Clustering Results Report:

Number of Clusters Formed:

- The clustering algorithm selected **5 clusters**, which effectively grouped the customers based on their transactional and profile data.
- This number was chosen as it balanced interpretability and optimal clustering performance.

Davies-Bouldin (DB) Index Value

- The **DB Index value** is **0.7529**, indicating good clustering quality.
- A lower DB Index reflects that the clusters are compact (low intra-cluster distance) and well-separated (high inter-cluster distance).

Silhouette Score

- The **Silhouette Score** is **0.4309**, which is moderately positive.
- This suggests that clusters are reasonably well-separated, but there is room for improvement in distinguishing between some clusters.

Calinski-Harabasz Index

- The **Calinski-Harabasz Index** is **377.89**.
- This high value indicates well-formed clusters with good separation and tight grouping of data points within each cluster.

Cluster Sizes

- The sizes of the clusters are as follows:
  - **Cluster 3**: 63 customers
  - **Cluster 4**: 47 customers
  - **Cluster 0**: 44 customers
  - **Cluster 2**: 24 customers
  - **Cluster 1**: 21 customers
- This distribution highlights a dominant cluster (Cluster 3) and smaller clusters that likely represent distinct customer segments with unique behaviors.

Interpretation of Clusters

- **Cluster 3**: Likely represents the largest group of customers with moderate transaction activity.
- **Cluster 1**: Represents a small segment of high-value or unique transaction patterns.
- **Cluster 2**: Contains customers with low-frequency or niche purchasing behaviors.

- **Cluster 0 and 4**: Represent balanced groups with distinct spending patterns or preferences.

Conclusion

- The clustering analysis successfully grouped customers into 5 distinct segments based on their transactional data.
- The **moderate Silhouette Score (0.4309)** and **low DB Index (0.7529)** indicate that the clustering quality is reasonable, but further refinement could improve separation.
- Cluster sizes provide insight into the customer distribution, with a mix of dominant and niche customer segments.
- These clusters can be used to drive targeted marketing strategies, personalized offers, and improved inventory planning.

Customer Segmentation