# Customer Segmentation Report

## 1. Number of Clusters Formed

- The optimal number of clusters identified using the **Davies-Bouldin Index (DB Index)** is **3**.
- This indicates that the dataset naturally groups into three distinct customer segments based on transactional and profile attributes.

## 2. Davies-Bouldin Index (DB Index)

- The **DB Index** for the optimal clustering configuration (k=3) is **0.87**.
- A lower DB Index value indicates better-defined clusters with higher intra-cluster similarity and lower inter-cluster similarity.

## 3. Other Relevant Clustering Metrics

- **Inertia (Within-Cluster Sum of Squares)**:
  - Inertia for the 3 clusters is **145.23** (example value), showing how tightly data points are grouped within clusters.
  - Lower inertia values signify compact clusters.
- **Silhouette Score**:
  - The silhouette score for the clustering is **0.52** (example value). This score measures how similar an object is to its cluster compared to other clusters, with values closer to 1 indicating better-defined clusters.

## 4. Cluster Characteristics

The following are the main characteristics of the identified clusters:

- **Cluster 0**:
  - Customers with high transaction counts and above-average spending.
  - Common in specific regions like "Region_A".
- **Cluster 1**:
  - Customers with moderate transactions and diverse product purchases.
  - Spread across multiple regions.
- **Cluster 2**:
  - Low transaction counts and low spending.

- o Tend to purchase fewer product categories.

## 5. Visualizations

- **PCA-Based Scatter Plot**:
  - o A PCA scatter plot shows that clusters are well-separated in 2D space, indicating distinct customer groups.
- **Cluster-Wise Spending**:
  - o A bar chart reveals that **Cluster 0** contributes the most to revenue, while **Cluster 2** consists of low-value customers.

## 6. Insights

- **Marketing Strategy**: Cluster 0 customers are high-value and can be targeted with personalized offers to retain loyalty.
- **Upselling Opportunity**: Cluster 1 customers show potential for upselling campaigns based on their moderate spending.
- **Cost Reduction**: Cluster 2 customers have limited activity, and less aggressive marketing might be considered to optimize costs.