Clustering Results Report

1. **Number of Clusters Formed:**
    - The clustering algorithm (KMeans) grouped the dataset into 4 distinct clusters.
    - Cluster centers represent the average position of each cluster in the feature space.

2. **Evaluation Metrics:**

    a. Davies-Boudin Index(DBI):
        - Value : 0.9666
        - The DBI measures the compactness and separation of clusters.
        - Lower values indicate better clustering, and minimal intra-cluster distance.

    b. Silhouette Score
        - Value: 0.3103
        - The silhouette score measures how similar data points are within their own cluster compared to others.
        - The value of 0.3103 suggests moderate clustering quality. Ideal scores are closer to 1.

3. **Other Observations:**

    a. Cluster Centers:Each centroid represents the mean characteristics of the respective cluster.

```
[[ 1.43060142  1.45989407  1.51220823  0.14823417]
 [-0.93465291 -0.52653084 -0.91309982  1.0761604 ]
 [-0.76201735 -0.98284998 -0.72303507 -1.0831366 ]
 [ 0.3008952   0.20203401  0.2217955   0.03264817]]
```

    b. Cluster Visualization:
    - A scatter plot was generated to visualize clusters based on:
    - X-Axis: Number of Transactions (NumTransactions)
    - Y-Axis: Total Spend (TotalSpend)
    - Different clusters are color-coded, showing distinct groupings.

4. **Insights and Recommendations:**

Moderate Clustering Quality:The DBI and Silhouette scores indicate reasonable but not perfect clustering quality. Consider optimizing the number of clusters or preprocessing the data further.

Cluster Utility:The clusters can be used for customer segmentation, enabling personalized marketing strategies or customer retention programs.