**Final Year Project Report**

**QuickStock**

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**Dedication**

I would like to dedicate this project to my teacher, Sir Noaman Saleem, who has been my constant source of support and guidance throughout this journey. His encouragement and valuable feedback helped us stay motivated during challenging times. His insight and expertise were instrumental in shaping this project.

I also dedicate this work to my parents, for their endless love, sacrifices and belief in me. They have supported me unconditionally in all my pursuits. This achievement would not have been possible without their encouragement.

Finally, I dedicate this project to my teammates - Faseeh, Usaid, Hashim, and Munib. It was a pleasure working together and learning from each other over the past few months. Their dedication and problem-solving skills contributed greatly towards completing this project.

## 

**Final Approval**

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**Acknowledgment**

First, I want to say thanks to my teacher Sir Noaman Saleem. He helped me a lot with this project. Whenever I had questions, he took time to explain things to me clearly until I understood. His knowledge and patience was very important for finishing this.

I also want to thank Dr. Jameel Ahmed for helping out too.

I want to thank my family and friends for supporting me during this project. Doing this project took a lot of my time, but they encouraged me to keep working hard. My friends checked on me and reminded me that I could do it when I thought it was impossible on our own.

Finally, I want to thank everyone who helped me. I learned a lot from doing this project. Sir Noaman and Dr. Jameel taught me many new skills as a computer science student. And my family and friends gave me strength and happiness during difficult times. Thank you all very much for your support and help.

**Project Title:** QuickStock

**Objective** To Simplify POS systems

**Undertaken by** Amaan Majeed

Faseeh Ud Din

Muhammad Usaid Afzal

Muhammad Hashim Khurshid

Munib Ahsan Khan

**Supervised by** Sir Noaman Saleem

**Starting Date** 03-10-23

**Completion Date** On Going

**Tools Used** Html, CSS, JavaScript, Python

**Operating System** Windows

**Plagiarism ReportAbstract**

Cloud POS and Inventory System with Smart Stock Predictions

It is difficult for small shops to keep the right number of products because sales change often and they don't have many computers. This project will create a system to help with that using the cloud. The system will learn from past sales records and predict how much of each item the shop needs next. Then it can automatically order the right amounts.

With reports and charts online, shop owners can manage inventory and sales from any device like phone or tablet. They don't need special computers. This makes work easier for small shops. By using previous sales data and modern cloud technology, the system aims to help small stores pick the correct inventory levels to make more profit. Everything is accessible anytime from anywhere on the cloud.

Revision Chart

| **Version** | **Primary Author(s)** | **Description of Version** | **Date Completed** |
| --- | --- | --- | --- |
| Draft | Amaan, Munib, Usaid | Initial draft created | 20-12-23 |
| Initial Version | Amaan | Initial version created with the initial details | 23-12-23 |
| Mid-semester Report v1 | Amaan, Munib | Second draft incorporating initial review comments, distributed for final review | 25-12-23 |
| Final | TBD | First complete draft, which is placed under change control | TBD |
| Revision 1 | TBD | Revised draft, revised according to the change control process and maintained under change control | TBD |
| Revision 2 | TBD | Revised draft, revised according to the change control process and maintained under change control | TBD |
| Etc. | TBD | TBD | TBD |

Table : Revision Chart

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## Definitions and Acronyms

|  |  |
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| **Acronym** | **Definition** |
| UMT | University of Management and Technology |
| POS | Point of Sale |
| ML | Machine Learning |
| API | Application Programming Interface |
| ERD | Entity Relationship Diagram |
| UML | Unified Modeling Language |
| MVP | Minimum Viable Product |
| UI | User Interface |
| KYC | Know Your Customer |
| UC | Use Case |

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# Introduction

## Motivations

This project aims to simplify inventory management and optimize profits for small to medium businesses through an integrated cloud-based point-of-sale (POS) and accounting system. By analyzing past sales data, our machine learning-powered solution will recommend stock levels to avoid stock-outs or excess stock. Being cloud-based provides flexibility for owners to access their business data anywhere, anytime. Automating routine tasks through an all-in-one platform helps small shops streamline operations and focus on growth.

## Project Overview

Managing inventory manually is time-consuming and error-prone for small to medium retail shops. They often struggle with stock outs, excess stocks and tracking customer credit purchases. Cloud based systems allow the data to be backed up in case of an outage, and helps streamline the project, optimize profits and simplify operations, helping in the process of growth and franchising.

## Problem Statement

Managing inventory is one of the biggest challenges for small retail shops. They often struggle to maintain optimal stock levels as manual tracking of stocks and sales is tedious and prone to errors. This leads to issues like stock-outs of popular items or maintaining excess stock of slow-moving products. These operational inefficiencies consume valuable time and resources of shop owners. With limited capital, small businesses cannot afford losses due to poor inventory management. There is a need for an integrated solution that automates inventory management, simplified record-keeping, and helps optimize stock levels based on sales patterns to maximize profits. This project aims to develop a cloud-based point-of-sale and inventory management system with machine learning to address these issues faced by local small retail shops, and help them grow.

## Objectives

1. Develop a cloud-based inventory management and point-of-sale system to automate core operations for small retail shops.
2. Implement machine learning algorithms to analyze historical sales data and recommend stocking levels to maximize profits and maintain minimum excess inventory.
3. Integrate inventory, sales, accounting and customer credit features into a single platform for ease of use.
4. Generate automated re-ordering of products based on recommended stock levels as sales occur to maintain optimal inventory levels.
5. Provide sales analysis reports and insights to help shop owners identify top-selling items, customize stocks, and maximize profits.
6. Develop a user-friendly dashboard interface for shop owners to access business data and manage day-to-day operations from any device with internet connectivity.
7. Conduct user evaluations to test the usability and effectiveness of the system in improving operational efficiency for small retailers.
8. Deploy a minimum viable product and obtain feedback from real shop owners to refine and enhance the system.

# Domain Analysis

## Customer

The main customers for this POS and inventory system will be small shops. Things like grocery stores, provision stores, hardware stores and food shops will use it. These kinds of stores usually don't have a lot of money to spend on computers. But they need to keep track of lots of different products every day.

The things they sell can change a lot each week or month. Sometimes they have too many things left unsold. Other times some things run out fast. This system will help with that. It will learn from past sales and tell them what to order next.

Many small shops are in villages or small towns. They serve customers who come to the shop every day. Some people want things delivered or want to pay later. This system will help with those things too like keeping a record of credit customers.

By using this cloud-based system, small shops can get technology tools usually for big stores. It will make their work easier like managing stock, keeping records and accepting payments. This will help the small shops a lot with the difficult parts of running a store.

## Stakeholders

|  |  |
| --- | --- |
| **Stakeholder** | **Role in System** |
| Customers/users | The businesses and employees using the POS system to process transactions and manage their operations. Their needs and experience are top priority*.* |
| Vendors/merchants | Businesses selling goods/services that will be processed through the POS system. They need it to efficiently ring up sales and manage inventory. |
| Developers | The technical team building and maintaining the POS software. They need clear requirements and feedback to develop an effective product*.* |
| Sales/account managers | The team responsible for selling the POS system to new clients and supporting existing clients. They rely on the software meeting client needs. |
| Payment processors | Firms enabling payment processing through the POS like credit cards. Interfaces must meet their standards. |

Table : Stakeholders

## Affected Groups with social or economic impact

* **Small Businesses/Merchants** - POS systems profoundly impact how they operate, engage customers, and track sales/inventory. Failed systems could seriously harm livelihoods.
* **Employees** - Workers rely on POS systems to efficiently do their jobs like ringing up sales. Downtime shifts work burden or causes loss in sales/productivity.
* **Customers** - Outages or issues impact the shopping experience and ability to purchase items in a convenient manner. Repeat customers may seek alternatives.

## Dependencies/ External Systems

* StableWi-Fi Connection
* Hardware capable of running a low-level Machine Learning Model

## Reference Documents

### Related Projects

In order to develop QuickStock, we looked up several different projects with similar working. Their details are given below

1. [*Intelligent Inventory Management System Using Machine Learning*](https://github.com/intel/intelligent-inventory-management-system)

The Intelligent Inventory Management System project on GitHub is an open-source project that provides a comprehensive solution for inventory management using machine learning.

1. [*Cloud-Based POS System with Facial Recognition*](https://www.youtube.com/watch?v=123456789)

The Cloud-Based POS System with Facial Recognition demo showcases a working prototype of a POS system that utilizes facial recognition technology for fraud prevention.

1. [*Machine Learning-Powered POS System for Small Businesses*](https://www.example.com/products/pos-system)

The Machine Learning-Powered POS System for Small Businesses product page provides an overview of a commercial POS system that leverages machine learning to improve inventory management and sales forecasting.

1. [*Machine Learning-Powered POS System for Retail Stores*](https://github.com/retail-ai/machine-learning-pos-system)

The Machine Learning-Powered POS System for Retail Stores project on GitHub is an open-source project that provides a comprehensive solution for retail POS systems using machine learning.

### Feature Comparison

| Features | QuickStock | Vyapar | Quickbooks |
| --- | --- | --- | --- |
| POS Accounting Software | ✔ | ✔ | ✔ |
| Data Backup | ✔ | ✔ | ✔ |
| Cloud Storage | ✔ | X | X |
| Stock Prediction | ✔ | X | X |
| Sales Report | ✔ | X | X |
| Sales Graph | ✔ | X | X |
| Credit System | ✔ | X | X |

Table : Feature Comparison

# Requirements analysis

## Requirements

* + 1. **Functional Requirement**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RID | Description | Category | Attribute | Details & Boundary Constraints |
| FR1 | User authentication | Functional Requirement | Login functionality | Username and passwords must be validated. |
| FR2 | Inventory management | Functional Requirement | Adding, editing, removing inventory items | Only authorized users can manage inventory. Validate item details. |
| FR3 | POS transactions | Functional Requirement | Processing sales transactions | Calculate totals, update inventory, support different payment modes. |
| FR4 | Customer management | Functional Requirement | Viewing customer details, loyalty programs | Implement appropriate data security and privacy practices. |
| FR5 | Sales reporting | Functional Requirement | Generating sales reports | Reports should be exportable in common formats with graphical representations. |
| FR6 | Stock prediction | Functional Requirement | Machine learning model | Model should analyze past sales data to predict inventory needs with defined accuracy. |
| FR7 | Reorder notifications | Functional Requirement | Alerts for low inventory levels | Send timely alerts to both the app and registered emails/notifications. |
| FR8 | Multi-location access | Functional Requirement | Managed multiple storefronts | A central dashboard view with access controls for location-specific features. |
| FR9 | Supplier portal | Functional Requirement | Placing replenishment orders | Interface for suppliers to view demand patterns and place confirmed orders. |
| FR10 | Backup and restore | Non-Functional Requirement | Data backup | Capable of backing up and restoring database, configuration and settings. |

Table : Functional Requirement

* + 1. **Non-Functional Requirements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RID | Description | Category | Attribute | Details & Boundary Constraints |
| NFR1 | Performance | Non-Functional Requirement | Response Time | Homepage loads in under 3 seconds on mobile/desktop |
| NFR2 | Scalability | Non-Functional Requirement | Concurrent Users | Support up to 100 concurrent users during peak hours |
| NFR3 | Reliability | Non-Functional Requirement | System Uptime | Uptime of at least 99% and no data loss during crashes |
| NFR4 | Security | Non-Functional Requirement | Data Protection | Encrypt sensitive data and support multifactor authentication |
| NFR5 | Usability | Non-Functional Requirement | User Interface Design | Responsive web design, user-friendly UI, ARIA compliant |
| NFR6 | Compatibility | Non-Functional Requirement | Browser Support | Compatible with latest two versions of major browsers |
| NFR7 | Maintainability | Non-Functional Requirement | Modularity | Independent and pluggable modules for easy upgrades |
| NFR8 | Portability | Non-Functional Requirement | Platform Support | Support running on all major mobile and desktop platforms |
| NFR9 | Regulations | Non-Functional Requirement | Compliance | Adhere to privacy, security and accessibility standards |
| NFR10 | Documentation | Non-Functional Requirement | Documentation | Detailed design, and code documentation |

Table : Non-Functional Requirements

## List of Actors

1. **Cashier:** this person performs all the financial activities
2. **Account Manager:** this person supervises all financial activities
3. **Customer:** Main end user that buys items from the store
4. **Store Owner:** Manages one or multiple store locations and uses POS for reporting, monitoring, replenishment etc.
5. **Supplier:** Provides inventory to stores and accesses POS data for demand planning and logistics.
6. **Machine Learning Model:** Not a true actor but plays a role in automated processes like stock predictions and recommendations.

## List of use cases

1. **Buy Item:** let users buy items from he pos software
2. **Log In:** allow user to provide account information and access the restricted services
3. **Stock Prediction:** ML model analyzes past sales data to determine optimum stock levels for maximizing sales while minimizing excess inventory.
4. **Product Recommendations:** System recommends additional products to customers during purchases based on their purchase history and preference patterns.
5. **Accounting Integration:** Inventory, sales and financial data seamlessly syncs with accounting software in real-time to eliminate redundant data entry and provide integrated insights.
6. **Supplier Management:** Authorized suppliers can access inventory data to better plan production and timely deliveries based on real demand patterns.
7. **Inventory Counting:** Digital stock records automatically facilitate accurate cycle counting with minimal manual effort.
8. **Sales Reporting:** Detailed reports provide actionable intelligence on best-sellers, trends etc. to optimize merchandising decisions.
9. **Multi-Location Monitoring:** Cloud-based accessibility allows remote operation and insights across multiple storefront locations.
10. **Alerts for Low Stock:** ML predictions notify owners in advance of low inventory levels to timely replenish and avoid stock-outs.

## System use case diagram



Figure : System use case diagram

## Extended use cases

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-001 | | | |
| **Use Case Name:** | User Login | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner, Cashier | | |
| **Description:** | | This use case allows store owners to login to the POS system. | | |
| **Trigger:** | | User clicks on the login button on the home page. | | |
| **Preconditions:** | | 1. User has a valid user account. 2. User account is not locked or deactivated. | | |
| **Post conditions:** | | 1. Users are navigated to their default dashboard. 2. Session is established for the user. | | |
| **Normal Flow:** | | 1. User Clicks on the login button. 2. System displays a login form. 3. User enters username/email and password. 4. User clicks the submit button. 5. System authenticates credentials. 6. If valid, the user is logged in and redirected to the dashboard. | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. Invalid credentials:   1. Error Displayed 2. User retries login 3. Resumes at step 3 4. Account locked 5. Email sent to unlock the account   1b. Authentication fails:   1. Error Displayed 2. Flow returns to step 2 | | |
| **Exceptions:** | | 1. Empty Fields:   1. Validation Error 2. Returns to step 2   2. Account Locked:   1. Message to contact admin 2. User unable to login. 3. Email sent to unlock the account | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | Each access by a registered user. | | |
| **Special Requirements:** | | 1. Internet Availability 2. Personal System | | |
| **Assumptions:** | | Internet Connection | | |
| **Notes and Issues:** | | None | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-002 | | | |
| **Use Case Name:** | Buy Item | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Cashier, Customer | | |
| **Description:** | | This use case allows a cashier to sell an item to a customer. | | |
| **Trigger:** | | Cashier clicks on the “Add Item” buttons or scans the barcode of the item. | | |
| **Preconditions:** | | 1. Cashier is logged in. 2. Item details are available in the database. | | |
| **Post conditions:** | | 1. Item/s are added to the customer's order. 2. Inventory quantity is updated. | | |
| **Normal Flow:** | | 1. Cashier scans the item. 2. Cashier specifies the quantity. 3. System adds to order. 4. Cashier can add more items or proceed to payment. | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. Out of Stock Item:   1. Message displayed 2. Cashier checks alternative options 3. Message sent to the backend   1b. Invalid Barcode/Scanned Incorrectly:   1. Warning message 2. Cashier manually inputs item | | |
| **Exceptions:** | | 1. Empty Quantity:   1. Validation prompt 2. Cashier Specifies Quantity   2. Database Error:   1. Error Message 2. Cashier retries transaction | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | Item sold to a customer. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-003 | | | |
| **Use Case Name:** | Stock Prediction | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner | | |
| **Description:** | | This use case analyzes historical sales data and predicts future demand for inventory planning. | | |
| **Trigger:** | | The system automatically runs the machine learning model on a preset basis (eg. daily/weekly). | | |
| **Preconditions:** | | 1. Historical sales data is available 2. ML model is ready to be trained | | |
| **Post conditions:** | | 1. Predicted inventory needs are generated for the upcoming period | | |
| **Normal Flow:** | | 1. System accesses sales transaction database 2. ML model analyzes historical sales pattern 3. Model uses algorithm to predict future demand 4. Predictions are stored in system | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1. Insufficient data:   1. Notification sent to the owner 2. Owner provides additional inputs   2. Model Requires Training:   1. System prompts retraining 2. New model deployed after validation | | |
| **Exceptions:** | | 1. Data Error:   1. Logs error 2. Retry with cleaned data   2. Prediction Deviations   1. Alerts sent for manual review | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | As per configured periodic schedule | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | 1. Machine Learning Compatible System | | |
| **Notes and Issues:** | | None | | |

## 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-004 | | | |
| **Use Case Name:** | Product Recommendations | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner, Cashier | | |
| **Description:** | | This use case allows the system to generate product recommendations for customers during checkout. | | |
| **Trigger:** | | Customer initiates payment for current order. | | |
| **Preconditions:** | | 1. Customer's purchase history data is available 2. ML model is trained for recommendations | | |
| **Post conditions:** | | 1. Recommended additional products are displayed to customer | | |
| **Normal Flow:** | | 1. System retrieves customer's order details 2. ML model analyzes purchase patterns 3. Related and complementary products are identified 4. Recommendations are displayed to customer 5. Customer can optionally add products to order | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1. Insufficient data:   1. Generic popular products showed | | |
| **Exceptions:** | | 1. System/model error:   1. Standard backups are displayed   2. Network failure:   1. Recommendations not showed | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | During each checkout process. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

## 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-005 | | | |
| **Use Case Name:** | Accounting Integration | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner | | |
| **Description:** | | This use case allows transactional data to be synced between the POS system and accounting software. | | |
| **Trigger:** | | The sync is automatically triggered on a periodic basis (e.g. daily). | | |
| **Preconditions:** | | 1. POS system and accounting software are configured for integration 2. Credentials are provided to access accounting APIs | | |
| **Post conditions:** | | 1. Transactions are updated in both systems | | |
| **Normal Flow:** | | 1. POS system collects transactions since last sync 2. APIs are used to connect to accounting software 3. Transactional data is mapped and synced in both directions 4. Sync status is stored in audit logs | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. API or network error:   1. Error logged 2. Manual sync initiated | | |
| **Exceptions:** | | 1. Validation error:   1. Errors logged 2. Problem transactions skipped   2. Software incompatibility:   1. Alert sent to developer | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | Based on integrated apps configuration schedules. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

## 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-006 | | | |
| **Use Case Name:** | Supplier Management | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner | | |
| **Description:** | | This use case allows store owners to manage supplier profiles, place orders, and track order status. | | |
| **Trigger:** | | Store owner selects the "Suppliers" menu option. | | |
| **Preconditions:** | | 1. At least one supplier profile is created | | |
| **Post conditions:** | | 1. Supplier/order details are updated as per actions | | |
| **Normal Flow:** | | 1. Store owner views existing supplier list 2. Owner can add/edit supplier profiles 3. Owner raises purchase requisitions against suppliers 4. Supplier can update order statuses 5. Owner tracks orders to receipt of goods | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. Invalid data:   1. Field level validation 2. Data is corrected | | |
| **Exceptions:** | | 1a. Validation error:   1. Changes rolled back 2. Errors logged   2a. Software incompatibility:   1. Offline actions synced later | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | Whenever supplier/order management is needed. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

## 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-007 | | | |
| **Use Case Name:** | Inventory Counting | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner, Cashier | | |
| **Description:** | | This use case allows users to physically count inventory stock and reconcile it with the system records. | | |
| **Trigger:** | | Store owner/cashier initiates the inventory counting process. | | |
| **Preconditions:** | | 1. Necessary supplies/tools for counting are available 2. System is ready to receive count updates | | |
| **Post conditions:** | | 1. Physical count details are updated in the system 2. Inventory stock balances are reconciled | | |
| **Normal Flow:** | | 1. Items are selected for counting 2. Physical count is taken 3. Count details are entered in system 4. Variances are identified and adjustments made 5. Counts are submitted for approval | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. Variances found:   1. Reasons analyzed 2. Corrective actions taken | | |
| **Exceptions:** | | 1a. Data entry error:   1. Error corrected 2. Re-count as needed   2a. System error:   1. Counts saved offline 2. Synced after issue resolved | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | As per predefined inventory cycle/schedule. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

## 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-008 | | | |
| **Use Case Name:** | Sales Reporting | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner | | |
| **Description:** | | This use case allows users to generate various sales reports from transactional data. | | |
| **Trigger:** | | User selects "Reports" and chooses a report type. | | |
| **Preconditions:** | | 1. Sufficient transaction history is available 2. User has login credentials | | |
| **Post conditions:** | | 1. Selected report is generated and displayed | | |
| **Normal Flow:** | | 1. User selects the report type - daily/weekly/monthly etc. 2. Selection filters for date range, items etc are applied 3. System fetches relevant transactions 4. Report is generated in predefined template 5. User can view, email or export report | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. No transactions found:   1. Inform user 2. Allow broader filters | | |
| **Exceptions:** | | 1a. Data entry error:   1. System logs error 2. Inform user   2a. Network failure:   1. Reports cached for later access | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | As and when analysis of sales is required. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

## 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-009 | | | |
| **Use Case Name:** | Multi-Location Monitoring | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Manager | | |
| **Description:** | | This use case allows store managers to monitor operations across multiple branch locations from a centralized system. | | |
| **Trigger:** | | Manager logs into the central system and selects the location dashboard. | | |
| **Preconditions:** | | 1. POS systems deployed across all locations 2. Locations configured in central system | | |
| **Post conditions:** | | 1. Operation metrics and KPIs are visible for each location | | |
| **Normal Flow:** | | 1. Manager selects location from list 2. Key metrics for sales, inventory, staff etc are displayed 3. Drill down into transaction details is available 4. Alerts for exceptions are visible 5. Manager can action on issues remotely | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. Location offline:   1. Delayed metrics synced 2. Manager notified | | |
| **Exceptions:** | | 1a. System/connectivity error:   1. Error handled 2. Metrics cached | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | As required to monitor operations performance. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

## 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Use Case ID:** | UC-010 | | | |
| **Use Case Name:** | Alerts for Low Stock | | | |
| **Created By:** | Munib Ahsan Khan | | **Last Updated By:** | Amaan Majeed |
| **Date Created:** | 27/12/2023 | | **Last Revision Date:** | 30/12/2023 |
| **Actors:** | | Store Owner, Cashier | | |
| **Description:** | | This use case allows the system to monitor inventory levels and generate alerts when stock of an item goes below predefined thresholds. | | |
| **Trigger:** | | Inventory quantity is updated after a sale. | | |
| **Preconditions:** | | 1. Inventory thresholds are configured per item 2. System has real-time inventory data | | |
| **Post conditions:** | | 1. Alert notifications are sent as per configured rules | | |
| **Normal Flow:** | | 1. Sale reduces stock of an item 2. System checks stock against thresholds 3. If below, alert is triggered 4. Alert notification is sent to concerned users 5. Users can take timely replenishment action | | |
| **Alternative Flows:**  **[Alternative Flow 1 – Not in Network]** | | 1a. Threshold breach after hours:   1. Notification next business day | | |
| **Exceptions:** | | 1a. Data error:   1. Alert generated manually | | |
| **Includes:** | | None | | |
| **Frequency of Use:** | | Real-time after each inventory update. | | |
| **Special Requirements:** | | None | | |
| **Assumptions:** | | None | | |
| **Notes and Issues:** | | None | | |

## User interfaces (mock screens)

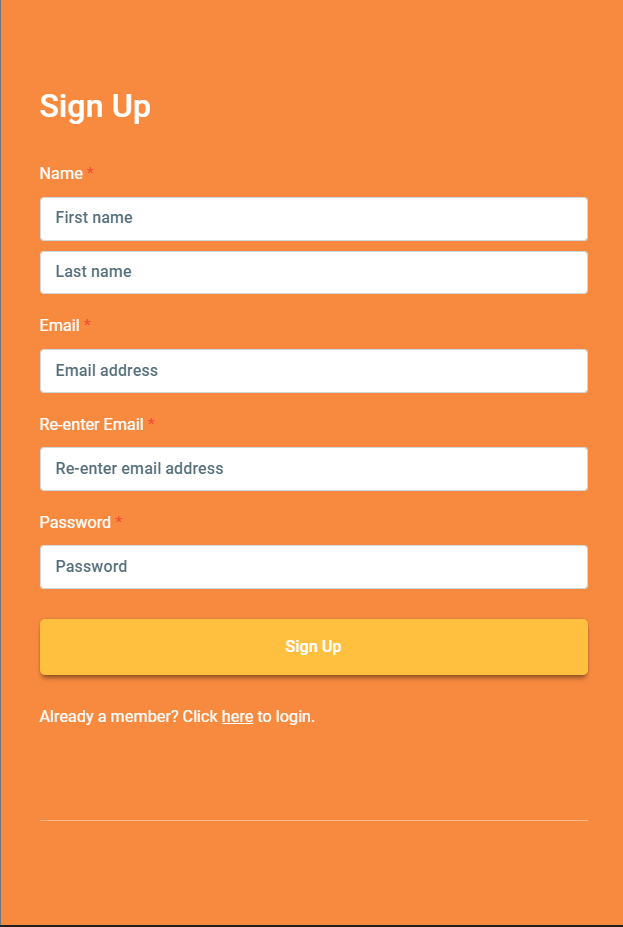
****

Figure : User Interface

**P1: Register New User**:

**User Interface:**

* **Name:** The user's full name to register for the system
* **Email:** The user's email address to register for the system
* **Password:** The user's password to register for the system
* **Sign Up:** Submits the form and creates a new account for the user.

**Functionality:**

* The sign up form allows users to create a new account on the website.
* Users must provide their name, email address, and password in order to create an account.
* Once the user clicks the "Sign Up" button, the form data is submitted to the server.
* The server validates the form data and creates a new account for the user.
* The user is then redirected to the home page or another designated page.

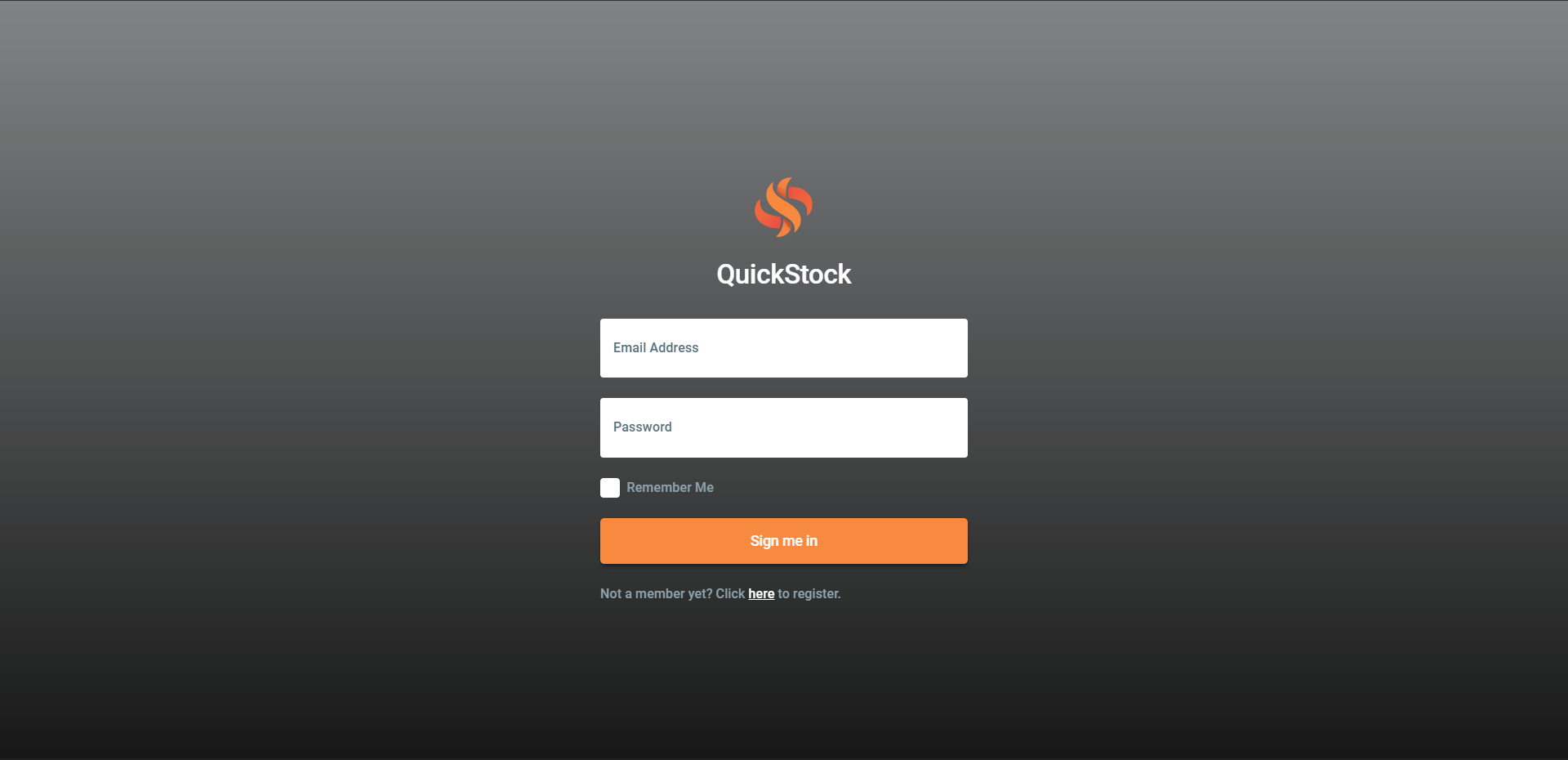


Figure : Login Screen

**P2: Login Screen**

**User Interface:**

* **Email:** The user's email address to access the system
* **Password:** The user's password to access the system
* **Log In:** Submits the form and attempts to log the user into their account.

**Functionality:**

* The login page allows users to access their account on the website or app.
* Users must provide their email address and password in order to log in.
* Once the user clicks the "Log In" button, the form data is submitted to the server.
* The server validates the form data and checks the user's credentials against the stored user data.
* If the credentials are valid, the user is logged into their account and redirected to the home page or another designated page.
* If the credentials are invalid, the user is presented with an error message and prompted to try again.

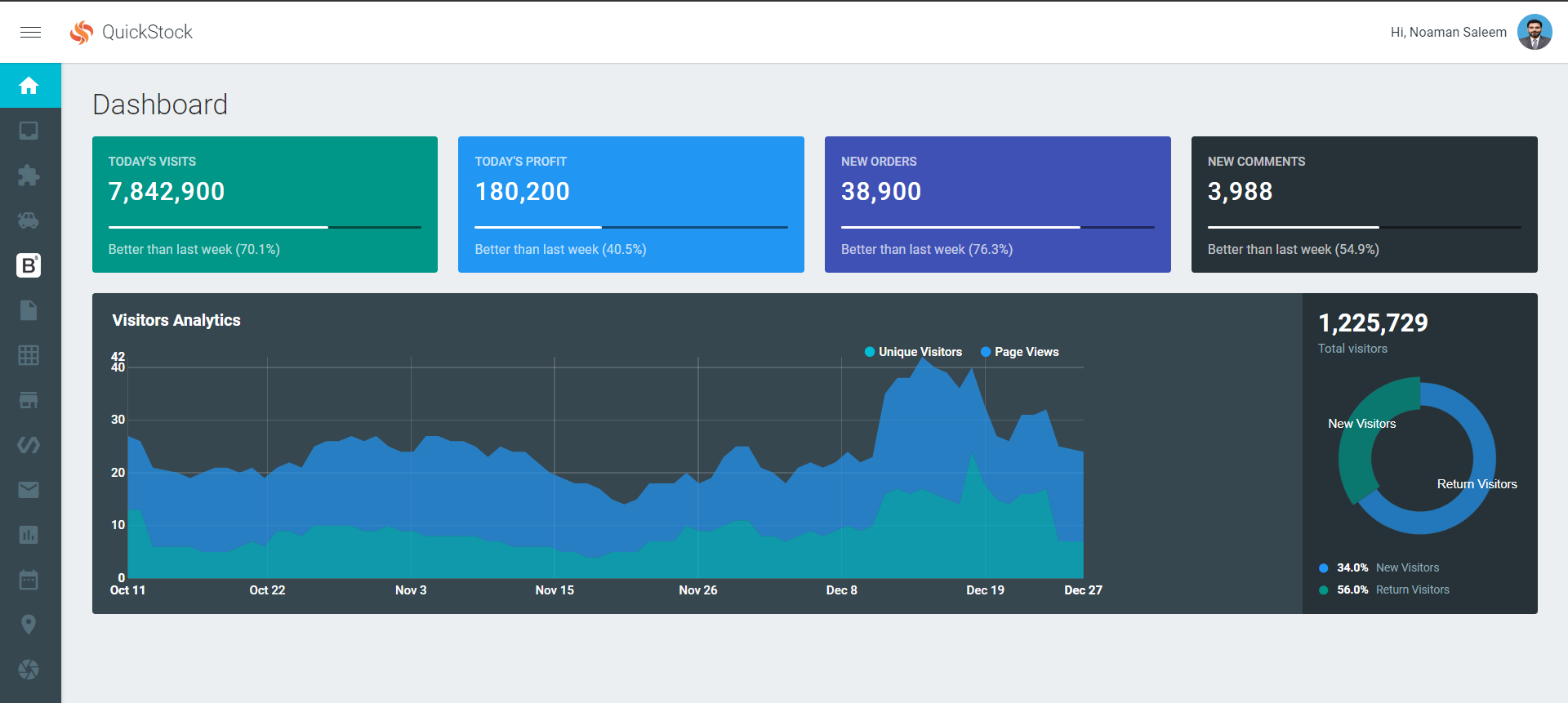
**

Figure : Main Dashboard

**P3: Main Dashboard**

**User Interface:**

* Today's Visits
* Today's Profit
* New Orders
* New Comments
* Visitors Analytics

**Functionality:**

The dashboard displays the following information:

* The number of unique visitors to the website today, compared to the number of visitors on the same day last week.
* The total profit generated by the website today, compared to the profit generated on the same day last week.
* The number of new orders placed on the website today, compared to the number of orders placed on the same day last week.
* The number of new comments posted on the website today, compared to the number of comments posted on the same day last week.

# System Design

## System Architecture Diagram

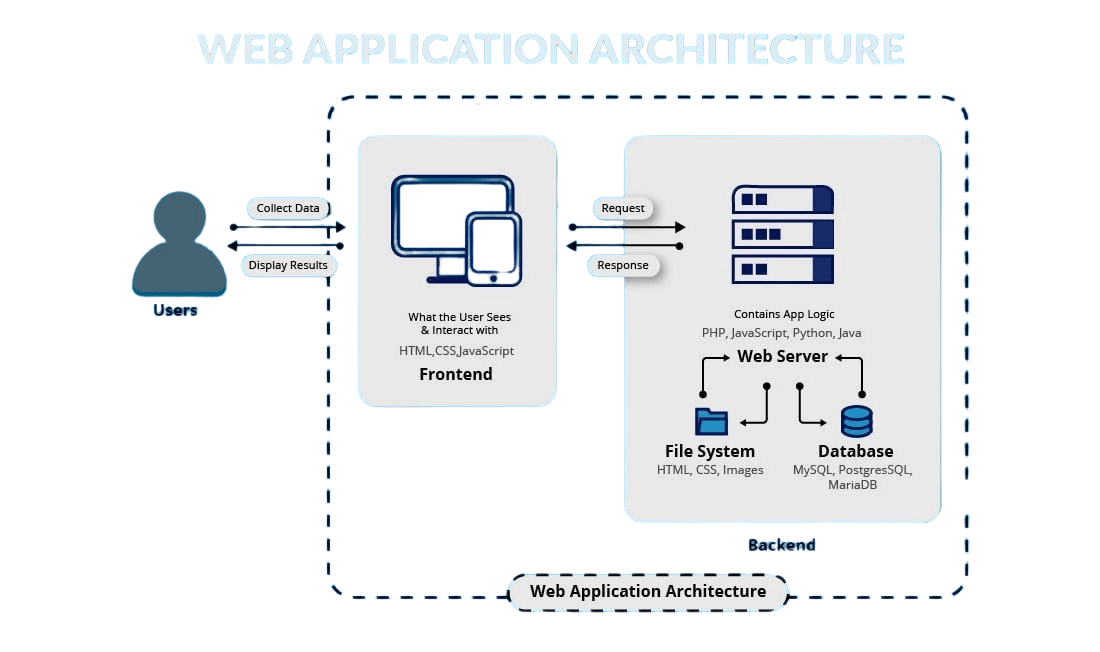
**

Figure : System Architecture Diagram

## Class Diagram

Figure : Class Diagram

*Figure : Class Diagram*

## Sequence Diagrams

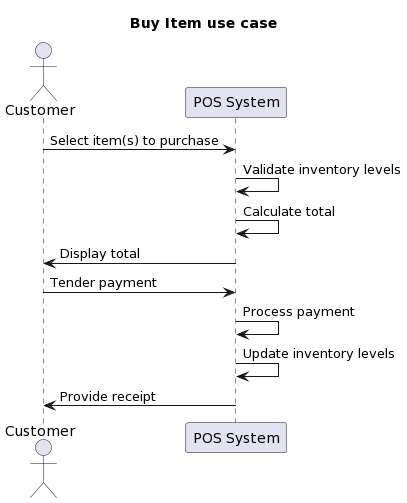


Figure : Buy Item

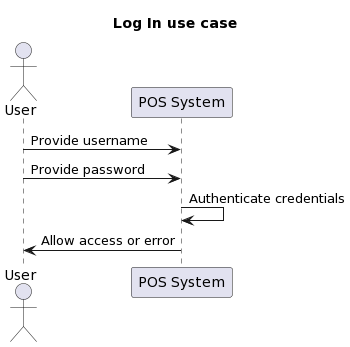


Figure : Login Use Case

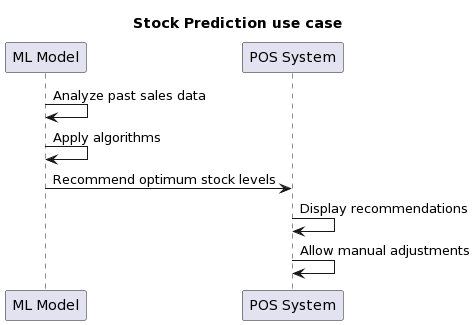


Figure : Stock Prediction Use Case

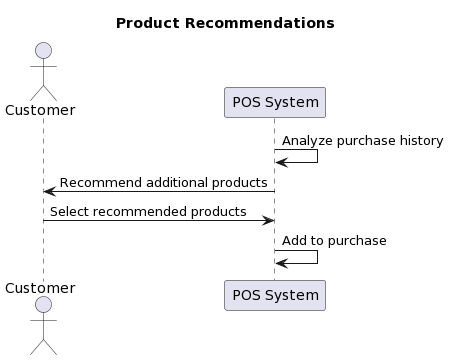


Figure : Product Recommendations

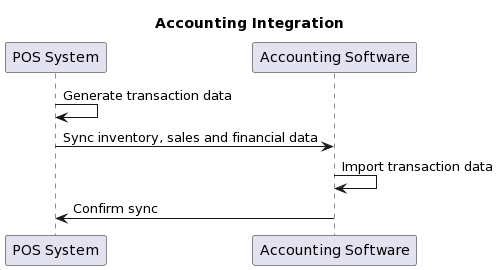


Figure : Accounting Integration

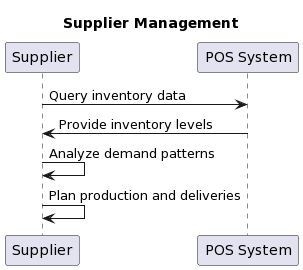


Figure : Supplier Management

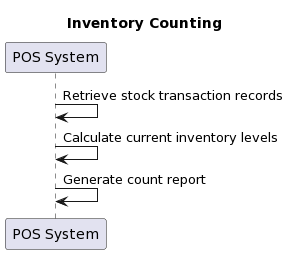


Figure : Inventory Management

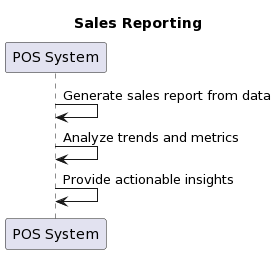


Figure : Sales Reporting

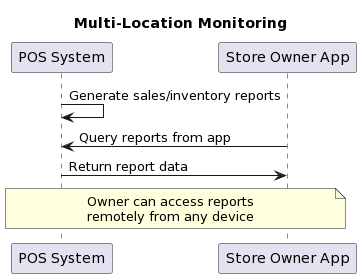


Figure : Multi-Location Monitoring

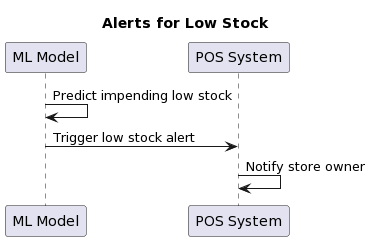


Figure : Alerts for low Stocks

## Collaboration Diagrams

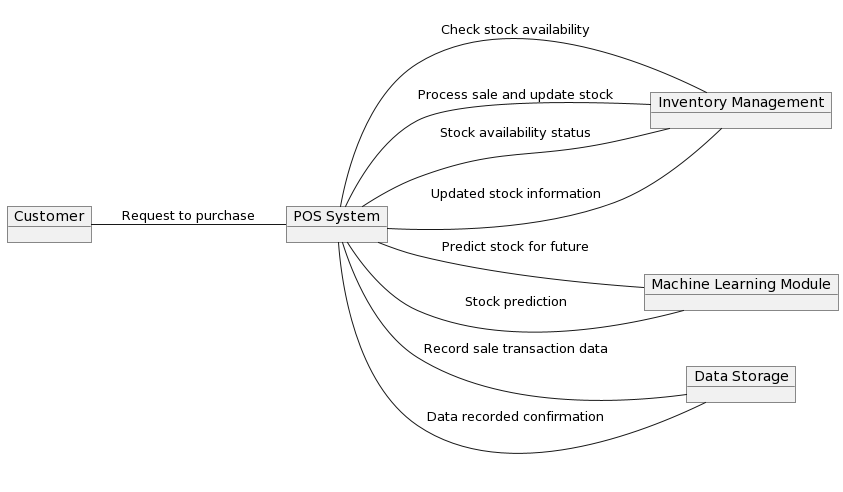


Figure : Collaboration Diagram

## Other UMLs

**DataBase Diagram**

**

Figure : Database Diagram

## ERD

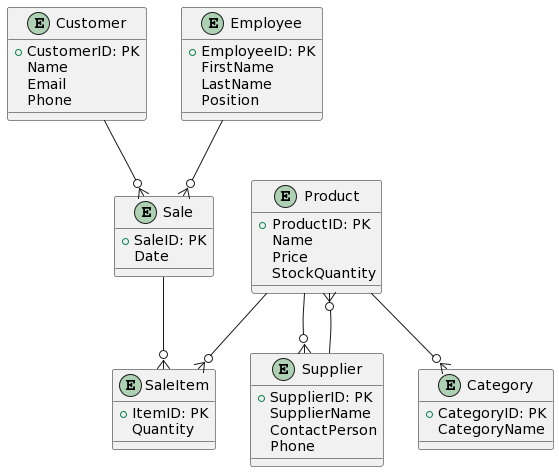


Figure : ERD Diagram

## 

## Data Dictionary

**Screen 1: Login Screen (P1)**

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Name | Type | Description |
| 1 | Email | Text Field | Enter registered email id to login |
| 2 | Password | Password Field | Enter password to login |
| 3 | Login Button | Button | Click to login with provided credentials |

Table : Data Dictionary - Login Screen

**Screen 2: Dashboard (P2)**

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Name | Type | Description |
| 1 | Inventory Levels | Information Widget | Shows current inventory quantities of top products |
| 2 | Sales Summary | Chart | Displays total sales and profit for current month |
| 3 | Top Products | List | Lists best selling products of the month |
| 4 | Low Stock Alerts | Notification Box | Shows products with less than threshold stock level |
| 5 | View Reports | Button | Button to access detailed sales and inventory reports |

Table : Data Dictionary - Dashborad

**Screen 3: Home Screen**

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Name | Type | Description |
| 1 | Store Name | Heading | Name of the current store |
| 2 | Menu | Navigation | Links to different modules |
| 3 | Today's Stats | Info Cards | Quick stats like total sales, customers etc. |

Table : Data Dictionary - Home Screen

**Screen 4: POS System**

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Name | Type | Description |
| 1 | Product List | Dropdown | Select product for transaction |
| 2 | Quantity | Number Input | Enter quantity to purchase |
| 3 | Total | Calculation | Displays total price |
| 4 | Customer | Dropdown | Select or add new customer |
| 5 | Pay | Buttons | Payment options like cash, credit etc. |

Table : Data Dictionary - POS System

**Screen 5: Machine Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Name | Type | Description |
| 1 | Product | Dropdown | Select product for analysis |
| 2 | Sales Graph | Line Chart | Past sales trends over time |
| 3 | Recommendation | Text | Optimum stock levels |
| 4 | Risk Analysis | Table | Possible outcomes at diff levels |
| 5 | Update | Button | Submit recommendation |

Table : Data Dictionary - Machine Learning

**Screen 6: Inventory**

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Name | Type | Description |
| 1 | Product List | Data Table | List all products and stocks |
| 2 | Low Stock | Filter | Show products below threshold |
| 3 | Scan | Button | Scan barcode for counting |

Table : Data Dictionary - Inventory

# Implementation details

## Development Setup

*List your tools and technologies and their role in development.*

## Deployment setup

*How and where was your software deployed? Did you face any problems, how did you overcome these problems.*

## Algorithms

*Entire code of software is not required. Just highlight your important (user defined/ improved) algorithms.*

## Constraints

### Assumptions

*Things we assume will be true.*

*e.g.:*

* *We will receive all necessary technical support from the engineers at cMeRun, Select and Mellon Bank to help design the interfaces between their systems and enGyro.*
* *All database maintenance will be handled by the client.*
* *There will be no real-time interfacing with any accounting systems.*

### System constraints

*A constraint specifies how the system must operate or how it must be built*

### Restrictions

*Constraints applied on the system by the client*

### Limitations

*Services your software is unable to provide*

# Testing

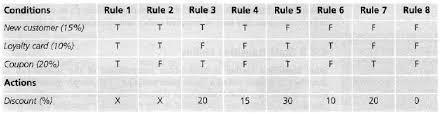
## Extended Test Cases

## 

## Decision Table

### Code snippet

### Decision coverage table



## Traceability Matrix

### RID vs UCID (requirements vs use cases)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UCID/RID** | **R**  **1** | **R**  **2** | **R**  **3** | **R**  **4** | **R**  **5** | **R**  **6** | **R**  **7** | **R**  **8** | **R**  **9** | **R**  **10** | **R**  **11** | **R**  **12** | **R**  **13** | **R**  **14** | **R**  **15** | **R**  **16** | **R**  **17** | **R**  **18** | **R**  **19** | **R**  **20** | **R**  **21** |
| UC 1 | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 2 |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 3 | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  | ✔ |  |  |  |  |  |  |  |  |
| UC 4 | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  |  | ✔ |  |  |  |  |  |  |  |
| UC 5 | ✔ | ✔ | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 6 | ✔ | ✔ |  | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 7 | ✔ | ✔ | ✔ |  |  |  |  |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 8 | ✔ | ✔ |  | ✔ |  |  |  |  |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |
| UC 9 | ✔ | ✔ | ✔ |  | ✔ |  |  |  |  |  | ✔ |  |  |  |  |  |  |  |  |  |  |
| UC 10 | ✔ | ✔ |  | ✔ |  | ✔ |  |  |  |  |  | ✔ |  |  |  |  |  |  |  |  |  |
| UC 11 | ✔ | ✔ | ✔ |  | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 12 | ✔ | ✔ |  | ✔ |  | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 19 | ✔ | ✔ | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  | ✔ |  |  |  |  |  |  |
| UC 20 | ✔ | ✔ |  | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  | ✔ |  |  |  |  |  |
| UC 21 | ✔ | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 22 | ✔ | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| UC 23 | ✔ | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  | ✔ |  |  |  |  |
| UC 24 | ✔ | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  | ✔ |  |  |  |
| UC 25 | ✔ | ✔ | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ✔ |  |  |
| UC 26 | ✔ | ✔ | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ✔ |  |
| UC 27 | ✔ | ✔ | ✔ | ✔ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ✔ |

*Table 8: RID vs UCID (requirements vs use cases)*

### Prototypes (RID vs PID)

### Test Cases (RID vs TID)

### Coverage (UCID vs TID)

# Results/Output/Statistics

## %completion

*Use the matrix & values from 7.3.1 to show that all requirements are being fulfilled.*

## %accuracy

*Use the matrix & values from 7.3.3 to show that all requirements have been implemented correctly.*

## %correctness

*Use the matrix & values from 7.3.4 to show that all requirements have been tested to be conforming to requirements.*

# Conclusion

# Future work

# Bibliography

*Use IEEE or ACM format for citations*

## Books

## Journals

## Articles

## Research papers

## Other References

# Appendix

## Glossary of terms

## Pre-requisites

*Must use contents of development/ deployment setup & external system dependencies*