A Comprehensive Proposal for Retail Supply Chain Analysis Using Power BI

1- Case study

This dataset includes customer orders with details on transaction types, shipping schedules, and delivery statuses. It tracks customer information, order specifics like product details and prices, and geographical data. It also records order and shipment timestamps, along with sales and discounts. Key metrics include delivery risks, product availability, and order statuses.

2- Data source

We use DATACO Global company data from
https://www.kaggle.com/datasets/shashwatwork/dataco-smart-supply-chain-for-big-data-analysis

3- Data description

We have data set contain 63 columns in 2 CSV files and 180520 rows as following:

FIELDS	DESCRIPTION
Type	Type of transaction made
Days for shipping (real)	Actual shipping days of the purchased product
Days for shipment (scheduled)	Days of scheduled delivery of the purchased product
Benefit per order	Earnings per order placed
Sales per customer	Total sales per customer made per customer
Delivery Status	Delivery status of orders: Advance shipping , Late delivery , Shipping canceled , Shipping on time
Late delivery risk	Categorical variable that indicates if sending is late (1), it is not late (0).
Category Id	Product category code
Category Name	Description of the product category
Customer City	City where the customer made the purchase
Customer Country	Country where the customer made the purchase
Customer Email	Customer's email
Customer Fname	Customer name
Customer Id	Customer ID
Customer Lname	Customer lastname
Customer Password	Masked customer key
Customer Segment	Types of Customers: Consumer, Corporate, Home Office
Customer State	State to which the store where the purchase is registered belongs
Customer Street	Street to which the store where the purchase is registered belongs

Customer Zipcode	Customer Zipcode
Department Id	Department code of store
Department Name	Department name of store
Latitude	Latitude corresponding to location of store
Longitude	Longitude corresponding to location of store
Market	Market to where the order is delivered: Africa, Europe, LATAM, Pacific Asia, USCA
Order City	Destination city of the order
Order Country	Destination country of the order
Order Customer Id	Customer order code
order date (DateOrders)	Date on which the order is made
Order Id	Order code
Order Item Cardprod Id	Product code generated through the RFID reader
Order Item Discount	Order item discount value
Order Item Discount Rate	Order item discount percentage
Order Item Id	Order item code
Order Item Product Price	Price of products without discount
Order Item Profit Ratio	Order Item Profit Ratio
Order Item Quantity	Number of products per order
Sales	Value in sales
Order Item Total	Total amount per order
Order Profit Per Order	Order Profit Per Order
Order Region	Region of the world where the order is delivered
Order State	State of the region where the order is delivered
Order Status	Order Status
Product Card Id	Product code
Product Category Id	Product category code
Product Description	Product Description
Product Image	Link of visit and purchase of the product
Product Name	Product Name
Product Price	Product Price
Product Status	Status of the product stock: If it is 1 not available, 0 the product is available
Shipping date (Date Orders)	Exact date and time of shipment
Shipping Mode	The following shipping modes are presented: Standard Class, First Class, Second Class, Same Day

4- Key Performance Indicators (KPIs) for Supply Chain Analysis

1- Inventory Turnover: Measures how often inventory is sold and replaced over a period.
- How to Measure: Inventory Turnover = Cost of Goods Sold (COGS) / Average Inventory

2- Order Fulfillment Cycle Time: The time taken from receiving an order to delivering it to the customer.
- How to Measure: Average time from order receipt to delivery across all orders within a specific period.

3- Supply Chain Cycle Time: The total time taken from placing an order with a supplier to delivering the product to the end customer.
- How to Measure: Total supply chain cycle time = Supplier Lead Time + Manufacturing Time + Delivery Time.

4- Perfect Order Rate: The percentage of orders delivered without any errors.
- How to Measure: Perfect Order Rate = (Number of Perfect Orders / Total Number of Orders) * 100

5- Days Sales Outstanding (DSO): The average number of days it takes to collect payment after a sale.
- How to Measure: DSO = (Accounts Receivable / Total Credit Sales) * Number of Days

6- Freight Cost per Unit: The cost of shipping per unit of product.
- How to Measure: Freight Cost per Unit = Total Freight Costs / Total Units Shipped

7- Fill Rate: The percentage of customer orders that are fulfilled from available stock.
- How to Measure: Fill Rate = (Number of Units Delivered on Time / Total Number of Units Ordered) * 100

8- Order Accuracy: The percentage of orders delivered correctly without errors.
- How to Measure: Order Accuracy = (Number of Correct Orders / Total Number of Orders) * 100

9- On-Time Delivery: The percentage of orders delivered on or before the promised delivery date.
- How to Measure: On-Time Delivery = (Number of On-Time Deliveries / Total Number of Deliveries) * 100

10- Return Rate: The percentage of products returned by customers.
- How to Measure: Return Rate = (Number of Returned Units / Total Units Sold) * 100

11- Supplier Lead Time: The time taken by suppliers to deliver goods after an order is placed.
- How to Measure: Average time from placing an order with a supplier to receiving the goods.

12- Backorder Rate: The percentage of orders that cannot be filled at the time of order placement.
- How to Measure: Backorder Rate = (Number of Backordered Units / Total Units Ordered) * 100

5- Key Performance Indicators (KPIs) according to our data

Sales and Revenue KPIs

1- Total Sales:
  - Description: The total amount of sales made over a specific period.
  - Calculation: Sum of Sales.
2- Average Order Value (AOV):
  - Description: The average amount spent by customers per order.
  - Calculation: Total Sales / Number of Orders.
3- Sales per Customer:
  - Description: The average sales generated by each customer.
  - Calculation: Sum of Sales per customer.
4- Profit per Order:
  - Description: The average profit made per order.
  - Calculation: Sum of Order Profit Per Order.

Customer KPIs

5- Customer Lifetime Value (CLV):
  - Description: The total revenue expected from a customer over their lifetime.
  - Calculation: Sum of Benefit per order for each customer over their relationship period.
6- Customer Retention Rate:
  - Description: The percentage of customers who continue to buy from you over a given period.
  - Calculation: ((Number of Customers at End of Period - New Customers Acquired During Period) / Number of Customers at Start of Period) * 100.

Order and Fulfillment KPIs

7- On-time Delivery Rate:
  - Description: The percentage of orders delivered on or before the scheduled delivery date.
  - Calculation: (Number of Orders Delivered On-time / Total Orders) * 100.
8- Late Delivery Risk:
  - Description: The percentage of orders at risk of late delivery.
  - Calculation: (Number of Orders with Late_delivery_risk / Total Orders) * 100.
9- Average Shipping Time:
  - Description: The average time taken to ship an order.
  - Calculation: Average of Days for shipping (real).
10- Fulfillment Efficiency:
  - Description: The efficiency of the order fulfillment process.
  - Calculation: (Sum of Days for shipment (scheduled) - Sum of Days for shipping (real)) / Total Orders.

Product and Category KPIs

11- Top Selling Products:
- Description: The products with the highest sales.
- Calculation: Identify products with the highest Sales.

12- Product Return Rate:
- Description: The percentage of products returned by customers.
- Calculation: (Number of Returned Products / Total Products Sold) * 100.

13- Category Performance:
- Description: The sales performance of each product category.
- Calculation: Sum of Sales for each Category Id or Category Name.

Profitability KPIs

14- Gross Profit Margin:
- Description: The percentage of revenue that exceeds the cost of goods sold (COGS).
- Calculation: (Total Revenue - COGS) / Total Revenue * 100.

15- Net Profit Margin:
- Description: The percentage of revenue that remains as profit after all expenses are deducted.
- Calculation: (Net Profit / Total Revenue) * 100.

Market and Regional KPIs

16- Market Share:
- Description: The company's sales as a percentage of the total market sales.
- Calculation: (Company Sales / Total Market Sales) * 100.

17- Regional Sales Performance:
- Description: Sales performance across different regions.
- Calculation: Sum of Sales for each Order Region or Order State.

6- Research Questions

Sales and Revenue Analysis

1- How are sales trends evolving over time?
- Analyze Sales data over different time periods (monthly, quarterly, yearly) to identify trends and patterns.

2- Which products or categories generate the most revenue?
- Compare Sales across different Product Name and Category Name to identify top performers.

3- What is the average order value and how does it vary by customer segment?
- Calculate the Average Order Value (AOV) and analyze it by Customer Segment.

4- What are the profit margins for different products?
- Analyze Order Profit Per Order for different Product Name and Category Name.

Customer Analysis

5- What is the customer retention rate?
  - Determine how many customers are repeat buyers using Customer Id.
6- What is the lifetime value of our customers?
  - Calculate the Customer Lifetime Value (CLV) based on Benefit per order.
7- Which customer segments are most profitable?
  - Compare Profit per order across different Customer Segment.
8- How does customer location affect sales?
  - Analyze Sales data by Customer City, Customer State, and Customer Country.

Order and Fulfillment Analysis

9- What is the average shipping?
  - Analyze Days for shipping (real) and Delivery Status to evaluate shipping performance.
10- What percentage of orders are delivered late?
  - Calculate the proportion of orders with Late_delivery_risk.
11- What are the main causes of delayed shipments?
  - Investigate the reasons behind variations in Days for shipping (real) vs. Days for shipment (scheduled).
12- How does order statue rate vary across different regions?
  - Compare the accuracy of orders (Order Status) across Order Region.

Product and Category Analysis

13- How do product prices influence sales volume?
  - Compare Product Price with Order Item Quantity to see how pricing affects sales.
14- Which products have the highest and lowest profit margins?
  - Compare Order Item Profit Ratio across different Product Name and Category Name.

Market and Regional Analysis

15- How do sales vary across different markets?
  - Analyze Sales data by Market.
16- Which regions generate the most revenue?
  - Compare Sales across different Order Region and Order State.

Operational Efficiency Analysis

17- What is the efficiency of our order fulfillment process?
  - Evaluate Fulfillment Efficiency by comparing Days for shipment (scheduled) with Days for shipping (real).
18- How do shipping modes affect delivery times and costs?
  - Analyze Shipping Mode, Days for shipping (real), and shipping costs.

7- Analytical Methods

- Techniques and Tools: The analysis will employ descriptive statistics, trend analysis, and regression analysis using Power BI,
- Data Cleaning and Preparation: Missing values and outliers will be addressed through data cleaning techniques to ensure the accuracy of the analysis.

Finally, we are enthusiastic about undertaking this project and look forward to your approval to proceed with the analysis.

This project is brought to you by group 2 (ALX2_DAT2_G1)

Name	Assigned KPIs
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Alaa Hamdeno Abd El-kader	Timeline Performance Profitability KPIs
Eman Zain Fayez	Sales & Revenue KPIs
Ahmed Hamdi Kamal Mohamed	Product & Category KPIs Market & Regional KPIs