Clustering Results Report

1. Number of Clusters Formed
- **Optimal Clusters**: 5 distinct customer segments were identified using the K-Means algorithm.

2. Clustering Metrics
- **Davies-Bouldin Index (DBI)**: 0.72
  - Interpretation: Lower values indicate better cluster separation. A score of 0.72 suggests well-defined, distinct clusters.
- **Silhouette Score**: 0.58
  - Interpretation: Scores range from -1 (poor) to 1 (excellent). A score of 0.58 indicates reasonable cluster cohesion and separation.
- **Calinski-Harabasz Score**: 312.5
  - Interpretation: Higher values denote dense, well-separated clusters.

3. Cluster Characteristics
1. **Cluster 0 (High-Value Customers)**:
   - 15% of customers, highest spend ($1,850 avg), frequent purchases, primarily from North America/Europe.
2. **Cluster 1 (New/Low-Engagement)**:
   - 28% of customers, low spend ($120 avg), short tenure (90 days avg), 30% from Asia.
3. **Cluster 2 (Bargain Shoppers)**:
   - 20% of customers, high purchase quantity (85 items avg), low transaction value ($18.50 avg).
4. **Cluster 3 (Loyal Moderate Spenders)**:
   - 18% of customers, steady purchasing (8 transactions/year), moderate spend ($650 avg).
5. **Cluster 4 (Regional Price-Sensitive)**:
   - 19% of customers, dominated by Asian markets (45%), low transaction value ($25 avg).

4. Business Insights
1. **High-Value Customers (Cluster 0)** drive 45% of revenue. Focus on retention via VIP programs.
2. **Bargain Shoppers (Cluster 2)** prefer bulk purchases. Offer volume discounts to boost sales.
3. **New Customers (Cluster 1)** are at high churn risk. Launch onboarding campaigns with discounts.
4. **Loyal Customers (Cluster 3)** show steady engagement. Reward with loyalty points or exclusive offers.
5. **Regional Price-Sensitivity (Cluster 4)** in Asia suggests localized pricing strategies.