MACHINE LEARNING

Medical Store Inventory Management System

K. Viveknanda, M. Rithwik, M. Pushkar, M. Vamshi, Dharmendra Roy

Department of Computer Science and Engineering, Hyderabad Institute of Technology and Management (HITAM), Hyderabad, Telangana, India

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Abstract

The management of medical store inventory plays a vital role in ensuring the availability, safety, and proper distribution of pharmaceutical products. Traditional inventory management practices in many medical stores rely on manual record-keeping and outdated methods, which often result in inventory inaccuracies, difficulties in tracking medicine availability, stock mismanagement, delayed updates, and financial losses. Additionally, improper monitoring of medicine expiration dates and insufficient coordination between suppliers, purchases, and sales can lead to medicine wastage and operational inefficiencies. To address these challenges, this research proposes the development of a Web-Based Medical Store Inventory Management System designed to improve the efficiency, accuracy, and reliability of pharmaceutical inventory operations. The proposed system provides an integrated digital platform for managing and monitoring medical store activities through a centralized inventory management interface. It incorporates essential functionalities, including medicine management, stock monitoring, supplier management, purchase management, sales management, expiry tracking, and report generation. The system enables administrators to maintain medicine details, update stock quantities, monitor low-stock conditions, identify medicines approaching their expiration dates, and manage purchase and sales records efficiently. Furthermore, the dashboard provides a consolidated overview of important inventory information, helping users understand the current operational status of the medical store and make informed management decisions. The development of this system follows a structured software development approach involving requirement analysis, system design, implementation, and functional testing. A web-based architecture is adopted to provide an accessible and user-friendly interface for managing inventory-related operations. By reducing dependence on manual documentation and organizing inventory information digitally, the proposed solution aims to minimize human errors, improve data accessibility, enhance stock visibility, and support timely inventory-related decisions. The proposed Medical Store Inventory Management System offers a practical and scalable approach to modernizing pharmaceutical inventory operations. It can help medical store administrators improve inventory control, reduce avoidable medicine wastage, maintain accurate records, and enhance overall operational efficiency. The system demonstrates how web-based technologies can support the digital transformation of traditional medical store management practices.

Keywords: Medical Store Management; inventory management system; pharmaceutical inventory; medicine stock monitoring; expiry date tracking; supplier management; web-based application; inventory automation

1 Introduction

The pharmaceutical industry plays a significant role in the healthcare sector by ensuring the availability and distribution of medicines required for patient care and treatment. Medical stores are an essential part of this industry, as they are responsible for maintaining medicine stocks, handling purchases and sales, managing supplier information, and ensuring that pharmaceutical products are available whenever required. Effective inventory management is therefore essential for maintaining

the smooth operation of medical stores, reducing unnecessary expenses, and ensuring the availability of medicines.

Inventory management refers to the systematic process of purchasing, storing, monitoring, and controlling products within an organization. In medical stores, inventory management involves maintaining accurate records of medicines, monitoring stock quantities, tracking expiration dates, managing supplier details, and recording daily purchase and sales transactions. Since medicines have specific storage requirements and expiration periods, proper inventory control is particularly important in pharmaceutical environments. Poor inventory management can result in medicine shortages, excess stock accumulation, financial losses, and wastage of expired pharmaceutical products.

Traditionally, many small and medium-sized medical stores depend on manual record-keeping methods, registers, spreadsheets, or basic billing applications to manage their inventory operations. These approaches may create several operational challenges, including inaccurate stock records, duplicate entries, difficulty in locating medicine information, delayed stock updates, and time-consuming report preparation. Furthermore, manually monitoring expiration dates and identifying medicines with low stock levels can be difficult, especially when a store manages a large number of pharmaceutical products. Such limitations may affect the efficiency of daily operations and create difficulties in making timely inventory-related decisions.

With the advancement of information technology and web-based application development, digital inventory management systems have become an effective approach to addressing these challenges. Web-based systems enable organizations to maintain centralized information, automate routine operations, improve data accessibility, and monitor business activities through user-friendly interfaces. The integration of digital technologies into medical store operations can improve the organization of inventory records and support more effective management of pharmaceutical resources.

To address the limitations of traditional inventory management practices, this research focuses on the design and development of a Web-Based Medical Store Inventory Management System. The proposed system provides a centralized platform through which medical store administrators can manage medicines, monitor available stock, maintain supplier information, record purchases and sales, track medicine expiration dates, and generate inventory-related reports. It also provides a dashboard that displays important inventory information, such as total medicines, low-stock items, medicines approaching expiration, and daily sales information. These features help administrators obtain a clear overview of store activities and manage inventory operations more systematically.

2 Problem statement

The efficient management of pharmaceutical inventory is a major challenge for many medical stores, particularly those that depend on manual record-keeping and conventional inventory management practices. Managing a large number of medicines requires continuous monitoring of stock availability, expiration dates, supplier information, purchase records, and sales transactions. When these activities are handled manually or through disconnected systems, maintaining accurate and updated inventory information becomes difficult and time-consuming.

One of the major problems in traditional medical store management is the lack of centralized inventory information. Medicine details, stock quantities, supplier records, and transaction

information may be maintained in separate registers or files, making it difficult to access and update information whenever required. This can lead to duplicate records, data inconsistencies, inaccurate stock calculations, and delays in retrieving important information.

Another significant challenge is the improper monitoring of medicine stock levels. Without an effective stock monitoring mechanism, medical store administrators may find it difficult to identify medicines that are running low or determine when new stock should be purchased. This can result in unexpected medicine shortages, delayed replenishment, or unnecessary accumulation of excess inventory. Similarly, manually tracking medicine expiration dates increases the possibility of overlooking products approaching their expiry dates, potentially leading to financial losses and avoidable medicine wastage.

Furthermore, managing supplier information, purchase transactions, and sales records separately creates additional operational difficulties. Administrators may spend considerable time maintaining records, verifying transactions, calculating available stock, and preparing reports. The absence of an integrated reporting mechanism also limits the ability to obtain a clear overview of inventory status and make timely management decisions.

Therefore, there is a need for an integrated, reliable, and user-friendly inventory management solution that can organize and simplify the major activities of a medical store. The proposed Web-Based Medical Store Inventory Management System aims to address these challenges by providing a centralized platform for medicine management, inventory monitoring, supplier management, purchase management, sales management, expiry tracking, and report generation.

The main problem addressed by this research is the lack of an integrated digital platform for efficiently managing medical store inventory operations. The proposed system aims to reduce dependence on manual documentation, improve the accuracy and accessibility of inventory records, support timely identification of low-stock and near-expiry medicines, and enhance the overall efficiency of medical store management.

3 Objectives

The objectives of this work are as follows:

1. To design and develop a web-based Medical Store Inventory Management System that provides a centralized platform for managing pharmaceutical products, inventory records, and daily medical store operations.
2. To implement a medicine management module that enables administrators to add, update, view, search, and maintain medicine information, including medicine names, categories, quantities, and other relevant details.
3. To develop an inventory monitoring mechanism that maintains stock information, identifies low-stock medicines, and helps administrators make timely replenishment decisions to avoid unexpected stock shortages and excessive inventory accumulation.
4. To implement an expiry tracking module that monitors medicine expiration dates and identifies products approaching their expiry periods, helping administrators take appropriate action and reduce avoidable medicine wastage.
5. To provide supplier and purchase management functionalities for maintaining supplier details, organizing procurement records, and monitoring medicine purchasing activities within the medical store.

6. To develop a sales management module that maintains sales transaction records and supports the systematic monitoring of medicine sales and related inventory information.

7. To design an interactive administrative dashboard that displays important inventory indicators, including total medicines, low-stock items, medicines approaching expiration, and daily sales information, enabling administrators to obtain an overview of store operations.

8. To implement a report generation facility that helps administrators access and review inventory-related information, supporting better monitoring, record maintenance, and management decisions.

9. To develop a user-friendly and responsive web interface that simplifies navigation between different inventory management modules and provides an organized environment for performing medical store operations.

10. To evaluate the developed system through functional testing of its major modules, including medicine management, stock monitoring, supplier management, purchase and sales operations, expiry tracking, and reporting, while identifying its advantages and limitations.

4 Literature review

Several studies have been conducted on the development of digital inventory management systems to improve the efficiency of pharmaceutical and medical store operations. Misran and Mohmad Hassim [1], in their study titled "Development of Web Based Pharmacy Inventory System," focused on developing a web-based pharmacy management application to handle product inventory, sales operations, stock records, and expired medicine management. Their research highlighted the difficulties associated with manually checking medicine quantities and expiration dates, emphasizing the importance of automating pharmacy-related activities. The proposed system aimed to simplify pharmacy operations and improve the efficiency of inventory management.

Scott et al. [2], in their research titled "Optimizing Drug Inventory Management with a Web-Based Information System: The TBTC Study 31 / ACTG A5349 Experience," presented a web-based Drug Management Module for managing pharmaceutical inventory across multiple clinical trial locations. The system integrated inventory monitoring, shipment management, expiration-date tracking, and automated notifications to improve drug availability and restocking activities. Their findings demonstrated that the implementation of a centralized web-based system helped reduce shipment-related drug stock-outs and improved the efficiency of inventory management compared with the previous manual process.

Dubey et al. (2022), in their review of pharmaceutical inventory management literature, discussed the importance of inventory control in pharmaceutical organizations and examined different inventory management models used to maintain appropriate stock levels. Their study emphasized the need for maintaining safety stock and controlling pharmaceutical inventory to minimize shortages, excess stock, and financial losses associated with improper inventory management. The review highlighted the importance of systematic inventory planning and monitoring in pharmaceutical operations.

Recent research on web-based pharmacy inventory management has also emphasized the importance of integrating stock monitoring, medicine expiry tracking, and centralized information management. A 2026 study titled "A Smart Web-Based Inventory Management System for Efficient and Accessible Pharmacy Operations" proposed a web-based pharmacy solution incorporating real-

time inventory monitoring, low-stock alerts, expiry notifications, and role-based access. This research further demonstrates the growing role of web technologies in improving the accessibility and efficiency of pharmacy management operations.

Although previous studies have introduced different approaches to pharmaceutical inventory management, there remains a practical need for an integrated and user-friendly solution that brings essential medical store activities together within a centralized platform. Existing approaches may involve specialized inventory techniques, complex institutional workflows, or additional technologies that are not necessary for every small or medium-sized medical store. Therefore, the present research focuses on designing and developing a Web-Based Medical Store Inventory Management System that integrates medicine management, stock monitoring,

5 Proposed system

The proposed system is a web-based Medical Store Inventory Management System designed to automate and organize pharmaceutical inventory operations through a centralized digital platform. As illustrated in Figure 1, the system follows a structured processing pipeline consisting of five major components: users, input layer, system processing layer, output layer, and a centralized database. These components work together to simplify inventory management, improve stock monitoring, and support efficient medical store administration.

The process begins with the user layer, which represents the individuals interacting with the application, including administrators, pharmacists, and sales staff. These users access the system through a web-based interface to perform their respective inventory-related activities. The input layer collects essential information required for medical store operations, including medicine details, supplier information, purchase records, sales transactions, and medicine expiration dates. This information provides the necessary input for the system to perform inventory management activities.

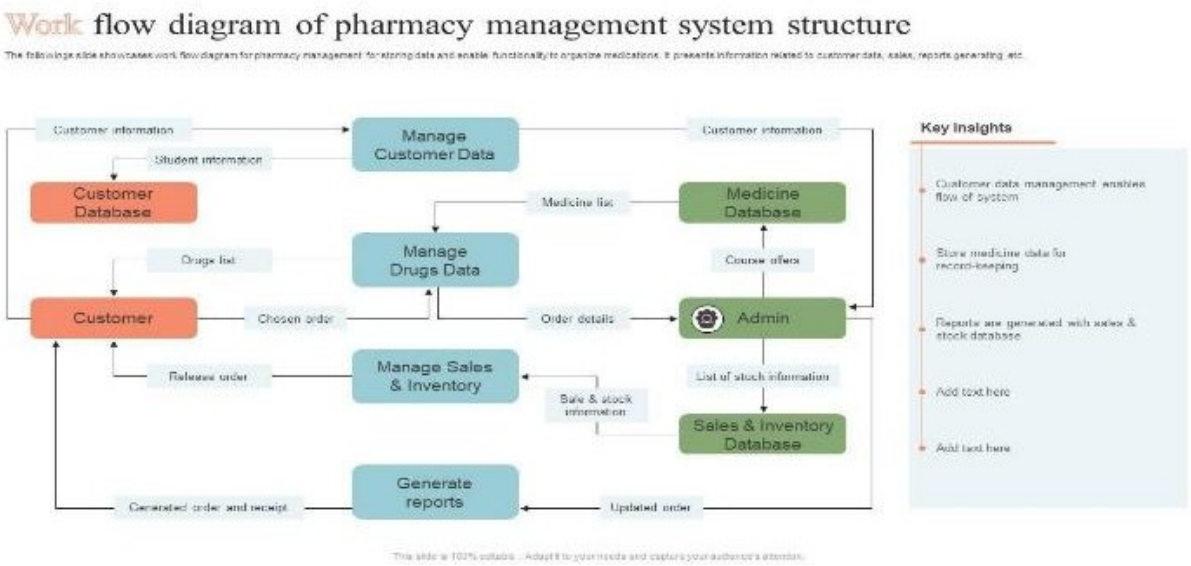


Figure 1. Conceptual processing pipeline of the proposed inventory system.

The system processing layer forms the core of the proposed application and consists of four major functional components. The inventory management module processes medicine-related information and supports stock monitoring by maintaining available quantities and identifying low-stock

medicines. The expiry tracking module monitors medicine expiration dates and helps identify products approaching their expiry periods. The data analysis module organizes inventory and transaction information to support report generation and provide useful insights into medical store operations. The business logic component handles the application rules and validation processes required for maintaining consistent inventory information and processing user operations.

The centralized database acts as the storage component of the proposed system. It maintains medicine details, supplier information, purchase records, sales transactions, and other relevant inventory information. The application retrieves and updates the stored information whenever users perform supported operations. This centralized approach helps maintain organized records and provides a consistent source of inventory information across the application.

Based on the processed information, the output layer generates three major types of outputs. The dashboard provides an overview of medical store activities, including total medicines, available stock, low-stock items, and daily sales information. The alert mechanism helps administrators identify low-stock medicines and products approaching their expiration dates. The reporting component provides access to inventory and sales-related information, supporting the review of store activities and management decisions.

For example, consider a medical store that initially maintains 120 units of Paracetamol 500 mg. When a sales transaction of 100 units is recorded, the system updates the available quantity to 20 units. If the predefined minimum stock level is 25 units, the inventory management module identifies the medicine as a low-stock item. This information is reflected in the dashboard or alert section, allowing the administrator to arrange replenishment from the supplier. Similarly, when a medicine approaches its expiration date, the expiry tracking module helps the administrator identify it and take appropriate action.

The overall objective of the proposed processing pipeline is to improve inventory accuracy, reduce avoidable medicine wastage, support timely stock replenishment, and enhance the efficiency of daily medical store operations. By integrating different inventory management activities into a single web-based application, the proposed system provides an organized and practical approach to pharmaceutical inventory management.

6 System architecture

The system architecture of the proposed Medical Store Inventory Management System represents the overall structure and interaction between different components of the web-based application. It follows a modular architecture consisting of the presentation layer, application processing layer, and data storage layer. The presentation layer provides a user-friendly interface through which administrators interact with the application. The application processing layer handles inventory operations, business logic, and data validation, while the database layer maintains medicine details, supplier information, purchase records, sales transactions, and expiry information. Each component performs a specific function and communicates with the other components to ensure organized inventory management. The architecture is designed to simplify system maintenance, improve data accessibility, and support efficient execution of medical store operations. The architecture is shown in Figure 2.

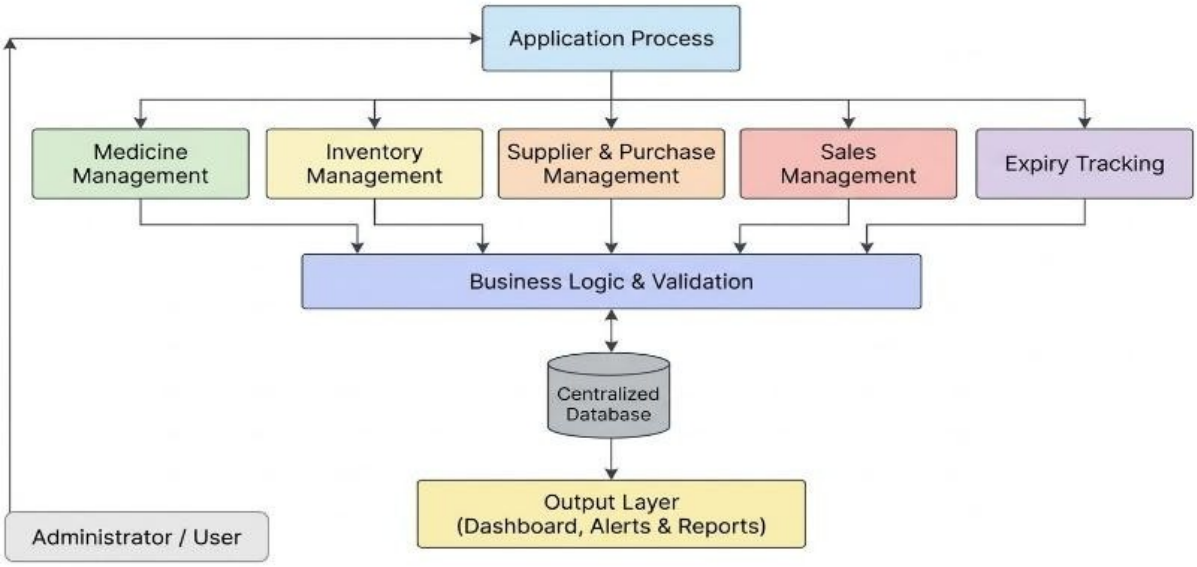


Figure 2. System architecture of the proposed Medical Store Inventory Management System.

The major components of the proposed system architecture are explained below:

Presentation Layer (User Interface): Provides a web-based interface for interacting with the medical store inventory system. Displays dashboard information, medicine records, inventory details, supplier information, and transaction records. Allows administrators to perform operations such as adding, updating, viewing, and managing inventory information. Provides organized navigation between different application modules.

Application Processing Layer: Acts as the central processing component responsible for handling user requests and application operations. Processes medicine management, inventory monitoring, supplier management, purchase management, and sales transactions. Applies business rules and validation mechanisms to maintain consistent inventory information. Processes requests and communicates with the database to retrieve or update the required records.

Inventory Management Module: Maintains medicine information, including medicine names, categories, and available stock quantities. Updates inventory information based on supported purchase and sales transactions. Identifies medicines whose available quantities fall below the predefined stock level. Helps administrators monitor stock availability and plan timely replenishment.

Expiry Tracking Module: Maintains and monitors the expiration dates of medicines stored in the inventory. Identifies medicines approaching their expiration dates. Provides expiry-related information to help administrators take appropriate action. Supports better inventory control and helps reduce avoidable medicine wastage.

Database Layer: Acts as the centralized storage component of the application. Stores medicine details, supplier records, purchase information, sales records, and inventory data. Supports data retrieval, insertion, modification, and deletion operations. Maintains organized records that can be accessed by the application whenever required.

Output and Reporting Layer: Displays processed information through the administrative dashboard. Provides information about total medicines, low-stock items, near-expiry medicines, and daily sales. Generates inventory-related information and reports for administrative review. Helps administrators understand inventory conditions and make informed management decisions.

7 Methodology

This section formally describes how the proposed Medical Store Inventory Management System processes inventory-related information and generates meaningful outputs. The system combines six major categories of input information: medicine details (M), stock quantities (Q), supplier information (U), purchase transactions (P), sales transactions (S) and medicine expiration dates (E). These inputs are processed through interconnected inventory management modules and application-level business rules to produce outputs such as updated stock information, low-stock identification, expiry status, dashboard summaries, and inventory reports.

The processing mechanism is based on predefined inventory rules and transaction operations rather than a single mathematical prediction model. Therefore, the following formulation represents the general processing logic of the proposed application and should be interpreted as a conceptual description of the implemented system rather than its literal source code.

7.1 Effect of medicine and stock information on inventory management

Each medicine (M_i) registered in the system is associated with a collection of attributes, including its name, category, available quantity, and expiration date. These attributes are maintained as part of the medicine management module.

The medicine information can be represented as

$$M_i = \left\{\mathrm{ID}_i,\ \mathrm{Name}_i,\ \mathrm{Category}_i,\ Q_i,\ E_i\right\} \tag{1}$$

where (ID_i) represents the unique medicine identifier, (Name_i) represents the medicine name, ($\mathrm{Category}_i$) represents its classification, (Q_i) represents its available quantity, and (E_i) represents its expiration date.

The inventory management module uses this information to maintain medicine records and monitor stock availability. Each medicine is associated with a predefined minimum stock threshold (R_i). The stock status is determined using the following rule:

$$\mathrm{StockStatus}\left(M_i\right) = \begin{cases} \mathrm{Low}, & Q_i \le R_i \\ \mathrm{Available}, & Q_i > R_i \end{cases} \tag{2}$$

This rule enables the system to identify medicines whose quantities have reached or fallen below the specified minimum level. The identified medicines can be displayed in the inventory dashboard to support timely replenishment decisions.

7.2 Effect of purchase and sales transactions on stock calculation

Purchase and sales transactions directly influence the available quantity of medicines in the inventory. The purchase management module records incoming medicine quantities, while the sales management module maintains outgoing medicine transactions. The updated stock quantity can be represented using the following inventory balance equation

$$Q_i^{\mathrm{new}} = Q_i^{\mathrm{old}} + P_i - S_i \tag{3}$$

where (Q_i^{old}) represents the previous stock quantity, (P_i) represents the purchased quantity, and (S_i) represents the sold quantity.

This equation describes the relationship between incoming and outgoing inventory transactions. For example, if a medical store initially maintains 120 units of Paracetamol 500 mg, purchases 50 additional units, and sells 100 units, the resulting stock quantity is

$$Q_i^{\text{new}} = 120 + 50 - 100 = 70 \tag{4}$$

Therefore, the available stock becomes 70 units.

The system uses transaction information to maintain inventory records and provide an updated view of stock availability. This process helps administrators monitor medicine movement and maintain organized purchase and sales information.

The formal processing model of the system is shown in Figure 3.

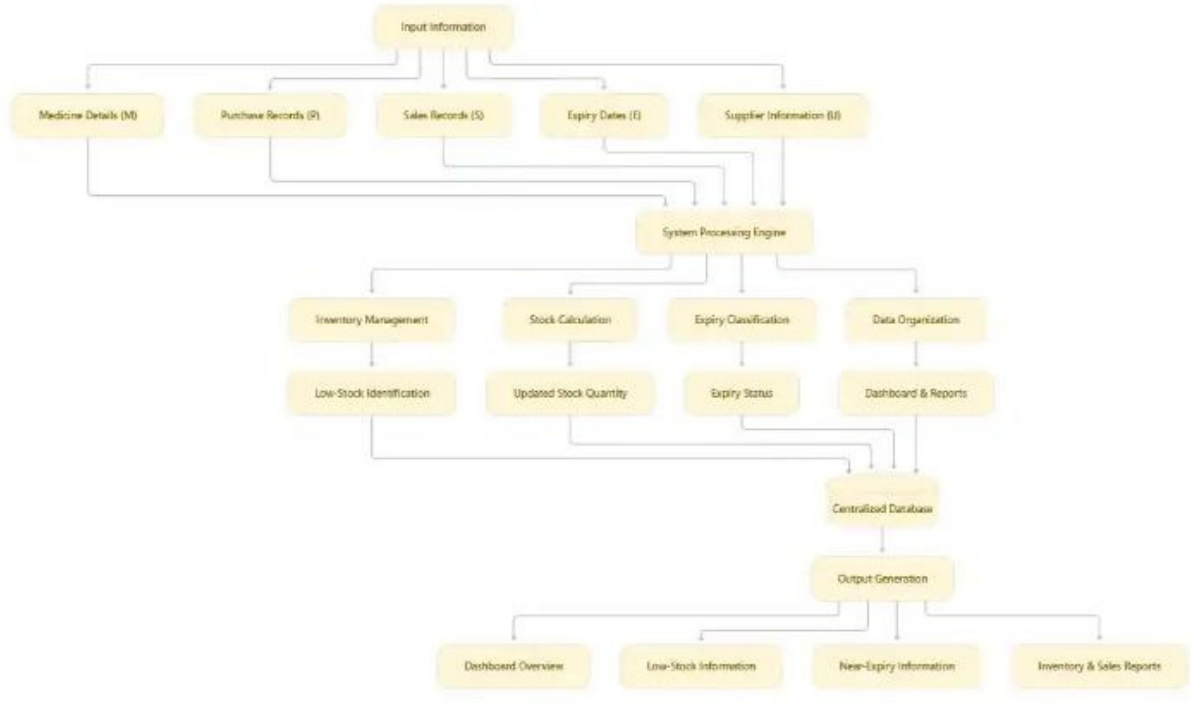


Figure 3. Formal processing model of the proposed Medical Store Inventory Management System.

7.3 Effect of expiration dates on medicine monitoring

Medicine expiration monitoring is an important function of pharmaceutical inventory management. Each medicine record contains an expiration date (E_i), which is compared with the current system date (D) to determine its expiry status.

The remaining validity period can be represented as

$$T_i = E_i - D \tag{5}$$

where (T_i) represents the remaining time before the medicine expires.

Based on the remaining validity period, the system can classify medicine records into three categories:

$$\text{ExpiryStatus}(M_i) = \begin{cases} \text{Expired}, & T_i < 0 \\ \text{NearExpiry}, & 0 \le T_i \le \theta \\ \text{Valid}, & T_i > \theta \end{cases} \tag{6}$$

Here, (θ) represents the predefined near-expiry monitoring period.

This classification helps administrators identify expired medicines and medicines approaching their expiration dates. The expiry tracking module presents the relevant information to support timely inventory review and appropriate action. The monitoring process helps reduce the possibility of overlooking medicines that require attention.

7.4 Generation of dashboard information and inventory reports

After processing medicine records, stock information, purchase transactions, sales transactions, and expiry dates, the system organizes the resulting information for presentation through the administrative dashboard and reporting module.

The dashboard provides a consolidated overview of important inventory indicators. These indicators can be represented as

$$\text{Dashboard} = \left\{ M_{\text{total}},\ Q_{\text{low}},\ E_{\text{near}},\ \text{Sales}_{\text{daily}} \right\} \tag{7}$$

where (M_{total}) represents the total number of registered medicines, (Q_{low}) represents the medicines identified as low-stock items, (E_{near}) represents the medicines approaching their expiration dates, and ($\text{Sales}_{\text{daily}}$) represents the daily sales information.

The reporting module organizes inventory and transaction information to support administrative review. These outputs help users understand medicine availability, monitor inventory conditions, review sales activities, and identify medicines requiring replenishment or expiry-related attention.

The overall processing mechanism integrates the different functional modules through a centralized inventory management platform. By combining structured medicine records, transaction processing, stock monitoring, expiry classification, and dashboard generation, the proposed system provides an organized approach to managing medical store inventory operations.

8 Rule-based algorithm recommendation

Algorithm 1 (Figure 4) summarizes the end-to-end procedure followed by the inventory monitoring module, consistent with the system architecture and development methodology described in Sections 6 and 7. The algorithm processes medicine details, purchase quantities, sales quantities, expiry dates, and minimum stock levels using predefined rules and arithmetic operations. It calculates the updated stock quantity, identifies medicines that require restocking, classifies medicines according to their expiry status, and generates the corresponding inventory information for the dashboard and reports.

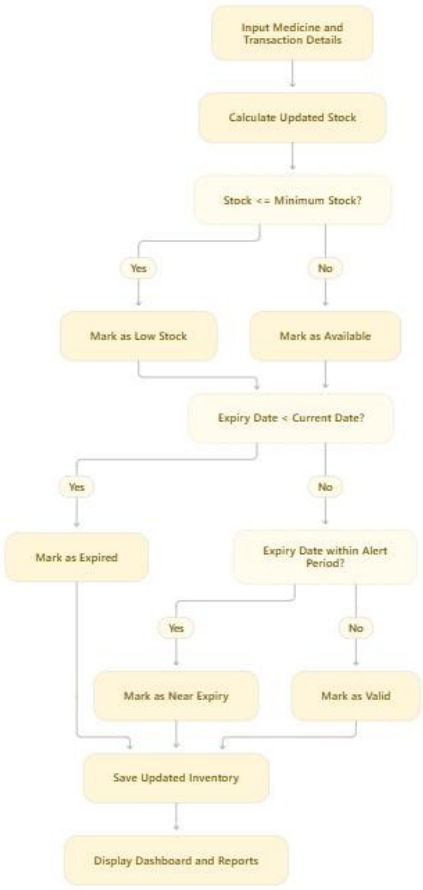


Figure 4. Rule-based inventory monitoring and classification algorithm (Algorithm 1).

Since the operations performed by the algorithm follow predefined conditions and calculations, the same valid input data produces the same output. This deterministic behaviour makes the inventory monitoring process predictable and supports verification through the functional test cases presented in the testing section. It also helps maintain consistency in stock classification and expiry monitoring.

9 Implementation plan

The Medical Store Inventory Management System is implemented using modern web technologies and tools to provide an efficient, reliable, and user-friendly solution for pharmacy inventory operations.

Frontend: The frontend is developed using React.js, HTML, CSS, and JavaScript to provide an interactive and responsive user interface. It includes dedicated modules for the dashboard, medicines, inventory, suppliers, purchases, sales, expiry tracking, and reports. The interface is designed to support both desktop and mobile devices.

Backend: The backend manages application logic, user requests, and communication between the frontend and database. It handles medicine registration, stock updates, supplier management, purchase and sales processing, and inventory monitoring. The backend ensures smooth data flow and accurate transaction processing.

Data Persistence: The database is used to store and manage medicine details, supplier records, stock information, purchase history, sales transactions, and expiry dates. It ensures organized data storage,

easy retrieval, and consistent inventory updates. Database operations help maintain accurate and reliable records.

Inventory Management: The system monitors medicine stock levels and identifies low-stock items and medicines approaching their expiry dates. It provides inventory status information through the dashboard, helping pharmacy administrators make timely decisions and reduce stock-related losses.

Version Control and Deployment: Git and GitHub are used for source code management, version control, and collaborative development. The application is developed and tested in a local development environment using Vite. The deployment process makes the system accessible to users through a web browser.

10 Experimental setup and test cases

Because no deployed application, source code or measured test execution results are yet available, this paper defines representative functional test cases for evaluating the proposed workflow. These cases describe expected outcomes and must be executed against the completed implementation before they can be reported as observed results.

Table 1 lists example input conditions. Quantities and dates are illustrative and should be adapted to the actual system configuration.

Table 1. Representative functional test scenarios.

ID	Scenario	Input condition
T1	Add medicine	Unique medicine code and valid details
T2	Receive stock	Batch B01; quantity 100; valid expiry
T3	Record sale	Sell 12 units from B01 with 100 available
T4	Insufficient stock	Attempt sale of 150 units from B01
T5	Low-stock alert	Total quantity 8; reorder level 10
T6	Expiry warning	Batch expires within configured W days
T7	Expired batch	Expiry date earlier than current date
T8	Duplicate batch	Repeat existing medicine-batch identifier

For T1 and T2, the expected result is successful creation of the medicine and batch records after validation. For T3, the batch balance should decrease from 100 to 88 and the sale should appear in transaction history. For T4, the system should reject the sale and leave the balance unchanged. For T5, a low-stock alert should be visible because $8 \leq 10$. For T6 and T7, the batch should be labelled near-expiry or expired according to the configured date rule. For T8, the system should reject or safely resolve the duplicate according to its unique-key policy. The expected outcomes are summarised in Table 2.

Table 2. Expected outcomes for functional test scenarios.

ID	Expected system behaviour
T1	Medicine appears in searchable master list
T2	Batch quantity and expiry are saved

ID	Expected system behaviour
T3	Quantity becomes 88; sale is recorded
T4	Sale rejected; quantity remains 100
T5	Low-stock status is generated
T6	Near-expiry status is displayed
T7	Expired status is displayed distinctly
T8	Duplicate record is prevented

11 Results and discussion

The proposed design provides a consistent way to represent medicine inventory at both product and batch level. Its key operational benefit is the separation of medicine master information from batch quantities and expiry dates. This makes it possible to display one medicine with several batches and to identify which specific batch requires attention. The purchase and sales workflow also establishes a direct relationship between stock changes and transaction records.

The reorder rule provides a simple signal when stock reaches a configured threshold. This is useful for routine review, but the threshold must be maintained by the store and may not reflect seasonal demand, supplier lead time or sudden changes in consumption. Similarly, expiry warnings depend on correct batch entry and a suitable warning period. Incorrect source data will produce incorrect alerts.

The functional scenarios define how the system should behave for valid transactions, insufficient stock, low stock, near-expiry products and expired batches. Until these tests are executed on the implemented application, no quantitative claim can be made about accuracy, time savings, reduction in wastage or improvement in medicine availability. Such claims would require a controlled evaluation using real operational records and an appropriate baseline.

A practical deployment should also examine usability with store staff. The number of steps needed to receive stock, record a sale and locate a batch can influence whether the system is used consistently. Training, clear labels, reliable backups and a process for correcting data-entry mistakes are therefore important parts of implementation.

12 Advantages

- **Centralised records:** medicine, supplier, batch and transaction details are maintained in one application.
- **Batch visibility:** staff can distinguish multiple batches of the same medicine and review their expiry dates.
- **Stock movement traceability:** purchase and sale entries provide a history of quantity changes.
- **Low-stock awareness:** configurable reorder thresholds highlight medicines requiring review.
- **Expiry monitoring:** near-expiry and expired batches can be identified without manually inspecting every record.
- **Search and reporting:** medicine and batch records can be retrieved using common search fields.
- **Extensible design:** additional functions can be added without changing the basic separation of master data, batches and transactions.

13 Limitations

- Alert quality depends on accurate medicine, batch, quantity and expiry data entered by users.
- Reorder thresholds are manually configured and do not automatically learn demand patterns or supplier lead times.
- The proposed design does not establish compliance with every applicable pharmacy, medicines or data-protection regulation; deployment requires local legal and professional review.
- A prototype using a local database may not support concurrent multi-branch or high-volume operations.
- The system is an inventory aid and does not provide clinical advice, prescription validation or medicine-substitution recommendations.
- Barcode scanning, accounting integration and supplier ordering are not assumed to be implemented in the present scope.
- The expected test outcomes have not been independently measured in a live store.

14 Conclusion

This paper presented the design of a Medical Store Inventory Management System intended to support medicine master management, batch-wise stock tracking, purchase and sales recording, reorder alerts and expiry monitoring. The proposed architecture separates the user interface, application services, validation and inventory logic, alert generation and relational persistence. Its central design choice is to represent batches separately from medicine master records so that stock quantities and expiry dates can be monitored at the level at which they are operationally relevant.

The methodology defines deterministic rules for stock-in, stock-out, low-stock identification and expiry warnings. Transactional updates and a stock-movement history are proposed to improve consistency and traceability. The functional test scenarios provide a basis for checking valid and invalid transactions and verifying that alerts are generated from configured thresholds and dates.

The contribution should be understood as a proposed system design and implementation blueprint, not as a validated claim of improved store performance. The paper does not report measured deployment outcomes because implementation evidence and real-store evaluation data are not yet available. Future implementation and field testing are required to assess usability, data accuracy, operational efficiency and suitability for larger deployments. With these qualifications, the proposed system offers a structured starting point for digitising routine inventory operations in a medical store.

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