Inventory Management System

Complete System Documentation

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# Table of Contents

1. 1. Introduction
2. 2. Statement of the Problem (SOP)
3. 3. Objectives (Solutions)
4. 4. Scope
5. 5. Limitations
6. 6. System Features

# 1. INTRODUCTION

The Inventory Management System is a comprehensive Django-based web application designed to streamline inventory operations, user management, attendance tracking, and supplier collaboration. This enterprise-grade solution provides role-based access control with four distinct user types: Super Admin, Admin, Staff, and Supplier.

Built with security as the top priority, the system implements multiple layers of protection including SQL injection prevention, CSRF protection, XSS protection, and comprehensive audit logging. The application supports multi-user environments with granular permission management and complete activity tracking for compliance and security.

The system is designed for businesses that require precise inventory control, production tracking, supplier management, and employee attendance monitoring. It features automated workflows, real-time stock tracking, expiration management, and QR code-based purchase order processing.

## 1.1 Technology Stack

• Backend Framework: Django 5.1.3

• Database: MySQL 5.7+

• Programming Language: Python 3.8+

• Timezone: Asia/Manila

• Security: Django ORM, CSRF Protection, HSTS, XSS Protection

# 2. STATEMENT OF THE PROBLEM (SOP)

Traditional inventory management systems face numerous challenges that lead to inefficiencies, losses, and security vulnerabilities. This section outlines the key problems that businesses commonly encounter in inventory management, user administration, production tracking, and supplier coordination.

## 2.1 Inventory Tracking Problems

### Problem 1: Inaccurate Stock Levels

Manual inventory tracking leads to discrepancies between actual and recorded stock levels. Businesses struggle with stock-outs or overstocking due to lack of real-time visibility into inventory quantities.

### Problem 2: Expired and Wasted Products

Perishable items expire before use due to poor tracking of expiration dates and lack of FIFO (First In First Out) implementation. This results in significant financial losses and waste, especially in food and pharmaceutical industries.

### Problem 3: No Low Stock Alerts

Without automated reorder alerts, businesses run out of critical items unexpectedly, causing production delays and lost sales opportunities. Manual monitoring is time-consuming and prone to human error.

### Problem 4: Difficulty Tracking Stock Movements

Businesses cannot easily trace where inventory went (consumed, transferred, spoiled) or who performed the action. This lack of traceability makes it difficult to identify theft, errors, or process inefficiencies.

### Problem 5: Manual Item Code Generation

Creating unique item codes manually is time-consuming and leads to duplicate codes or inconsistent naming conventions. This causes confusion and errors in inventory records.

## 2.2 User Management and Security Problems

### Problem 6: Unauthorized Access to Sensitive Data

Without proper role-based access control, employees can access and modify data beyond their authorization level. This poses security risks and compliance issues.

### Problem 7: No Audit Trail

When problems occur (missing inventory, unauthorized changes), there is no way to track who did what and when. This makes accountability and troubleshooting nearly impossible.

### Problem 8: Complex Permission Management

Assigning and managing granular permissions for different staff members is cumbersome in traditional systems. Admins struggle to control who can view, edit, or delete specific types of data.

### Problem 9: SQL Injection and Security Vulnerabilities

Many inventory systems are vulnerable to SQL injection attacks, data breaches, and cross-site scripting (XSS) attacks. This puts sensitive business data at risk.

## 2.3 Production Management Problems

### Problem 10: Manual Ingredient Calculation

Production staff must manually calculate ingredient quantities needed for each batch, leading to errors, over-consumption, or under-consumption of raw materials.

### Problem 11: No Recipe Standardization

Without standardized recipes, product quality varies between batches. Different staff members use different ingredient quantities, affecting consistency and cost control.

### Problem 12: Ingredient Waste Due to Loss Factors

Recipes do not account for loss factors (spillage, trimming, evaporation), causing actual ingredient usage to exceed planned amounts. This leads to unexpected stock depletion.

### Problem 13: No Production History

Businesses cannot track what was produced, when, by whom, and using which ingredients. This makes it difficult to analyze production efficiency or trace quality issues.

## 2.4 Supplier and Purchase Order Problems

### Problem 14: Manual Purchase Order Processing

Creating purchase orders manually through phone calls, emails, or paper forms is slow and error-prone. Order details are often miscommunicated or lost.

### Problem 15: No Supplier Collaboration Platform

Suppliers have no direct access to view orders, confirm availability, or update pricing. All communication happens through intermediaries, causing delays and miscommunication.

### Problem 16: Difficulty Tracking Order Status

Businesses cannot easily track whether orders are pending, approved, shipped, or received. This leads to confusion, duplicate orders, or missed deliveries.

### Problem 17: Manual Receiving Process

When deliveries arrive, staff must manually verify items, create stock lots, and update inventory records. This is time-consuming and prone to data entry errors.

### Problem 18: No QR Code or Barcode Tracking

Without QR codes or barcodes, tracking physical orders and matching them to digital records is difficult. This causes receiving errors and inventory discrepancies.

## 2.5 Employee Attendance Problems

### Problem 19: Manual Attendance Recording

Paper-based or manual attendance systems are easily manipulated (buddy punching) and difficult to verify. Managers spend excessive time compiling and verifying attendance records.

### Problem 20: No Shift-Based Tracking

Businesses with AM/PM shifts cannot accurately track when employees clock in and out for each shift. This makes payroll calculation and shift management complicated.

### Problem 21: No Attendance History Visibility

Employees and managers cannot easily view historical attendance records or identify patterns of absences or tardiness. This makes performance reviews and scheduling difficult.

## 2.6 Reporting and Decision-Making Problems

### Problem 22: Lack of Real-Time Dashboards

Managers cannot get instant visibility into key metrics like total inventory value, low stock items, or production output. They must manually compile reports, which are often outdated by the time they are ready.

### Problem 23: No Trend Analysis

Without historical data visualization, businesses cannot identify trends in inventory value, consumption patterns, or production efficiency. This limits strategic planning and forecasting.

### Problem 24: Difficult to Generate Reports

Creating reports for stock levels, expiring items, or production summaries requires manual data extraction and formatting. This is time-consuming and limits data-driven decision making.

# 3. OBJECTIVES (SOLUTIONS)

The Inventory Management System addresses all the problems outlined in the Statement of the Problem section through comprehensive, automated solutions. Each objective directly solves one or more identified problems.

## 3.1 Solutions to Inventory Tracking Problems

### Solution 1: Real-Time Stock Level Tracking

✓ Implement automatic stock calculations that update in real-time with every receive, consume, or production transaction

✓ Provide instant visibility into current stock quantities for all items

✓ Eliminate discrepancies through automated tracking instead of manual counting

✓ Display stock status (In Stock, Low Stock, Out of Stock) on dashboards

### Solution 2: Expiration Date Management and FIFO

✓ Track expiration dates for all perishable items at the lot level

✓ Implement FIFO (First In First Out) automatic consumption to use oldest stock first

✓ Generate alerts for items expiring within 7 days

✓ Identify expired items automatically

✓ Provide expiration tracker dashboard for easy monitoring

### Solution 3: Automated Low Stock Alerts

✓ Set reorder levels for each item

✓ Automatically detect when stock falls below reorder level

✓ Display low stock and out-of-stock counts on dashboard

✓ Enable proactive reordering to prevent stock-outs

### Solution 4: Complete Stock Movement Tracking

✓ Record all stock movements (Receive, Consume, Produce, Adjust, Transfer, Spoilage)

✓ Track who performed each movement and when

✓ Maintain reference numbers and reasons for each movement

✓ Provide searchable movement history for traceability

✓ Enable identification of theft, errors, or inefficiencies

### Solution 5: Auto-Generated Item Codes

✓ Automatically generate unique item codes in format YYYYMM0001

✓ Ensure no duplicate codes

✓ Maintain consistent naming convention

✓ Save time and eliminate manual code creation errors

## 3.2 Solutions to User Management and Security Problems

### Solution 6: Role-Based Access Control (RBAC)

✓ Implement 4 user roles: Super Admin, Admin, Staff, Supplier

✓ Restrict access based on role (e.g., Staff cannot manage users)

✓ Enforce role hierarchy (Admin cannot create Super Admin)

✓ Protect sensitive data from unauthorized access

### Solution 7: Comprehensive Audit Logging

✓ Log every user action (Create, Read, Update, Delete, Login, Logout)

✓ Record IP address, user agent, and timestamp for each action

✓ Maintain immutable audit trail for compliance

✓ Enable troubleshooting and accountability

✓ Provide searchable and filterable audit logs

### Solution 8: Granular Permission Management

✓ Implement 10 permission types (Inventory Read/Write/Delete, User Read/Write/Delete, Reports, Settings)

✓ Allow admins to assign specific permissions to staff

✓ Support bulk permission updates

✓ Enable permission expiration dates

✓ Simplify permission management through user-friendly interface

### Solution 9: Multi-Layer Security Protection

✓ Prevent SQL injection through Django ORM (no raw SQL queries)

✓ Implement CSRF protection on all forms

✓ Sanitize and validate all user inputs to prevent XSS attacks

✓ Apply secure headers (HSTS, X-Frame-Options, Content-Type-Nosniff)

✓ Enforce strong password validation

## 3.3 Solutions to Production Management Problems

### Solution 10: Automated Ingredient Calculation

✓ Calculate ingredient quantities automatically based on production quantity and recipe

✓ Eliminate manual calculation errors

✓ Ensure accurate ingredient consumption

✓ Display ingredient usage breakdown for each production

### Solution 11: Recipe Standardization

✓ Create standardized recipes with exact ingredient quantities

✓ Link recipes to finished goods products

✓ Ensure consistent product quality across all batches

✓ Enable cost control through standardized ingredient usage

### Solution 12: Loss Factor Accounting

✓ Include loss factor percentage for each ingredient in recipes

✓ Automatically adjust ingredient quantities for spillage, trimming, evaporation

✓ Provide accurate ingredient consumption calculations

✓ Prevent unexpected stock depletion

### Solution 13: Production History and Tracking

✓ Record all production activities with date, time, and user

✓ Track which recipe was used and what quantity was produced

✓ Show ingredients consumed for each production

✓ Provide daily production summary on staff dashboard

✓ Enable production efficiency analysis and quality tracing

## 3.4 Solutions to Supplier and Purchase Order Problems

### Solution 14: Digital Purchase Order System

✓ Create purchase orders digitally with auto-generated order numbers (PO-YYYYMMDD-XXXX)

✓ Eliminate phone calls, emails, and paper forms

✓ Ensure accurate order details

✓ Maintain complete order history

### Solution 15: Supplier Portal for Collaboration

✓ Provide dedicated supplier login portal

✓ Allow suppliers to view assigned purchase orders

✓ Enable suppliers to approve orders and set pricing

✓ Allow suppliers to update order status (Shipped)

✓ Eliminate communication delays and errors

### Solution 16: Order Status Workflow Tracking

✓ Implement clear order status workflow: Draft → Pending → Approved → Shipped → Received

✓ Display current status for all orders

✓ Prevent duplicate orders through status visibility

✓ Track expected delivery dates

### Solution 17: Automated Receiving Process

✓ Scan QR code to instantly identify order

✓ Automatically create stock lots for all received items

✓ Populate lot numbers, quantities, unit costs, and expiration dates

✓ Eliminate manual data entry errors

✓ Save time during receiving process

### Solution 18: QR Code Tracking System

✓ Generate unique QR code for each purchase order

✓ Enable quick order identification during receiving

✓ Match physical deliveries to digital records accurately

✓ Reduce receiving errors and inventory discrepancies

## 3.5 Solutions to Employee Attendance Problems

### Solution 19: Digital Attendance System

✓ Implement digital clock in/out system

✓ Prevent buddy punching through user authentication

✓ Automatically record attendance with timestamps

✓ Eliminate manual attendance compilation

### Solution 20: AM/PM Shift Tracking

✓ Support separate clock in/out for AM and PM shifts

✓ Prevent duplicate clock-ins for same shift

✓ Track partial attendance (AM only or PM only)

✓ Simplify payroll calculation for shift-based work

### Solution 21: Attendance History and Calendar View

✓ Provide monthly calendar view with attendance status indicators

✓ Show complete, partial, and missing attendance

✓ Enable employees to view their own attendance history

✓ Allow admins to review all staff attendance records

✓ Support performance reviews and scheduling decisions

## 3.6 Solutions to Reporting and Decision-Making Problems

### Solution 22: Real-Time Dashboards

✓ Provide instant visibility into key metrics:

- Total products count

- Total inventory value

- Low stock and out-of-stock counts

- Finished goods statistics

- Recent items with stock status

✓ Update metrics in real-time with every transaction

✓ Enable data-driven decision making

### Solution 23: Trend Analysis and Visualization

✓ Display 6-month stock value trend chart

✓ Show value change percentage compared to previous month

✓ Enable identification of inventory patterns

✓ Support strategic planning and forecasting

### Solution 24: Automated Report Generation

✓ Generate stock reports automatically (current levels, low stock, out of stock)

✓ Provide expiration tracker report

✓ Create production summaries

✓ Offer searchable and filterable audit logs

✓ Eliminate manual report compilation

# 4. SCOPE

## 4.1 Functional Scope

### User Management

• User account creation, modification, and deletion

• Role assignment (Super Admin, Admin, Staff, Supplier)

• Granular permission management (10 permission types)

• User relationship tracking (manager, subordinate, colleague)

• Account activation/deactivation

### Inventory Management

• Item master data management (4 categories: Ingredient, Finished Good, Packaging, Equipment)

• Stock lot tracking with lot numbers and expiration dates

• Stock movement recording (6 types: Receive, Consume, Produce, Adjust, Transfer, Spoilage)

• Real-time stock level calculations

• Low stock and out-of-stock alerts

• Expiration tracking and alerts

• FIFO (First In First Out) stock consumption

### Production Management

• Recipe creation with ingredients and yield quantities

• Loss factor calculation for ingredients

• Automated ingredient consumption during production

• Finished goods stock lot creation

• Production history and tracking

### Purchase Order Management

• Purchase order creation and management

• QR code generation for order tracking

• Order workflow (Draft → Pending → Approved → Shipped → Received)

• Supplier approval with pricing

• QR code scanning for receiving

• Automatic stock lot creation upon receipt

### Supplier Portal

• Supplier account management

• Order viewing and approval

• Pricing input during approval

• Order status updates

• Expected delivery date setting

### Attendance Tracking

• AM/PM shift clock in/out

• Daily attendance records

• Monthly calendar view

• Attendance history

• Admin attendance overview

### Reporting & Analytics

• Dashboard with key metrics

• Stock value trends (6-month chart)

• Low stock reports

• Expiration tracker

• Production summaries

• Audit logs with filtering

## 4.2 Technical Scope

• Web-based application accessible via browser

• MySQL database backend

• Django framework (Python)

• Responsive design for desktop and mobile

• Local network access support

• Asia/Manila timezone support

• UUID-based primary keys

• RESTful API endpoints for dynamic data

## 4.3 User Scope

• Super Admin: Full system access and control

• Admin: User management and staff permission assignment

• Staff: Attendance tracking and production operations

• Supplier: Purchase order management through dedicated portal

# 5. LIMITATIONS

## 5.1 Technical Limitations

• Single Database: The system currently supports only MySQL database. Migration to other databases would require configuration changes.

• Local Network Deployment: Designed for local network deployment. Cloud deployment would require additional security configurations and HTTPS setup.

• No Multi-location Support: The system does not currently support multiple warehouse locations or inter-location transfers.

• Limited Reporting: Advanced reporting features like custom report builders and data export to Excel are not implemented.

• No Email Notifications: The system does not send automated email notifications for low stock, expiring items, or order updates.

## 5.2 Functional Limitations

• No Barcode Scanning: While QR codes are supported for purchase orders, general barcode scanning for items is not implemented.

• No Multi-currency Support: All pricing is in single currency. Multi-currency support is not available.

• No Integration with Accounting: The system does not integrate with external accounting software.

• Limited Batch Operations: Bulk operations are limited. Mass updates require individual processing.

• No Mobile App: Access is through web browser only. Native mobile applications are not available.

## 5.3 Business Limitations

• Single Organization: The system is designed for single organization use. Multi-tenant support is not available.

• No Customer Management: The system focuses on inventory and suppliers. Customer relationship management features are not included.

• No Sales Module: While production is tracked, sales order management is not implemented.

• Limited Shift Management: Only AM/PM shifts are supported. Complex shift patterns are not available.

## 5.4 Security Limitations

• No Two-Factor Authentication: The system uses username/password authentication only.

• No Password Recovery: Password reset functionality requires admin intervention.

• Limited Session Management: Advanced session controls like concurrent login prevention are not implemented.

## 5.5 Performance Limitations

• Not Optimized for Large Scale: The system is designed for small to medium businesses. Performance with millions of records has not been tested.

• No Caching: Advanced caching mechanisms for improved performance are not implemented.

• Sequential Processing: Batch operations are processed sequentially, not in parallel.

# 6. SYSTEM FEATURES

The following features have been implemented to solve the problems identified in Section 2 and achieve the objectives outlined in Section 3.

## 6.1 Security & Authentication Features

• Unified login system for all user types

• Role-based authentication (Super Admin, Admin, Staff, Supplier)

• SQL Injection Protection via Django ORM

• CSRF Protection on all forms

• XSS Protection through input validation

• Secure headers (HSTS, X-Frame-Options)

• Comprehensive audit logging with IP tracking

• Password validation and encryption

## 6.2 User Management Features

• User CRUD operations (Create, Read, Update, Delete)

• Auto-generated usernames from first/last name

• Role assignment and hierarchy enforcement

• Granular permission system (10 permission types)

• Bulk permission updates

• User relationship tracking

• Account activation/deactivation

## 6.3 Inventory Management Features

• Auto-generated item codes (YYYYMM0001 format)

• 4 item categories (Ingredient, Finished Good, Packaging, Equipment)

• 8 unit types (pcs, kg, g, L, mL, pack, box, dozen)

• Stock lot tracking with lot numbers

• Expiration date management

• FIFO (First In First Out) consumption

• Real-time stock level calculations

• Low stock and out-of-stock alerts

• Expiration tracker (7-day alert threshold)

• 6 stock movement types (Receive, Consume, Produce, Adjust, Transfer, Spoilage)

• Complete movement history with user tracking

## 6.4 Production Features

• Recipe creation with standardized ingredients

• Yield quantity specification

• Loss factor calculation for ingredients

• Automated ingredient consumption during production

• Automatic finished goods stock lot creation

• Production history tracking

• Daily production summary on staff dashboard

• Ingredient usage breakdown display

## 6.5 Purchase Order Features

• Auto-generated order numbers (PO-YYYYMMDD-XXXX format)

• Unique QR code generation for each order

• Order status workflow (Draft → Pending → Approved → Shipped → Received)

• Supplier portal for order viewing and approval

• Pricing input by suppliers during approval

• Expected delivery date setting

• QR code scanning for receiving

• Automatic stock lot creation upon receipt

• Order cancellation capability

## 6.6 Attendance/DTR Features

• AM/PM shift clock in/out

• Manila timezone support

• Single clock-in per shift enforcement

• Daily attendance records

• Monthly calendar view with status indicators

• Complete/Partial/Missing attendance display

• Attendance history

• Admin attendance overview for all staff

## 6.7 Dashboard & Reporting Features

• Real-time dashboard with key metrics

• Total inventory value display

• Low stock and out-of-stock counts

• Finished goods statistics

• 6-month stock value trend chart

• Value change percentage

• Recent activity logs

• Stock reports (current levels, low stock, out of stock)

• Expiration tracker report

• Production summaries

• Searchable and filterable audit logs

## 6.8 Additional Features

• Search and filtering (users, items, dates)

• Pagination support

• RESTful API endpoints for dynamic data

• Input sanitization and validation

• Responsive design for mobile access

• Local network access support

• CSRF-protected forms

• Error and success messaging

# 7. SYSTEM STATISTICS

• Total Database Models: 14

• Total View Functions: 40+

• Total URL Patterns: 40+

• User Roles: 4 (Super Admin, Admin, Staff, Supplier)

• Permission Types: 10

• Stock Movement Types: 6

• Item Categories: 4

• Unit Types: 8

• Order Status Types: 6

# 8. CONCLUSION

The Inventory Management System comprehensively addresses the 24 problems identified in the Statement of the Problem through targeted, automated solutions. By implementing real-time tracking, role-based security, automated workflows, and comprehensive reporting, the system transforms traditional manual inventory management into an efficient, secure, and data-driven operation.

Key achievements include:

• Elimination of manual tracking errors through automation

• Reduction of waste through expiration management and FIFO

• Enhanced security through multi-layer protection and audit logging

• Improved production efficiency through recipe standardization

• Streamlined supplier collaboration through dedicated portal

• Accurate attendance tracking with shift support

• Real-time visibility into business operations through dashboards

The system is designed for scalability and can be extended with additional features such as email notifications, barcode scanning, multi-location support, and accounting integration as business needs evolve.