RetailPulse Docs

None

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1. RetailPulse

A simple, web-based system for billing, inventory, and reports for medical wholesalers.

1.1 The Problem

Medical wholesalers face three main challenges:

1.1.1 1. Manual Bill Generation is Slow

Managers spend too much time writing bills by hand. This leads to wasted hours, mistakes, and lost paper bills.

1.1.2 2. Inventory is Hard to Manage

It's difficult to track stock levels in real-time. This causes expired medicines to go unnoticed, stockouts, and errors in records.

1.1.3 3. No Business Visibility

Owners lack clear information on sales, profits, and trends. They spend hours reviewing paper bills and cannot make data-driven decisions.

1.1.4 Current Workflow (The Hard Way)

Customer arrives → Manager checks stock by hand → Writes bill on paper → Calculates total → Updates inventory book → Files paper bill → Owner reviews bills weekly.

This process is slow, error-prone, and lacks real-time information.

1.2 The Solution – RetailPulse

RetailPulse is a web-based system that automates medical wholesale operations through three parts:

1. **Bill Generation**: Fast digital billing with automatic PDF creation.
2. **Inventory Management**: Real-time stock tracking, including expiry dates and batches.
3. **Analytics**: Real-time business insights and performance reports.

1.2.1 Transformed Workflow

Customer arrives → Manager creates a digital bill (1 min) → System automatically updates inventory → Bill is saved & PDF generated → Owner sees real-time reports.

1.3 Who Uses This System?

Role	Access Level	What they can do
Store Manager	Limited	Create bills, view stock, download PDF bills, search products.
Admin (Owner)	Full	View all bills, manage inventory, access reports, manage users.

2. Functional Documentation

2.1 User Roles

Role	Access	What they can do
Admin	Full	See reports, profits, stock trends, add/change/delete products, view all bills, manage users
Store Manager	Limited	Create bills, view stock, download PDF bills, search products

2.2 System Modules Overview

RetailPulse has three main parts that help medical wholesale businesses.

2.3 Module 1: Bill Generation

2.3.1 Purpose

To help store managers make bills quickly and correctly.

2.3.2 Features

1.1 Product Search and Selection

- Search: Find medicines by name, maker, or type.
- Product Details: See stock, price, and expiry when picking a product.
- Multi-Product: Add many products to one bill.

1.2 Real-time Stock Validation

- Availability: Check if a product is in stock before adding to a bill.
- Quantity: Make sure the amount asked for is not more than what's available.

1.3 Bill Creation Form

- Customer Info: Add customer name, contact.
- Product List: Shows product name, unit price, quantity, and total price.
- Calculations: Shows subtotal, discount, tax, and grand total.

1.4 Bill Numbering and Tracking

- Unique Numbers: Bills get an automatic, unique number.
- Date/Time: Records when the bill was made.
- Created By: Shows which manager made the bill.

1.5 PDF Generation

Bills are made in a professional PDF format with the store logo. Includes store info, item list, and payment summary. You can download the PDF instantly.

1.6 Automatic Inventory Update

- Stock Deduction: Stock amounts are automatically reduced.
- Sales Log: Every sale is recorded for reports.

2.4 Module 2: Inventory Management

2.4.1 Purpose

To give admins full control over products and stock, with alerts for low or expiring items.

2.4.2 Features

2.1 Product Creation

- Basic Info: Add product name, category, manufacturer, and description.
- Pricing: Set cost price, selling price, and see profit margin.

2.2 View Inventory

- List View: See all products in a sortable table with key details.
- Search and Filter: Find products by name, maker, category, or stock status.

2.3 Update Inventor

- Edit Details: Change product prices, reorder levels, or descriptions.
- Stock Adjustments: Manually add or reduce stock, with reasons and a record of who did it.

2.4 Delete Product

- Delete: permanently removed.

2.5 Module 3: Analytics Dashboard

2.5.1 Purpose

To give admins real-time business insights for smart decisions.

2.5.2 Features

3.1 Sales Analytics

- Revenue: Shows total revenue and trends over time.
- Bills: Shows number of bills, average bill value, and peak hours.
- Profit: Shows total profit, profit margin, and trends.

3.2 Product Performance

- Best Sellers: Lists top products by sales, revenue, and profit.
- Slow Movers: Identifies products with low sales.
- Profitability: Shows products with high profit margins or those losing money.

3.3 Inventory Insights

- Stock Summary: Shows total inventory value, unique products, and low/out-of-stock items.
- Categories: Shows stock and sales by category.

3.4 Time Range Filters

- Quick Views: See data for today, this week, this month, or this year.
- Custom Dates: Pick your own start and end dates.

3.5 Visual Dashboards

- Charts: Uses line, bar, and pie charts for easy understanding.
- Interactive: Hover for details, click to see more.

2.6 Module 4: Authentication and Authorization

2.6.1 Purpose

To secure the system and ensure users only access what they are allowed to.

2.6.2 Features

4.1 User Registration

- Admin Only: Only admins can create new user accounts.
- User Details: Admins add name, username, password, and role.

4.2 User Login

- Methods: Log in with username and password.
- Session: Manages user sessions and automatic logouts.

4.3 Role-Based Access Control

- Manager Role: Can create bills, view stock, and see their own bill history.
- Admin Role: Has all manager permissions plus full control over inventory, analytics, and user management.

3. Use Cases

3.1 Primary Use Cases

3.1.1 UC-01: Store Manager Creates a Bill

- **Actor**: Store Manager
- **Goal**: To create a bill for a customer quickly.
- **Flow**:
  a. Manager goes to the "Create Bill" page.
  b. Searches for a product and adds it to the bill.
  c. Enters the quantity.
  d. Repeats for all products.
  e. Enters customer name and contact (optional).
  f. Clicks "Generate Bill".
  g. The system saves the bill, updates the stock, and creates a PDF.
  h. Manager can download the PDF.
- **Alternative**: If the quantity is more than the stock, the system shows an error.

3.1.2 UC-02: Admin Adds New Medicine to Inventory

- **Actor**: Admin
- **Goal**: To add a new product to the system.
- **Flow**:
  a. Admin goes to "Inventory Management" and clicks "Add New Product".
  b. Fills in product details: name, category, cost price, and selling price.
  c. Clicks "Save Product".
  d. The product is now in the inventory and can be sold.
- **Alternative**: If the product name already exists, the system shows an error.

3.1.3 UC-03: Admin Views Sales Analytics

- **Actor**: Admin
- **Goal**: To see how the business is performing.
- **Flow**:
  a. Admin goes to the "Analytics Dashboard".
  b. The system shows key numbers like Total Revenue, Total Profit, and Bills Count.
  c. The system shows charts for sales trends and top-selling products.
  d. Admin can change the time range (e.g., last 30 days) to see different data.

3.1.4 UC-04: Admin Updates Product Stock Manually

- **Actor**: Admin

- **Goal**: To manually change the stock quantity of a product.
- **Flow**:
  a. Admin finds a product in the inventory and clicks "Edit Stock".
  b. Enters the new quantity and a reason for the change (e.g., "New purchase").
  c. Clicks "Save Adjustment".
  d. The system updates the stock quantity and logs the change.
- **Alternative**: The system will not allow the stock to go below 0.

3.1.5 UC-05: Manager Views Their Bill History

- **Actor**: Store Manager
- **Goal**: To see a list of bills they have created.
- **Flow**:
  a. Manager goes to the "My Bills" page.
  b. The system shows a list of their past bills, with date, customer name, and total.
  c. Manager can click on a bill to see full details or download the PDF again.

3.1.6 UC-06: Admin Manages User Accounts

- **Actor**: Admin
- **Goal**: To create or deactivate user accounts.
- **Flow (Create)**:
  a. Admin goes to "User Management" and clicks "Add New User".
  b. Enters the user's name, username, role (Admin or Manager), and a password.
  c. Clicks "Create User". The new user can now log in.
- **Flow (Deactivate)**:
  a. Admin finds a user and clicks "Deactivate".
  b. The user's account is turned off and they can no longer log in.
- **Alternatives**:
  - Usernames must be unique.
  - An admin cannot deactivate their own account or the last remaining admin account.

3.1.7 UC-07: User Logs In

- **Actor**: Admin or Store Manager
- **Goal**: To log into the system.
- **Flow**:
  a. User goes to the login page.
  b. Enters their username and password.
  c. Clicks "Login".
  d. The system logs them in and shows the correct dashboard for their role.

- **Alternatives**:
  - If the username or password is wrong, an error is shown.
  - If the account is deactivated, login fails.

4. Technical Docs

4.1 Tech Stack

Frontend

Technology	Purpose
React + Vite	UI framework
React Router	Page navigation
Material UI	UI components
Recharts	Charts
Axios	API requests

Backend

Technology	Purpose
Python	Programming language
FastAPI	Web framework
SQLAlchemy	Database interaction (ORM)
PostgreSQL	Database
ReportLab	PDF generation
Pytest	Testing
Uvicorn	Web server

DevOps and Deployment

Technology	Purpose
EC2	App Hosting
GitHub Actions	CI/CD (testing & deployment)
AWS	Cloud hosting

4.2 Data Flow Diagrams

4.2.1 1. Bill Creation Flow

This shows the steps for creating a bill.

```
%%{init: {'theme':'base', 'themeVariables': { 'fontSize':'18px', 'fontFamily':'Arial'}}}%%
sequenceDiagram
    actor Manager
    participant UI as Frontend
    participant API as Backend
    participant DB as Database

    Manager->>UI: Fills out bill form
    UI->>API: Sends bill data
    API->>DB: Save bill details
    API->>DB: Update product stock
    API-->>UI: Return success
    UI-->>Manager: Show success message
```

4.2.2 2. User Login Flow

This shows how a user logs in to the system.

```
%%{init: {'theme':'base', 'themeVariables': { 'fontSize':'18px', 'fontFamily':'Arial'}}}%%
sequenceDiagram
    actor User
    participant UI as Frontend
    participant API as Backend
    participant DB as Database

    User->>UI: Enters username and password
    UI->>API: Sends login credentials
    API->>DB: Check username and password
    DB-->>API: Return user data
    alt Login successful
        API-->>UI: Return success with user role
        UI-->>User: Redirect to dashboard
    else Login failed
        API-->>UI: Return error
        UI-->>User: Show error message
    end
```

4.2.3 3. Add New Product Flow

This shows how an Admin adds a new product.

```
%%{init: {'theme':'base', 'themeVariables': { 'fontSize':'18px', 'fontFamily':'Arial'}}}%%
sequenceDiagram
    actor Admin
    participant UI as Frontend
    participant API as Backend
    participant DB as Database

    Admin->>UI: Fills product form
    UI->>API: Sends product data
    API->>DB: Save product
    DB-->>API: Return success
    API-->>UI: Return success
    UI-->>Admin: Show "Product Added" message
```

4.2.4 4. Update Product Stock Flow

This shows how an Admin updates product stock.

```
%%{init: {'theme':'base', 'themeVariables': { 'fontSize':'18px', 'fontFamily':'Arial'}}}%%
sequenceDiagram
    actor Admin
    participant UI as Frontend
    participant API as Backend
    participant DB as Database
```

```
    Admin->>UI: Enters new stock quantity
    UI->>API: Sends product ID and new quantity
    API->>DB: Update stock in inventory table
    DB-->>API: Return success
    API-->>UI: Return success
    UI-->>Admin: Show "Stock Updated" message
```

4.2.5 5. View Reports Flow

This shows how an Admin views sales and inventory reports.

```
%%{init: {'theme':'base', 'themeVariables': { 'fontSize':'18px', 'fontFamily':'Arial'}}}%%
sequenceDiagram
    actor Admin
    participant UI as Frontend
    participant API as Backend
    participant DB as Database

    Admin->>UI: Opens reports page
    UI->>API: Request reports data
    API->>DB: Query bills and inventory
    DB-->>API: Return data
    API-->>UI: Send formatted data
    UI-->>Admin: Display charts and tables
```

4.3 Authentication and Authorization

4.3.1 Authentication Flow

A user enters their username and password on the login page. The system checks if the credentials are correct. If they are, the user is logged in and can access the app. If not, an error message is shown.

```
graph TD
    A[User enters credentials on login page] --> B{Are credentials valid?};
    B -- Yes --> C[Log in user];
    B -- No --> G[Show error message];
    C --> D{Check user role};
    D -- Admin --> E[Redirect to Admin Dashboard];
    D -- Manager --> F[Redirect to Manager Dashboard];
```

4.3.2 Authorization Rules

The system uses Role-Based Access Control (RBAC) to decide who can do what.

Action	Manager	Admin
Create Bills	Yes	Yes
View Own Bills	Yes	Yes
View All Bills	No	Yes
View Analytics	No	Yes
Add/Edit Products	No	Yes
Manage Users	No	Yes

4.4 Schema Design

4.4.1 Database Overview

We use a PostgreSQL database to store all our data. It's reliable and keeps our information safe.

4.4.2 Entity Relationship Diagram

This diagram shows how the different data tables are connected.

```
erDiagram
    USERS ||--o{ BILLS : creates
    PRODUCTS ||--o{ INVENTORY : has
    PRODUCTS ||--o{ BILL_ITEMS : contains
    BILLS ||--|{ BILL_ITEMS : has

    USERS {
        int id PK
        varchar username UK
        varchar password_hash
        varchar role
        varchar full_name
        boolean is_active
    }

    PRODUCTS {
        int id PK
        varchar name UK
        varchar category
        varchar manufacturer
        text description
        decimal cost_price
        decimal selling_price
        boolean is_active
    }

    INVENTORY {
        int id PK
        int product_id FK
        int quantity
    }

    BILLS {
        int id PK
        date bill_date
        varchar bill_number UK
        varchar customer_name
        varchar customer_contact
        decimal total_amount
        decimal discount
        decimal tax_amount
        decimal grand_total
        int created_by FK
        varchar pdf_path
    }

    BILL_ITEMS {
        int id PK
        int bill_id FK
        int product_id FK
        int quantity
        decimal unit_price
        decimal total_price
    }
```

4.4.3 Table Schemas

1. users

This table holds information for user login.

```
CREATE TABLE users (
    id              SERIAL PRIMARY KEY,
    username        VARCHAR(50) UNIQUE NOT NULL,
    password_hash   VARCHAR(255) NOT NULL,
    role            VARCHAR(20) NOT NULL CHECK (role IN ('admin', 'manager')),
    full_name       VARCHAR(100),
```

```
    is_active       BOOLEAN DEFAULT TRUE NOT NULL
);
```

- `username` : The name a user types to log in.
- `password_hash` : The user's password, stored safely.
- `role` : What the user is allowed to do (admin or manager).

---

2. products

This table lists all the products we sell.

```
CREATE TABLE products (
    id              SERIAL PRIMARY KEY,
    name            VARCHAR(200) UNIQUE NOT NULL,
    category        VARCHAR(100),
    manufacturer    VARCHAR(100),
    description     TEXT,
    cost_price      DECIMAL(10,2) NOT NULL,
    selling_price   DECIMAL(10,2) NOT NULL,
    is_active       BOOLEAN DEFAULT TRUE NOT NULL
);
```

- `name` : The product's name.
- `cost_price` : How much we pay for the product.
- `selling_price` : How much we sell the product for.

---

3. inventory

This table tracks the stock level for each product.

```
CREATE TABLE inventory (
    id              SERIAL PRIMARY KEY,
    product_id      INTEGER NOT NULL REFERENCES products(id) ON DELETE RESTRICT,
    quantity        INTEGER NOT NULL DEFAULT 0
);
```

- `product_id` : Links to the product.
- `quantity` : How much stock is currently available.

---

4. bills

This table stores the main details of each customer bill.

```
CREATE TABLE bills (
    id                  SERIAL PRIMARY KEY,
    bill_number         VARCHAR(50) UNIQUE NOT NULL,
    customer_name       VARCHAR(100),
    customer_contact    VARCHAR(20),
    total_amount        DECIMAL(10,2) NOT NULL,
    discount            DECIMAL(10,2) DEFAULT 0,
    tax_amount          DECIMAL(10,2) DEFAULT 0,
    grand_total         DECIMAL(10,2) NOT NULL,
    created_by          INTEGER NOT NULL REFERENCES users(id),
    bill_date           DATE NOT NULL,
    pdf_path            VARCHAR(255)
);
```

- `bill_number` : A unique number for the bill.
- `customer_name` : The customer's name (optional).
- `grand_total` : The final amount the customer pays.
- `created_by` : The user who made this bill.
- `pdf_path` : Location where the PDF bill is stored.

5. bill_items

This table lists each product sold within a bill.

```
CREATE TABLE bill_items (
    id              SERIAL PRIMARY KEY,
    bill_id         INTEGER NOT NULL REFERENCES bills(id) ON DELETE CASCADE,
    product_id      INTEGER NOT NULL REFERENCES products(id),
    quantity        INTEGER NOT NULL,
    unit_price      DECIMAL(10,2) NOT NULL,
    total_price     DECIMAL(10,2) NOT NULL
);
```

- `bill_id` : Links to the bill this item is part of.
- `product_id` : Links to the product that was sold.
- `quantity` : How many units of the product were sold.
- `total_price` : Total price for this line item (quantity × unit_price).

4.5 Architecture

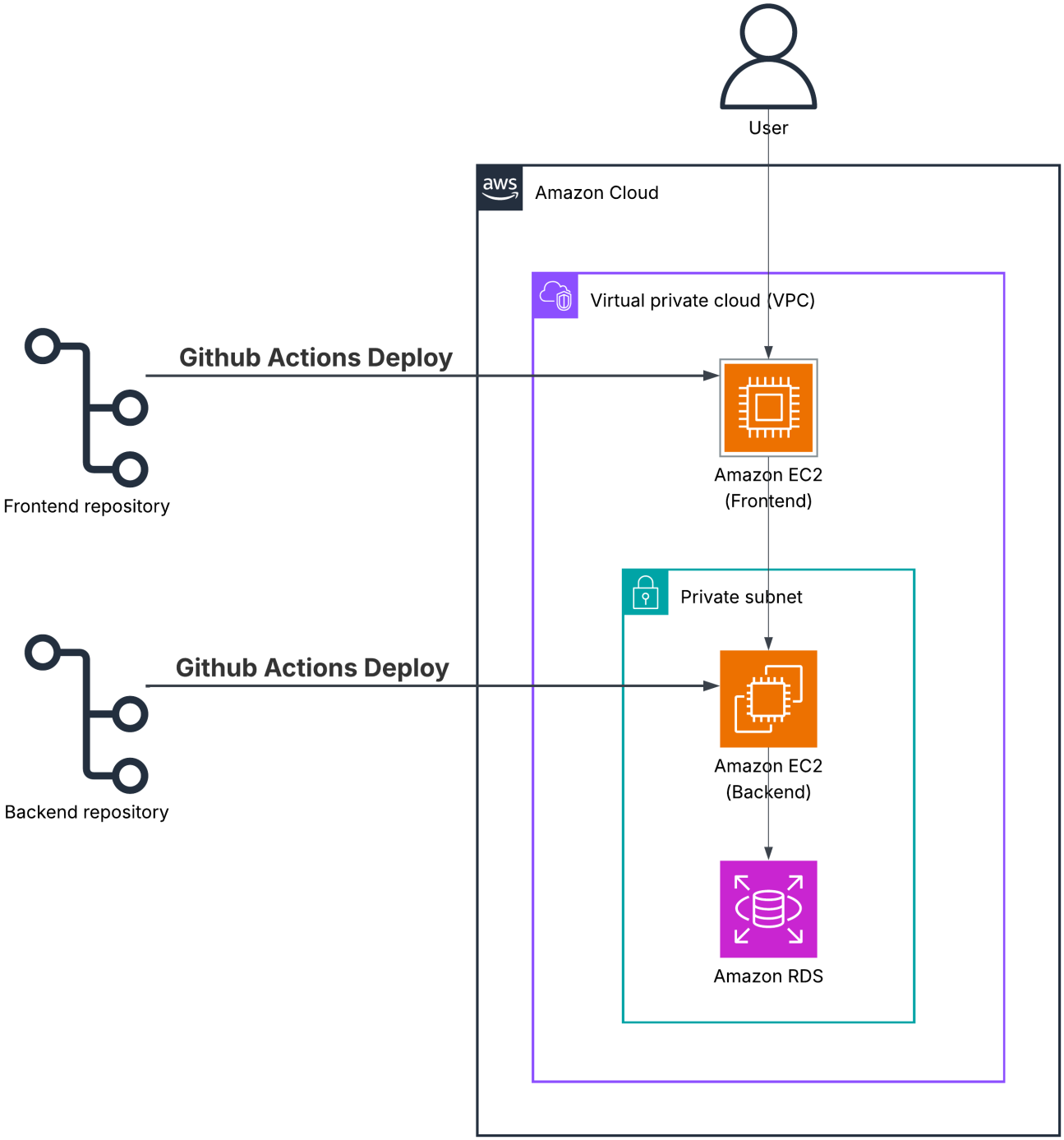
4.5.1 System Architecture Overview

RetailPulse is a standard web application with three layers:

1. **Frontend**: A React application that users see in their web browser.
2. **Backend**: A FastAPI application that contains all the business logic.
3. **Database**: A PostgreSQL database that stores all the data.

4.5.2 AWS-Specific Architecture Diagram

This diagram shows a simplified view of the system hosted on AWS, with the frontend on Vercel.


User
aws
Amazon Cloud
Virtual private cloud (VPC)
Github Actions Deploy
Frontend repository
Amazon EC2
(Frontend)
Private subnet
Github Actions Deploy
Backend repository
Amazon EC2
(Backend)
Amazon RDS

4.6 API Design

The API is designed in a RESTful way. Here are the main endpoints.

Authentication Endpoints

Method	Endpoint	Description
`POST`	`/auth/login`	User login to get an access token.

Bill Endpoints

Method	Endpoint	Description
`POST`	`/bills`	Create a new bill.
`GET`	`/bills`	List bills (Admins see all, Managers see their own).
`GET`	`/bills/:id`	Get details for one bill.

Product Endpoints

Method	Endpoint	Description
`GET`	`/products`	List all products.
`POST`	`/products`	Create a new product (Admin only).
`PATCH`	`/products/:id`	Update a product (Admin only).
`DELETE`	`/products/:id`	Delete a product (Admin only).

Analytics Endpoints

Method	Endpoint	Description
`GET`	`/analytics/dashboard`	Get main dashboard metrics (Admin only).
`GET`	`/analytics/sales`	Get sales report data (Admin only).

User Management Endpoints

Method	Endpoint	Description
`GET`	`/users`	List all users (Admin only).
`POST`	`/users`	Create a new user (Admin only).
`PATCH`	`/users/:id`	Update a user (Admin only).
`DELETE`	`/users/:id`	Deactivate a user (Admin only).

5. Edge Cases and Error Handling

5.1 Overview

This document explains how RetailPulse handles common problems and unexpected situations.

5.2 1. Login and Access Problems

- **Problem**: User tries to log in with no username or password.
  - **Solution**: The system shows a "Username and password are required" message.
- **Problem**: User enters the wrong username or password.
  - **Solution**: The system shows an "Invalid username or password" message.
- **Problem**: A deactivated user tries to log in.
  - **Solution**: The system shows a "Your account has been deactivated" message.
- **Problem**: A manager tries to access an admin-only page.
  - **Solution**: The system shows an "Insufficient permissions" message.

5.3 2. Bill Creation Problems

- **Problem**: User tries to create a bill with no products.
  - **Solution**: The system requires at least one product to be in the bill.
- **Problem**: A product is not found or is inactive.
  - **Solution**: The system shows a "Product not found or inactive" message.
- **Problem**: The quantity requested is more than the available stock.
  - **Solution**: The system shows an error message like "Only 5 units available".
- **Problem**: The quantity is zero or a negative number.
  - **Solution**: The system requires the quantity to be greater than zero.
- **Problem**: The final bill total is zero.
  - **Solution**: The system requires the bill total to be greater than zero.
- **Problem**: The database connection is lost while creating a bill.
  - **Solution**: The entire transaction is cancelled to prevent partial data. The user is asked to try again.

5.4 3. Inventory Management Problems

- **Problem**: Admin tries to create a product with a name that already exists.
  - **Solution**: The system shows a "Product with this name already exists" message.
- **Problem**: Admin tries to create a product with a negative price.
  - **Solution**: The system requires the price to be a positive number.
- **Problem**: Admin tries to delete a product that has been sold in past bills.
  - **Solution**: The system prevents deletion to keep historical sales data intact.

- **Problem**: Admin tries to adjust stock to a negative quantity.
  - **Solution**: The system shows a "Stock cannot be negative" message.
- **Problem**: Admin adjusts stock without giving a reason.
  - **Solution**: The system requires a reason for all stock adjustments to maintain a clear history.

5.5 4. Analytics Problems

- **Problem**: There is no sales data for the selected date range.
  - **Solution**: The system shows a "No data available for this time period" message.
- **Problem**: The start date is after the end date in a custom date range.
  - **Solution**: The system shows a "Start date must be before end date" message.

5.6 5. User Management Problems

- **Problem**: Admin tries to create a user with a username that already exists.
  - **Solution**: The system shows a "Username already exists" message.
- **Problem**: Admin tries to deactivate their own account.
  - **Solution**: The system prevents this to ensure there's always an active admin.
- **Problem**: Admin tries to deactivate the last remaining admin account.
  - **Solution**: The system prevents this and asks the admin to promote another user first.

6. Future Functional Enhancements

1. Track product expiry dates and show alerts for items expiring soon (30/60/90 days)
2. Support multiple batches per product with batch number, manufacturing date, expiry date, and quantity tracking
3. Quick product search and billing using barcode scanner
4. Send bill PDFs directly to customer's WhatsApp
5. Store customer contact details and view their purchase history
6. Track credit sales and outstanding payments
7. Manage multiple store locations from one system
8. Maintain supplier details and track purchase orders
9. Automatic notifications when products fall below minimum stock level
10. Send bills and reminders via email