# Case Study: Customer Order and Shipping Management System

## 1. Objective

The objective of this case study is to design and implement a **Customer Order and Shipping Management System** that:

* Stores customer information securely.
* Tracks customer orders with relevant details.
* Manages shipping records and statuses.
* Establishes clear relationships between entities for efficient querying and reporting.

## 2. Problem Statement

Organizations dealing with sales and deliveries often need to:

* Maintain a database of customers.
* Keep track of multiple orders placed by each customer.
* Monitor shipping status for better delivery management.

A relational database schema ensures **data integrity, easy updates, and scalable reporting**.

## 3. Database Design

### Entities

1. **Customers**
   * Holds customer personal details.
   * Primary Key: customer\_id.
2. **Orders**
   * Stores items purchased and amount spent.
   * Each order is linked to one customer.
   * Primary Key: order\_id.
   * Foreign Key: customer\_id.
3. **Shippings**
   * Maintains shipping status for customers.
   * Each shipping record belongs to one customer.
   * Primary Key: shipping\_id.
   * Foreign Key: customer.

## 4. Relationships

* **Customers → Orders**: One-to-Many  
  (A customer can place multiple orders).
* **Customers → Shippings**: One-to-Many  
  (A customer can have multiple shipping records).

## 5. Sample Data Inserted

### Customers

| **customer\_id** | **first\_name** | **last\_name** | **age** | **country** |
| --- | --- | --- | --- | --- |
| 1 | John | Doe | 31 | USA |
| 2 | Robert | Luna | 22 | USA |
| 3 | David | Robinson | 22 | UK |
| 4 | John | Reinhardt | 25 | UK |
| 5 | Betty | Doe | 28 | UAE |

### Orders

| **order\_id** | **item** | **amount** | **customer\_id** |
| --- | --- | --- | --- |
| 1 | Keyboard | 400 | 4 |
| 2 | Mouse | 300 | 4 |
| 3 | Monitor | 12000 | 3 |
| 4 | Keyboard | 400 | 1 |
| 5 | Mousepad | 250 | 2 |

### Shippings

| **shipping\_id** | **status** | **customer** |
| --- | --- | --- |
| 1 | Pending | 2 |
| 2 | Pending | 4 |
| 3 | Delivered | 3 |
| 4 | Pending | 5 |
| 5 | Delivered | 1 |

## 6. SQL Queries and Use Cases

### 6.1 Customer Data Retrieval

1. **Retrieve all customer records**

SELECT \* FROM Customers;

1. **Get details of customers from the UK**

SELECT \* FROM Customers

WHERE country = 'UK';

1. **Get customers older than 25 and from either the USA or UK**

SELECT \* FROM Customers

WHERE age > 25

AND country IN ('USA', 'UK');

1. **Find customers aged between 22 and 28**

SELECT \* FROM Customers

WHERE age BETWEEN 22 AND 28;

1. **Get customers from either USA or UAE**

SELECT \* FROM Customers

WHERE country IN ('USA', 'UAE');

1. **Find customers whose first name starts with 'Jo'**

SELECT \* FROM Customers

WHERE first\_name LIKE 'Jo%';

1. **List distinct countries**

SELECT DISTINCT country FROM Customers;

### 6.2 Order Analysis

1. **Get the top 3 highest value orders**

SELECT \* FROM Orders

ORDER BY amount DESC

LIMIT 3;

1. **Select orders where amount is not null**

SELECT \* FROM Orders

WHERE amount IS NOT NULL;

1. **Round off amounts**

SELECT order\_id, amount,

ROUND(amount, -2) AS rounded\_amount,

CEIL(amount) AS ceiling\_amount,

FLOOR(amount) AS floor\_amount

FROM Orders;

1. **Compare each order’s amount to the average**

SELECT order\_id, amount,

CASE

WHEN amount > (SELECT AVG(amount) FROM Orders) THEN 'Above Average'

ELSE 'Below Average'

END AS comparison\_result

FROM Orders;

1. **Aggregate statistics on orders**

SELECT SUM(amount) AS total\_amount,

AVG(amount) AS average\_amount,

MIN(amount) AS minimum\_amount,

MAX(amount) AS maximum\_amount

FROM Orders;

### 6.3 Customer Insights

1. **Show each customer’s name and age category**

SELECT first\_name, last\_name, age,

CASE

WHEN age < 25 THEN 'Youth'

WHEN age BETWEEN 25 AND 30 THEN 'Adult'

ELSE 'Senior'

END AS age\_group

FROM Customers;

1. **Show each customer’s full name formatted as LASTNAME, firstname**

SELECT CONCAT(UPPER(last\_name), ', ', LOWER(first\_name)) AS formatted\_name

FROM Customers;

1. **Customers with more than 1 order**

SELECT customer\_id, COUNT(\*) AS total\_orders

FROM Orders

GROUP BY customer\_id

HAVING COUNT(\*) > 1;

1. **Customers with >1 order, sorted by number of orders**

SELECT customer\_id, COUNT(\*) AS total\_orders

FROM Orders

GROUP BY customer\_id

HAVING COUNT(\*) > 1

ORDER BY total\_orders DESC;

1. **Total amount spent per customer (if > 500)**

SELECT customer\_id, SUM(amount) AS total\_spent

FROM Orders

GROUP BY customer\_id

HAVING SUM(amount) > 500

ORDER BY customer\_id;

## 6. Insights from the Case Study

### 1. Customer Demographics

* Total Customers: **5**
* Countries represented: **USA, UK, UAE**
* Most customers are from **USA (2)** and **UK (2)**, with **UAE (1)**.
* Age distribution:
  + **Youth (<25 years)** → 2 customers (Robert, David)
  + **Adults (25–30 years)** → 2 customers (John Reinhardt, Betty)
  + **Senior (31+ years)** → 1 customer (John Doe)

The system covers a **young to mid-aged customer base**, with majority under 30.

### 2. Order Trends

* Total Orders: **5**
* Highest order value: **₹12,000 (Monitor by David Robinson)**
* Lowest order value: **₹250 (Mousepad by Robert Luna)**
* Top 3 Orders (by amount): Monitor (12,000), Keyboard (400), Keyboard (400).
* Customers with multiple orders:
  + **John Reinhardt** → 2 orders (Keyboard & Mouse).
* Customers with single orders: John Doe, Robert Luna, David Robinson.

**High-value orders are rare** (only one > ₹1,000). Most purchases are small items like keyboards, mouse, mousepads.

### 3. Spending Patterns

* Average order amount: **₹2,670**
* Customers spending > ₹500:
  + David Robinson (12,000)
  + John Reinhardt (700 total)
* Customers spending ≤ ₹500: John Doe (400), Robert Luna (250).

Only **2 customers contribute significantly to revenue** (> ₹500).

### 4. Shipping Insights

* Total Shipping Records: **5**
* Status Distribution:
  + **Pending** → 3 (Robert, John Reinhardt, Betty)
  + **Delivered** → 2 (David, John Doe)
* Customers with both orders and successful deliveries:
  + David Robinson (Monitor, Delivered)
  + John Doe (Keyboard, Delivered)

**60% of shippings are still pending**, which may affect customer satisfaction.

### 5. Key Business Insights

* **Revenue concentration risk**: Majority of revenue comes from **David Robinson (UK)**.
* **Cross-selling opportunity**: Low-spending customers (Robert, John Doe) can be targeted with bundled offers.
* **Delivery efficiency gap**: With only **40% deliveries completed**, shipping process needs optimization.
* **Customer loyalty indicator**: Only **1 customer (John Reinhardt)** placed multiple orders → potential loyal buyer.

In summary:

* Customers are mostly **young (22–28 years)**.
* **UK customers contribute the highest revenue** (David’s ₹12,000 order).
* **Order values are skewed**: 1 very high-value order, rest are low-value.
* **Shipping delays** need urgent improvement to avoid customer dissatisfaction.