

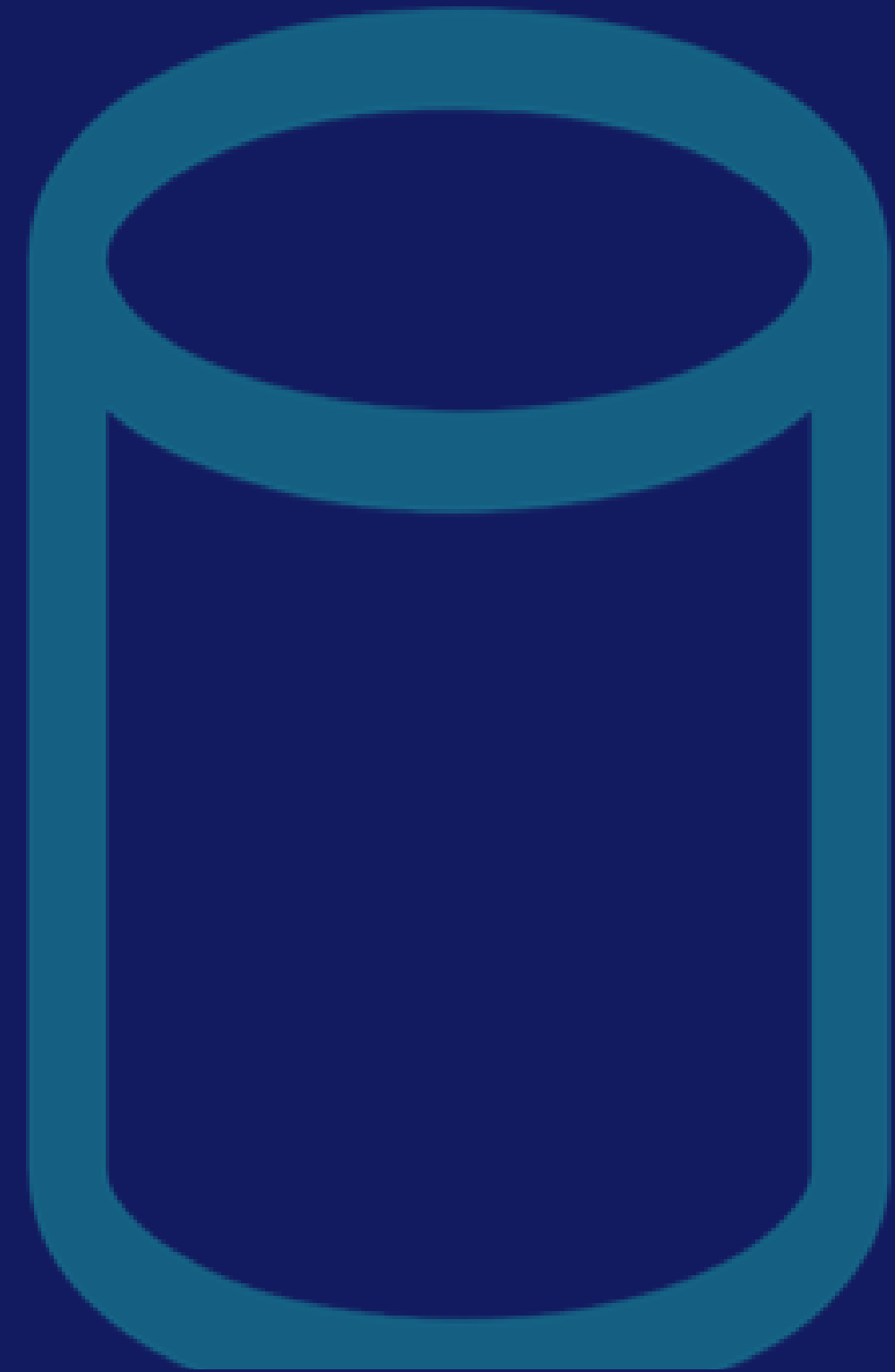
# Customer Data Management and Analysis

From Database Design to Data Warehousing and Visualizations



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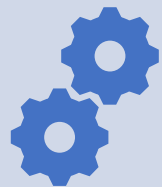




# Project Overview



**Objective:** Develop a customer data management system integrating a transactional database, data warehouse, and data visualization.



**Key Phases:** Database schema design, data warehouse setup, ETL process, Python and Power BI visualizations.



**Technologies:** SQL Server, Python, Power BI, SSIS.



1

# Database Design



# Key Database Phases

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ERD

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Mapping

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Database Schema

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Stored Procedures

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Views

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Indexes



# Original Database Design

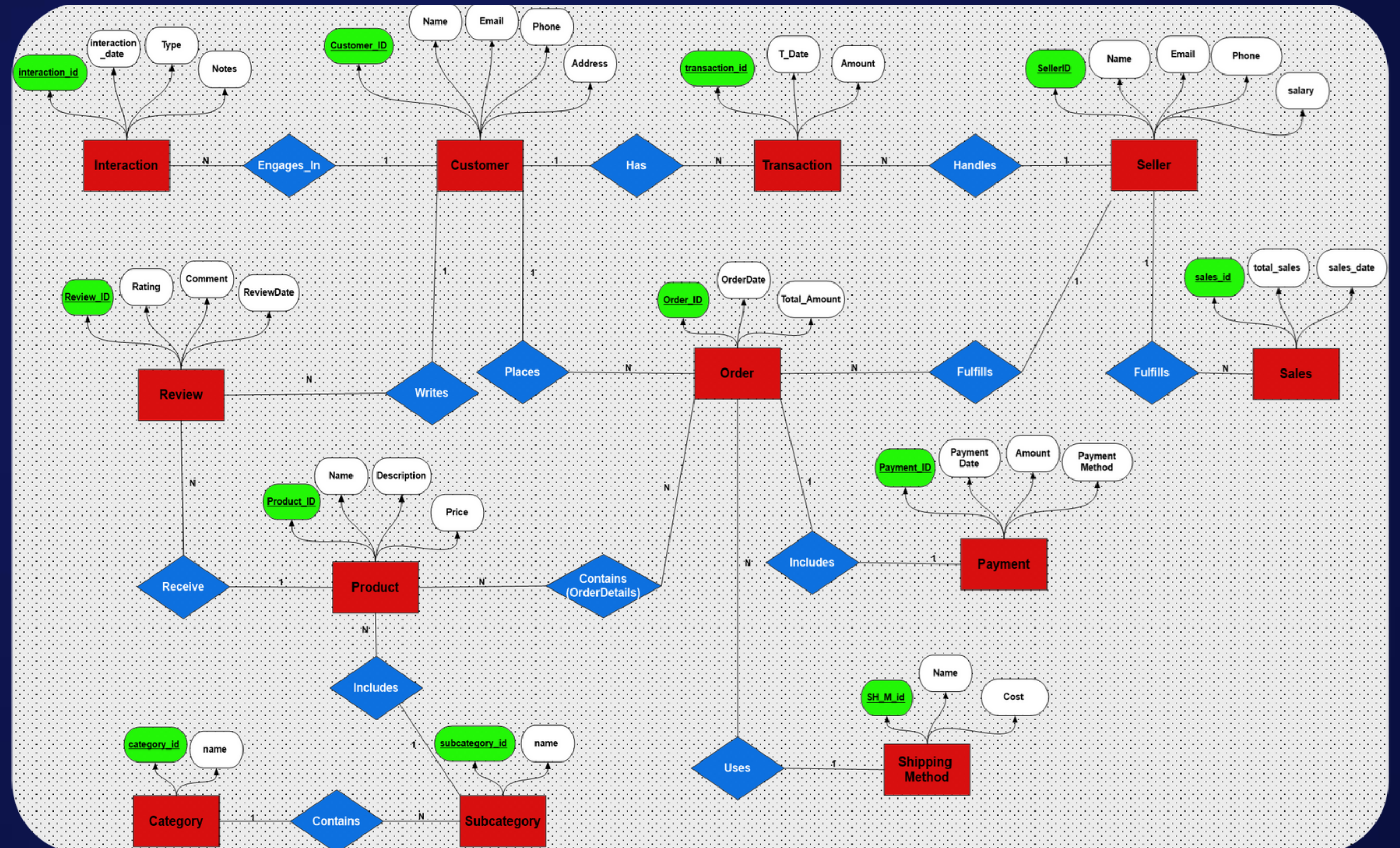
## Overview

We created a relational database with key entities such as Customers, Orders, Products, Payments, and Sellers.

## Key Tables

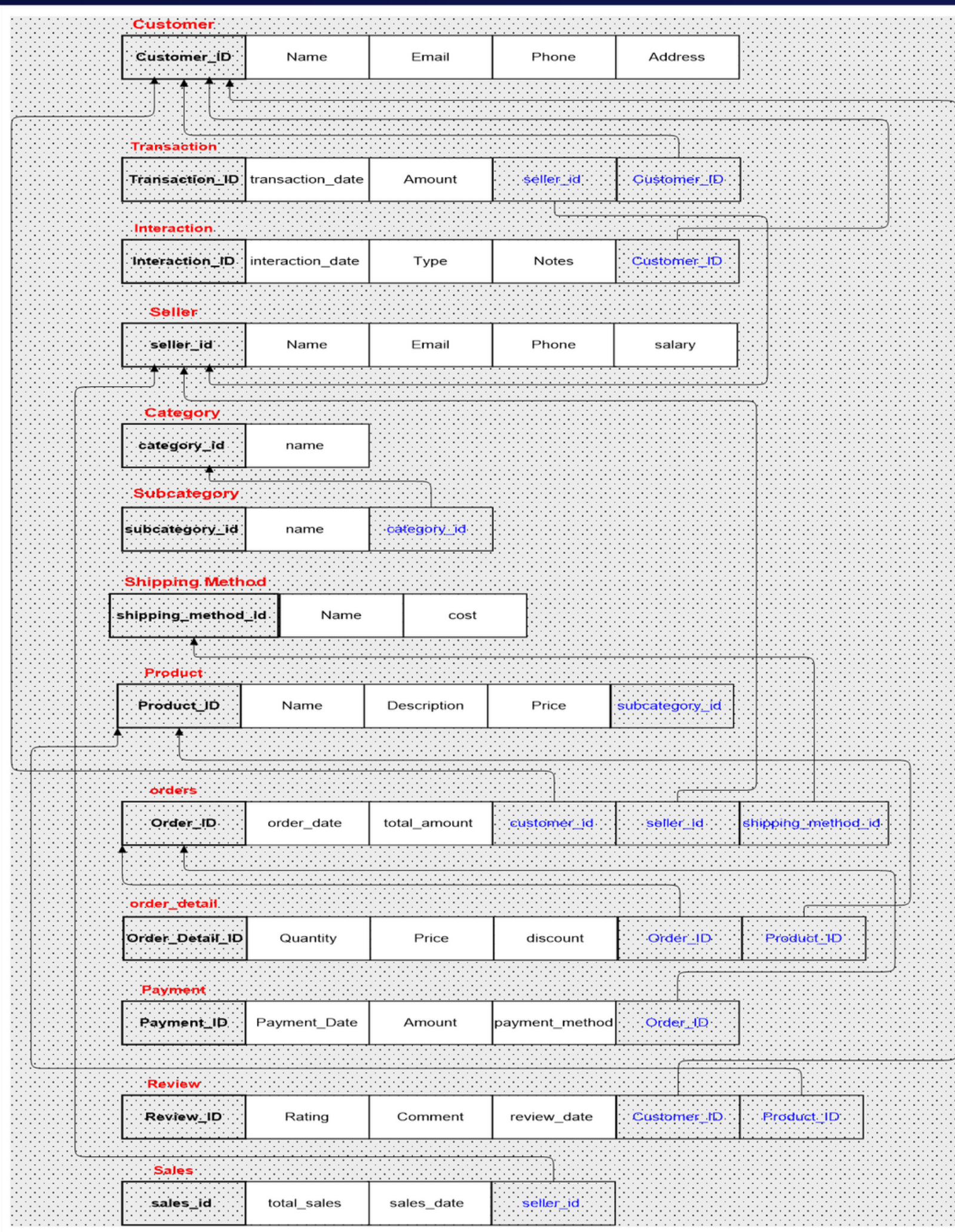
Customer, Product, Seller, Payment, Order.

## Entity Relationship Diagram (ERD)





# Data Mapping Overview



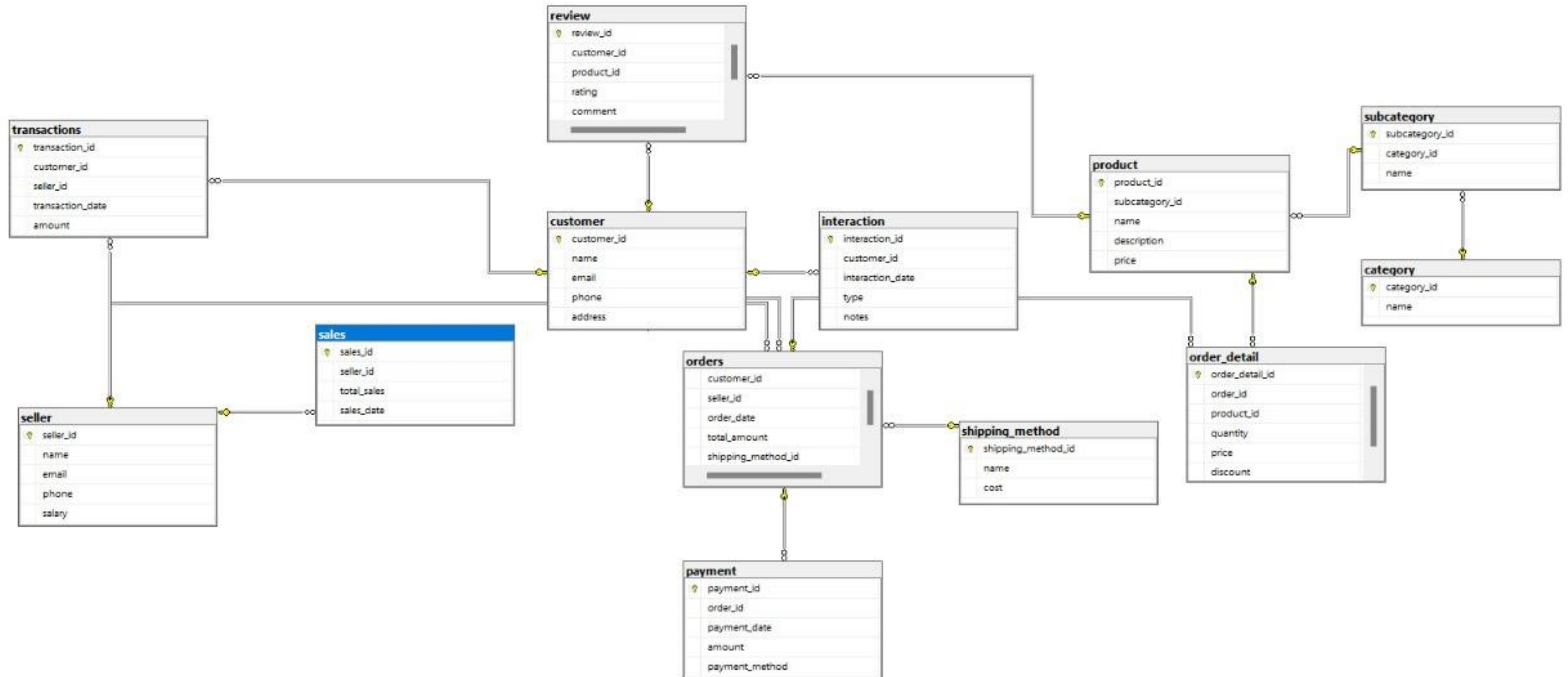


# Sample data of our products

DESKTOP-P42EG0V.F...IDB - dbo.product					
	product_id	subcategory_id	name	description	price
▶	1	1	iPhone 14	Latest model with advanced features	999.99
	2	1	Samsung G...	High-performance smartphone with great camera	899.99
	3	2	Dell XPS 13	Lightweight laptop with powerful performance	1299.99
	4	2	HP Spectre ...	2-in-1 laptop with a stunning display	1499.99
	5	3	LG 55 inch 4...	Ultra HD Smart TV with vivid colors	699.99
	6	4	The Great G...	A classic novel by F. Scott Fitzgerald	15.99
	7	4	Becoming	A memoir by Michelle Obama	20.99
	8	5	Yoga Mat	Non-slip yoga mat for your workouts	25.99
	9	5	Tennis Racket	Lightweight racket for perfect swings	89.99
	10	6	Moisturizin...	Hydrating cream for all skin types	35.99
	11	6	Shampoo	Gentle shampoo for healthy hair	12.99
	12	7	Monopoly B...	Classic board game for family fun	29.99
	13	7	Action Figur...	Collectible action figures from popular movies	49.99
	14	8	Car Vacuum...	Compact vacuum for car cleaning	45.99
	15	9	Organic Gre...	Premium organic green tea leaves	19.99
	16	9	Potato Chips	Crispy and salty snacks	2.99
	17	10	Leather Sofa	Elegant leather sofa for living room	1299.99
	18	10	Wooden Di...	Sturdy dining table for family gatherings	799.99
	19	1	Bluetooth H...	Wireless headphones with noise cancellation	199.99
	20	2	Mens Casua...	Comfortable and stylish casual shirt	49.99
*	NULL	NULL	NULL	NULL	NULL



# Database Schema



# Stored Procedures

## Some other procedures

+ [System Stored Procedures]
+ [dbo.AddCategory]
+ [dbo.AddCustomer]
+ [dbo.AddInteraction]
+ [dbo.AddOrderDetail]
+ [dbo.AddOrders]
+ [dbo.AddPayments]
+ [dbo.AddProduct]
+ [dbo.AddReview]
+ [dbo.AddSales]
+ [dbo.AddSeller]
+ [dbo.AddShippingMethod]
+ [dbo.AddSubcategory]
+ [dbo.AddTransaction]
+ [dbo.CancelOrder]
+ [dbo.deleteCustomer]
+ [dbo.DeleteProduct]
+ [dbo.GetCustomerOrders]

## Stored Procedure to add/place new order

```
--10) insert into order
CREATE PROCEDURE AddOrders
    @order_id INT,
    @customer_id INT,
    @seller_id INT,
    @order_date DATE,
    @total_amount DECIMAL(10, 2),
    @shipping_method_id INT
AS
BEGIN
    INSERT INTO orders (order_id, customer_id, seller_id, order_date, total_amount, shipping_method_id)
    VALUES (@order_id, @customer_id, @seller_id, @order_date, @total_amount, @shipping_method_id);
END;
```

## Procedure to get the number of orders placed by a specific customer

```
--23) get customer order
CREATE PROCEDURE GetCustomerOrders
    @customer_id INT
AS
BEGIN
    SELECT *
    FROM orders
    WHERE customer_id = @customer_id;
END;
EXEC GetCustomerOrders 5
```

87 %

Results Messages

	name	order_id	order_date	product_id	Quantity	price
1	Youssef Adel	5	2024-10-01	5	2	699.99



# Views

- [-] Views
  - [+] System Views
  - [+] dbo.cat\_Pro
  - [+] dbo.category\_sum
  - [+] dbo.cus\_order
  - [+] dbo.cust\_order
  - [+] dbo.customer\_info
  - [+] dbo.customer\_orders\_count
  - [+] dbo.customer\_reviews
  - [+] dbo.daily\_sales
  - [+] dbo.inter\_summary
  - [+] dbo.order\_ship\_info
  - [+] dbo.payment\_det
  - [+] dbo.prd\_subcat
  - [+] dbo.product\_review\_summary

```
--view 6: customer order details
create view cust_order as
select c.customer_id,c.name as customer_name,od.order_id,od.quantity,o.total_amount,p.name as product_name
from customer c
join orders o on c.customer_id=o.customer_id
join order_detail od on o.order_id=od.order_id
join product p on od.product_id=p.product_id

select * from cust_order
```

106 %

Results Messages

	customer_id	customer_name	order_id	quantity	total_amount	product_name
1	1	Ahmed Ali	1	2	1994.98	iPhone 14
2	2	Sara Youssef	2	1	899.99	Samsung Galaxy S23
3	3	Mohamed Nabil	3	3	3897.97	Dell XPS 13
4	4	Mona Fathy	4	1	1494.99	HP Spectre x360
5	5	Youssef Adel	5	2	1399.98	LG 55 inch 4K TV
6	6	Khaled Samir	6	1	5.99	The Great Gatsby
7	7	Rania Mahmoud	7	4	83.96	Becoming
8	8	Omar Ahmed	8	1	15.99	Yoga Mat
9	9	Laila Hassan	9	1	84.99	Tennis Racket
10	10	Tarek Ismail	10	3	107.97	Moisturizing Cream
11	11	Samira Tawfik	11	2	25.98	Shampoo
12	12	Hassan El-Sayed	12	5	144.95	Monopoly Board Game
13	13	Heba Yassin	13	3	149.97	Action Figure Set
14	14	Ali Kamal	14	4	183.96	Car Vacuum Cleaner
15	15	Fatma Mostafa	15	1	19.99	Organic Green Tea
16	16	Wael Ibrahim	16	2	5.98	Potato Chips
17	17	Marwa Hamdy	17	1	1299.99	Leather Sofa
18	18	Hany Sherif	18	2	1599.98	Wooden Dining Table
19	19	Nadia Maher	19	1	194.99	Bluetooth Headphones
20	20	Ziad Osama	20	1	49.99	Mens Casual Shirt
21	21	Sherif Amr	21	3	2999.97	iPhone 14
22	22	Samar Fathy	22	2	1799.98	Samsung Galaxy S23

Query executed successfully.

localh

# Indexes

Created for better performance and querying on the most queried columns withing each table.

```
-- Customer Table Indexes
CREATE INDEX idx_customer_email ON customer(email);
CREATE INDEX idx_customer_phone ON customer(phone);

-- Seller Table Indexes
CREATE INDEX idx_seller_email ON seller(email);
CREATE INDEX idx_seller_phone ON seller(phone);

-- Transactions Table Indexes
CREATE INDEX idx_transactions_customer_id ON transactions(customer_id);
CREATE INDEX idx_transactions_seller_id ON transactions(seller_id);
CREATE INDEX idx_transactions_date ON transactions(transaction_date);

-- Category and Subcategory Tables Indexes
CREATE INDEX idx_subcategory_category_id ON subcategory(category_id);

-- Product Table Indexes
CREATE INDEX idx_product_subcategory_id ON product(subcategory_id);
CREATE INDEX idx_product_price ON product(price);

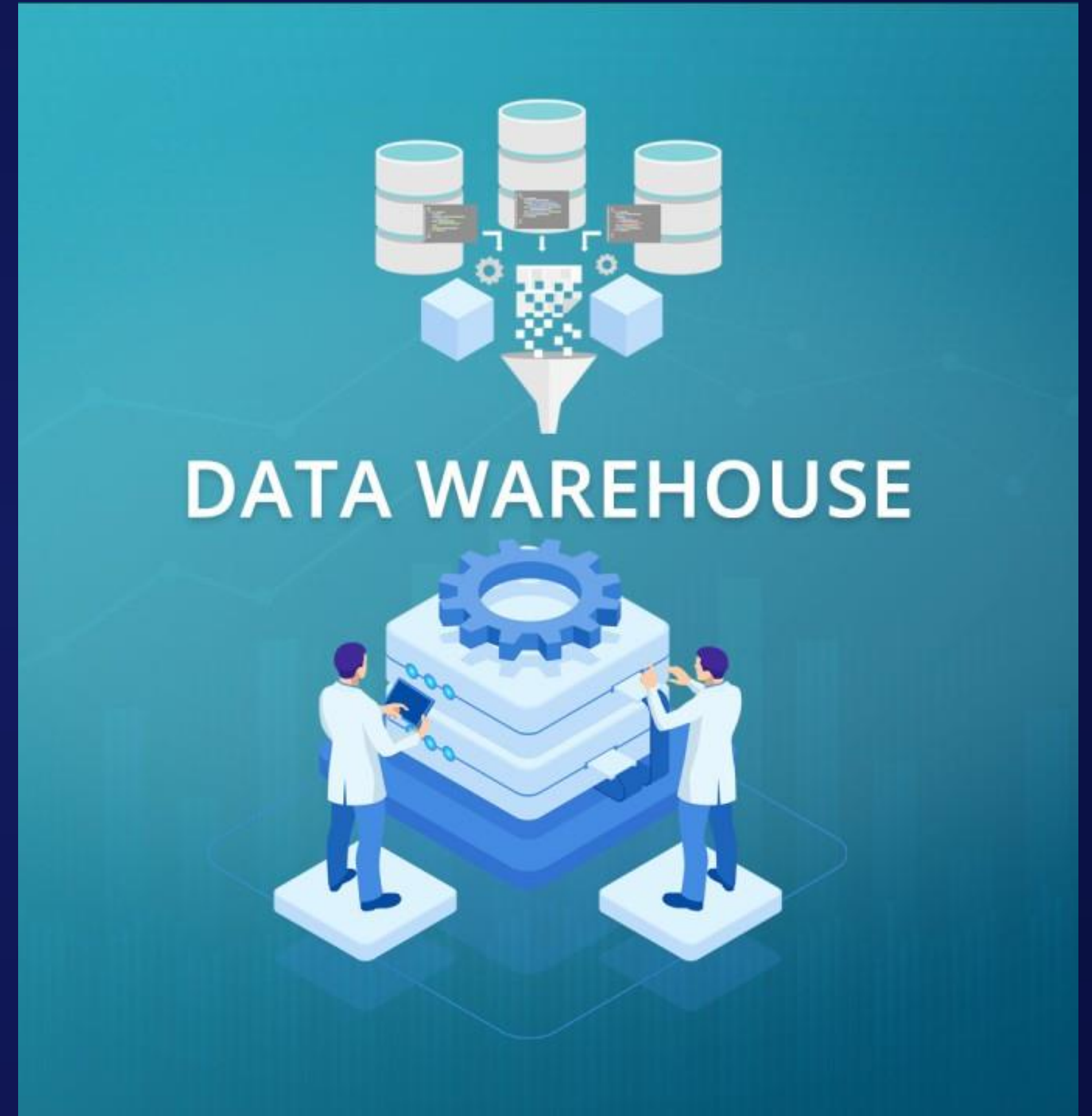
-- Shipping Method Table Indexes
CREATE INDEX idx_shipping_method_name ON shipping_method(name);

-- Orders Table Indexes
CREATE INDEX idx_orders_customer_id ON orders(customer_id);
CREATE INDEX idx_orders_seller_id ON orders(seller_id);
CREATE INDEX idx_orders_date ON orders(order_date);
```



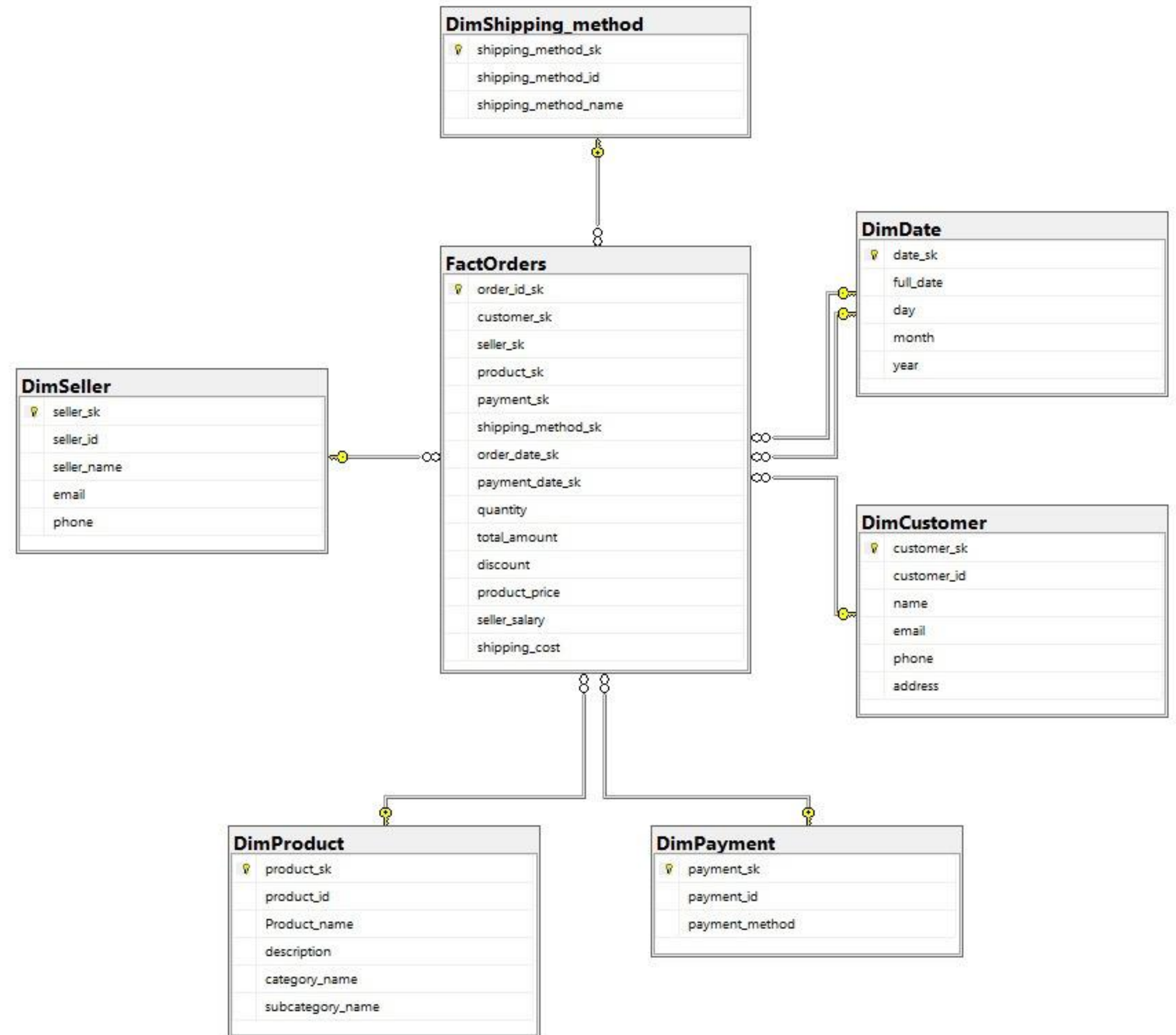
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# Data Warehouse Schema



# Data Warehouse Schema: (Star Schema)

- **Explanation:** Implemented a star schema for easier querying and reporting.
- **Fact Table:** FactOrders (storing metrics like quantity, price, total amount, etc.)
- **Dimensions:** DimCustomer, DimProduct, DimSeller, DimShippingMethod, DimPayment, DimDate





DESKTOP-P42EG0V.F...- dbo.DimProduct							DESKTOP-P42EG0V....- dbo.DimPayment							DESKTOP-P42EG0V....dbo.DimCustomer							DESKTOP-P42EG0V.F...H - dbo.DimSeller							DESKTOP-P42EG0V....- dbo.DimPayment																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	product_sk	product_id	Product_name	description	category_name	subcategory_name												seller_id	seller_name	email	phone																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

DESKTOP-P42EG0V....- dbo.DimPayment				DESKTOP-P42EG0V....- dbo.DimPayment			
	payment_sk	payment_id	payment_method				
▶	1	1	paypal				
	2	2	bank_transfer				
	3	3	credit_card				
	4	4	paypal				
	5	5	bank_transfer				
	6	6	credit_card				
	7	7	paypal				
	8	8	bank_transfer				

Dimension tables

# Fact table (orders)

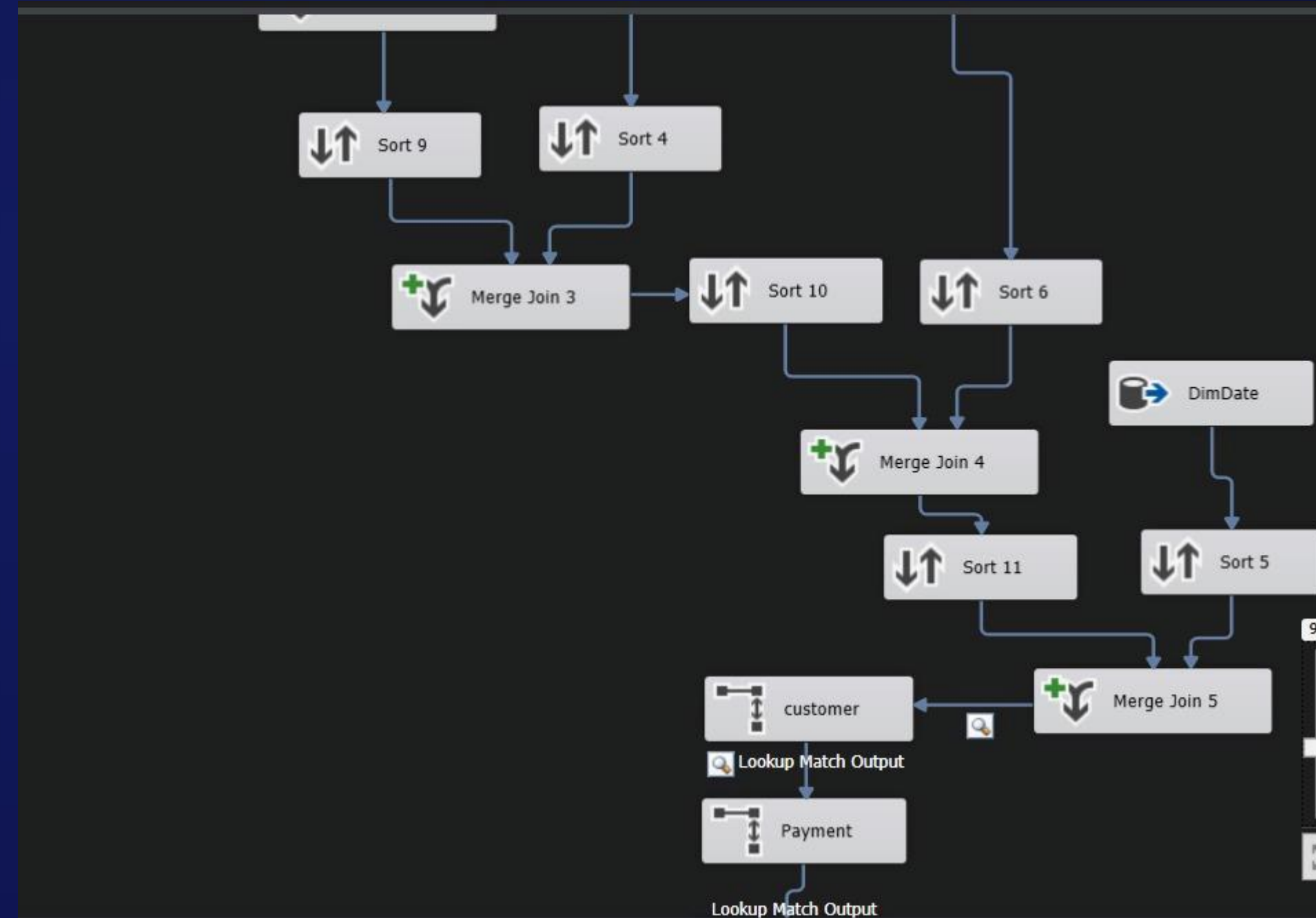
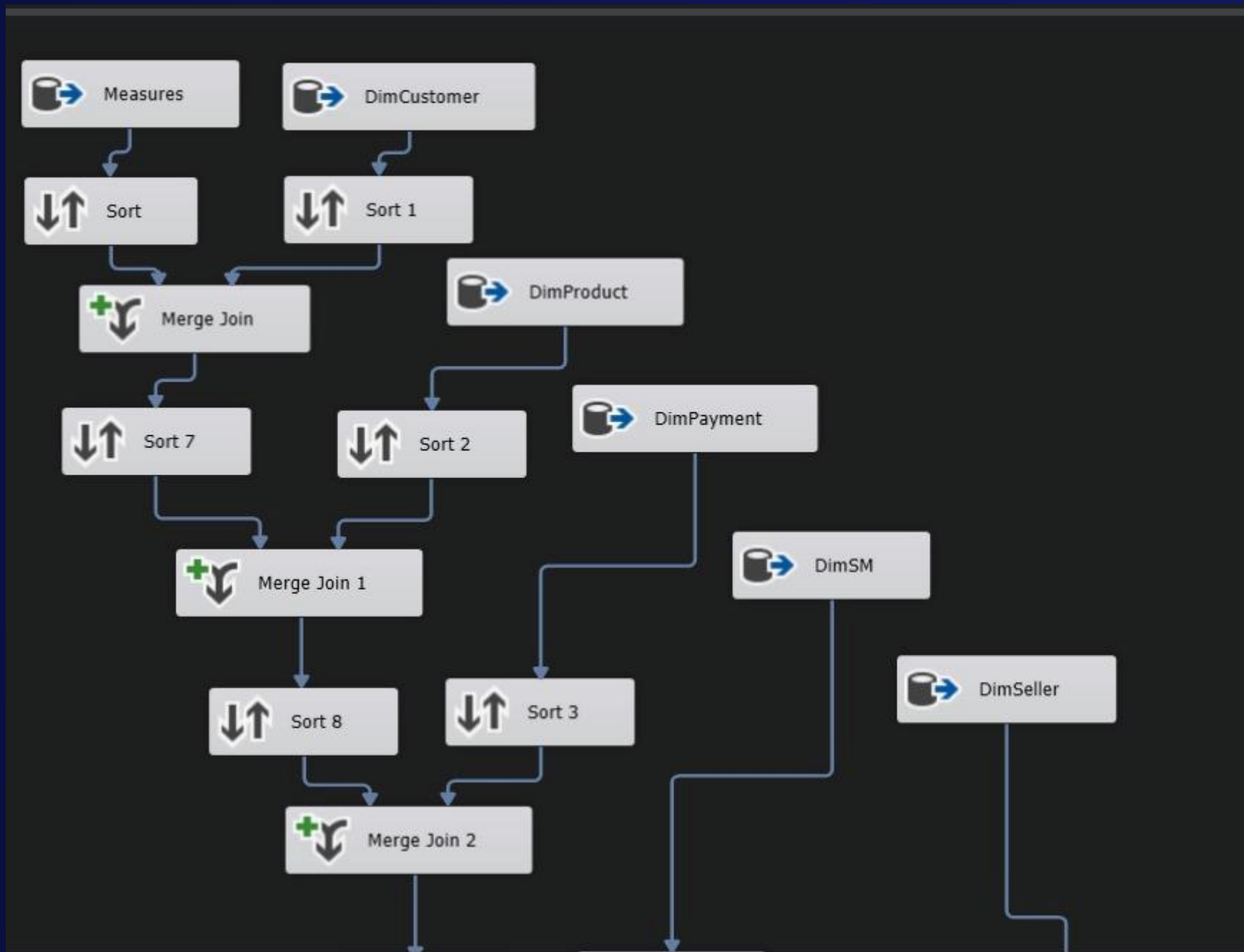
P42EG0V....- dbo.DimPayment			DESKTOP-P42EG0V.F...- dbo.DimProduct			DESKTOP-P42EG0V.F...- dbo.FactOrders				
sk	payment_sk	shipping_m...	order_date...	payment_d...	quantity	total_amou...	discount	product_pri...	seller_salary	shipping_c...
1	1	1	1	1	2	1994.98	5.00	999.99	5000.00	5.99
2	2	2	1	1	1	899.99	0.00	899.99	6000.00	15.99
3	3	3	1	1	3	3897.97	2.00	1299.99	5500.00	25.99
4	1	1	1	1	1	1494.99	5.00	1499.99	7000.00	5.99
5	2	2	1	1	2	1399.98	0.00	699.99	5200.00	15.99
6	1	2	2	2	1	5.99	10.00	15.99	4800.00	5.99
7	3	2	2	2	4	83.96	0.00	20.99	5900.00	25.99
8	2	2	2	2	1	15.99	10.00	25.99	6500.00	15.99
9	1	2	2	2	1	84.99	5.00	89.99	5300.00	5.99
10	3	2	2	2	3	107.97	0.00	35.99	6200.00	25.99
11	2	2	2	2	2	25.98	0.00	12.99	5400.00	15.99
12	1	2	2	2	5	144.95	5.00	29.99	6000.00	5.99
13	2	3	3	3	3	149.97	0.00	49.99	5800.00	15.99
14	3	3	3	3	4	183.96	0.00	45.99	5100.00	25.99
15	1	3	3	3	1	19.99	0.00	19.99	4700.00	5.99
16	2	4	4	4	2	5.98	0.00	2.99	7500.00	15.99
17	1	4	4	4	1	1299.99	0.00	1299.99	5600.00	5.99
21	2	5	5	5	3	2999.97	0.00	999.99	5000.00	15.99
18	3	5	5	5	2	1599.98	0.00	799.99	5400.00	25.99
19	2	5	5	5	1	194.99	5.00	199.99	5900.00	15.99
20	1	5	5	5	1	49.99	0.00	49.99	5000.00	5.99
22	1	6	6	6	2	1799.98	0.00	899.99	6000.00	5.99
23	2	6	6	6	1	1297.99	2.00	1299.99	5500.00	15.99



# ETL Process Overview

**Process:** Extract data from the original database, transform it for accuracy, and load it into the data warehouse.

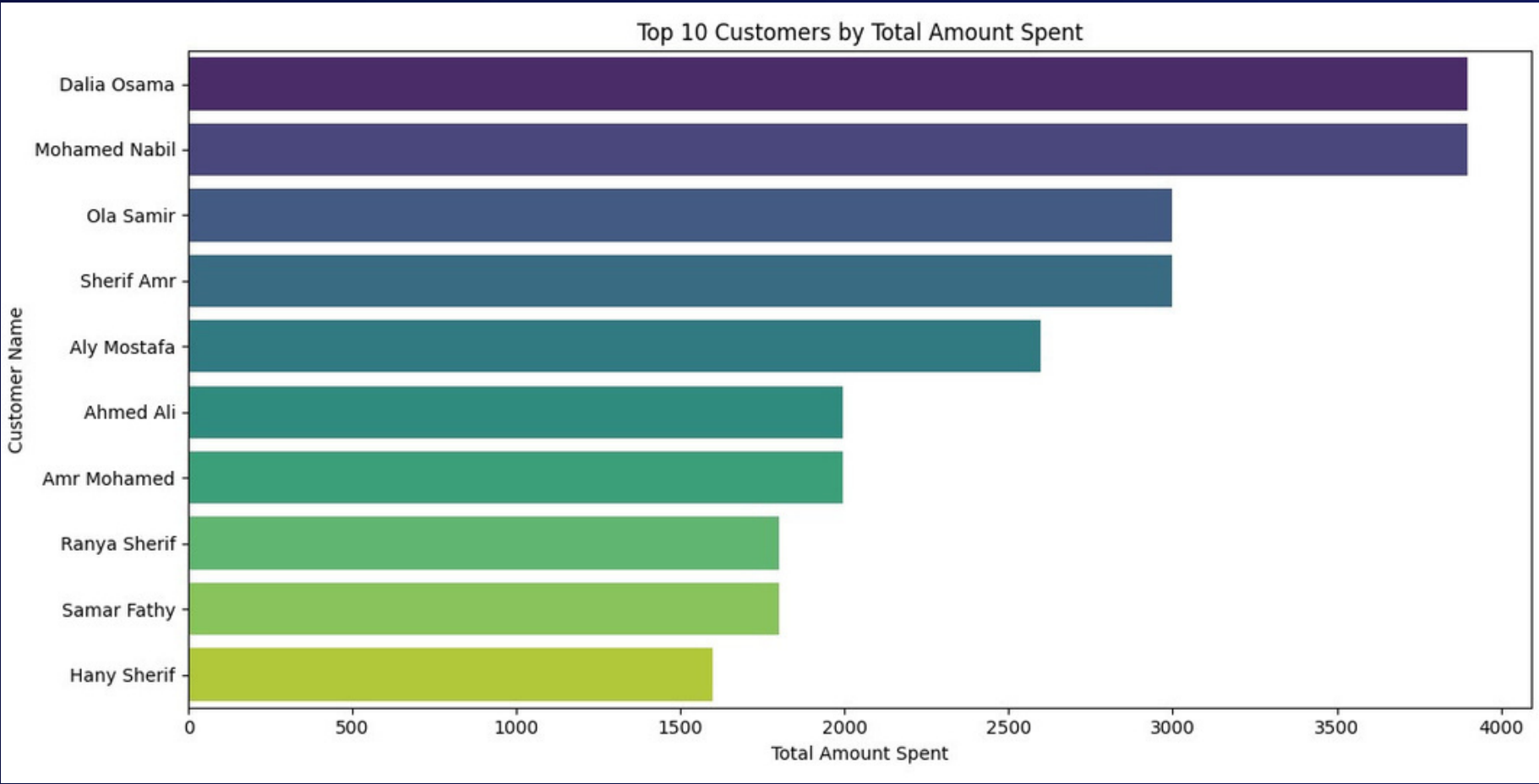
**Tools:** SQL Server Integration Services (SSIS), SQL, SSMS, VS code.



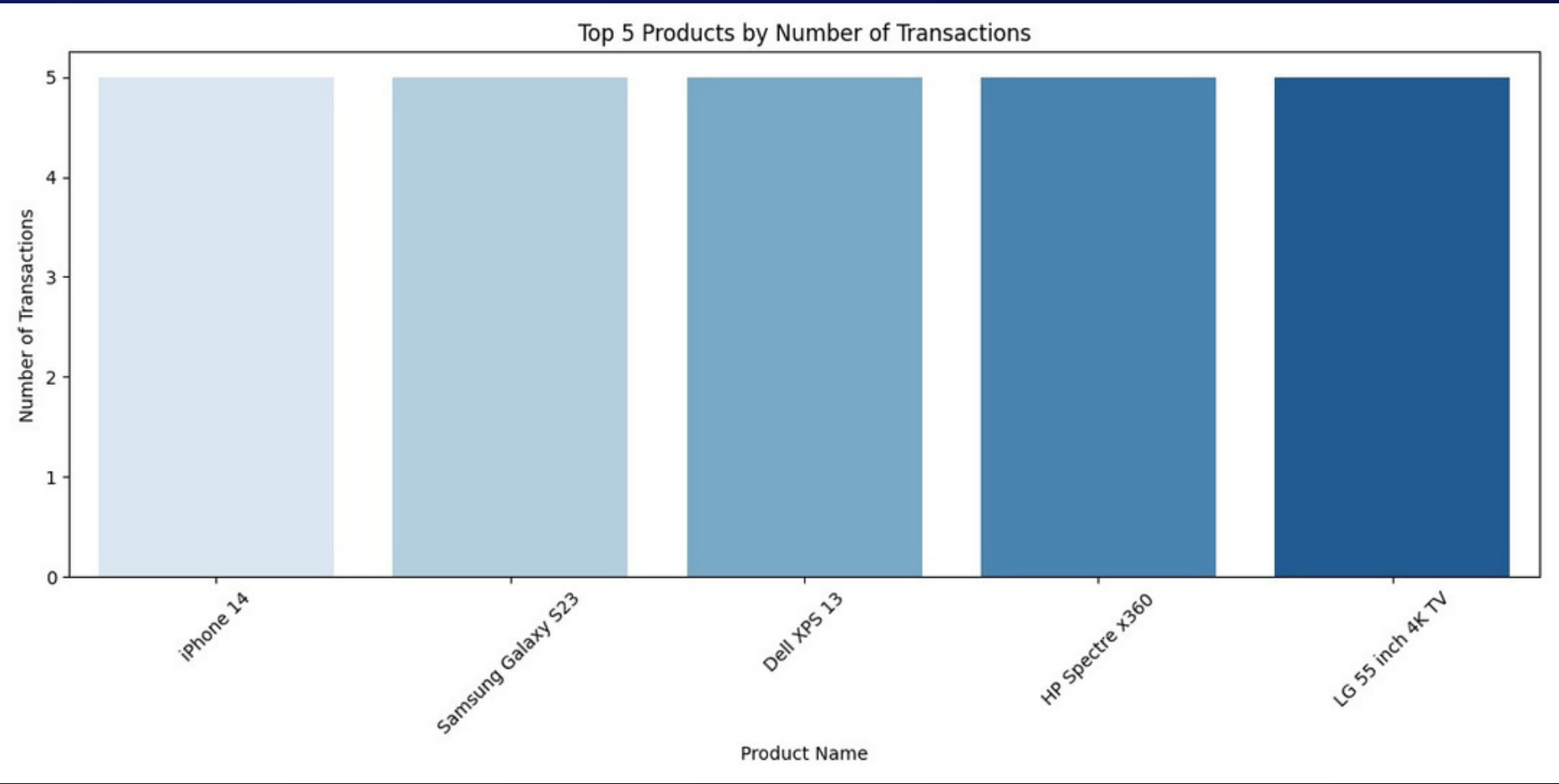
# Python Data Visualizations

**Overview:** Visualizations were created using Python for detailed data exploration and analysis.

## Visualization Examples



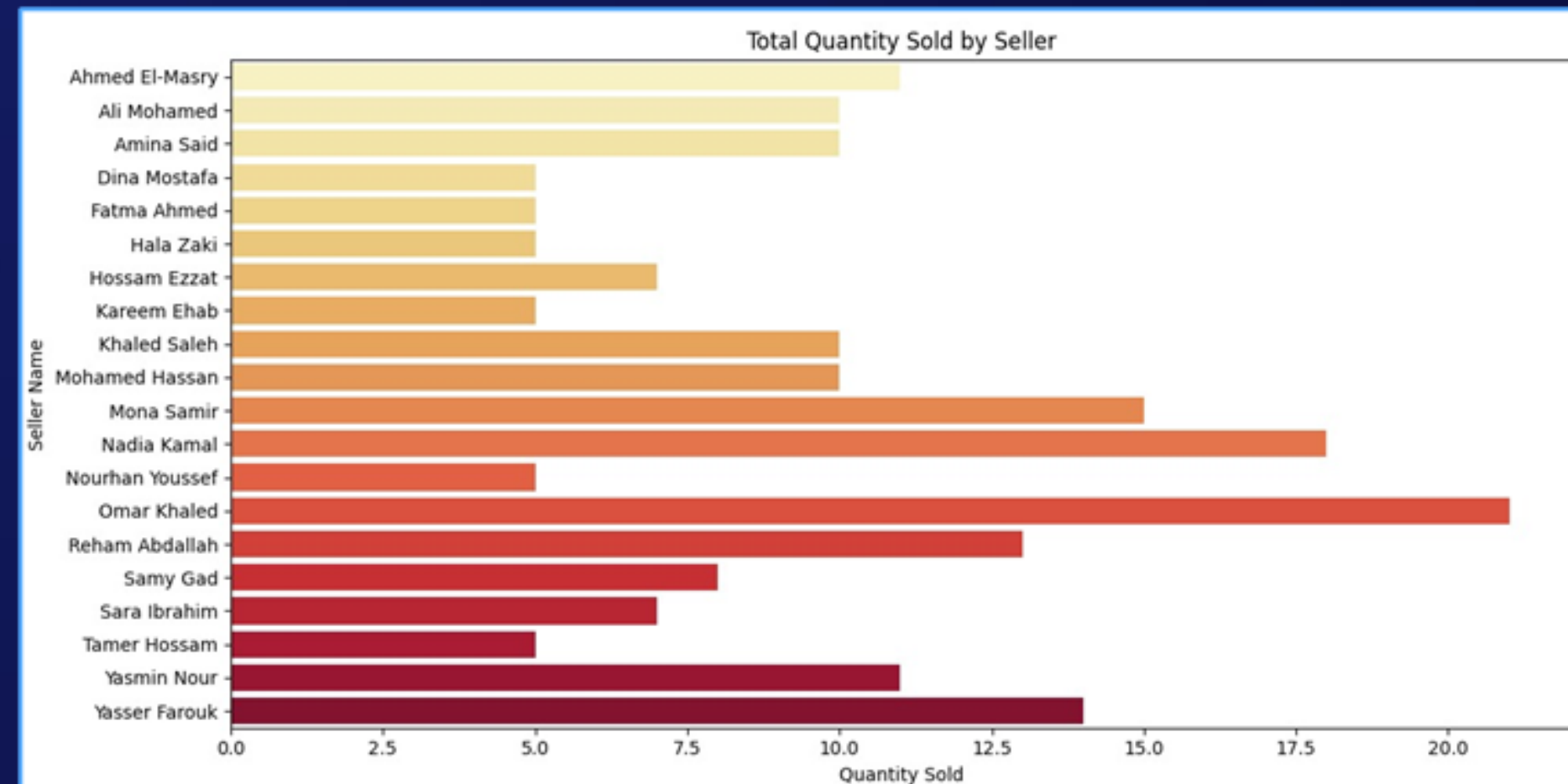
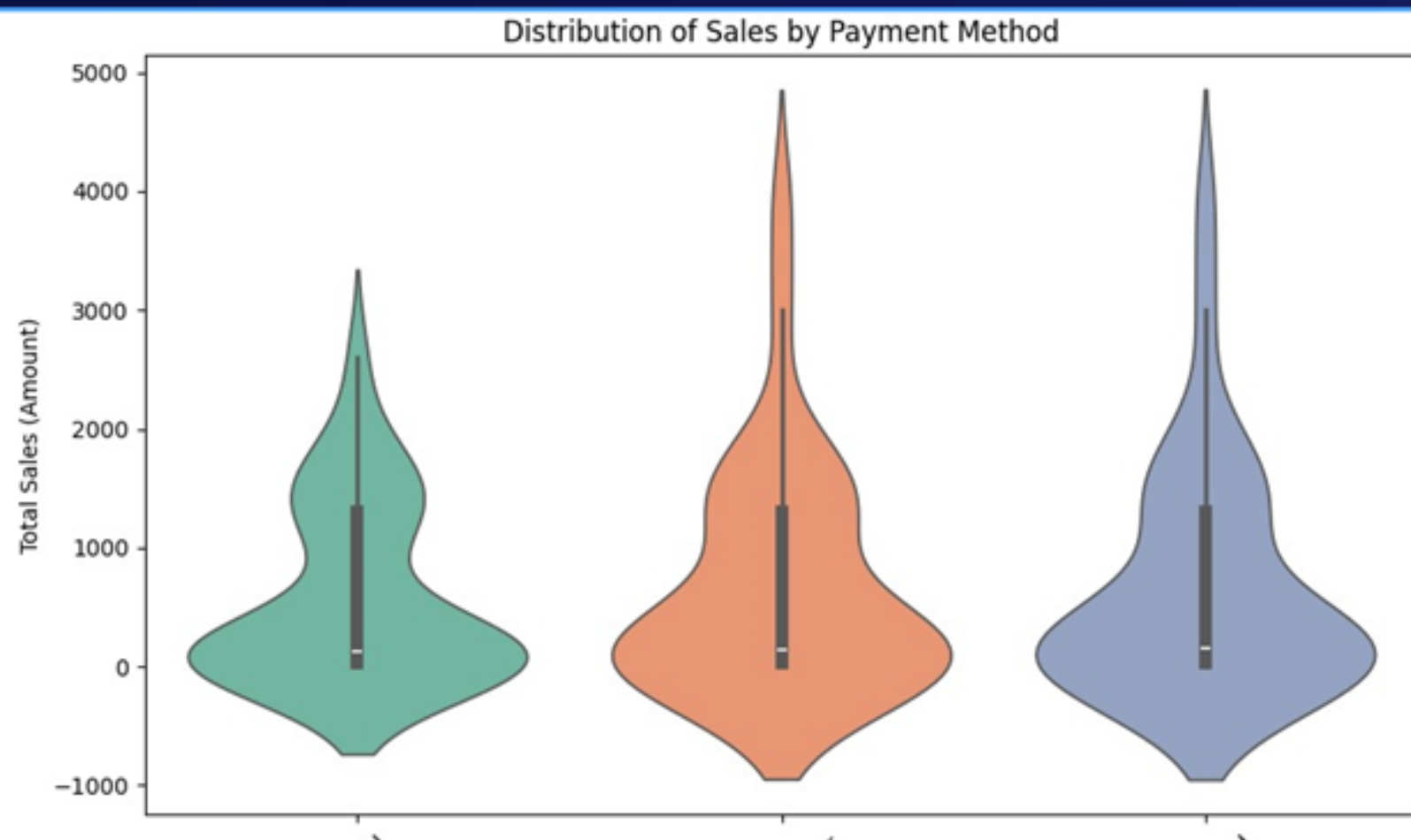
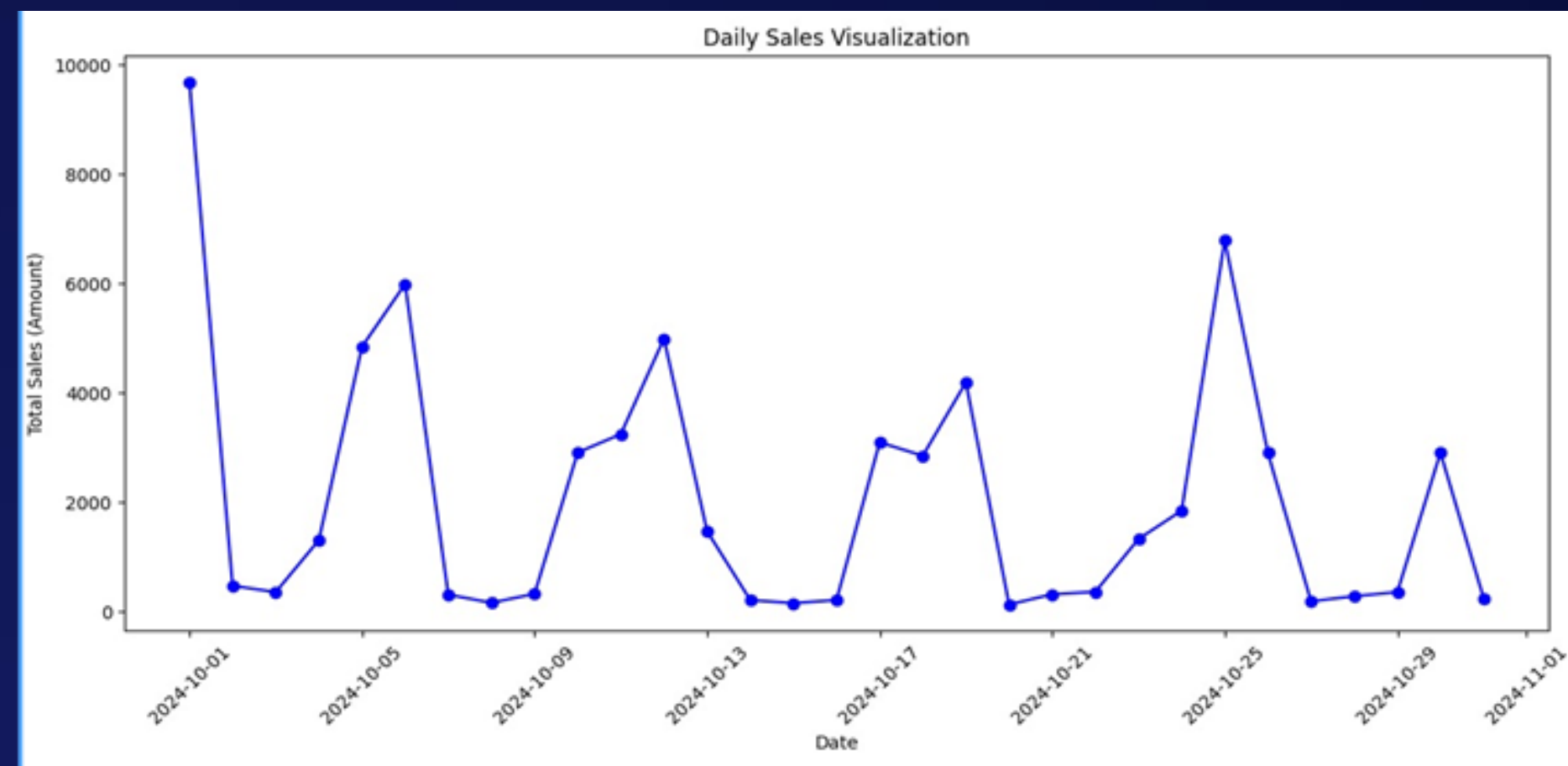
Top 10 Customers by Total Amount Spent



Top 5 Products by Number of Transactions



# More Visualization Examples



# Power BI Visualizations

Power BI dashboards provide real-time insights and interactivity for business intelligence.

**Key Metrics:** Total sales, AVG. Sellers Salary, No. Orders and Total Sales By Category, No. Orders By Sales Person.





NO. Orders

100

Total\_Sales

64.40K

NO. Sellers

20

AVG. Sellers Salary

5.69K

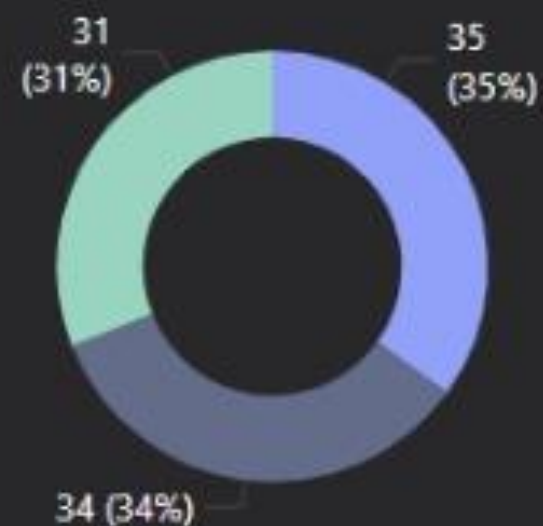
No. Customers

100

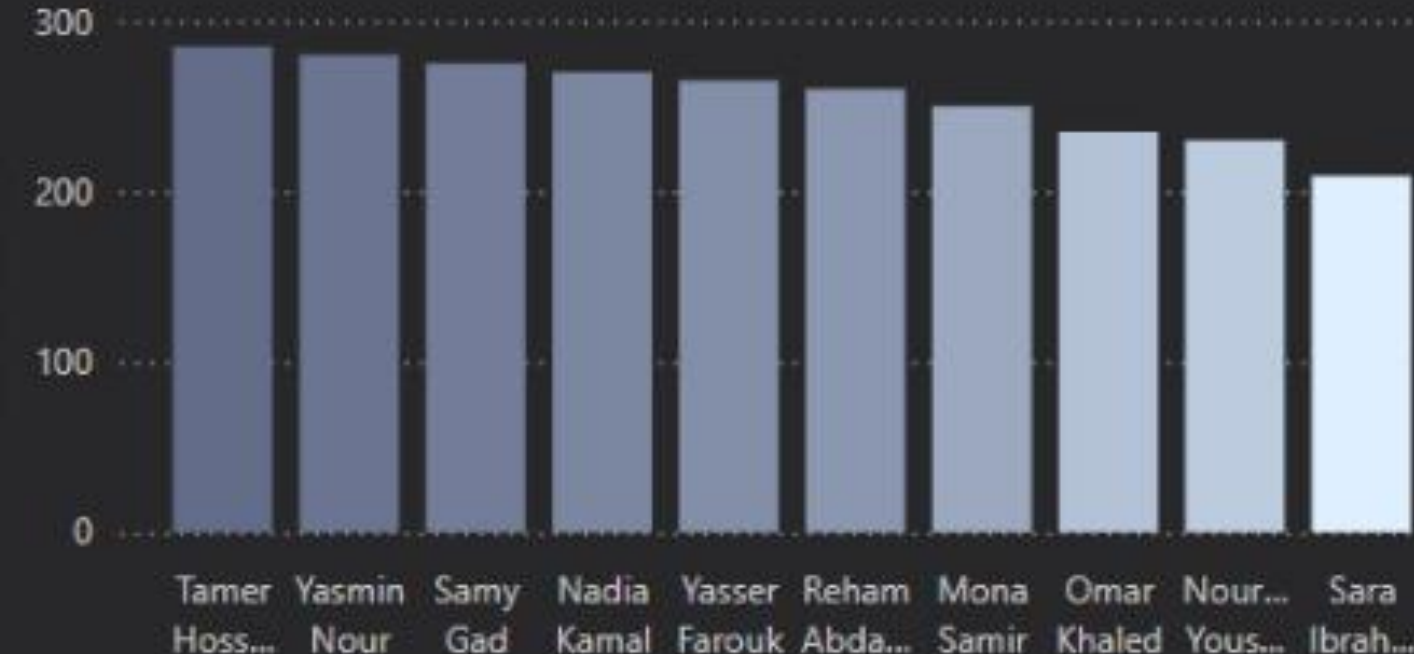
No. Orders By Order\_Date



No. orders By Shipping\_Method



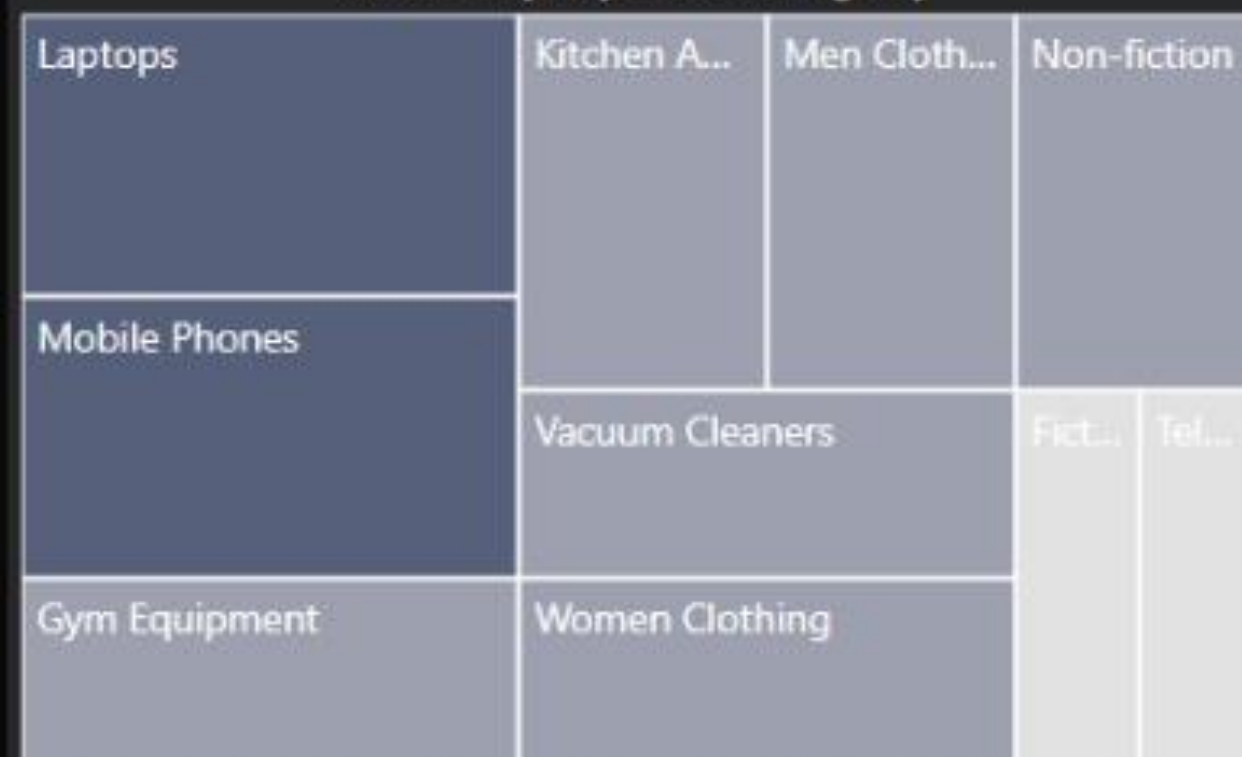
No. Orders By Sales Person



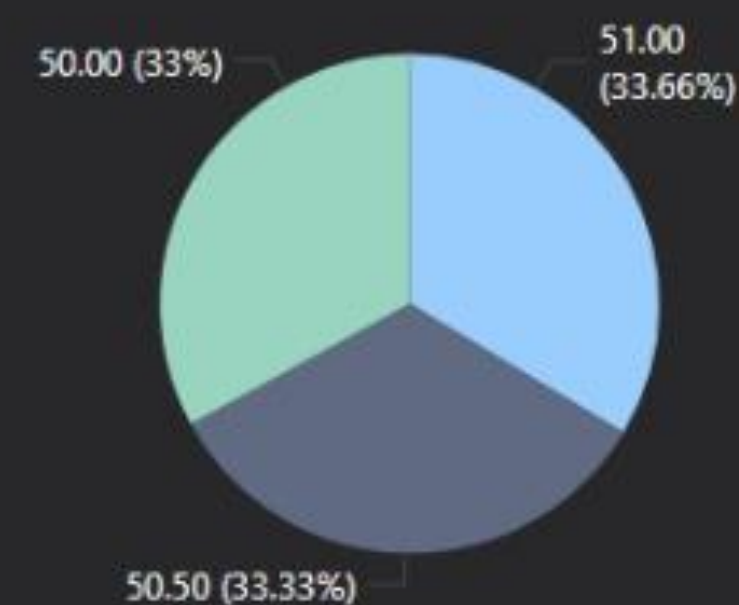
No. Orders and Total Sales By Category



Quantity By Subcategory



AvgNo. Customers by Payment\_method



# Conclusion

1. Conclusion: Successfully integrated a customer data management system that allows for comprehensive data reporting and analysis.



# Presented By:

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# Thanks

