Design and Development of Web-Based Wooden Toy Retail Business Stock Operation System

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***Abstract*—This work presents the design, development, and evaluation of a stock management system for small retail businesses operating across multiple e-commerce platforms. Key features include stock management, sales dashboard, sales tracking, and CSV/XLSX file import for multi-platform data integration. A comparative study of five existing systems was conducted to identify feature gaps and guide system design. The system was evaluated through user interviews and surveys, showing improvements in operational efficiency and a reduction of manual errors. The results demonstrate that the proposed system provides an effective solution for small businesses managing multi-platform sales data.**

***Keywords*—Stock Management System, Inventory Management, E-commerce Integration, Sales Dashboard, Multi-Platform E-commerce**

I. Introduction

Retail businesses today often face challenges in managing stock and handling sales data effectively, especially when selling products across multiple e-commerce platforms. As online platforms become a major part of business operations, combining stock information and managing sales data from different sources becomes more complicated. Traditional methods, such as spreadsheet-based tracking and manual record-keeping, often rely heavily on manual data entry and fragmented data management across multiple sources, leading to human errors, incorrect stock levels, and time-consuming administrative tasks. To address these challenges, many businesses have adopted inventory management software to improve operational efficiency. However, these solutions often come with subscription costs and bundled features structured in tiered plans, which may not align with the actual needs of every business. As a result, small and medium-sized enterprises (SMEs) may experience inefficiencies from underutilized features while still incurring ongoing costs. A clear example of this is a wooden toy retailer that continues to manage daily operations such as updating stock, tracking sales, and summarizing data using traditional approaches. Its workflow relies on manual order entry and manual stock adjustments, which may lead to ordering and counting errors [1], as well as basic tools such as Microsoft Excel, Google Sheets, and logbooks. As orders are received from multiple channels, including walk-in customers, social media, and e-commerce platforms, including TikTok, Shopee, and Lazada, maintaining accurate and organized records becomes increasingly difficult. Furthermore, the retailer relies heavily on LINE Messenger as its primary communication platform for coordination and order management; however, most software solutions available in the market do not provide integration with LINE, limiting compatibility with existing business workflows. This fragmented approach often leads to stock discrepancies, inaccurate sales data, and inefficient workflows. Moreover, existing software solutions in the market may not be suitable for these businesses, as they typically require only a limited set of core features to effectively support their operations. To address these issues, this study focuses on developing a multi-platform stock operation system that aims to streamline stock-related tasks and the process of gathering and visualizing sales data by integrating with e-commerce platforms, including Shopee, Lazada, and TikTok Shop, via CSV and XLSX file imports. In addition, the system includes a LINE notification feature to support daily operations. This includes low-stock alerts to notify users when product quantities fall below a defined level, as well as file-import reminders to ensure sales and stock data are updated regularly. The paper is structured as follows: Section II reviews and analyzes related work and related software; Section III presents the system design and architecture; Section IV describes the system implementation; Section V evaluates the system; and Section VI concludes the paper and outlines future work.

II. Related Works

To support the system development, an analysis of 3 related works and a comparative study of five related systems are conducted. This analysis aims to identify the key strengths and weaknesses of existing solutions currently available in the market. The findings will serve as a guideline for the design and development of the proposed system. Javaid et al. (2025) [2] proposed an inventory system using Raspberry Pi and webcams to scan QR codes for real-time tracking of inbound and outbound items, replacing traditional inventory management methods that rely on manual data entry. They also applied a Random Forest model for sales forecasting and inventory optimization. While the system improved operational efficiency and addressed common inventory issues, such as stock level inaccuracies, which is also one of the pain points in the wooden toy retail business, this approach may not be suitable for small wooden toy businesses due to its reliance on additional hardware components, such as Raspberry Pi devices and webcams, which may increase implementation and maintenance costs. Furthermore, the integration of machine learning forecasting introduces technical complexity that may exceed the operational needs of small businesses with relatively simple inventory patterns and limited technical resources. Therefore, the system may be less practical for small-scale enterprises seeking a low-cost and easy-to-maintain stock management solution. Güneş et al. (2025) [3] developed a machine learning framework using XGBoost to detect and prioritize inventory counting errors. The model can identify over 85% of potential errors, helping staff focus on items that need rechecking and effectively addressing inventory counting inaccuracies, which are one of the common pain points in wooden toy retail businesses. However, it may not be suitable for small wooden toy

businesses, where a simpler preventive stock management approach may be more practical than relying on post-error detection through machine learning analysis. Ferdianto et al. (2023) [4] developed an SME sales management application to address inefficiencies caused by manual sales data collection and processing. The system supports the management of sales data, inventory, and reports, helping business owners reduce reporting errors and monitor sales performance more effectively, particularly for SMEs managing sales across multiple store locations. This solution addresses problems similar to those discussed in this study, especially inefficient manual sales data handling. However, the system mainly focuses on supporting sales operations in physical stores and does not emphasize centralized sales data consolidation across multiple e-commerce platforms. Therefore, it may not be suitable for businesses that operate across multiple online sales channels and require integrated sales monitoring from different platforms. Despite the advancements presented in these studies, their approaches may not be well-suited for small and medium-sized enterprises (SMEs). Many of the proposed solutions rely on advanced technologies, specialized hardware, and complex data processing techniques, which can increase implementation and maintenance costs and create barriers for small businesses. In addition, some systems do not fully address the operational requirements of businesses that manage sales across multiple online platforms, limiting their applicability in multi-channel retail environments. These solutions often introduce a level of complexity that goes beyond the practical needs of SMEs, which typically prioritize simplicity, ease of use, and quick adoption in daily operations. As a result, there remains a need for a lightweight and cost-effective solution that focuses on essential functionalities while minimizing system complexity.

To further support the system development, a comparative study of five related systems are conducted. The selected software includes Zoho Inventory, inFlow Inventory, Ordoro, Cin7 Core, and Brightpearl.

A. Zoho Inventory

The Zoho Inventory system provides comprehensive stock management features, including real-time inventory tracking, automated low-stock alerts, and sales tracking across multiple channels [5]. It also supports CSV and XLSX file import for bulk data updates. However, the system does not natively support integration with LINE Official Account (LINE OA) for notifications. In addition, some advanced features are only available in higher-tier subscription plans, which may not be cost-effective for SMEs. Furthermore, the platform includes additional functionalities such as barcode scanning, multi-warehouse management, and automation tools that may not be fully utilized by small businesses but are still bundled within paid plans.

B. inFlow Inventory

The inFlow Inventory offers strong stock management capabilities and detailed sales tracking features [6]. It includes low-stock alerts and supports only CSV file imports. However, its reporting dashboard is relatively basic compared to more advanced systems, and it lacks integration with communication platforms such as LINE OA, limiting its usability for businesses that rely on messaging applications for daily operations. Additionally, the system provides features such as barcode management and purchase order automation, which may exceed the operational needs of SMEs while still contributing to overall subscription costs.

C. Ordoro

Ordoro focuses on inventory and order management for e-commerce businesses [7]. It provides stock tracking and sales monitoring features, along with CSV import support. However, it does not support XLSX import or LINE-based notification systems, which may reduce its effectiveness for SMEs seeking simple and integrated solutions. Moreover, Ordoro includes shipping and logistics management features that may not be relevant for smaller retailers, yet are incorporated into its pricing structure.

D. Cin7 Core

Cin7 Core offers advanced inventory management, sales tracking, and comprehensive sales dashboards with strong analytics capabilities [8]. It supports CSV imports and provides robust automation features. However, the system is relatively complex and may require significant setup and training. Additionally, it lacks direct integration with LINE OA, and its pricing structure may be prohibitive for small businesses. The platform also includes extensive features such as multi-warehouse management and advanced integrations, which may be unnecessary for SMEs with simpler operational requirements.

E. Brightpearl

Brightpearl is a retail-focused platform that provides powerful inventory management, real-time sales tracking, and advanced reporting dashboards [9]. It also supports CSV data import and offers automation features for stock management. However, similar to other systems, it does not support XLSX import as flexibly and lacks integration with LINE OA. Furthermore, its enterprise-oriented design and cost structure make it less suitable for SMEs that prioritize simplicity and affordability. In addition, Brightpearl includes a wide range of enterprise-level functionalities, such as advanced fulfillment and accounting integrations, which may remain underutilized by small businesses. A comparison table for inventory-related software is presented in TABLE I.

TABLE I. INVENTORY RELATED SOFTWARE COMPARISON

Feature	*Z*	*I*	*O*	*C*	*B*	*P*
Stock Management	✓	✓	✓	✓	✓	✓
Low Stock Alert (via LINE OA)	✗	✗	✗	✗	✗	✓
Sales Dashboard	✓	✓	✓	✓	✓	✓
Sales Tracking	✓	✓	✓	✓	✓	✓
Support CSV Import	✓	✓	✓	✓	✓	✓
Support XLSX Import	✓	✗	✗	✗	✗	✓

[a.] Note that Z = Zoho Inventory, I = inFlow Inventory, O = Ordoro, C = Cin7 Core, B = Brightpearl, P = The Proposed System

Overall, while these systems provide a wide range of functionalities in stock management, sales tracking, and data visualization, they often lack support for lightweight workflows such as flexible file imports and integration with widely used communication platforms like LINE OA. Additionally, their complexity and cost structures may not align with the needs of SMEs, which typically prioritize simplicity, cost-effectiveness, and ease of use in daily operations. Among the reviewed systems, Zoho Inventory

presents the closest alignment to the proposed system in terms of core functionalities, including stock management, low stock alert via LINE OA, Sales Dashboard, Sales Tracking, and Support CSV/XLSX import. However, the proposed system offers several advantages by focusing on simplicity and practical usability for SMEs. It also integrates directly with LINE OA for direct notifications and avoids bundling unnecessary enterprise-level features such as advanced warehouse management and barcode systems. As a result, the proposed approach reduces system complexity and cost while better aligning with the operational needs and workflows of small businesses.

III. System Design

This section presents the design of the proposed stock management system. The software architecture describes the overall system structure, including the adopted technologies, database design, and system integration approach, providing a technical foundation of how the system is implemented. Subsequently, the system design focuses on the functional aspects by outlining the core features of the proposed system and their corresponding user requirements.

A. Software Architecture

The system is developed using a modern web technology stack. The frontend is built with React, providing a responsive and interactive user interface. The backend is implemented using Express.js (Node.js), which handles business logic, API endpoints, and data processing. The system uses PostgreSQL as the primary database to store structured data. In addition, the system integrates with the LINE Messaging API to send notification messages for low stock alerts and missing file upload reminders to users in real time. The system architecture is presented in Fig 1.

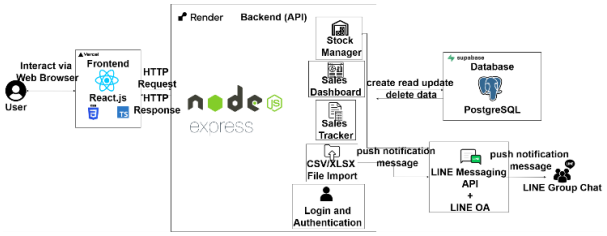

Fig. 1. System Architecture.

B. System Design

The proposed system consists of five main features designed to support stock and sales operations across multiple e-commerce platforms by improving inventory visibility, reducing manual operational tasks, and enhancing the efficiency of sales data management. This section presents both the functional design and database design of the system. To further illustrate the functional scope of the proposed system, a Use Case Diagram is presented to describe the interactions between system users and the system functionalities. The diagram includes two primary user roles, namely User and Admin, and consists of 15 use cases corresponding to the five main features of the proposed system, namely stock management, sales dashboard, sales tracker, file import, and login and authentication. The use case diagram is illustrated in Fig. 9.

Fig. 2. Use Case Diagram of Stock Management System.

The description of each feature and its corresponding user requirement specification is presented as follows:

1) Stock Management: The Stock Management allows users to view and update stock levels, perform bulk replenishment, manage product and variant images, and receive low stock alerts via LINE notifications. In this feature, there are 5 URS as follows:

URS-01: The user can view the current stock levels and product details, including product name, total stock, last updated, and status, as well as variant information, including size, color, stock, minimum stock, and status.

URS-02: The user can update stock information for a product variant, including quantity and minimum quantity.

URS-03: The user can perform bulk stock replenishment by adding multiple products with their respective stock quantities.

URS-04: The user can update product image and product variant image by uploading an image file in PNG or JPEG format.

URS-05: The user can receive a low stock alert via a text message in the designated LINE group at 12:00 PM each day when any product's stock level falls below the predefined minimum threshold.

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The user interface of the Stock Management feature, including the low stock notification via LINE OA message and the Stock Management page, is shown in Fig. 3, 4.

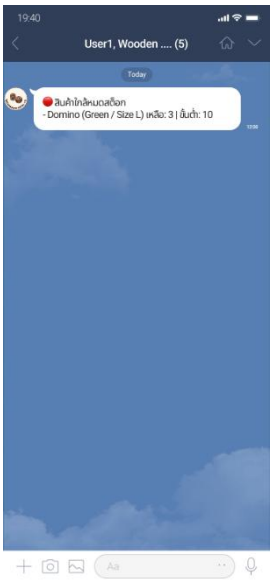

Fig. 3. Low Stock Notification via LINE OA Message.

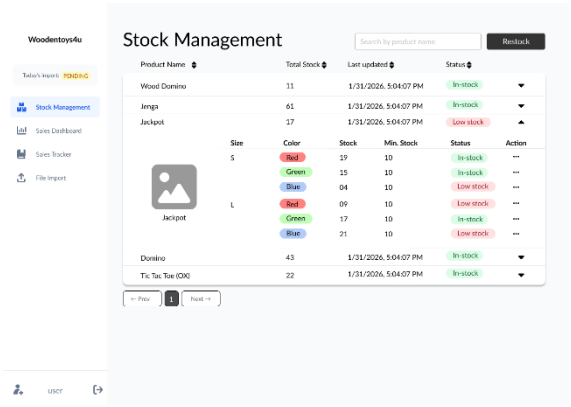

Fig. 4. Stock Management page.

2) Sales Dashboard: The Sales Dashboard presents summarized sales data in the form of charts and key performance indicators (KPIs), with support for time range selection. In this feature, there are 2 URS as follows:
URS-06: The user can view the sales dashboard displaying summarized sales data for the selected month, including total orders, units sold, average items per order, sales breakdown by order status, sales breakdown by platform, and the top 5 highest-selling items.
URS-07: The user can select a specific time range by selecting a month to filter and update the sales

The user interface of the Sales Dashboard feature, including the Sales Dashboard page, is shown in Fig. 5.

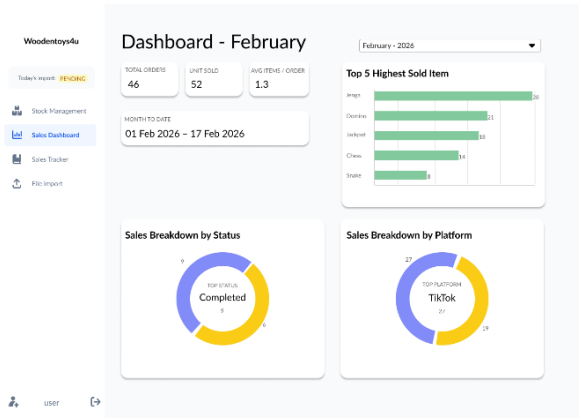

Fig. 5. Sales Dashboard page.

3) Sales Tracker: The Sales Tracker enables users to view and inspect detailed sales transaction records. In this feature, there are 2 URS as follows:
URS-08: The user can view a list of sales records, including Order ID, Buyer, Platform, Payment Method, Status, and Created At.
URS-09: The user can select a sales record to view its detailed information, including Buyer, Platform, Payment Method, Created At, Note, and a list of purchased products with their details, including Product Name, Size, Color, and Quantity.

The user interface of the Sales Tracker feature, including the Sales Tracker page, is shown in Fig. 6.

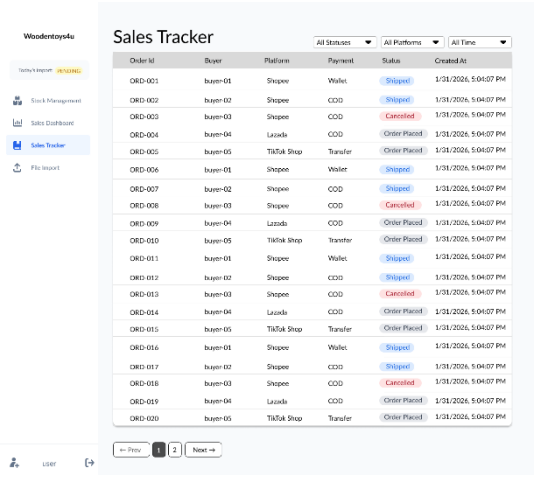

Fig. 6. Sales Tracker page.

4) CSV/XLSX File Import: The CSV/XLSX File Import allows users to upload transaction data exported from supported e-commerce platforms and receive notifications for missing uploads. In this feature, there are 3 URS as follows:
URS-10: The user can import a daily transaction file (CSV/XLSX format), exported from 3 e-commerce platforms, including Shopee, Lazada, and TikTok Shop, into the system
URS-11: The user can view today's upload status through the system navigation bar.

URS-12: The user can receive a missing upload alert via a text message in the designated LINE group if no daily transaction file is submitted by 12:00 PM each day.

The user interface of the CSV/XLSX File Import feature, including the File Import page, is shown in Fig. 7.

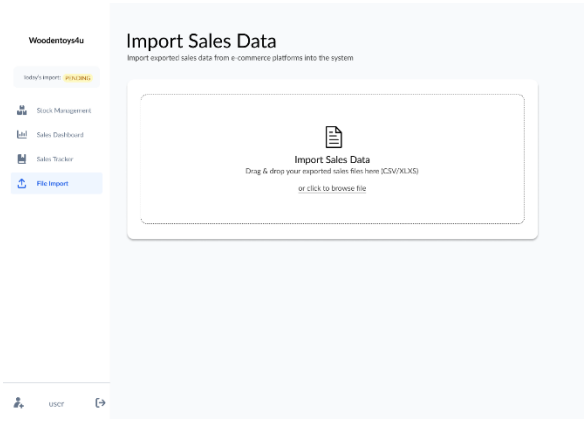

Fig. 7. File Import page.

5) Login and Authentication: The Login and Authentication module manages user access through role-based control, supporting both standard users and administrators. In this feature, there are 3 URS as follows:

URS-13: The user can log into the system using a valid username and password in order to access authorized system features based on their assigned role.

URS-14: The user can log out of the system to terminate the active session and prevent unauthorized access.

URS-15: The admin can create a new user account through the create new user modal by specifying username, password, and role.

The user interface of the Login and Authentication feature, including the Login page, is shown in Fig. 8.

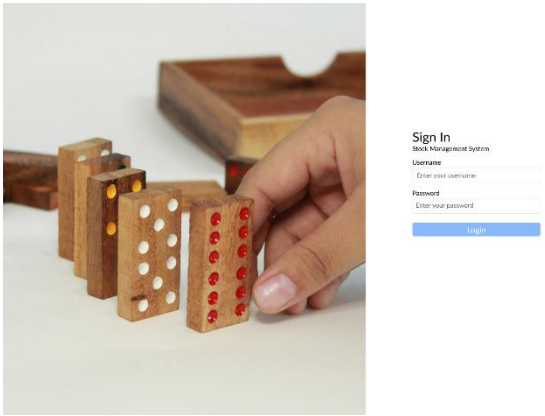

Fig. 8. Login page.

To support the functional features described above, the database design of the proposed system is presented through an Entity-Relationship design. The Entity-Relationship design consists of several core entities, including users, refresh_tokens, products, product_variants, transactions, and transaction_items, along with supporting entities such as product_size, product_color, payment_type, platform, and platform_product_mapping, as shown in Fig. 9.

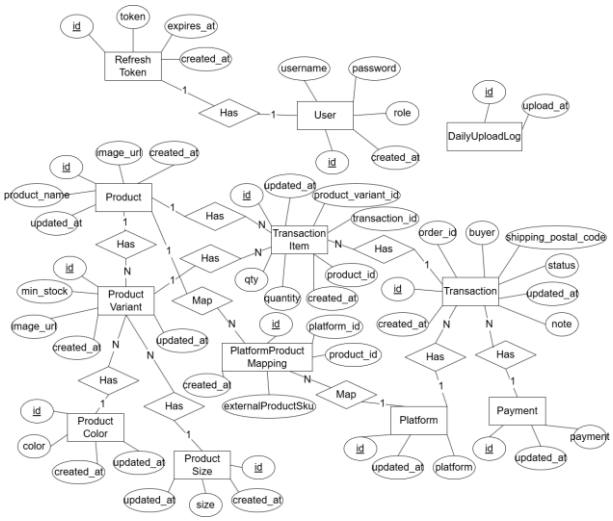

Fig. 9. Entity-Relationship Diagram.

IV. Implementation

The implementation process of the proposed system is structured around its core features, with each feature implemented in an appropriate sequence to ensure system functionality and data flow. By following the ISO/IEC 29110 standard, the development process ensures a structured approach that improves overall software quality, reliability, and maintainability. It also enhances development efficiency by providing clear guidelines for planning, design, implementation, and testing, thereby reducing potential risks and errors throughout the project lifecycle. After the implementation phase was completed, the proposed system underwent comprehensive testing to verify that all functionalities operated as intended and met the specified requirements. The testing process included both unit testing and system testing. A total of 63 unit test cases and 21 system test cases were conducted to evaluate the correctness and reliability of the implemented features. All test cases were completed successfully, with the actual results matching the expected results for every test case, indicating that the system performed according to the expected specifications.

V. Evaluation

To evaluate the effectiveness and usability of the proposed system, an evaluation was conducted with nine operational staff participants. The purpose of the evaluation was to assess user satisfaction and system performance across several criteria, including usability, efficiency, problem-solving capability, and feature effectiveness. Participants used the system and completed a questionnaire using a Likert-scale rating, along with optional written feedback. The evaluation results were analyzed in three parts: overall system performance, feature-level performance, and qualitative feedback.

A. Overall Results

The overall evaluation indicates that the system performs well across all assessed criteria. In particular, the ability to reduce manual work achieved the highest mean score (Mean = 4.22), demonstrating that the system effectively minimizes time spent on routine tasks and repetitive operations. Usability

also received a strong rating (Mean = 4.00), suggesting that users found the system easy to navigate and interact with. The system further supports decision-making and improves operational efficiency, each with a mean score of 3.78, indicating that it provides useful and reliable information for business processes. The capability to solve existing problems scored slightly lower (Mean = 3.89) but still reflects positive user feedback. While these results are positive overall, the relatively lower scores in decision-making support and operational efficiency suggest that there is still room to improve how the system presents information and assists users in workflow-related tasks, such as enhancing data visualization and streamlining user interactions. An overall evaluation is shown in Fig. 10

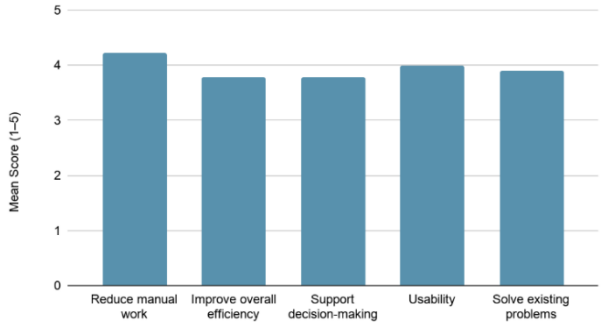

Fig. 10. Overall Evaluation Results of the System.

B. *Feature-Level Analysis*

At the feature level, the highest-rated functionalities were Sales Tracker (Mean = 4.04) and File Import (Mean = 4.07), followed by Stock Management (Mean = 3.92), Authentication (Mean = 3.89), and Sales Dashboard (Mean = 3.82). These results suggest that the system's core functions are well-received by users and provide practical support in managing inventory, sales tracking, and data import processes, as presented in Fig. 12. However, the lower score of the Sales Dashboard may indicate that users expect clearer visualization or more useful analytical insights when reviewing summarized sales data. This could be improved by refining dashboard layouts or introducing additional chart filtering and comparison options. Similarly, while Stock Management received positive feedback overall, some users may still experience difficulty when interacting with certain stock-related operations, which may be improved through interface simplification and more intuitive controls. A feature-level evaluation is shown in Fig. 11

Fig. 11. Feature-Level Evaluation Results of the System.

C. *Qualitative Feedback*

In addition to the numerical results, participants shared positive feedback regarding the system's practicality and usability. Users appreciated that the system reduces repetitive tasks, provides a clear overview of business information through the dashboard, supports sales tracking, delivers stock alerts, and visualizes trends that improve situational awareness. Participants also noted that the system is easy to understand and convenient to use across all three supported platforms. Some users identified minor usability concerns, particularly regarding the stock adjustment process, which may become slightly cumbersome when managing a large number of items. To improve efficiency, participants suggested implementing simple up/down arrow controls to streamline stock quantity adjustments. Additionally, several users recommended integrating parcel tracking functionality into the Sales Tracker feature, allowing direct access to shipment tracking across different logistics providers and platforms. Overall, the qualitative feedback supports the positive quantitative evaluation results while highlighting several opportunities for future enhancement, particularly in stock management usability and expanded logistics integration.

VI. Conclusion

This work presents a multi-platform stock management system designed to support small retail businesses in managing stock and sales data. The system includes key features such as stock management, file import, sales tracking, and a sales dashboard. The results show that the system helps reduce manual work, lowers the chance of human error, and improves overall efficiency. By combining data from multiple platforms into a single system, users can manage inventory and track sales more easily. The notification feature also helps users stay aware of important updates. However, the system currently relies on file-based data import, which limits real-time synchronization capabilities. In addition, several operational features, such as shipment tracking and return/refund handling, are not yet included in the current implementation. Based on user feedback from the evaluation, future improvements may focus on enhancing stock management usability by simplifying quantity adjustments through more intuitive controls, such as increment and decrement buttons. Furthermore, shipment tracking functionality may be integrated into the sales tracking module to better support logistics monitoring. The system may also be further enhanced through real-time API integration, when available, to provide more timely and automated data synchronization across platforms.

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