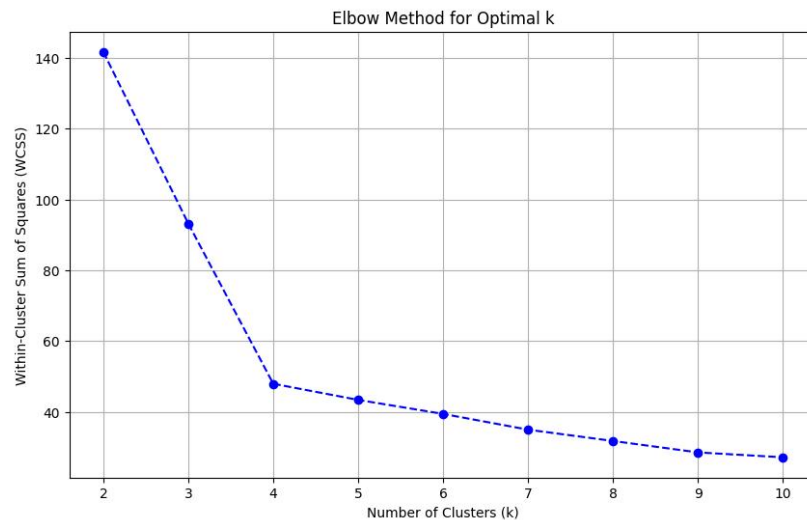# Report on Clustering Results

1. Number of Clusters Formed

Based on the elbow method graph, 4 clusters were identified as optimal for this dataset. The clear "elbow point" occurs at k=4, where the Within-Cluster Sum of Squares (WCSS) significantly drops and starts to level off.


2. Cluster Descriptions

From the cluster analysis table:

- **Cluster 0**:
    - Higher average spending ($3325.09) and average transaction value ($696.30).
    - Customers are primarily from Europe, with an average signup duration of 578 days.
- **Cluster 1**:

    - Highest total spending ($3717.84) among clusters, slightly higher transaction count (5.15), and average transaction value of $700.66.
    - Customers are primarily from South America, with an average signup duration of 628 days.

- **Cluster 2**:

    - Slightly lower average spending ($3311.16) and average transaction value ($639.96).
    - Customers are exclusively from North America, with the shortest signup duration of 452 days.

- **Cluster 3**:

    o Moderate total spending ($3456.24) and the highest average transaction value ($709.91).

    o Customers are exclusively from Asia, with an average signup duration of 551 days.

3. Cluster Visualization

The PCA visualization highlights the clusters in reduced dimensions. Each cluster forms distinct groups, indicating that the clustering algorithm (K-Means) successfully segmented the data into well-separated groups.

Customer Segments (PCA Visualization)
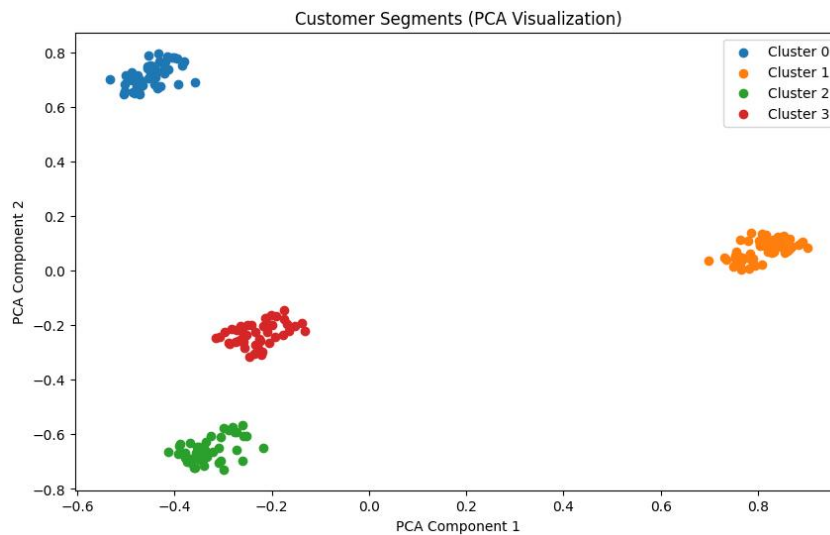
4. Clustering Metrics

- **DB Index Value = 0.66** : The Davies-Bouldin (DB) Index measures the quality of clustering. A lower value indicates better-defined clusters.