Master of Science (IT) SEM – 10

LJ Institute of Computer Applications

RetailIQ - Smart Retail Operations & Analytics Platform

Guided By:

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Internal Guide: HOD:

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To whom so ever it may concern I/We, confirm that Project (document/PPT or Code) is my own work, is not copied from any other person's work (published or unpublished or generated using CHATGPT/AI, and has not previously submitted for assessment either at University or elsewhere. We confirm that we have read and understood the rules regulations on plagiarism in LJ University.

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Commitment Form

I/we assure that following are the components on which we worked in the said project titled **RetailIQ - Smart Retail Operations & Analytics Platform**. Further we confirm that, we have read and understood the rules and regulations of UFM in LJU.

Student 1.

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Name: Arnold Macwan

Sr.	Component	Sr.	Component

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Student 2.

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Name: Manthan Parmar

Sr.	Component	Sr.	Component

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Semester 10.

Project title: RetailIQ - Smart Retail Operations & Analytics Platform

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1. Introduction

The retail sector is undergoing in a massive **digital transformation** driven by the increasing need for efficiency, intelligent decision making and **data-driven operations**. Meanwhile the large organization leverage sophisticated use of AI-powered tools and automation techniques, but the small-medium size enterprises often rely manual processes and operations and traditional **POS – point of sale** systems.

RetailIQ is designed to bridge this technological gap by providing a smart and unified platform which combines all the management and processes with advanced analytics. The system empowers local shops, supermarkets, and fashion stores to manage inventory, track sales, monitor supplier performance, and understand purchase patterns — all in a centralized ecosystem.

1.1. Existing System

In the current retail environment, most small and medium-sized stores rely on traditional **Point-of-Sale** (POS) software or manual methods to manage their operations. These existing systems primarily focus on **basic functionalities** such as billing, inventory updates, and transaction recording. While effective for routine tasks, they **lack intelligent decision-support** capabilities. Retailers must manually analyse sales data, estimate future demand, and track stock levels, which often leads to *inaccuracies* and *inefficiencies*.

Overall, the existing system is **transactional** rather than analytical. It records data but does not help retailers interpret it for **strategic decisions**. As a result, retail operations become reactive, inefficient, and less competitive in the modern digital market.

1.2. Need for new system

With increasing competition and rapidly changing consumer behavior, retailers require more than just POS software—they need an **intelligent platform** that can transform raw data into actionable insights. This necessity creates a strong demand for a system like RetailIQ, which integrates **conventional** retail management with advanced analytics and AI-driven predictions.

The system is needed to:

- Enhance decision making
- Prevent stock-out
- Understand customer behavior
- Streamline business management
- Reduce human error

The **need for the system** arises from the growing demand for smart, analytical retail operations that can support better decision-making, reduce costs, and increase competitiveness.

1.3. Objective

The main objective of RetailIQ is to develop an intelligent, integrated platform that enhances retail operations through advanced data analytics and AI-powered decision support. The specific objectives include:

- Automate & optimize inventory management
- Advanced sales & profit analysis
- Data-driven decision making
- Enhance customer relations
- Improve accuracy
- Scalable and unified platform

Build an AI-driven, analytics-focused system that enhances decisions, optimizes inventory, improves sales strategies, and empowers retailers with insights previously accessible only to large enterprises.

1.4. Problem statement

Retail businesses, especially small and mid-sized stores, generate large volumes of transactional data through daily sales, purchases, and inventory movements. However, most retailers lack the tools and expertise to analyze this data effectively. These limitations prevent retailers from operating efficiently, understanding their customers, or forecasting future business needs. Therefore, the problem is the absence of a unified, smart retail management system that not only handles operations but also provides predictive analytics, actionable insights, and intelligent decision support for modern retail environments.

1.5. Scope of the project

The scope of RetailIQ encompasses the design, development, implementation, and evaluation of an intelligent retail management and analytics platform aimed at empowering small and mid-sized retail businesses. The project covers functional, non-functional, analytical, and technological aspects as described below.

I. Operational scope
   a. Inventory management
   b. Sales & Billing integration
   c. Supplier & purchase management

II. Analytical scope
   a. Demand forecasting
   b. Market basket analysis
   c. Stock prediction
   d. Interactive dashboards

III. User Scope

The system is intended for:

a. Local shop owners
b. Vendors, mini-markets
c. Retails stores

IV. Technical scope

a. Frontend interface
b. Backend services
c. API services
d. Database systems
e. Machine learning pipelines

V. Out of scope

a. Multi-store management
b. Real-time or barcode hardware systems
c. Integration with third part e-commerce systems

The project will deliver a functional, scalable platform capable of transforming traditional retail data into meaningful business intelligence.

1.6. Project profile

Project Name	RetailIQ
Frontend	HTML, CSS, JavaScript, ReactJS
Backend	ExpressJS, NodeJS
Database	MongoDB, MySQL
ML Services	Python, FastAPI
Tools	VS Code, MS-Office

1.7. Core Components

Admin	Supplier	Customer	Store manager
• Login • Manage suppliers • Manage stores • Manage permissions • Analytics & monitoring • Pricing & Discounts • Reports • Logout	• Login • Manage purchases • Products & pricing • Communication • Profile management • Order analytics • Logout	• Login • Registration • Profile management • Past purchases • Feedbacks • Orders & Wishlist • Logout	• Login • Profile Management • Inventory management • Sales & Billing • Manage supplies • Sales dashboard • Store level Analytics • Logout

1.8. Assumptions & Constraints

➢ Assumptions

- Uploaded datasets will not contain malicious or corrupted files that break the system.
- Users will provide timely feedback during each iteration for improvements.
- The system will operate in an environment with stable internet connectivity, as it relies on external services/APIs.
- Users will have basic digital literacy to operate the dashboard, upload files, and understand analytical insights.
- Retailers will provide accurate sales, inventory, and purchase data, either through POS exports or manual uploads.
- Other historic data will be used for training model for stock/sales analysis and prediction if retailer does not have sufficient data.

➢ Constraints

- Computational resources (RAM, CPU) may restrict training of large ML models.
- Retailers unfamiliar with technology may require training to fully utilize analytics features.
- Lack of sufficient historical data may reduce forecasting performance.
- System performance may depend on server capabilities (processing time for large datasets).
- Web browser compatibility may limit advanced visualizations.
- The ML model accuracy may vary based on dataset size, seasonal variations, and store type.

1.9. Advantages & Limitations

➢ Advantages

- Data-driven decision making
- Improved inventory management
- Enhanced profitability
- Better customer segmentation and understanding
- Enhanced stock management

➢ Limitation

- Accuracy depends on data quality
- Can't capture external market factors for model training
- Limited real-time analytics
- Lack of back-up service
- Multilingual support
- Low maintenance

2. Requirement determination & Analysis

Requirement determination and analysis is the process of gathering, studying, and validating the needs of users, stakeholders, and the system itself. This phase ensures that the project's objectives align with real-world retail operations and that the final system is both technically feasible and user-oriented.

For RetailIQ, requirement analysis focuses on understanding how retailers currently manage operations, what limitations they face, and what features are essential to build an effective, intelligent retail analytics platform.

2.1. Requirement determination

Requirement determination and gathering has been done through several methods and techniques such as:

- Interviews
- Observations of existing system
- Case studies
- Surveys/Feedbacks
- Industry research

2.2. Requirement analysis

After gathering information from different sources, the requirements are analyzed and broken into categories:

I. **Functional requirement**

   a. <u>Inventory management</u>

   - Add, Read, Update or Delete products
   - Track stock levels automatically
   - Identifying slow moving stocks
   - Low-High stock alerts

b. Sales management
  - Upload and handle sales data
  - Generate reports
  - Identify sales trends
  - Billing and sales integration

c. Supplier management
  - Register suppliers
  - Manage purchase history
  - Track supplies

d. AI-ML module
  - Demand forecast
  - Market basket analysis
  - Stock/sales/profit prediction

e. Dashboard & Reporting
  - Interactive visuals & charts
  - KPI insights

f. User management
  - Login, Register authentication
  - Role based access control
  - Purchases
  - Interests

II. Non-functional requirement

a. Performance requirement
b. Reliability
c. Usability
d. Security
e. Scalability

III. User requirement

a. Easy product/inventory management
b. Sales analytics
c. Recommendation
d. Reports
e. Accessible

IV. System requirement

a. Standard PC with windows 10+ and stable internet connection
b. Python installed if needed in local PC
c. Cloude storage or other storage devices to store sales data

2.3. Targeted Users

The system primarily targets users who manage retail activities but lack access to advanced analytics or enterprise-level retail solutions.

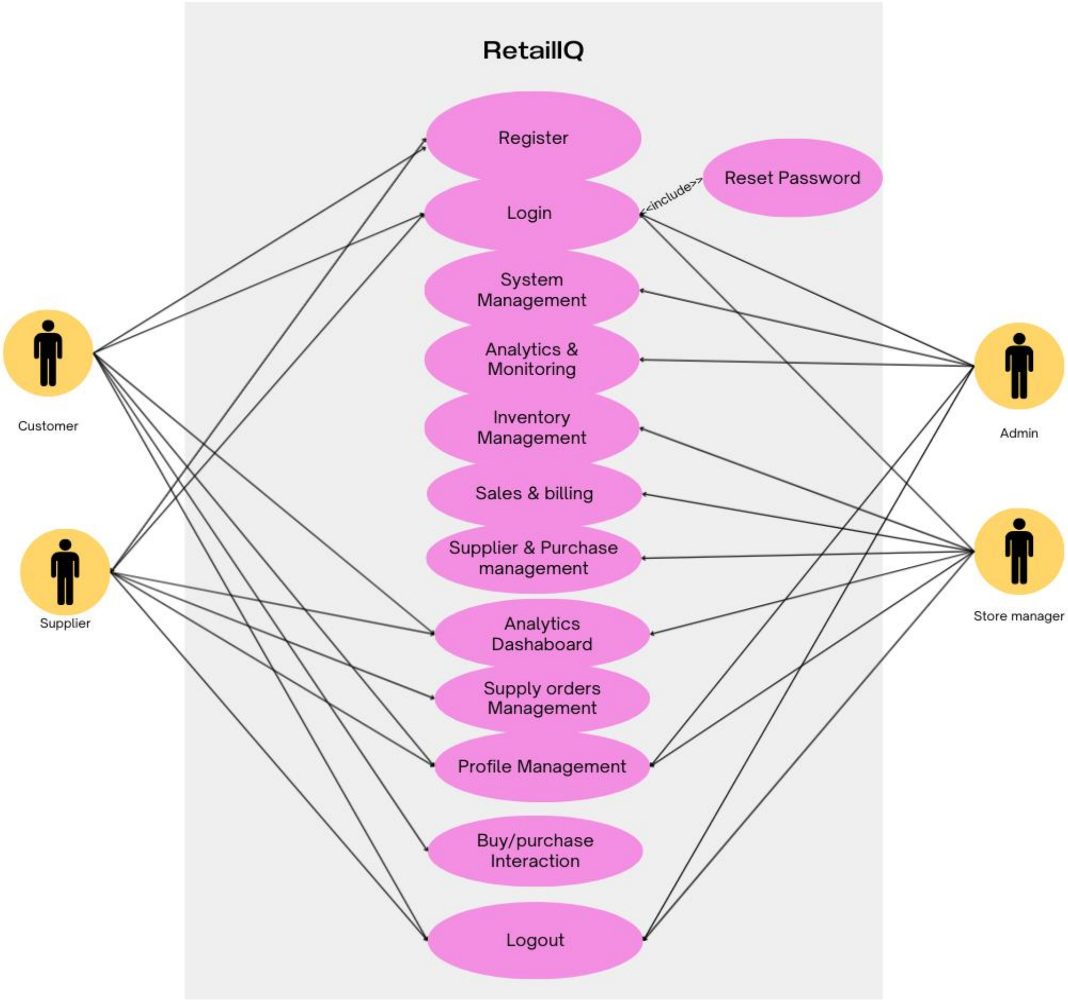
- Retail shop owners
- Supermarket store managers
- Retail data analyst
- Store managers & operational staff
- Suppliers & vendors (passive users)

With context of login or role-based users the system allows following users:

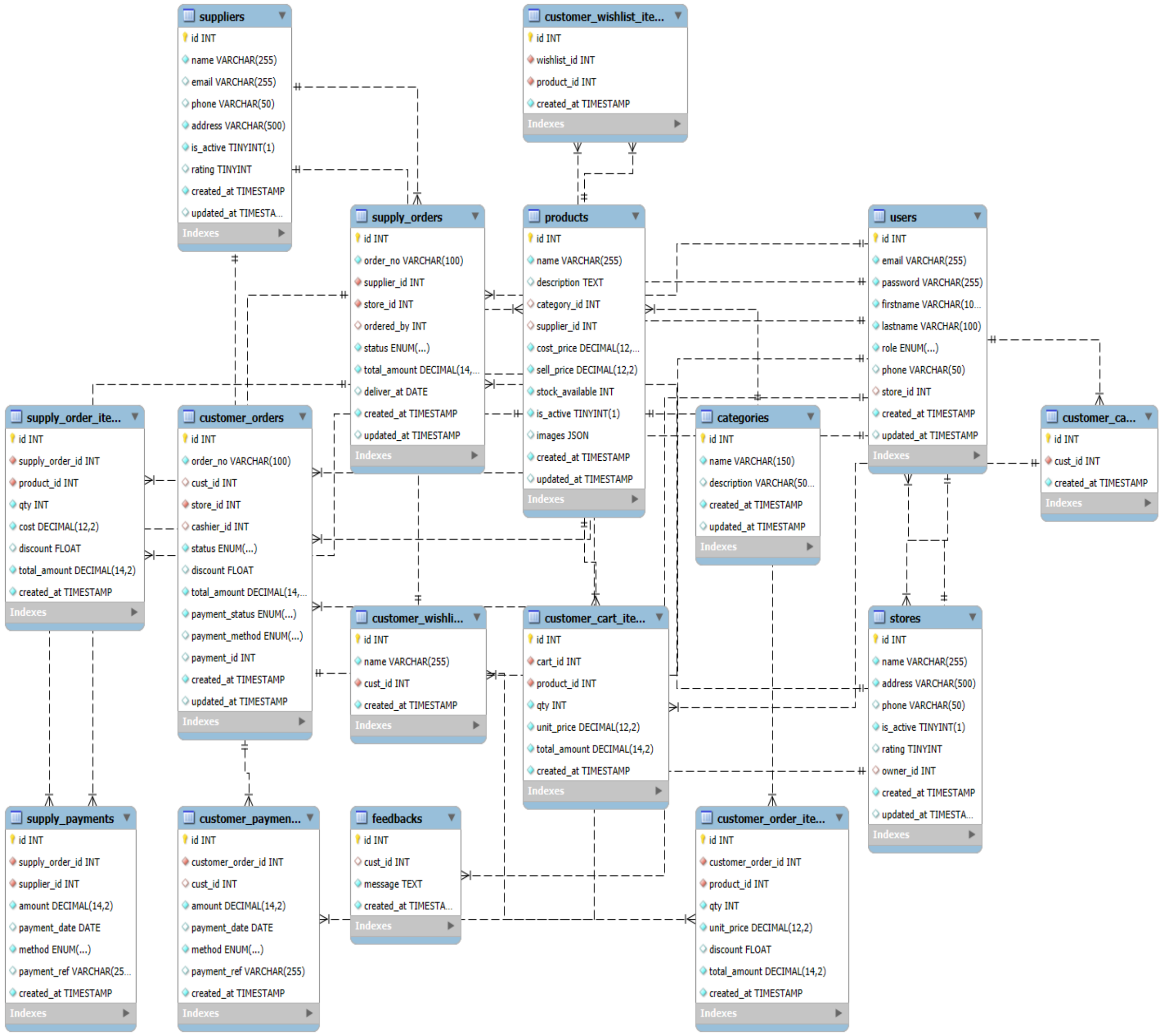
- Admin
- Customer
- Store Manager/staff
- Supplier

3. System Design

3.1. Use Case Diagram



3.2. Class Diagram



3.3. Activity Diagram

3.4. Sequence Diagram

3.5. Data Dictionary

1. Users

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
Email	Varchar	Unique	abc@gmail.com	Email id of the user
Password	Varchar	Not null	123456	Hash password
Firstname	Varchar	Not null	John	Firstname of the user
Lastname	Varchar	Not null	Doe	Lastname of the user
Role	Enum (admin, customer, store manager)	Not null	Admin	Role of the user for access
Phone	Varchar	Unique	82**7**2*8	Phone number
Store_id	Int	Foreign key (refers store table)	001	Store id which belongs to a store manager
CreatedAt	Timestamp	Default	20-02-2025	Timestamp of record creation

2. Categories

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
Name	Varchar	Unique	Men	Category for the products
Description	Varchar	-	All clothes for men	Summary of the category
CreatedAt	Timestamp	Default	21-12-2025	Date of creation

3. Products

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
Name	Varchar	Unique	JoggersX	Name of the product
Description	Varchar	-	Skinny fit jogger	Summary of the product
CreatedAt	Timestamp	Default	21-12-2025	Date of creation
CategoryId	Int	Foreign key (refers category table)	011	A Category belongs to the product
SupplierId	Int	Foreign key (refers supplier table)	121	A supplier belongs to product
CostPrice	Decimal	Not null	$ 499	Price of cost from user
SellPrice	Decimal	Not null	$ 599	Price of sale
Stock_available	Int	Not null	50	Quantity of stock available
isActive	Boolean	Not null	True	Status of product
Images	Array	-	abc.jpeg	Images for the products

4. Suppliers

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
Name	Varchar	Unique	Torrent supplies Ltd.	Name of the supplier

Email	Varchar	Unique	ts@gmail.com	Email of the supplier
CreatedAt	Timestamp	Default	21-12-2025	Date of creation
Phone	Varchar	Unique	7820**41*6	Phone/contact number
Address	Varchar	Not null	Avenue complex, NYC, USA	Address of the supplier
isActive	Boolean	Not null	False	Status of the supplier
Rating	Enum (1-5)	-	4	Rating for supplier

5. Stores

Name	**Type**	**Constraints**	**Example**	**description**
Id	Int	Primary key	001	Table identifier
Name	Varchar	Unique	Fista	Name of the store
Address	Varchar	Not null	Siteni complex, NYC, USA	Address of the store
CreatedAt	Timestamp	Default	21-12-2025	Date of creation
Phone	Varchar	Unique	7820**41*6	Phone/contact number
isActive	Boolean	Not null	False	Status of the supplier
Rating	Enum (1-5)	-	4	Rating for supplier
ownerId	Int	Foreign key (refers user table)	0131	A user/owner belongs to store

6. Supply_Orders

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
OrderNo	String	Unique	PO-52045	Unique identifier for order
supplierId	Int	Foreign key (refers suppliers table)	125	Supplier belongs to supply order
storeId	Int	Foreign key (refers store table)	111	Store from order belongs
orderedBy	Int	Foreign key (refers user table)	101	User belongs to order
Status	Enum	Not null	Sent	Status of the order
TotalAmount	Decimal	Not null	$ 4500	Total amount for the order
deliverAt	Date	Not null	12-05-26	Date of delivery
createdAt	Datetime	Default	11-04-26	Record creation

7. Supply_Orders_items

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
Supply_orderId	Int	Foreign key (refers supply_orders)	500	Supply Items belongs to supply

productid	Int	Foreign key (refers products)	511	Product belongs order
Qty	Int	Not null	50	Quantity of product
Cost	decimal	Not null	$ 50	Price per unit of the product
Discount	Float	-	5.5	Discount if any
Total_amount	Decimal	Not null	$ 2500	Total amount for order
createdAt	Datetime	Default	11-04-26	Record creation

8. Supply_Payment

Name	**Type**	**Constraints**	**Example**	**description**
Id	Int	Primary key	001	Table identifier
Supply_orderId	Int	Foreign key (refers supply_orders)	500	Supply Items belongs to supply
supplierId	Int	Foreign key (refers supply_orders)	111	Supplier belongs to order
Amount	Decimal	Not null	$ 32500	Amount of payment
Payment_date	Date	Default	12-05-26	Date of payment

Method	Enum	Not null	IMPS	Transaction method
payment Ref	String	Not null	PayId: 56512	Reference of payment
createdAt	Datetime	Default	11-04-26	Record creation

9. Customer_Orders

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
orderNo	String	Unique	CO-52146	Unique no. of order
custId	Int	Foreign key (refers user table)	111	User belongs to order
storeId	Int	Foreign key (refers store table)	233	Store belongs order
Cashier	Int	Foreign key (refers user table)	166	Order created by
Status	Enum	Not null	Pending	Status of the order
Discount	Float	-	5.56	Discount if any
createdAt	Datetime	Default	11-04-26	Record creation
totalAmout	Decimal	Not null	$ 4500	Total amount of the order
Payment_status	Enum	Not null	Pending	Status of the payment
payment Method	Enum	Not null	Pending	Method of payment

paymentId	Int	Foreign key (refers customer_Payment)	52242	Payment reference

10. Customer_Orders_items

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
Cust_orderId	Int	Foreign key (refers customer_orders)	500	order Items belongs to customer
productid	Int	Foreign key (refers products)	511	Product belongs order
Qty	Int	Not null	50	Quantity of product
Cost	decimal	Not null	$ 50	Price per unit of the product
Discount	Float	-	5.5	Discount if any
Total_amount	Decimal	Not null	$ 2500	Total amount for order
createdAt	Datetime	Default	11-04-26	Record creation

11. Customer_Payment

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
customer_orderId	Int	Foreign key (refers customer_orders)	500	order Items belongs to customer order

custId	Int	Foreign key (refers user)	111	customerbe longs to order
Amount	Decimal	Not null	$ 32500	Amount of payment
Payment_ date	Date	Default	12-05-26	Date of payment
Method	Enum	Not null	IMPS	Transaction method
payment Ref	String	Not null	PayId: 56512	Reference of payment
createdAt	Datetim e	Default	11-04-26	Record creation

12. Customer_wishlist

Name	**Type**	**Constraints**	**Example**	**description**
Id	Int	Primary key	001	Table identifier
Name	String	Not null	My wishlist	Wishlist name
custId	Int	Foreign key (refers user)	111	customerbe longs to order
createdAt	Datetim e	Default	11-04-26	Record creation

13. Customer_wishlist_items

Name	**Type**	**Constraints**	**Example**	**description**
Id	Int	Primary key	001	Table identifier
wishlistId	Int	Foreign key (refers wishlist)	699	Wishlist reference

productid	Int	Foreign key (refers product)	155	Product belongs wishlist
createdAt	Datetime	Default	11-04-26	Record creation

14. Customer_cart

Name	**Type**	**Constraints**	**Example**	**description**
Id	Int	Primary key	001	Table identifier
custId	Int	Foreign key (refers users)	121	User belongs cart
createdAt	Datetime	Default	11-04-26	Record creation

15. Customer_cart_items

Name	**Type**	**Constraints**	**Example**	**description**
Id	Int	Primary key	001	Table identifier
cartId	Int	Foreign key (refers customer cart)	566	Cart items belong to cart
productid	Int	Foreign key (refers product)	155	Product belongs cart
createdAt	Datetime	Default	11-04-26	Record creation
Qty	Int	Not null	5	Quantity of product
Unit_price	Decimal	Not null	$ 25	Price per product
Total_amount	Decimal	Not null	$ 125	Total amount to be paid

16. Feedbacks

Name	Type	Constraints	Example	description
Id	Int	Primary key	001	Table identifier
custId	Int	Foreign key (refers user)	121	User belongs feedback
Message	Text	Not null	“Good”	Message for feedback
createdAt	Datetime	Default	11-04-26	Record creation

4. Development

4.1. Coding standard

- *Project structure*
  Use clear and descriptive names for the whole directory of the project and also recommend the naming conventions rules for the variables and functions names.

- *Code version management*
  Use a version control system (i.e., GitHub) for the project to collaborate effectively.

- *UI Design*
  Design a user-friendly interface so that user can use the system and understand it easily

- *Error Handling*
  Implement an error free code and use error handling mechanism for user interactions

- *Further development*
  Maintain the system as well conduct regular reviews that genuine feedback for the system.
  Always look for the further improvement of the system that can make the system work more accurate and reliable

4.2. Screenshots

5. Agile Documentation

5.1. Project Charter

Project Name	RetailIQ
Guide	
Start Date	01-10-2025
End Date	30-04-2025
Project Scope	RetailIQ is a smart retail analytics and operations platform built to unify and automate key retail workflows. The project covers inventory management, sales tracking, supplier coordination, and AI-driven analytics for demand forecasting, market-basket insights, dynamic pricing, and predictive stock management.
Project Mission	To empower local retailers, supermarkets, and small businesses with intelligent, data-driven tools that simplify operations, optimize inventory, enhance profitability, and enable smarter decision-making through actionable insights and modern AI/ML technologies.
Project Vision	To become the leading smart retail analytics platform that transforms traditional retail into efficient, tech-enabled businesses—bridging the gap between small stores and enterprise-level retail intelligence through affordable, scalable, and automated solutions.

5.2. Project Roadmap

5.3. User Story

5.4. Release Plan

5.5. Sprint Backlog

5.6. Test Plan

6. Proposed Enhancement
7. Conclusion
8. Bibliography