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Data Overview:

The dataset consists of multiple tables that provide a comprehensive view of supplier performance, defect tracking, material analysis, and plant-level insights. Each table serves a specific purpose in the supplier quality evaluation process.

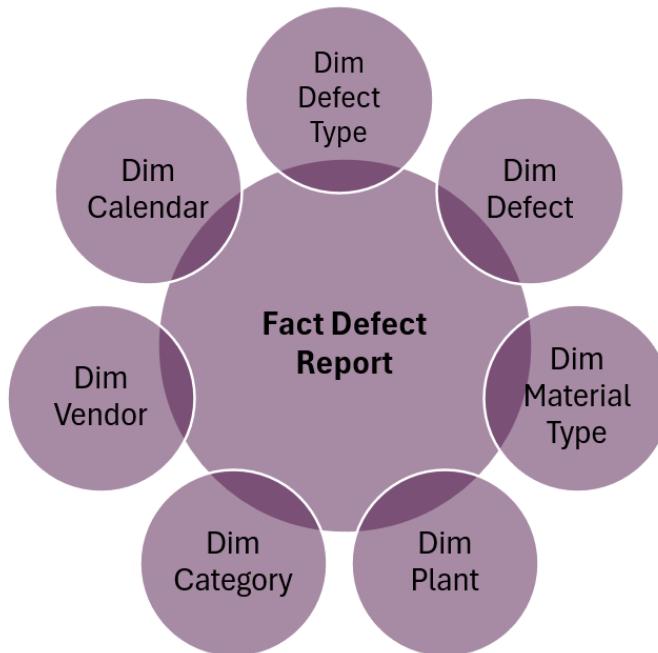
Fact Table:

Fact_Defect_Report – Stores transactional defect data, linking defects to vendors, plants, materials, and defect types.

Dimension Tables:

- Dim_Defect Type – Classifies defects based on their impact on operations.
- Dim_Defect – Contains various defects.
- Dim_Material Type – Lists different categories of materials used in production.
- Dim_Plant – Provides information on manufacturing plants, including their locations.
- Dim_Category – Groups defects into broader defect classification categories.
- Dim_Vendor (Supplier) – Stores details about suppliers, including their IDs and names.
- Dim_Calendar - Provides a date hierarchy for trend analysis and forecasting.

By integrating these tables, businesses can track defect trends, assess supplier performance, and make data-driven decisions to improve supply chain efficiency.



Business Questions:

Vendor Performance

1. Which vendor has contributed the most to downtime in the production process?
2. How does defect quantity vary across different vendors?
3. How does supplier performance compare across different plants?

Defect Analysis

5. What are the most common types of defects reported?
6. Which material type has the highest number of defects?
7. How do defect types correlate with different material types?
8. Is there a seasonal trend in defect occurrences over time?

Plant & Location Insights

9. Which plant has the most downtime due to supplier issues?
10. How does defect frequency vary across different plant locations?
11. Are certain defects more common in specific plants?

Operational Efficiency & Cost Impact

12. How much downtime is caused by supplier defects?
13. What is the relationship between defect quantity and production downtime?
14. How does defect frequency impact overall supply chain efficiency?

Forecasting & Trends

15. What is the projected defect rate and downtime trend for the upcoming months?

Data Cleaning:

To ensure data accuracy and consistency, several data cleaning steps were applied across different tables. These steps include handling duplicates, renaming tables, standardizing data types, and reordering columns.

1. Dim_Vendor (Supplier Table)

Issue: Duplicate records in the Vendor column.

Inconsistent naming formats (uppercase, lowercase, extra spaces).

Action Taken:

- Trimmed spaces.
- Applied Remove Duplicates in Power Query based on Vendor ID to ensure each supplier appears only once.
- Ensured all Vendor names were correctly filled to avoid missing values.
- Capitalized Each Word in the Vendor column for consistency.
- Renamed table from Vendor to Dim_Vendor for consistency.
- Converted Vendor ID to Text format.
- Moved Vendor ID to be the first column.

2. Dim_Category

Issue: Category and Sub Category had identical values , creating redundancy.

Action Taken:

- Kept only one column (Category) and removed Sub Category since it was redundant.
- Ensured unique categories were correctly classified.
- Trimmed spaces.
- Renamed table from Category to Dim_Category.
- Converted Category ID to Text format.
- Moved Category ID to be the first column.

3. Dim_Defect

Issue: Duplicate defect records found.

Some defect names had slight variations (e.g., "Print defects" vs. "Printing Defect").

Action Taken:

- Trimmed spaces and cleaned text to remove inconsistencies.
- Converted Defect ID to Text format for consistency.
- Renamed table from Defect to Dim_Defect for clarity.
- **Replace Inconsistent Values:**
 - "Wrong Size" → "Wrong Size"
 - "Print defects" → "Printing Defect"
 - "Printing Defects" → "Printing Defect"
 - "Wrong Bands" → "Wrong Band"
 - "Scratches" → "Scratch"
 - "Cracked" → "Crack"
 - "Foreign objects found" → "Foreign Objects"
 - "Warping" → "Warped"
- Reordered columns for better readability.
- Grouped defect records to consolidate similar issues.
- Removed unnecessary columns to optimize data size.
- Removed duplicates based on Defect ID to ensure uniqueness.

4. Dim_Defect Type

Action Taken:

- Trimmed spaces.
- Ensured all Defect Type were correctly filled.
- Renamed table from Defect Type to Dim_Defect Type.
- Converted Defect Type ID to Text format.
- Moved Defect Type ID to be the first column.

5. Dim_Material Type

Action Taken:

- Trimmed spaces.
- Ensured all Material Type was correctly filled.
- Renamed table from Material Type to Dim_Material Type.
- Converted Material Type ID to Text format.
- Moved Material Type ID to be the first column.

6. Dim_Plant

Action Taken:

- Trimmed spaces.
- Ensured all plant locations were correctly filled.
- Renamed table from Plant to Dim_Plant.
- Converted Plant ID to Text format.
- Moved Plant ID to be the first column.

7. Fact_Defect Report

Issue: Data consistency issues in defect tracking.

Action Taken:

- Ensured all foreign keys (e.g., Vendor ID, Plant ID, Defect ID) exist in corresponding dimension tables.
- Standardized date format for Date column.
- Renamed table from Defect Report to Fact_Defect Report.
- Converted all IDs to Text format for consistency.
- Moved Date to be the first column for chronological analysis.
- Trimmed spaces.

Summary of Key Data Cleaning Steps

1. Trimmed & Cleaned Text

- Removed extra spaces and inconsistencies in defect descriptions.

2. Standardized Defect Names

- Unified defect names (e.g., "Print defects" → "Printing Defect").

3. Handled Duplicates

- Removed duplicate records based on **ID** to ensure uniqueness.

4. Formatted Data

- Converted **ID** to **Text** format for consistency.
- Reordered columns for better structure.

5. Filtered & Refined Data

- Removed unnecessary columns.
- Kept only valid defect records.

Data Modeling:

Purpose of the Data Model:

The data model is designed to optimize supplier quality analysis by ensuring efficient data storage, reducing redundancy, and enabling seamless reporting. It follows the Star Schema approach to enhance query performance and maintain data integrity.

Normalization & Star Schema:

- Normalization: Applied to eliminate redundant data and ensure consistency.
- Star Schema: Implemented to improve reporting efficiency, with a central fact table linked to multiple dimension tables for easy filtering and aggregation.

Data Model Optimization Steps:

Primary Key Highlighting: Ensured each dimension table has a clearly defined Primary Key for establishing relationships.

Hiding Unused Columns: Unused columns in each table were hidden to enhance usability and prevent unnecessary data exposure.

Fact_Defect Report

- Purpose: Stores transactional defect data, linking defects to vendors, plants, materials, and defect types.
- Key Fields:
 - Date (Foreign Key → Dim_Calendar)
 - Defect ID (Foreign Key → Dim_Defect)
 - Defect Type ID (Foreign Key → Dim_Defect Type)
 - Material Type ID (Foreign Key → Dim_Material Type)
 - Plant ID (Foreign Key → Dim_Plant)
 - Sub Category ID (Foreign Key → Dim_Category)
 - Vendor ID (Foreign Key → Dim_Vendor)
 - Defect Qty (Aggregated measure)
 - Downtime Min (Aggregated measure)
 - Material ID

Dim_Vendor

- **Purpose:** Stores supplier details.
- **Key Fields:**
 - Vendor ID (Primary Key)
 - Vendor Name

Dim_Defect

- **Purpose:** Stores defect descriptions.
- **Key Fields:**
 - Defect ID (Primary Key)
 - Defect Name

Dim_Defect Type

- **Purpose:** Categorizes defects.
- **Key Fields:**
 - Defect Type ID (Primary Key)
 - Defect Type
 - Sort Order (For ranking defects)

Dim_Material Type

- Purpose: Stores material classifications.
- Key Fields:
 - Material Type ID (Primary Key)
 - Material Type

Dim_Category

- **Purpose:** Groups defects into Categories.
- **Key Fields:**
 - Sub Category ID (Primary Key)
 - Category

Dim_Plant

- **Purpose:** Identifies production plants.
- **Key Fields:**
 - Plant ID (Primary Key)
 - Plant Name

Dim_Calendar

- **Purpose:** Provides a date hierarchy for trend analysis and forecasting.
- **Key Fields:**
 - Date
 - Month
 - Month#
 - Quarter
 - Year

Month Sorting:

- Set the Month column to be sorted by the Month# column to ensure proper chronological order in visualizations.

Disable Summarization for Month:

- Change the Default Summarization setting of the Month# column to Do Not Summarize to prevent incorrect aggregations.

Measure Table (_Measure)

- Stores calculated measures such as:
 - Defect Rate (Last 3 Months)
 - Total Defects Qty
 - Total Downtime Min
 - Total Number of Vendors

Key Table Relationships:

1. Fact_Defect_Report ↔ Dim_Vendor (1:M Relationship)

- Vendor ID is the primary key in Dim_Vendor and a foreign key in Fact_Defect_Report.
- **Purpose:** Allows tracking of defect quantities and downtime per supplier.

2. Fact_Defect_Report ↔ Dim_Defect (1:M Relationship)

- Defect ID is the primary key in Dim_Defect and a foreign key in Fact_Defect_Report.
- **Purpose:** Helps categorize and analyze defect occurrences.

3. Fact_Defect_Report ↔ Dim_Defect_Type (1:M Relationship)

- Defect Type ID is the primary key in Dim_Defect_Type and a foreign key in Fact_Defect_Report.
- **Purpose:** Enables classification of defects into broader types for trend analysis.

4. Fact_Defect_Report ↔ Dim_Material_Type (1:M Relationship)

- Material Type ID is the primary key in Dim_Material_Type and a foreign key in Fact_Defect_Report.
- **Purpose:** Helps track defects related to specific materials, identifying high-risk materials.

5. Fact_Defect_Report ↔ Dim_Category (1:M Relationship)

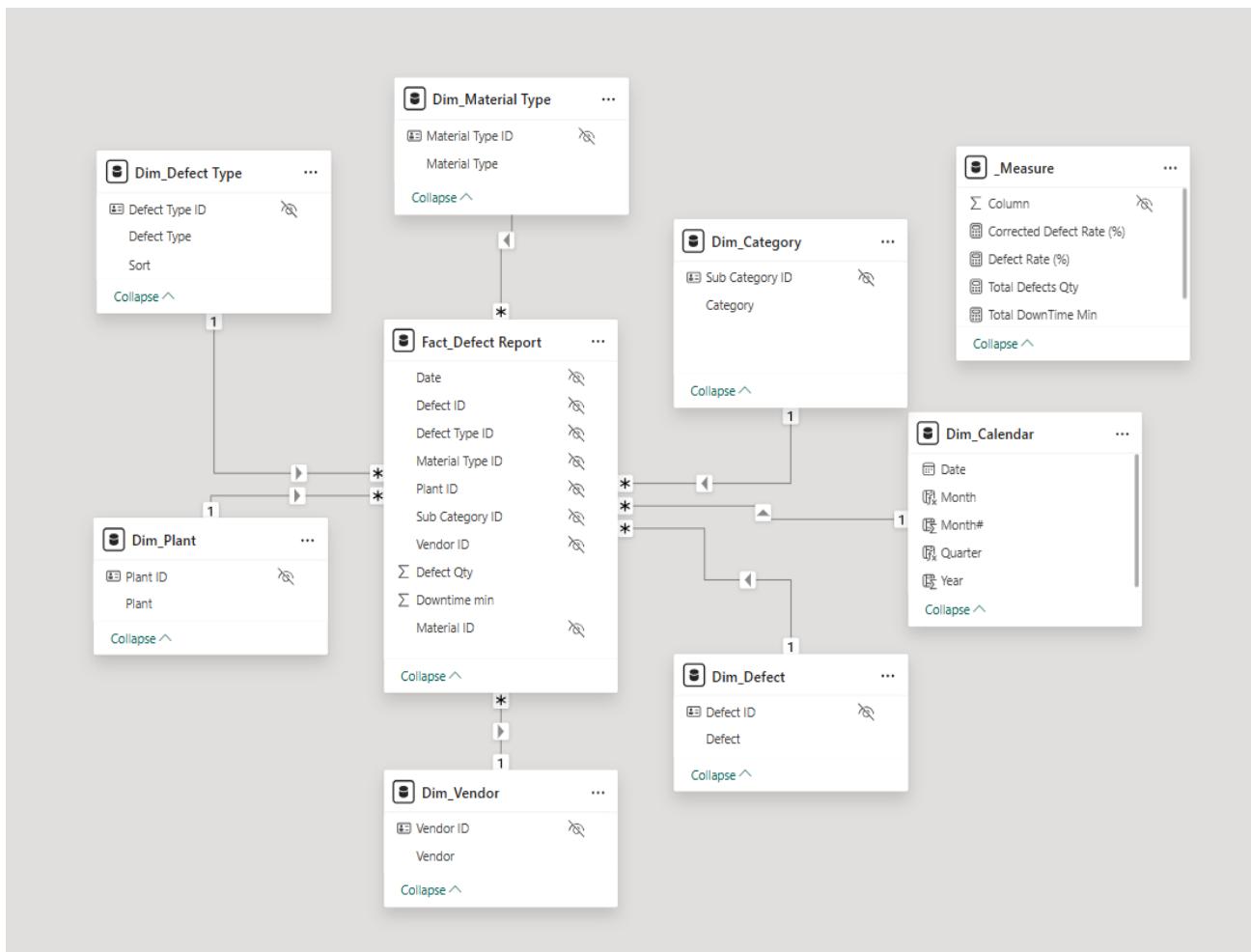
- Sub Category ID is the primary key in Dim_Category and a foreign key in Fact_Defect_Report.
- **Purpose:** Groups defects into broader classification categories for better reporting.

6. Fact_Defect_Report ↔ Dim_Plant (1:M Relationship)

- Plant ID is the primary key in Dim_Plant and a foreign key in Fact_Defect_Report.
- **Purpose:** Enables defect analysis by plant location, identifying high-defect plants.

7. Fact_Defect_Report ↔ Dim_Calendar (1:M Relationship)

- **Purpose:** Supports **time-based trend analysis** and forecasting of defect patterns.



DAX Calculations:

1. Creating the Dim_Calendar Table:

Purpose: The Dim_Calendar table is essential for enabling time-based analysis.

Dax Formula:

```
Dim_Calendar = CALENDARAUTO()  
Year = Dim_Calendar[Date].[Year]  
Month = Dim_Calendar[Date].[Month]  
Month# = Dim_Calendar[Date].[MonthNo]  
Quarter = Dim_Calendar[Date].[Quarter]
```

Logic:

- CALENDARAUTO() automatically generates a continuous date table based on the dataset.
- Extracts Year, Month, Month Number, and Quarter to facilitate time-based filtering and reporting.
- Enables time intelligence functions like SAMEPERIODLASTYEAR, DATESINPERIOD, and forecasting.

2. Measures for Analysis:

1. Total Defects Quantity

Purpose: Calculates the total number of defects reported.

Dax Formula:

```
Total Defects Qty = SUM(Fact_Defect Report[Defect Qty])
```

Logic:

- Uses SUM to aggregate all reported defect quantities.

2. Total Downtime (Minutes)

Purpose: Computes the total downtime caused by defects.

Dax Formula:

Total DownTime Min = SUM(Fact_Defect_Report[Downtime min])

Logic:

- Uses SUM to total all downtime minutes associated with defects.

3. Total Number of Vendors

Purpose: Counts the unique number of vendors contributing to defects.

Dax Formula:

Vendors = COUNT(Dim_Vendor[Vendor ID])

Logic:

- Uses COUNT to count all unique Vendor IDs in the Dim_Vendor table.

4. Defect Rate (Last 3 Months)

Purpose: Calculates the average defect quantity over the last 3 months to identify recent trends.

Dax Formula:

Defect Rate (Last 3 Months) =

AVERAGEX(DATESINPERIOD(Dim_Calendar[Date], MAX(Dim_Calendar[Date]), -3, MONTH),
[Total Defects Qty])

Logic:

- Uses DATESINPERIOD to get the last 3 months from the most recent date.
- AVERAGEX calculates the average defect quantity over that period.

Home Page Overview

The Home Page serves as the entry point to the Supplier Quality dashboard, providing a high-level summary of key defect metrics and quick navigation to detailed insights. It ensures users can quickly understand the current state of supplier quality performance and explore further details as needed.

Key Elements:

1. KPI Cards

- Total Defects Qty (43M): Displays the overall number of defects recorded.
- Total DownTime Min (103K): Represents the total downtime caused by defects.
- Defect Rate (Last 3 Months) (99K): Shows the number of defects recorded in the last three months to track latest trends.

2. Navigation Buttons

- Overview: Leads to a broader summary of supplier quality.
- Details: Provides a more in-depth analysis of defect types and trends.
- Report Summary: Offers key insights, conclusions, and actionable recommendations.

User Guidance:

- Click on any button to navigate to the page.
- Use the Report Summary page to gain a final analysis of supplier quality performance.

Overview Page:

The Overview Page provides a comprehensive view of supplier quality metrics, focusing on defect trends, downtime impact, and defect distribution across different plants. It helps users quickly assess key performance indicators and identify patterns in supplier defects.

Key Features:

1. KPIs

- Total Defects Qty: The total number of reported defects.
- Total Downtime Min: The total downtime (in minutes) caused by defects.
- Vendors: The total number of suppliers contributing to the defect data.
- Average Defects (Last 3 Months): The average number of defects over the past three months.

2. Visualizations & Insights

Defect & Downtime Trend (Line Chart)

- Shows how defects and downtime fluctuate over time (by month).
- Helps analyze if an increase in defects leads to more downtime.

Top 5 Frequent Defects (Bar Chart)

- Displays the most common defects by quantity.
- Helps identify major defect sources and prioritize corrective actions.

Relationship Between Defect Quantity & Downtime (Scatter Plot)

- Shows the correlation between total defect quantity and downtime.
- A trend line is included to indicate whether higher defects result in higher downtime.

Defects by Plant (Map Visualization)

- Displays defect distribution across different manufacturing plants.
- Helps identify problematic locations contributing to a high defect rate.

Details Page:

The Vendor & Material Defects Analysis Page provides insights into top defect contributors by vendor and material type. It helps stakeholders identify high-risk vendors and materials causing significant defects and downtime.

Key Features:

1. KPIs

- Total Defects Qty: The total number of reported defects.
- Total Downtime Min: The total downtime (in minutes) caused by defects.
- Vendors: The total number of suppliers contributing to the defect data.
- Average Defects (Last 3 Months): The average number of defects over the past three months.

2. Visualizations & Insights

Top 10 Vendors by Defect Quantity & Downtime Trends:

- A combination bar and line chart ranking vendors by defect quantity and associated downtime.

Downtime Trends & Forecast:

- A trend line with forecasting displaying historical and predicted downtime trends over time.

Material Type Defect & Downtime Table:

- A sortable table listing materials, their defect quantities, and their impact on downtime.
- Highlights the most problematic materials for quality control and procurement teams.

Report Summary Page:

This page serves as a comprehensive summary of all previous dashboards, highlighting key insights, trends, and recommendations related to supplier defects and their impact on downtime.

Key Insights

- 42.99 million defects reported.
- 103,259 downtime minutes recorded across 326 vendors.
- Defect Trends by Vendor: Top 10 vendors contribute significantly to total downtime.
- Defect Rate Analysis: High defect rates in hardware, labels, and cartons indicate quality improvement areas.
- Downtime Impact: Packaging,
- components, and logistics drive downtime, making them focus areas.
- Defect Seasonality & Forecasting:
 - Seasonal trends suggest recurring defect patterns.
 - Forecasting models predict an increasing trend in defects and downtime, requiring proactive quality management.

Recommendations

- Supplier Quality Audits: Conduct performance evaluations to maintain quality standards.
- Targeted Quality Improvement: Focus on high-defect material types.
- Defect Prevention Strategies: Implement stricter quality checks.
- Downtime Reduction Initiatives: Develop action plans for vendors with high defect-related downtime.
- Forecasting & Trend Analysis: Leverage historical data to predict future defects.
- Supplier Collaboration & Training: Work with vendors to improve quality control.

By implementing these strategies, businesses can enhance supplier quality management, reduce downtime, and improve operational efficiency.

Dataset Navigation Feature:

Overview

This feature allows users to quickly access the dataset behind visualizations in Power BI. By using the shortcut, users can inspect underlying data, verify insights, and perform deeper analysis.

How to Use

- Accessing the Dataset:**

- Hover over that icon in the navbar menu.
- Press CTRL + Click on the icon to open the dataset.
- The dataset view will appear, displaying raw data used in the report.

CTRL + click here to show DataSet



Dataset Link:

<https://docs.google.com/spreadsheets/d/1iiFz16Pezs1Quuse8tmNFJD0MCjIcLcS/edit?gid=1934382196#gid=1934382196>

Page Navigation Feature:

The Page Navigation Feature allows users to quickly switch between different report sections, enhancing user experience and accessibility.

How to Use

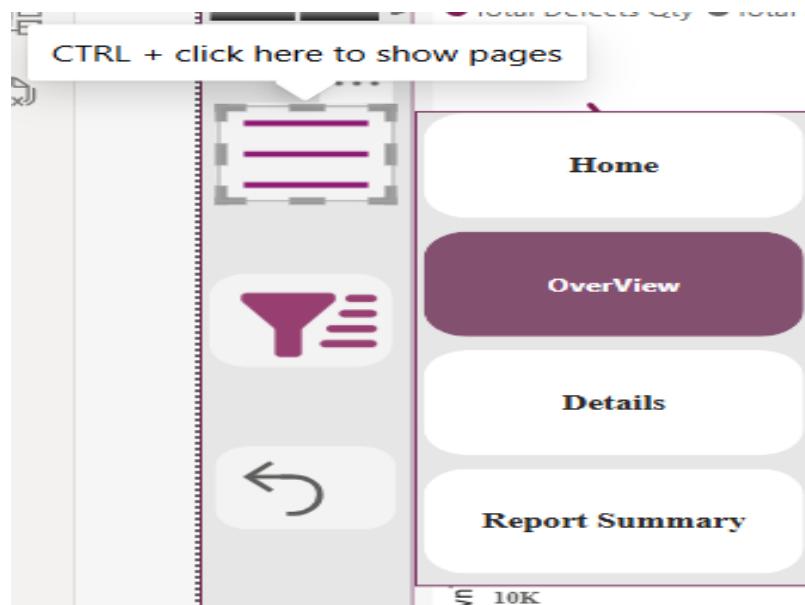
- Accessing Pages:**

- Click on the Page Navigation icon in the sidebar.
- press CTRL + Click to open the page navigation menu.

- Navigating Through Pages:**

- Select a page from the menu options:**

- Home – Returns to the main dashboard.
 - Overview – Displays a comprehensive view of key insights.
 - Details – Provides in-depth breakdowns and analysis.
 - Report Summary – Presents a concise summary of findings.



Slicer Panel Feature:

The Slicer Panel Feature enables users to filter data dynamically based on specific criteria such as category, defect type, and year. This improves data analysis by allowing users to focus on relevant information.

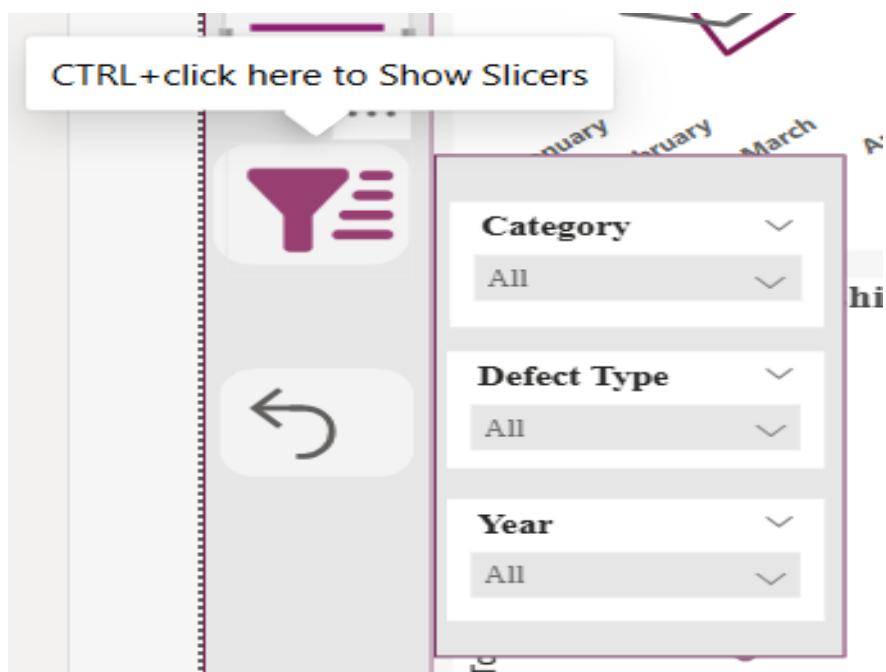
How to Use

- **Accessing Slicers:**

- Click on the Filter (Slicer Panel) icon in the sidebar.
- press CTRL + Click to open the slicer menu.

- **Applying Filters:**

- Category: Filter data based on defect categories.
- Defect Type: Select specific defect types to analyze.
- Year: Narrow down the data to a specific period.



Reset Button:

The Reset Button is designed to enhance user experience by restoring the report to its default state. It resets all applied filters and selections while also closing the Page Navigation and Slicer Navigation tabs, ensuring a clean and organized view of the report.

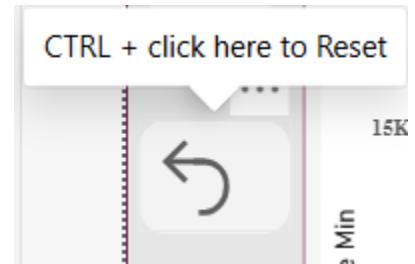
Functionality

When clicked, the Reset Button performs the following actions:

- Resets all applied filters and slicers to their default state.
- Closes the Page Navigation tab, hiding the report page selection menu.
- Closes the Slicer Navigation tab, ensuring a clutter-free interface.

How to Use

- Click on the Reset Button to reset the report view and close navigation panels.



Q&A Button:

The Q&A Button allows users to interact with the report dynamically by asking questions in natural language. This feature leverages Power BI's AI-driven capabilities to generate insights based on user queries.

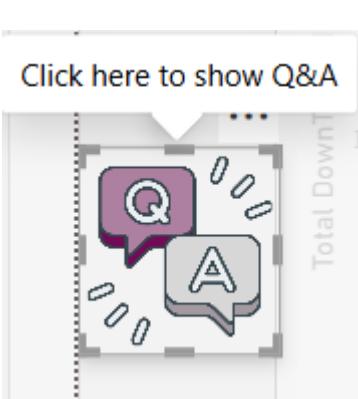
Functionality

When clicked, the Q&A Button:

- Opens the Q&A Panel, where users can type questions.
- Provides AI-generated answers using charts, tables, or key metrics.
- Helps users explore data without needing predefined visuals.

How to Use

- Click on the Q&A Button to open the interactive Q&A panel.
- Type a question related to the dataset (e.g., "What is the total sales for 2014?").
- The system will generate a relevant visual or metric based on the query.



Supplier Quality

Ensuring Quality, Reducing Downtime!

Overview

Details

Report Summary

43M

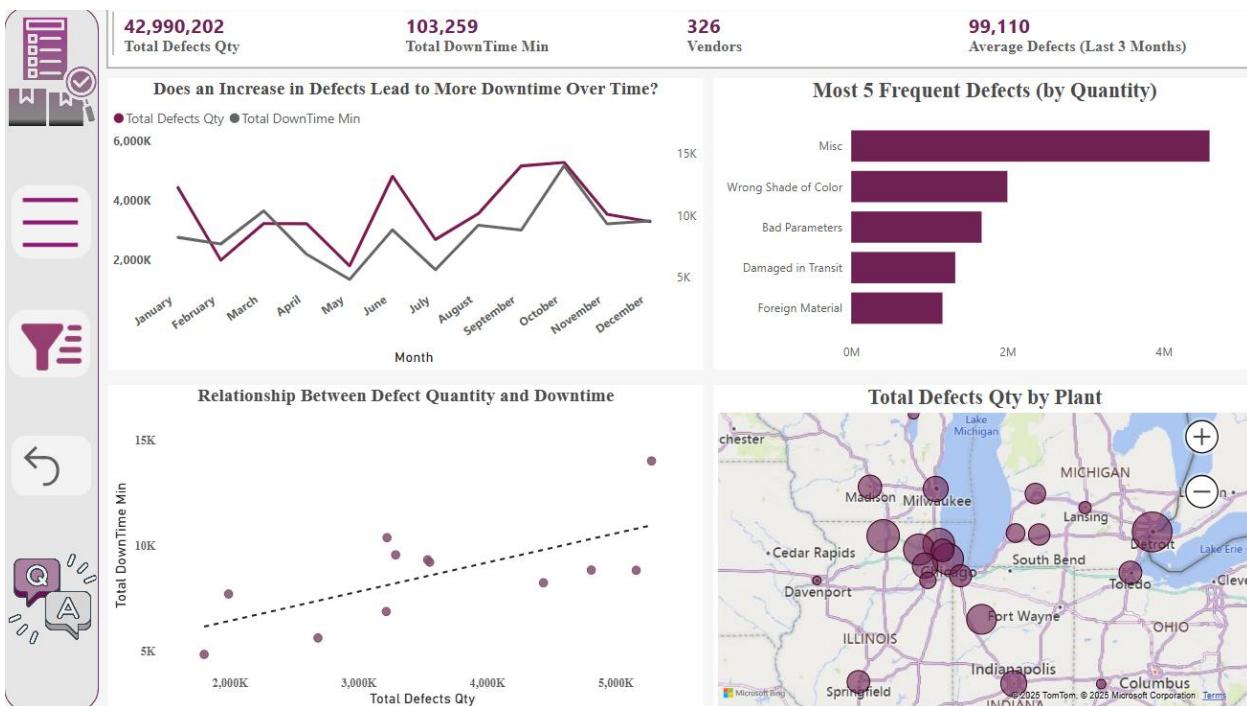
Total Defects Qty

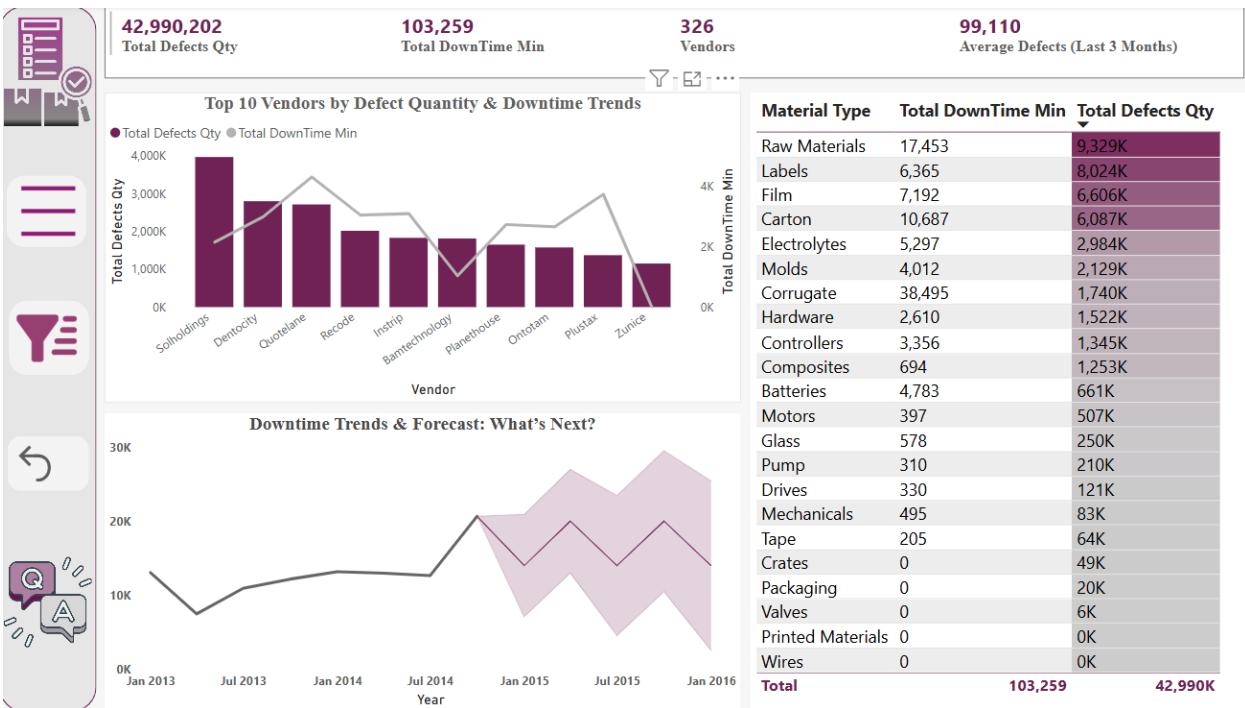
103K

Total Downtime Min

99K

Average Defects (Last 3 Months)





Supplier Quality

This report provides a comprehensive analysis of supplier defects, highlighting key trends and their impact on downtime. The data reveals that a total of 42.99 million defects were reported, resulting in approximately 103,259 minutes of downtime across 326 vendors.

Key Insights:

- Defect Trends by Vendor:** The top 10 vendors with the highest defect counts contribute significantly to total downtime, with some vendors showing a strong correlation between defect volume and downtime impact.
- Defect Rate Analysis:** Certain material types, such as **hardware, labels, and cartons**, exhibit exceptionally high defect rates, indicating areas for quality improvement.
- Downtime Impact:** Categories like **packaging, mechanical components, and logistics** contribute significantly to both defect volume and total downtime, making them critical focus areas for supplier quality enhancement.
- Defect Seasonality & Forecasting**
 - There are **seasonal trends** in defect occurrences, indicating potential **recurring patterns**.
 - Forecasting models suggest an **increasing trend** in defects and downtime, emphasizing the need for **proactive quality management**.

Recommendations:

- Supplier Quality Audits:** Conduct regular supplier performance evaluations to ensure quality standards are met.
- Targeted Quality Improvement:** Focus on high-defect material types (e.g., raw materials, labels, cartons) to minimize quality issues.
- Defect Prevention Strategies:** Implement stricter quality checks at the supplier level to prevent defects before materials reach production.
- Downtime Reduction Initiatives:** Develop action plans for vendors with high defect-related downtime to optimize operational efficiency.
- Forecasting & Trend Analysis:** Leverage historical defect and downtime data to predict future trends and proactively address potential issues.
- Supplier Collaboration & Training:** Work closely with vendors to improve their quality control processes and implement best practices.

By leveraging these insights, businesses can enhance supplier quality management, reduce downtime, and improve operational efficiency.