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Inventory, Billing, And Supply Chain Management System Using Javafx

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ABSTRACT

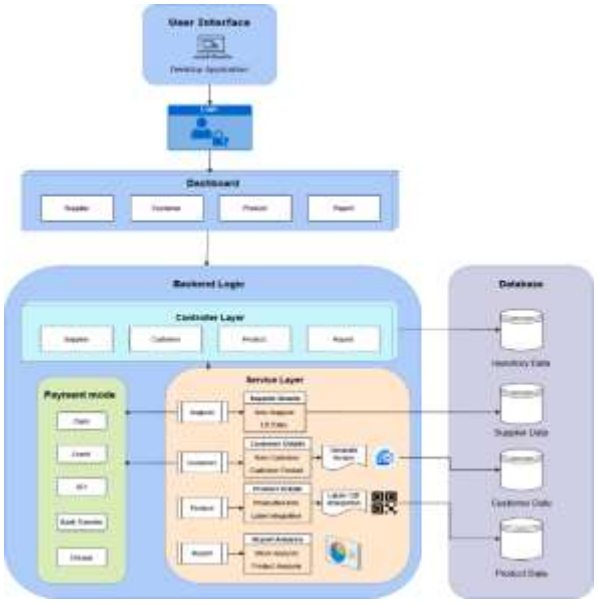
Small and medium-sized enterprises (SMEs) often face significant challenges in managing inventory due to reliance on manual systems or expensive cloud-based solutions. These methods lead to inventory inaccuracies, billing delays, and increased operational costs, especially in low-connectivity regions. To address this, we present an offline, Java-based Inventory, Billing, and Supply Chain Management System using JavaFX and MySQL. The system features real-time inventory tracking, billing automation, supplier and customer management, and comprehensive reporting. Its one-time setup and modular design enable use on basic hardware, offering cost-effective and efficient operations for SMEs.

Keywords: Inventory, JavaFX, Supply Chain, Offline System, SME

1. Introduction

Efficient inventory management plays a pivotal role in the success of modern supply chains, especially in sectors like manufacturing and export where timely product delivery and stock visibility are vital. Unfortunately, many SMEs either use manual record-keeping methods or adopt cloud-based solutions that may not align with their infrastructure or budget constraints. Manual inventory processes are often labor-intensive, prone to human error, and provide no real-time data visibility. Conversely, modern cloud-based inventory systems, while powerful, demand continuous internet access and recurring subscription fees. These pose serious challenges in rural or connectivity-limited regions. Hence, there is a need for a dependable offline system that is affordable, scalable, and easy to use. This project aims to bridge this gap with a robust Java-based desktop application, tailored to the specific needs of inventory-focused SMEs.

2. System Architecture



This architecture diagram represents the overall flow of a desktop-based inventory and billing system. It begins with a user interface where users log in and access a dashboard containing modules like Supplier, Customer, Product, and Report. These modules interact with the backend logic, which is split

into a Controller Layer (handling user requests) and a Service Layer (managing business logic). The Service Layer processes supplier details, customer records, product information, and generates reports and invoices—also integrating label/QR features. It supports various payment modes like cash, credit, UPI, and bank transfer. All data is stored and retrieved from a centralized database, which maintains inventory, supplier, customer, and product data. This layered structure ensures modularity, data integrity, and efficient operations.

3. Modeling And Analysis

The proposed inventory, billing, and supply chain management system is composed of eight integrated modules. Each module has been thoughtfully designed to enhance efficiency, reduce manual errors, and streamline business processes for small and medium-sized enterprises (SMEs). The following elaborates on the individual modules:

1. Login and Authentication

This module serves as the primary gatekeeper for the system, ensuring that only authorized personnel can access specific functionalities. It implements role-based access control (RBAC) where each user is assigned a role—such as Administrator, Sales Manager, or Inventory Manager—with customized permissions. Administrators have full system access including configuration settings, while other roles are limited to their operational domain. The module supports session tracking and login attempt monitoring to enhance security.

2. Inventory Module

The inventory module is the core of the system, offering comprehensive tools for managing stock levels. Users can add, update, or remove products, assign categories, and monitor stock movement in real-time. Threshold alerts are configured to notify users when stock levels fall below minimum levels, helping to prevent stockouts. Features also include batch tracking, product expiry management, and usage analytics, which enable businesses to make data-driven restocking decisions.

3. Supplier Module

This module facilitates the management of supplier relationships and transactions. It allows users to store detailed supplier profiles, including contact information, banking details, and transaction history. Users can log purchase orders, record payments, and track outstanding dues. CRUD (Create, Read, Update, Delete) operations are supported to ensure the data remains up to date.

4. Customer Module

Designed for managing customer data and sales relationships, this module maintains contact information, billing/shipping addresses, and transaction records for each customer. It helps track purchase frequency, credit balances, and payment history, providing useful insights into customer behavior.

5. Transaction Module

This module handles the recording and processing of all sales and purchase activities. It automatically updates stock levels based on each transaction and links the data with the corresponding customer or supplier record. It also supports product returns, refunds, and multi-mode payment processing (cash, credit, UPI, bank transfer, etc.).

6. Invoice Generator

One of the most frequently used modules, the invoice generator automates the creation of professional, legally compliant invoices post-transaction. It populates invoice fields based on transaction data, supports discounts, tax calculations (GST/VAT), and offers multiple output formats (PDF, Excel). Invoices can be printed, emailed, or exported, enhancing customer experience and supporting proper documentation for audits and compliance.

7. Reports and Analytics

This module enables businesses to analyze performance trends and operational metrics. Users can generate customized reports on inventory levels, sales revenue, product movement, and customer activity. Reports can be exported in multiple formats (PDF, CSV) for further analysis or presentation.

8. Backup and Security

Data integrity and security are addressed through this module, which offers automated and manual backup options. It encrypts sensitive information like user credentials and transaction details to prevent unauthorized access. Additional features include session timeout, activity logging, and admin-controlled access resets. This ensures that critical business data remains secure and recoverable in case of system failure or accidental data loss.

4.Results And Discussion

The system underwent comprehensive testing phases including unit, integration, system, and user acceptance testing (UAT). Test cases validated functionality such as login, stock updates, invoice generation, and data retrieval. Out of 25 scenarios, 24 passed successfully. A single failure related to invalid date format was corrected by introducing additional validation. The performance was stable on systems with basic specifications (Intel i5, 4GB RAM).

5. Conclusion

This paper presents a robust, desktop-based inventory, billing, and supply chain management system tailored specifically for the needs of small and medium-sized enterprises (SMEs). Designed to operate entirely offline, the system addresses key challenges faced by businesses in remote or low-connectivity regions. By avoiding reliance on cloud infrastructure and subscription-based models, it ensures cost-efficiency, data privacy, and uninterrupted operational access, making it particularly beneficial for organizations with limited technical resources or budgets.

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