

PYTHON PROJECT

INVENTORY MANAGEMENT SYSTEM(IMS)

Submitted as part of the course requirements for

[Python for Computational Problem Solving]

Course Code: UE25CS151A

Submitted By

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1. PROBLEM STATEMENT

Many small shops and businesses still depend on manual methods to manage their inventory, which often leads to errors, misplaced records, and difficulty keeping track of stock levels. Identifying low-stock items, expired products becomes challenging without a proper system. These issues can result in poor decision-making, delays in restocking, and even financial losses.

To overcome these challenges, there is a need for a reliable digital solution that can automate and streamline inventory tasks. Shelpify aims to provide a simple yet effective inventory management system that stores product details, updates stock in real time, tracks sales, and generates important alerts for low stock and expiry dates. By reducing manual effort and improving data accuracy, Shelpify helps businesses operate more efficiently and maintain better control over their inventory.

2. MODEL DESCRIPTION

Shelpify is a smart inventory management platform designed to simplify how businesses track, organize, and manage their stock.

With real-time updates, cloud sync, and intuitive dashboards, it turns chaos into clarity.

From warehouses to retail shelves, Shelpify ensures everything stays in perfect order.

Stay stocked, stay smart – with Shelpify.

3.TECHNICAL APPROACH AND DATA STRUCTURES

The Inventory Management System (IMS) is developed using Python with a modular design to ensure readability, maintainability, and scalability. The system follows a structured approach where the backend logic, user interface, and data handling are separated into different modules.

3.1 Technical Approach

3.1.1. Modular Programming

The project is divided into multiple user-defined Python modules such as:

- **data_model.py** – Handles all data operations
- **add_product_page.py** – UI for adding products
- **remove_product_page.py** – UI for deleting products
- **find_product_page.py** – UI for searching products
- **app.py** – Main application controller

This structure makes the program easier to develop, test, debug, and expand.

3.1.2. Streamlit-Based User Interface

The front-end is created using **Streamlit**, which provides:

- Interactive UI components
- Real-time updates without page refresh
- Clean navigation using tabs/pages

Each operation (add, delete, search) is displayed on separate UI pages for simplicity.

3.1.3 Data Handling Using Pandas

All product information is stored in a **Pandas DataFrame**, which allows:

- Efficient storage of tabular data
- Fast searching, sorting, and filtering
- Easy CSV file reading and writing
- Instant updates to the table when products are added or removed

Pandas ensures high performance even for large inventories.

3.1.4. File Management Using OS Module

The **OS** module is used to:

- Verify if the data file exists
- Create a new file if missing
- Manage file paths for loading and saving product data

This ensures smooth data persistence.

3.1.5. Date Processing Using DateTime Module

The **datetime** module is used to:

- Validate expiry date inputs
- Compare expiry date with today's date
- Identify products expiring soon
- Generate expiry alerts

This enhances the accuracy of stock monitoring.

3.2 Data Structures Used

The Shelpify Inventory Management System uses **three main datasets**, all stored in **CSV format**, to manage inventory, product details, and sales records.

3.2.1. Shelpify Data (Main Inventory Dataset)

File: *Shelpify data.csv*

This dataset acts as the **core inventory table**. It stores detailed information about all products currently in the system.

Contains fields such as:

- customer_id
- transaction_date
- product_name
- quantity
- unit_price
- total_amount

Purpose:

- Used for calculating stock movement
- Tracks product-level purchasing and transaction patterns
- Supports inventory counting, demand analysis, and restock decisions
- Helps to identify which items are frequently sold

This dataset forms the primary reference for understanding overall inventory flow.

3.2.2. Product Data

File: *product data.csv*

This dataset contains **processed, filtered, or intermediate product records**, representing product availability and pricing details.

Contains fields such as:

- Product Name
- Date of Entry
- Entry ID
- Customer ID
- Product ID
- Quantity
- Unit Price
- Total Sale Amount

Purpose:

- Used for displaying product tables inside Streamlit
- Powers sorting (category-wise, price-wise, stock-wise)
- Helps generate filtered lists (low stock, expiring soon, most sold items)
- Acts as a temporary storage layer for processed inventory reports

This dataset efficiently manage product details separate from sales or transaction logs.

3.2.3. Sales Data

File: *Sales data.csv*

This dataset records **all customer sales transactions**. Every time a customer buys a product, a new entry is added here.

Contains fields such as:

- Entry ID
- Customer ID
- Product ID
- Product Name
- Date of Sale
- Quantity Sold
- Unit Price
- Total Sale Amount

Purpose:

- Used for generating sales reports
- Tracks daily, weekly, and monthly revenue
- Helps identify fast-moving and slow-moving items
- Enables calculation of total sales, average bill amount, and frequent customers
- Supports business analytics and decision-making

This dataset allows us to analyze trends and produce summaries of customer purchases.

4. SAMPLE UI OUTPUT

Welcome page

Deploy ⋮



Welcome to Shelpify

Shelpify is your intelligent, all-in-one inventory and sales management system designed to help stores operate with accuracy, speed, and clarity.

What Shelpify Does

Shelpify brings together inventory control, expiry tracking, sales logging, and analytics into one smooth, automated platform. The system updates stock in real time, highlights products that are nearing expiry, tracks transactions, and provides meaningful insights into product performance and revenue trends.

Why Shelpify?

- Reduce waste through expiry alerts
- Maintain accurate stock levels
- Track sales instantly and automatically
- Identify slow-moving and fast-moving products
- Make smarter decisions with visual analytics
- Enjoy a clean, modern dashboard experience

How to Use This Dashboard

Use the tabs above to navigate through Shelpify:

- Recent Updates: Expired & near-expiry alerts
- Inventory Management: Add, remove, and find products
- Inventory Analytics: Stock levels, filters, trends
- Sales: Create transactions and analyze customer behavior
- Auto Discounts: Apply discounts to near-expiry products

✓ Your Store, Smarter.

Shelpify helps you run your inventory the smart way — organized, automated, and always in your control.

Login

Username

Affan Khan

Password

....



Login

Home page

Deploy ⋮



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[Home](#) [Recent Updates](#) [Inventory Management](#) [Inventory Analytics](#) [Sales](#) [Auto Discounts](#) [Settings](#)

>Welcome to Shelpify Dashboard

What is Shelpify?

Shelpify is an intelligent inventory and sales management system designed to help businesses automate stock tracking, sales logging, analytics, and expiry monitoring.

Key Features

- Real-time inventory management
- Automated sales-to-stock updates
- Expiry & near-expiry alerts
- Visual analytics & revenue reports
- Customer transaction tracking
- Fast, clean UI with smart automation

Getting Started

Use the tabs above to access all modules.

Recent Updates

Deploy ⚙️



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🔔 Updates

Expired Products (0)

No expired products.

🟠 Near-Expiry Products (107)

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total_Amount	Manufacture_Date	Expiry_Days	Expiry_Date	Applied_Sales_Total	Expiry_Status
54	4604	Mangoes	Fruit	Veg	38	98	4560	2025-12-02	7	2025-12-09	22	Near Expiry
56	4606	Watermelon	Fruit	Veg	42	100	5040	2025-12-03	7	2025-12-10	20	Near Expiry
57	4607	Pineapple	Fruit	Veg	44	104	5280	2025-12-03	7	2025-12-10	16	Near Expiry
58	4608	Pomegranate	Fruit	Veg	46	106	5520	2025-12-02	7	2025-12-09	14	Near Expiry
60	4610	Tomatoes	Vegetable	Veg	50	185	10000	2025-12-01	7	2025-12-08	15	Near Expiry
61	4611	Potatoes	Vegetable	Veg	52	184	10400	2025-12-01	7	2025-12-08	16	Near Expiry
63	4613	Carrots	Vegetable	Veg	56	187	11200	2025-12-01	7	2025-12-08	13	Near Expiry
64	4614	Broccoli	Vegetable	Veg	58	187	11600	2025-12-01	7	2025-12-08	13	Near Expiry
65	4615	Cauliflower	Vegetable	Veg	60	178	12000	2025-12-03	7	2025-12-10	22	Near Expiry
66	4616	Spinach	Vegetable	Veg	62	186	12400	2025-12-01	7	2025-12-08	14	Near Expiry

Products not sold for N days

Show products not sold for at least (days)

5

- +

Products not sold for \geq 5 days (or never sold): 3

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total_Amount	Manufacture_Date	Expiry_Days	Expiry_Date
195	4701	Blue Prime Hydration	Beverage	Veg	300	60	18000	2025-11-21	180	2026-05-20
196	4702	Prime Hydration	Beverage	Veg	250.5	50	12525	2025-11-28	180	2026-05-27
197	4251	sausage (Large)	Canned/Processed	Non-Veg	150	70	10500	2025-12-07	365	2026-12-07

Inventory Management

Deploy ⋮



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Inventory Actions

[+ Add Product](#)

[Remove Product](#)

[Find Product](#)

Inventory Management - Add Product

+ Add Product

Enter Product Details

Product Name

Manufacture Date

2025/12/08

Category

Product Type (auto-filled but editable)

Veg

Total Quantity

Expiry Days

7

-

+

Unit Price

Product ID will be automatically assigned: 4703

[Save Product](#)

[Back](#)

Inventory Management - Delete Product

Remove Product

Delete by:

- Product ID
- Product Name

Enter Product ID

4252

[Delete Product](#)

⚠ No matching product found to delete. Check the ID or name and try again.

[Back to Inventory](#)

Deploy ⋮

Remove Product

Delete by:

- Product ID
- Product Name

Enter Product ID

4251

[Delete Product](#)

✓ Deleted 1 record(s).

Deleted Record(s)

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total_Amount	Manufacture_Date	Expiry_Days	Expiry_Date
197	4251	sausage (Large)	Canned/Processed	Non-Veg	150	70	10500	2025-12-07	365	2026-12-07

[Back to Inventory](#)

Inventory Management - Find Product

🔍 Find Product

Search by:

- Product ID
- Product Name

Enter Product Name to search

Chicken

Find

Found 16 matching product(s):

Matching Record(s):

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total_Amount	Manufacture_Date	Expiry_Days	Expiry_Date
150	4201	Chicken Breast (Kg)	Meat/Protein	Non-Veg	200.000000	50.000000	10000.000000	2025-12-01	7	2025-12-08
151	4202	Chicken Thighs (Kg)	Meat/Protein	Non-Veg	205.000000	50.000000	10250.000000	2025-12-04	7	2025-12-11
152	4203	Chicken Wings (Kg)	Meat/Protein	Non-Veg	210.000000	50.000000	10500.000000	2025-12-04	7	2025-12-11
153	4204	Whole Chicken	Meat/Protein	Non-Veg	215.000000	50.000000	10750.000000	2025-12-07	7	2025-12-14
154	4205	Chicken Mince	Meat/Protein	Non-Veg	220.000000	50.000000	11000.000000	2025-12-06	7	2025-12-13
166	4219	Chicken Nuggets	Frozen/Processed	Non-Veg	290.000000	50.000000	14500.000000	2025-12-05	7	2025-12-12
167	4220	Chicken Sausages	Frozen/Processed	Non-Veg	295.000000	50.000000	14750.000000	2025-12-04	7	2025-12-11
171	4224	Chicken Salami	Frozen/Processed	Non-Veg	315.000000	50.000000	15750.000000	2025-12-03	7	2025-12-10
173	4226	Chicken Strips	Frozen/Processed	Non-Veg	325.000000	50.000000	16250.000000	2025-12-07	7	2025-12-14
177	4232	Canned Chicken	Canned/Processed	Non-Veg	355.000000	50.000000	17750.000000	2025-12-03	7	2025-12-10

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Inventory Analytics



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Advanced Inventory Analytics

Total Products	Expired	Near Expiry	Understock	Overstock
197	0	107	0	35

Filters

Category

Stock Status

Expiry Status

Min Price Max Price

Filtered Results (197 items)

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total Amount	Manufacture Date	Expiry Days	Expiry Date	Stock Status	Expiry Status
20	5721	Wet Wipes	Personal Care	Inedible	150.000000	90.000000	13500.000000	2025-12-01	548	2027-06-02	Overstock	Good
21	5722	Cotton Rolls	Household/Care	Inedible	155.000000	100.000000	15500.000000	2025-12-05	548	2027-06-06	Normal	Good
22	5723	Garbage Bags	Household/Care	Inedible	160.000000	100.000000	16000.000000	2025-12-01	548	2027-06-02	Normal	Good
23	5724	Aluminum Foil	Household/Care	Inedible	165.000000	100.000000	16500.000000	2025-12-05	548	2027-06-06	Normal	Good
24	5725	Cling Wrap	Household/Care	Inedible	170.000000	100.000000	17000.000000	2025-12-02	548	2027-06-03	Normal	Good
25	5726	Washing Powder	Cleaning	Inedible	175.000000	100.000000	17500.000000	2025-12-05	548	2027-06-06	Overstock	Good
26	5727	Fabric Softener	Cleaning	Inedible	180.000000	100.000000	18000.000000	2025-12-01	548	2027-06-02	Overstock	Good
27	5728	Drain Cleaner	Cleaning	Inedible	185.000000	100.000000	18500.000000	2025-12-03	548	2027-06-04	Overstock	Good
28	5729	Air Freshener	Household/Care	Inedible	190.000000	100.000000	19000.000000	2025-12-03	548	2027-06-04	Normal	Good
29	5730	Mosquito Repellent	Household/Care	Inedible	195.000000	100.000000	19500.000000	2025-12-06	548	2027-06-07	Normal	Good

Sales - Data & Stats

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Sales & Transactions

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Sales Summary & Statistics

Inventory Snapshot (After Sales Applied)

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total_Amount	Manufacture_Date	Expiry_Days	Expiry_Date	Applied_Sales_Total
0	5701	Laundry Detergent	Household/Care	Inedible	50	73	4500	2025-12-04	548	2027-06-05	17
1	5702	Dishwashing Liquid	Cleaning	Inedible	55	76	4950	2025-12-04	548	2027-06-05	14
2	5703	Floor Cleaner	Cleaning	Inedible	60	66	5400	2025-12-01	548	2027-06-02	24
3	5704	Toilet Cleaner	Cleaning	Inedible	65	67	5850	2025-12-06	548	2027-06-07	23
4	5705	Glass Cleaner	Cleaning	Inedible	70	81	6300	2025-12-02	548	2027-06-03	9
5	5706	Surface Disinfectant	Cleaning	Inedible	75	74	6750	2025-12-07	548	2027-06-08	16
6	5707	Handwash Refill	Personal Care	Inedible	80	71	7200	2025-12-05	548	2027-06-06	19

Total Revenue Summary

Total Revenue

₹518,322.00

Veg Revenue

₹174,972.00

Non-Veg Revenue

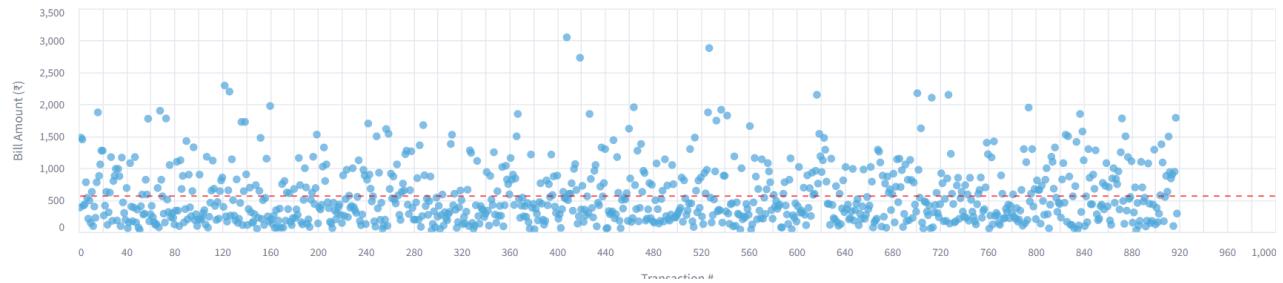
₹214,650.00

Inedible Revenue

₹128,700.00

Customer Bill Scatter (Transaction # vs Bill Amount)

Average Bill Amount → ₹564.62



Total Sales by Date (Date-wise) ↔



Products Not Sold for N Days

Enter days:

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total_Amount	Manufacture_Date	Expiry_Days	Expiry_Date
4	5705	Glass Cleaner	Cleaning	Inedible	70	90	6300	2025-12-02	548	2027-06-03
18	5719	Shower Gel	Personal Care	Inedible	140	90	12600	2025-12-01	548	2027-06-02
26	5727	Fabric Softener	Cleaning	Inedible	180	100	18000	2025-12-01	548	2027-06-02
27	5728	Drain Cleaner	Cleaning	Inedible	185	100	18500	2025-12-03	548	2027-06-04
55	4605	Papaya	Fruit	Veg	40	120	4800	2025-12-06	7	2025-12-13
60	4610	Tomatoes	Vegetable	Veg	50	200	10000	2025-12-01	7	2025-12-08
74	4624	Beetroot	Vegetable	Veg	78	100	7800	2025-12-06	7	2025-12-13
83	4633	Mixed Fruit Juice	Beverage	Veg	96	70	6720	2025-12-01	7	2025-12-08
90	4640	Basmati Rice (5kg)	Grain/Staple	Veg	110	100	11000	2025-12-04	365	2026-12-04
97	4647	Cornflakes	Grain/Staple	Veg	124	100	12400	2025-12-06	7	2025-12-13

Sales - View Transactions

Sales & Transactions

Data & Stats [View Transactions](#) Add Transaction

View Transactions

Filter by Product ID: Filter by Customer ID: Filter by Date: 2025/12/08

Filtered Transactions

	Customer ID	Product ID	Product Name	Date of Sale	Quantity Sold	Unit Price	Total Sale Amount
804	1775	5724	Aluminum Foil	2025-12-08	4	165	660
805	1783	4638	Energy Drink	2025-12-08	3	106	318
806	1790	4622	Cucumber	2025-12-08	3	74	222
807	1792	5733	Engine Oil	2025-12-08	1	210	210
808	1814	4663	Cheese Slices	2025-12-08	1	156	156
809	1822	4228	Cold Cut Platter	2025-12-08	4	335	1340
810	1822	4621	Capsicum	2025-12-08	1	72	72
811	1824	4613	Carrots	2025-12-08	2	56	112
812	1833	4604	Mangoes	2025-12-08	3	38	114
813	1842	4620	French Beans	2025-12-08	4	70	280

Total Revenue for Displayed Transactions: ₹91,888.00

Sales - Add Transaction

Sales & Transactions

Data & Stats [View Transactions](#) [Add Transaction](#)

+ Add New Transaction

Select Product: -- Select --

Customer ID (optional):

Quantity Sold: 1

Unit Price (0 = auto): 0.00

Date of Sale: 2025/12/08

[Create Transaction](#)

Auto Discounts

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Auto Discounts – Expiry-Based Pricing

Near-Expiry Items

	Product ID	Product Name	Category	Type	Unit Price	Total Quantity	Total_Amount	Manufacture_Date	Expiry_Days	Expiry_Date	Days_Left
63	4613	Carrots	Vegetable	Veg	56	200	11200	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
64	4614	Broccoli	Vegetable	Veg	58	200	11600	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
60	4610	Tomatoes	Vegetable	Veg	50	200	10000	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
61	4611	Potatoes	Vegetable	Veg	52	200	10400	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
83	4633	Mixed Fruit Juice	Beverage	Veg	96	70	6720	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
70	4620	French Beans	Vegetable	Veg	70	200	14000	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
69	4619	Green Peas	Vegetable	Veg	68	200	13600	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
66	4616	Spinach	Vegetable	Veg	62	200	12400	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
103	4653	Noodles	Grain/Staple	Veg	136	100	13600	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
104	4654	Bread Loaf	Grain/Staple	Veg	138	100	13800	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
66	4616	Spinach	Vegetable	Veg	62	200	12400	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
103	4653	Noodles	Grain/Staple	Veg	136	100	13600	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
104	4654	Bread Loaf	Grain/Staple	Veg	138	100	13800	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
95	4645	Rava	Grain/Staple	Veg	120	100	12000	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
88	4638	Energy Drink	Beverage	Veg	106	70	7420	2025-12-01 00:00:00	7	2025-12-08 00:00:00	0
		..									

Apply Discount (Category-Wise)

Select Category

-- Select --

Discount %

10

- +

Apply Category Discount

Applied 10% discount to category: Seafood

⋮ ⌂ ⌃

	Product ID	Product Name	Category	Unit Price	Discounted Price
158	4211	Fresh Fish (Rohu)	Seafood	250	225
159	4212	Fresh Prawns	Seafood	255	229.5
160	4213	Salmon Fillet	Seafood	260	234
161	4214	Tuna Steak	Seafood	265	238.5
162	4215	Crab Meat	Seafood	270	243
179	4234	Smoked Salmon	Seafood	365	328.5
192	4248	Fish Roe	Seafood	435	391.5
193	4249	Oyster Pack	Seafood	440	396

Settings

 **Shelpify**

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 **Settings**

User preferences and system controls will appear here.

[Logout](#)

5.CHALLENGES FACED

During the development of Shelpify, several challenges were encountered:

1. Data Storage and Consistency

Managing product data using CSV files required careful handling to avoid duplication, missing entries, or data corruption during read-write operations.

2. Implementing Multiple Pages in Streamlit

Creating separate functional pages (Add Product, Remove Product, Find Product) and ensuring smooth navigation between modules required proper routing and modular structure.

3. Expiry Date and Validation Logic

Handling different date formats and validating expiry dates using the datetime module was initially challenging, especially while calculating “expiring soon” items.

4. Integrating Sorting and Filtering

Sorting items by category, brand, price, stock level, and premium type required efficient use of Pandas functions and DataFrame manipulation.

5. Real-Time Updates in UI

Ensuring that Streamlit refreshed the data immediately after each operation (add/delete/update) needed proper state management.

6. Error Handling

Handling invalid inputs such as negative quantities, incorrect dates, or missing fields required additional validation logic.

6. SCOPE FOR IMPROVEMENT

Several enhancements can further improve its performance and usability in the future:

1. Cloud-Based Data Storage

Integrating cloud databases like Firebase or MySQL would allow real-time synchronization across multiple devices and users.

2. Barcode and QR Code Scanning

Adding barcode/QR code support would make product entry and billing faster and more accurate.

3. Role-Based User Access

Introducing separate roles such as Admin, Staff, and Viewer would enhance security and control within the system.

4. Automated Purchase Order System

Shelpify could automatically generate purchase orders whenever stock levels go below the set threshold.

5. Advanced Analytics Dashboard

fast-moving items, and category-wise performance can help businesses make better decisions.

6. Mobile App Version

Developing an Android/iOS version would make inventory management more accessible for shop owners.

7. Notification and Reminder System

Email/SMS alerts for low stock, expiry warnings, or daily/weekly sales summaries can increase convenience.

8. Returned Products Management

Adding a dedicated module to handle returned products, update stock accordingly, and maintain a clear record of return reasons and refunds.