

# Manufacturing & Supply Chain Analytics

Transforming operational data into strategic insights for  
automotive manufacturing excellence





CHALLENGE

# The Business Problem



## Complex Operations

Multi-plant production systems with interconnected inefficiencies



## Cost Impact

Production, quality, and inventory issues affecting bottom line



## Decision Support

Need for real-time visibility and data-driven insights

# Dataset Overview

693+

Production Records



5

Data Sources



Production Metrics



Supply Chain

Quality Data



# Data Cleaning & Preparation



## Date Standardization

Converted text fields to Date data type

## Data Validation

Removed null and invalid production records

## Metric Derivation

Created defect rate, production gap, inventory status

**Tools Used:** Google Sheets, PostgreSQL (pgAdmin4), Python (pandas, numpy)



# Star Schema Data Model



Central Fact Table: Manufacturing Production

Attributes: Plant, supplier, date keys, Production metrics, Quality indicators, Cost & efficiency data



Plant Dimension

Location and facility attributes



Supplier Dimension

Vendor details and contract info



Date Dimension

Calendar keys and hierarchies



Quality & Events Dimension

Defect types and downtime reasons

- Star schema enables accurate aggregations, simplified KPI calculations, and scalable analytics aligned with enterprise BI best practices

# Key Performance Indicators



Production Efficiency %

Actual Units / Planned Units



First Pass Yield %

Good Units / Total Units



Defect Rate %

Defective Units / Total Units



Inventory Risk %

Excess Inventory / Ideal Inventory



Manufacturing Health Score %

Composite: efficiency, quality, downtime



Delivery Delay Rate %

Delayed Deliveries / Total Deliveries

# Executive Analytics Dashboard



## Executive KPIs

Cost, efficiency, yield, defect rate, health score



## Trend Analysis

Monthly production and defect patterns



## Comparative Views

Plant efficiency, supplier lead times



## Risk & Quality

Inventory risk, defect types, downtime causes



INSIGHTS

## Critical Findings



### Inventory Risk

**26.69%** excess stock exposure

Working capital inefficiency



### Production Efficiency

**~91%** stable across plants

Defects spike during peak months



### Downtime Drivers

Maintenance and material shortages

Primary contributors to delays



### Supplier Variability

Lead time inconsistency

Introduces delivery risk

## ACTION PLAN

# Strategic Recommendations



## Inventory Optimization

Implement reorder-point planning to reduce excess stock and improve working capital

## Preventive Maintenance

Focus on maintenance-related downtime reduction initiatives

## Supplier Performance

Prioritize suppliers with consistently lower lead time variance

## Quality Improvement

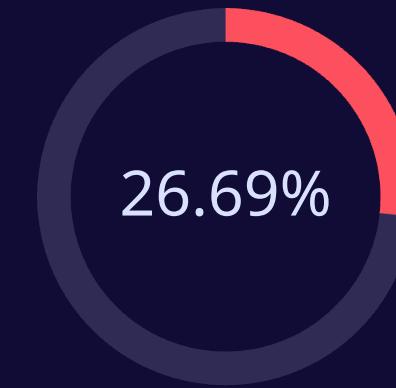
Target welding and assembly defect reduction programs

# Project Impact



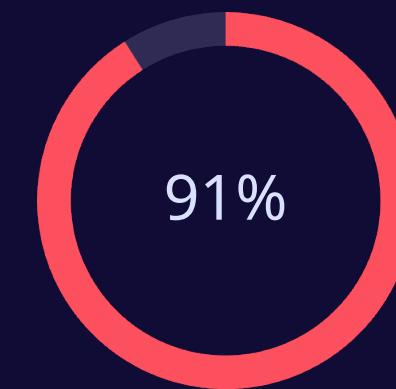
Real-Time Visibility

Plant performance monitoring



Risk Identified

Inventory optimization opportunity



## Tools & Technologies:

PostgreSQL, Python, Power BI, DAX, Google Sheets