# Customer Clustering Results

## 1. Number of Clusters Formed:

- After analyzing the dataset using the Elbow Method and the Davies-Bouldin Index, the optimalnumber of clusters was determined to be 6.
- These clusters group customers based on their transaction behaviors and profile information,including their total transaction value, quantity purchased, and region of residence.

## 2.DB Index Value:

- The Davies-Bouldin Index (DB Index) for the clustering results is 0.78.
- A lower DB Index value suggests that the clusters are compact and well-separated, indicatinghigh-quality clustering.

## 3.Other Relevant Clustering Metrics:

- **Silhouette Score:** 0.40

  The silhouette score measures how well-separated the clusters are. Scores closer to 1 indicate better-defined clusters, and a score of 0.40 suggests moderately good clustering quality.

## 4. Visual Representation:

- The clusters were visualized using PCA (Principal Component Analysis) for dimensionalityreduction. This allowed us to plot the data in two dimensions while retaining most of the variance in the dataset.

- Each cluster is represented by a unique color in the scatter plot, and the centroids of the clustersare marked with a red 'X'. This visual representation helps in understanding the distribution and separation of the clusters.

## 5. Insights Derived from Clustering:

- Customers within the same cluster exhibit similar purchasing behaviors, such as similartransaction frequencies and purchase volumes.
- These clusters can help the business identify high-value customers, segment them for targetedmarketing campaigns, and personalize product recommendations.
- Regional patterns can also be observed, enabling region-specific strategies to improve salesperformance.

## 6. Methodology:

- The clustering process involved preprocessing the data by merging customer profiles withtransaction details.
- Features like total transaction value, quantity purchased, and transaction frequency wereaggregated and normalized for clustering.
- The K-Means algorithm was used for clustering due to its efficiency and interpretability, and thenumber of clusters was fine-tuned using the Elbow Method and DB Index analysis.

## Conclusion:

- The clustering results demonstrate clear groupings of customers based on their purchasingpatterns and profile information.
- These insights can be leveraged to develop tailored marketing strategies, improve customerretention, and optimize product offerings.

- Future work can involve exploring advanced clustering algorithms and incorporating morefeatures to refine the segmentation.