Customer Segmentation Report

K-Means Clustering

Elbow Method Analysis
- The **elbow point** appears around **k = 4**, where the rate of decrease in inertia slows down significantly.
- This suggests that **4 clusters** might provide a good balance between cluster compactness and simplicity.

DB Index Analysis
- The **DB Index** decreases sharply and stabilizes after **k = 4**.
- Since a lower **DB Index** indicates better clustering, **k = 4** seems to be the optimal choice here as well.

DB Index value : 1.0236095510632044

Cluster Insights :

Cluster 0 (218 Customers):
- Average **Total Value**: 697.59 dollars.
- Customers purchase slightly lower-priced products.
- Average **quantity purchased**: 2.57 items per transaction.

Cluster 1 (304 Customers):
- **Largest cluster**.
- Highest spending customers with an **Average Total Value**: 721.55 dollars.
- Average **quantity purchased**: 2.60 items.
- Tend to buy **higher-priced products**: 277.01 dollars.

Cluster 2 (244 Customers):
- Lowest spending customers with an **Average Total Value**: 624.23 dollars.
- Transactions involve **fewer quantities**: 2.43 items.
- Products purchased are **lower-priced**: 265.24 dollars.

Cluster 3 (234 Customers):
- Similar spending behavior to **Cluster 1** with an **Average Total Value**: 710.49 dollars.
- Average **quantity purchased**: 2.54 items.
- Spend on **mid-range products**: 275.57 dollars.

Actionable Insights for Marketing:
- For personalized promotions or premium product campaigns,**Focus on Cluster 1 and Cluster 3**
- To increase the spending.**Design loyalty programs for Cluster 0**
- To engage Cluster 2 customers **Offer discounts or bundled deals**

Hierarchical Clustering¶

Number of clusters formed :
- Based on the dendrogram, The total number of clusters are 4

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DBSCAN Clustering

Clustering Metrics

- **Unique Clusters**: **75 clusters** (0 to 74) and **noise points (-1)**.
- **Silhouette Score**: **0.6818**
    - Indicates **well-defined clusters** with good separation and cohesion.
- **Davies-Bouldin Index**: **0.3527**
    - Indicates excellent cluster compactness and separation.

Cluster Insights :

1. High-Value Clusters (Premium Customers):

Clusters with positive metrics for all features, representing frequent, high-spending customers.

Cluster 71 (8 customers):

- **Quantity**: 1.309
- **TotalValue**: 1.488
- **Price**: 0.592
- **Insight**: High-spenders who purchase frequently and prefer premium products.

Cluster 72 (1 customer):

- **Quantity**: 1.309
- **TotalValue**: 1.728
- **Price**: 0.802
- **Insight**: Exceptional customer with extremely high spending on premium products.

2. Moderate-Value Clusters (Growth Potential):

Clusters with mixed or average metrics, representing customers with growth opportunities.

Cluster 3 (20 customers):

- **Quantity**: 0.414
- **TotalValue**: 0.454
- **Price**: 0.227
- **Insight**: Moderate spenders purchasing mid-priced products. Potential to move up to higher tiers.

Cluster 74 (4 customers):

- **Quantity**: -0.481
- **TotalValue**: 0.594
- **Price**: 1.556
- **Insight**: Customers purchasing high-priced items but in small quantities.

3. Low-Value Clusters (Budget-Conscious Customers):

Clusters with negative metrics, representing low spenders and infrequent buyers.

Cluster 0 (26 customers):

- **Quantity**: -1.375
- **TotalValue**: -0.764
- **Price**: 0.289
- **Insight**: Low-spending customers who prefer low-to-mid priced products.

Cluster 1 (7 customers):

- **Quantity**: -1.375
- **TotalValue**: -0.813
- **Price**: 0.120
- **Insight**: Represents the least engaged and lowest-spending customers.

Actionable Insights

High-Value Clusters
- Retain with personalized rewards, VIP programs, and exclusivity.

Moderate Clusters:
- Upsell, cross-sell, and use targeted promotions.

Low-Value Clusters:
- Re-engage with discounts, bundles, and value-focused campaigns.