# Clustering Results Report

## Overview of the Analysis

The objective of this clustering analysis was to segment customers based on transactional and demographic data. The analysis used the K-Means clustering algorithm, with the number of clusters determined using the Davies-Bouldin Index (DBI) as the key evaluation metric. Principal Component Analysis (PCA) was applied for visualization of clusters in a two-dimensional space.

## Key Results

- **Optimal Number of Clusters**: 8

  The optimal number of clusters was determined by selecting the cluster count that minimized the Davies-Bouldin Index (DBI).

- **Minimum DBI**: 0.8098

  The DBI indicates how well the clusters are separated and compact. Lower values represent better clustering performance.

## Visualization

- **Scatter Plot of Clusters**

The scatter plot of clusters in PCA space visually demonstrates the segmentation. Each cluster is clearly distinguished, with minimal overlap between groups.

- **Evaluation Metrics**

  **DBI Plot**: The DBI decreases steadily as the number of clusters increases, reaching a minimum at 8 clusters before increasing slightly.

  **Inertia Plot**: The inertia curve shows a steady decrease, with the elbow point observed near 8 clusters.

## Conclusion

The clustering analysis successfully segmented customers into 8 distinct clusters, achieving a DBI of 0.8098. These results provide actionable insights for improving customer engagement and optimizing marketing strategies.