STRATEGIC DECISION-MAKING USING POWER-BI

REPORT SUBMISSION

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REG. NO: 2023JULB01239

TABLE OF CONTENT

Table of Figures

Table of Figures

1. Problem Statement

The project presents a comprehensive analysis of an e-commerce business, utilizing Excel and Power BI tools. Key performance metrics and trends are analyzed and displayed using pivot tables, charts, and a Power BI dashboard. The insights gained from this analysis can aid in informed decision-making and drive business growth. The project also includes forecasting techniques to predict future trends and performance. The aim of this project is to provide a clear and actionable understanding of the e-commerce business and its various components, helping to identify areas for improvement and growth.

Objective of the Power BI Dashboard

The objective of the Power BI dashboard shown is to provide a comprehensive analysis of e-commerce sales performance across various key metrics. The dashboard includes:

1. **Overall Sales and Profit**: It displays the total sales ($2.30M), total profit ($286.40K), quantity sold (37.9K), and the number of orders (9,994), along with the profit margin (12.47%).
2. **Sales and Profit Analysis**: A graphical representation of monthly sales and profit trends throughout the year.
3. **Category-Wise Profit**: The dashboard breaks down the profit by categories such as Technology, Office Supplies, and Furniture, showing how each category contributes to the total profit.
4. **Category-Wise Sales Share**: It highlights the distribution of sales among the three main categories.
5. **Sales by State**: A map that shows where sales are occurring, giving insights into regional performance.
6. **Top 5 Subcategories by Sales**: It lists the top-selling subcategories like Phones, Chairs, and Storage, providing detailed revenue breakdowns.
7. **Filters**: The dashboard includes filters to analyze the data by year (2011-2014) and by region (Central, East, South, West), as well as customer types (Consumer, Corporate, Home Office).

This dashboard enables quick and clear insights into the sales performance, profit contributions by category, and geographical performance, aiding decision-making and business strategy planning.

Expected Outcomes

1. **Performance Monitoring:**
    - Tracking of overall sales, profits, and other key metrics (such as quantity sold, number of orders, and profit margin) to monitor the health of the e-commerce business.
    - Understanding sales trends over time, with month-to-month comparisons, allowing for better forecasting and financial planning.
2. **Category Performance Analysis:**

- Insight into the profit contributions of different product categories (Technology, Office Supplies, and Furniture), helping to identify which categories are performing the best or underperforming.
- Data-driven decisions on resource allocation, such as where to focus marketing efforts, inventory management, or promotional activities.

3. **Geographical Insights:**
    - Sales performance by state can reveal geographic trends and highlight regions with high or low sales, helping the business tailor regional strategies, such as regional promotions or targeted ad campaigns.
    - The ability to identify potential regions with untapped market opportunities or those needing additional support or resources.
4. **Product-Level Insights:**
    - Detailed breakdown of the top-selling subcategories (Phones, Chairs, Storage, Tables, Binders) to highlight products with the highest sales volume.
    - Informing stock management, product development, or focus areas for promotions based on the best-performing products.
5. **Profitability Analysis:**
    - Evaluation of profit margins by category, helping to determine which product categories not only generate revenue but also offer the best profitability.
    - Identification of areas where profit margins may be improved (e.g., adjusting pricing or cost structures for certain categories).
6. **Strategic Decision-Making:**
    - The ability to drill down into specific regions or time periods with the filters, facilitating more granular analysis and allowing the business to adapt strategies according to regional trends or seasonality.
    - Empowering stakeholders to make informed decisions regarding product offerings, marketing strategies, and sales targets.
7. **Actionable Insights for Sales Teams:**
    - Sales teams can use insights from the dashboard to better prioritize sales efforts, target specific categories or regions with tailored approaches, and set realistic sales goals.
    - Highlighting underperforming areas and helping to address potential issues through strategic changes.

Overall, this dashboard is designed to offer actionable insights to drive growth, optimize operations, and improve profitability across the e-commerce business.

2. DATA REQUIREMENT

Row ID	Order ID	Year	Order Date	Ship Date	shipment days	Ship Mode	Customer ID	Customer Name	Segment	Country	City	State	Postal Code	Region	Product ID	Category	Sub-Category	Product Name	Sales	Quantity	Discount	Profit
1	CA-2013-15215	2013	09-11-2013	12-11-2013	3	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	Kentucky	42420	South	FUR-BO-10001798	Furniture	Bookcases	Bush Somerset Collection Bookcase	261.96	2	0	41.9136
2	CA-2013-15215	2013	09-11-2013	12-11-2013	3	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	Kentucky	42420	South	FUR-CH-10000454	Furniture	Chairs	Hon Deluxe Fabric Upholstered Stacking Chairs, Rounded Back	731.94	3	0	219.582
3	CA-2013-13868	2013	13-06-2013	17-06-2013	4	Second Class	DV-13045	Darrin Van Huff	Corporate	United States	Los Angeles	California	90036	West	OFF-LA-10000240	Office Supplie	Labels	Self-Adhesive Address Labels for Typewriters by Universal	14.62	2	0	6.8714
4	US-2012-10899	2012	11-10-2012	18-10-2012	7	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	Florida	33311	South	FUR-TA-10000577	Furniture	Tables	Bretford CR4500 Series Slim Rectangular Table	957.5775	5	0.45	-383.031
5	US-2012-10899	2012	11-10-2012	18-10-2012	7	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	Florida	33311	South	OFF-ST-10000760	Office Supplie	Storage	Eldon Fold 'N Roll Cart System	22.368	2	0.2	2.5164
6	CA-2011-11581	2011	09-06-2011	14-06-2011	5	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	FUR-FU-10001487	Furniture	Furnishings	Idon Expressions Wood and Plastic Desk Accessories, Cherry Wox	48.86	7	0	14.1694
7	CA-2011-11581	2011	09-06-2011	14-06-2011	5	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	OFF-AR-10002833	Office Supplie	Art	Newell 322	7.28	4	0	1.9656
8	CA-2011-11581	2011	09-06-2011	14-06-2011	5	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	TEC-PH-10002275	Technology	Phones	Mitel 5320 IP Phone VoIP phone	907.152	6	0.2	90.7152
9	CA-2011-11581	2011	09-06-2011	14-06-2011	5	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	OFF-BI-10003910	Office Supplie	Binders	DXL Angle-View Binders with Locking Rings by Samsill	18.504	3	0.2	5.7825
10	CA-2011-11581	2011	09-06-2011	14-06-2011	5	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	OFF-AP-10002892	Office Supplie	Appliances	Belkin F5C206VTEL 6 Outlet Surge	114.9	5	0	34.47
11	CA-2011-11581	2011	09-06-2011	14-06-2011	5	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	FUR-TA-10001539	Furniture	Tables	Chromcraft Rectangular Conference Tables	1706.184	9	0.2	85.3092
12	CA-2011-11581	2011	09-06-2011	14-06-2011	5	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	TEC-PH-10002033	Technology	Phones	Konftel 250 Conference phone - Charcoal black	911.424	4	0.2	68.3568
13	CA-2014-11441	2014	16-04-2014	21-04-2014	5	Standard Class	AA-10480	Andrew Allen	Consumer	United States	Concord	North Carolina	28027	South	OFF-PA-10002365	Office Supplie	Paper	Xerox 1967	15.552	3	0.2	5.4432
14	CA-2013-16138	2013	06-12-2013	11-12-2013	5	Standard Class	IM-15070	Irene Maddox	Consumer	United States	Seattle	Washington	98103	West	OFF-BI-10003656	Office Supplie	Binders	Fellowes PB200 Plastic Comb Binding Machine	407.976	3	0.2	132.5922
15	US-2012-11898	2012	22-11-2012	26-11-2012	4	Standard Class	HP-14815	Harold Pawlan	Home Office	United States	Fort Worth	Texas	76106	Central	OFF-AP-10002311	Office Supplie	Appliances	Replacement Filter for HEPA Air Cleaner, Very Large Room, HE	68.81	5	0.8	-123.858
16	US-2012-11898	2012	22-11-2012	26-11-2012	4	Standard Class	HP-14815	Harold Pawlan	Home Office	United States	Fort Worth	Texas	76106	Central	OFF-BI-10003759	Office Supplie	Binders	Storex DuraTech Recycled Plastic Frosted Binders	2.544	3	0.8	-3.816
17	CA-2011-10568	2011	11-11-2011	18-11-2011	7	Standard Class	PK-19075	Pete Kriz	Consumer	United States	Madison	Wisconsin	53711	Central	OFF-ST-10004186	Office Supplie	Storage	Stur-D-Stor Shelving, Vertical 5-Shelf: 72"H x 36"W x 18 1/2"D	665.88	6	0	13.3176
18	CA-2011-16716	2011	13-05-2011	15-05-2011	2	Second Class	AG-10270	Alejandro Grove	Consumer	United States	West Jordan	Utah	84084	West	OFF-ST-10001078	Office Supplie	Storage	Fellowes Super Stor/Drawer	55.5	2	0	9.99
19	CA-2011-14333	2011	27-08-2011	01-09-2011	5	Second Class	ZD-21925	Zuschuss Donatelli	Consumer	United States	San Francisco	California	94109	West	OFF-AR-10003056	Office Supplie	Art	Newell 341	8.56	2	0	2.4824
20	CA-2011-14333	2011	27-08-2011	01-09-2011	5	Second Class	ZD-21925	Zuschuss Donatelli	Consumer	United States	San Francisco	California	94109	West	TEC-PH-10001949	Technology	Phones	Cisco SPA 501G IP Phone	213.48	3	0.2	16.011

Source: Kaggle Dataset (2_Ecommerce Sales Data Analysis Excel.xlsx)

To execute the analysis, the following columns are required:

1. **Order ID** - Identifies individual orders.
2. **Year** - The year when the order was placed.
3. **Order Date** - The date the order was placed.
4. **Ship Date** - The date the order was shipped.
5. **Shipment Days** - The number of days taken to ship the order.
6. **Ship Mode** - The shipping method (e.g., Standard Class, Second Class).
7. **Customer ID** - Unique identifier for each customer.
8. **Customer Name** - Name of the customer.
9. **Segment** - The customer segment (e.g., Consumer, Corporate).
10. **Country** - The country where the order is placed.
11. **City** - The city where the customer is located.
12. **State** - The state where the customer is located.
13. **Postal Code** - The postal code for the delivery address.
14. **Product ID** - The unique identifier for each product.
15. **Category** - The product category (e.g., Furniture, Technology).
16. **Sub-Category** - The product's sub-category (e.g., Bookcases, Phones).
17. **Product Name** - The name of the product.
18. **Sales** - The sales value of the order.
19. **Quantity** - The quantity of items ordered.
20. **Discount** - The discount applied to the order.
21. **Profit** - The profit generated from the sale.

3. Data Collection

1. **Sales Transactions** - The data could be directly extracted from sales transactions, where each entry represents a unique order placed by a customer, including details such as the order ID, product purchased, sales value, and discount.
2. **Customer Relationship Management (CRM) System** - The customer details, such as customer IDs, names, and segments, may be sourced from the company's CRM system, which tracks customer interactions and behaviors.
3. **Inventory Management System** - Product IDs, product names, categories, and sub-categories likely originate from the company's inventory management system, which organizes and tracks the products available for sale.
4. **Order Fulfillment System** - Shipment-related data, such as the ship date, shipment days, and shipping modes, may be extracted from the company's order fulfillment or logistics system that tracks the processing and delivery of orders.
5. **Accounting/Financial System** - Data on sales, discounts, and profits may be gathered from the company's accounting or financial systems, which record monetary transactions and calculate profit margins.
6. **Geographic Data Sources** - Location-related data, such as city, state, postal code, and region, may come from the company's geographic or customer segmentation database that tracks sales performance by region.
7. **Point of Sale (POS) Systems** - Transactional data, including the products sold, quantity, and price, may be captured at the point of sale (POS) systems within the retail or grocery stores.

4. Data Validation

Purpose: Ensure data accuracy, consistency, and reliability for analysis by identifying and correcting errors or anomalies.

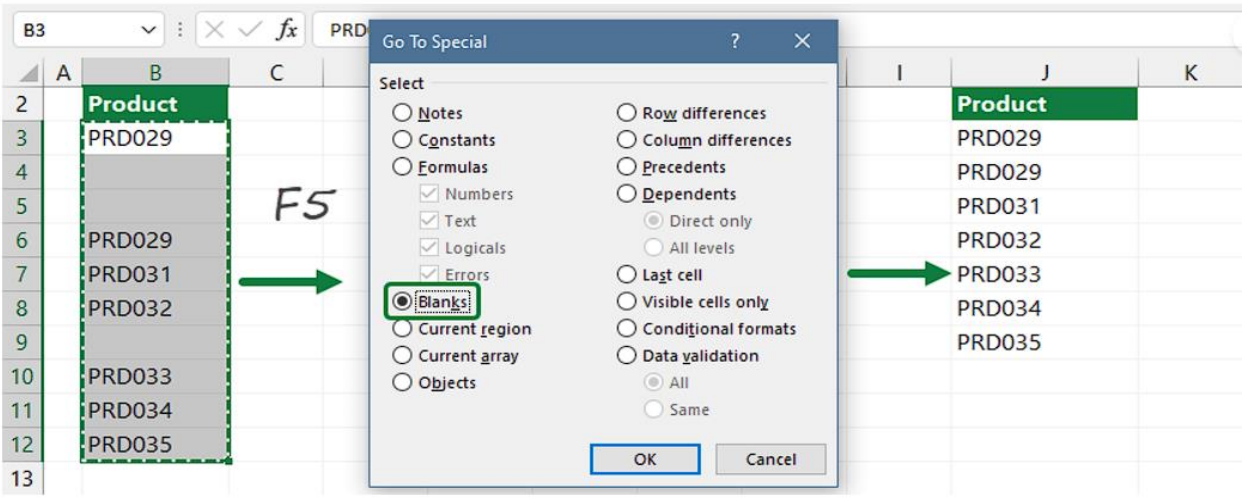


Figure 1, Data Cleaning, https://exceldashboardschool.com/15-ways-to-clean-data-in-excel

Steps

1. **Validate Column Headers**:
    - Confirm headers match the expected schema.

- Fix missing, extra, or misnamed columns.

2. **Check for Missing Data**:
   - Highlight blank cells.
   - Handle missing values (e.g., impute or remove rows).
3. **Data Type Validation**:
   - Ensure numeric columns (e.g., "Sales") contain only numbers.
   - Check categorical columns for consistent entries.
4. **Check for Duplicates**:
   - Remove duplicate rows to retain unique records.
5. **Validate Numerical Ranges**:
   - Identify outliers in "Sales" and "Item Visibility."
   - Verify reasonable min, max, and average values.
6. **Ensure Categorical Consistency**:
   - Standardize categories (e.g., "Low Fat" and "LF").
7. **Cross-Check Relationships**:
   - Verify logical links (e.g., "Outlet Type" matches "Outlet Identifier").
8. **Data Completeness**:
   - Confirm the dataset covers all expected records and timeframes.
9. **Document Validation**:
   - Log all cleaning actions and detected issues.
10. **Test Final Dataset**:
    - Create test summaries to verify data readiness.

5. Data Cleaning

Purpose: Ensure the dataset is accurate, consistent, and ready for analysis by eliminating errors and irrelevant information.

Steps for Data Cleaning:

1. **Remove Duplicates**:
   - Eliminate repeated rows to avoid distorted calculations.
2. **Handle Missing Values**:
   - Fill numeric fields with mean/median and categorical fields with mode or placeholders (e.g., "Unknown").

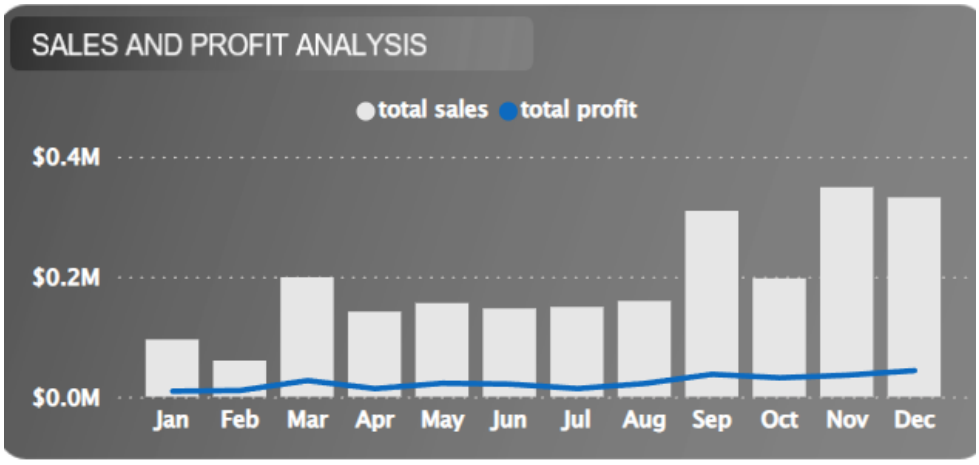
3. **Correct Data Types**:
    - Ensure numeric columns (e.g., "Sales") and categorical fields are in the correct format.
4. **Standardize Categorical Values**:
    - Unify inconsistent entries (e.g., "Low Fat" and "LF").
5. **Remove Outliers/Irrelevant Data**:
    - Exclude extreme outliers or irrelevant rows/columns.
6. **Ensure Consistent Units**:
    - Standardize measurements like "Item Weight."
7. **Validate Relationships**:
    - Confirm logical links between fields (e.g., "Outlet Identifier" and "Outlet Type").
8. **Address Formatting Issues**:
    - Trim spaces and ensure consistent text formatting.
9. **Create Derived Fields (Optional)**:
    - Add fields like "Year of Operation" or "Sales per Item" for better insights.
10. **Document Changes**:
    - Maintain a log of cleaning actions for transparency and reproducibility.

6. TOOLS

Tools to be Used for Analysis and Visualization:

1. **Power BI:** For creating interactive dashboards and visualizations.
2. **Microsoft Excel:** For data cleaning, validation, and basic exploratory analysis.

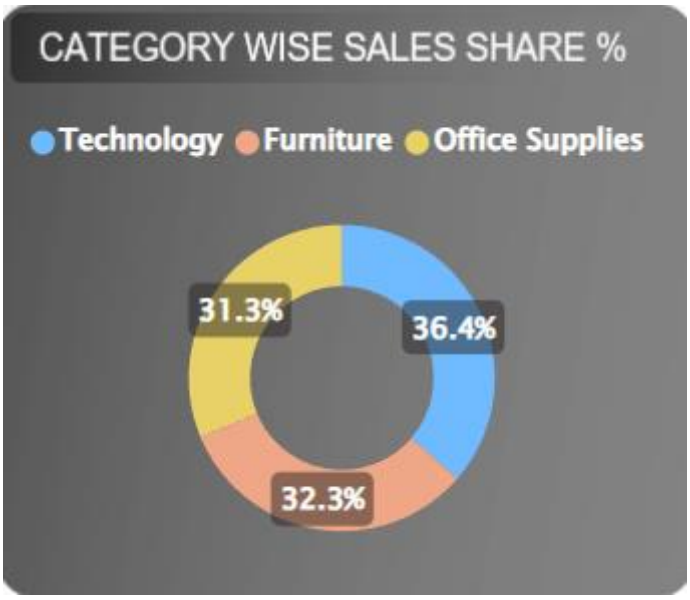
7. GRAPH



This graph represents the monthly analysis of **Total Sales** (white bars) and **Total Profit** (blue line) over the course of a year.

Key Observations:

1. **Sales and Profit Trend:**
    - There is a significant increase in both sales and profit starting from **August** and peaking in **November** and **December**.
    - **November and December** show the highest sales and profits, which could be indicative of peak season sales, possibly due to holiday shopping or promotions.
2. **Profit Consistency:**
    - Profit remained relatively consistent throughout the year, with only a slight increase in **August** before accelerating towards the end of the year. This may suggest that the profit margin is stable or improving despite fluctuations in sales.
3. **Low Sales Periods:**
    - The beginning of the year, especially **January** through **April**, shows lower sales and profits, which could reflect slower market activity or post-holiday season effects.



Type: This is a donut chart, a variation of a pie chart with a hole in the centre. Donut charts are often used to compare proportions of different categories within a whole.

Categories and Their Shares:

- **Technology:** 31.3%
- **Furniture:** 32.3%
- **Office Supplies:** 36.4%

Interpretation:

The graph visually represents the percentage of sales attributed to each category. We can see that Office Supplies contribute the most to sales, followed closely by Furniture, and then Technology.

8. DASHBOARD

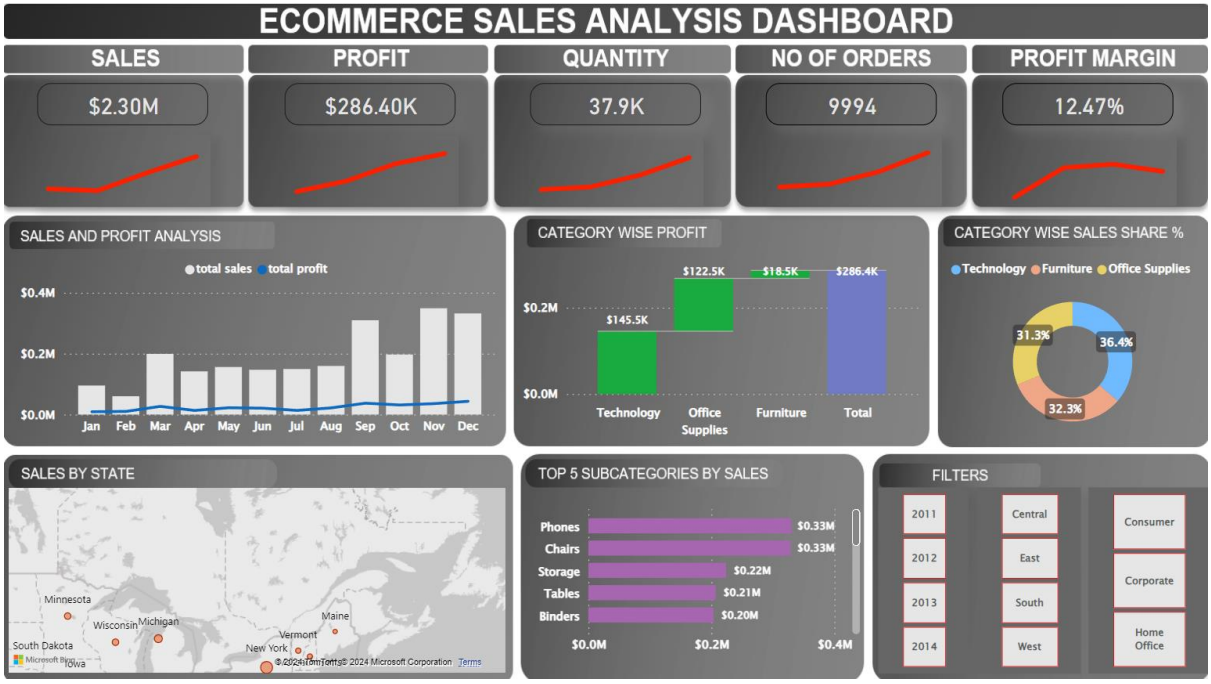


Figure 2, Demo Ecommerce Sales Analysis Dashboard

Key Components of the Dashboard:

1. Sales, Profit, Quantity, and Orders

- **Sales ($2.30M):** The total revenue generated from sales.
- **Profit ($286.40K):** The total profit made after costs.
- **Quantity (37.9K):** The total number of units sold.
- **Number of Orders (9994):** The total number of individual orders processed.
- **Profit Margin (12.47%):** The profit margin expressed as a percentage of total sales.

2. Sales and Profit Analysis

- **Monthly Sales and Profit Trend:** A graph that shows total sales and total profit over the months, highlighting the trend and providing insights into performance.
- **Total Sales and Profit Comparison:** Helps to assess the relationship between sales volume and profit over time.

3. Category-wise Profit

- **Technology (Profit: $145.5K):** The profit earned from the technology category.
- **Office Supplies (Profit: $122.5K):** The profit earned from office supplies.
- **Furniture (Profit: $18.5K):** The profit earned from the furniture category.
- **This section highlights which categories are contributing the most to profit.**

4. Category-wise Sales Share Percentage

- **Sales Distribution by Category:** A pie chart shows the proportion of sales from Technology (31.3%), Furniture (32.3%), and Office Supplies (36.4%).

5. Sales by State

- **Map View:** Displays a map with marked locations that represent different states, showing regional sales performance.

6. Top 5 Subcategories by Sales

- Phones ($0.33M), Chairs ($0.33M), Storage ($0.22M), Tables ($0.21M), Binders ($0.20M): This section lists the top five subcategories based on sales revenue, helping to understand the most popular products.

7. Filters

- Time Filters (Years: 2011-2014): This allows users to filter the data by different years.
- Region Filters (Central, East, South, West): Filters by geographical region.
- Segment Filters (Consumer, Corporate, Home Office): Filters by customer segment to analyze sales based on customer type.

This dashboard gives an overview of the sales performance, broken down by category, region, and product subcategory, along with detailed monthly trends to help make data-driven decisions.

9. STORYTELLING

This E-Commerce Sales Analysis Dashboard provides a clear snapshot of our business performance, highlighting key areas that directly impact growth and profitability.

- **Revenue Growth:** Sales have reached **$2.30M**, with **$286.4K** in profit, demonstrating a strong financial position. The **12.47% profit margin** signals effective cost management and operational efficiency.
- **Category Focus: Technology** and **Office Supplies** are driving profit, contributing significantly to the bottom line, with **$145.5K** and **$122.5K** in profits respectively. **Furniture**, though a smaller contributor, presents an opportunity for growth with targeted marketing strategies.
- **Regional Insights:** The state-level sales map reveals key markets like **New York** and **California**, while uncovering untapped opportunities in the Midwest and South. Regional strategies can further fuel expansion.

- **Top-Selling Products: Phones** and **Chairs** are leading sales, indicating high consumer demand for tech and office furniture. These insights can guide product focus and inventory planning.

By leveraging this data, the business can optimize product offerings, refine marketing efforts, and focus on expanding in high-potential regions. These actions will drive sustained revenue growth and ensure profitability moving forward.