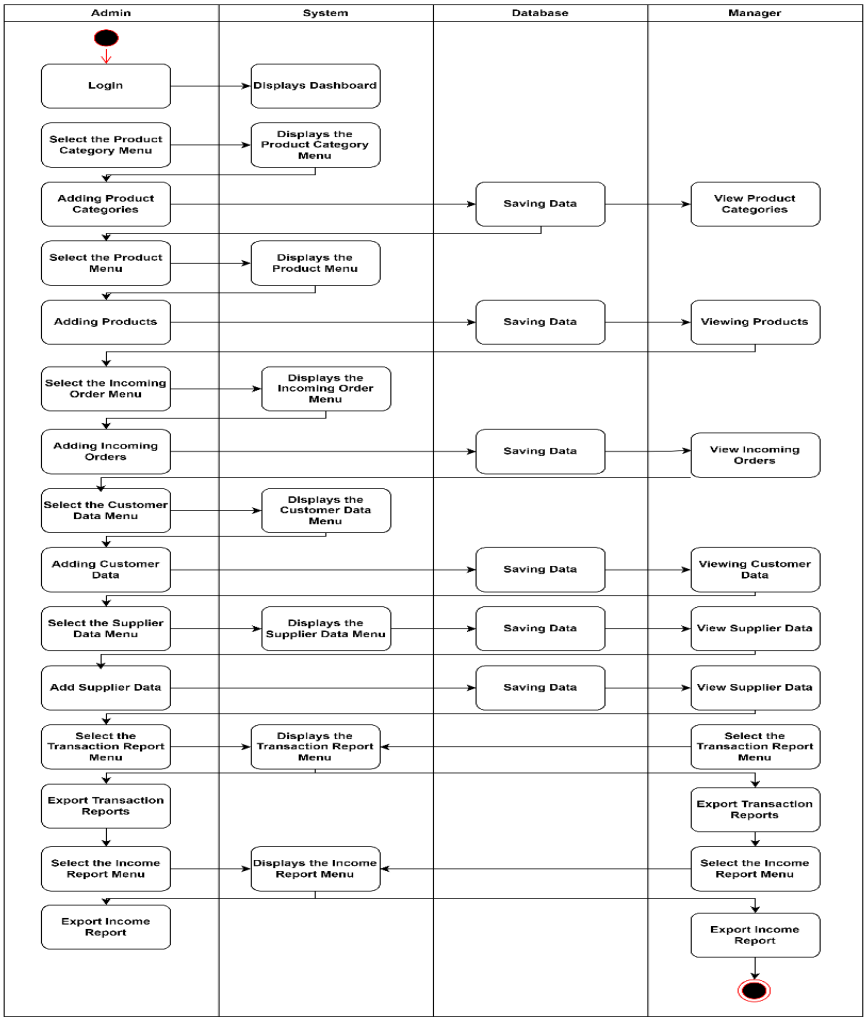

Figure 3. Activity diagram

Design

In this stage, system design is carried out based on the specifications gathered in the requirements analysis phase. During the system design phase, the researcher develops the database design, which is the core of the Web-Based Warehouse Information System. This database design consists of several tables representing the main entities in the system. Below is the database design used in this system.

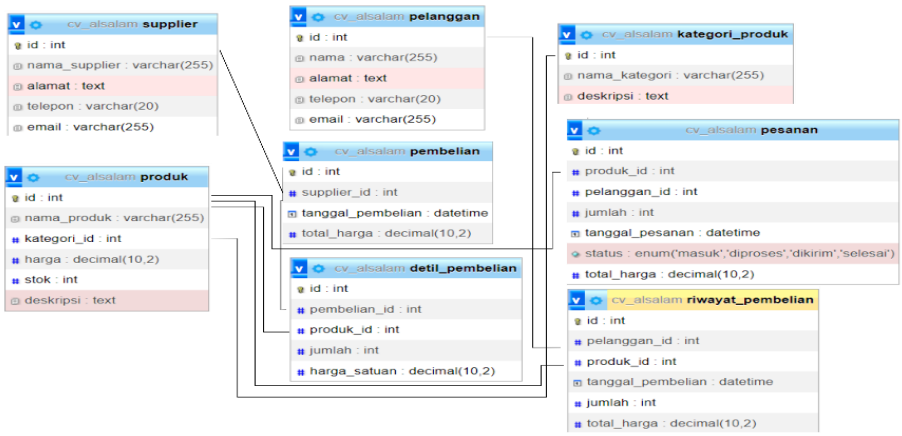

Figure 4. Warehouse information system ERD

Development

The result of this stage is the implementation of the system consisting of several main modules. Development is carried out using PHP, JavaScript, HTML, CSS, and MySQL, ensuring the system can be accessed online and easily managed. Below is the implementation of the Warehouse Information System design.

1) Login Screen

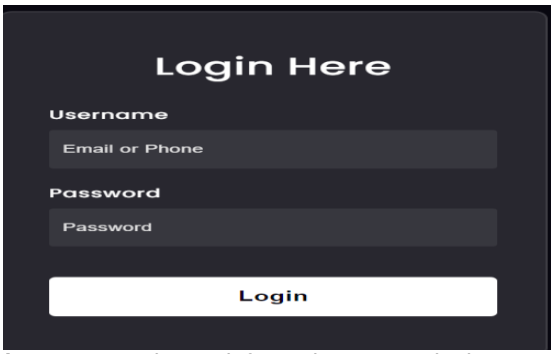

Figure 5. Warehouse information system login screen

Figure 5 shows the login screen of the warehouse information system, where users enter their username and password for verification. There are two roles that use this warehouse information system: admin and manager.

2) Dashboard Screen

Figure 6. Warehouse information system dashboard screen

Figure 6 shows the dashboard screen, which provides intuitive and informative tools for each role to perform their tasks effectively, displaying revenue data, sales, and weekly graphs. With clear data visualization and relevant warehouse information summaries, users can quickly understand the current warehouse situation and make decisions based on available data.

3) Product Category Screen

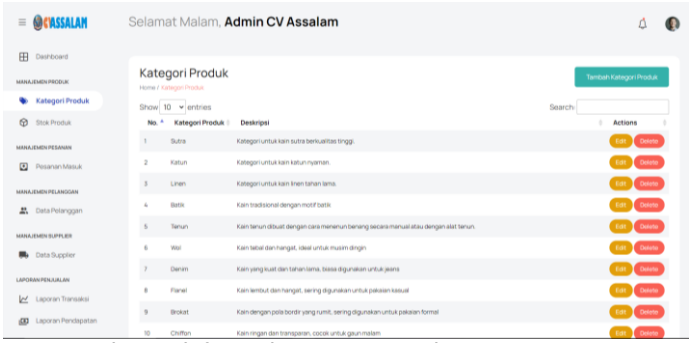

Figure 7. Warehouse information system product category screen

Figure 7 shows the product category management screen, which provides tools for admins to effectively manage income data through add, edit, filter, delete, and search features. Key features include a structured income table with product category details and descriptions, as well as a search function for quickly and efficiently finding information.

4) Product Stock Screen

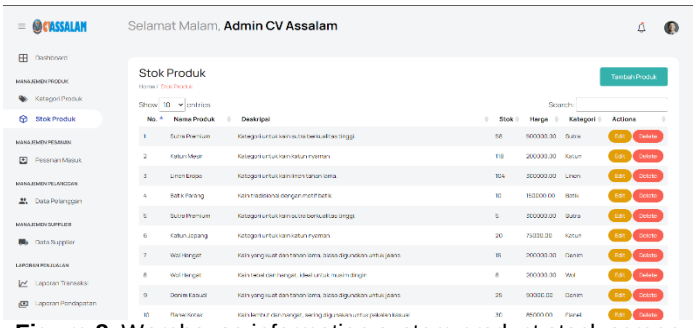

Figure 8. Warehouse information system product stock screen

Figure 8 displays the income management screen with add, edit, filter, delete, and search features, allowing admins to effectively manage income data. Other key features include a structured income table with details such as product name, description, stock, price, and product category, as well as a search function for quick and efficient information access.

5) Incoming Orders Screen

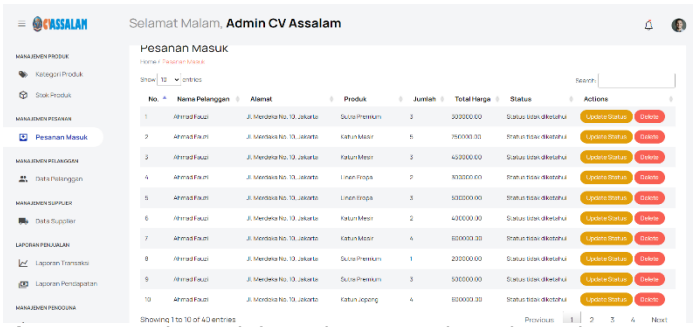

Figure 9. Warehouse information system incoming orders screen

Figure 9 displays the incoming orders screen with add, edit, filter, delete, and search features, allowing admins to effectively manage income data. Other key features include a structured income table showing details such as customer name, address, product, quantity, total price, and status, as well as a search function for quick and efficient information access.

6) Customer Data Screen

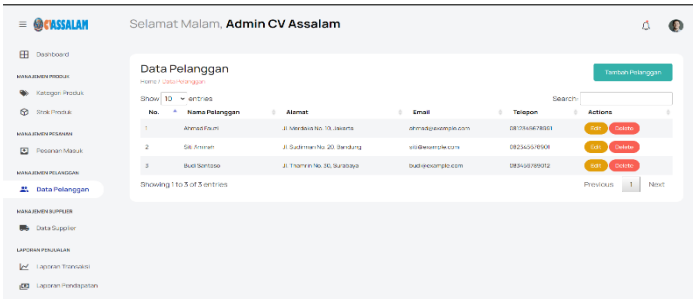

Figure 10. Warehouse information system customer data screen

Figure 10 displays the customer data screen with add, edit, filter, delete, and search features, allowing admins to effectively manage income data. Other key features include a structured income table with details such as customer name, address, email, and phone number, as well as a search function for quick and efficient information access.

7) Supplier Data Screen

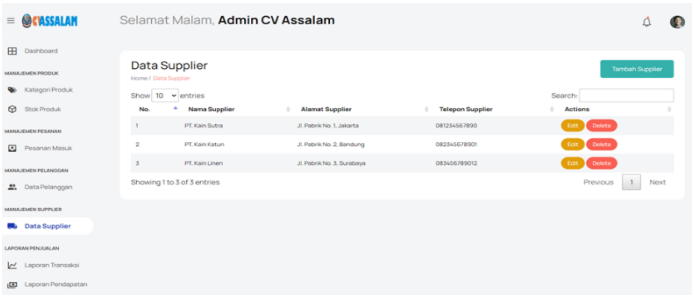

Figure 11. Warehouse information system supplier data screen

Figure 11 displays the supplier data screen with add, edit, filter, delete, and search features, allowing admins to effectively manage income data. Other key features include a structured income table with details such as supplier name, supplier address, and phone number, as well as a search function for quick and efficient information access.

8) Transaction Report Screen

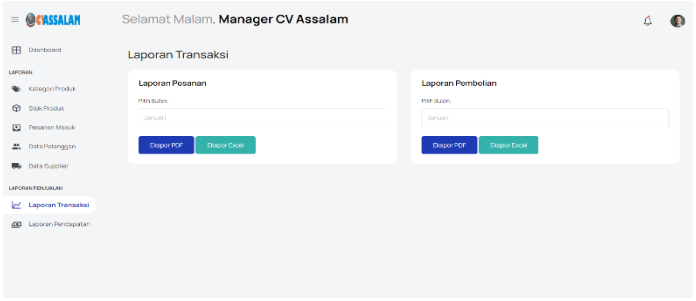

Figure 12. Warehouse information system transaction report screen

Figure 12 displays the transaction report screen with PDF and Excel export features to facilitate documentation and analysis of order and purchase data. This system helps admins and managers monitor and manage transactions transparently and efficiently, enabling decision-making based on actual data.

9) Revenue Report Screen

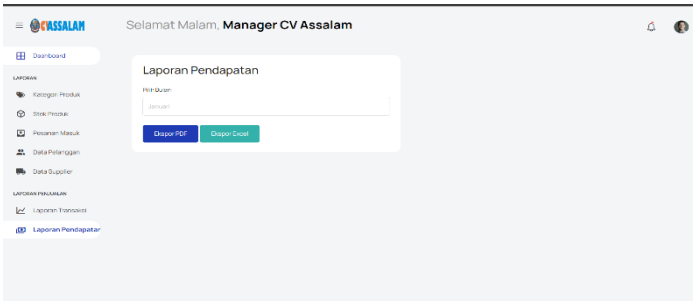

Figure 13. Warehouse information system revenue report screen

Figure 13 displays the revenue report screen with PDF and Excel export features to facilitate documentation and analysis. This system helps admins and managers monitor and manage revenue transparently and efficiently.

Testing

The testing of the CV. Al Salam Warehouse Information System application was conducted using black box testing to ensure all functionalities work according to specified requirements. Below is the table of black box testing results.

Table 1. BlackBox testing

No	Screen	Input	Expected Output	Status
1	Login Screen	Email and Password	If valid, login successful and redirected to the dashboard according to role. If invalid, error message appears.	Success (100%)
2	Dashboard Screen	Login, access dashboard	Displays revenue data, sales, sales by category, nominal amount, weekly revenue graph.	Success (100%)
3	Product Category	Admin login, access category	Displays category table with add, edit, filter, delete, search features, showing product category details and descriptions.	Success (100%)
4	Product Stock	Admin login, access stock	Displays product table with add, edit, filter, delete, search features, showing product name, description, stock, price, product category details.	Success (100%)
5	Incoming Orders	Admin login, access orders	Displays order table with add, edit, filter, delete, search features, showing customer name, address, product, quantity, total price, status details.	Success (100%)
6	Customer Data	Admin login, access customers	Displays customer table with add, edit, filter, delete, search features, showing customer name, address, email, phone number details.	Success (100%)
7	Supplier Data	Admin login, access suppliers	Displays supplier table with add, edit, filter, delete, search features, showing supplier name, address, phone number details.	Success (100%)
8	Transaction Report	Admin/manager login, access report	Displays transaction data with PDF and Excel export features, showing order and purchase data.	Success (100%)
9	Revenue Report	Admin/manager login, access report	Displays revenue data with PDF and Excel export features.	Success (100%)

From the above test results, each feature in the system has been tested and all results show complete success. This indicates that the developed warehouse information system has a 100% success rate in each tested module, reflecting that the system has been well-developed and tested according to the specified requirements and needs. The system can accurately record, generate timely reports, and effectively manage stock data.

Comparison with Performance Metrics

The implemented system was evaluated against predefined performance metrics, demonstrating significant improvements across various aspects. Firstly, the accuracy of stock records increased by 95% compared to the previous manual system, highlighting the effectiveness of automated processes in minimizing errors. Additionally, the reporting speed experienced a substantial reduction, moving from an average of 2 days to real-time reporting, thus enabling timely decision-making and enhancing operational efficiency. Moreover, user satisfaction was remarkably

high, with the system achieving a satisfaction score of 4.8 out of 5 based on feedback surveys from users. This high level of satisfaction underscores the system's ease of use and the tangible benefits it provides in streamlining warehouse operations and improving overall user experience.

4. CONCLUSION

This research successfully designed and implemented a web-based warehouse information system at CV. Al Salam using PHP, MySQL, and JavaScript technology, as well as the Waterfall methodology. The developed system addresses various inventory management issues previously faced by CV. Al Salam, such as manual recording errors and piles of purchase request documents. With this system, CV. Al Salam can monitor stock in real-time, reduce recording errors, speed up reporting processes, and receive automatic restock notifications. The provided interactive dashboard feature facilitates data analysis and decision-making, while transaction and revenue reports that can be exported in PDF and Excel formats simplify documentation and further analysis. The system also features good security with access rights determined based on user roles, namely admin and manager.

However, this research has some limitations. The system still relies on a stable internet connection, which can be an issue in areas with unstable internet connectivity. Additionally, users may need extra training to maximize the use of the available features in the system. Some additional features, such as integration with other systems (e.g., financial systems or CRM), are not available in this version. For future development, the system can be integrated with financial and CRM systems to provide a more comprehensive business management solution. Moreover, developing a mobile application would allow warehouse access and management from mobile devices. Adding artificial intelligence (AI) features for predictive demand analysis and more efficient stock management, as well as developing the system to support multi-warehouse operations, could also be undertaken. Enhancing security features, such as two-factor authentication, could further protect the company's sensitive data. Overall, this research has made a significant contribution to improving the efficiency and accuracy of inventory management at CV. Al Salam through the utilization of information technology. It also opens up opportunities for further development that could provide a more complete and integrated solution for the company.

ACKNOWLEDGEMENTS

This research contributes to the field of information technology and warehouse management by demonstrating the practical application of web-based systems to solve real-world problems. Specifically, it shows how automation and real-time data processing can enhance operational efficiency, reduce human error, and improve decision-making processes. The successful implementation of this system serves as a case study for other organizations seeking to modernize their warehouse operations and can guide future research in the development of similar systems.

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