Clustering Results Report

Objective:

The objective of this analysis was to segment the customers into distinct groups based on their transaction history and profile data. This type of segmentation can provide a clear understanding of customer behavior and help in implementing focused marketing strategies.

Key Findings:

1. **Number of Clusters Formed:**
   As per the Davies-Bouldin Index (DB Index) evaluation, the optimal number of clusters was found to be **9**. This indicates that the customer base can be split into nine distinct groups, each representing similar purchasing patterns and profiles.

2. **Davies-Bouldin Index (DB Index):**
   The DB Index for the clustering was calculated as **0.857**. A lower DB Index value indicates well-separated and compact clusters. This outcome explains that the clusters formed are distinct and meaningful.

3. **Inertia (Within-Cluster Sum of Squares):**
   The inertia value for the clustering was **90.846**, which measures how tightly grouped the data points are within each cluster. A lower inertia score further validates the compactness of the clusters.

4. **Cluster Visualization:**
   The clusters were plotted using PCA (Principal Component Analysis) to reduce the dimensionality of the dataset to two components, namely PCA1 and PCA2. The scatter plot points out the distinct grouping of customers into clusters. Each cluster is a unique segment of customers with similar purchasing behaviors.

5. **Interpretation of Clusters:**

   - Some clusters, like Cluster 0 and Cluster 1, are tightly packed, indicating customers with highly similar behaviors and preferences.
   - Other clusters, like Cluster 8, are more dispersed, representing customers with broader, more varied purchasing patterns.

Conclusion:

The customer segmentation process successfully grouped the customer base into nine meaningful clusters. The DB Index value of **0.857** confirms that the clustering is effective, with good separation and compactness of the clusters. This segmentation can be used to develop targeted marketing campaigns, improve inventory management, and enhance customer engagement strategies.