

Case Study:
Database Design & Development
for
E-commerce Platform

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1. Introduction

Amazon, the largest e-commerce platform, depends on strong databases to handle huge amounts of data. These databases help with:

- Managing product listings.
- Processing millions of customer orders daily.
- Ensuring smooth business operations.

Amazon’s success relies on:

- Managing large inventories.
- Improving operational efficiency.
- Enhancing customer experience.

2. Mission

"To provide customers with a seamless and personalized shopping experience through online."

3. Objectives

- **Inventory Management:** Ensure real-time tracking of product availability and optimize stock levels across Amazon's global network of warehouses.
- **Operational Efficiency:** Streamline the order processing and logistics pipeline to reduce delays and minimize operational costs.
- **Enhance Customer Experience:** Implement systems that allow personalized recommendations and seamless purchasing processes to improve customer satisfaction.

4. Database Design

The following section details the database design, including the tables, fields, relationships, variables, and Key Performance Indicators (KPIs) that support the mission and objectives.

a. Tables and Fields

| Table | Fields |
|----------|--|
| Users | UserID (Primary Key), FirstName, LastName, Email, PasswordHash, ShippingAddress, ContactNumber, CreatedAt, LastLogin |
| Products | ProductID (Primary Key), ProductName, ProductDescription, Price, StockQuantity, CategoryID, VendorID, CreatedAt |
| Orders | OrderID (Primary Key), UserID, OrderDate, TotalAmount, PaymentID, ShippingID, CreatedAt |

| Table | Fields |
|------------------------|--|
| Payments | PaymentID (Primary Key), PaymentMethod, PaymentStatus, TransactionDate |
| ShippingDetails | ShippingID (Primary Key), OrderID, ShippingAddress, ShippingDate, DeliveryDate, ShippingStatus |
| Vendors | VendorID (Primary Key), VendorName, VendorContact, VendorEmail, Address, CreatedAt |
| Inventory | InventoryID (Primary Key), ProductID, StockLevel, LastRestockDate |

b. Relationships

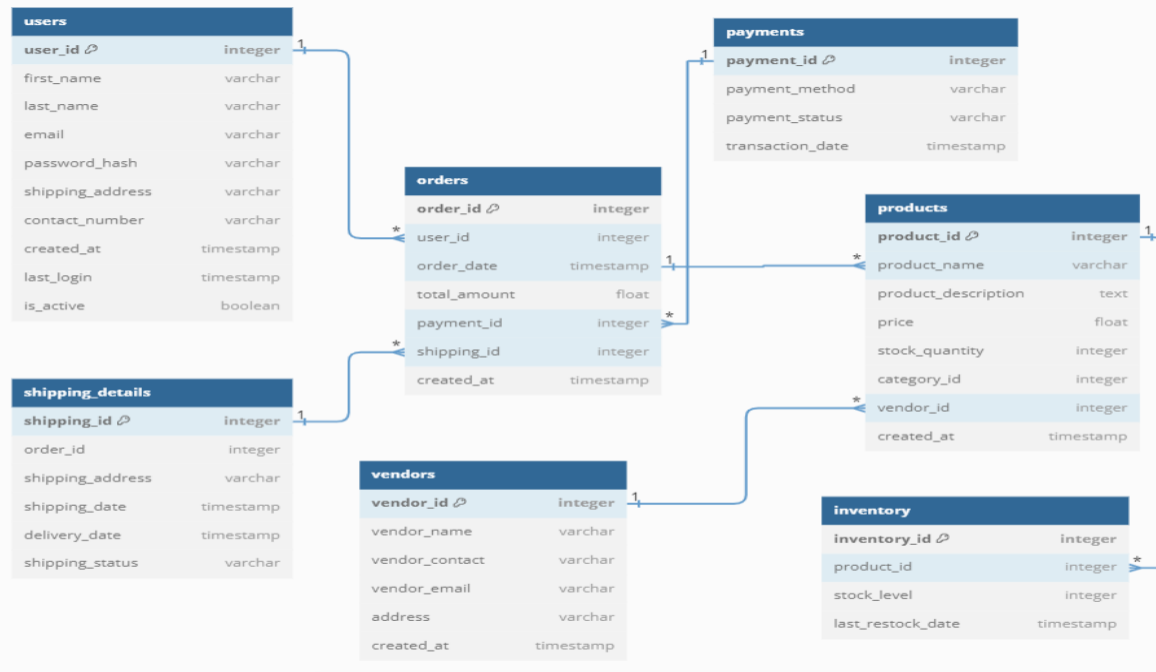
The relationships between the tables are vital to understanding the flow of information across different modules in Amazon's system. The primary relationships are as follows:

- **Users to Orders:** One-to-Many – A single user can place multiple orders.
- **Products to Vendors:** Many-to-One – Each product is supplied by one vendor, but a vendor can supply multiple products.
- **Orders to Payments:** One-to-One – Each order has a corresponding payment.
- **Orders to Shipping Details:** One-to-One – Each order has associated shipping details.
- **Products to Inventory:** One-to-One – Each product has a unique inventory record.

5. Entity-Relationship Diagram (ERD)

The ERD visually represents the relationships between the tables in Amazon's database.

- **Users** place **Orders**, which are composed of multiple **OrderItems**. Each **OrderItem** is associated with a specific **Product**.
- **Products** belong to a **Category** and are supplied by a **Vendor**.
- **Orders** are linked to **Payments** and **ShippingDetails** to ensure the order is paid for and delivered efficiently.
- **Users** also leave **Reviews** for **Products** they purchase, enhancing the customer experience by providing feedback.



6. Conclusion

Amazon's database plays a critical role in its success by:

- Supporting inventory management.
- Boosting operational efficiency.
- Enhancing customer satisfaction.

With real-time data on products, orders, and payments, Amazon can:

- Make data-driven decisions.
- Optimize its supply chain.
- Improve the customer experience.

A well-designed database helps Amazon run smoothly and achieve its mission of offering a seamless and personalized shopping experience.

Appendix A

a. Tables of Data Dictionary

Users

| Field | Data Type | Description |
|------------------------|-----------|--|
| UserID | Integer | (Primary key) unique identifier for each user. |
| FirstName | Varchar | User's first name. |
| LastName | Varchar | User's last name. |
| Email | Varchar | User's email address. |
| PasswordHash | Varchar | Encrypted password for user authentication. |
| ShippingAddress | Varchar | User's shipping address for orders. |
| ContactNumber | Varchar | User's contact phone number. |
| CreatedAt | Timestamp | Account creation date and time. |
| LastLogin | Timestamp | Last login date and time. |
| IsActive | Boolean | Indicates if the user's account is active. |

Products

| Field | Data Type | Description |
|---------------------------|-----------|---|
| ProductID | Integer | (Primary key) unique identifier for each product. |
| ProductName | Varchar | Name of the product. |
| ProductDescription | Text | Detailed description of the product. |

| | | |
|----------------------|-----------|---|
| Price | Float | Price of the product. |
| StockQuantity | Integer | Available quantity in stock. |
| CategoryID | Integer | (Foreign key) links to the product's category. |
| VendorID | Integer | (Foreign key) links to the product's vendor. |
| CreatedAt | Timestamp | Date and time the product was added. |

Orders

| Field | Data Type | Description |
|--------------------|-----------|--|
| OrderID | Integer | (Primary key) unique identifier for each order. |
| UserID | Integer | (Foreign key) links to the user who placed the order. |
| OrderDate | Timestamp | Date and time the order was placed. |
| TotalAmount | Float | Total price of the order. |
| PaymentID | Integer | (Foreign key) links to the payment details. |
| ShippingID | Integer | (Foreign key) links to the shipping details. |
| CreatedAt | Timestamp | Date and time the order was created. |

Payments

| Field | Data Type | Description |
|-----------------|-----------|--|
| PaymentID | Integer | (Primary key) unique identifier for each payment. |
| PaymentMethod | Varchar | Method of payment (e.g., credit card, PayPal). |
| PaymentStatus | Varchar | Status of the payment (e.g., completed, pending). |
| TransactionDate | Timestamp | Date and time the payment was made. |

Shipping Details

| Field | Data Type | Description |
|-----------------|-----------|--|
| ShippingID | Integer | (Primary key) unique identifier for shipping details. |
| OrderID | Integer | (Foreign key) links to the order being shipped. |
| ShippingAddress | Varchar | Address where the order is shipped. |
| ShippingDate | Timestamp | Date and time the order was shipped. |
| DeliveryDate | Timestamp | Estimated or actual delivery date. |
| ShippingStatus | Varchar | Status of the shipment (e.g., in transit, delivered). |

Vendors

| Field | Data Type | Description |
|------------|-----------|---|
| VendorID | Integer | (Primary key) unique identifier for each vendor. |
| VendorName | Varchar | Name of the vendor. |

| | | |
|----------------------|-----------|-------------------------------------|
| VendorContact | Varchar | Contact information of the vendor. |
| VendorEmail | Varchar | Email address of the vendor. |
| Address | Varchar | Physical address of the vendor. |
| CreatedAt | Timestamp | Date and time the vendor was added. |

Inventory

| Field | Data Type | Description |
|------------------------|-----------|--|
| InventoryID | Integer | (Primary key) unique identifier for each inventory entry. |
| ProductID | Integer | (Foreign key) links to the product. |
| StockLevel | Integer | Current stock level of the product. |
| LastRestockDate | Timestamp | Date and time of the last restock. |

Categories

| Field | Data Type | Description |
|-------------------------|-----------|--|
| CategoryID | Integer | (Primary key) unique identifier for each category. |
| CategoryName | Varchar | Name of the category (e.g., Electronics). |
| ParentCategoryID | Integer | (Foreign key) links to a parent category (if applicable). |

Appendix B

a. SQL Test Database

CONNECTIONS Welcome SQLQuery_1 - disconnected SQLQuery_2.sql - localh... (root)

SERVERS rani.database.windows.ne... C:\Users> ammbu > Downloads > Data Science > SQLQuery_2.sql

Run Cancel Disconnect Change Database: test

```
131
132
133 SELECT
134     Users.UserID,
135     Users.FirstName,
136     Users.LastName,
137     COUNT(Orders.OrderID) AS TotalOrders,
138     SUM(Orders.TotalAmount) AS TotalSpent,
139     Payments.PaymentMethod
140 FROM
141     Orders
142 JOIN
143     Users ON Orders.UserID = Users.UserID
144 JOIN
145     Payments ON Orders.PaymentID = Payments.PaymentID
146 GROUP BY
147     Users.UserID, Payments.PaymentMethod;
148
149
150
151
```

Results Messages

| | UserID | FirstName | LastName | TotalOrders | TotalSpent | PaymentMethod |
|---|--------|-----------|----------|-------------|------------|---------------|
| 1 | 1 | John | Doe | 1 | 1299.99 | Credit Card |
| 2 | 2 | Jane | Smith | 1 | 799.99 | PayPal |
| 3 | 3 | Sam | Brown | 1 | 1199.98 | Credit Card |

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CONNECTIONS Welcome SQLQuery_1 - disconnected SQLQuery_2.sql - localh... (root)

C:\Users> ammbu > Downloads > Data Science > SQLQuery_2.sql

Run Cancel Disconnect Change Database: test

```
130 JOIN Inventory ON Products.ProductID = Inventory.ProductID;
131
132 SELECT
133     Users.UserID,
134     Users.FirstName,
135     Users.LastName,
136     Orders.OrderID,
137     Orders.OrderDate,
138     Orders.TotalAmount,
139     Payments.PaymentMethod,
140     Payments.PaymentStatus,
141     ShippingDetails.ShippingAddress,
142     ShippingDetails.ShippingDate,
143     ShippingDetails.DeliveryDate,
144     ShippingDetails.ShippingStatus
145 FROM
146     Orders
147 JOIN
148     Users ON Orders.UserID = Users.UserID
149 JOIN
150     Payments ON Orders.PaymentID = Payments.PaymentID
151 JOIN
152     ShippingDetails ON Orders.OrderID = ShippingDetails.OrderID;
153
154
```

Results Messages

| UserID | FirstName | LastName | OrderID | OrderDate | TotalAmount | PaymentMethod | PaymentStatus | ShippingAddress | ShippingDate | DeliveryDate | ShippingStatus |
|--------|-----------|----------|---------|---------------------|-------------|---------------|---------------|-----------------------------|---------------------|---------------------|----------------|
| 1 | John | Doe | 1001 | 2023-09-10 00:00:00 | 1299.99 | Credit Card | Completed | 123 Main St, New York, NY | 2023-09-11 00:00:00 | 2023-09-13 00:00:00 | Delivered |
| 2 | Jane | Smith | 1002 | 2023-09-12 00:00:00 | 799.99 | PayPal | Completed | 456 Elm St, Los Angeles, CA | 2023-09-13 00:00:00 | 2023-09-15 00:00:00 | Delivered |
| 3 | Sam | Brown | 1003 | 2023-09-15 00:00:00 | 1199.98 | Credit Card | Pending | 789 Oak St, Chicago, IL | 2023-09-16 00:00:00 | NULL | Shipped |

Thank You