

E-commerce Orders & Marketing Analytics

INTRODUCTION

The E-commerce sector has emerged as one of the fastest-growing industries worldwide, driven by digital transformation, evolving consumer behavior, and increased internet penetration. In India, the sector has witnessed exponential growth, fueled by smartphone adoption, convenient payment systems, and competitive online marketplaces. As competition intensifies, data has become the cornerstone for achieving differentiation through personalized marketing, operational efficiency, and customer retention.

This project focuses on E-commerce Orders and Marketing Analytics to analyze how data visualization and performance tracking can enhance decision-making in this dynamic industry. The E-commerce domain was chosen because it offers diverse, interlinked data across sales, customers, products, and marketing campaigns, making it ideal for demonstrating the strategic use of analytics.

By building an interactive Power BI dashboard, the project aims to uncover insights into sales performance, profitability, customer behavior, and marketing effectiveness. Through this, it underscores how data-driven intelligence can empower E-commerce firms to optimize operations and sustain growth in an increasingly competitive digital economy.

PART-A

Area of the Dataset:

Marketing & Sales / Operations (E-commerce analytics)

Source of the Dataset:

Internal project Excel workbook: [Ecommerce DAX Project Advanced.xlsx](#) (self-curated dataset)

Problem Statement:

Our Objective is to build an interactive Power BI dashboard to track sales, profitability, product performance, customer behavior, and marketing campaign effectiveness. To provide operational KPIs (sales, profit, AOV), marketing attribution (campaign spend → revenue), and

enable drill-down by product category, product, city, and campaign for business decision-making.

PART B: Data Preparation and Modelling

We have curated a comprehensive dataset comprising **six interrelated tables**, designed to facilitate experimentation with various marketing techniques and analytics. The dataset captures multiple aspects of customer behavior, marketing performance, and business operations, enabling end-to-end analysis for strategy optimization.

Total Number of Tables Used: **6**

Table Name	Row Names	Purpose
Customers (D)	CustomerID, Name, Gender, Age, City, SignupDate	Customer dimension for segmentation, lifetime metrics.
Products (D)	ProductID, Category, SubCategory, ProductName, Brand, CostPrice, ListPrice, GrossMargin%	Product attributes for product-level reporting and margin calculation.
Orders (F)	OrderID, CustomerID, ProductID, OrderDate, Quantity, ListPrice, Discount, SalesAmount, ShippingCost, ReturnFlag, OrderStatus, Rating, Marketing Channel, Overall Profit	base fact table for sales, profits, order-level KPIs. core transactional table that includes refunds, listing price, order value, transaction costs, and net revenue
Payments (D)	PaymentID, OrderID, PaymentMethod, PaymentDate, PaymentStatus, PaymentAmount, TransactionFee, NetRevenue	Records of payments collected, revenue generated, reconcile refunds & fees.
Calendar (D)	Date, Year, Quarter, Month, MonthName, YearMonth, WeekNumber, DayOfWeek, FiscalYear	Robust date hierarchies and time-intelligence.

Marketing (D)	CampaignID, StartDate, EndDate, Marketing Channel, SpendAmount, CustomersAcquired, OrdersGenerated, RevenueAttributed, AOV	campaign spend vs returns for attribution analysis.
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Data Cleaning

- Missing values:**
 - Checked CustomerID, OrderID, ProductID for nulls; dropped rows missing primary keys (these break joins).
 - For optional fields (e.g., Rating), left nulls intact but handled in measures with BLANK() checks.
- Data types:**
 - Ensured Date fields are Date type (Calendar.Date, Orders.OrderDate, Payments.PaymentDate, Marketing.StartDate/EndDate).
 - Numeric fields (Quantity, ListPrice, SalesAmount, CostPrice, NetRevenue, SpendAmount) set to decimal/currency. Changed the currency to Rupee from dollar.
- Duplicates:**
 - Removed exact duplicate rows in Orders and Payments.
 - Ensured ProductID and CustomerID masters unique rows.
- Standardized formats:**
 - Normalized Marketing Channel names (trim, lower/upper normalization) for consistent filtering.
 - Trimmed whitespace in string columns (City, Brand).
- Derived columns added (Power Query / Power BI):**
 - OrderYear, OrderMonth, OrderWeek from Orders.OrderDate if not using Calendar join.

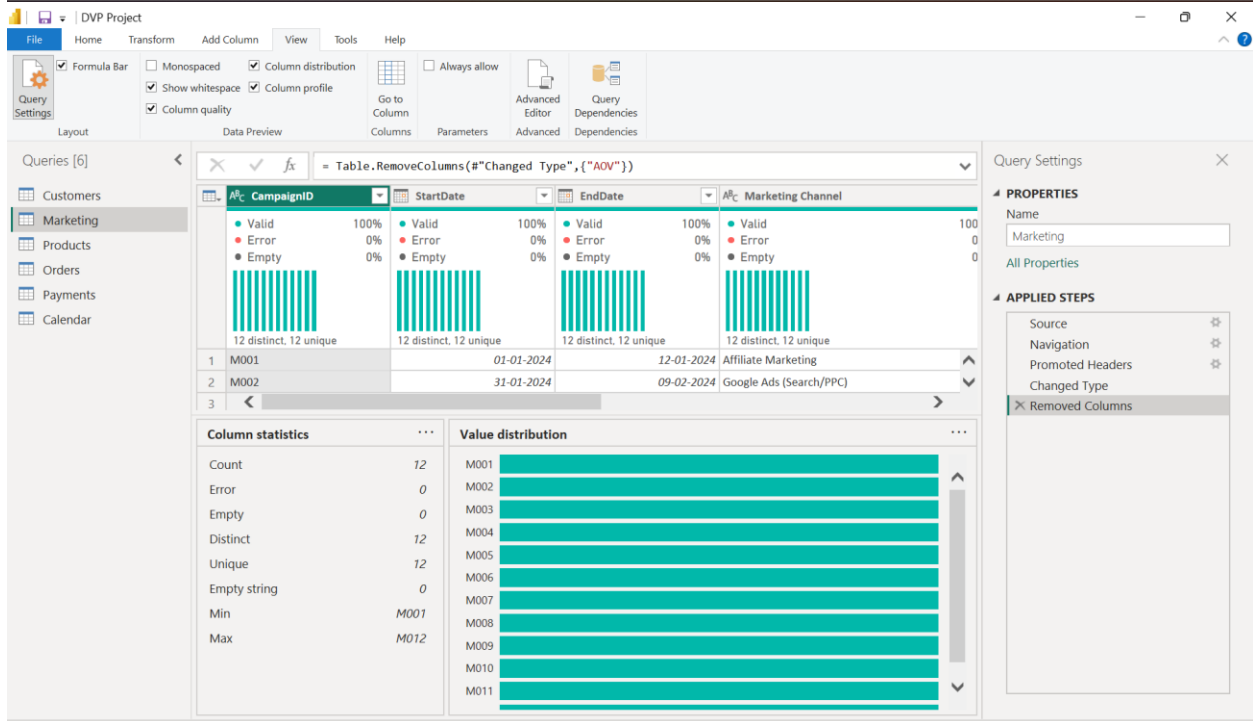
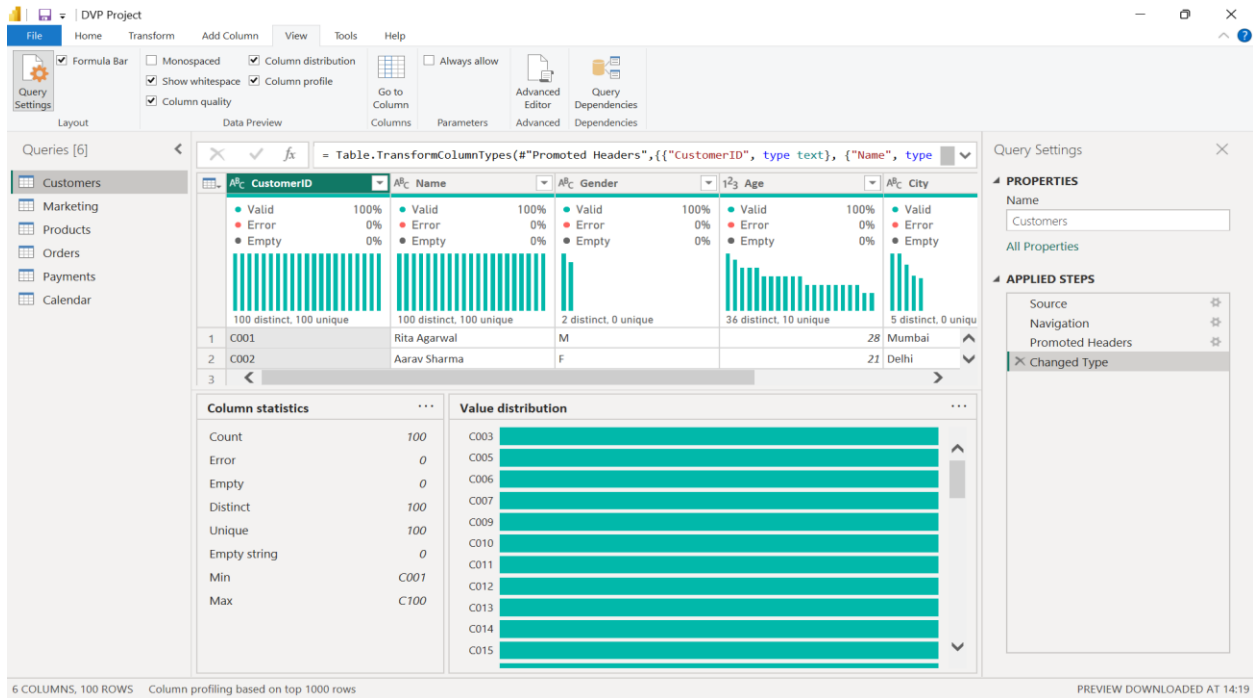
- $\text{GrossProfit} = \text{SalesAmount} - \text{CostPrice} * \text{Quantity} - \text{ShippingCost}$ (if CostPrice available).
- $\text{AOV} = \text{SalesAmount} / \text{OrdersCount}$ (often computed as measure).
- ReturnFlag converted to boolean / yes-no.
- Most importantly, to support visualisations, have transformed the marketing channel column from the marketing table, the Product category column from the product table, and the net revenue column from the payments table to the Orders (fact table) after establishing relationships.

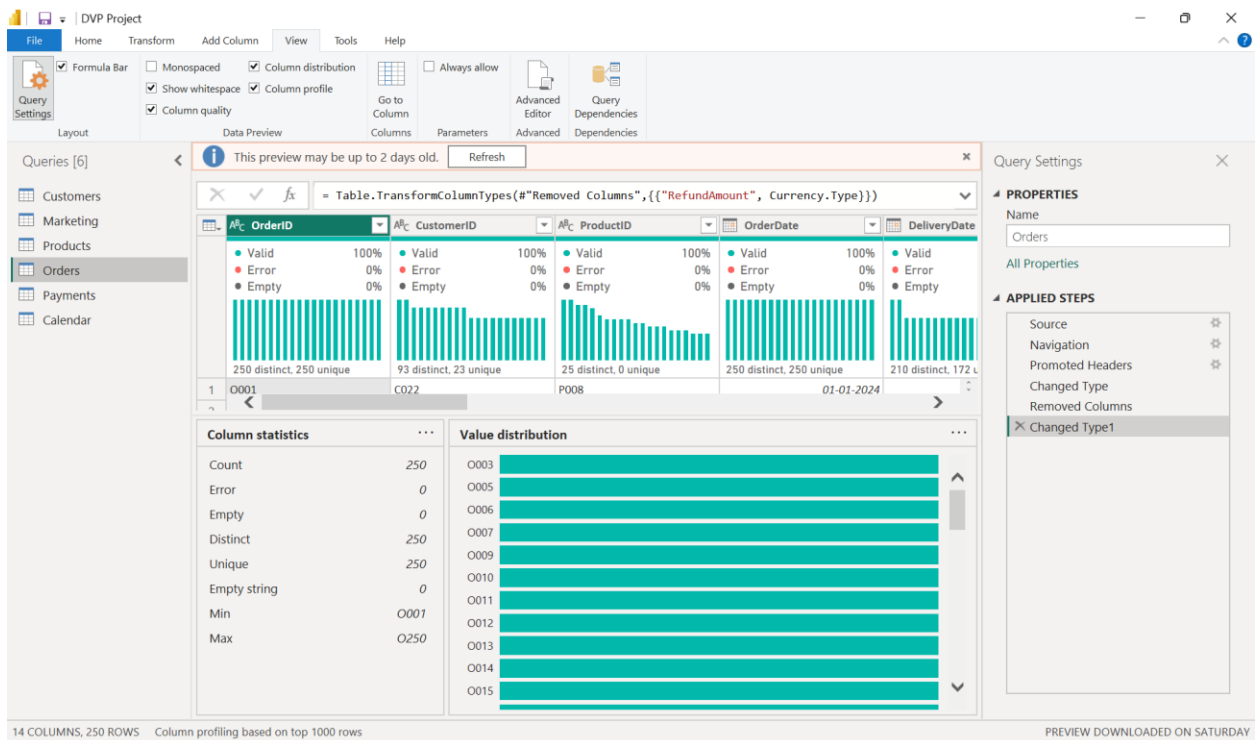
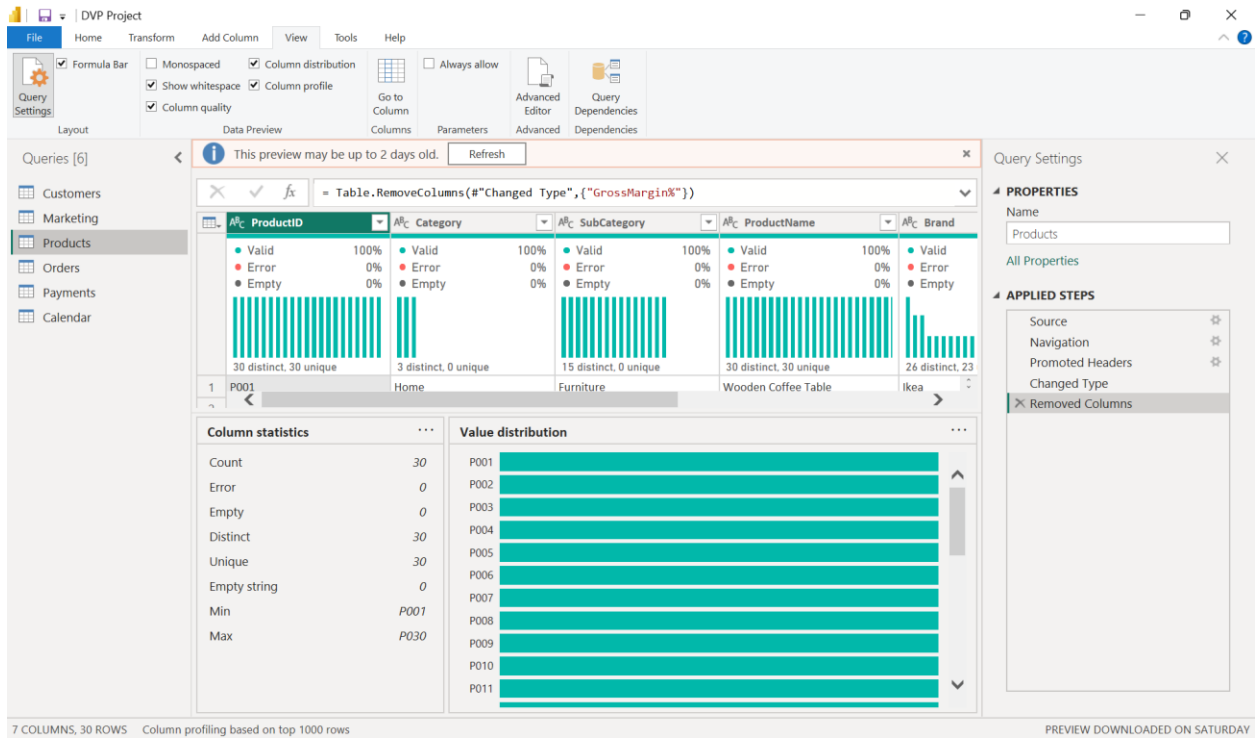
Data Profiling

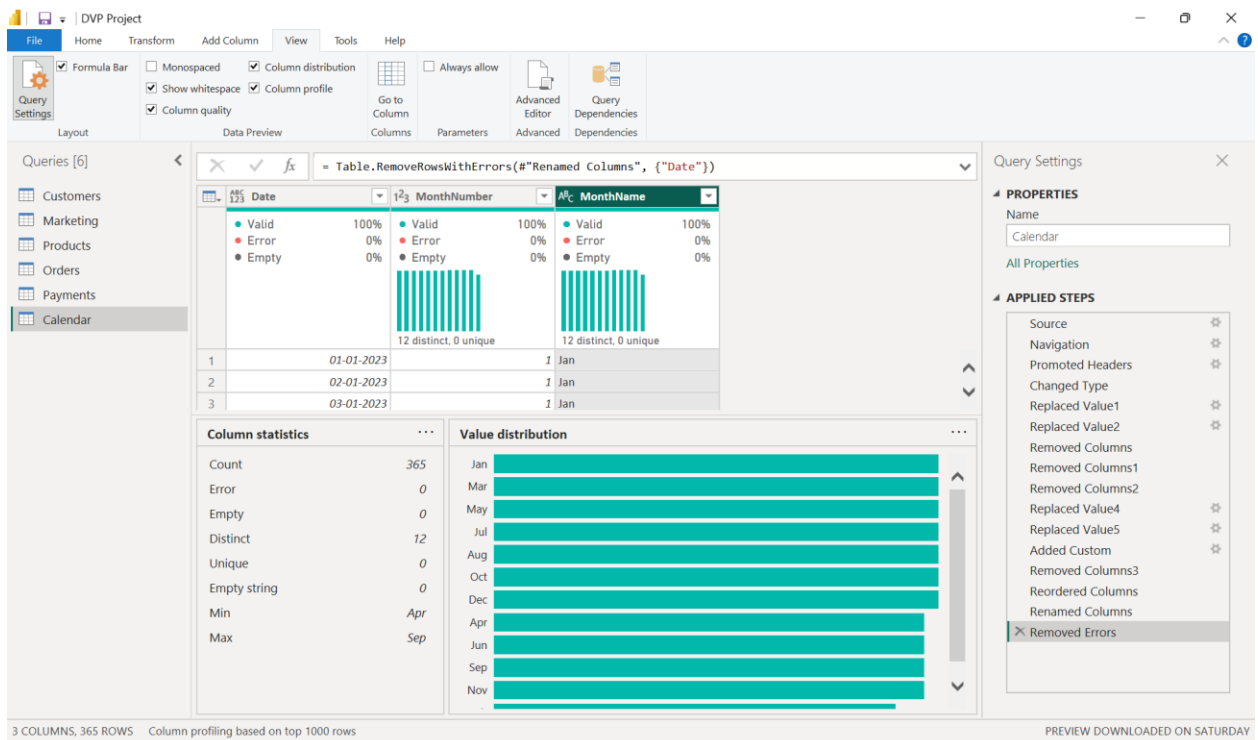
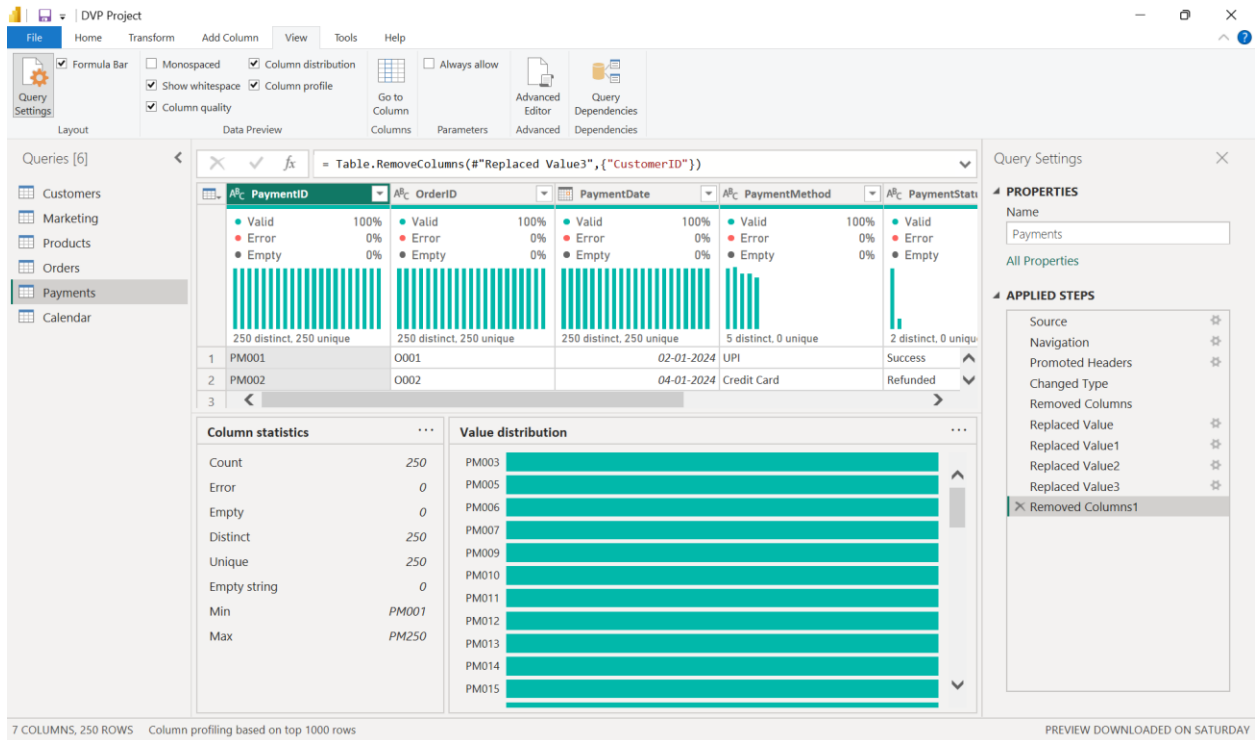
We examined column distributions and unique counts for key columns (e.g., unique customers, products, campaign counts).

In order to capture:

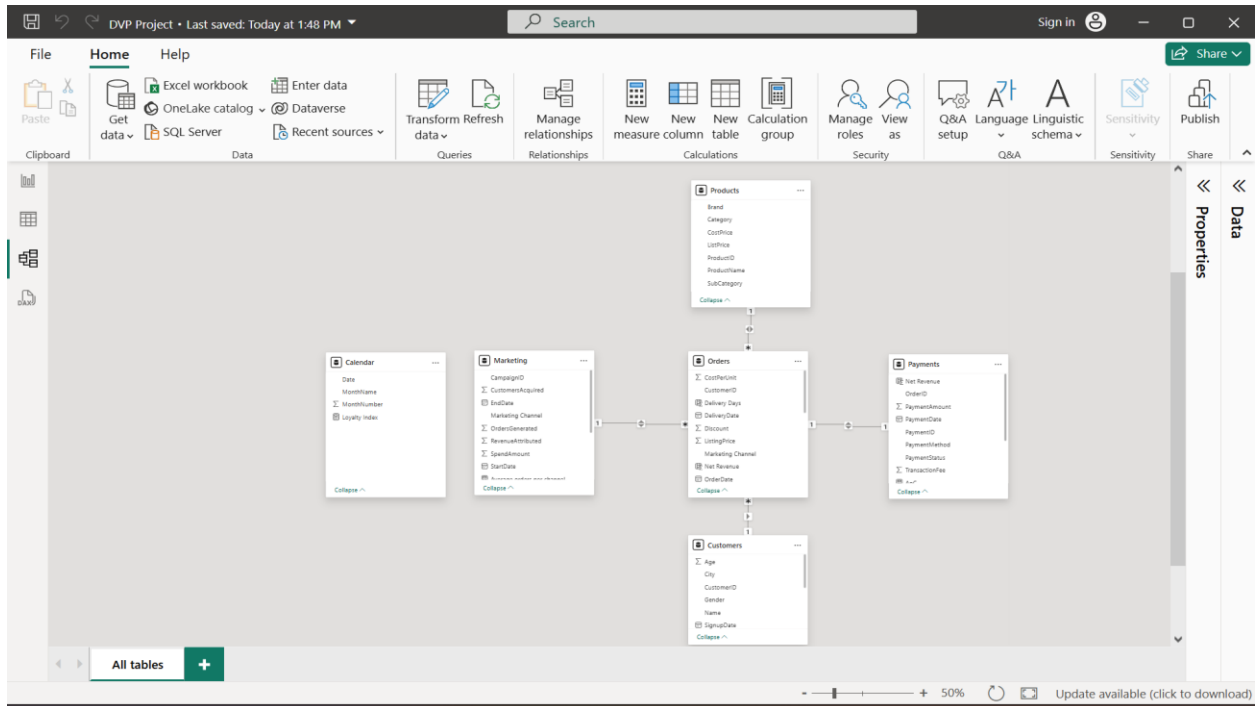
- Null counts per column (Orders, Payments).
- Distribution of SalesAmount (outliers).
- Using Column Profile, quality, distribution to do a final check to find out any errors in the tables.





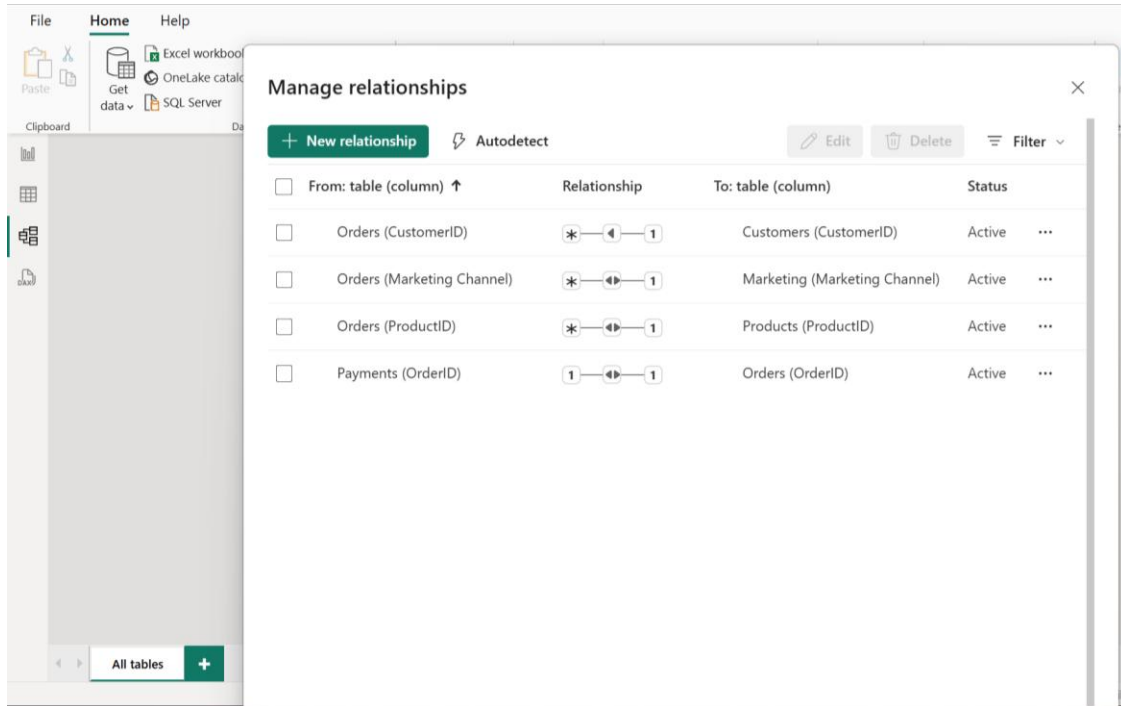


Data Model Diagram



Model Type: Star schema (Orders fact at center, Customers & Products & Calendar & Marketing as dimension tables).

Relationships:



PART C: DAX Formulas and Measures

Customer Metrics

Avg Customer Age

- Formula: Avg Customer age = `average(Customers[Age])`
- Explanation: Finds the average age of all customers.
- Rationale: Useful for demographic segmentation and targeted strategies.

Female %

- Formula: Female % = `DIVIDE(CALCULATE(COUNTROWS(customers), Customers[Gender] = "F"), [Total Customers], 0)`
- Explanation: Percentage of customers who are female.
- Rationale: Helps understand gender mix and design gender-based campaigns.

New Customers

- Formula: `New Customers = COUNTROWS(FILTER(Customers, Customers[SignupDate] >= MIN(Calendar[Date]) && Customers[SignupDate] <= MAX(Calendar[Date])))`
- Explanation: Counts customers who signed up in the selected date range.
- Rationale: Tracks new acquisitions during the period.

Profit per Customer

- Formula: `Profit per customer = DIVIDE([Gross Profit], [Total Customers],0)`
- Explanation: Average gross profit per customer.
- Rationale: Shows how valuable each customer is in terms of profit.

Repeat Customers

- Formula: `RepeatCustomers = COUNTROWS(FILTER(Customers, COUNTROWS(RELATEDTABLE(Orders)) > 1))`
- Explanation: Counts customers with more than one order.
- Rationale: Identifies repeat purchase behavior.

Repeat Purchase Rate

- Formula: `Repeat Purchase Rate = DIVIDE([Repeat Customers], [Total Customers],0)`
- Explanation: Percentage of customers who make repeat purchases.
- Rationale: Key measure of customer loyalty and retention.

Total Customers

- Formula: `Total Customers = DISTINCTCOUNT(Customers[CustomerID])`
- Explanation: Counts unique customers.
- Rationale: Baseline measure for customer base size.

Marketing Metrics

Average Orders per Channel

- Formula: $\text{Average orders per channel} = \text{DIVIDE}(\text{SUM}(\text{Marketing}[\text{OrdersGenerated}]), \text{DISTINCTCOUNT}(\text{Marketing}[\text{Marketing Channel}]), 0)$
- Explanation: Average orders generated per marketing channel.
- Rationale: Helps compare efficiency of marketing channels.

CAC (Customer Acquisition Cost)

- Formula: $\text{CAC} = \text{DIVIDE}(\text{SUM}(\text{Marketing}[\text{SpendAmount}]), \text{SUM}(\text{Marketing}[\text{CustomersAcquired}]), 0)$
- Explanation: Marketing spend per acquired customer.
- Rationale: Tracks efficiency and cost of customer acquisition.

CLV (Customer Lifetime Value)

- Formula: $\text{CLV} = \text{AVERAGEX}(\text{VALUES}(\text{Customers}[\text{CustomerID}]), \text{CALCULATE}(\text{SUM}(\text{Payments}[\text{Net Revenue}])))$
- Explanation: Average lifetime revenue per customer.
- Rationale: Balances acquisition cost with long-term value.

Conversion Rate

- Formula: $\text{Conversion Rate} = \text{DIVIDE}(\text{SUM}(\text{Marketing}[\text{OrdersGenerated}]), [\text{Total Prospects}], 0)$
- Explanation: Percentage of acquired customers who placed an order.
- Rationale: Measures effectiveness of acquisition campaigns.

Marketing RoI

- Formula: $\text{Marketing RoI} = \text{DIVIDE}(\text{SUM}(\text{Marketing}[\text{RevenueAttributed}]) - [\text{Total Marketing Costs}], [\text{Total Marketing Costs}], 0)$
- Explanation: Return on marketing investment.
- Rationale: Evaluates profitability of marketing spend.

Total Marketing Costs

- Formula: $\text{Total Marketing Costs} = \text{SUM}(\text{Marketing}[\text{SpendAmount}])$
- Explanation: Total money spent on marketing.
- Rationale: Basis for ROI and CAC analysis.

CSAT % (Customer Satisfaction)

- Formula: $CSAT \% = \frac{COUNTROWS(Orders[Rating] \geq 4)}{COUNTROWS(Orders)}$
- Explanation: Percentage of orders rated 4 or higher.
- Rationale: Indicates customer satisfaction levels.

Loyalty Index

- Formula: $Loyalty\ Index = \frac{DISTINCTCOUNT(Orders[OrderID])}{[Total\ Customers]}$
- Explanation: Calculates average number of unique orders per customer.
- Rationale: Indicates customer loyalty and frequency of purchases, helping identify retention success.

Order & Revenue Metrics

Refund Rate

- Formula: $Refundrate = \frac{SUM(Orders[RefundAmount])}{SUM(Orders[OrderValue])}$
- Explanation: Ratio of refunded amount to total order value.
- Rationale: Highlights refund issues affecting profitability.

Total Cost

- Formula: $Total\ Cost = SUMX(Orders, Orders[Quantity] * Orders[CostPerUnit])$
- Explanation: Total cost of goods sold.
- Rationale: Basis for profit calculation.

Total Quantity

- Formula: $Total\ Quantity = SUM(Orders[Quantity])$
- Explanation: Total number of units sold.
- Rationale: Tracks sales volume and demand trends.

AOV (Average Order Value)

- Formula: $AOV = \frac{[Total\ Net\ Revenue]}{DISTINCTCOUNT(Orders[OrderID])}$
- Explanation: Average revenue per order.
- Rationale: Useful for analyzing transaction value.

Gross Margin

- Formula: $\text{Gross Margin} = \text{DIVIDE}([\text{Gross Profit}], [\text{Total Net Revenue}], 0)$
- Explanation: Gross profit as a percentage of net revenue.
- Rationale: Shows efficiency in controlling costs.

Gross Profit

- Formula: $\text{Gross Profit} = [\text{Total Net Revenue}] - [\text{Total Cost}] - \text{SUM}(\text{Orders}[\text{RefundAmount}])$
- Explanation: Revenue after deducting costs and refunds.
- Rationale: Core measure of business profitability.

Total Net Revenue

- Formula: $\text{Total Net Revenue} = \text{SUM}(\text{Payments}[\text{Net Revenue}])$
- Explanation: Total net sales revenue collected.
- Rationale: Key top-line indicator for growth.

Average Order Value per Customer

- Formula: $\text{AoC} = \text{DIVIDE}([\text{AOV}], \text{COUNT}(\text{Customers}[\text{CustomerID}]), 0)$
- Explanation: Average order value per one customer
- Rationale: Useful for analyzing customer lifetime and transactional value.

New Columns

Delivery days per order

- Formula: $\text{Delivery Days} = \text{DATEDIFF}(\text{Orders}[\text{OrderDate}], \text{Orders}[\text{DeliveryDate}], \text{Day})$
- Explanation: Measures the number of days taken to deliver an order from the order date to the delivery date.
- Rationale: This metric helps assess operational efficiency, track logistics performance, and identify delays in fulfillment that can affect customer satisfaction (CSAT).

Product Category (from Products Table)

- Formula: $\text{Product Category} = \text{RELATED}(\text{Products}[\text{Category}])$

- Explanation: Fetches the product category from the Products table into the Orders table using the existing relationship.
- Purpose: Enables category-wise sales and performance analysis within the Orders dataset for visualisations

Net Revenue (from Payments Table)

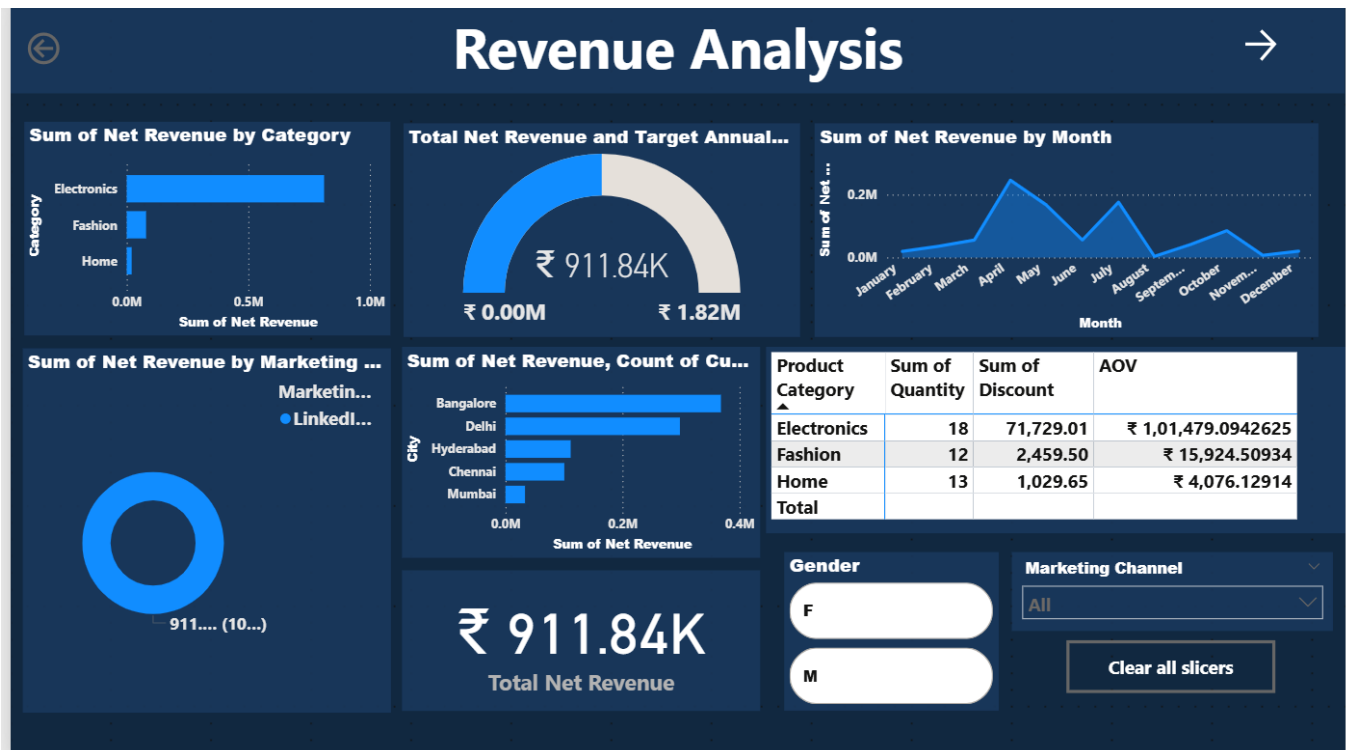
- Formula: Net Revenue = `RELATED(Payments[Net Revenue])`
- Explanation: Retrieves the net revenue value from the Payments table into the Orders table via the defined relationship.
- Purpose: Allows detailed order-level revenue analysis and comparison across products, customers, and categories for visualisations.

PART D: Visuals and Business Questions

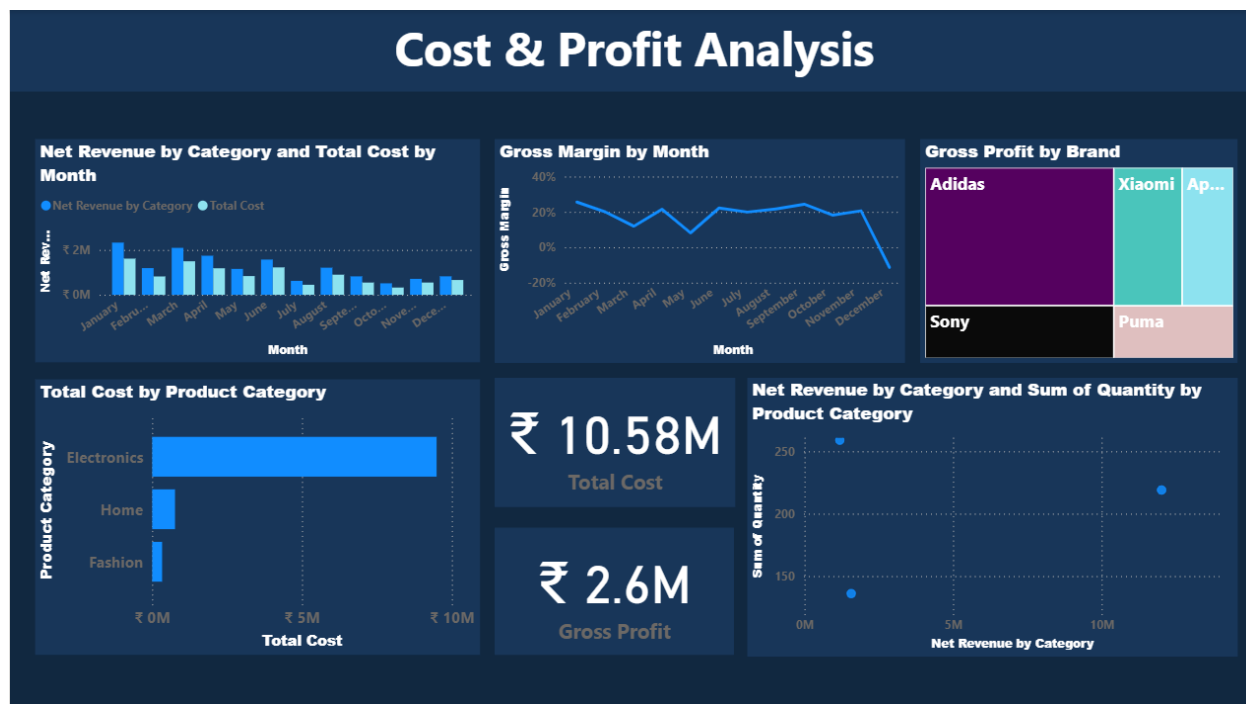
Dashboard Snapshots

Executive Summary →				
₹ 14.78M Total Net Revenue	₹ 10.58M Total Cost	₹ 2.6M Gross Profit	17.82% Gross Margin	₹ 26.32K Profit per customer
614 Total Quantity	100 Total Customers	36.19 Avg Customer age	₹ 158.88K CLV	70.00% Repeat Purchase Rate
₹ 1.63M Total Marketing Costs	7.65% Marketing RoI	312.60% Conversion Rate	₹ 2.48K CAC	₹ 59.1K AOV
51.20% CSAT %	70 Repeat Customers	11.57% Refund rate	45.00% Female %	3 Loyalty Index

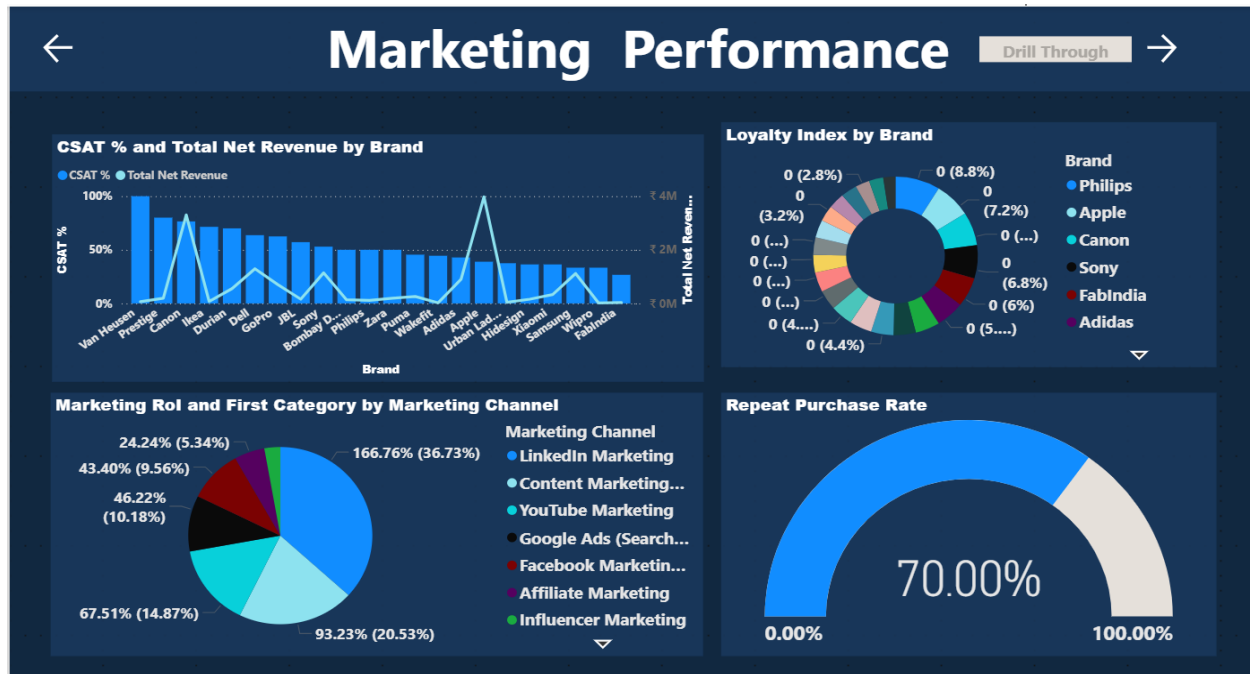
Executive Summary: Captures all the DAX measures created relating to revenue, cost, profit, marketing metrics etc.



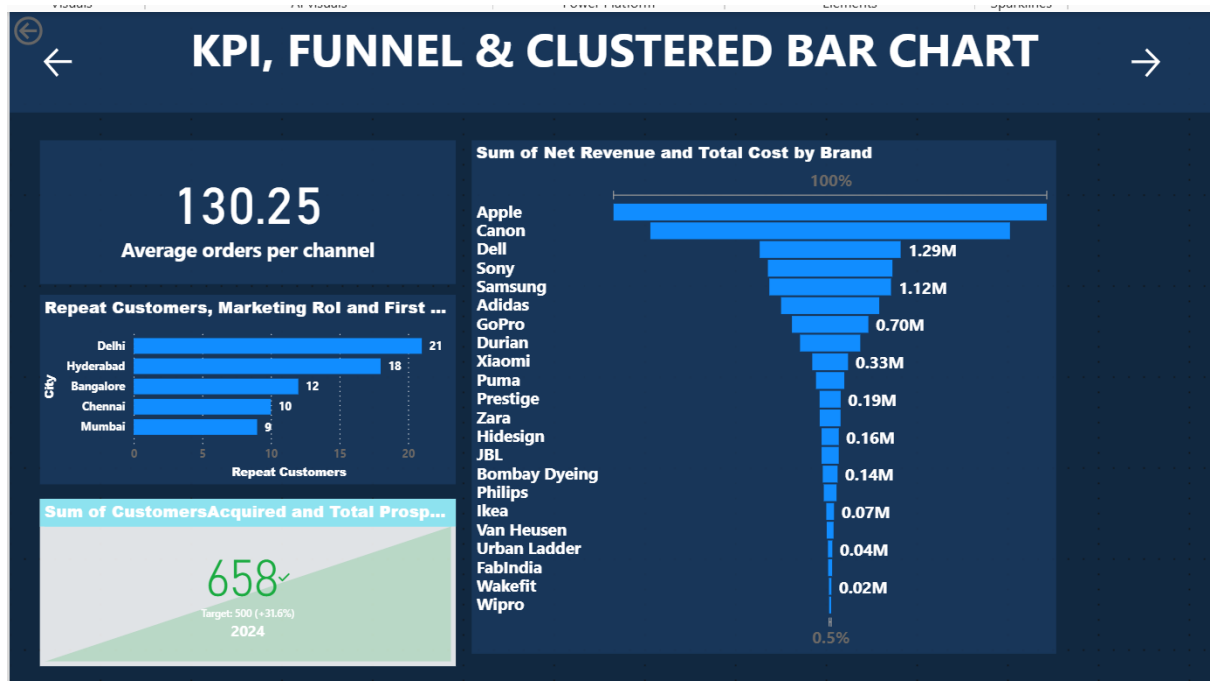
Revenue Analysis: Consists of all the relevant metrics and visualisations concerned with revenue understanding.

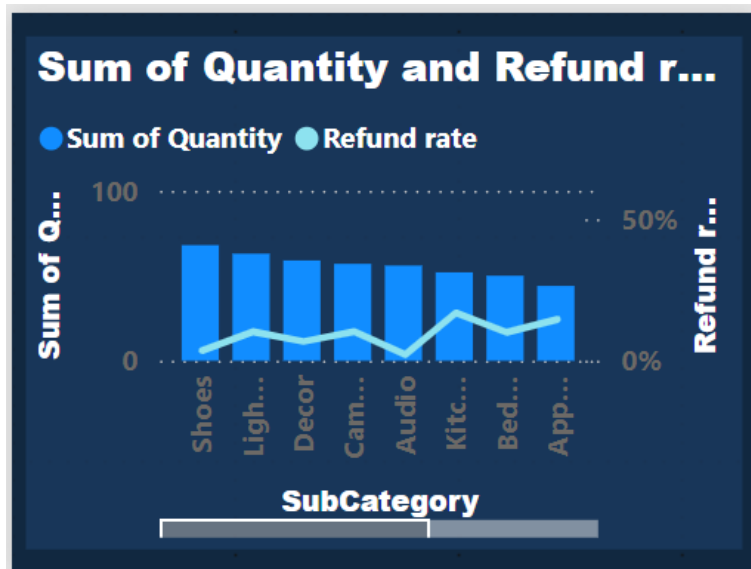


Cost & Profit Analysis: Cost and profit related KPIs are included in this slide

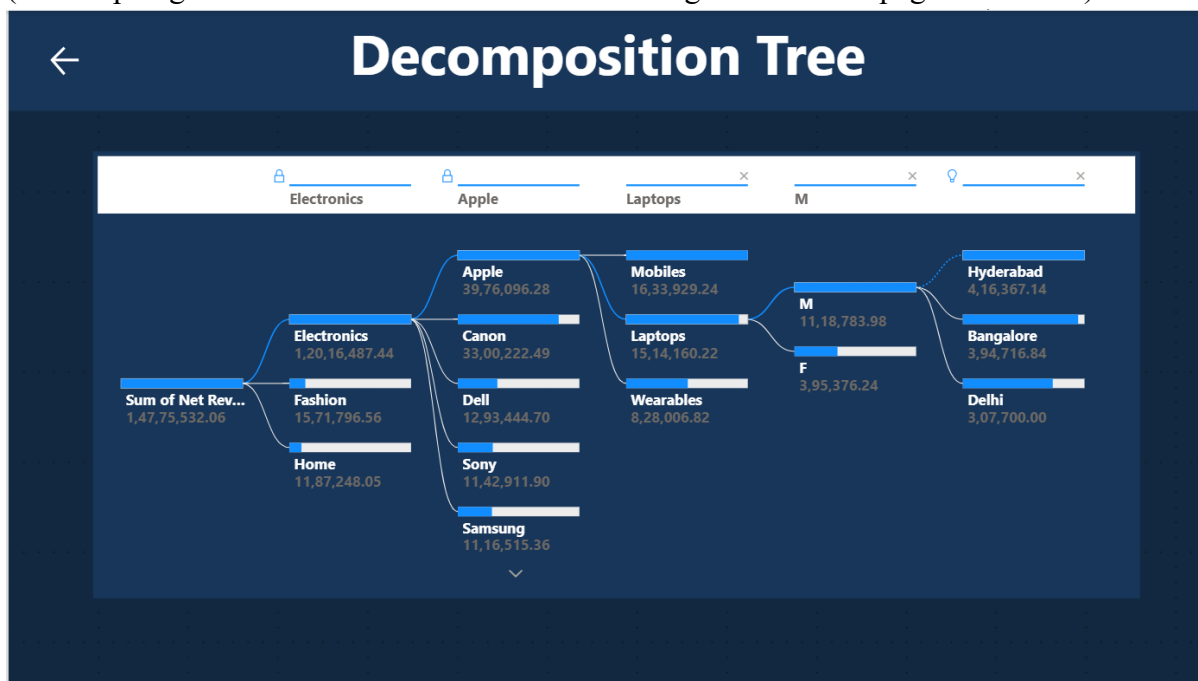


Marketing Performance: Visualisations relating to analysing the performance of the marketing efforts are included here.





(Tool Tip Page : Linked to the visual in the Marketing Performance page's Pie chart)



PART E: Dashboard Features

Navigation

Navigation buttons at top using bookmarks & page navigation actions for each page.

Between

Pages:

Bookmarks**Used:**

Bookmarks for: applied in the cost & profit analysis page where I inserted three buttons: Revenue charts, Cost Charts, and the third as Revenue & Cost Chart

Row-Level Security (RLS):

Created Manage role for Marketing channel

Created two roles:

1. Marketing Performance by Marketing Channel = Affiliate Marketing
2. Revenue Analysis by Revenue by Product Category = Electronics

Tooltip**Used:**

Have applied Static Tooltip to several charts

Also, have applied interactive tooltip:

Created a new page, activated tooltip from the canvas setting, later selected a Line & Stacked Column chart to visualise quantity vs Refund rate, with a net revenue line, this I have linked to the Pie Chart (marketing RoI vs Marketing channel) in the Marketing performance page.

Drill Through or Custom Tooltip:

Have enabled Drill through button in the octagon shape in the Marketing Performance Page to the Pie chart, when we select any marketing channel and then click on the drill down button, it will take to the Revenue analysis page, the page to which we linked the drill down button

Date Hierarchy Table:

Using a Calendar table as a dedicated Date table. Enabled time-intelligence by marking as Date table.

Slicers and Filters Used:

Key slicers/filters: button slicers: Gender Based, Drop-Down Slicer: Marketing Channel, Payment Method, Order Status.

Dynamic Titles or Conditional Formatting:

Dynamic titles for charts (DAX string measures) and conditional formatting on KPI cards & table cells (e.g., red if YoY decline > 10%, green if growth > 10%).

Dashboard Design and Layout:

- Clean, consistent theme with company colors (primary/secondary), readable fonts.
- Left panel: filters & slicers; top row: KPI cards; middle: time-series & channel analysis; bottom: product & customer drill-down.
- Consistent padding & 12-column grid alignment, cards with subtle shadows. Use a saved Power BI theme JSON for consistent colors.

PART F: Innovation and Insights

Unique / Creative Elements Added:

- Campaign attribution summary tile combining Marketing[SpendAmount], RevenueAttributed and ROI along with sparkline trend for each campaign.
- Decomposition Tree to break down drivers of AOV (Category → Brand → City).
- Custom tooltip showing 3-period trend and return rate for each product to spot problematic SKUs.
- Dynamic scenario switch using bookmarks: Toggle between “Revenue view” and “Profit-first view” (switches visible measures & conditional formatting).

The Power BI dashboard incorporates several innovative elements that enhance user interactivity, analytical depth, and decision support. These include:

- 1. Integrated Campaign Attribution Dashboard**
A consolidated campaign attribution visual merges Marketing[SpendAmount], RevenueAttributed and ROAS/ROI within a single tile. Each campaign’s sparkline trend visualizes performance over time, allowing immediate recognition of campaigns yielding the highest ROI and those requiring optimization.
- 2. Decomposition Tree for AOV Driver**

The Decomposition Tree visual analyzes the Sum of Net Revenue by breaking it down across multiple dimensions: Category, Brand, Subcategory, Gender, and City.

Starting from the overall revenue, the tree allows step-by-step exploration to identify which factors drive the highest performance. The analysis reveals how revenue varies first by Category, then further by Brand and Subcategory.

At the Gender level, an AI split was applied to automatically highlight the segment contributing the highest revenue, providing deeper insight into customer demographics. Finally, the City dimension helps understand regional revenue distribution and key market clusters.

3. **Dynamic View Switching (Scenario Analysis)**

The dashboard features a *scenario toggle* using bookmarks and measure-switching, allowing users to alternate between “Revenue View” (sales-driven KPIs) and “Profit-First View” (margin-centric KPIs). This design facilitates data storytelling from different business perspectives without duplicating visuals.

4. **Advanced Custom Tooltips and Drill-Through**

Custom tooltip pages display product thumbnails, 3-month mini-trends, and return rates on hover. Additionally, drill-through functionality enables seamless navigation from aggregate charts to order-level insights, fostering detailed root-cause analysis for anomalies.

5. **Customer Loyalty & Satisfaction Analytics**

A “Loyalty Index” metric was introduced, integrating *repeat customer percentage*, *CSAT (Customer Satisfaction) scores*, and *AOV trends*. This innovation quantifies brand affinity and helps prioritize retention-focused strategies alongside acquisition campaigns.

6. **Row-Level Security (RLS) for Marketing Channels**

Implemented RLS ensures that marketing teams can access only their respective channel data (e.g., Google Ads, LinkedIn, Email), reinforcing data privacy while personalizing insights for cross-functional stakeholders.

Key Business Insights:

1. **Top-Performing Brands and Profitability Patterns:**

Brands like Adidas, Xiaomi, Apple, Sony, and Puma emerged as consistent profit leaders. However, while these brands contributed to high net profits, certain subcategories within them exhibited declining margins, indicating potential supply chain inefficiencies or rising input costs.

2. **Marketing Channel Effectiveness:**

- LinkedIn Marketing showed the highest ROI and customer acquisition efficiency, suggesting it as a prime channel for future investment.

- Influencer Marketing and Affiliate Campaigns underperformed in revenue generation despite higher spending, indicating a need for performance-based payout models and better influencer segmentation.
- Email Campaigns recorded strong repeat purchase behavior, highlighting their importance in customer retention.

3. Sales–Profit Disparity in High-Volume SKUs:

Analysis revealed several high-revenue SKUs delivering low margins. This signals the need to revisit pricing, supplier contracts, or logistics costs to ensure profitable growth rather than pure sales volume.

4. Customer Demographics and Behavioral Trends:

The average customer age group of 25–34 years accounted for the majority of orders, especially in electronics and sportswear categories. Repeat purchase rates were highest in Tier-1 cities, indicating stronger brand loyalty and higher lifetime value within mature markets.

5. Operational Efficiency and Fulfilment Insights:

Delivery days per order averaged around 3–5 days for metro regions but extended beyond 7 days in smaller cities. Delayed deliveries were correlated with lower CSAT scores, suggesting an opportunity for logistics optimization and warehouse network expansion.

Strategic Implications

1. **Optimizing Marketing Budget Allocation:** Redirect spending from underperforming channels (e.g., influencer marketing) toward high-ROI platforms like LinkedIn and Email campaigns.
 2. **Profitability Management:** Reassess product pricing and sourcing strategies for high-sales, low-margin SKUs to ensure sustainable profitability.
 3. **Customer Retention Strategy:** Strengthen loyalty programs and personalized marketing for high-repeat segments, leveraging the “Loyalty Index” as a KPI.
 4. **Operational Improvements:** Use delivery-time insights to redesign supply chains for better customer satisfaction and lower return rates.
 5. **Scalable Data Model:** The star schema and modular DAX design support future integration with ERP or CRM systems for real-time analytics and predictive insights.
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PART G: Conclusion

The *E-commerce Orders and Marketing Analytics* project provided a comprehensive, hands-on experience in applying **data analytics and business intelligence concepts** to a real-world industry context. Working with a self-curated dataset and developing an interactive Power BI dashboard enabled us to translate theoretical knowledge into practical insights, reinforcing both technical proficiency and business understanding.

From a technical standpoint, we gained a deep understanding of **data preparation, modeling, and visualization workflows**. Tasks such as establishing a star schema model, creating calculated columns, and designing complex DAX measures (for KPIs like CLV, CAC, ROI, and AOV) enhanced our analytical capabilities. Implementing advanced Power BI features, including **row-level security (RLS)**, **dynamic filtering**, **custom tooltips**, and **bookmarks**, strengthened our skills in creating user-centric, interactive dashboards.

On the business side, the project deepened our understanding of how **data storytelling** supports managerial decision-making. We learned how metrics derived from sales and marketing data can reveal performance gaps, customer trends, and opportunities for operational improvement. The process of interpreting profitability patterns, campaign effectiveness, and customer loyalty indicators emphasized the importance of contextualizing numbers within broader strategic objectives.

Equally significant was the **collaborative learning experience**. Dividing responsibilities between data cleaning, DAX formulation, and visualization design allowed us to simulate a real-world analytics team environment, improving coordination, time management, and problem-solving skills.

Overall, this project not only enhanced our technical expertise in Power BI but also cultivated a **data-driven mindset**, demonstrating how business intelligence can transform raw data into actionable insights. It reaffirmed our belief that mastering analytical tools and frameworks is essential for thriving in today's data-centric business landscape.