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Purchasing Operational Dashboard

Data Analyst Team

Introduction

The Purchasing Department requested the Data Analyst Team to develop an Operational Dashboard that provides leadership with a clear and intuitive overview to aid in decision-making and enhance operational efficiency. This booklet has been created to introduce the process of building this Dashboard, provide instructions for using the Dashboard, and present the team's recommendations.
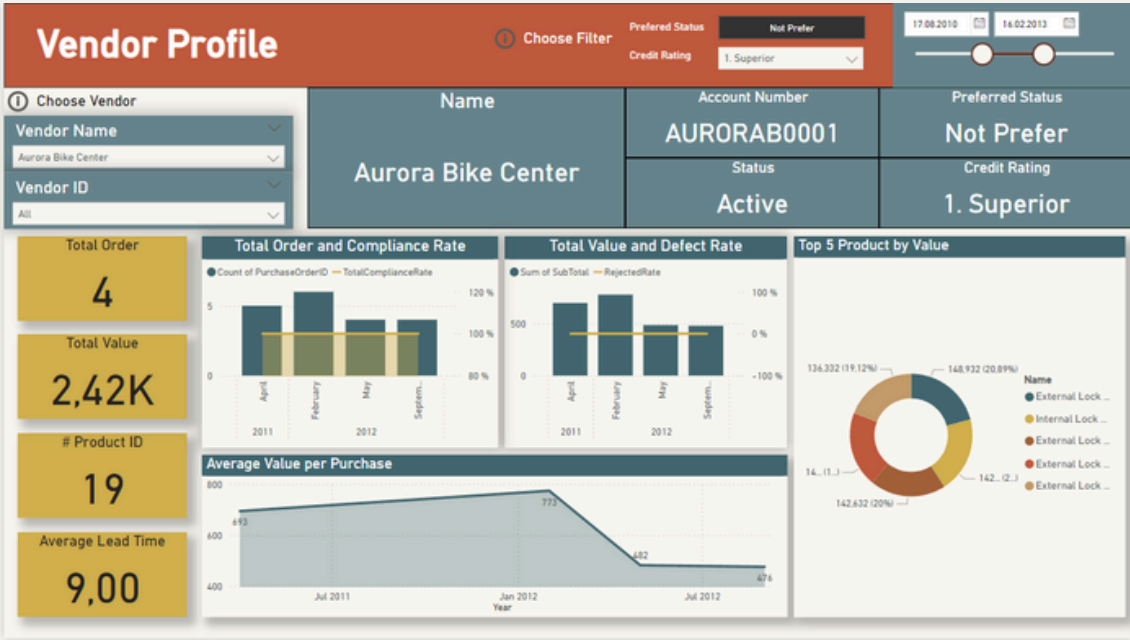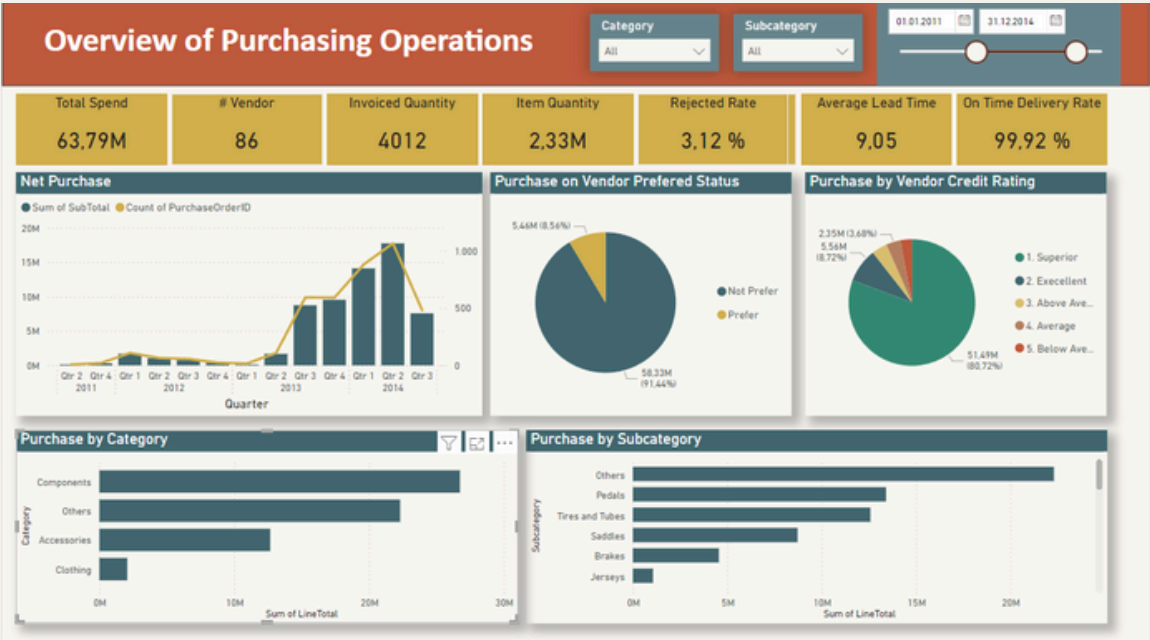
Agenda

PART 1: Preparation Process

1.1 Goals of Dashboard

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- **Current status** of purchasing for production and retail
- Track **KPIs**: purchase rate, material costs, vendor performance
- **Forecast inventory** to ensure sufficient stock for sales and production
- **Support** leadership make **informed decisions** on **optimal pricing**, **timely purchasing**, and **operational efficiency**

1.2 Design Thinking Implementation

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Process

1. Empathy
   - 5W1H
   - Empathy Map
   - Stakeholder Journey
2. Define POV
   - NorthStar Metrics and POV
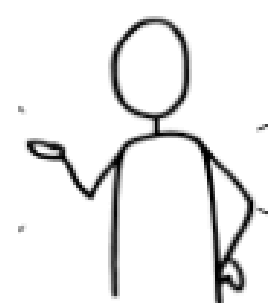3. Ideate

1.2.1 Empathy

a. 5W1H

WHO will watch this Dashboard?	WHAT problem does this dashboard solve?	WHEN/WHERE will stakeholders view this Dashboard?	WHY do stakeholders need this Dashboard?	HOW do stakeholders achieve their goals
Primary viewers are leadership, purchasing directors, and operations managers; secondary viewers include purchasing staff, accounting, and warehouse teams.	It addresses the current state of purchasing for production and retail, tracks purchasing KPIs, forecasts inventory, and helps optimize costs and operations.	Viewed by leadership during strategic meetings and by the purchasing team during daily operations.	To gain a comprehensive view of purchasing performance, monitor supplier efficiency, optimize costs, and ensure a steady supply of materials for production.	The dashboard helps track inventory, identify underperforming suppliers, optimize pricing and contracts, and predict demand to prevent supply shortages.

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1.2.1 Empathy

b. Empathy Map

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Thinking and feeling What does the user/customer think and feel?	Seeing What does the customer/user see?	Saying and doing What does the customer/user say?
Concerned about ensuring enough materials for production and on-time deliveries, while optimizing costs and monitoring supplier performance. Under pressure to maintain a smooth flow of goods and manage purchasing budgets efficiently.	Viewing complex reports and data from multiple departments, lacking an intuitive overview for quick decision-making. Observing issues like stock shortages, delivery delays, or rising costs without clear causes.	Expressing the need for better tools to track purchasing progress and supplier performance, and wanting reliable, easy-to-understand data. Participating in meetings to discuss purchasing and inventory, often relying on manual reports, which delays decision-making.

Pains What are the biggest problems and challenges?		Gains What are the opportunities and benefits?
Difficulty obtaining a complete overview of purchasing, inventory, and supplier performance. Time-consuming manual data analysis leading to delayed decisions and missed opportunities.	STAKEHOLDER	Desire for a visual dashboard that provides a clear, real-time overview of purchasing and inventory. Faster decision-making with timely, accurate data, enabling better cost optimization and supplier management.

1.2.1 Empathy

c. Stakeholder Journey

Dashboard Setup:	Daily Dashboard Use:	Benefits After Implementation:
Data analysts begin designing the dashboard according to leadership's requirements. They work with purchasing, inventory, and supplier data to integrate it into the dashboard logically.	Leadership and managers start using the dashboard regularly to track purchasing activities and make decisions.	More Efficient Purchasing Processes: Shorter decision-making times.
Leadership Input: Leadership can provide feedback during this stage to refine the dashboard and ensure accurate, easy-to-understand data display.	Real-Time Data: They can see real-time data on inventory levels, compare supplier pricing, and receive alerts for stock risks or delivery delays.	Better Cost Control: Through tracking of supplier pricing and inventory levels.
Expected Outcome: The dashboard is configured to showcase key performance indicators (KPIs) like inventory levels, material costs, supplier delivery times, and purchasing costs.	Experience: The dashboard provides peace of mind by offering a comprehensive overview of operations, saving time, and enabling faster decision-making. It also helps identify potential issues and opportunities to improve the	Improved Supplier Performance: Enabled by continuous evaluation and monitoring. Increased Leadership Satisfaction: Effective management of the purchasing process with less reliance on manual reporting.

1.2.2 NorthStar Metrics and POV

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What VALUE you want to measure?	
Net Purchase: The total purchasing amount over a defined period.	
WHEN the value DELIVERY SUCCESS?	
When the Net Purchase aligns with budget forecasts, optimizing stock levels without over-purchasing or stockouts.	
Northstar Metric Name	
Net Purchase	
WHY do you choose this metric?	
Net Purchase reflects the company's purchasing efficiency and budget management. It directly affects inventory management, cost control, and the ability to meet production demands, making it a crucial metric for financial and operational optimization.	

View	Description	Why
Over Time	Tracks purchasing patterns, identifying peaks and seasonal fluctuations.	Helps manage budgets, align stock levels with production needs.
by Vendor Prefered Status	Shows purchasing volume from preferred vs. non-preferred vendors.	Optimizes vendor relationships and reduces risk from non-preferred vendors.
by Vendor Credit Rating	Highlights purchasing across vendors with different credit ratings.	Manages financial risk by balancing purchases across vendor credit ratings.
by Category/ Subcategory	Provides a detailed view of spending across product lines.	Identifies key expenditure areas and optimizes inventory management.

1.2.3 Ideate

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Idea Name	Layer 0 dimension	Layer 1 dimension	Layer 2 dimension	What are still missing?
Purchase Overview	Total Net Purchase # Invoice, Item Quantity	Net Purchase by Vendor Preferred Status Net Purchase by Vendor Preferred Status and Category Net Purchase by Vendor Credit Status	# Vendor Rejected Rate Average Lead Time Ontime Delivery Rate	Inventory Focus, Vendor Info
Inventory Management	Total Inventory Value/Quantity	Inventory Value/Quantity by Category Inventory Value/Quantity by Location	Inventory Turnover Ratio # Understock	Vendor Info
Vendor Performance	Vendor basic Information # Order, Spend on each vendor	Complaince Rate Defect Rate Top Product by Value Value per Purchase		

1.3 Data Preparation

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Dataset: adventureworks2019 (in public Google BigQuery dataset)

Dataset Schema: https://i0.wp.com/improveandrepeat.com/wp-content/uploads/2018/12/AdvWorksOLTPSchemaVisio.png?ssl=1

1.3.1 Extract data with Google BigQuery

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```
1   WITH s AS (
2   SELECT
3       CAST(ProductSubcategoryID AS STRING) AS ProductSubcategoryID
4       ,ProductCategoryID
5       ,Name
6   FROM `adventureworks2019.Production.ProductSubcategory`
7   )
8
9   SELECT
10      p.ProductID
11      ,p.Name AS Product
12      ,s.Name AS Sub_category
13      ,c.Name AS Category
14  FROM `adventureworks2019.Production.Product` AS p
15  FULL JOIN s ON p.ProductSubcategoryID = s.ProductSubcategoryID
16  FULL JOIN `adventureworks2019.Production.ProductCategory` AS c ON s.ProductCategoryID = c.ProductCategoryID
```

Query results

⬇ SAVE RESU

JOB INFORMATION	RESULTS	JSON	EXECUTION DETAILS	CHART PREVIEW	EXECUTION GRAPH

Row	ProductID ▼	Product ▼	Sub_category ▼ ↓	Category ▼	
1	815	LL Mountain Front Wheel	Wheels	Components	
2	816	ML Mountain Front Wheel	Wheels	Components	

Output product ID, product name, sub-category, category

1.3.1 Extract data with Google BigQuery

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```
1   -- Calculate total_inventory_qty by product ID
2   SELECT
3     ProductID
4     ,SUM(Quantity) AS total_inventory_qty
5     FROM `adventureworks2019.Production.ProductInventory`
6     GROUP BY 1
7
```

Query results

⤓ SAVE RESULTS

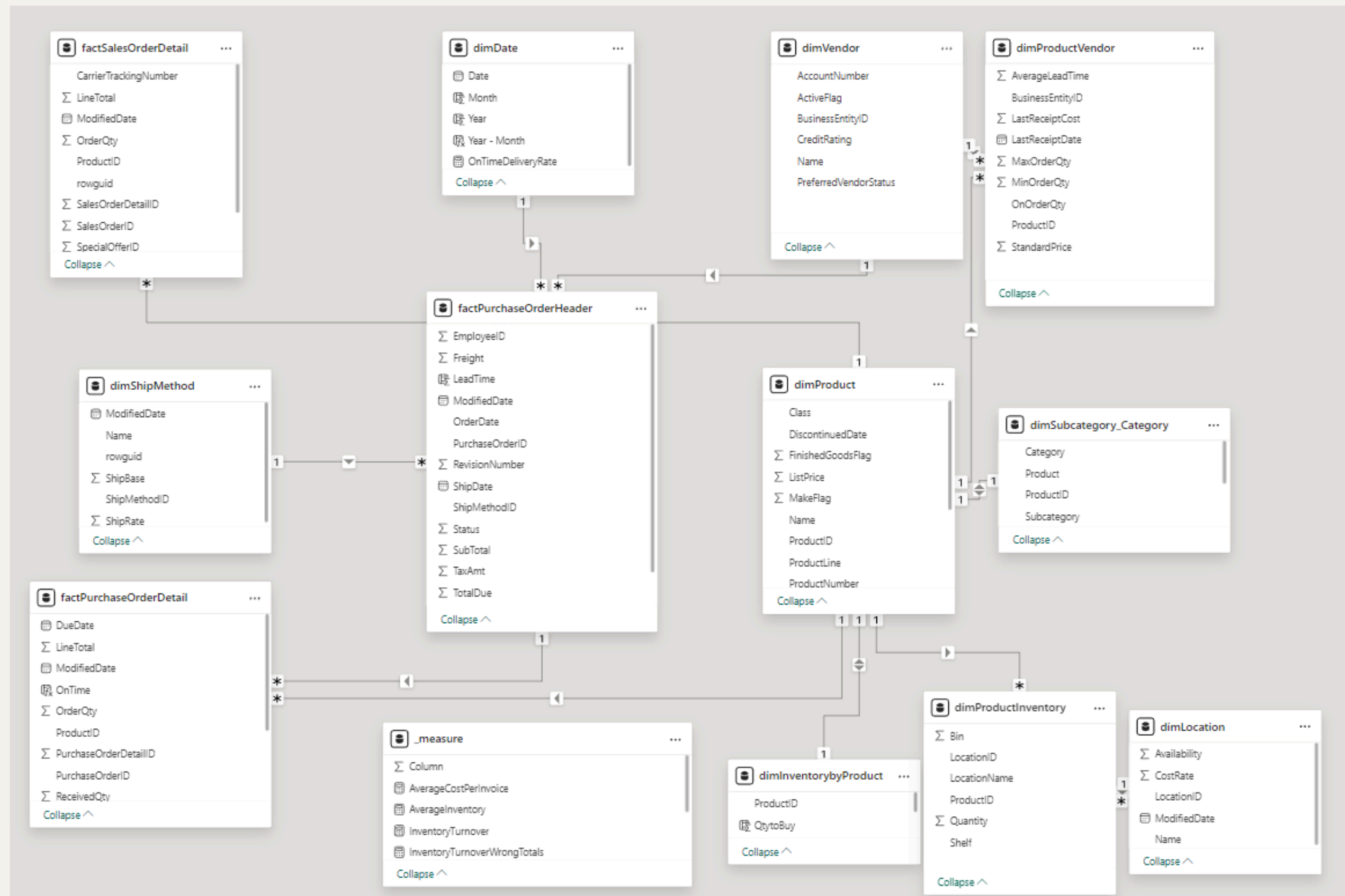| JOB INFORMATION	RESULTS	JSON	EXECUTION DETAILS	CHART PREVIEW	EXECUTION GRAPH

Row	ProductID ▼	total_inventory_qty
1	429	1599
2	430	1594
3	431	1604
4	432	1613
5	463	1685
6	464	1690
7	427	1608
8	428	1604

Output total inventory quantity by product ID (dim_inventory_by_product table)
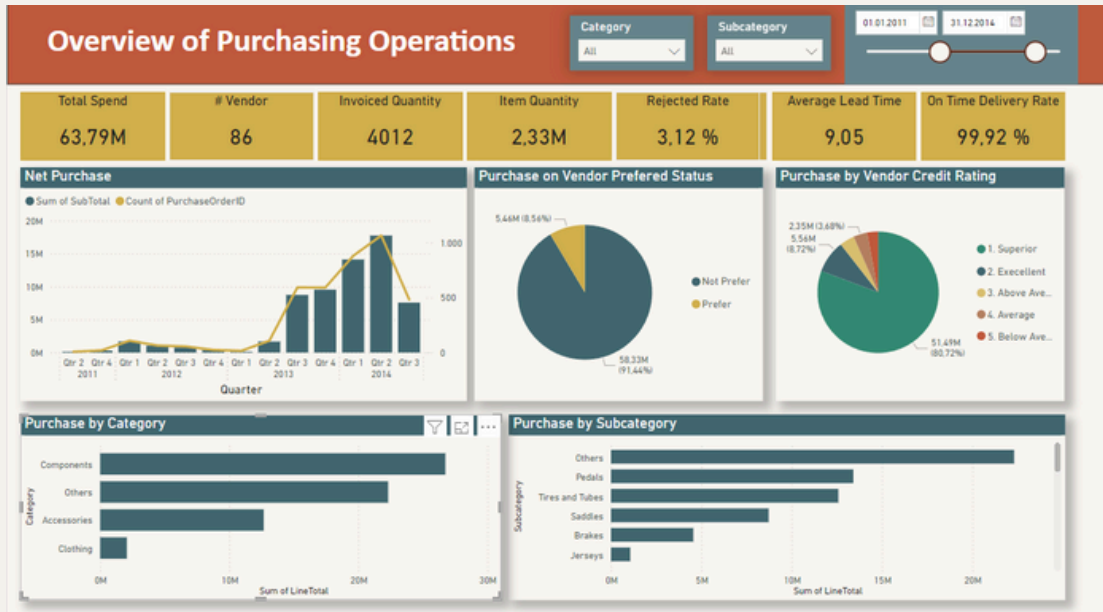
1.4 Data Modelling

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Connect queries above and available tables of dataset to Power BI, clean and model data

PART 2: Dashboard
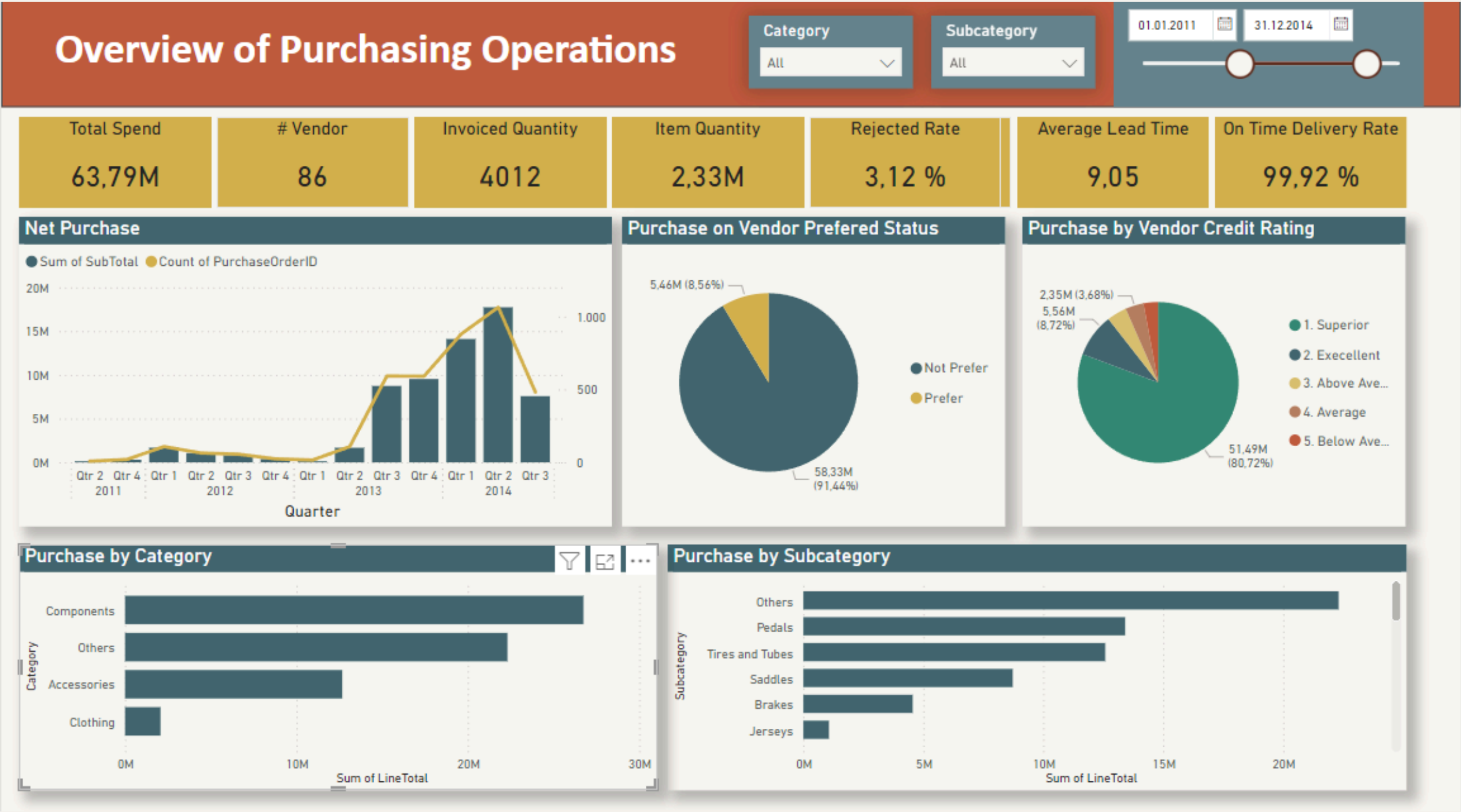
2.1 Overview

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- 3 Pages with Top-down flow
  - P1: Overview of Purchasing Operations
  - P2: Inventoy Management
  - P3: Vendor Profile

2.1.1 Page 1 Overview

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Goal: Overview with most important KPIs of Purchasing Operations
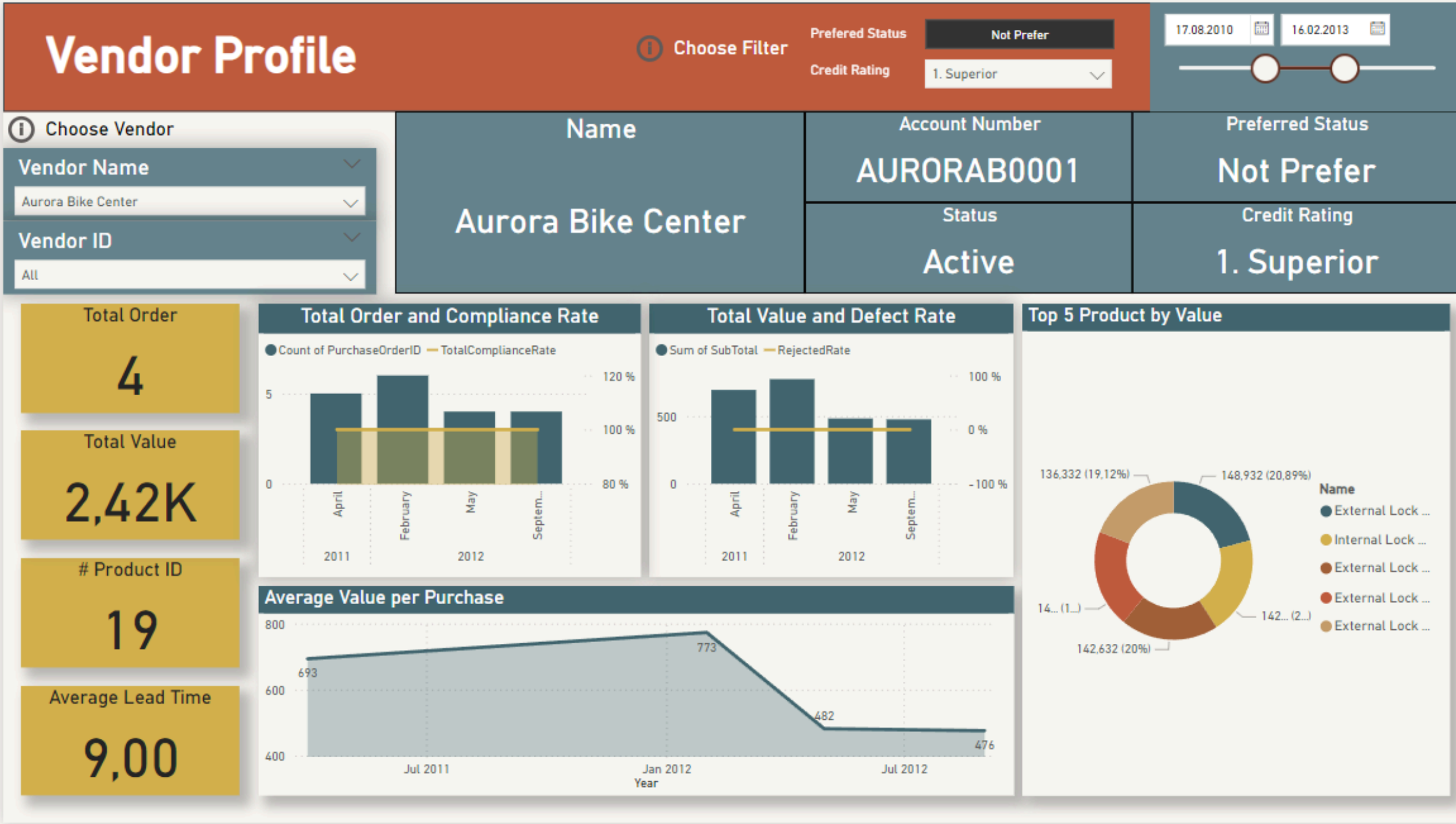
2.1.2 Page 2 Overview

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Ctrl + Click on this bar to view this chart

Goal: Provide an overview of current inventory, indicate products that need replenishment, and highlight inventory turnover.

2.1.3 Page 3 Overview

Goal: Provide the profile and performance metrics of each vendor. Suitable for purchasing department for further analysis in the future.
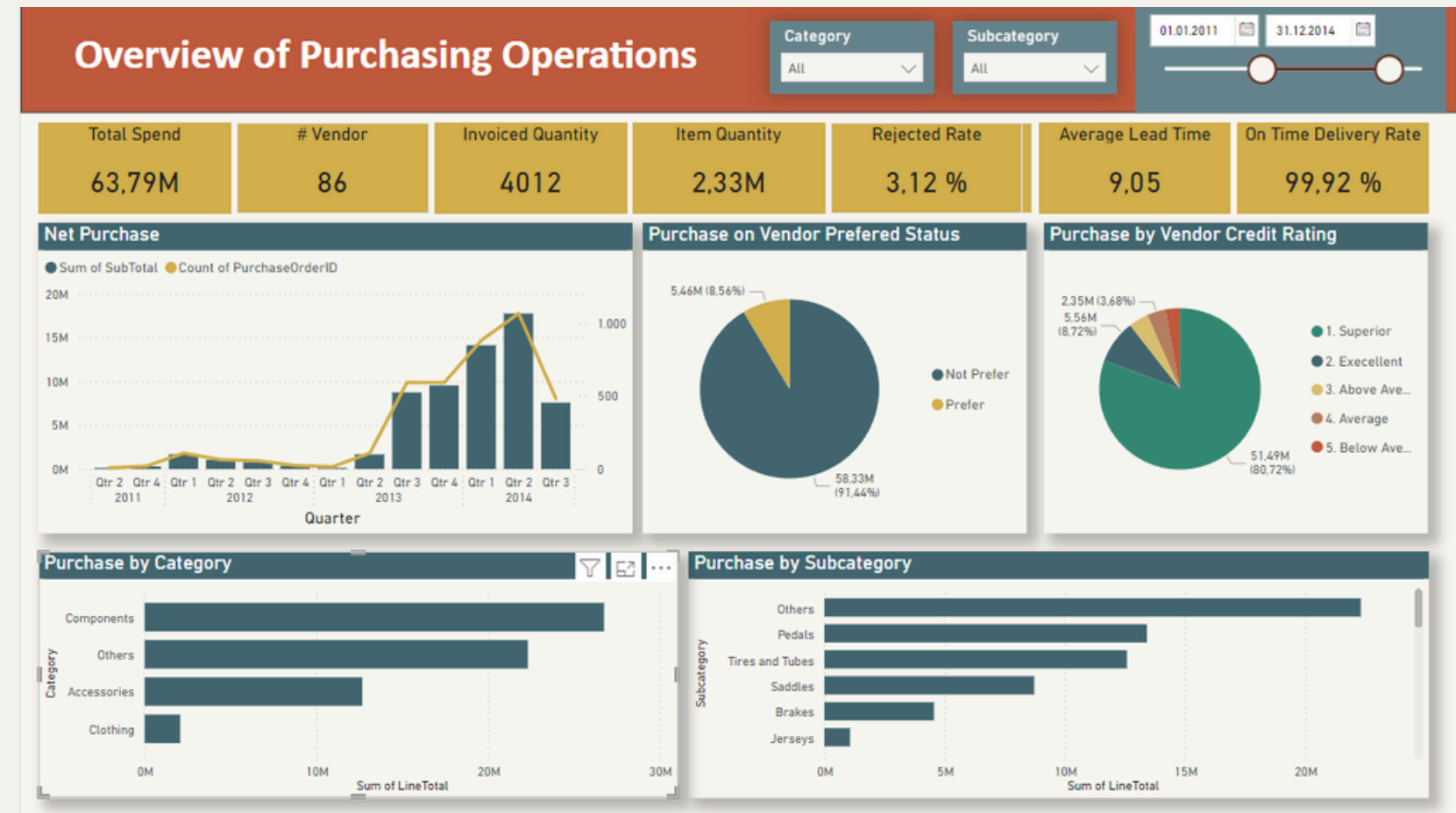
PART 3: Insights

3.1 Insights from Page 1

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- Net Purchase saw a significant increase from Q2 2013 at around 1.7 million USD, peaking in Q2 2014 at approximately 17 million USD *(Note: Q3 2014 data is unavailable, so no conclusion can be made about a potential decline)*.
- AdventureWorks is sourcing a large proportion from non-preferred vendors, accounting for over 90%.
- Key KPIs like rejected rate and on-time delivery rate are at very good and stable levels.
- Spending from vendors with low credit ratings is at an acceptable level and provides stability for the company.

3.2 Insights from Page 2

- Locations that are occupying the highest amount of inventory are Subassembly (95K units) and Miscellaneous Storage (83K units), but have low total inventory values (3.3M and 1.5M, respectively) => Store many items that are low-value

- Location Final Assembly and Finished Goods Storage, although not having a high inventory volume (20K and 17K, respectively), have the highest total inventory value (13.6M and 12.2M respectively) => Store items that are high-value.

3.3 Insights from Page 3

- Locations that are occupying the highest amount of inventory are Subassembly (95K units) and Miscellaneous Storage (83K units), but have low total inventory values (3.3M and 1.5M, respectively) => Store many items that are low-value

- A significant number of products (69 SKUs of 432 total SKUs) need to be replenished immediately to avoid shortages.

- Location Final Assembly and Finished Goods Storage, although not having a high inventory volume (20K and 17K, respectively), have the highest total inventory value (13.6M and 12.2M respectively) => Store items that are high-value.

PART 4: Recommendations

Optimize Vendor Selection

Shift focus towards preferred vendors to improve supply stability and credit rating. Monitor vendors with low credit ratings but stable performance to reduce risk.

Improve Inventory Replenishment

Address the 69 SKUs below safety stock immediately to prevent shortages. Enhance forecasting and reduce lead times to improve the Inventory Turnover Ratio.

Implement Inventory Tracking Over Time

The current dataset contains no inventory data over time. Set up a system to regularly capture and store inventory data at key intervals (daily, weekly, or monthly) to enable trend analysis, forecasting, and better inventory management decisions.

Strategic Inventory Management

Rebalance inventory across locations to avoid congestion and manage high-value items like HL Mountain Frames carefully to maintain optimal stock levels.

We always look forward for improvement !

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Sources

PBIX File
https://drive.google.com/drive/folders/1RhF0k_Qfb04ZlFoJThRKd8PvEFx4ihrz

Dataset Schema
https://i0.wp.com/improveandrepeat.com/wp-content/uploads/2018/12/AdvWorksOLTPSchemaVisio.png?ssl=1