Chapter II: System Development Process

1.Analysis

1.1 Requirement Analysis

The requirements were gathered through discussions with the café owner and observation of day-to-day operations. Stakeholders identified include café staff (cashiers, baristas), the café owner (admin), and customers (indirect users).

Functional Requirements:

- Product and category listing
- Order placement and modification
- Automated billing and receipt generation
- Daily/weekly/monthly sales reporting
- Admin dashboard for item management and price updates
- Login authentication for staff and admin

Non-Functional Requirements:

- User-friendly interface with minimal learning curve
- Quick response time for transaction processing
- Secure data handling

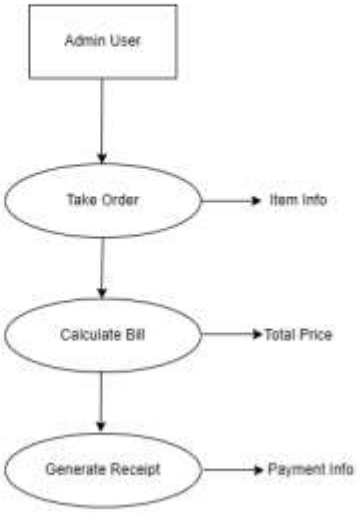
1.2 Feasibility Study

- **Technical Feasibility:**
  The system is technically feasible using modern web technologies such as React, Node.js, and MySQL/Supabase. These are accessible and offer rapid development capabilities.
- **Operational Feasibility:**
  Café staff can quickly learn and adapt to the interface. Simple UI design and guided workflows ensure minimal training.
- **Economic Feasibility:**
  Since the project will be built using open-source technologies and does not rely on expensive hardware integration, development costs are minimal.

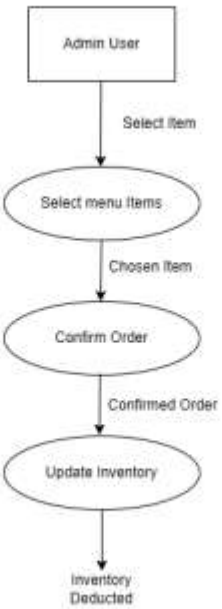
1.3 Structured Modelling

1.3.1 DFD Diagram :

DFD 0



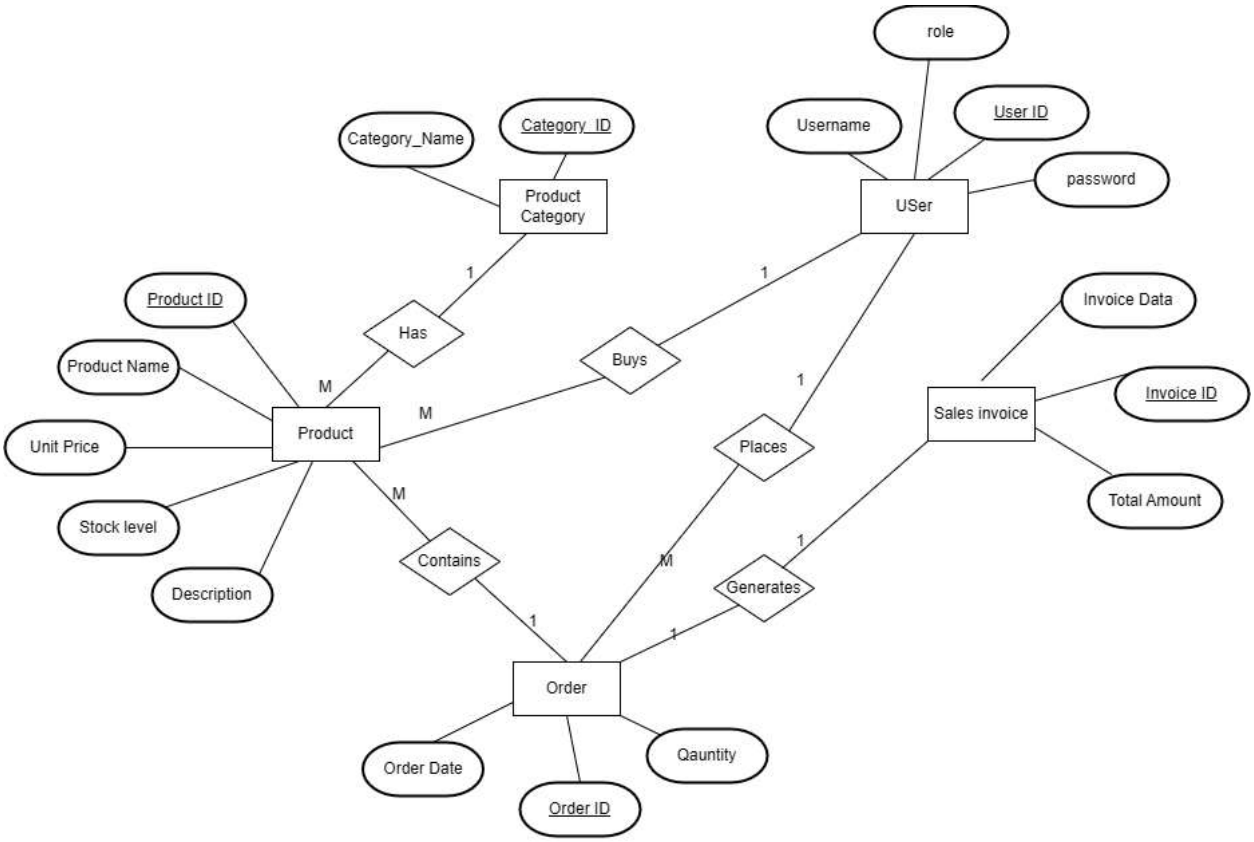
DFD 1



DFD 2: Expanding Orderig Process

- **Level 0**: Entire POS system as one process.
- **Level 1**: Core processes — Take Order, Calculate Bill, Process Payment, Generate Receipt.
- **Level 2**: Detailed view of "Take Order".

1.3.2 ER Diagram :



ER Diagram

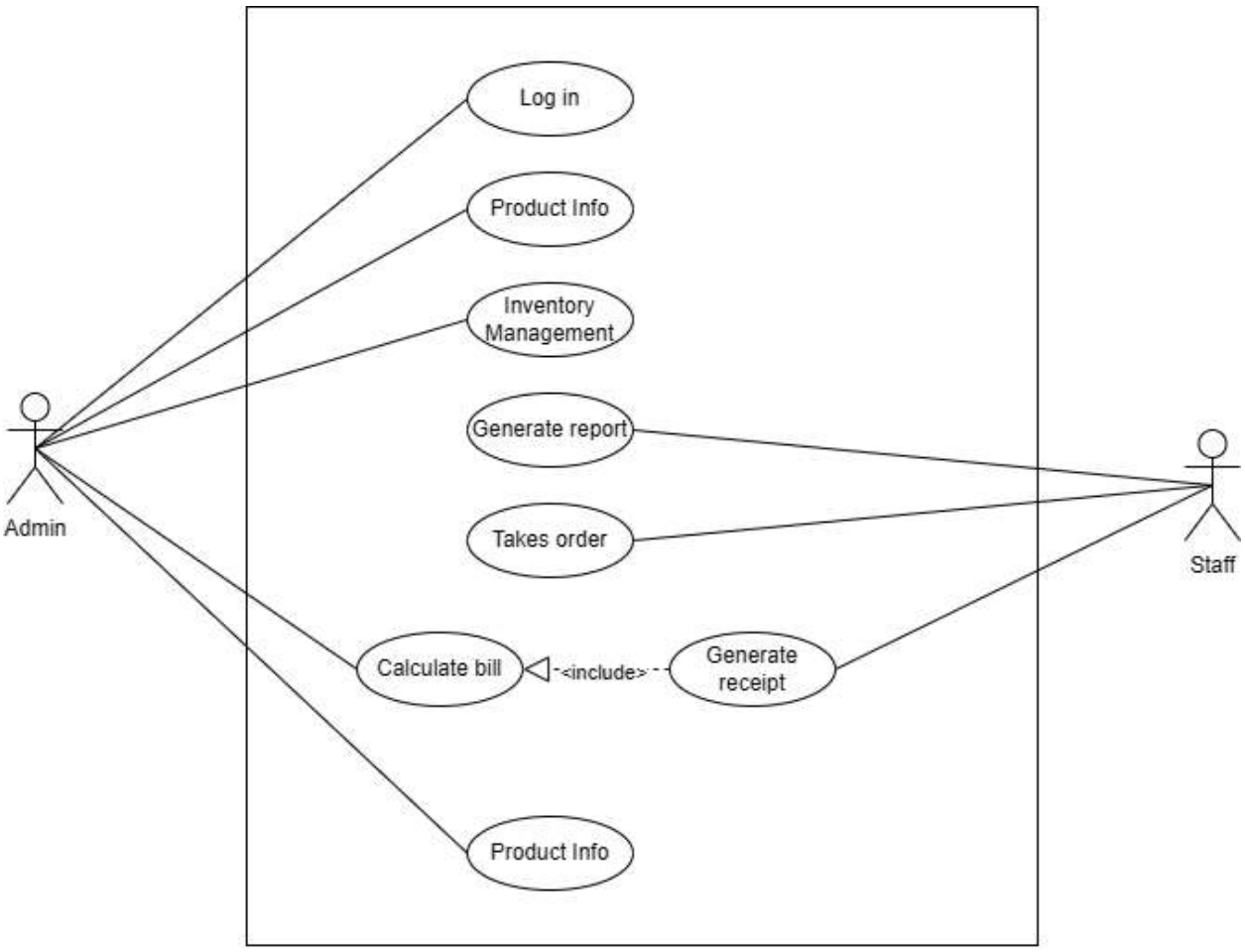
ER Diagram Key Entities:

- Users (userId, username, password, role)
- Products (productId, name, category, price, quantity,description)
- Product Category(Category name,Category_ID)
- Orders (orderId, quantity,order date))
- SalesInvoice (InvoiceData, InvoiceId, totalAmount)

Relationships:

- One User can place many Orders
- One User can buys many Products
- One Order contains many Products
- One Order generates one sales Invoice

1.3.3 Use Case diagram



Use case Diagram

2. Design

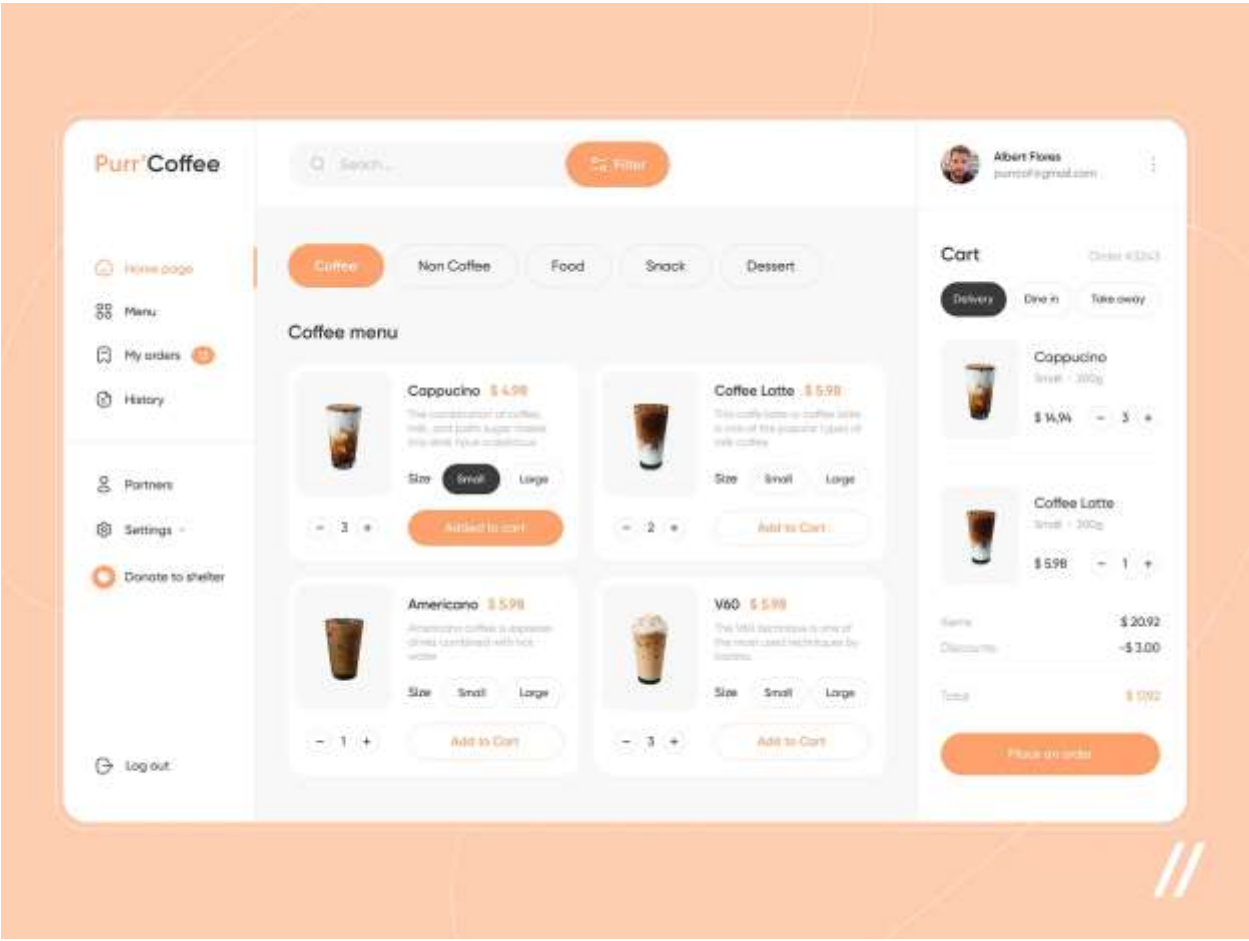
2.1 User Interface Design:

- **Login Screen**
- **POS Terminal Interface**: Product list, order summary, "Place Order" button
- **Admin Dashboard**: Product management, sales report view

Design Principles:

- Minimalist layout with clear call-to-actions
- Use of color-coded buttons for quick navigation
- Responsive layout for desktop use

Sample UI:



2.2 Database Design / Object-Oriented Design Models

◆ 1. User

Field	Data Type	Constraints
UserID	INT	PRIMARY KEY

Field	Data Type	Constraints
Username	VARCHAR(50)	UNIQUE, NOT NULL
Password	VARCHAR(255)	NOT NULL
Role	VARCHAR(30)	NOT NULL (e.g. Admin, Cashier)

◆ 2. ProductCategory

Field	Data Type	Constraints
CategoryID	INT	PRIMARY KEY
CategoryName	VARCHAR(50)	NOT NULL

◆ 3. Product

Field	Data Type	Constraints
ProductID	INT	PRIMARY KEY
ProductName	VARCHAR(100)	NOT NULL
UnitPrice	DECIMAL(8,2)	NOT NULL
StockLevel	INT	NOT NULL DEFAULT 0
Description	TEXT	NULLABLE
CategoryID	INT	FOREIGN KEY → ProductCategory(CategoryID)

◆ 4. Order

Field	Data Type	Constraints
OrderID	INT	PRIMARY KEY
OrderDate	DATETIME	NOT NULL
UserID	INT	FOREIGN KEY → User(UserID)

◆ 5. OrderItem

Field	Data Type	Constraints
OrderID	INT	FOREIGN KEY → Order(OrderID)
ProductID	INT	FOREIGN KEY → Product(ProductID)
Quantity	INT	NOT NULL
Composite PK: OrderID, ProductID		

◆ 6. SalesInvoice

Field	Data Type	Constraints
InvoiceID	INT	PRIMARY KEY
OrderID	INT	FOREIGN KEY → Order(OrderID)
InvoiceDate	DATETIME	NOT NULL
TotalAmount	DECIMAL(10,2)	NOT NULL

Relationships Overview

- One User places many Orders
- Each Order contains many Products (via OrderItem)
- Each Order generates one SalesInvoice
- Each Product belongs to one Category
- No customer data is stored — only internal staff manages orders and inventory.

3. Implementation

3.1 Tools and Technologies Used

- **Frontend:** React.js, Tailwind CSS
- **Backend:** Node.js with Express.js
- **Database:** MySQL or Supabase
- **Development Tools:** VS Code, GitHub
- **Deployment:** Local server, cloud deployment (Vercel)

3.2 Module Description

Module	Description
Authentication	Allows login for staff with role-based access
Order Management	Select products, adjust quantities, generate order
Billing System	Calculates totals, taxes, and generates printable bill
Product Management	Admin can add/update/delete products
Sales Reporting	Displays sales data with filters (daily/weekly/monthly)

3.3 Testing

- **Unit Testing:** Conducted on individual functions (e.g., price calculation, login validation)

- **Integration Testing:** Ensures seamless flow from order creation to sales recording
- **User Acceptance Testing (UAT):** To be conducted with café staff to verify ease of use and accuracy