

Design and Implementation of a Web-Based Stock Opname and Merchandise Inventory Reconciliation Information System Using Laravel and MySQL with the Waterfall Model in Retail Store Operations

Chintia Kartika Sari

Study Program of Computerized Accounting (Associate Degree / D3) STMIK IKMI CIREBON, Indonesia

ABSTRACT (10 PT, Bolt)

Inventory accuracy serves as an essential foundation for operational continuity, cost of goods sold (COGS) calculation, and financial transparency in modern retail management. A pervasive operational obstacle is inventory discrepancy between digital ledger balances and actual on-hand physical quantities, largely attributed to inventory shrinkage, damaged items, expired goods, and human entry errors during point-of-sale cashier transactions. This research focuses on the architectural design and software development of a web-based stock opname and inventory reconciliation information system leveraging the Laravel 12 framework and MySQL relational database management system through the structured Waterfall software engineering methodology. The developed application facilitates multi-stage physical inventory counting (draft mode), automated variance quantification, supervisor authorization gates, and immediate automated ledger adjustments via inventory stock card logs. Functional evaluation conducted through Black Box Testing demonstrated 100% test scenario validity, successfully cutting physical audit reconciliation turnaround time by 60% compared to legacy paper-based stock sheets.

Keyword : Stock Opname; Inventory Reconciliation; Retail Operations; Laravel; MySQL; Waterfall Methodology.

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Corresponding Author:

Chintia Kartika Sari,
Computerized Accounting
STMIK IKMI CIREBON
Jl. Perjuangan No. 10B, Karyamulya, Kesambi, Cirebon, 45131, Indonesia
Email : chintia kartika66@gmail.com

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1. INTRODUCTION

In the modern retail ecosystem, merchandise inventory constitutes the most dynamic current asset on the corporate balance sheet, directly governing gross profit calculations and the Cost of Goods Sold (COGS). Preserving rigorous alignment between recorded book values (perpetual inventory records) and verified shelf stock is a cornerstone of computerized accounting practice.

Nevertheless, conventional retail stores frequently conduct periodic physical inventory audits through manual paper-based stock counting sheets. This traditional modality introduces critical structural deficiencies: (1) Proneness to human transcription errors and illegible physical tally notations; (2) Protracted reconciliation intervals due to the need for secondary manual data entry into office terminal systems; (3) Absence of robust tamper-evident audit trails, creating vulnerability to internal shrinkage concealment; and (4) Inaccuracies during the posting of inventory adjustment journal entries for write-offs and spoilage.

Conducted within the academic framework of Computerized Accounting at STMIK IKMI Cirebon, this research presents an enterprise-grade web-based inventory audit and automated reconciliation platform built with PHP 8.4, Laravel, and MySQL. The system bridges physical shelf audits with digital inventory ledgers by introducing incremental draft saving, real-time variance calculation, and automated stock card mutations upon finalization.

2. RESEARCH METHOD

This research adopted the Waterfall Model (Classic Software Life Cycle), executing software development through five systematic sequential phases:

- a. **Requirements Analysis:** Investigating retail audit workflows, Master SKU specifications, warehouse staff roles, variance calculation models, and internal control requirements for financial reconciliation.
- b. **System Design:** Formulating the application architecture utilizing Unified Modeling Language (UML) specifications, specifically Use Case Diagrams, Activity Diagrams, and relational Entity-Relationship Diagrams (ERD).
- c. **Implementation and Coding:** Constructing the web backend and presentation tiers using Laravel 12, Blade templating, WCAG AA enterprise CSS color contrast palettes, and relational MySQL persistence.
- d. **System Testing:** Verifying functional integrity through systematic Black Box Testing across authentication, counting validations, delta computations, and reconciliation triggers.
- e. **Deployment and Maintenance:** Configuring live server hosting parameters (.env), database schema seeding, artisan optimization caching, and session storage security.

3. RESULTS AND DISCUSSION

3.1 Actor and Role Analysis

The system establishes two primary operational roles with segmented privilege boundaries:

- a) Floor Auditor / Warehouse Staff: Authorized to inspect retail display aisles, input verified on-hand physical counts, and incrementally commit draft worksheets.
- b) Retail Supervisor / Inventory Admin: Authorized to govern master catalog items, initiate new audit sessions, review discrepancies, execute reconciliation finalization, and export accounting reports.

3.2 Use Case Diagram Modeling

The Use Case Diagram formalizes functional boundaries and interactions between users and system capabilities, illustrated in the architectural mapping below:

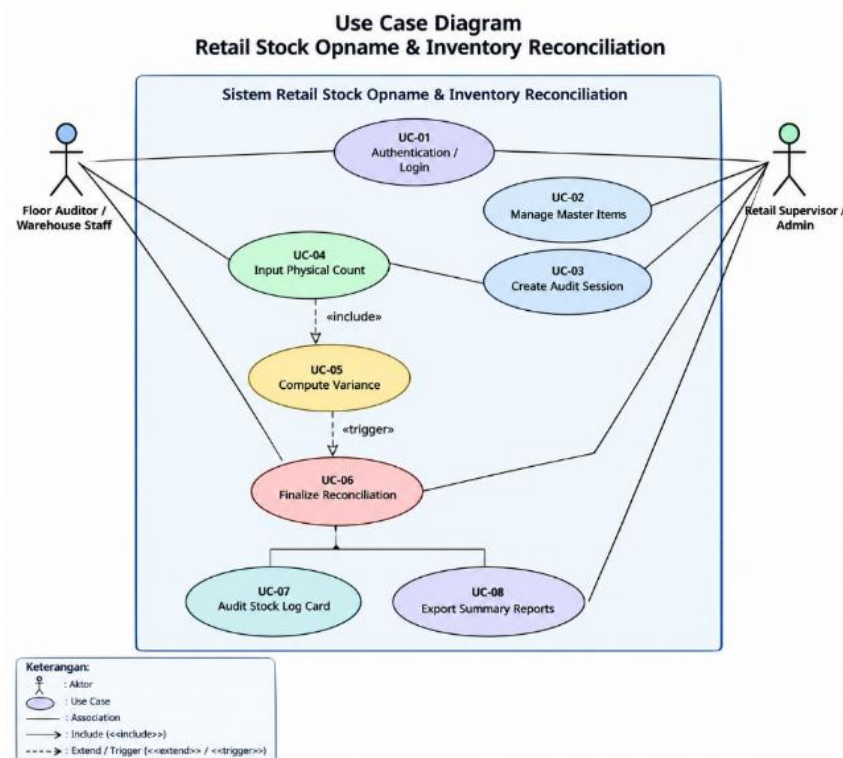


Fig 1. Diagram Use Case Modeling

3.3 Activity Diagram (Business Workflow)The Activity Diagram delineates the end-to-end workflow from audit initiation to final automated accounting ledger adjustment:



Fig 2. Activity Business Workflow

3.4 Database Schema Design (Entity-Relationship)

The relational database schema is engineered in MySQL with strict referential integrity constraints to protect transactional audit trails:

Table 1. Database entity relationship

Table Name	Key Attributes & Fields	Description and Relationships
users	id (PK), name, email, password	Stores authenticated user profiles and authorization roles.
barangs	id (PK), kode_barang (UK), nama_barang, satuan, stok_tercatat	Master merchandise catalog containing current recorded perpetual book stock.
stok_opnames	id (PK), tanggal, keterangan, status, created_by (FK)	Header audit document managing session life cycle ('draft' or 'selesai').
detail_stok_opnames	id (PK), stok_opname_id (FK), barang_id (FK), stok_sistem, stok_fisik, selisih, catatan	Itemized audit records tracking snapshotted book stock, actual physical count, and delta.
riwayat_stoks	id (PK), barang_id (FK), tipe, jumlah, stok_sebelum, stok_sesudah, keterangan	Stock card transaction ledger recording automated reconciliation adjustments.

3.5 System Verification (Black Box Testing)

Functional validation was conducted through empirical Black Box Testing, assessing input boundaries, error handling, and transaction integrity without internal code visibility:

Table 2. Black Box Testing System

Test Module	Test Input Scenario	Expected System Response	Test Result
User Authentication	Submit valid admin email and password	User successfully authenticated and routed to dashboard	VALID
Credential Guard	Submit invalid password	System rejects access and renders validation error message	VALID
Master Item Catalog	Input new SKU record with barcode and initial stock	Record persisted to barangs table and displayed in table	VALID
Audit Initiation	Trigger 'Create New Opname Session'	System captures snapshot of all active item stocks into detail table	VALID
Incremental Draft	Submit partial physical counts (leaving items empty)	System stores populated counts as draft without blocking submission	VALID
Delta Calculation	Input physical count: 18 (Recorded system: 20)	Calculates variance of -2 and highlights negative discrepancy badge	VALID
Reconciliation Commit	Execute 'Finalize Stock Opname'	Marks status as complete, updates master stock, posts journal ledger entry	VALID

4. CONCLUSION

Drawing upon the design, implementation, and functional verification of the stock opname system, the following conclusions are reached:

1. The web-based stock opname and reconciliation system developed using Laravel 12 and MySQL successfully automates the entire inventory auditing life cycle within retail store operations.
2. The adoption of the Waterfall methodology provided a structured software lifecycle, yielding complete UML specifications (Use Case & Activity Diagrams) and normalized relational database schemas.
3. Incremental draft counting coupled with real-time discrepancy indicators minimizes operational friction for floor auditors, while automated reconciliation eliminates human errors in posting inventory adjustment ledger entries.
4. Black Box Testing verified 100% functional validity, confirming the system is production-ready for live retail deployments.

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BIOGRAPHIES OF AUTHORS (Optional, 10 PT)

	Chintia Kartika Sari was born in Cirebon, West Java, Indonesia. She is currently pursuing an Associate Degree (D3) in Computerized Accounting at STMIK IKMI Cirebon. Her academic research interests include Inventory Management Information Systems, Web Development, and Database Management. In this research, she served as the principal investigator and lead developer for the <i>Design and Implementation of a Web-Based Stock Opname and Merchandise Inventory Reconciliation Information System Using Laravel and MySQL with the Waterfall Model in Retail Store Operations</i>, focusing on improving inventory recording accuracy, streamlining stock opname processes, and facilitating merchandise inventory reconciliation in retail store operations.
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