E-Commerce (Target 2.0) Management System

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Overview

The Target 2.0 E-Commerce Management System will redefine the online shopping experience through the seamless management of users, orders, products, promotions, and logistics. The system ensures seamless operations with much precision, security, and in real time for both customers and administrators. It creates trust among customers, makes life easier, provides scalability, and thereby enables business growth, innovation, and great digital retail experiences.

Business Problems and Objectives

- User Management
    - Maintain (enter, update, and delete) user profiles, including email addresses, phone numbers, and password-protected accounts.
    - Manage user addresses, supporting multiple addresses with default options for ease of checkout.
    - Track user payment methods, including details like payment type, provider, account number, and expiration dates.
- Product Management
    - Maintain data on products, including descriptions, categories, pricing, images, and SKU details.
    - Track product variations, including size, color, and other configurable options.
    - Manage product categories and subcategories for better catalog organization.
    - Monitor stock availability to prevent overselling.
- Shopping Cart and Order Management
    - Enable the creation and management of shopping carts for users, tracking selected products and their quantities.

- ○ Record and manage orders, including payment methods, shipping methods, addresses, and order totals.
- ○ Track the status of orders throughout their lifecycle (e.g., pending, shipped, delivered, returned).
- Order Line Management
  - ○ Track details of each item in an order, including quantities and item-specific pricing.
- Promotions and Discounts
  - ○ Maintain data on promotions, including descriptions, discount rates, and validity periods.
  - ○ Associate promotions with specific product categories or items for targeted marketing.
- Review and Feedback Management
  - ○ Enable users to provide reviews and ratings for ordered products, along with optional comments for feedback.
- Customer support:
  - ○ Implement a ticketing system to enable customers to raise queries, report issues, and request assistance.
  - ○ Provide automated updates on ticket status (e.g., open, in progress, resolved).
- Data Security and Integrity
  - ○ Ensure secure handling of user data, including passwords and payment information.
  - ○ Maintain historical records for auditing purposes while providing mechanisms for updates and deletions when needed.

E-R Diagram
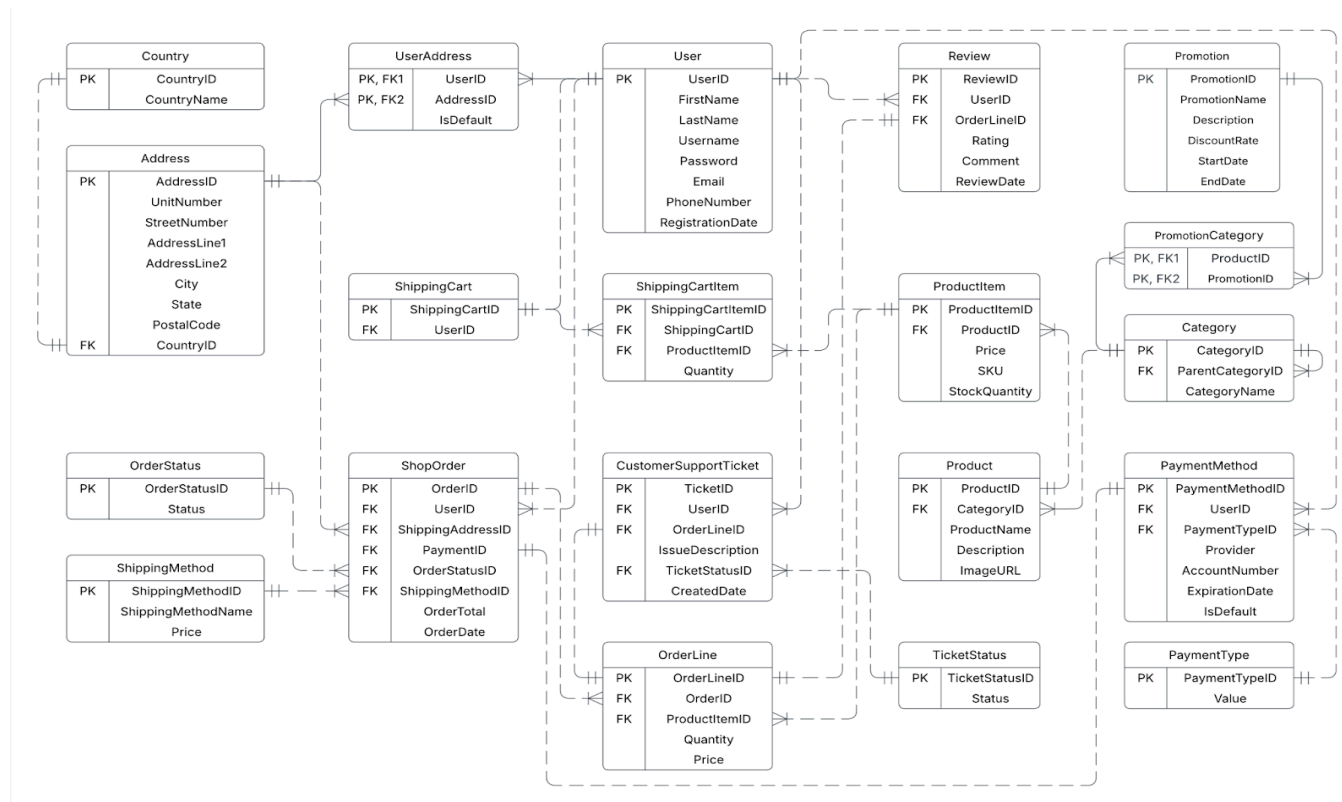
Entities & Relationships & Design Decision

1. User

- **Attributes:**
    - o UserID (Primary Key)
    - o FirstName
    - o LastName
    - o UserName
    - o Email
    - o PhoneNumber
    - o Password (hashed)
    - o RegistrationDate

- **Relationships:**
  - o One-to-Many with User Address (Each user can have multiple addresses)
  - o One-to-Many with Payment Method (A user can have multiple payment methods)
  - o One-to-One with Shopping Cart (Each user can have a shopping cart)
  - o One-to-Many with Review (Each user can submit multiple reviews)
  - o One-to-Many with Customer Support Ticket (Each user can create multiple tickets)

- **Why Included:** Central to the system, users interact with the platform for shopping, managing orders, making payments, and contacting support. Essential for personalized experiences like account management and activity tracking.

2. UserAddress

- **Attributes:**
  - o AddressID (Primary Key, Foreign Key)
  - o UserID (Primary Key, Foreign Key)
  - o IsDefault (Boolean)
- **Relationships:**
  - o Many-to-One with User (Each user can have multiple user addresses)
  - o Many-to-One with Address (Each address can have multiple user addresses)
- **Why Included:** Allows users to save multiple addresses (e.g., home, office) for convenience. Differentiates between users and shared addresses, ensuring reusability.

3. Address

- **Attributes:**
  - o AddressID (Primary Key)
  - o UnitNumber
  - o StreetNumber
  - o AddressLine1
  - o AddressLine2
  - o City

- o State
- o ZipCode
- o CountryID (Foreign Key)
- **Relationships:**
  - o One-to-Many with Order (An address can be used for multiple orders)
  - o Many-to-One with Country (Each country can have multiple addresses)
  - o One-to-Many with User Address (Each address can have multiple user addresses)
- **Why Included:** Facilitates address reuse across multiple users, orders, or scenarios. Stores detailed information about location and is linked to countries for accuracy.

4. Country

- **Attributes:**
  - o CountryID (Primary Key)
  - o CountryName
- **Relationships:**
  - o One-to-Many with address (Each country can have multiple addresses)
- **Why Included:** Stores country details to support international transactions and address normalization.

5. PaymentMethod

- **Attributes:**
  - o PaymentMethodID (Primary Key)
  - o UserID (Foreign Key)
  - o PaymentType (Foreign Key, e.g., Credit Card, PayPal)
  - o Provider (e.g., Visa, MasterCard)
  - o AccountNumber (Masked)
  - o ExpirationDate
  - o IsDefault (Boolean)
- **Relationships:**
  - o Many-to-One with User (A user can have multiple payment methods)

o Many-to-One with Payment Type (A Payment type can belong to multiple user payment methods)

o One-to-One with Order (An order can belong to one payment method)

- **Why Included:** Enables users to securely save multiple payment methods (credit cards, PayPal, etc.) for seamless checkout experiences.

6. PaymentType

- **Attributes:**
  - o PaymentTypeID (Primary Key)
  - o Value
- **Relationships:**
  - o One-to-Many with Payment Method (A Payment type can belong to multiple payment methods)
- **Why Included:** Standardizes payment method categories (e.g., credit card, PayPal) for better organization and compatibility.

7. Product

- **Attributes:**
  - o ProductID (Primary Key)
  - o ProductName
  - o Description
  - o CategoryID (Foreign Key)
  - o ImageURL
- **Relationships:**
  - o Many-to-One with Category (Each product belongs to a category)
  - o One-to-Many with Product Item (A product can have many product items)
- **Why Included:** Represents the core items being sold on the platform. Helps store basic details like name, description, and associated category for easier browsing.

8. Category

- **Attributes:**
  - o CategoryID (Primary Key)
  - o CategoryName
  - o ParentCategoryID (Foreign Key, Nullable)
- **Relationships:**
  - o One-to-Many with Product (Each category contains multiple products)
  - o Self-referential (Categories can have subcategories)
  - o One-to-Many with promotion category (Each category can have multiple promotion category)
- **Why Included:** Groups products for easier navigation and search. Supports hierarchical categorization for subcategories (e.g., Electronics > Laptops).

9. ProductItem

- **Attributes:**
  - o ProductItemID (Primary Key)
  - o ProductID (Foreign Key)
  - o Price
  - o SKU
  - o StockQuantity
- **Relationships:**
  - o One-to-Many with order line (Each product item belongs to multiple order lines)
  - o One-to-Many with shopping cart item (Each product item can linked to many shopping carts)
- **Why Included:** Tracks individual items, including their price, SKU, and stock, allowing for detailed inventory management.

10. PromotionCategory

- **Attributes:**
  - o CategoryID (Primary Key, Foreign Key)

o   promotionID (Primary Key, Foreign Key)
- **Relationships:**
    o   Many-to-One with Category (Each category can have multiple promotion categories)
    o   Many-to-One with Promotion (Each promotion can have multiple promotion categories)
- **Why Included:** Associates promotions with specific product categories, ensuring discounts are applied appropriately during sales events.

11. Promotion

- **Attributes:**
    o   PromotionID (Primary Key)
    o   PromotionName
    o   PromotionDescription
    o   DiscountRate
    o   StartDate
    o   EndDate
- **Relationships:**
    o   One-to-Many with Promotion Category (Each promotion can have multiple promotion categories)
- **Why Included:** Represents sales campaigns or discounts applied to products or categories, improving marketing flexibility.

12. ShoppingCart

- **Attributes:**
    o   CartID (Primary Key)
    o   UserID (Foreign Key)
- **Relationships:**
    o   One-to-One with User (Each user has one shopping cart)
    o   One-to-Many with Shopping Cart Item (A cart can contain multiple items)

- **Why Included:** Essential for enabling users to temporarily save items before purchasing, simplifying the shopping process.

13. ShoppingCartItem

- **Attributes:**
    - o ShoppingCartItemID (Primary Key)
    - o ShoppingCartID (Foreign Key)
    - o ProductID (Foreign Key)
    - o Quantity
- **Relationships:**
    - o Many-to-One with Shopping Cart (A shopping cart contains multiple items)
    - o Many-to-One with Product Item (A product item can be multiple shopping cart item)
- **Why Included:** Tracks individual items in a user's shopping cart, including quantity and linked product details.

14. ShopOrder

- **Attributes:**
    - o OrderID (Primary Key)
    - o UserID (Foreign Key)
    - o ShippingAddressID (Foreign Key)
    - o PaymentMethodID (Foreign Key)
    - o OrderTotal
    - o OrderStatus (Foreign Key, Pending, Shipped, Delivered, Returned)
    - o OrderDate
- **Relationships:**
    - o Many-to-One with Address (Each address can have multiple shop orders)
    - o Many-to-One with User (Each user can have multiple shop orders)
    - o One-to-One with Payment Method (An order can only have one user payment method)
    - o One-to-Many with Order Line (An order contains multiple order lines)

o   Many-to-One with Order Status (Each order have an order status)
- **Why Included:** Captures detailed order information, including payment, user, address, and status, for transaction tracking and fulfillment.

15. OrderLine

- **Attributes:**
    - o   OrderLineID (Primary Key)
    - o   OrderID (Foreign Key)
    - o   ProductItemID (Foreign Key)
    - o   Quantity
    - o   Price (at the time of order)
- **Relationships:**
    - o   Many-to-One with Shop Order (An order contains multiple order lines)
    - o   Many-to-One with Product Item(Each product item corresponds to many order lines)
    - o   One-to-One with Review (An order line can have one review)
    - o   One-to-One with Customer Support Ticket (If applicable, a order line only corresponds to one review)
- **Why Included:** Tracks individual items in an order, including their quantity and price at purchase time. Critical for accurate order summaries.

16. OrderStatus

- **Attributes:**
    - o   OrderStatusID (Primary Key)
    - o   Status
- **Relationships:**
    - o   One-to-Many with Order (Each order status have many corresponds orders)
- **Why Included:** Represents the current state of an order (e.g., Pending, Shipped), improving tracking for both users and administrators.

17. Review

- **Attributes:**
  - o ReviewID (Primary Key)
  - o UserID (Foreign Key)
  - o OrderLineID (Foreign Key)
  - o Rating (1-5)
  - o Comment
  - o ReviewDate
- **Relationships:**
  - o Many-to-One with User (Multiple reviews are written by a user)
  - o One-to-One with Order line (Each review belongs to an Order line)
- **Why Included:** Allows users to provide feedback on purchased items, improving product quality and user engagement.

18. CustomerSupportTicket

- **Attributes:**
  - o TicketID (Primary Key)
  - o UserID (Foreign Key)
  - o OrderLineID (Foreign Key, Nullable)
  - o IssueDescription
  - o TicketStatusID (Foreign Key, Open, In Progress, Resolved)
  - o CreatedDate
- **Relationships:**
  - o Many-to-One with User (Each ticket is created by a user)
  - o One-to-One with Order line (If applicable, a ticket can be assigned to an Order line)
- **Why Included:** Tracks user-reported issues with orders or other platform experiences, enabling structured customer support.

19. TicketStatus:

- **Attributes:**
  - o TicketStatusID (Primary Key)
  - o Status
- **Relationships:**
  - o One-to-Many with Ticket Status (Each ticket status can belong to many Customer Support Ticket)
- **Why Included:** Provides clear visibility into the status of support tickets (e.g., Open, Resolved), improving communication and resolution workflows.

Design Considerations

1. **Aligns with Business Goals** – Supports key operations such as user management, product cataloging, order fulfillment, promotions, and customer engagement. By directly addressing business needs, the system streamlines operations, enhances shopping experiences, and fosters customer trust. This efficiency not only improves customer satisfaction but also drives higher conversion rates and increases revenue.

2. **Ensures Data Integrity** – We make sure the normalization and referential integrity in our system eliminate data redundancy, ensuring efficient, structured, and consistent data storage. This approach prevents data anomalies, enhances accuracy in transactions, and maintains reliable relationships between entities.

3. **Optimizes Performance** – We enhance system performance by leveraging indexes on primary and foreign keys, improving search and retrieval speed for large datasets, such as finding user orders or filtering products by category.

4. **Enhances Security & Compliance** – Secure handling of user data, payments, and authentication details prevents unauthorized access. We hash user passwords to ensure encrypted storage and protect against security breaches.

5. **Scalable for Future Growth** – The system is built for scalability, supporting multiple currencies, and new payment providers. Its modular design allows easy integration of additional features such as AI-driven recommendations, advanced analytics, and personalized marketing campaigns.

Conclusion

The Target 2.0 E-Commerce Management System is structured to provide an efficient, secure, and scalable solution that meets the needs of both customers and administrators. By aligning entities and relationships with business objectives, the system ensures seamless operations, trust, and digital retail excellence.