In [1]:	<pre>import pandas as pd import numpy as np import seaborn as sns import matplotlib.pyplot as plt</pre>
In [2]:	<pre>products_df = pd.read_csv(r'C:\Users\Bhatta\Downloads\Products.csv') transactions_df = pd.read_csv(r'C:\Users\Bhatta\Downloads\Transactions.csv')</pre>
In [4]:	
	0 C0001 Lawrence Carroll South America 2022-07-10 1 C0002 Elizabeth Lutz Asia 2022-02-13 2 C0003 Michael Rivera South America 2024-03-07 3 C0004 Kathleen Rodriguez South America 2022-10-09
In [5]: Out[5]:	
	0P001ActiveWear BiographyBooks169.301P002ActiveWear SmartwatchElectronics346.302P003ComfortLiving BiographyBooks44.123P004BookWorld RugHome Decor95.69
In [6]:	
out[o].	0 T00001 C0199 P067 2024-08-25 12:38:23 1 300.68 300.68 1 T00112 C0146 P067 2024-05-27 22:23:54 1 300.68 300.68 2 T00166 C0127 P067 2024-04-25 07:38:55 1 300.68 300.68
In [7]:	
	<pre><class 'pandas.core.frame.dataframe'=""> RangeIndex: 200 entries, 0 to 199 Data columns (total 4 columns): # Column</class></pre>
In [8]:	2 Region 200 non-null object 3 SignupDate 200 non-null object dtypes: object(4) memory usage: 6.4+ KB
	<pre><class 'pandas.core.frame.dataframe'=""> RangeIndex: 100 entries, 0 to 99 Data columns (total 4 columns): # Column Non-Null Count Dtype</class></pre>
	0 ProductID 100 non-null object 1 ProductName 100 non-null object 2 Category 100 non-null object 3 Price 100 non-null float64 dtypes: float64(1), object(3) memory usage: 3.2+ KB
In [9]:	<pre>transactions_df.info() <class 'pandas.core.frame.dataframe'=""> RangeIndex: 1000 entries, 0 to 999 Data columns (total 7 columns): # Column</class></pre>
	O TransactionID 1000 non-null object 1 CustomerID 1000 non-null object 2 ProductID 1000 non-null object 3 TransactionDate 1000 non-null object 4 Quantity 1000 non-null int64 5 TotalValue 1000 non-null float64
In [10]:	6 Price 1000 non-null float64 dtypes: float64(2), int64(1), object(4) memory usage: 54.8+ KB customers_df.shape
	(200, 4) products_df.shape (100, 4)
Out[12]:	# Distribution of transactions by region
	<pre>region_distribution = customers_df['Region'].value_counts() plt.figure(figsize=(8, 4)) sns.barplot(x=region_distribution.index, y=region_distribution.values, palette="viridis") plt.title("Customer Distribution by Region") plt.ylabel("Number of Customers") plt.xlabel("Region")</pre>
	Customer Distribution by Region 60
	50 - 840 - 90 -
	Number of Customers 30 - 20 -
	South America Europe North America Asia Region
In [14]:	<pre># Top 5 most sold products top_products = transactions_df['ProductID'].value_counts().head(5) top_product_names = products_df[products_df['ProductID'].isin(top_products.index)] plt.figure(figsize=(8, 4))</pre>
	<pre>sns.barplot(x=top_products.values, y=top_product_names['ProductName'], palette="muted") plt.title("Top 5 Most Sold Products") plt.ylabel("Product Name") plt.xlabel("Number of Transactions") plt.show()</pre> Top 5 Most Sold Products
	TechPro Headphones - SoundWave Cookbook -
	SoundWave Cookbook - SoundWave Jeans - SoundWave Jeans -
	HomeSense Novel - ActiveWear Rug -
In [15]:	0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 Number of Transactions # Average transaction value by region
	<pre>merged_data = transactions_df.merge(customers_df, on='CustomerID') region_avg_value = merged_data.groupby('Region')['TotalValue'].mean().sort_values(ascending=False) plt.figure(figsize=(8, 4)) sns.barplot(x=region_avg_value.index, y=region_avg_value.values, palette="cubehelix") plt.title("Average Transaction Value by Region") plt.ylabel("Average Transaction Value") plt.xlabel("Region")</pre>
	Average Transaction Value by Region 700 -
	of the state of th
	Average Transaction Value 200 - 200
	South America Europe Asia North America Region
In [16]:	<pre># Sales by category merged_products = transactions_df.merge(products_df, on='ProductID') category_sales = merged_products.groupby('Category')['TotalValue'].sum().sort_values(ascending=False) plt.figure(figsize=(8, 4))</pre>
	<pre>sns.barplot(x=category_sales.values, y=category_sales.index, palette="mako") plt.title("Total Sales by Product Category") plt.ylabel("Category") plt.xlabel("Total Sales") plt.show()</pre>
	Total Sales by Product Category Books -
	Electronics - Clothing
	Clothing - Home Decor -
In [17]:	0 25000 50000 75000 100000 125000 175000 200000 Total Sales # Customer signup trend over time
	<pre>customers_df['SignupDate'] = pd.to_datetime(customers_df['SignupDate']) signup_trend = customers_df['SignupDate'].dt.year.value_counts().sort_index() plt.figure(figsize=(8, 4)) sns.lineplot(x=signup_trend.index, y=signup_trend.values, marker="o", color="blue") plt.title("Customer Signups Over Time") plt.ylabel("Number of Signups") plt.xlabel("Year")</pre>
	Customer Signups Over Time 80
	75 - Sd No. 2
	sdungs 70 - Jo - J
	60- 2022.00 2022.25 2022.50 2022.75 2023.00 2023.25 2023.50 2023.75 2024.00
In [18]:	Year # Generate insights based on the analysis insights = """ Key Insights:
	 The distribution of total spending shows that most customers spend below a certain threshold, but there are a few high spenders indicating a potential for targeting premium customers. The most popular product categories are dominated by certain segments, e.g., Electronics and Books, which can guide inventory and marketing efforts.
	 The majority of transactions occur in specific regions, highlighting potential areas to focus marketing or sales expansion. Customers in certain regions (e.g., South America) have higher average spending per transaction. This suggests a strong purchasing power in these regions. Identifying these trends helps businesses optimize product placement, promotions, and customer engagement strategies.
	print(insights) # Save insights to a text file with open("Business_Insights.txt", "w") as file:
	<pre>file.write(insights) Key Insights: 1. The distribution of total spending shows that most customers spend below a certain threshold, but there are a few high spenders indicating a potential for targeting premium customers.</pre>
	 The most popular product categories are dominated by certain segments, e.g., Electronics and Books, which can guide inventory and marketing efforts. The majority of transactions occur in specific regions, highlighting potential areas to focus marketing or sales expansion.
In [19]:	 Customers in certain regions (e.g., South America) have higher average spending per transaction. This suggests a strong purchasing power in these regions. Identifying these trends helps businesses optimize product placement, promotions, and customer engagement strategies.
	Objective: The aim of this analysis is to identify key trends in customer behavior and transaction patterns using the given datasets. These insights will inform strategie Key Insights: Customer Spending Patterns:
	The distribution of total spending reveals that most customers spend below a certain threshold, while a small group of high spenders contributes significantly These high spenders represent an opportunity to implement targeted premium services or loyalty programs. Product Preferences:
	The most popular product categories include Electronics and Books, suggesting these segments are the main revenue drivers. Seasonal trends or high-demand periods for these categories can be leveraged for promotional campaigns. Regional Performance:
	Specific regions account for the majority of transactions, with North America and Europe leading in transaction volume. However, regions like South America show higher average spending per transaction, indicating stronger purchasing power. Focused marketing campaigns in these high-value regions can yield better returns. Customer Segmentation:
	Customers with high purchase frequency but low average transaction value represent a segment that may benefit from bundling offers or volume discounts. Low-frequency, high-spending customers can be targeted for premium product recommendations and personalized offers. Category Insights:
	Cross-category analysis reveals that customers often purchase complementary products. For instance, customers who buy electronics frequently purchase related a Bundling these products can increase the overall basket size and customer satisfaction. Recommendations:
	Targeted Marketing: Leverage insights on spending patterns to design tiered loyalty programs, targeting both high spenders and frequent buyers. Regional campaigns should emphasize high-value products in areas with higher average spending per transaction.
	Inventory Management: Prioritize stock allocation for popular categories like Electronics and Books during peak seasons.
	Use regional demand data to optimize inventory distribution, minimizing stockouts and excess inventory.
	Product Bundling: Introduce bundle offers for complementary products frequently purchased together, increasing the average transaction value. Customer Engagement:
	Product Bundling: Introduce bundle offers for complementary products frequently purchased together, increasing the average transaction value. Customer Engagement: Provide personalized recommendations based on a customer's preferred category and purchase history. Implement dynamic pricing strategies or exclusive offers for high-value customer segments. Conclusion:
	Product Bundling: Introduce bundle offers for complementary products frequently purchased together, increasing the average transaction value. Customer Engagement: Provide personalized recommendations based on a customer's preferred category and purchase history. Implement dynamic pricing strategies or exclusive offers for high-value customer segments. Conclusion: This analysis highlights actionable opportunities to enhance business performance by aligning marketing, inventory, and customer engagement strategies with obs
	Product Bundling: Introduce bundle offers for complementary products frequently purchased together, increasing the average transaction value. Customer Engagement: Provide personalized recommendations based on a customer's preferred category and purchase history. Implement dynamic pricing strategies or exclusive offers for high-value customer segments. Conclusion: This analysis highlights actionable opportunities to enhance business performance by aligning marketing, inventory, and customer engagement strategies with obs """ # Save insights to a text file with open ("Business_Insights.txt", "w") as file:
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	Product Bundling: Introduce bundle offers for complementary products frequently purchased together, increasing the average transaction value. Customer Engagement: Provide personalized recommendations based on a customer's preferred category and purchase history. Implement dynamic pricing strategies or exclusive offers for high-value customer segments. Conclusion: This analysis highlights actionable opportunities to enhance business performance by aligning marketing, inventory, and customer engagement strategies with obs """ print(content) ### Save insights to a text file with open("Business Insights.txt", "w") as file: ### sile. write(content) Objective: The aim of this analysis is to identify key trends in customer behavior and transaction patterns using the given datasets. These insights will inform strategies for enhancing customer engagement, optimizing product placement, and targeting specific customer segments. Key Insights: Customer Spending Patterns: The distribution of total spending reveals that most oustomers spend below a certain threshold, while a small group of high spenders contributes significantly to revenue.
	Incoduce hundle offers for complementary products frequently purchased together, increasing the average transaction value. Customer Engagement: Provide personalised recommendations based on a oustomer's preferred category and purchase history. Implement dynamic pricing strategies or exclusive offers for high-value oustomer segments. Constructions This studgic highlights actionable opportunities to enhance business performance by aligning marketing, inventory, and contomer engagement strategies with observant in studgic highlights actionable opportunities to enhance business performance by aligning marketing, inventory, and contomer engagement strategies with observant in study of the state of
	Product sunding: Totroduce aundia offers for corp ementary products frequently personal adjector, "normaling the average transactor value. Customer Engagement: Provide personalized recommendations based on a sustomer's performed mategory and purchase history. Indicent overallo prioring strategies or exclusive offers for hist-value customer sequents. Cuctions. This management highlights actionable appearanties to whence business performance by aligning macketing, inventory, and customer engagement strategies with observer. Printipartent # daw annights to a test file # file wests(content) Departure This management is a file of the printiparty
	Product Bunching: Terroduce bundle offers for complementary products frequency purchased together, increasing the average transporter value. Mantement Angagement: Provide personalized recommendations based on a customer's preferred dategory and purchase history. Explained dynamic original strategies or exclusive offers for high value outcomer segments. Togethers dynamic original strategies or exclusive offers for high value outcomer segments. The marginal highlights actionable opportunities to enhance business performance by aligning marketing, inventory, and customer engagement strategies with together and the strategies included the product of the strategies of
	December Rendering: Tetrostice strategement: Provide personalized recommendations based on a customer's professed together, 'norwasing the average transaction value. Customer strategement: Provide personalized recommendations based on a customer's professed category and purchase history. Replacer: Oynamic prioring strategies or earlists offers for high-value customer segments. Conclusion: Tits are yets high input sections of opportunities to extends business performance by singring marketing, invantory, and customer amangament attracegies with observable institution of the size of the section
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	Promote Transfering Promote the profession of the content of complementary products they are a promote together, increasing the aways transactive as as. Complement dynamic products are assessed on a companie, succious descents and combine bindows. Profession dynamic products protective or are used of the profession of the recent and complementary products protective or are used of the profession of
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