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WEB-BASED SUPPLY CHAIN MANAGEMENT SYSTEM IMPLEMENTATION USING FEFO METHOD IN CV. SAHABAT JAYA SUKSES

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Abstract: Distributors in the Fast Moving Consumer Goods (FMCG) sector, such as CV. Sahabat Jaya Sukses, face significant challenges in inventory control, particularly related to product expiration and stock discrepancies caused by manual recording. This study aims to design and implement a web-based Supply Chain Management (SCM) system that integrates the flow of goods from suppliers to retailers by applying the First Expired First Out (FEFO) method to minimize financial losses due to expired products. The research methodology employs the Waterfall model, which is selected because of its structured and systematic development stages and its suitability for systems with clear and stable requirements, facilitating effective analysis, design, implementation, and testing processes. The research stages include requirements analysis, system design, implementation, and testing. The results show that the SCM system successfully integrates data across the entire supply chain, automates inventory recording, and effectively prioritizes product distribution based on the nearest expiration dates. Black Box testing confirms that all system functionalities, including FEFO logic, operate properly, thereby improving operational efficiency and data accuracy.

Keywords: distributor; FEFO; inventory controls; supply chain management; web based system

Abstrak: Distributor di sektor Fast Moving Consumer Goods (FMCG) seperti CV. Sahabat Jaya Sukses menghadapi tantangan dalam pengendalian persediaan, khususnya terkait produk kedaluwarsa dan selisih stok akibat pencatatan manual. Penelitian ini bertujuan merancang dan mengimplementasikan sistem Supply Chain Management (SCM) berbasis web yang mengintegrasikan aliran barang dari pemasok hingga pengecer dengan menerapkan metode First Expired First Out (FEFO) untuk meminimalkan kerugian akibat produk kedaluwarsa. Metodologi penelitian menggunakan model Waterfall yang dipilih karena memiliki tahapan pengembangan yang terstruktur, sistematis, dan sesuai dengan kebutuhan sistem yang jelas serta stabil, sehingga memudahkan proses perancangan, implementasi, dan pengujian. Tahapan penelitian meliputi analisis kebutuhan, desain sistem, implementasi, dan pengujian. Hasil penelitian menunjukkan bahwa sistem SCM berhasil mengintegrasikan data di seluruh rantai pasok, mengotomatisasi pencatatan stok, serta memprioritaskan distribusi barang berdasarkan tanggal kedaluwarsa terdekat. Pengujian Black Box membuktikan bahwa seluruh fungsi sistem, termasuk logika FEFO, berjalan dengan baik sehingga meningkatkan efisiensi operasional dan akurasi data.

Kata kunci: distributor; FEFO; manajemen rantai pasok; pengendalian stok; sistem berbasis web

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INTRODUCTION

The Fast Moving Consumer Goods (FMCG) sector, particularly in the beverage and snack distribution segment, remains one of the most dynamic and competitive industries in Indonesia. In recent years, the Indonesian FMCG market has shown consistent growth, driven by increasing urban consumption, convenience product demand, and expansion of modern retail and e-commerce channels [1]. Categories such as Food & Beverage continue to dominate as essential household items [2].

CV. Sahabat Jaya Sukses, a distributor of beverages and snacks, faces significant operational challenges in inventory control. The main problems include: frequent product expiration leading to financial losses, stock discrepancies caused by manual recording, delays in distribution due to lack of real-time information, poor coordination with suppliers and retailers, and difficulty in responding quickly to market demand [3], [4]. These issues often result in overstocking of near-expiry products, frequent stockouts of fast-moving items, and reduced overall operational efficiency.

This study aims to design and implement a web-based Supply Chain Management (SCM) system integrated with the First Expired First Out (FEFO) [5] method at CV. Sahabat Jaya Sukses. The main objectives are to automate inventory updates, prioritize distribution of products with the nearest expiration dates, integrate data flow from suppliers to retailers, and support faster and more accurate managerial decision-making.

The Supply Chain Management concept focuses on integrating the flow of goods, information, and finances among supply chain actors to improve efficiency, reduce costs, and enhance service levels [1], [6]. In the FMCG sector especially for perishable goods effective SCM implementation through digital systems has been proven to significantly improve inventory accuracy, reduce distribution delays, and minimize risks of overstocking and stockouts [2], [7].

Previous studies have explored SCM and technology-based solutions in various contexts. Several works have reported improvements in inventory management and distribution efficiency through information systems [7], [8]. Other research highlights the importance of data integration and electronic SCM (e-SCM) in increasing transparency, coordination, and overall supply chain performance [4], [1]. However, most previous studies have the following limitations relative to this research: Many focus on larger enterprises or theoretical modeling rather than practical implementation in small-medium distributors [2]; Few specifically address FEFO implementation for perishable FMCG products (especially beverages and snacks) in the Indonesian SME context [3], [6]; Most do not perform real-world validation of expiry-aware inventory logic in actual distribution operations [3], [9].

The novelty of this research lies in: (1) Practical design, development, and testing of a fully integrated web-based SCM system specifically for a small-medium FMCG distributor in Indonesia, (2) Explicit implementation and functional validation of FEFO logic to minimize expiry-related losses an aspect that remains under-explored in local SME distribution settings, (3) Use of the Waterfall model combined with Black Box testing to ensure system reliability in a real operational environment.

This work bridges the gap between theoretical Supply Chain Management

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(SCM) frameworks and their concrete application in resource-constrained distribution businesses in Indonesia. It translates established SCM concepts into a practical and scalable system tailored to the operational realities of small and medium-sized enterprises (SMEs). By aligning theoretical models with actual business processes, this study demonstrates how structured supply chain strategies can improve inventory control, transaction accuracy, and decision-making effectiveness.

METHOD

This research uses a systems development research approach employing the Waterfall model, which consists of sequential phases: analysis, design, implementation, and testing. The research began with problem identification through direct observation and interviews with the company owner and distribution staff at CV. Sahabat Jaya Sukses to understand existing operational issues (e.g., manual recording errors, delayed deliveries, and expiry problems).

Data were collected through interviews with the company owner and staff involved in distribution activities, direct operational observations, and analysis of relevant company documents related to distribution and sales processes. The obtained data were analyzed descriptively to identify weaknesses in the existing distribution system and to evaluate the effectiveness of implementing a Supply Chain Management (SCM) system as an integrated distribution control solution [10]. The research framework is illustrated in Image 1.

Image 1. Research Stages

The research process consists of thefollowing stages.

Problem Identification

Conducting direct observations and interviews with the company owner and distribution staff to understand existing distribution control issues, including delays, data recording problems, and the lack of system integration.

Data Collection

Data collection involved gathering qualitative and operational data to ensure comprehensive analysis and system accuracy, including: Interview transcripts with the owner and four key staff members (warehouse, purchasing, and sales departments) to understand existing workflows, challenges, and decision-making processes; Direct observation of 15 sales and procurement transactions over a two-week period to capture real-time operational practices and identify inefficiencies; Analysis of company documents (sales records, stock cards, and purchase orders from the past six months) to evaluate historical data patterns and inventory turnover rates and a structured sample dataset of 120 product batches (including item codes, quantities, and purchase dates) to simulate, test, and validate the implementation of the FEFO logic during system development.

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System Analysis

Analyzed the system's functional requirements, including data management needs for inventory, suppliers, customers, and the implementation of FEFO logic.

System Design

Utilized the Unified Modeling Language (UML), which comprises Use Case, Activity, Sequence, and Class Diagrams. The database structure was designed using Entity Relationship Diagrams (ERD).

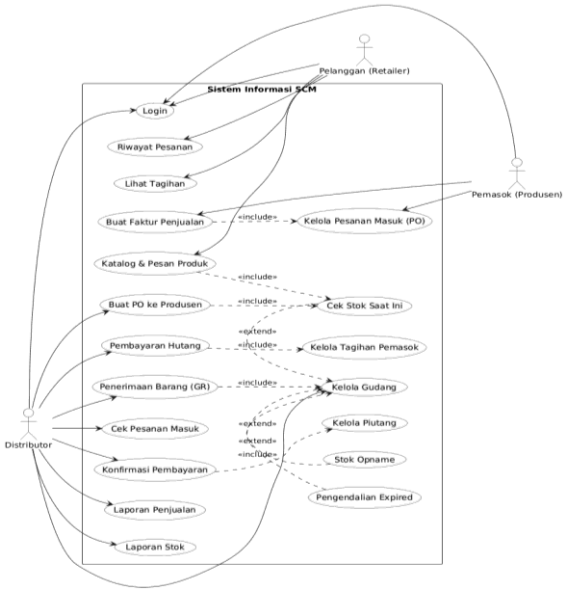

Image 2. Diagram Usecase
Source: dea tantri, 2026

Build System

The system was developed using the PHP programming language within the CodeIgniter 4 framework and a MySQL database.

Testing

Applied the Black Box Testing method to ensure that the system functionality operates according to the design specifications. The testing process focused on validating input, process, and output functions across all main modules, including login, master data, purchasing, and sales transactions. Particular attention was given to verifying the accuracy of the FEFO logic in allocating stock based on the nearest expiration date and ensuring that the system properly rejects transactions when stock is insufficient. The test results indicate that all features functioned as expected, confirming the reliability, consistency, and readiness of the system for real operational implementation.

RESULT AND DISCUSSION

The developed web-based SCM system successfully integrates the supply chain flow at CV. Sahabat Jaya Sukses. The core FEFO logic automatically sorts and allocates stock by nearest expiration date during sales transactions, ensuring older batches are distributed first. For example, in a simulated order of 70 units of UHT Milk, the system correctly allocated 50 units from Batch-001 (expiring June) before 20 units from Batch-002 (expiring August), aligning with best practices in perishable goods management. This approach is consistent with findings from warehouse management studies that show FEFO significantly reduces waste and maintains product quality in food & beverage distribution.

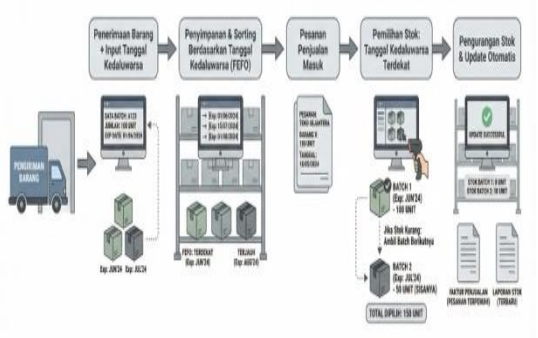

Image 3. FEFO Logic Design
Source: dea tantri, 2026

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Compared to previous research, this implementation extends beyond theoretical modeling or general inventory systems by delivering a fully functional, tested system for an SME distributor. While earlier works reported improvements in inventory accuracy through information systems, they rarely validated FEFO logic in real transactions or focused on expiry-sensitive FMCG products in Indonesia. This study confirms that FEFO integration not only minimizes financial losses from expired goods but also enhances operational responsiveness results that align with broader literature on expiry-aware inventory methods but provide concrete evidence in a local SME context.

FEFO Logic Analysis

A core feature of this SCM system is the implementation of the First Expired First Out (FEFO) method to address inventory expiration issues. In contrast to manual procedures, the system automatically allocates inventory based on the nearest expiration date during sales transactions.

The system algorithm operates starting from: (1) The system identifies the batch of products ordered; (2) Data is sorted by expiration date in ascending order, from the closest to the furthest; (3) Stock is reduced from the batch with the earliest expiration date until the order quantity is fulfilled.

Within the context of supply chain management as a distributor, this mechanism ensures better inventory rotation, minimizes the risk of expired goods in the warehouse, and reduces financial losses due to unsold products. By integrating FEFO logic into the SCM workflow, the distributor can maintain product quality across the distribution network, improve service reliability to retailers, and enhance overall supply chain efficiency through accurate, real-time stock control and traceable batch management

Logic Simulation Example

If there is an order for 70 units of "UHT Milk," the system will allocate 50 units from Batch-001 (Exp: June) and 20 units from Batch-002 (Exp: August). This mechanism ensures that older inventory is sold first, thereby reducing waste.

System Implementation

The developed SCM system consists of several integrated main modules. The following are the user interfaces resulting from the implementation:

Admin Dashboard

Displays a summary of critical information, such as total products, low stock notifications, and monthly sales graphs to facilitate real-time monitoring and support faster, data-driven decision-making. It also provides visual insights into sales trends and inventory movement, enabling management to quickly identify potential shortages, overstock situations, and overall business performance.

Image 4. Dasboard Form

Purchasing Module (Purchase Order)

Enables the administrator to place orders with suppliers. Upon the receipt of goods, the administrator inputs the reception data along with the expiration dates,

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which automatically updates the warehouse inventory.

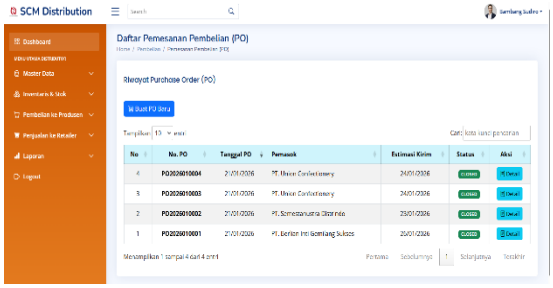

Image 5. PO Form

Report Module

The system generates automated reports, including inventory, sales, and purchasing reports. These reports can be exported to PDF format, replacing error-prone manual recapitulation.

The following table 1 summarizes key operational improvements observed after implementing the SCM system (based on company feedback, transaction logs, and one-month post-implementation monitoring):

System Testing (*Black Box Testing*)

Testing was conducted to validate input, process, and output functions. Based on *Black Box* testing performed on the Login, Master Data, Procurement, and Sales modules, "Valid" results were obtained for all test scenarios.

Specifically regarding transaction testing, the system successfully rejected transactions when stock levels were insufficient. Furthermore, it successfully deducted stock automatically according to the FEFO logic upon the completion of a valid transaction. One of the tests conducted was on the sales module. The results can be seen in table 2.

Table 1. Comparison Before and After SCM System Implementation

Aspect	Before Implementation	After Implementation	Improvement
Stock recording method	Manual stock cards and Excel sheets	Automated real-time database updates	Eliminated recording errors
Expiry management	No systematic prioritization	Autometic FEFO sorting and allocation during sales	One-way expired stock write-off
Stock accuracy	Difference between recorded and actual stock	Stock taking feature to control the original stock with the stock in the system	Improved data reliability
Low stock alert	None / reactive	Real-time notifications on dashboard	Proactive inventory management
Report generation	Manual recapitulation (2-3 days)	Instant PDF reports	Reduced time and errors in reporting

Table 2. Sales Module Testing Results

Test Scenario	Input Data	Expected Result	Test Result	Status
Sufficient Stock Transaction	Select Item, Stock: 20, Purchase Qty: 5	Transaction successful, receipt printed, and Stock decreases to 15	As expected	Valid
Insufficient Stock Transaction	Select Item, Stock: 2, Purchase Qty: 5	System displays "Insufficient Stock" warning and transaction is cancelled	As expected	Valid

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CONCLUSION

The results of the research and implementation conducted, it can be concluded that the designed Web-based Supply Chain Management (SCM) system has successfully resolved the issues regarding manual recording and inventory control at CV. Sahabat Jaya Sukses. The application of the First Expired First Out (FEFO) method within the system has proven effective in prioritizing the distribution of products with the nearest expiration dates, thereby minimizing financial losses caused by expired goods.

Furthermore, data integration across the warehouse, sales, and purchasing divisions enables real-time stock monitoring and accelerates managerial decision-making. For future development, it is recommended to expand the system into a mobile platform (Android/iOS) to facilitate the sales team's operations in the field. Additionally, integrating an automated notification feature via WhatsApp Gateway to provide alerts when stock reaches the Reorder Point would further enhance the system's responsiveness.

Moreover, the use of a structured development approach through the Waterfall model and validation using Black Box testing ensures that the system operates reliably in real operational conditions. Overall, the implementation of this web-based SCM system demonstrates that the integration of FEFO logic and centralized data management can significantly improve operational efficiency, inventory accuracy, and supply chain transparency, while also providing a scalable digital solution for small and medium-sized FMCG distributors in Indonesia.

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