

Exploratory Data Analysis (EDA) and Business Insights

1. Overview

This analysis investigates eCommerce transaction data to understand customer behavior and derive meaningful business insights. By merging transaction details with product information, we explore patterns such as spending behavior, quantity bought, product categories, and customer segmentation through clustering.

2. Data Overview

The dataset contains two main files:

- Transactions: Details of each transaction, including `TransactionID`, `CustomerID`, `ProductID`, `Quantity`, and `TotalValue`.
- Products: Information on the products, including `ProductID`, `Price`, and `Category`.

After merging the data, we aggregated customer-level features like total spending, quantity purchased, average price, and favorite product category.

3. Key Insights from EDA

- Total Spending & Quantity: The data reveals the distribution of total spending and quantity purchased across different customers. The analysis shows that a small proportion of customers account for the majority of the total spending, suggesting that there is a concentration of high-value customers.
- Price vs Quantity: There is a noticeable inverse relationship between the price and quantity of products purchased. Customers tend to purchase more items at lower prices, while high-priced products are bought in smaller quantities, indicating a price-sensitive segment.

- Favorite Product Categories: Through the aggregation of customer purchases, we identified the most frequent product categories. Categories such as electronics, clothing, and home appliances are the most popular, with electronics being the leading category, followed by clothing. This insight can guide inventory management and targeted marketing strategies.
- Customer Segmentation: Using KMeans clustering, we segmented customers into four clusters based on their purchasing behavior (total spending, quantity, average price). The clusters reveal distinct customer profiles:
 - High-Spenders: Customers with high total spending and lower quantity purchases.
 - Frequent Shoppers: Customers with high quantity purchases but lower overall spending.
 - Bargain Hunters: Customers buying low-priced items in high quantities.
 - Occasional Shoppers: Customers who make sporadic purchases with moderate spending.

4. Business Insights

- Targeted Marketing: By identifying high-value customers (High-Spenders), the business can target them with exclusive offers and loyalty programs to increase their lifetime value. Similarly, Frequent Shoppers can be engaged with promotions encouraging them to spend more per transaction.
- Product Pricing Strategy: The inverse relationship between price and quantity suggests the opportunity for dynamic pricing. The business could experiment with bundle pricing strategies for high-ticket items and provide discounts on bulk purchases to encourage more spending from Bargain Hunters.
- Category-Specific Promotions: The popularity of categories like electronics and clothing provides an opportunity for category-specific campaigns. The business can run sales or promotions targeting specific customer segments based on their favorite product categories.

- Customer Retention: The insights from clustering can guide customer retention efforts. By understanding the purchasing behavior of each cluster, personalized retention strategies can be developed. For example, offering discounts on high-ticket products to High-Spenders or personalized discounts on items within their favorite category to Occasional Shoppers.
- Inventory and Supply Chain Optimization: With a clearer understanding of product preferences (e.g., electronics), the business can optimize inventory levels and supply chain processes. Ensuring that popular items are well-stocked can minimize stockouts and lost sales.

5. Conclusion

This EDA reveals critical customer purchasing patterns and product preferences, enabling data-driven decisions in marketing, pricing, and inventory management. By leveraging these insights, businesses can enhance customer satisfaction, optimize resources, and increase profitability.