

Power BI Practical Exam – Comprehensive Report

DSA 3050A US End Semester Exam

AdventureWorks Sales: End-to-End BI Solution

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Executive Summary

- End-to-end BI pipeline completed: data import, Power Query transformations, star-schema modeling, advanced DAX, multi-page reports, a published dashboard and documentation.
- Key business insights include top-performing product categories (e.g., Bikes and Road Bikes) and profitability tracking with a 30% target margin KPI.
- Interactivity delivered via slicers, drill-downs, Q&A and role-based views (US and Europe Managers).
- Artifacts: .pbix, exported PDF report, screenshots and a shareable Power BI Service link (as provided in the project README).

Scope & Objectives

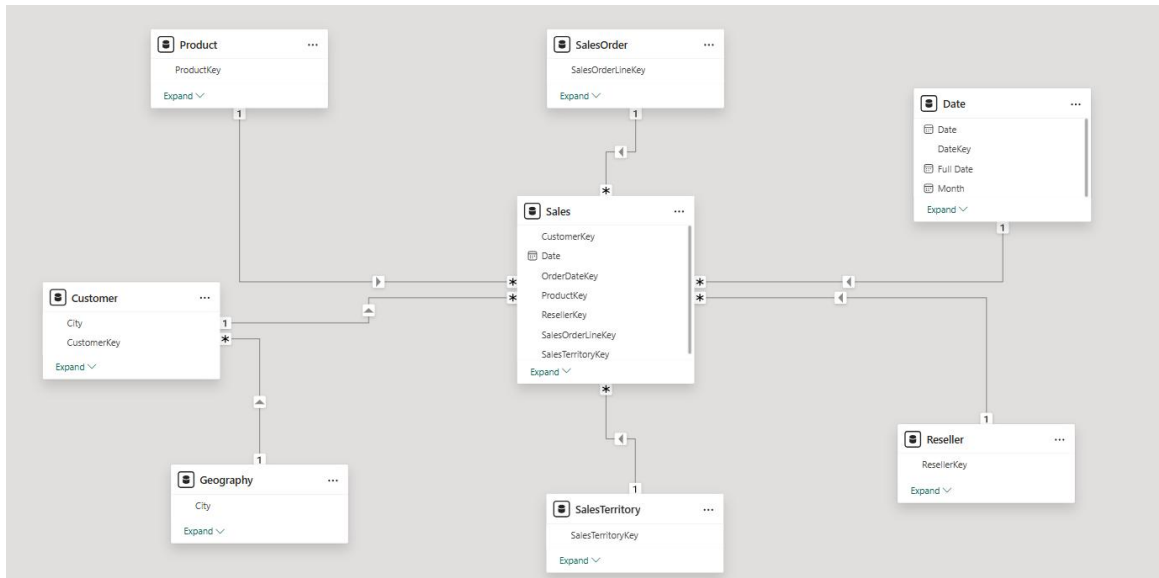
The scope covers the full lifecycle of a BI solution using the AdventureWorks-style retail sales dataset: ingestion, cleaning, modeling, analytical measures, report design, dashboard assembly, access control, and publishing. Objectives are to build decision-ready, reliable visuals and KPIs aligned to marking criteria.

Data Sources & Preparation (Power Query)

- Imported tables: Sales, Product, Customer, Date, SalesTerritory, SalesOrder, and Reseller.
- Enforced correct data types (dates, currency, whole numbers).
- Created Profit via merging Products cost with Sales ($\text{Profit} = \text{SalesAmount} - \text{Quantity} \times \text{Cost}$).
- Split Customer full name into FirstName and LastName.
- Derived Sales Category by SalesAmount thresholds (High, Medium, Low).
- Removed duplicate Products; filtered Sales to 2018 and later.
- Built Yearly_Sales summary and Outliers (99th percentile) view for data quality checks.
- Created Geography from Customer attributes for downstream modeling.

Data Modeling

- Star schema centered on Sales fact table linked to Product, Customer, Date, SalesTerritory, SalesOrder, and Reseller; Geography links to Customer.

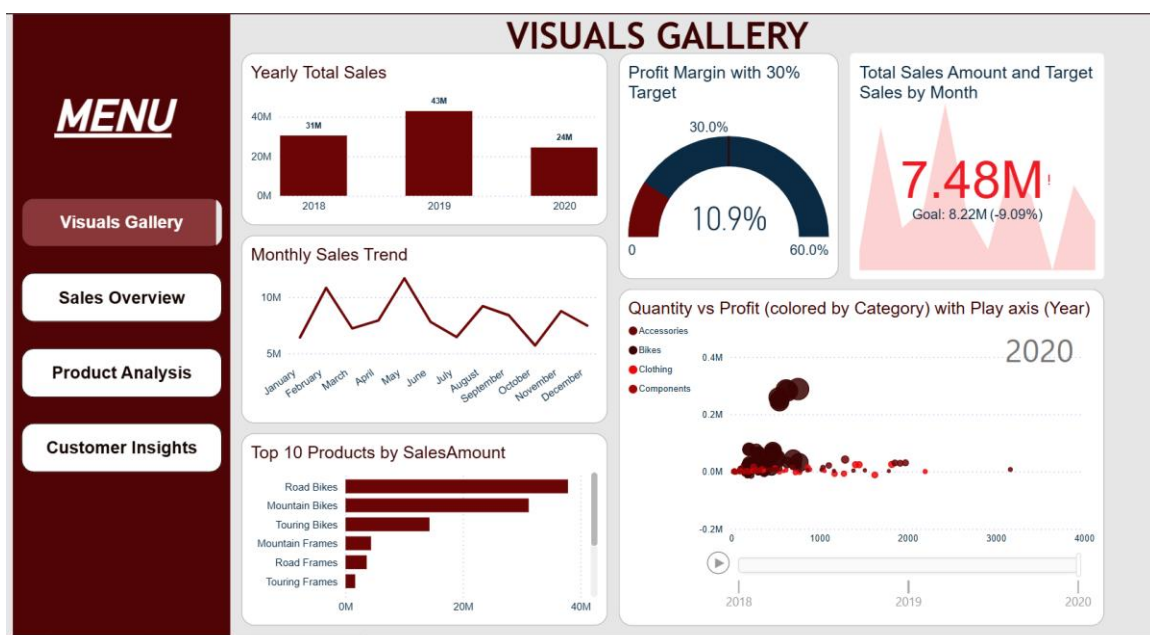


- Defined Date and Product hierarchies; formatted measures and hid technical keys.
- Validated relationships and filter directions for reliable cross-highlighting.

Visuals & Reports

Core visuals and report pages delivered:

- **Visuals Gallery:** Yearly Total Sales, KPI cards with targets, Profit Margin gauge (30% target), monthly trend line, Quantity vs. Profit scatter (by Sales Category) with Year play axis, Top 10 Products.



- MENU

Visuals Gallery

Sales Overview

Product Analysis

Customer Insights

SALES OVERVIEW

Year

All

Month

All

Quarter

All

Day

All

97.88M

Total Sales

107.67M

Target Sales

10.9%

Profit Margin %

10.67M

Total Profit

Sales Category Distribution

| Category | Amount | Percentage |
|----------|--------|------------|
| High | 6.21M | 6.34% |
| Medium | 8.33M | 8.51% |
| Low | 83.34M | 85.15% |

Monthly Sales Trend

| Month | Total Sales Amount (M) | Sum of Quantity (K) |
|-----------|------------------------|---------------------|
| January | 8.5 | 15 |
| February | 10.5 | 20 |
| March | 9.5 | 18 |
| April | 9.0 | 17 |
| May | 11.5 | 22 |
| June | 10.5 | 20 |
| July | 9.0 | 18 |
| August | 12.5 | 25 |
| September | 10.5 | 20 |
| October | 9.0 | 18 |
| November | 10.5 | 20 |
| December | 9.5 | 18 |

Top 10 Products by SalesAmount

| Product | SalesAmount (M) |
|-----------------|-----------------|
| Road Bikes | 40 |
| Mountain Bikes | 35 |
| Touring Bikes | 15 |
| Mountain Frames | 5 |
| Road Frames | 3 |
| Touring Frames | 2 |
| Jerseys | 1 |
| Wheels | 1 |

Top 50 Sales

| Sales Order | Year | Month | Channel | Region | Sum of Quantity | Total Sale |
|--------------|------|-------|----------|-----------|-----------------|------------|
| SO40606 | 2018 | May | Reseller | Central | 59 | |
| SO40607 | 2018 | May | Reseller | Central | 115 | |
| SO40607 | 2018 | July | Reseller | Canada | 238 | |
| SO46616 | 2018 | July | Reseller | Canada | 413 | |
| SO46643 | 2018 | July | Reseller | Northwest | 231 | |
| SO46645 | 2018 | July | Reseller | Canada | 208 | |
| SO46660 | 2018 | July | Reseller | Southwest | 251 | |
| Total | | | | | 13395 | £ |

- MENU

Visuals Gallery

Sales Overview

Product Analysis

Customer Insights

PRODUCT ANALYSIS

CategoryAllSubcategoryAllModelAllColorAll

Product Sales Analysis

| Product | Category | Subcategory | Color | City |
|------------------------|-------------|-------------|-------|------------|
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Beaverton |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Beaverton |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Beaverton |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Beliflower |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Beliflower |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Beliflower |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Bellingham |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Bellingham |
| All-Purpose Bike Stand | Accessories | Bike Stands | NA | Bendigo |
| Total | | | | |

Product Breakdown

Product x

 - Mountain-200 Black, 38
4400592.80
 - Mountain-200 Black, 42
4009494.76
 - Mountain-200 Silver, 38
3693678.03

Total Sales Amount
97880718.68

TOP PRODUCT PERFORMERS

Top CategoryBikes — \$83,362,057.37

Top SubcategoryRoad Bikes — \$37,873,581.58

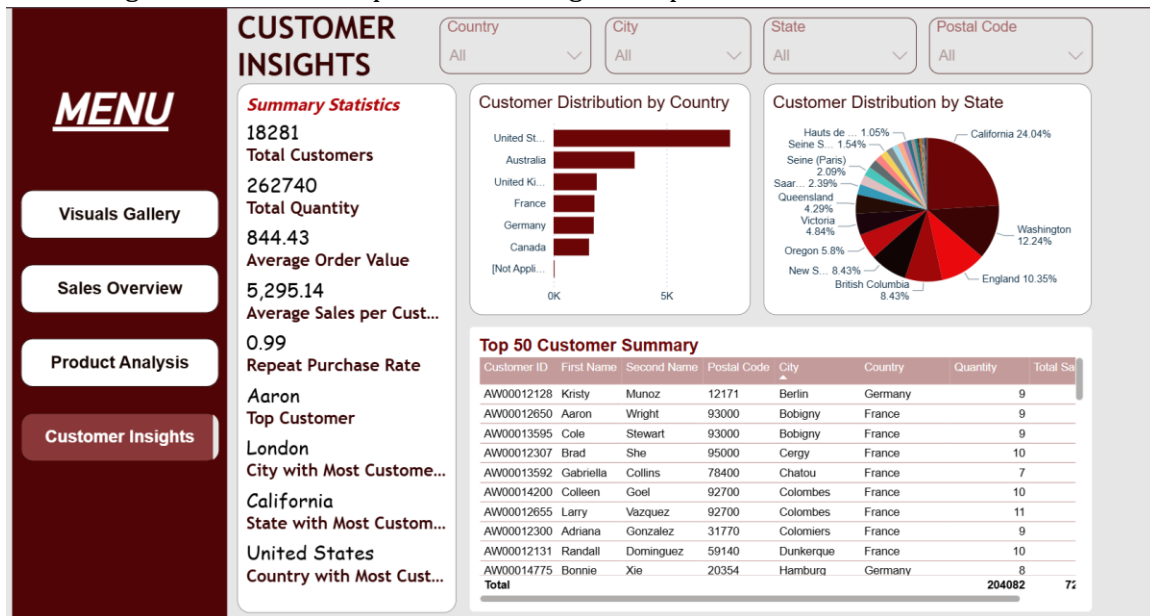
Top ColorBlack — \$34,743,049.40

Category Rank Over Time

● Accessories ● Bikes ● Clothing ● Components

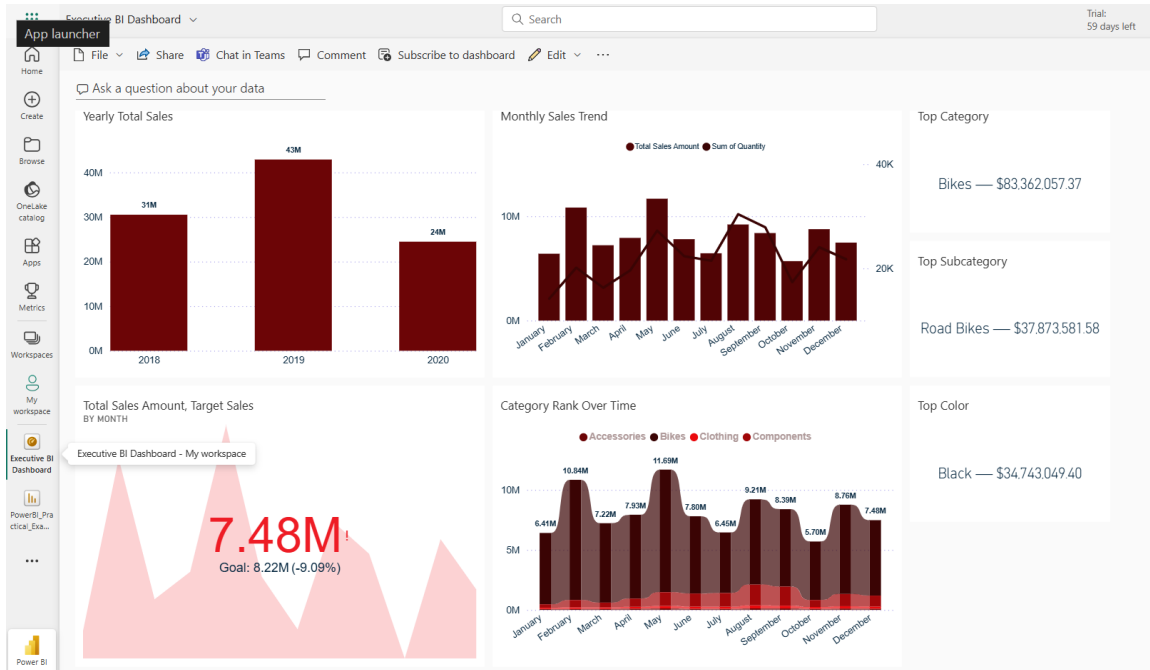
| Month | Accessories | Bikes | Clothing | Components | Total |
|-----------|-------------|-------|----------|------------|--------|
| January | 6.41M | 2.84M | 0.10M | 0.05M | 9.40M |
| February | 7.22M | 3.01M | 0.10M | 0.05M | 10.38M |
| March | 7.93M | 3.18M | 0.10M | 0.05M | 11.26M |
| April | 7.80M | 3.05M | 0.10M | 0.05M | 10.90M |
| May | 6.45M | 2.92M | 0.10M | 0.05M | 9.52M |
| June | 8.30M | 3.18M | 0.10M | 0.05M | 11.63M |
| July | 5.70M | 2.88M | 0.10M | 0.05M | 8.73M |
| August | 8.76M | 3.01M | 0.10M | 0.05M | 11.92M |
| September | 7.41M | 2.92M | 0.10M | 0.05M | 10.48M |
| October | 6.41M | 2.84M | 0.10M | 0.05M | 9.40M |
| November | 7.22M | 3.01M | 0.10M | 0.05M | 10.38M |
| December | 7.93M | 3.18M | 0.10M | 0.05M | 11.26M |

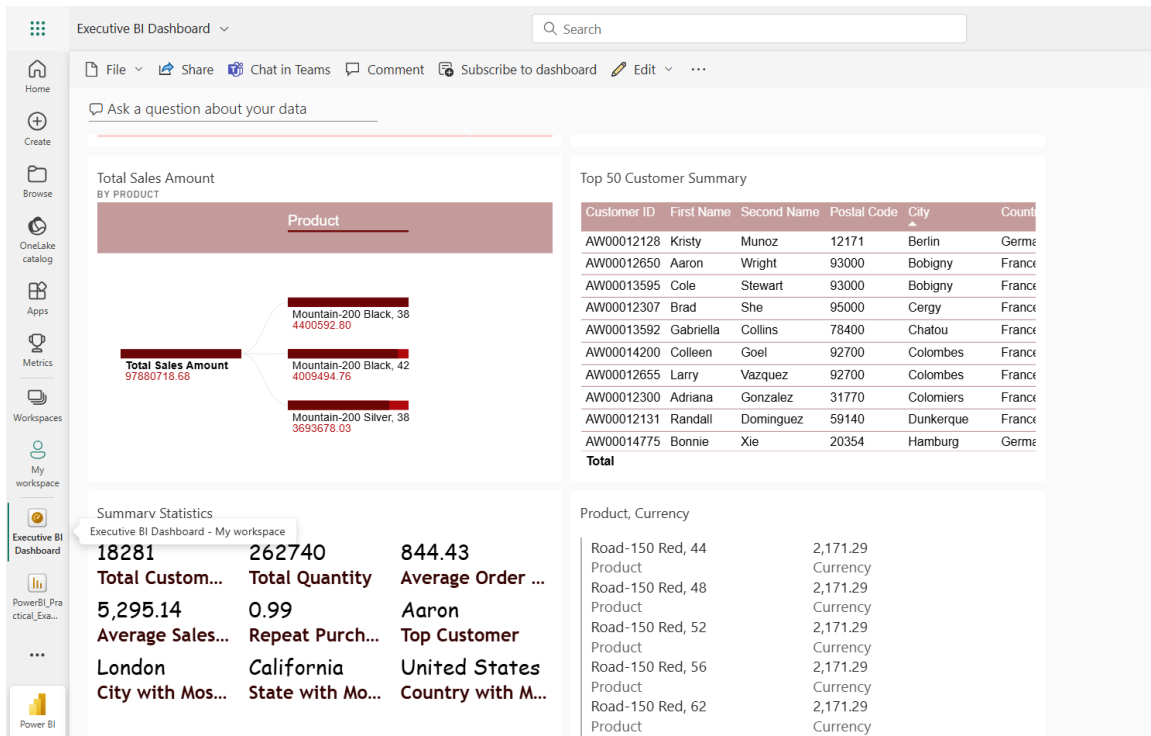
- **Page 3 – Customer Insights:** Total Customers, Total Quantity, AOV, Repeat Purchase Rate; geo distribution; Top Customer insights; Top 50 customers table.



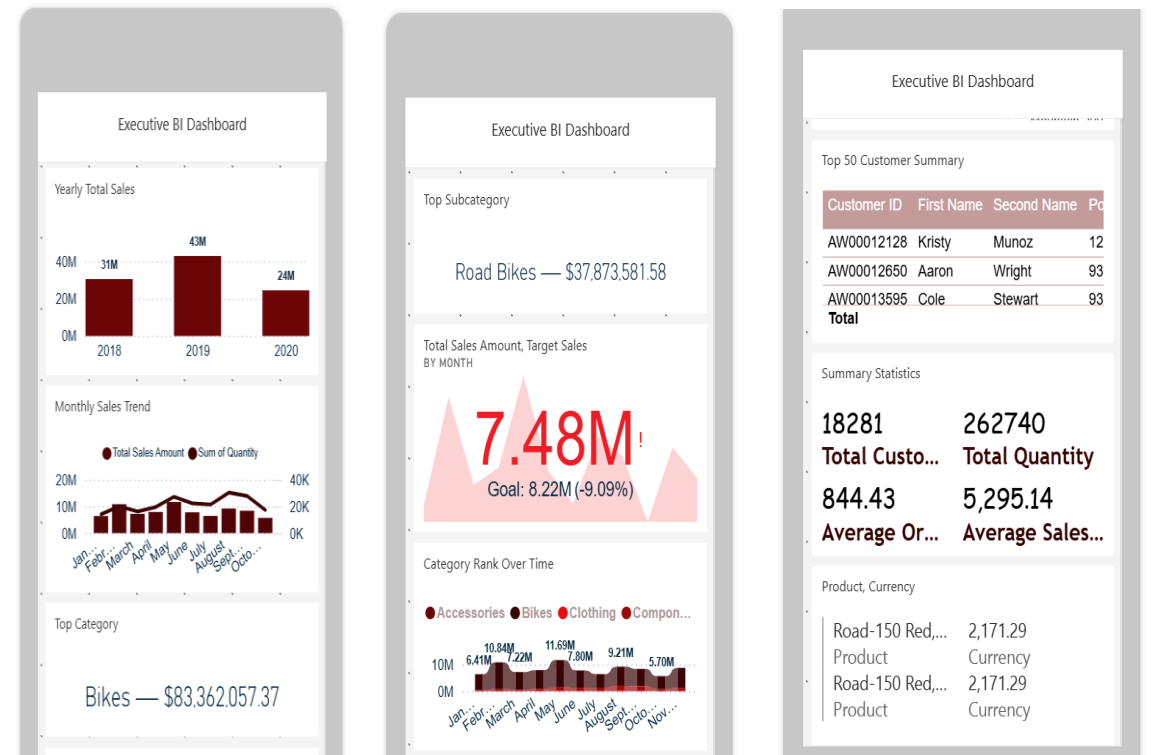
Dashboard & Publishing

- Published to Power BI Service, created Executive Business Performance dashboard.
- Pinned KPIs and key visuals; enabled Q&A tile (e.g., “Top product by Currency”).





- Applied consistent theming and optimized mobile layout with a curated mobile view.



DAX Measures

- Total Sales Amount, Total Profit, Total Quantity
- LastYearSales and YoY Growth %
- Running Total Sales
- Top 5 Product Rank (RANKX/TOPN)
- Average Order Value, Profit Margin %
- Total Customers, Average Sales per Customer, Repeat Purchase Rate
- State/City/Country with Most Customers

Row-Level Security (RLS)

Roles implemented: US Manager (Country = United States) and Europe Manager (countries within Europe).

Manage security roles

Create new security roles and use filters to define row-level data restrictions.

Roles

+ New

Europe Manager

US Manager

Tables

Customer

Date

Geography

Outliers_Sum...

Product

Reseller

Sales

SalesOrder

SalesTerritory

Yearly_Sales

Rules

Switch to default editor

1 [Country] = "United States"

Filter the data that this role can see by entering a DAX filter expression that returns a True/False value. For example: [Entity ID] = "Value"

Save

Close

Manage security roles



Create new security roles and use filters to define row-level data restrictions.

Roles

+ New

Europe Manager ...

US Manager ...

Tables

Customer ...

Date ...

Geography ...

Outliers_Sum... ...

Product ...

Reseller ...

Sales ...

SalesOrder ...

SalesTerritory ...

Yearly_Sales ...

Rules

Switch to default editor

1 [Country] IN { "France", "Germany", "Spain", "Italy", "United Kingdom" }

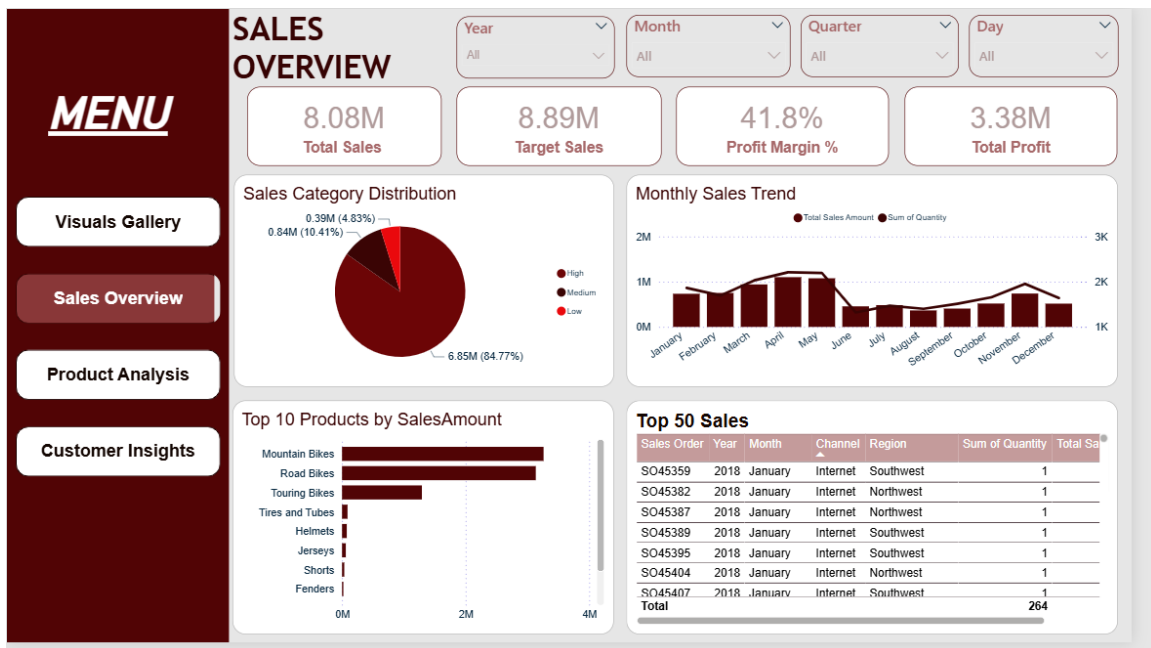
Filter the data that this role can see by entering a DAX filter expression that returns a True/False value. For example: [Entity ID] = "Value"

Save

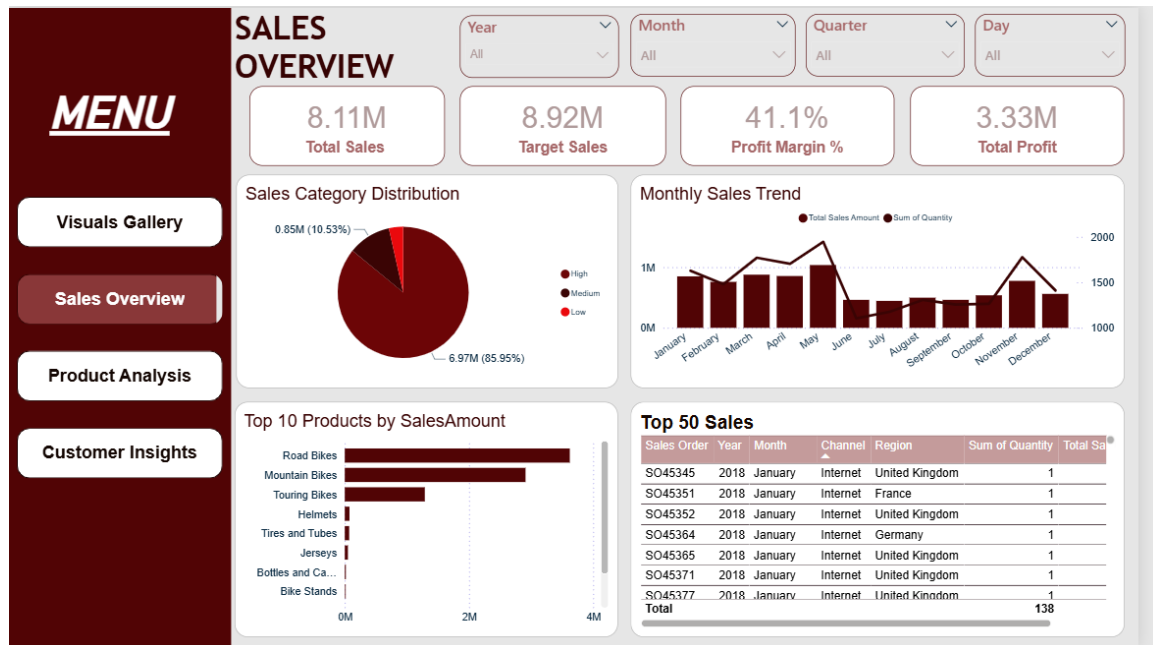
Close

Tested by viewing as each role to validate filters and KPI behavior.

As US Manager:



As EUROPE Manager:



Key Insights & Recommendations

- Product Mix - Bikes dominate category sales; focus promotions on high-margin subcategories (e.g., Road Bikes) while monitoring inventory turnover.
- Profitability - Track Profit Margin against the 30% target with conditional alerts; investigate low-margin SKUs for pricing or cost optimization.
- Customer Strategy - High repeat purchase rate suggests loyalty levers; consider segmentation to tailor offers by geography and category affinity.
- Data Quality - Maintain outlier monitoring and refresh schedules; document data lineage and assumptions for auditability.

Assumptions & Limitations

Assumptions

- The AdventureWorks dataset provided is complete, accurate, and representative of actual business operations.
- All required business rules (e.g., Profit = SalesAmount - Quantity × Cost, Sales Category thresholds) are correct and accepted by stakeholders.
- The provided time period (2018 onwards) sufficiently reflects current sales trends for meaningful analysis.
- Power BI Service and user accounts are assumed to have the necessary licenses and permissions for publishing, sharing and applying Row-Level Security (RLS).

Limitations

- Historical data prior to 2018 is excluded, which may limit long-term trend analysis and seasonality insights.
- Outlier handling is limited to the 99th percentile filter; additional data quality checks may be required in production.
- Performance testing on very large datasets was not conducted, so scalability in enterprise-scale environments is unverified.
- Custom visuals used in the report may have licensing or compatibility restrictions in different Power BI environments