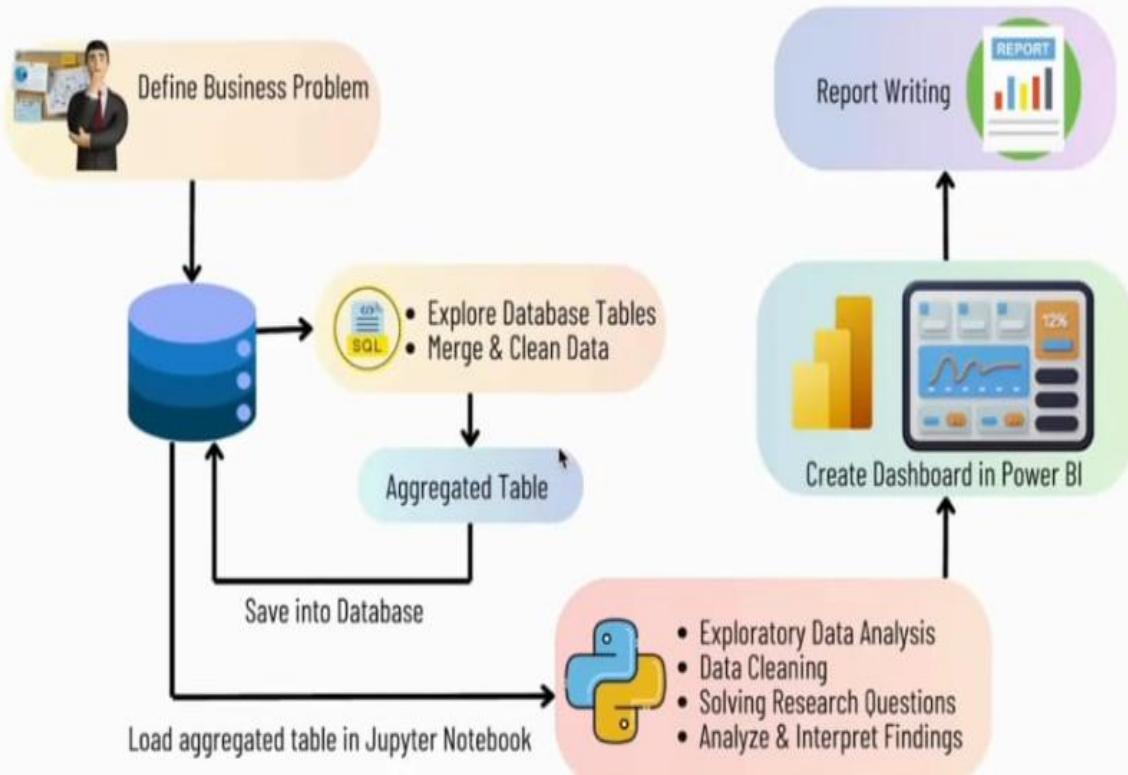


# Vendor Performance Analysis

## Capstone Project

## Vendor Performance Analysis Project



# Business Problem

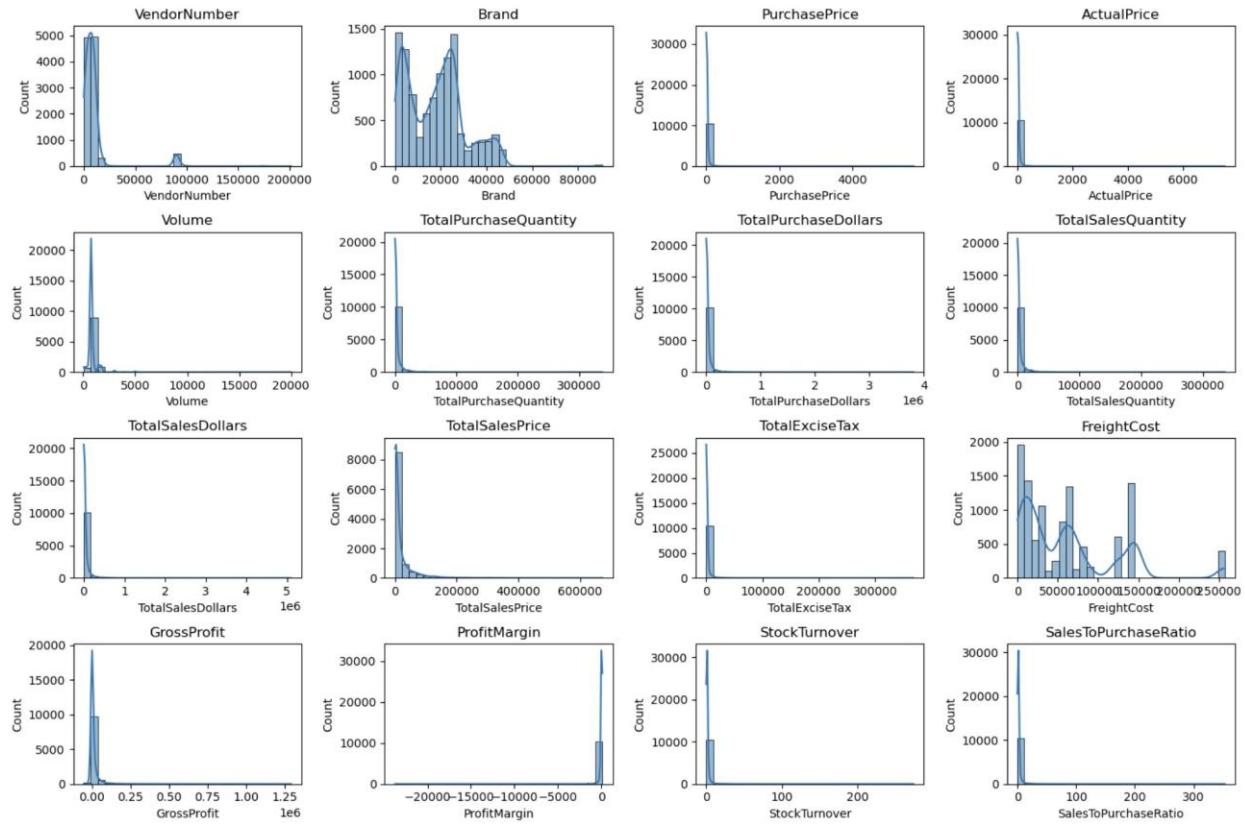
Effective inventory and sales management are critical for optimizing profitability in the retail and wholesale industry. Companies need to ensure that they are not incurring losses due to inefficient pricing, poor inventory turnover, or vendor dependency. The goal of this analysis is to:

- Identify underperforming brands that require promotional or pricing adjustments.
- Determine top vendors contributing to sales and gross profit.
- Analyze the impact of bulk purchasing on unit costs.
- Assess inventory turnover to reduce holding costs and improve efficiency.
- Investigate the profitability variance between high-performing and low-performing vendors.

## Exploratory Data Analysis Insights

### Summary Statistics

	count	mean	std	min	25%	50%	75%	max
VendorNumber	10692.0	1.065065e+04	18753.519148	2.00	3951.000000	7153.000000	9552.000000	2.013590e+05
Brand	10692.0	1.803923e+04	12662.187074	58.00	5793.500000	18761.500000	25514.250000	9.063100e+04
PurchasePrice	10692.0	2.438530e+01	109.269375	0.36	6.840000	10.455000	19.482500	5.681810e+03
ActualPrice	10692.0	3.564367e+01	148.246016	0.49	10.990000	15.990000	28.990000	7.499990e+03
Volume	10692.0	8.473605e+02	664.309212	50.00	750.000000	750.000000	750.000000	2.000000e+04
TotalPurchaseQuantity	10692.0	3.140887e+03	11095.086769	1.00	36.000000	262.000000	1975.750000	3.376600e+05
TotalPurchaseDollars	10692.0	3.010669e+04	123067.799627	0.71	453.457500	3655.465000	20738.245000	3.811252e+06
TotalSalesQuantity	10692.0	3.077482e+03	10952.851391	0.00	33.000000	261.000000	1929.250000	3.349390e+05
TotalSalesDollars	10692.0	4.223907e+04	167655.265984	0.00	729.220000	5298.045000	28396.915000	5.101920e+06
TotalSalesPrice	10692.0	1.879378e+04	44952.773386	0.00	289.710000	2857.800000	16059.562500	6.728193e+05
TotalExciseTax	10692.0	1.774226e+03	10975.582240	0.00	4.800000	46.570000	418.650000	3.682428e+05
FreightCost	10692.0	6.143376e+04	60938.458032	0.09	14069.870000	50293.620000	79528.990000	2.570321e+05
GrossProfit	10692.0	1.213238e+04	46224.337964	-52002.78	52.920000	1399.640000	8660.200000	1.290668e+06
ProfitMargin	10692.0	-inf	NaN	-inf	13.324515	30.405457	39.956135	9.971666e+01
StockTurnover	10692.0	1.706793e+00	6.020460	0.00	0.807229	0.981529	1.039342	2.745000e+02
SalesToPurchaseRatio	10692.0	2.504390e+00	8.459067	0.00	1.153729	1.436894	1.665449	3.529286e+02



## Negative & Zero Values:

**Gross Profit:** Minimum of -52,002.78, indicating potential losses due to high costs or heavy discounts. This could be due to selling products at lower prices than their purchase costs.

**Profit Margin:** Has a minimum of  $-\infty$ , which suggests instances where revenue is zero or even lower than the total cost, leading to extreme negative profit margins.

**Total Sales Quantity & Sales Dollars:** Some products show zero sales, indicating they were purchased but never sold. These may be slow-moving or obsolete stock, leading to inventory inefficiencies.

## Outliers Detected by High Standard Deviations:

**Purchase & Actual Prices:** The maximum values (5,681.81 & 7,499.99) are significantly higher than the mean (24.39 & 35.64), indicating premium product offerings.

**Freight Cost:** Extreme variation from 0.09 to 257,032.07 suggests logistics inefficiencies, bulk shipments, or erratic shipping costs across different products.

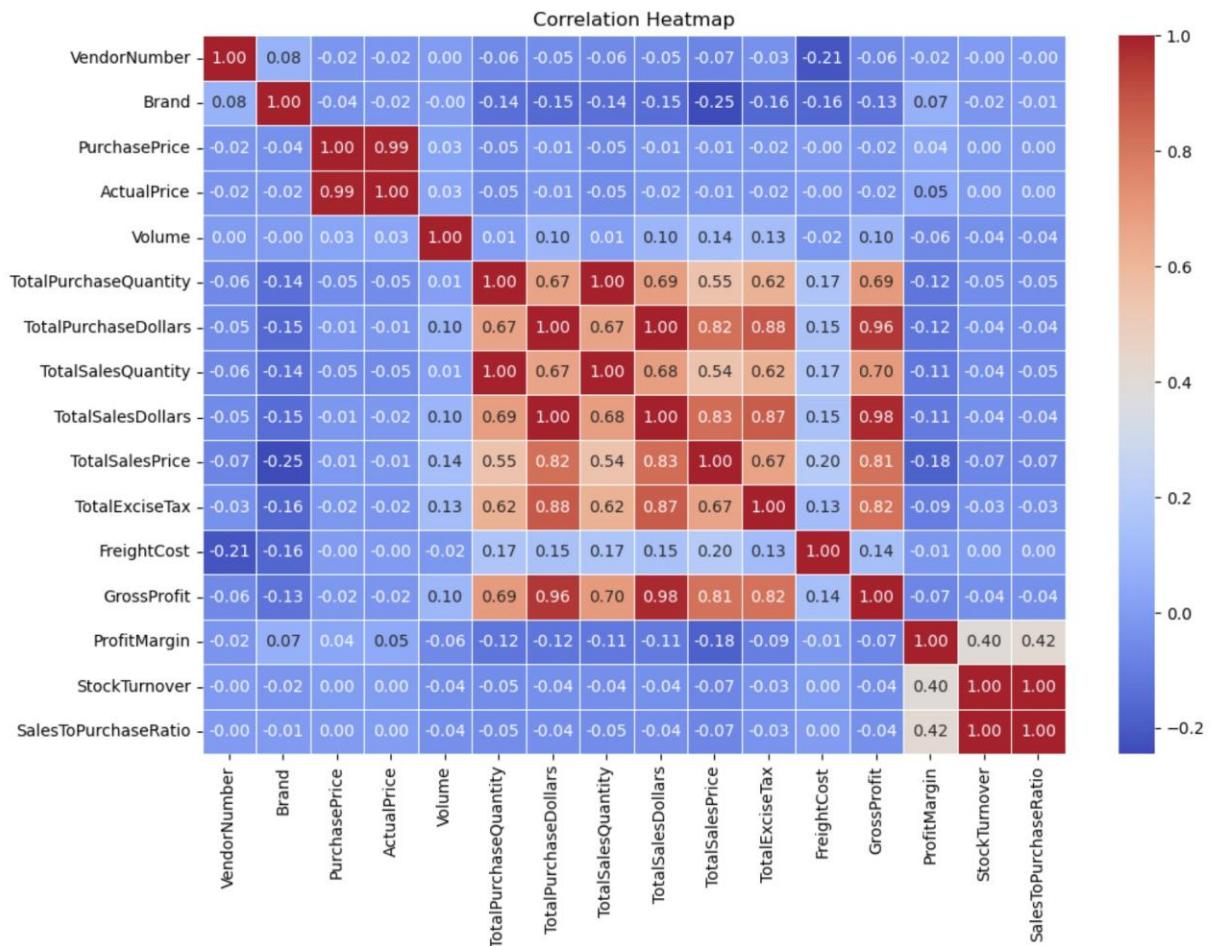
**Stock Turnover:** Ranges from 0 to 274.5, suggesting some products sell rapidly while others remain unsold for long periods. A value greater than 1 indicates that sales for a product exceed the purchased quantity due to older stock fulfilling orders.

## Data Filtering

To enhance the reliability of the insights, we removed inconsistent data points where:

- Gross Profit  $\leq 0$  (to exclude transactions leading to losses).
- Profit Margin  $\leq 0$  (to ensure analysis focuses on profitable transactions).
- Total Sales Quantity = 0 (to eliminate inventory that was never sold).

## Correlation Insights



**Purchase Price vs. Total Sales Dollars & Gross Profit:** Weak correlation (-0.012 and -0.016), indicating that price variations do not significantly impact sales revenue or profit.

**Total Purchase Quantity vs. Total Sales Quantity:** Strong correlation (0.999), confirming efficient inventory turnover.

**Profit Margin vs. Total Sales Price:** Negative correlation (-0.179), suggesting increasing sales prices may lead to reduced margins, possibly due to competitive pricing pressures.

**Stock Turnover vs. Gross Profit & Profit Margin:** Weak negative correlation (-0.038 & -0.055), indicating that faster stock turnover does not necessarily equate to higher profitability.

## Research Questions & Key Findings

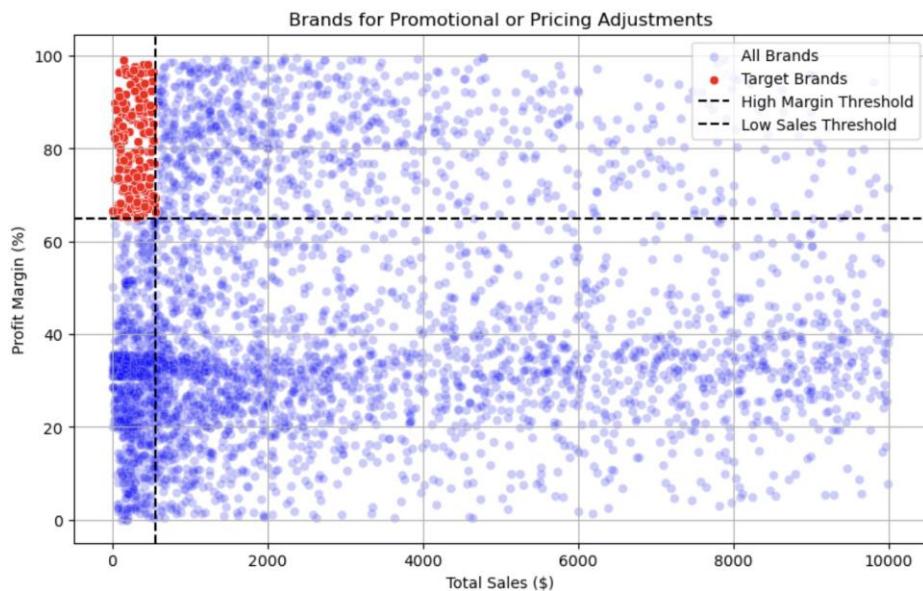
### 1. Brands for Promotional or Pricing Adjustments

Brands with Low Sales but High Profit Margins:

	Description	TotalSalesDollars	ProfitMargin
6199	Santa Rita Organic Svgn Bl	9.99	66.466466
2369	Debauchery Pnt Nr	11.58	65.975820
2070	Concannon Glen Ellen Wh Zin	15.95	83.448276
2188	Crown Royal Apple	27.86	89.806174
6237	Sauza Sprklg Wild Berry Marg	27.96	82.153076
...	...	...	...
5074	Nanbu Bijin Southern Beauty	535.68	76.747312
2271	Dad's Hat Rye Whiskey	538.89	81.851584
57	A Bichot Clos Marechaudes	539.94	67.740860
6245	Sbragia Home Ranch Merlot	549.75	66.444748
3326	Goulee Cos d'Estournel 10	558.87	69.434752

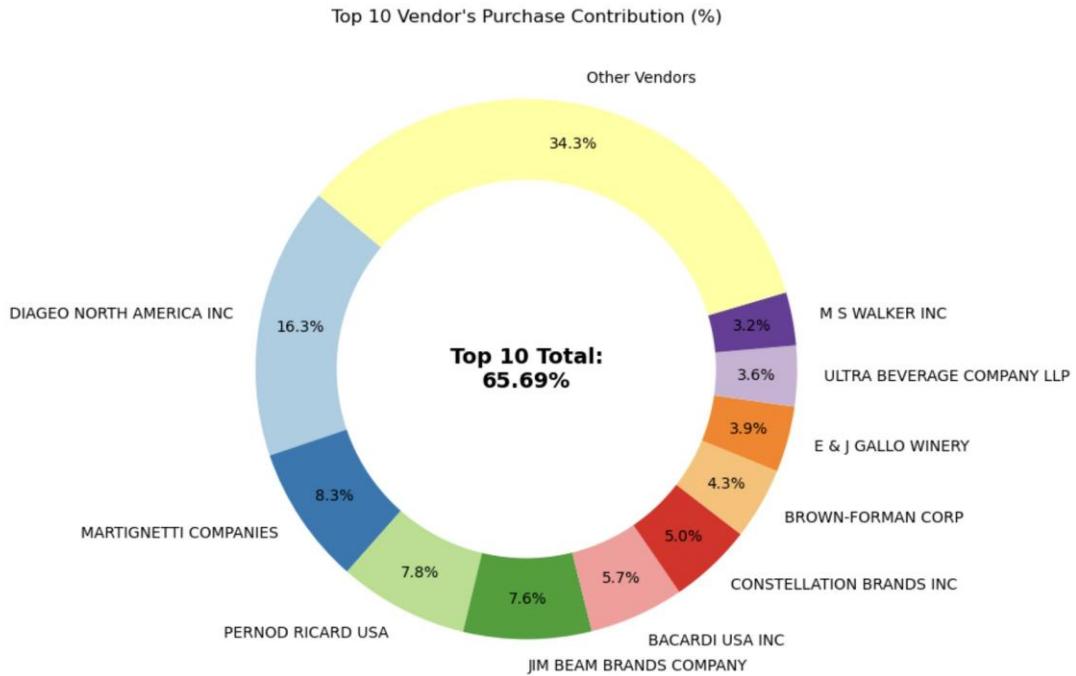
198 rows × 3 columns

198 brands exhibit lower sales but higher profit margins, which could benefit from targeted marketing, promotions, or price optimizations to increase volume without compromising profitability.



## 2. Top Vendors by Sales & Purchase Contribution

The top 10 vendors contribute 65.69% of total purchases, while the remaining vendors contribute only 34.31%. This over-reliance on a few vendors may introduce risks such as supply chain disruptions, indicating a need for diversification.



## 3. Impact of Bulk Purchasing on Cost Savings

Vendors buying in large quantities receive a 72% lower unit cost (\$10.78 per unit vs. higher unit costs in smaller orders).

Bulk pricing strategies encourage larger orders, increasing total sales while maintaining profitability.

OrderSize	UnitPurchasePrice
Small	39.057543
Medium	15.486414
Large	10.777625

## 4. Identifying Vendors with Low Inventory Turnover

Total Unsold Inventory Capital: \$2.71M

Slow-moving inventory increases storage costs, reduces cash flow efficiency, and affects overall profitability.

Identifying vendors with low inventory turnover enables better stock management, minimizing financial strain.

VendorName	StockTurnover	VendorName	UnsoldInventoryValue
ALISA CARR BEVERAGES	0.615385	DIAGEO NORTH AMERICA INC	722.21K
HIGHLAND WINE MERCHANTS LLC	0.708333	JIM BEAM BRANDS COMPANY	554.67K
PARK STREET IMPORTS LLC	0.751306	PERNOD RICARD USA	470.63K
Circa Wines	0.755676	WILLIAM GRANT & SONS INC	401.96K
Dunn Wine Brokers	0.766022	E & J GALLO WINERY	228.28K
CENTEUR IMPORTS LLC	0.773953	SAZERAC CO INC	198.44K
SMOKY QUARTZ DISTILLERY LLC	0.783835	BROWN-FORMAN CORP	177.73K
TAMWORTH DISTILLING	0.797078	CONSTELLATION BRANDS INC	133.62K
THE IMPORTED GRAPE LLC	0.807569	MOET HENNESSY USA INC	126.48K
WALPOLE MTN VIEW WINERY	0.820548	REMY COINTREAU USA INC	118.60K

## 5. Profit Margin Comparison: High vs. Low-Performing Vendors

Top Vendors' Profit Margin (95% CI): (30.74%, 31.61%), Mean: 31.17%

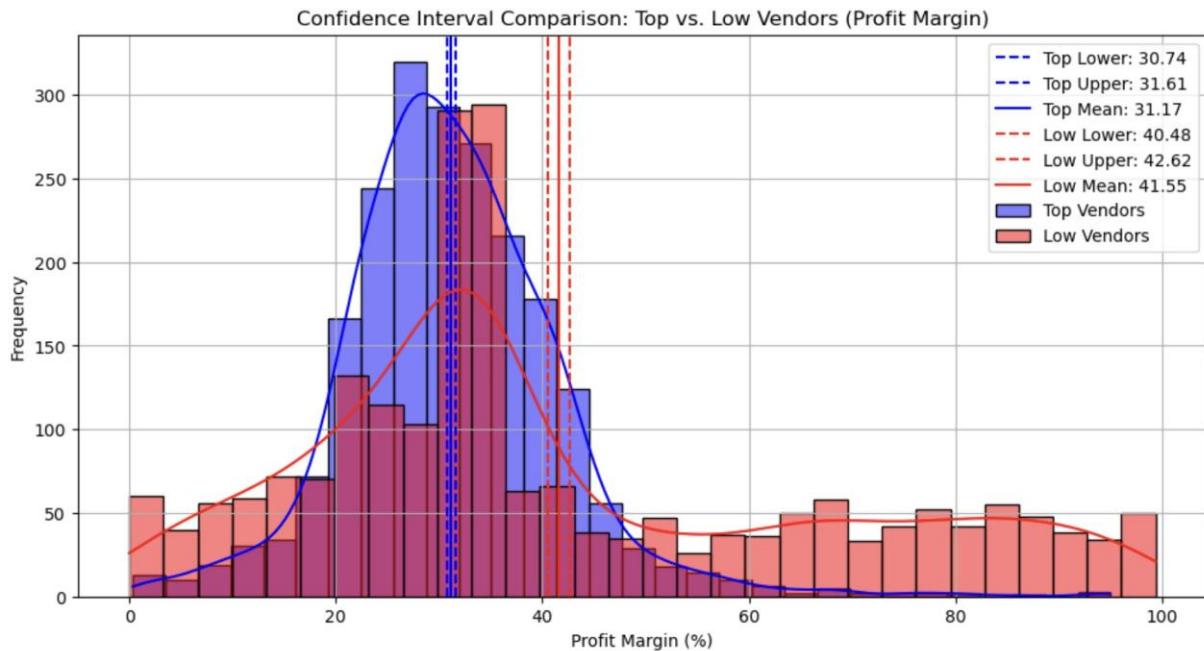
Low Vendors' Profit Margin (95% CI): (40.48%, 42.62%), Mean: 41.55%

Low-performing vendors maintain higher margins but struggle with sales volumes, indicating potential pricing inefficiencies or market reach issues.

Actionable Insights:

- Top-performing vendors: Optimize profitability by adjusting pricing, reducing operational costs, or offering bundled promotions.

- Low-performing vendors: Improve marketing efforts, optimize pricing strategies, and enhance distribution networks.



## 6. Statistical Validation of Profit Margin Differences

### Hypothesis Testing:

$H_0$  (Null Hypothesis): No significant difference in profit margins between top and low-performing vendors.

$H_1$  (Alternative Hypothesis): A significant difference exists in profit margins between the two vendor groups.

**Result:** The null hypothesis is rejected, confirming that the two groups operate under distinctly different profitability models.

**Implication:** High-margin vendors may benefit from better pricing strategies, while top-selling vendors could focus on cost efficiency.

### Final Recommendations

- Re-evaluate pricing for low-sales, high-margin brands to boost sales volume without sacrificing profitability.

- Diversify vendor partnerships to reduce dependency on a few suppliers and mitigate supply chain risks.
- Leverage bulk purchasing advantages to maintain competitive pricing while optimizing inventory management.
- Optimize slow-moving inventory by adjusting purchase quantities, launching clearance sales, or revising storage strategies.
- Enhance marketing and distribution strategies for low-performing vendors to drive higher sales volumes without compromising profit margins.
- By implementing these recommendations, the company can achieve sustainable profitability, mitigate risks, and enhance overall operational efficiency.



## Power BI Dashboard Summary

The **Vendor Performance Dashboard** in Power BI serves as a dynamic visualization layer that translates analytical insights into real-time, actionable intelligence. It enables stakeholders to monitor sales effectiveness, vendor contributions, inventory movement, and profit dynamics across the business. Designed for clarity and decision-making, the dashboard complements the report's findings with visual storytelling.

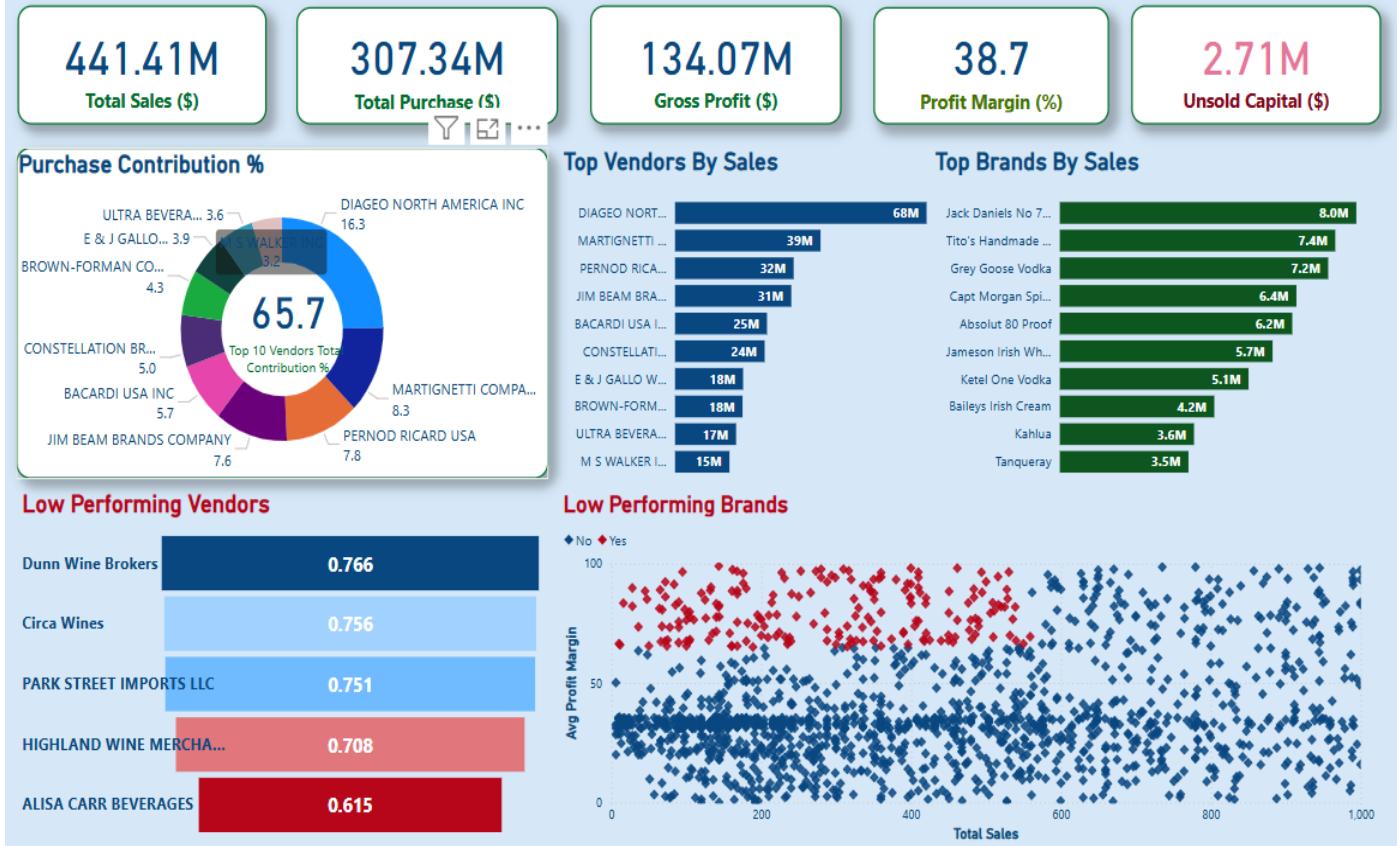
### Data Model Support

The dashboard is built on a robust DAX-based model, including calculated tables like:

- **BrandPerformance**: Brand-wise aggregations of sales and profit margins.
- **PurchaseContribution**: Vendor-level purchase breakdowns.
- **LowTurnoverVendor**: Vendor filter for stock turnover inefficiency.
- **TargetBrand**: Brand segmentation using percentile thresholds.

These measures ensure that the dashboard remains dynamic, insight-driven, and analytically aligned with the business goals

# Vendor Performance Dashboard



## Executive KPIs Overview

At the top of the dashboard, five high-level KPIs summarize the organization's vendor and inventory performance:

- Total Sales (\$441.41M)** and **Total Purchases (\$307.34M)** highlight the revenue inflow and procurement scale.
- Gross Profit (\$134.07M)** and **Profit Margin (38.7%)** indicate healthy margins across transactions.
- Unsold Capital (\$2.71M)** draws attention to the dollar value of products in inventory that remain unsold, pointing to potential liquidity concerns.

These indicators provide a concise and compelling overview of business performance and operational efficiency.

## Key Visuals and Insights

### 1. Vendor Purchase Contribution

A donut chart displays each vendor's share of the total purchase volume. The **top 10 vendors account for 65.7% of all purchases**, with **Diageo North America Inc.** alone contributing 16.3%. This visualization supports the report's earlier finding regarding over-reliance on a handful of vendors and the associated supply chain risk.

The chart is driven by the following DAX logic:

```
PurchaseContribution% =  
PurchaseContribution[TotalPurchaseDollars] /  
SUM(PurchaseContribution[TotalPurchaseDollars]) * 100
```

### 2. Top Vendors by Sales

This horizontal bar chart ranks vendors based on sales performance. **Diageo North America Inc.** leads with \$68M, followed by **Martignetti** (\$39M) and **Pernod Ricard** (\$32M). The visualization supports identifying strategic partners and vendors that are major revenue contributors.

### 3. Top Brands by Sales

The dashboard features another bar chart ranking brands by sales dollars. Key performers include **Jack Daniels No. 7 (\$8.0M)**, **Tito's Handmade Vodka (\$7.4M)**, and **Grey Goose Vodka (\$7.2M)**. These insights help spotlight high-demand products, guiding marketing focus and inventory alignment.

## Performance Risk Visuals

### 4. Low Performing Vendors

A vertical bar chart highlights vendors with poor inventory turnover, with all listed vendors showing an average stock turnover below 1. This includes **Alisa**

**Carr Beverages** (0.615) and **Dunn Wine Brokers** (0.766), indicating stock remains unsold for extended periods.

DAX logic:

```
LowTurnoverVendor =
VAR FilteredData =
    FILTER(vendor_sales_summary, vendor_sales_summary[StockTurnover] < 1)
RETURN
    SUMMARIZE(
        FilteredData,
        vendor_sales_summary[VendorName],
        "AvgStockTurnOver",
        AVERAGE(vendor_sales_summary[StockTurnover])
    )
```

## 5. Low Performing Brands – Margin vs Sales Scatter Plot

A scatter plot maps each brand's **average profit margin** against **total sales**. Brands marked in **red** ("Yes") represent those in the **bottom 15% for sales** but **top 15% for margin**—suggesting high-margin products with low volume that may benefit from strategic promotions.

DAX logic:

```
TargetBrand =
IF(
    [TotalSales] <= PERCENTILEX.INC(BrandPerformance, BrandPerformance[TotalSales], 0.15) &&
    [AvgProfitMargin] >= PERCENTILEX.INC(BrandPerformance, BrandPerformance[AvgProfitMargin], 0.85
    "Yes",
    "No"
)
```

This allows the business to identify undervalued brands that can be promoted to improve overall profitability without significant margin erosion.

## Unsold Capital Analysis

A key metric shown on the dashboard is **Unsold Capital**, amounting to **\$2.71M**, representing the financial burden of inventory that has not been

converted to sales. This complements the report's findings on low inventory turnover and associated holding costs.

The logic behind this metric:

```
UnsoldCapital =  
(vendor_sales_summary[TotalPurchaseQuantity] - vendor_sales_summary[TotalSalesQuantity]) *  
vendor_sales_summary[PurchasePrice]
```

This metric converts stock inefficiencies into a quantifiable financial risk, enabling inventory planners to take targeted action.

## Strategic Value

The dashboard empowers business users to:

- **Identify sales and profit leaders** among vendors and brands.
- **Spot and act on inefficiencies** like low stock turnover or unsold capital.
- **Target high-margin low-volume brands** for growth-focused promotions.
- **Mitigate vendor dependency risk** by analyzing contribution concentrations.
- **Track profitability** at a granular level, enabling smarter procurement and sales strategies.

## Conclusion

The Power BI dashboard is not just a reporting tool—it is a **decision support system**. It takes the analytical outcomes of the project and brings them to life through visual exploration and dynamic KPIs. By aligning stakeholder attention with strategic levers like margin, volume, and vendor performance, the dashboard enables efficient, profitable, and risk-aware operations.