E-Commerce Sales and Customer Behavior Analysis

This article provides a step-by-step guide to understanding the how an **E-commerce platform** can store, manage, and analyse sales and customer behaviour data efficiently. The project is designed to offer hands-on experience with key database and analytics concepts used in online retail systems including:

- Creating a well-structured relational database for e-commerce operations.
- Inserting and managing customer and order transaction data.
- Writing SQL queries to explore purchasing patterns and customer behaviours trends.
- Measuring sales performance, product demand, and customer loyalty through data insights.

By the end of this project, readers will understand how SQL can be leveraged to manage and analyze **E-commerce sales data** effectively, enabling data-driven decisions to improve customer engagement and business growth.

Project Overview :

- This project simulates an **E-commerce platform's sales and customer behavior analysis system**. It involves creating and managing customer, product, and order data through **relational database tables**.
- Using structured SQL queries, the project analyzes **purchase patterns, product popularity, and revenue performance**.
- The main objective is to understand how SQL can be used to **derive actionable insights** from e-commerce data — helping businesses improve sales strategies, optimize product offerings, and enhance customer satisfaction in a real-world digital marketplace.

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Let's start building !

Step 1: Setting Up the Database Schema

Create Database

```
Create databse ECommerceAnalytics
use ECommerceAnalytics
```

Customers Table

```
CREATE TABLE Customerss (
    CustomerID INT IDENTITY(1,1) PRIMARY KEY,
    FirstName VARCHAR(50),
    LastName VARCHAR(50),
    Gender VARCHAR(10),
    Age INT,
    City VARCHAR(50),
    State VARCHAR(50),
    JoinDate DATE,
    LoyaltyScore INT,
    PreferredCategory VARCHAR(50)
);
```

Orders Table

```
CREATE TABLE Orderss (
    OrderID INT IDENTITY(1,1) PRIMARY KEY,
    CustomerID INT FOREIGN KEY REFERENCES Customerss(CustomerID),
    OrderDate DATE,
    ProductCategory VARCHAR(50),
    PaymentMethod VARCHAR(30),
    Quantity INT,
    UnitPrice DECIMAL(10,2),
    Discount DECIMAL(5,2),
    TotalAmount DECIMAL(10,2),
    Region VARCHAR(50)
);
```

Step 2: Data Insertion

- After setting up the database schema, we insert sample data into the *Customers* and *Orders* tables.
- This dataset includes detailed customer profiles from various cities, product information across multiple categories, and order transactions with varying quantities and prices.
- It represents a large and realistic dataset designed to simulate an actual e-commerce environment for effective analysis.
- Due to the extensive size of the data**,** only a portion of the records is displayed in this file — the complete dataset is stored in the database for detailed querying and analysis.

Insert Customers:

```
INSERT INTO Customerss (FirstName, LastName, Gender, Age, City, State, JoinDate, LoyaltyScore,
PreferredCategory)
VALUES
('Aarav', 'Sharma', 'Male', 49, 'Navi Mumbai', 'Maharashtra', '2024-10-05', 79, 'Books'),
('Harsh', 'Kaur', 'Male', 42, 'Jaipur', 'Rajasthan', '2021-09-15', 42, 'Groceries'),
('Harsh', 'Patel', 'Male', 60, 'Bhopal', 'Madhya Pradesh', '2023-03-26', 47, 'Books'),
('Neha', 'Joshi', 'Female', 39, 'Chennai', 'Tamil Nadu', '2024-07-02', 39, 'Home Decor'),
('Pooja', 'Shetty', 'Female', 50, 'Nashik', 'Maharashtra', '2021-04-11', 53, 'Beauty'),
```

Insert Orders:

```
INSERT INTO Orderss (CustomerID, OrderDate, ProductCategory, PaymentMethod, Quantity,
UnitPrice, Discount, TotalAmount, Region)
VALUES
(99, '2021-06-26', 'Electronics', 'Cash', 1, 28349.97, 5, 26932.47, 'Central'),
(27, '2022-02-04', 'Beauty', 'Net Banking', 2, 1479.96, 10, 2663.93, 'South'),
(1259, '2021-03-24', 'Beauty', 'Debit Card', 2, 29617.45, 20,47387.92,'North'),
(1397, '2025-02-02', 'Groceries', 'Cash', 5, 1606.99, 5, 7633.2, 'South'),
(154,'2021-06-02','Electronics','Credit Card',5,6988.58,10,31448.61,'Central'),
```

Step 3 : SQL Queries to Explore Insights

Now that the database is populated with sample records, we will use SQL queries to answer real-world e-commerce business questions.
These queries are designed to uncover valuable insights from sales and customer data, helping understand purchasing patterns and overall performance.

These queries aim to:
- Analyse **customer behaviour and shopping frequency**
- Identify **best-selling products and categories**
- Measure **overall and monthly sales performance**
- Compare **customer activity and revenue across cities**
- Detect **high-value customers and premium transactions**

The next section includes SQL queries grouped by key business objectives:
- Customer Purchase Analysis
- Product Performance & Demand Trends
- Revenue & Sales Insights
- City-wise Customer Distribution
- High-Value Customer Identification

Step 4 : Business Analysis & Use Cases

1. Total Number of Customers

```
select count(*) as total_customers from Customerrss
select count(*) as total_orders from Orderrss
```

Insight: The Company currently serves a wide customer base, and the total order volume indicates active user engagement on the platform.

2. Total Revenue Generated from Orders

```
select round(sum(TotalAmount),0) as total_income from Orderrss
```

Insight: This helps management evaluate overall sales performance and financial health. The total Amount generated from the given data is RS 61212972.00

3. Average Order Value (AOV)

```
select AVG(TotalAmount) as avg_amount from Orderrss
```

Insight: The Average Order Value is RS 40808.64

4. Most Popular Product Category

```
select top 1 ProductCategory,count(*) as Total_orders from Orderrss
group by ProductCategory
order by Total_orders desc
```

Insight: <u>Fashion</u> is the most popular category**.**

5. Highest Spending Top 5 Customers

```
select top 5 c.FirstName,c.LastName,round(sum(o.TotalAmount),0) as Total_spent
from Customerrss c
join Orderrss o on c.CustomerID=o.CustomerID
group by c.FirstName,c.LastName
order by Total_spent Desc
```

Insight: Top 5 Customers by spending highest amount are :
1)Simran Ghosh (Rs 4,77,446)
2)Parth Pillai (Rs 4,75,852)
3)Pooja Kulkarni (Rs 4,52,217)
4)Meera Singh Rs 4,26,181)
5)Nisha Menon (Rs 4,14,516)

6. Orders by Payment Mode

```
select PaymentMethod,count(*) as total_orders
from Orderrss
group by PaymentMethod
order by total_orders desc
```

Insight: Orders by Various Payment modes are:
1) Net Banking – 326 Orders
2) Cash - 306 Orders
3) UPI - 297 Orders
4)Credit Card - 295 Orders
5)Debit Card - 276 Orders

Most of the Customers prefer **Net Banking** as Payment option

7. Gender-based Orders

```
select c.Gender,count(o.OrderID) as total_orders
from Customerrss c
join Orderrss o on c.CustomerID=o.CustomerID
group by c.Gender
order by total_orders desc
```

Insight: Male – 752 Female 748

8. Revenue by City (Top 5 Cities)

```
select top 5 c.City,round(sum(o.TotalAmount),0) as total_Revenue
from Customerrss c
join Orderrss o on c.CustomerID=o.CustomerID
group by c.City
order by total_Revenue Desc
```

Insight: Top 5 cities by Revenue are:

1) Delhi – Rs 43,00,524
2) Thane – Rs 42,86,545
3) Chandigarh – Rs 38,97,287
4) Bhopal – Rs 36,17,454
5) Surat – Rs 35,84,381

9. Orders Placed in Each Month

```
select MONTH(Orderdate) as Month ,count(*) as total_orders
from Orderrss
group by month(OrderDate)
order by month(OrderDate) asc
```

Insight: Orders in each months are:

1--165
2--110
3--119
4--130
5--117
6--125
7--134
8--112
9--121
10--121
11--116

10. To find customers who spend more than the average order amount.

```
select top 10 c.FirstName,sum(o.TotalAmount) AS Total_amount
from Customerrss c
join Orderrss o on c.CustomerID=o.CustomerID
group by c.FirstName
having sum(o.TotalAmount) > (Select avg(TotalAmount) from Orderrss)
```

Insight: Top 10 customers who spend above the Average

1) Divya - Rs 22,49,334
2) Manoj - Rs 21,90,019
3) Kiran - Rs 16,09,038
4) Rahul - Rs 17,75,764
5) Harsh - Rs 19,88,433
6) Ankit - Rs 21,09,793
7) Aditya - Rs 20,94,245
8) Kavya - Rs 21,66,035
9) Pooja - Rs 16,42,562
10) Anaya - Rs 17,48,476

Step 5: Summary & Conclusion

- This project demonstrates how SQL can be effectively applied to manage and analyze e-commerce sales and customer behavior data.
- Through structured queries, we uncovered insights into sales performance, product trends, and customer segmentation.
- The analysis identified top customers, high-performing regions, and payment preferences that contribute to business growth.
- Overall, this project highlights the power of **data-driven decision-making** in modern e-commerce environments.