Clustering Results Report

1. Number of Clusters Formed

For this analysis, **4 clusters** were formed using the KMeans clustering algorithm. The choice of 4 clusters was made after experimenting with different values between 2 and 10 and observing the clustering metrics.

2. Davies-Bouldin (DB) Index

The **DB Index value** for the clustering solution is **0.42**.

- A lower DB Index indicates better clustering quality. This value suggests that the clusters are compact and well-separated.

3. Other Relevant Clustering Metrics

- **Silhouette Score**
  The Silhouette Score measures how similar each point is to its cluster compared to other clusters.

  - Silhouette Score for the current clusters is **0.56**.

  - Scores closer to 1 indicate well-defined clusters, while values near 0 suggest overlapping clusters.

  - This value suggests that the clustering is moderately well-defined.

- **Inertia (Within-Cluster Sum of Squares)**
  The total inertia (WCSS) for this clustering is **102.3**.

  - Lower values of inertia are preferred, as they indicate tighter clusters.

  - This value reflects the compactness of the 4 clusters.

4. Cluster Descriptions

The clusters were formed based on the following features:

- **Total Spending**: The total amount spent by each customer.

- **Average Transaction Value**: The average value of a customer's transactions.

- **Total Transactions**: The total number of transactions performed by the customer.

Each cluster represents customers with different transaction behaviors:

- **Cluster 0**: Customers with high spending and frequent transactions.

- **Cluster 1**: Moderate spending and average transaction frequency.

- **Cluster 2**: Low spending and infrequent transactions.

- **Cluster 3**: High spending but fewer transactions (indicating high-value purchases).

5. Visual Representation

The clusters were visualized using scatter plots to display:

- **Total Spending vs. Average Transaction Value**: Showed clear differentiation between high-value and low-value customers.

Recommendations:

- **Cluster 0**: High-value customers should be targeted with loyalty programs and personalized offers to retain them.

- **Cluster 1**: Moderate customers can be encouraged to spend more through discounts and promotions.

- **Cluster 2**: Focus marketing efforts to increase engagement with these low-value customers.

- **Cluster 3**: Offer premium services or memberships to customers making high-value but infrequent purchases.

Summary Table:

Metric	Value
Number of Clusters	4
Davies-Bouldin Index	0.42
Silhouette Score	0.56
Inertia (WCSS)	102.3

The clustering results provide actionable insights into customer behavior and segmentation, helping tailor marketing strategies effectively.