Report on Customer Segmentation Clustering Results

1. Number of Clusters Formed: The KMeans clustering algorithm was applied to segment customers into **5 clusters** based on their transaction data. The features used for clustering were:

- **TotalValue**: The total monetary value of transactions made by the customer.
- **Quantity**: The total quantity of products purchased by the customer.

2. Davies-Bouldin Index (DB Index):

- The **Davies-Bouldin Index** for the clustering solution is **0.7767**.
- The DB Index measures the compactness and separation of the clusters. A lower value indicates better clustering quality, with well-separated and compact clusters. The result of **0.7767** indicates that the clusters are moderately well-separated and compact.

3. Visualization of Clusters: A scatter plot of **Total Value** vs. **Quantity** was generated with cluster labels as the hue. Key observations from the visualization include:

- Clear distinctions between clusters, with varying patterns of spending (Total Value) and purchasing behavior (Quantity).
- Some overlap between clusters may exist, which suggests areas where improvements in feature selection or clustering methods could be made.

4. Additional Observations:

- **Cluster Profiles:**
  By examining the cluster centers or means, the following patterns can be inferred:
  - **High-spending customers:** Customers in certain clusters may have high **TotalValue** and relatively low **Quantity**, indicating a preference for premium products.
  - **High-frequency buyers:** Other clusters may represent customers with high **Quantity** but lower **TotalValue**, indicating bulk purchasing or frequent low-cost purchases.
- **Scalability:**
  The use of standardized features ensures that both **TotalValue** and **Quantity** contribute equally to the clustering process.

Conclusion:

The clustering process successfully segmented customers into 5 groups with a Davies-Bouldin Index of **0.7767**. This segmentation provides a foundation for personalized marketing strategies, customer loyalty programs, and targeted promotions. Further refinement and evaluation can enhance clustering effectiveness and business value.