

Customer Segmentation Analysis Report

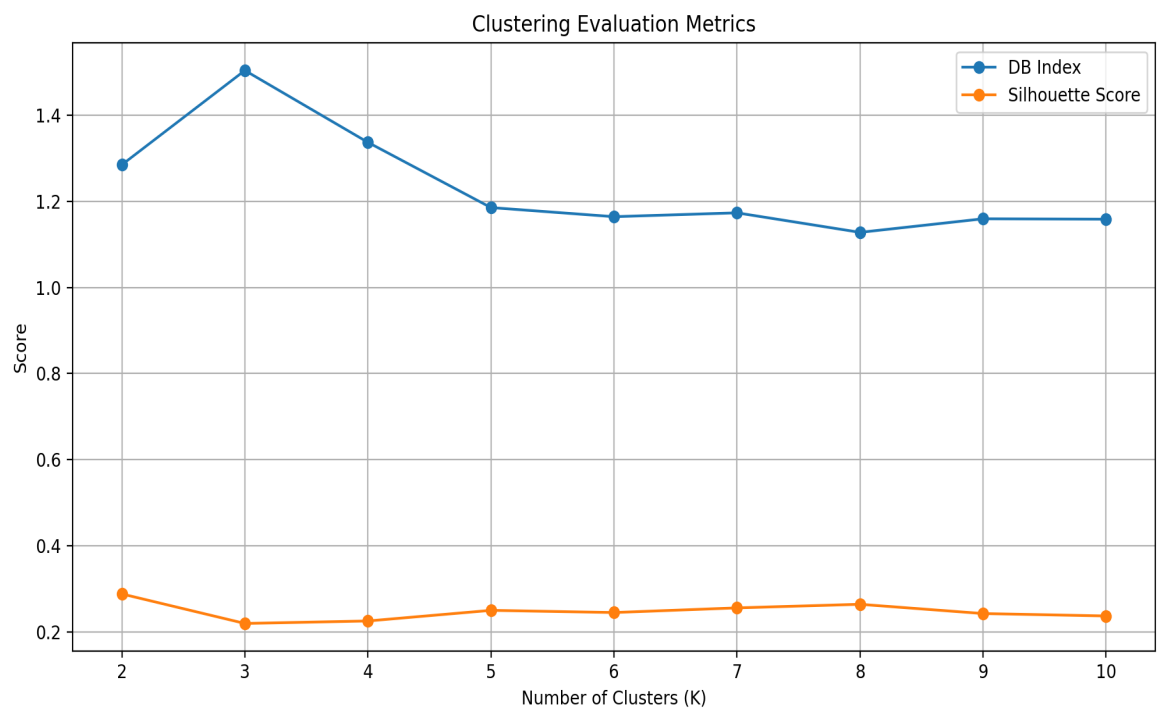
Methodology

Algorithm Used: K-Means Clustering
Features Used: Customer age, transaction metrics, spending patterns
Data Preprocessing: StandardScaler for feature normalization
Evaluation Range: 2 to 10 clusters

Optimal K-Means Result

Optimal Number of Clusters: 8
Davies-Bouldin Index: 1.1279 (the lower, the better)

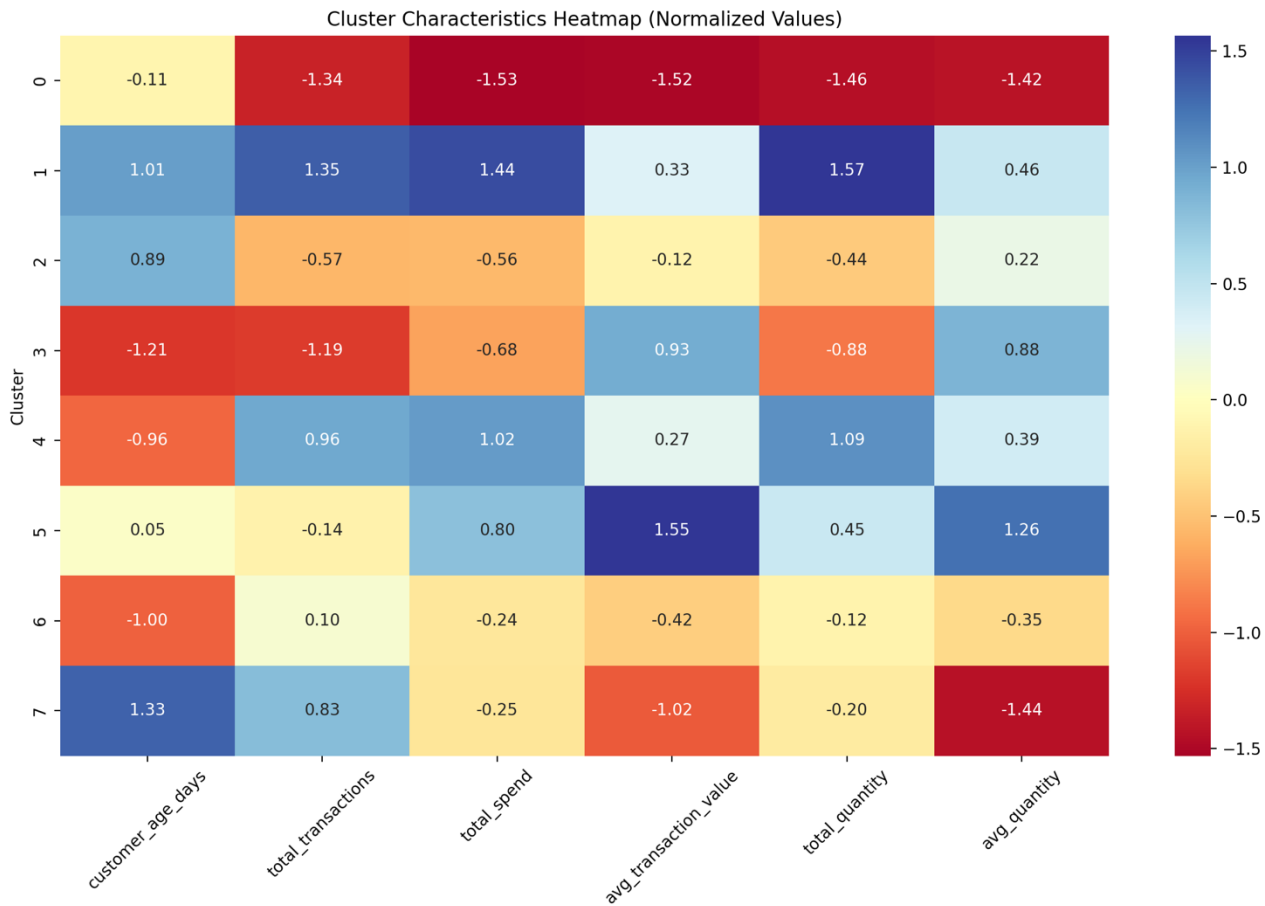
Visualizations: A graph displaying the clustering metric (e.g., **Davies-Bouldin Index**) across **K** values from **2** to **10** helps easily identify the range of the minimum value of the index as the optimal number of clusters.



Cluster Distribution

Cluster	customer_age_days	total_transactions	total_spend	avg_transaction_value	total_quantity	avg_quantity	number_of_customers	percentage_of_customers
0	562.8	2.15	701.29	327.39	3.7	1.64	20	10
1	894.55	8.18	6137.27	757.55	22.36	2.73	22	11
2	858.88	3.86	2485.03	651.5	9.95	2.59	42	21
3	239.24	2.48	2252.27	896.33	7.24	2.97	21	10.5
4	312.96	7.3	5372.01	742.74	19.41	2.69	27	13.5
5	610.53	4.84	4962.5	1041.67	15.47	3.19	19	9.5
6	303.02	5.36	3063.78	582.99	11.98	2.26	42	21
7	988.43	7	3038.6	442.47	11.43	1.63	7	3.5

Cluster Characteristic Heatmap



Cluster Interpretation

Cluster 0 (10% of customers): New, Low-Value Customers

- **Profile:** Moderately old customers with a median of **563 days** in existence
- **Behavior:** Low transaction frequency and value

Cluster 1 (11% of customers): Mature High-Frequency Buyers

- **Profile:** The oldest customers (**895 days**)
- **Behavior:** High transaction frequency, above-average total spend

Cluster 2 (21% of customers): Mature Medium-Value Customers

- **Profile:** Older customers (**859 days**)
- **Behavior:** Moderate transaction frequency, medium total spend

Cluster 3 (10.5% of customers): New Premium Buyers

- **Profile:** The newest customers (**239 days**)
- **Behavior:** Low frequency but high average transaction value, medium purchase quantities

Cluster 4 (13.5% of customers): Active High-Value Customers

- **Profile:** Newer customers with a median of **313 days**
- **Behavior:** High transaction frequency, high total spend

Cluster 5 (9.5% of customers): Premium Segment

- **Profile:** Medium age customers (**611 days**)
- **Behavior:** Highest average transaction value, high quantities of products purchased

Cluster 6 (21% of customers): Value Seekers

- **Profile:** Newer customers with an average life expectancy of **303 days**
- **Behavior:** Medium frequency and medium total spend

Cluster 7 (3.5% of customers): Mature Low-Value Segment

- **Profile:** Oldest customers (**988 days**)
- **Behavior:** Medium frequency, lower average transaction value

File Generated

Clustering results:

<https://drive.google.com/file/d/18CX0F1bLgCbilQabmpg9ieZ0Pkaw7xEK/view?usp=sharing>

Business Recommendation

Target Marketing

- **Premium Promotions:** Focus on **Cluster 3 ("New Premium Buyers")** and **Cluster 5 ("Premium Segment")** for high-value products and exclusive deals.
- **Retention Strategies:** Invest in **Cluster 4 ("Active High-Value Customers")**, offering appropriate rewards and exclusive access to new products to maintain engagement.
- **Reactivation Campaigns:** Re-engage **Cluster 7 ("Mature Low-Value Segment")** with offers such as discounts, personalized deals, or reminders of past preferences.

Customer Experience

- **Premium Service:** Enhance experiences for **Clusters 3 and 5** by providing faster shipping, priority technical support, and exclusive perks.
- **Loyalty Programs:** Foster long-term relationships with **Clusters 1 ("Mature High-Frequency Buyers")** and **4** by implementing tier-based rewards programs, referral incentives, and points-based systems.

Growth Opportunities

- **Upselling:** Encourage higher transaction value from **Cluster 0 ("New, Low-Value Customers")** and **Cluster 6 ("Value Seekers")** by introducing premium product lines or bundles.
- **Cross-Selling:** Target **Cluster 2 ("Mature Medium-Value Customers")** with complementary product suggestions to increase the number of purchases.