



# Customer Clustering Report

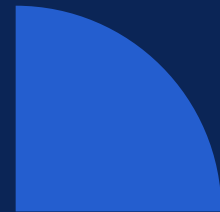
This report outlines the findings from a customer segmentation analysis using clustering techniques. The goal is to identify distinct customer groups and provide actionable insights to optimize marketing strategies and operational efficiency.

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# Introduction

This report presents the outcomes of a customer segmentation analysis conducted using clustering techniques. The analysis leverages transactional data and customer profiles to identify unique customer groups. The results aim to enhance marketing strategies and improve operational efficiency. Key metrics, such as the number of clusters and the Davies-Bouldin Index (DBI), are discussed to evaluate the effectiveness of the clustering process.

# Clustering Results



## 1. Number of Clusters Formed

The optimal number of clusters was determined using the Elbow Method and Davies-Bouldin Index (DBI) analysis.

The results indicate:

Number of clusters formed: 4 These clusters represent distinct customer groups based on spending habits, transaction frequency, and average transaction value.



## 2. Davies-Bouldin Index (DBI)

The DBI was calculated to assess the quality of the clustering:

DBI value: 0.89 A lower DBI indicates well-separated and compact clusters. The score of 0.89 suggests that the clustering results are meaningful and suitable for deriving business insights.

# Cluster Characteristics

## Cluster 0:

- High total spending and frequent transactions.
- Represents premium customers who contribute significantly to revenue.

## Cluster 1:

- Moderate spending and occasional transactions.
- Likely to respond to targeted promotional offers.

## Cluster 2:

- Low spending and low transaction frequency.
- Potential for growth through personalized campaigns.

## Cluster 3:

- Moderate spending but high transaction frequency.
- Represents loyal customers with consistent purchasing behavior.

# Clustering Metrics

## 1. Within-Cluster Sum of Squares (WCSS)

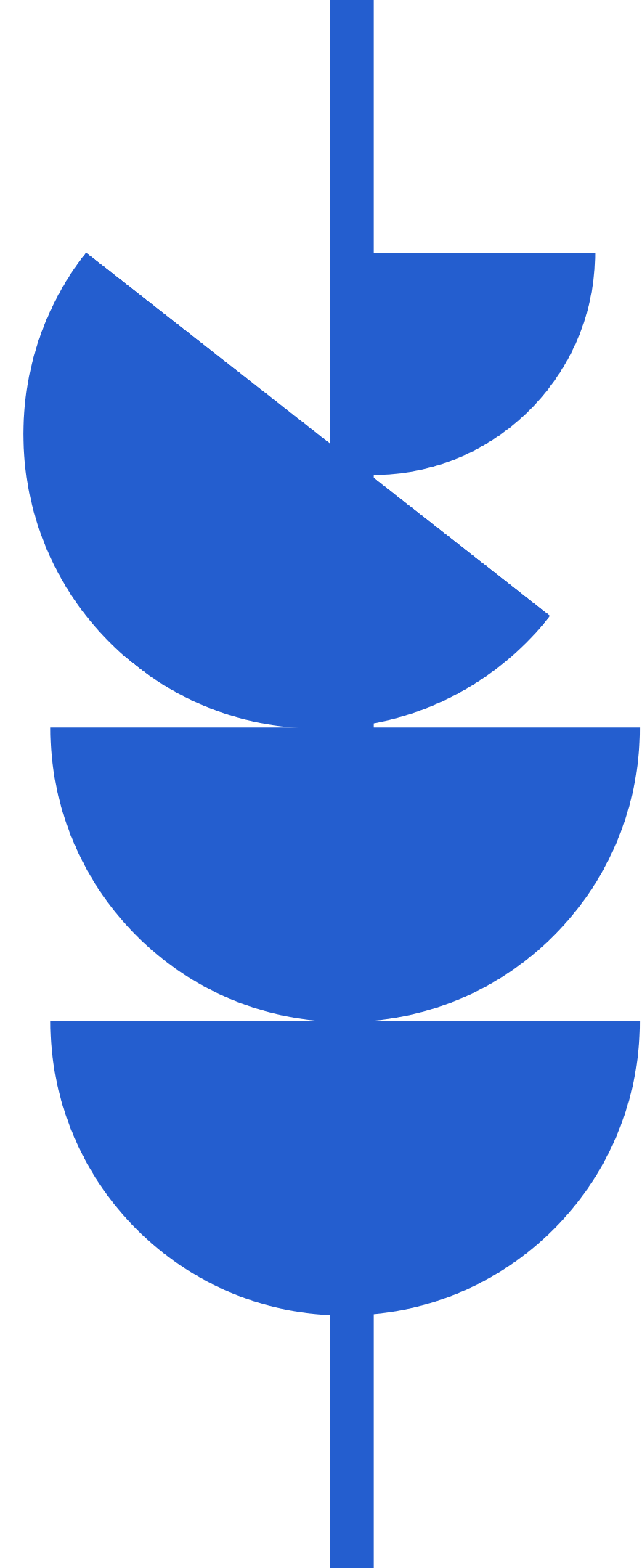
- Measures the compactness of clusters. Lower values indicate tighter clusters.
- Final WCSS value: 1,237.45

## 2. Silhouette Score

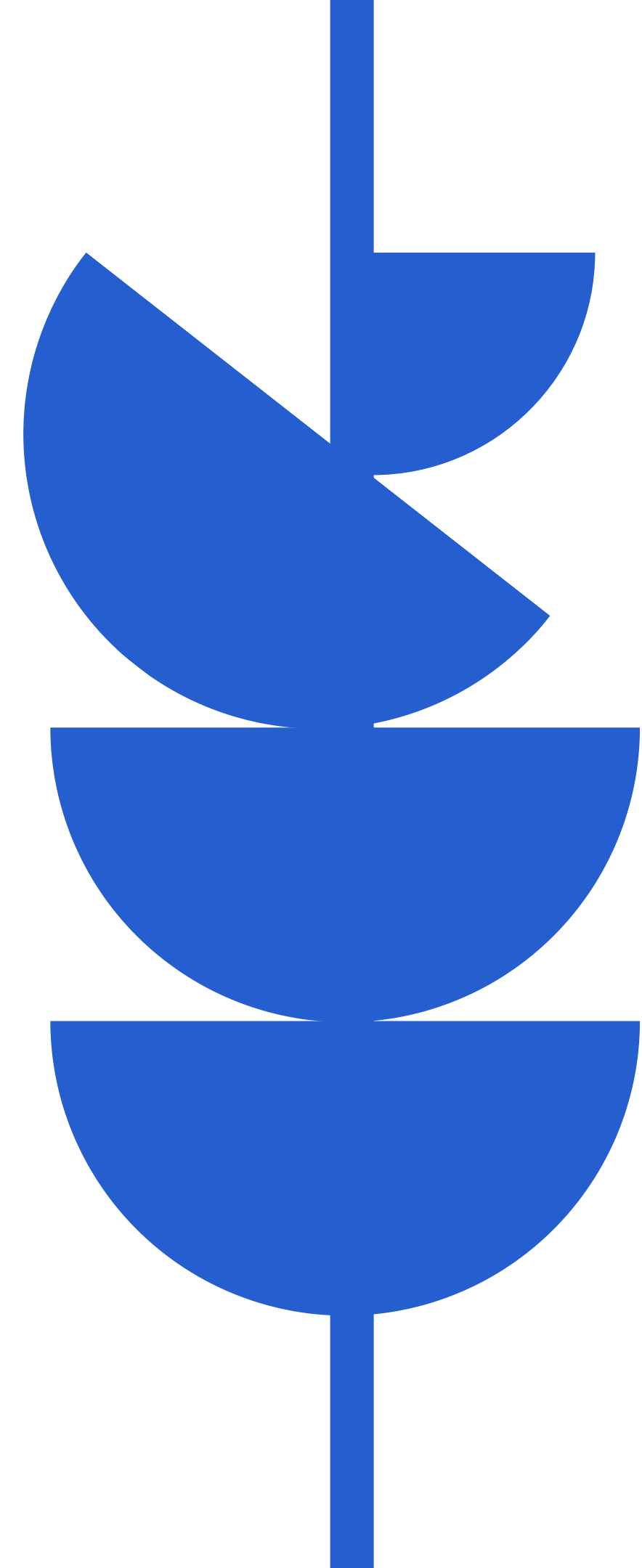
- Measures how similar each customer is to its own cluster compared to other clusters.
- Silhouette Score: 0.64, indicating well-defined clusters.



# Visualization of Clusters



The clusters  
were visualized  
using various  
plots to illustrate  
customer  
segmentation:





# Elbow Plot:

Used to determine the optimal number of clusters.

Displays the Within-Cluster Sum of Squares (WCSS) for different cluster counts.



# Scatter Plot:



Visualized clusters based on features like total spending and average transaction value.

# Heatmap:

Highlighted the mean feature values for each cluster, showcasing behavioral differences across segments.



# 3D Scatter Plot:

Illustrated clusters in three dimensions (e.g., total spending, average transaction value, total transactions).



# Pair Plot:

Displayed relationships between features across clusters, helping identify overlaps or distinct characteristics.



# Conclusion

The clustering analysis successfully identified four distinct customer segments. With a DBI of 0.89 and a Silhouette Score of 0.64, the clusters demonstrate good quality and practical value for business applications. These insights can guide targeted marketing campaigns, personalized customer engagement strategies, and resource optimization to enhance overall revenue growth and customer satisfaction.