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RESEARCH ARTICLE Open Access

Android-Based Inventory System for Sitayu Paint Shop to Optimize Goods Management

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Abstract: The Android-based Paint Shop Inventory Information System was developed to overcome the challenges of managing stock in Sitayu Paint more accurately, efficiently, and organized. This research aims to optimize the process of recording, monitoring, and inventory administration through a mobile application that can be accessed at any time. Using the waterfall development method, this research includes the stages of needs analysis, system design, implementation, verification, and maintenance. The app offers a variety of key features such as minimum stock notifications to prevent stockouts, integrated sales reports, and simple data analysis to support strategic decision-making. The system allows store staff to monitor and update inventory data in real-time, providing high flexibility in daily operations. The implementation results show that the application is able to reduce the risk of recording errors to speed up the work process. and improve time efficiency in inventory management. In addition, this system supports management in developing business strategies based on more organized and relevant data. With the application of this digital technology, Sitayu Paint has succeeded in increasing customer satisfaction through guaranteed product availability and more professional operations. This research makes a significant contribution to modern inventory management in the retail sector, especially paint shops, with the potential for development for the integration of further features such as stock demand prediction.

Keywords: Android Application; Inventory; Waterfall Method; Stock Management; Information Systems.

1. Introduction

Sitayu Paint, located in Medan, operates as a prominent paint retail outlet. It offers an extensive range of products including wall paints, wood paints, iron paints, and specialized coatings tailored to diverse painting requirements. These products are available in 5-kilogram gallon containers and 25-kilogram buckets, with ordering options in boxes containing four gallons or individual buckets for delivery to the store [1][2]. As a key player in the local paint market, Sitayu Paint faces the challenge of managing a varied inventory to meet customer demands effectively. In the current era of rapid technological advancement and globalization, information systems have emerged as indispensable tools across multiple domains, particularly in business operations [3]. Within the retail sector, inventory management stands as a critical determinant of operational success, especially in industries like paint sales where product diversity and stock turnover are significant factors [4]. Sitayu Paint acknowledges the necessity of precision and efficiency in inventory management to ensure seamless operations and sustain customer satisfaction [5][6]. Nevertheless, traditional manual approaches to inventory control frequently encounter substantial obstacles, including frequent recording inaccuracies, data loss, and significant time inefficiencies. These issues disrupt daily operations and pose risks to profitability and service quality. Addressing such challenges necessitates the adoption of a robust information system capable of automating and streamlining inventory processes [7][8]. Consequently, Sitayu Paint has initiated the development of an Android-based Paint Shop Inventory Information System, positioning it as a strategic solution to enhance stock management effectiveness and efficiency.

The Android-based Inventory Information System supports Sitayu Paint in the real-time recording, monitoring, and administration of paint stock [9]. Leveraging mobile technology, the system offers unparalleled flexibility, enabling employees to update inventory data seamlessly from any location at any time [10]. This mobility addresses the limitations of static, manual systems by ensuring that stock information remains current and accessible, thereby reducing decision-making delays. Prior research has demonstrated the value of Android-based solutions for stock management. For instance, Hartati Dyah Wahyuningsih *et al.* Have highlighted the efficacy of Android platforms in facilitating sales reporting, while Vicky Haeru Putera *et al.* Have demonstrated that automated stock monitoring significantly mitigates financial losses due to mismanagement. Diverging from these broader applications, the present study narrows its scope to address the unique demands of the paint retail sector. It focuses on product variations such as color codes, sizes, and specific inventory needs. The system incorporates essential functionalities, including notifications for minimum stock levels to prevent shortages, integrated sales reporting for performance tracking, and basic data analytics to support timely and informed decision-making.

The deployment of this system aims to substantially elevate Sitayu Paint's operational performance by minimizing errors in inventory management and enhancing service delivery to customers [11][12]. Internal records from Sitayu Paint reveal that manual recording errors have led to annual financial losses of up to 15%. This underscores the urgent need for automation. By transitioning to a digital inventory management framework, the system seeks to improve retail accuracy and operational efficiency. Beyond error reduction, such technology is poised to transform how stock-related decisions are made, shifting from reactive to proactive strategies based on real-time data. This shift is particularly crucial in a competitive market where product availability directly influences customer trust and loyalty.

Furthermore, the system addresses the broader challenges of inventory management in the digital age, where speed, accuracy, and adaptability are paramount. Manual systems, often reliant on paper-based records or outdated software, struggle to keep pace with retail demands, especially in a sector characterized by seasonal fluctuations and diverse product lines. Sitayu Paint's Android-based solution automates routine tasks but also provides a scalable platform that can evolve with the business. Potential future enhancements, such as predictive analytics for stock replenishment or integration with financial management modules, could further amplify its utility. Additionally, the system's design prioritizes user accessibility, ensuring that staff with varying levels of technological proficiency can operate it effectively. This reduces the learning curve and implementation barriers.

This paper examines the development process, key functionalities, and tangible benefits of the Android-based Inventory Information System implemented at Sitayu Paint. It evaluates the system's role as a viable solution to inventory management challenges in a digitalized retail landscape [13]. By analyzing both technical and operational impacts, the study seeks to provide a comprehensive assessment of how mobile technology can redefine inventory practices in niche sectors like paint retail. Moreover, it aims to contribute to the growing body of knowledge on digital transformation in small to medium-sized enterprises (SMEs), offering practical insights for other retailers facing similar operational hurdles. Through a detailed exploration of system design, implementation outcomes, and user feedback, the paper underscores the transformative potential of tailored electronic tools in enhancing business efficiency and customer satisfaction.

2. Related Work

Numerous studies have explored the application of Android-based inventory information systems to enhance goods management across various sectors. These investigations provide valuable insights into the potential of mobile technology to address stock control inefficiencies, offering a foundation for the development of tailored solutions. This section reviews key research efforts in this domain, highlighting their contributions, methodologies, and relevance to the Android-based inventory system designed for Sitayu Paint. By critically examining these works, this study identifies gaps and opportunities for innovation specific to the paint retail sector. One notable study was by Vicky Haeru Putera *et al.* (2024) Introduced the Goods Inventory Management Information System (SIMPB), a framework designed to monitor goods movement in real-time. The system focuses on minimizing losses due to inventory damage and optimizing purchasing decisions, ultimately contributing to improved financial performance for businesses. By automating stock tracking, SIMPB reduces human error and enhances decision-making precision, demonstrating the transformative potential of digital tools in inventory management [14]. While this study offers a broad perspective on goods management, its principles of automation and loss prevention are directly applicable to the operational challenges faced by paint retailers like Sitayu Paint, where stock accuracy is critical to avoiding shortages or overstocking.

Similarly, Hartati Dyah Wahyuningsih *et al.* (2019) Developed an Android-based sales information system for Candra Shop, emphasizing transaction simplification. Their system facilitates online ordering of goods and streamlines sales report generation, enhancing operational efficiency. Mobile technology in this context accelerates transaction workflows and provides business owners with actionable insights through accessible reporting tools [12]. This research underscores the importance of mobility and real-time data access, aspects that are central to the design of the inventory system for Sitayu Paint, where staff require immediate updates on stock levels to meet customer demands promptly. In another contribution, Ari Kurniawan Saputra and Fenty Ariani designed a web-based inventory application for Cat Mitra Depot Store, transitioning from a manual to a digital stock management approach. Their system significantly improved inventory tracking efficiency by automating data entry and retrieval processes, reducing the time and errors associated with traditional methods [20]. Although web-based, their findings on digitization benefits resonate with the goals of the Android-powered system proposed for Sitayu Paint, particularly in addressing the inefficiencies inherent in manual record-keeping within niche retail environments.

Further advancing the field, Muhammad Luthfi Syam and Erdisna (2022) developed an Android-based stock management system incorporating QR-code functionality. This feature enables mobile inventory control, allowing users to access and monitor stock data across locations and timeframes. QR codes enhance stock updates, a critical advantage for dynamic retail operations [16]. This innovation highlights the potential for integrating specialized features into mobile inventory systems. It inspired the inclusion of tailored functionalities like minimum stock notifications in the Sitayu Paint system to address sector-specific needs. Additionally, Andrew Jhosua *et al.* (2024) Applied the 7C Framework to develop a combined web and Android-based inventory and sales system for Kedai Cahaya Watches. Their approach focused on improving operational efficiency through a user-centric design that prioritized clarity, customization, and connectivity among other principles. The results demonstrated significant enhancements in stock management and sales tracking, reinforcing the value of hybrid platforms in retail settings [19]. This study provides a methodological reference for ensuring user adoption and system effectiveness, aspects that are carefully considered in the development process for Sitayu Paint's inventory solution.

While these studies collectively affirm the efficacy of Android-based and digital inventory systems in optimizing goods management, the current research diverges by addressing the unique operational context of a paint retail store like Sitayu Paint. Unlike the broader or multi-sector focus of prior works, this study tailors its system design to accommodate specific product variations (*e.g.*, paint types, sizes, and colors) and operational demands of the paint industry. Key features such as minimal stock notifications to prevent shortages, integrated sales reports for performance evaluation, and basic data analytics for strategic decision-making are incorporated to meet these specialized requirements. Furthermore, the adoption of a structured waterfall development methodology—encompassing requirement analysis, system design, implementation, testing, and maintenance—ensures that the resulting system aligns precisely with the store's operational workflows and long-term goals. Despite differences in scope and application, previous research converged on the critical role of Android-based systems in enhancing efficiency and accuracy in inventory management. These shared findings validate the direction of the current study and provide a robust theoretical and practical foundation for further innovation. For instance, the integration of advanced functionalities, such as machine learning algorithms for stock demand forecasting or seamless connectivity with accounting modules, emerges as a promising avenue for future development. Such enhancements could enable predictive inventory management, allowing retailers to anticipate demand fluctuations and optimize stock levels proactively. Additionally, the emphasis on user accessibility and real-time data in prior studies informed the design of the Sitayu Paint system, ensuring that it remains intuitive for staff with varying levels of technical expertise.

A critical gap in the reviewed literature is the limited exploration of inventory systems tailored to niche retail sectors like paint shops, where product diversity and seasonal demand patterns introduce unique challenges. While general inventory solutions offer valuable frameworks, they often lack the specificity required to address issues such as color-specific stock tracking or bulk order management, both pivotal in paint retail. This study bridges this gap by focusing on a customized solution that automates routine tasks but also embeds analytical tools to support strategic planning. By doing so, it contributes to the discourse on digital transformation in small to medium-sized enterprises (SMEs), offering actionable insights for similar businesses navigating inventory management complexities in specialized markets. The reviewed studies provide a compelling case for Android-based inventory systems, highlighting their capacity to streamline operations and reduce errors. Building on these insights, the current research innovates by aligning its system design with Sitayu Paint's specific needs, ensuring relevance and applicability. This tailored approach, combined with a rigorous development methodology, positions the proposed system as a significant advancement in inventory management for the paint retail sector. Future research could explore cross-sector comparisons or the integration of emerging technologies like artificial intelligence to further enhance system capabilities, paving the way for smarter and more adaptive inventory solutions.

3. Research Method

In the process of developing the Android-Based Paint Store Inventory Information System at Sitayu Paint, the waterfall method is used as a research method because the system is created in sequential stages. The Waterfall model was chosen in this study because it is in accordance with the needs of the Android-Based Paint Store Inventory Information System development project at Sitayu Paint which requires structured and organized system development stages with the Waterfall model providing a clear workflow through five main stages, namely needs analysis, design, implementation, verification, and maintenance. Each stage must be completed thoroughly before moving on to the next stage. This ensures that no elements are missed or undercooked during the development process. Allows the testing process to be carried out thoroughly after the implementation stage. This is important to ensure that every system feature such as login, item data entry, and reports can run according to store specifications. This documentation is a valuable guide for developers, stakeholders, and end users in understanding the system development and operation process [14]. The results of this study are an effective system to improve inventory management efficiency at Sitayu Paint. Each stage of using the waterfall must be completed first before moving on to the next round so that there is no repetition of stages.

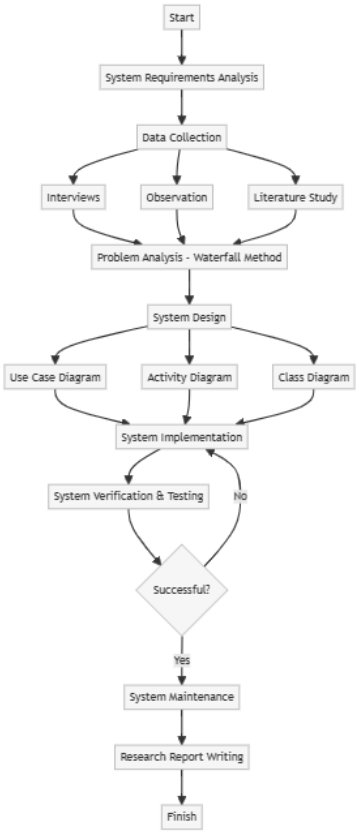

Figure 1. Research Outline

The waterfall method is a linear sequential model or also known as the classical life cycle. This method consists of 5 rounds that are carried out repeatedly. The waterfall method is based on the needs of organizations or companies in processing data and information, and involves procedures and technical operations related to work [15]. Here are the steps in the waterfall method:

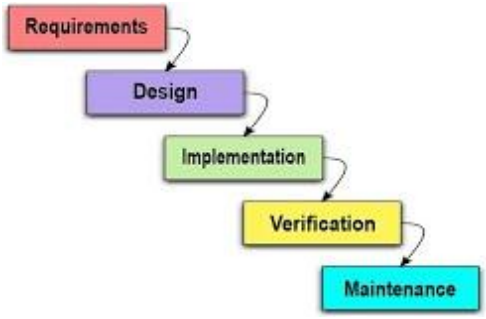

Figure 2. System Development Methods

1) Requirement
   At this stage, user needs are identified which aims to ensure that all functional and non-functional needs of the system are well documented. In addition, authors can add information on how user needs are prioritized and validated so that the system developed is truly relevant to store operations.
2) Design
   This stage involves designing the system architecture, user interface, and database. The author should explain in more detail how this design is created, for example by using UML diagrams such as use cases, class diagrams, and activity diagrams, which illustrate the workflow and relationships between system components. An explanation of the tools or software used to support the design can also add important details.
3) Implementation
   At this point, the coding is done based on the design that has been created. The author can explain how each key feature, such as minimum stock notifications and sales reports, is implemented technically. Additionally, it is important to note whether there are any iterations or revisions during the coding process to adapt to any user needs that may arise.
4) Verification
   At this stage, the system that has been created is tried to prove that it meets the set requirements. In this study, blackbox testing has been carried out to validate every system feature, such as login, item data input, and sales reports. However, the author can add whether there is user acceptance testing to ensure that the system meets the expectations of the end user. Tests on each module should also be reported to show that the app is running well before moving on to the next stage.
5) Maintenance
   The program that has been completed is used and maintained in the last phase of the waterfall method. The final stage involves maintaining the application after implementation, including performance monitoring, bug fixes, and adding new features based on user feedback. The author can explain whether there is a monitoring system used to proactively detect problems or whether there is a periodic evaluation schedule to measure the performance of the application in supporting store operations [16].

4. Result and Discussion

4.1 Results

4.1.1 Information System Design

The paint shop inventory information system on Sitayu Paint has 1 main access, namely admin. Where the system will collect inventory data at the Sitayu Paint store. Admin logs in to the account. If the admin does not have the account, the admin must create an account first.

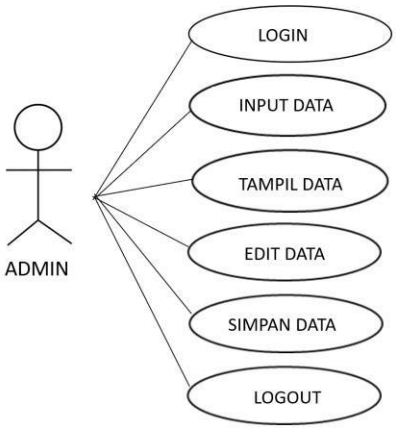

Figure 3. Use Case Diagram

As seen in figure 2 is a Use Case that illustrates the role of the Admin in the system. Admins have six main functions, namely Login to enter the system, Input Data to add new data, View Data to view stored data, Edit Data to change data, Save Data to save changes or new data, and Logout to log out of the system [17]. This diagram shows the Admin's direct interaction with various system features in data management Figure 3 illustrates the system process and the sequence of activities. The database that generates two tables- the user data table and the item data table are created based on the data being processed and the information needed, as shown in Figure 4.

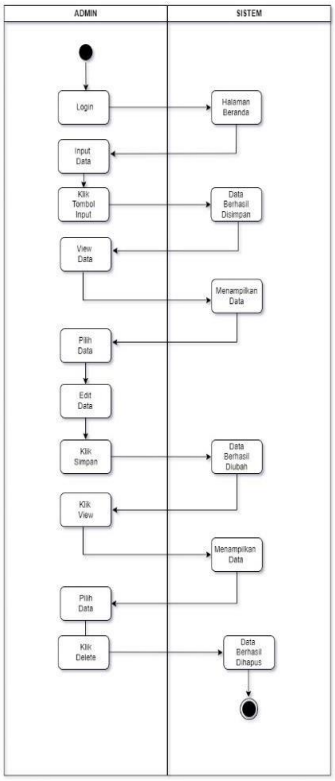

Figure 4. Activity Diagram

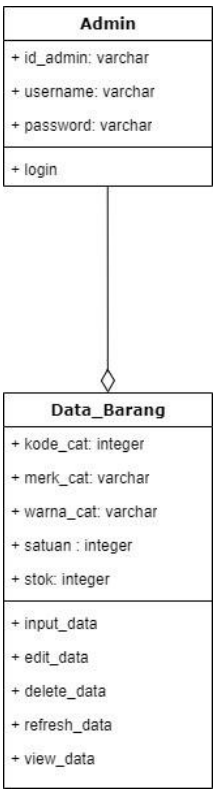

Figure 5. Class Diagram

4.1.2 App View

As seen in Figure 5, the administrator must enter the username and password on the login screen to access the paint shop inventory information system.

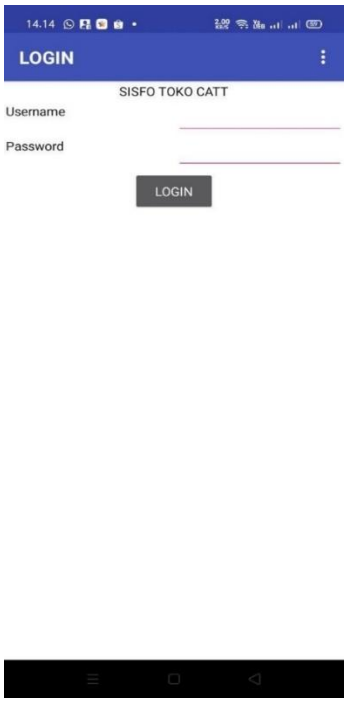

Figure 6. Login Page

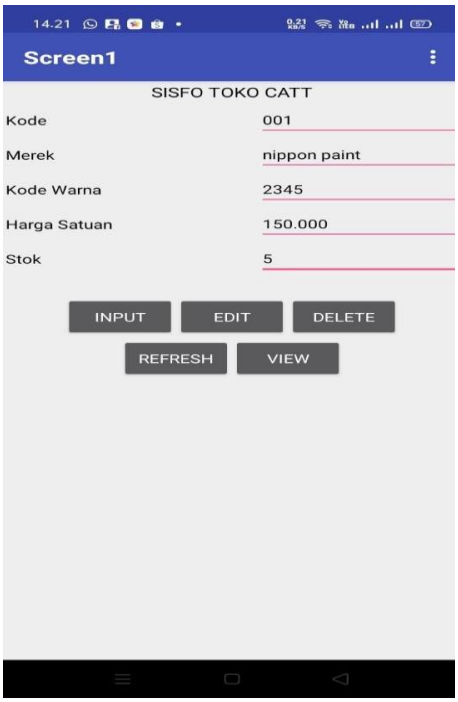

Figure 7. Item Data Input Page

Figure 8. Item Data Page

On the item input page, the admin must fill in the item data, namely: code, brand, color code, unit price, and stock of goods. Administrators can update, delete, and add new item data on this page. as illustrated in Figure 6. On the item data page, you can see all the item data that has been inputted. And on this page, admins can also edit and delete data that has previously been inputted. As seen in figure 7.

4.1.3 Database page

In this system, a cloud database is used, namely Airtable. Airtable allows users to create and manage their own databases with an intuitive and flexible interface, similar to using spreadsheets such as Microsoft Excel or Google Sheets, but with the further ability to compose and connect data in complex ways. In this database you can see all the data that has been inputted, as seen in Figure 9

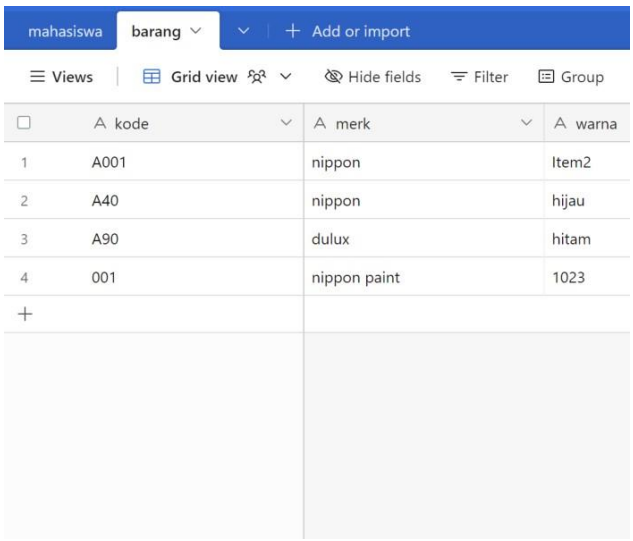

Figure 9. Airtable Database Page

4.1.3 Blackbox Testing

Blackbox testing is a software testing method that focuses on checking the functionality of a system based on specifications without knowing the details of the internal implementation. In tests conducted on the Android-based Sitayu Paint inventory information system, the main features tested include login, item data management (input, edit, delete), minimum stock notifications, sales reports, and integration with cloud databases[18] . Each test scenario has specific inputs with expected results, such as verifying the correct login

credentials or error messages for incorrect inputs. Testing showed all features worked as expected, with a status of "Pass" for each scenario.

Table 1. System Testing

No	Feature Tested	Test Scenarios	Input	Result What to Expect	Test Results	Status
1	Login	Enter a valid username and password	Username: admin Password: 12345	The system successfully enters and displays the main page.	Appropriate	Pass
2	Login	Entering the wrong username or password	Username: admin Password: false	The system displays an error message: "Wrong username or password".	Appropriate	Pass
3	Item Data Input	Admin enters new item data into the system	Code: 001, Brand: Dulux, Stock: 50	Item data is successfully saved and appears in the item list.	Appropriate	Pass
4	Edit Item Data	Admin changes existing stock	Code: 001, New Stock: 60	Item data is successfully updated with new stock.	Appropriate	Pass
5	Delete Item Data	Admin deletes data for certain items	Code: 001	Item data is successfully deleted from the item list.	Appropriate	Pass

4.2 Discussion

The findings of this study demonstrate that the Android-Based Inventory Information System developed for Sitayu Paint has successfully provided a significant solution in optimizing inventory management. The implementation of this system effectively reduces the risk of recording errors, enhances time efficiency, and offers real-time access to employees through mobile technology. Additionally, the system introduces standout features such as minimum stock notifications, sales reports, and data analytics, which facilitate more effective strategic decision-making. These advantages align with the results of prior research, such as the study by Vicky Haeru Putera *et al.*, (2024) which highlighted the benefits of inventory management systems in minimizing losses and optimizing purchases [14], and the work of Hartati Dyah Wahyuningsih *et al.*, (2019) who developed an Android-based system to accelerate transactions and improve the efficiency of sales reporting [12]. What sets this study apart from previous research is its unique focus on the specific needs of paint shops, particularly in managing stock for products with varying sizes and color variants, making it more industry-specific. Furthermore, the adoption of the Waterfall development methodology ensures a clear and controlled development process, from requirements gathering to system maintenance. Testing results confirm that all system features operate optimally, including integration with a cloud-based database using Airtable, which provides flexibility for online data management.

In comparison to other studies, such as the research by Muhammad Luthfi Syam and Erdisna that emphasized the use of QR-Code technology for inventory control flexibility, this study prioritizes data analytics to support strategic decision-making. Similarly, while the 7C Framework concept is applied by Andrew Jhosua *et al.* to enhance operational efficiency holds relevance, this research focuses on designing intuitively tailored features for users with diverse levels of technological literacy [21]. A deeper analysis reveals that this study reinforces the theory that Android-based information systems not only boost operational efficiency but also transform the inventory management paradigm into a more scalable and data-driven approach. By offering real-time access and straightforward data analysis capabilities, the system delivers a modern solution that meets the demands of businesses in the digital era. Moreover, this research contributes by proposing the development of additional features, such as stock demand prediction using machine learning and the integration of accounting modules—areas that have not been extensively explored in previous studies. This study not only validates the benefits identified in previous research but also introduces a new dimension through its application-specific focus on the paint industry. With its strengths in flexibility, efficiency, and data-driven decision-making, this system is expected to serve as an innovative model for inventory management in other retail sectors.

5. Conclusion and Recommendations

The development of an Android-based information system for inventory management at Sitayu Paint has successfully delivered a solution to enhance efficiency and accuracy in recording, monitoring, and managing stock in real-time. By employing the waterfall development methodology, the system was systematically designed through well-defined stages, from requirements gathering to implementation and maintenance. Equipped with features such as minimal stock notifications, sales reports, and data analytics, the system supports improved operational decision-making. The implementation outcomes demonstrate that it effectively reduces recording errors, boosts time efficiency, and provides seamless access for employees via mobile technology. Consequently, this system serves as a robust solution to address inventory management challenges in the digital era while enhancing customer service. Furthermore, this research significantly contributes to optimizing business processes within the paint sales industry. It holds potential for further development, including the integration of additional features or adaptation to other business sectors. Based on the findings of this study, the system is recommended for implementation in other retail sectors with similar stock management needs. These sectors include building material stores, pharmacies, or supermarkets. Customizing features like product categories and transaction volume handling can help address these industries' specific requirements. However, the deployment of this system is not without challenges. Technologically, the availability of compatible devices and system scalability to manage large data volumes remain primary concerns. Additionally, data security and privacy are critical issues, necessitating robust protective measures against potential cyber threats.

For the future development of the Sitayu Paint inventory information system, several recommendations are proposed. First, incorporating a stock demand prediction feature using machine learning algorithms is necessary to enable more precise restocking decisions. Second, integrating an accounting module into the system would streamline comprehensive financial management, including profit and loss calculations and operational cost tracking. Third, expanding the system to other platforms, such as iOS or web-based applications, could enhance accessibility and user flexibility. Fourth, improving the user interface (UI/UX) design to be more intuitive and user-friendly is essential, particularly for staff with limited technological literacy. Fifth, adding advanced security features, such as data encryption and multi-factor authentication, is crucial to safeguard sensitive inventory and transaction data. Finally, regular system evaluations and testing should be conducted to ensure sustained performance and reliability. The implementation of these suggestions is expected to further elevate operational efficiency and the quality of services provided to customers.

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