# Functional Requirement

Based on the provided use cases and data model, here are the functional requirements for Chapter 1:  
  
### 1.1 Customer Registration Function   
\*\*Function ID:\*\* FR-01   
\*\*Description:\*\* Enables new customers to create accounts by providing personal information. Validates input uniqueness and stores credentials securely.   
\*\*Input:\*\* Customer details (Name, Email, Password, PhoneNumber, Address)   
\*\*Output:\*\* New Customer record with CustomerID, encrypted password, RegistrationDate   
  
### 1.2 Customer Authentication Function   
\*\*Function ID:\*\* FR-02   
\*\*Description:\*\* Verifies customer credentials to establish authenticated sessions and track login activity.   
\*\*Input:\*\* Email, Password   
\*\*Output:\*\* Authenticated session token, updated LastLoginDate in Customer record   
  
### 1.3 Session Termination Function   
\*\*Function ID:\*\* FR-03   
\*\*Description:\*\* Terminates active customer sessions and invalidates authentication tokens.   
\*\*Input:\*\* Session token   
\*\*Output:\*\* Session invalidation confirmation, audit log entry   
  
### 1.4 Customer Profile Management Function   
\*\*Function ID:\*\* FR-04   
\*\*Description:\*\* Allows customers or administrators to update and view customer account information.   
\*\*Input:\*\* CustomerID, updated fields (e.g., Address, PhoneNumber)   
\*\*Output:\*\* Modified Customer record, change audit log   
  
### 1.5 Customer Account Removal Function   
\*\*Function ID:\*\* FR-05   
\*\*Description:\*\* Permits administrators to permanently delete customer accounts while anonymizing personal data.   
\*\*Input:\*\* CustomerID   
\*\*Output:\*\* Account deletion confirmation, anonymized records, disabled authentication tokens   
  
### 1.6 Purchase History Retrieval Function   
\*\*Function ID:\*\* FR-06   
\*\*Description:\*\* Provides customers and administrators with access to historical order data.   
\*\*Input:\*\* CustomerID (for administrators) or session token (for customers)   
\*\*Output:\*\* List of Order records with associated OrderItems   
  
### 1.7 Product Catalog Management Function   
\*\*Function ID:\*\* FR-07   
\*\*Description:\*\* Enables administrators to add, modify, or remove products from the store catalog.   
\*\*Input:\*\* Product details (Name, Description, Price, StockQuantity, Category)   
\*\*Output:\*\* Created/updated Product record or deletion confirmation with cart purges   
  
### 1.8 Inventory Adjustment Function   
\*\*Function ID:\*\* FR-08   
\*\*Description:\*\* Allows administrators to modify product stock levels with audit trails.   
\*\*Input:\*\* ProductID, adjustment quantity (±integer), reason   
\*\*Output:\*\* Updated StockQuantity, inventory change log entry   
  
### 1.9 Product Information Display Function   
\*\*Function ID:\*\* FR-09   
\*\*Description:\*\* Shows product details to users and administrators.   
\*\*Input:\*\* ProductID   
\*\*Output:\*\* Product attributes (Name, Description, Price, StockQuantity, ImageURL, availability status)   
  
### 1.10 Shopping Cart Modification Function   
\*\*Function ID:\*\* FR-10   
\*\*Description:\*\* Manages additions, quantity changes, and removals of items in customer carts.   
\*\*Input:\*\* ProductID, Quantity (or removal flag), session token   
\*\*Output:\*\* Updated ShoppingCartItem records, recalculated cart totals   
  
### 1.11 Cart Summary Display Function   
\*\*Function ID:\*\* FR-11   
\*\*Description:\*\* Preserves real-time view of cart contents with availability verification.   
\*\*Input:\*\* Session token   
\*\*Output:\*\* ShoppingCartItem details with subtotals, availability status, grand total   
  
### 1.12 Order Creation Function   
\*\*Function ID:\*\* FR-12   
\*\*Description:\*\* Converts shopping carts into orders with payment processing initiation.   
\*\*Input:\*\* Session token, shipping address, payment method   
\*\*Output:\*\* New Order record with OrderItems, inventory reservations, "Pending Payment" status   
  
### 1.13 Order Status Management Function   
\*\*Function ID:\*\* FR-13   
\*\*Description:\*\* Updates order progression states with business rule validation.   
\*\*Input:\*\* OrderID, new OrderStatus   
\*\*Output:\*\* Modified Order record, status change notifications, inventory adjustments   
  
### 1.14 Order Item Modification Function   
\*\*Function ID:\*\* FR-14   
\*\*Description:\*\* Allows administrators to alter order compositions before shipment.   
\*\*Input:\*\* OrderID, OrderItemID, new Quantity (or removal flag)   
\*\*Output:\*\* Updated OrderItem records, recalculated order totals   
  
### 1.15 Order Deletion Function   
\*\*Function ID:\*\* FR-15   
\*\*Description:\*\* Removes orders while enforcing status constraints and inventory restocking.   
\*\*Input:\*\* OrderID   
\*\*Output:\*\* Order deletion confirmation, restocked inventory   
  
### 1.16 Payment Method Management Function   
\*\*Function ID:\*\* FR-16   
\*\*Description:\*\* Handles secure storage and maintenance of customer payment instruments.   
\*\*Input:\*\* Payment details (PaymentMethod, CardNumber, ExpiryDate, CVV)   
\*\*Output:\*\* Tokenized Payment record, storage confirmation   
  
### 1.17 Payment Processing Function   
\*\*Function ID:\*\* FR-17   
\*\*Description:\*\* Executes financial transactions through payment gateways.   
\*\*Input:\*\* OrderID, PaymentMethodID, amount   
\*\*Output:\*\* Payment transaction record, "Paid" order status, confirmation emails   
  
### 1.18 Administrator Account Management Function   
\*\*Function ID:\*\* FR-18   
\*\*Description:\*\* Creates and maintains administrator profiles with privilege enforcement.   
\*\*Input:\*\* Administrator details (Username, Password, Role)   
\*\*Output:\*\* New/updated Administrator record with privilege verifications   
  
### 1.19 System Configuration Function   
\*\*Function ID:\*\* FR-19   
\*\*Description:\*\* Modifies global system parameters with validation and service reloads.   
\*\*Input:\*\* SettingID, new Value   
\*\*Output:\*\* Updated SystemSettings record, configuration reload confirmation   
  
### Logic Validation:  
- All inputs/outputs reference defined entities/attributes from the data model  
- Transformation feasibility ensured (e.g., cart items → orders, credentials → sessions)  
- Complete coverage of 34 use cases through atomic functions  
- No undefined terms - all references match provided E-R model  
- Functions derived exclusively from specified use cases without invention

# External Description

### Chapter 2: External Interfaces  
  
This chapter describes the external interfaces of the system, including user interfaces, hardware interfaces, software interfaces, and communication interfaces. Each interface is defined and described based on the functional requirements provided.  
  
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#### 2.1 User Interface Output  
  
The system provides several user interfaces for customers and administrators to interact with the system. Below are the key user interfaces identified:  
  
1. \*\*Customer Registration Page\*\*   
 - \*\*Description:\*\* A web page where new customers can input their personal information to create an account.   
 - \*\*Inputs:\*\* Name, Email, Password, PhoneNumber, Address.   
 - \*\*Outputs:\*\* Confirmation message, redirect to login page.  
  
2. \*\*Customer Login Page\*\*   
 - \*\*Description:\*\* A web page where customers can authenticate their accounts using their email and password.   
 - \*\*Inputs:\*\* Email, Password.   
 - \*\*Outputs:\*\* Session token, redirect to the dashboard.  
  
3. \*\*Customer Profile Page\*\*   
 - \*\*Description:\*\* A web page where customers can view and update their account information.   
 - \*\*Inputs:\*\* CustomerID, fields to update (e.g., Address, PhoneNumber).   
 - \*\*Outputs:\*\* Updated profile information, change audit log.  
  
4. \*\*Shopping Cart Page\*\*   
 - \*\*Description:\*\* A web page where customers can view and manage items in their shopping cart.   
 - \*\*Inputs:\*\* ProductID, Quantity (or removal flag), session token.   
 - \*\*Outputs:\*\* Updated cart contents, subtotals, and availability status.  
  
5. \*\*Checkout Page\*\*   
 - \*\*Description:\*\* A web page where customers can review their order and complete the payment process.   
 - \*\*Inputs:\*\* Session token, shipping address, payment method.   
 - \*\*Outputs:\*\* Order confirmation, redirect to order tracking page.  
  
6. \*\*Order History Page\*\*   
 - \*\*Description:\*\* A web page where customers can view their purchase history.   
 - \*\*Inputs:\*\* CustomerID or session token.   
 - \*\*Outputs:\*\* List of Order records with associated OrderItems.  
  
7. \*\*Administrator Dashboard\*\*   
 - \*\*Description:\*\* A web page where administrators can manage products, customers, and system settings.   
 - \*\*Inputs:\*\* Administrator credentials, product details, or system settings.   
 - \*\*Outputs:\*\* Updated product records, customer records, or system configuration confirmation.  
  
8. \*\*Product Catalog Page\*\*   
 - \*\*Description:\*\* A web page where customers and administrators can view product details.   
 - \*\*Inputs:\*\* ProductID.   
 - \*\*Outputs:\*\* Product attributes (Name, Description, Price, StockQuantity, ImageURL, availability status).  
  
9. \*\*Payment Method Management Page\*\*   
 - \*\*Description:\*\* A web page where customers can add or update their payment methods.   
 - \*\*Inputs:\*\* Payment details (PaymentMethod, CardNumber, ExpiryDate, CVV).   
 - \*\*Outputs:\*\* Tokenized Payment record, storage confirmation.  
  
10. \*\*Email Confirmation/Notification\*\*   
 - \*\*Description:\*\* An email sent to customers and administrators for account verification, order confirmation, or password reset.   
 - \*\*Inputs:\*\* Recipient email, event trigger (e.g., registration, order completion).   
 - \*\*Outputs:\*\* Email message with confirmation link or notification details.  
  
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#### 2.2 Hardware Interface Output  
  
The system does not directly interact with external hardware devices. However, the following hardware interfaces may be involved:  
  
1. \*\*Payment Terminal\*\*   
 - \*\*Description:\*\* A hardware device used for card-based payments.   
 - \*\*Inputs:\*\* Card swipe or insertion.   
 - \*\*Outputs:\*\* Card information for payment processing.  
  
2. \*\*Barcode/QR Code Scanner\*\*   
 - \*\*Description:\*\* A hardware device used for scanning product barcodes or QR codes.   
 - \*\*Inputs:\*\* Barcode/QR code data.   
 - \*\*Outputs:\*\* Product details for inventory management.  
  
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#### 2.3 Software Interface Output  
  
The system interacts with several software components and external services. Below are the key software interfaces identified:  
  
1. \*\*Customer Database\*\*   
 - \*\*Description:\*\* A database used to store customer information, including personal details and account credentials.   
 - \*\*Inputs:\*\* Customer details (Name, Email, Password, PhoneNumber, Address).   
 - \*\*Outputs:\*\* Customer record with CustomerID, encrypted password, and RegistrationDate.  
  
2. \*\*Product Database\*\*   
 - \*\*Description:\*\* A database used to store product information, including inventory details.   
 - \*\*Inputs:\*\* Product details (Name, Description, Price, StockQuantity, Category).   
 - \*\*Outputs:\*\* Product record with updated StockQuantity and inventory change log entry.  
  
3. \*\*Order Database\*\*   
 - \*\*Description:\*\* A database used to store order information, including order status and items.   
 - \*\*Inputs:\*\* OrderID, new OrderStatus, payment method details.   
 - \*\*Outputs:\*\* Updated Order record with status change notifications and inventory adjustments.  
  
4. \*\*Payment Gateway\*\*   
 - \*\*Description:\*\* An external service used to process payments securely.   
 - \*\*Inputs:\*\* OrderID, PaymentMethodID, amount.   
 - \*\*Outputs:\*\* Payment transaction record, "Paid" order status, confirmation emails.  
  
5. \*\*System Configuration Database\*\*   
 - \*\*Description:\*\* A database used to store global system parameters.   
 - \*\*Inputs:\*\* SettingID, new Value.   
 - \*\*Outputs:\*\* Updated SystemSettings record, configuration reload confirmation.  
  
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#### 2.4 Communication Interface Output  
  
The system communicates with external entities through various means. Below are the key communication interfaces identified:  
  
1. \*\*Email Notifications\*\*   
 - \*\*Description:\*\* Communication via email for account verification, order confirmation, and password reset.   
 - \*\*Inputs:\*\* Recipient email, event trigger (e.g., registration, order completion).   
 - \*\*Outputs:\*\* Email message with confirmation link or notification details.  
  
2. \*\*SMS Notifications\*\*   
 - \*\*Description:\*\* Communication via SMS for order status updates and password reset.   
 - \*\*Inputs:\*\* Recipient phone number, event trigger (e.g., order status change).   
 - \*\*Outputs:\*\* SMS message with status update or reset link.  
  
3. \*\*API Interfaces\*\*   
 - \*\*Description:\*\* Communication with external systems via APIs for payment processing, inventory management, or customer authentication.   
 - \*\*Inputs:\*\* API request parameters (e.g., ProductID, adjustment quantity).   
 - \*\*Outputs:\*\* API response with confirmation or error messages.  
  
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### Summary  
  
The system's external interfaces are categorized into user interfaces, hardware interfaces, software interfaces, and communication interfaces. Each interface is defined with its role, inputs, and outputs to ensure clear interaction with external entities. This section ensures that all referenced external data sources in the functional requirements are covered and clearly defined.