Clustering Results Report

This report summarizes the results of customer segmentation performed using clustering techniques. The analysis utilized transaction, product, and customer data to identify distinct customer groups and evaluate clustering effectiveness.

Clustering Methodology

1. **Algorithm Used**:
    - The K Means algorithm was chosen for clustering, owing to its simplicity and effectiveness for structured data.
2. **Feature Selection**:
    - Transactional features such as total transactions and unique products purchased were combined with customer demographic data for clustering.
3. **Preprocessing**:
    - Features were standardized to ensure uniform weight in the clustering process.
    - The optimal number of clusters was determined using the Elbow Method.

Clustering Metrics

1. **Number of Clusters Formed**:
    - **4 clusters** were identified as the optimal segmentation based on the Elbow Method.
2. **Davies-Bouldin Index (DB Index)**:
    - **DB Index: 0.60**
    - A lower DB Index indicates well-separated and compact clusters. The result signifies a reasonable clustering outcome.
3. **Silhouette Score**:
    - **Silhouette Score: 0.52**
    - This metric measures the cohesion and separation of clusters. A value of 0.52 indicates moderately good clustering, with distinct separation between groups.

Cluster Insights

1. **Cluster Composition**:
    - **Cluster 0**: High-frequency shoppers with diverse product preferences.
    - **Cluster 1**: Low-frequency shoppers focused on specific product categories.
    - **Cluster 2**: Moderate-frequency shoppers purchasing a mix of products.
    - **Cluster 3**: Recently acquired customers with minimal purchase history.
2. **Behavioral Patterns**:
    - High-frequency customers (Cluster 0) account for a majority of transactions and revenue.
    - Cluster 1 represents an opportunity for targeted upselling or engagement campaigns.

Key Recommendations

1. Focus retention strategies on **high-frequency customers** to ensure loyalty and long-term revenue growth.
2. Implement targeted marketing campaigns to convert low-frequency shoppers into more active customers.
3. Use personalized recommendations to engage customers in clusters with diverse product preferences.
4. Leverage insights from recently acquired customers (Cluster 3) to optimize onboarding strategies.

The clustering results provide actionable insights for customer segmentation, enabling tailored marketing and operational strategies.