

Customer Segmentation Report

Number of Clusters Formed:

The optimal number of clusters was determined based on multiple clustering evaluation metrics. Using the Davies-Bouldin (DB) Index and Silhouette Index (SI), the best number of clusters was found to be 2. This configuration provided the most distinct and well-separated clusters while minimizing the DB index value.

DB Index Value:

The DB Index measures the average similarity ratio of each cluster to its most similar cluster. A lower DB Index indicates better-defined and distinct clusters.

- The optimal number of clusters, $K=2$, resulted in a DB Index value of 0.7327.

Clustering Metrics:

- **Davies-Bouldin Index (DB Index):**
 - For $K=2$: 0.7327
 - For $K=3$: 0.7636
 - For $K=4$: 0.8152
 - For $K=5$: 0.8449
 - For $K=6$: 0.8547
 - For $K=7$: 0.8094
 - For $K=8$: 0.8659
- As seen from the DB Index values, the value starts to stabilize at $K=2$, indicating that this is the optimal number of clusters with the lowest DB Index.
- **Silhouette Index (SI):**
 - For $K=2$: 0.4859
 - For $K=3$: 0.4323
 - For $K=4$: 0.3744
 - For $K=5$: 0.3847
 - For $K=6$: 0.3937
 - For $K=7$: 0.3879
 - For $K=8$: 0.3738
- The Silhouette Index (SI) for $K=2$ is the highest among all values, indicating that the clusters are relatively well-separated.

Visual Representation of Clusters:

The clusters were visualized using Principal Component Analysis (PCA) to reduce dimensionality, allowing us to plot the clusters in a 2D space. The visual representation

clearly shows the separation of the clusters, where each cluster represents a group of customers with similar profiles and transaction behaviors.

Conclusion:

The optimal number of clusters for customer segmentation is 2, based on the clustering metrics and visual separation. The Davies-Bouldin Index (DBI) and Silhouette Index (SI) both suggest that $K=2$ provides the most meaningful and distinct separation. These clusters can help in tailoring marketing strategies, personalized product recommendations, and targeted customer engagement initiatives.