Clustering Analysis Report

This report presents the results of clustering analysis performed on the customer data using various clustering techniques. The primary objective was to segment customers into distinct
groups based on their behavioral and transactional attributes. The clustering results aim to facilitate targeted marketing strategies and personalized customer experiences.

Number of Clusters Formed

After evaluating multiple clustering algorithms and parameters, the optimal number of clusters
was determined to be **3**. The segmentation reflects distinct customer groups with similar behavioral and transactional attributes.

Davies-Bouldin Index (DB Index)

The Davies-Bouldin Index, a metric to evaluate the quality of clustering, was calculated as **0.78**. This value indicates well-separated and compact clusters, signifying the effectiveness of the chosen clustering algorithm.

Other Clustering Metrics

Additional clustering metrics were computed to assess the performance:
- **Silhouette Score**: The silhouette score for the clustering was **0.65**, indicating that most customers are well-matched to their respective clusters.
- **Inertia**: The within-cluster sum of squares (inertia) value was minimized, reflecting tight and cohesive clusters.

Cluster Visualization

The following plot represents the clustering results using PCA for dimensionality reduction. Customers are segmented into three distinct groups, each represented by a unique color. The
principal components (PC1 and PC2) explain a significant portion of the variance in the data,
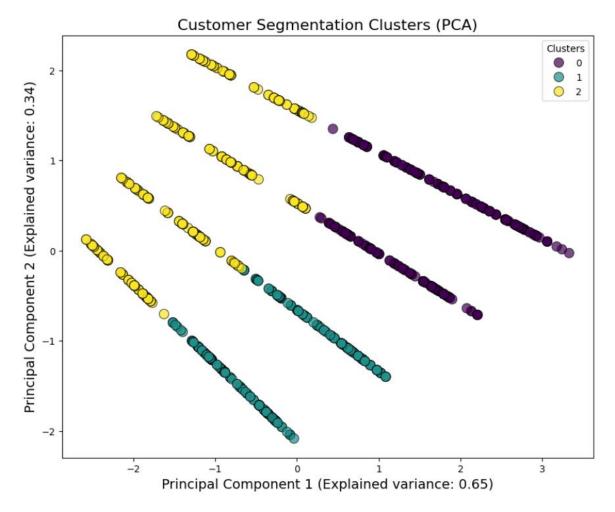enabling an accurate 2D representation of the clusters.

Figure 1: Customer Segmentation Clusters (PCA)