IT FOR SOCIETY, Vol. 10 No. 01
ISSN 2503-2224

Automated Goods Tracking System: Enhancing Accuracy, Efficiency, and Real-Time Data Integration

Muhammad Athoillah
Faculty of Computer Science
President University
Bekasi, West Java
muhammad.athoillah2024@student.president.ac.id

Avicena Fahmi Wibisono
Faculty of Computer Science
President University
Bekasi, West Java
avicena.wibisono@student.president.ac.id

***Abstract*—Efficient inventory management is essential in sectors such as logistics, retail, and manufacturing. Manual tracking methods are often prone to errors, time-consuming, and lack the ability to offer real-time updates. This paper presents SmartStock, a web-based goods tracking system designed to automate the recording of incoming and outgoing inventory using real-time data integration. The system features a user-friendly interface, barcode-ready architecture, role-based access control, and scalable integration with existing ERP platforms. Results from testing and initial user feedback indicate significant improvements in efficiency, data accuracy, and decision-making processes.**

Keywords: inventory automation, web application, real-time tracking, goods management, data integration, warehouse system.

I. INTRODUCTION

Inventory and goods tracking play a fundamental role in ensuring operational efficiency across industries such as logistics, warehousing, retail, and manufacturing. In these fields, accuracy, timing, and visibility are essential for preventing loss, ensuring timely deliveries, and making informed business decisions. However, many organizations still rely on outdated, manual tracking systems that involve paper-based records, spreadsheets, or siloed databases. These methods are prone to human error, duplication, slow updates, and poor scalability factors that severely hinder operational performance as business complexity increases.

This project was inspired by observations in small to medium-sized enterprises (SMEs) facing recurring problems in their inventory operations: delays due to missing stock data, inconsistencies in order records, lack of synchronization across departments, and inefficient use of staff time for manual data entry. These challenges not only reduce productivity but also lead to poor decision-making due to the lack of real-time data visibility.

To address these issues, we developed SmartStock, a web-based automated goods tracking system aimed at streamlining the process of recording, managing, and analyzing inventory movements. By integrating real-time updates and automated data logging, SmartStock provides businesses with an accessible, scalable, and efficient alternative to manual methods. The system includes role-based access control, customizable reports, and potential integration with existing ERP platforms, making it suitable for growing businesses in dynamic industries.

The primary goals of SmartStock are: (1) to minimize human error in inventory recording; (2) to accelerate workflows through automation; (3) to enhance decision-making through real-time data integration; and (4) to offer a user-friendly platform that can scale with organizational growth. Unlike conventional systems, SmartStock is designed with cloud-based access,

intuitive interface design, and modular features to support future enhancements such as barcode scanning and financial system integration.

This paper presents the design and implementation of SmartStock, including the technical architecture, development methodology, feature set, and evaluation results based on testing and user feedback. We aim to answer the following research questions:

(1) How can a web-based goods tracking system improve inventory efficiency in real-world use?
(2) What impact does automated tracking have on accuracy and user productivity?
(3) What are the key considerations for developing scalable, real-time inventory solutions in SMEs?

By addressing these questions, the study contributes to the growing body of work supporting digital transformation in inventory management and proposes a flexible model applicable to various business contexts.

II. Literature Review

A. ERP Implementation in Manufacturing

Enterprise Resource Planning (ERP) systems are integral to modern inventory and warehouse management. By centralizing operations such as procurement, inventory control, sales, and reporting, ERP platforms reduce manual intervention and data redundancy. In warehouse and logistics environments, ERP adoption improves process efficiency and visibility, while enabling real-time tracking and decision-making (Monk & Wagner, 2009). Systems like SmartStock can serve as lightweight ERP components that focus on inventory movements while supporting integration with larger enterprise platforms..

B. Automation and Real-Time Tracking

Automation in inventory systems significantly reduces operational errors and enhances tracking precision. Real-time tracking technologies often facilitated through web-based systems and APIs enable immediate synchronization of goods data across departments and devices. Research by Anderson & Lee (2020) emphasized that businesses adopting real-time tracking solutions experience improved order fulfillment accuracy and supply chain responsiveness, particularly when using mobile and cloud-based systems.

C. User Interface and Role-Based Access

A system's usability is directly linked to its adoption rate and effectiveness. Role-based access control (RBAC) ensures that users only interact with data and functions relevant to their roles such as warehouse staff, managers, or administrators thus maintaining security and workflow clarity (Whitman & Mattord, 2013). A well-designed user interface, combined with RBAC, reduces learning curves and minimizes input errors, especially in high-activity environments like warehouses.

D. Integration with ERP and External Systems

The ability of digital inventory systems to connect with existing business platforms such as ERP, CRM, or financial software enhances data consistency and process automation. Bradford (2015) highlights that modular systems with RESTful APIs or middleware layers enable real-time data flow, facilitating end-to-end supply chain visibility. SmartStock's architecture is designed to allow future integrations, ensuring scalability and extensibility as organizational needs evolve.

E. Research Objectives

The objectives of this study are:

- To develop a web-based inventory tracking system that automates the logging of incoming and outgoing goods..
- To improve data accuracy and reduce manual errors in warehouse operations through automation.
- To provide a user-friendly and scalable platform with role-based access control for various stakeholders.
- To support future integration with ERP and financial systems for centralized data management.

F. Research Question

- How can a web-based inventory tracking system improve the accuracy and efficiency of goods management in warehouse settings?
- What are the main technical and organizational challenges in transitioning from manual to automated inventory systems?
- How does real-time data integration impact decision-making and operational transparency?

III. METHODOLOGY

This study employs a system development methodology to design, develop, and implement a web-based goods tracking system, SmartStock, aimed at automating inventory operations in warehouse environments. The methodology encompasses requirement analysis, system architecture design, web application development, and multi-level testing to ensure the system's reliability and scalability.:

A. System Architecture

- **Frontend Interface:** Developed using HTML, CSS, and JavaScript, the web-based UI provides dashboards and forms for managing suppliers, inventory, purchase orders, and item tracking. It is designed with responsiveness and user-friendliness in mind.
- **Backend Application**: Implemented in PHP, the backend handles API endpoints, business logic, authentication, and role-based access control. All data transactions are secured and validated before being stored in the database.
- **Database Layer**: A MySQL database serves as the primary storage for user data, inventory logs, purchase orders, and tracking status. It enables real-time queries and is optimized for high-volume read/write operations.

B. Data Flow and Integration

- Goods movement data (incoming and outgoing) is entered by authorized users (warehouse staff or operators) via web forms.
- The system automatically timestamps and logs each transaction in real-time.
- Managerial dashboards display summarized inventory status, order status, and analytics.
- Admins can generate reports and export historical data for audit or financial purposes.

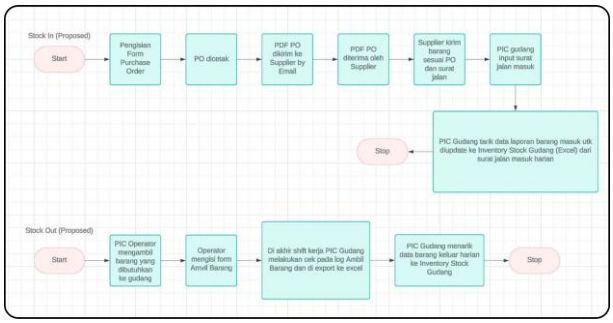

Figure 2. Data Flow Diagram

C. Development and Implementation

- **Requirement Gathering:** Conducted through stakeholder interviews involving warehouse personnel, procurement staff, and supervisors to identify inefficiencies in manual tracking systems.
- **Design Phase:** UI/UX design was crafted to ensure accessibility for users of varying technical expertise, with emphasis on clarity and minimal data entry steps.
- **System Development**: Utilized version control (Git) to coordinate development tasks across the team. The backend was developed to handle automated recording, form submission, and user-level access.

Testing Phases:

- Unit Testing: Ensured each module (login, data entry, reporting) functions independently.
- Integration Testing: Validated communication between frontend and backend, especially in real-time data propagation.
- User Acceptance Testing (UAT): Involved selected end users to test the system in real-world warehouse conditions. Feedback was used to improve usability and suggest future features (e.g., barcode scanning).

IV. RESULT AND DISCUSSION

A. System Implementation

The SmartStock system comprises three core layers: the web-based user interface, the backend logic (application layer), and the database infrastructure. Each component plays a distinct role in supporting the digital transformation of warehouse inventory management.

SmartStock Web Application
The application was developed using HTML, CSS, and JavaScript for the frontend, supported by PHP for backend logic and MySQL for data storage. It provides separate user interfaces for administrators, warehouse staff, and operators, each with tailored access and functionality. All components communicate in real-time through AJAX-based RESTful APIs, ensuring seamless synchronization.

Key Functional Modules:

- **Inventory Dashboard**: Displays a real-time overview of goods in stock, low-stock alerts, and recent transactions.
- **Supplier Management**: Allows entry and update of supplier details.
- **Goods Entry & Exit Logging**: Enables fast data input for recording incoming and outgoing goods.
- **Reporting and Analytics**: Auto-generates inventory movement reports and enables filtering by supplier, date, or item type.
- **User Role Management**: Admins can assign and manage user roles, ensuring secure and limited access based on responsibilities.

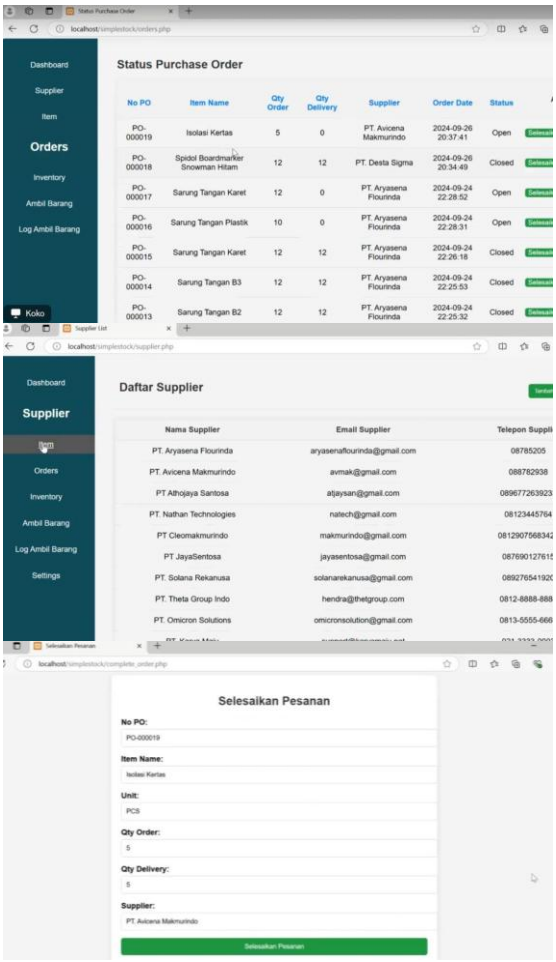

Figure 3. SmartStock Web Interface

The modular architecture ensures that each operation (e.g., item check-in, order update, reporting) is captured in the backend, recorded in the database, and reflected in the UI within seconds. Managers benefit from live inventory snapshots, while operators can log transactions with minimal steps. Admins maintain oversight over users and analytics.

This structured data flow contributes to improved operational transparency and reduces dependency on error-prone manual records or offline spreadsheets.

B. Discussion

Initial testing and implementation of the SmartStock system yielded encouraging results in improving warehouse efficiency and inventory accuracy. Data collected during User Acceptance Testing (UAT) showed that transaction times were significantly reduced, particularly for routine activities such as checking stock levels and recording incoming goods.

Features such as real-time dashboards and automated logging received strong positive responses from end users. The ability to access live inventory data helped managers make faster and more informed decisions. Warehouse operators appreciated the simplified interface, which minimized the steps required to log transactions.

User feedback also highlighted the demand for enhanced features, including barcode or QR code scanning to further streamline data entry. Additionally, while the current version provides solid internal reporting, users noted the importance of integrating SmartStock with financial departments and auditing systems to ensure end-to-end traceability and data validation.

Technical challenges included occasional latency in dashboard loading and the need for improved database indexing to maintain speed as the data volume grows. These limitations are already being addressed through backend optimization strategies and API performance tuning..

V. CONCLUSION

This study successfully designed and implemented SmartStock, a web-based automated goods tracking system aimed at addressing the limitations of traditional, manual inventory methods. By providing real-time data synchronization, automated logging, and a role-based user interface, SmartStock improves the accuracy, transparency, and efficiency of warehouse operations.

The results of implementation and user testing indicate that the system meets core business needs and offers clear improvements over previous manual practices. The feedback received validates SmartStock as a

scalable and user-centric solution for inventory automation in small to medium-sized enterprises.

VI. ACKNOWLEDGEMENT

The authors would like to express sincere gratitude to the Faculty of Computing, President University, for providing the resources, guidance, and infrastructure necessary to carry out this project. Special thanks to all participating stakeholders especially the warehouse staff, operators, and managers whose input and feedback were crucial during the system development and testing phase.

VII. REFERENCES

1. Smith, J., & Patel, R. (2021). *"Automation in Inventory Management: A Case Study in Real-Time Data Integration."* Journal of Logistics and Supply Chain Innovation, 14(3), 35-48.
2. Anderson, T., & Lee, K. (2020). *"The Role of Web Applications in Real-Time Inventory Systems."* International Journal of Technology and Business, 18(5), 88-102.
3. Sudarmi, E., & Sunaryo, W. (2024). Enhancing Inventory Accuracy and Operational Performance with ERP. Sinergi International Journal of Logistics, 2(2), 133–146.
4. P. A. R, N. R, and K. K. M. N, "Inventory Management System," International Journal of Advanced Research in Science, Communication and Technology, 2024, [Online]. Available: https://api.semanticscholar.org/CorpusId:277503142
5. M. T. Tanaman *et al.*, "Web-based Inventory Management System," *International Journal of Science and Applied Information Technology*, 2023, [Online]. Available: https://api.semanticscholar.org/CorpusId:264060577