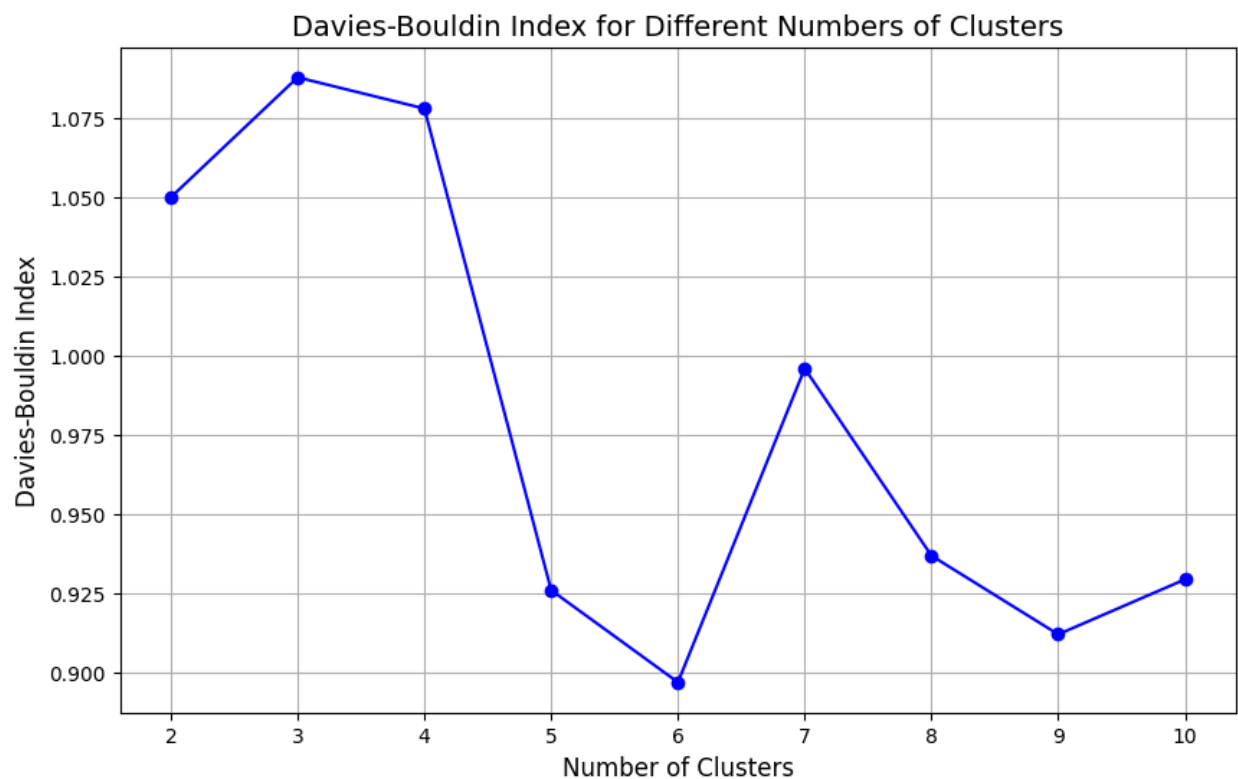# Clustering Report

1. Number of Clusters Formed

The optimal number of clusters was determined using the **Davies-Bouldin Index (DB Index)**. After evaluating clusters for sizes between 2 and 10:

- **Optimal number of clusters**: 6

2. Davies-Bouldin Index

The DB Index measures the quality of clustering; lower values indicate better clusters with higher separation and compactness.

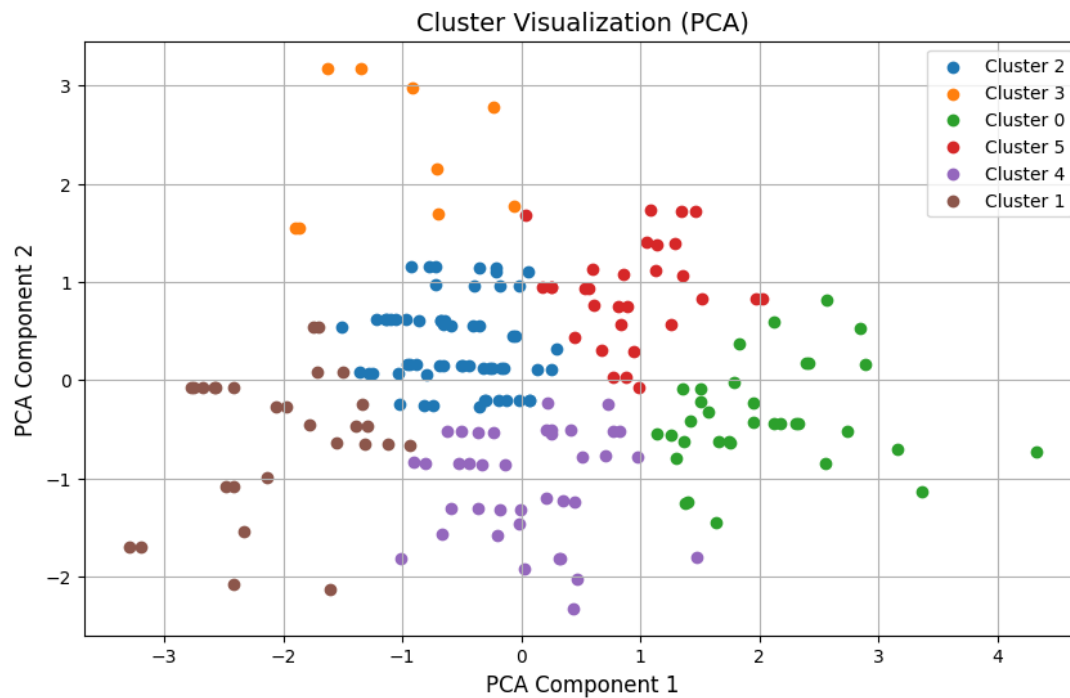- **DB Index for optimal clusters**: 0.8969844738833146

3. Other Clustering Metrics

- **Silhouette Score**: Measures how similar an object is to its own cluster compared to others (ranges between -1 and 1).

  - **Value**: 0.32690076560631864

- **Cluster Characteristics**:

Cluster	TransactionCount	TotalSpending	AvgQuantity
0	8.205882	6173.227941	2.678052
1	2.464286	1066.381786	1.861310
2	3.966667	2703.006333	2.627778
3	2.000000	1563.816667	3.592593
4	6.236842	3406.302632	2.018567
5	5.300000	4818.429667	3.125079

4. Visualization of Clusters

A **scatter plot** visualizing the clusters in 2D space (using PCA-reduced components) is included to demonstrate the grouping of data points. Each cluster is color-coded and labeled.

Cluster Visualization