SUPPLY CHAIN MANAGEMENT DASHBOARD

Executive Summary

This project report presents an end-to-end analysis of a simulated **supply chain system** using Power BI. The goal was to build a dynamic and insightful dashboard using a dataset containing product-level, supplier-level, inventory, customer, logistics, and cost data.

The dashboard allows decision-makers to visually track the key performance indicators (KPIs) and identify bottlenecks across the supply chain. It provides an integrated view of sales performance, supplier delivery times, shipping costs, inventory management, defect rates, customer behavior, and more.

Key business questions answered:

- Which products are generating the most revenue?
- Are we delivering products on time and within cost?
- Which suppliers and carriers are performing efficiently?
- How do quality failures impact our supply chain cost?
- Where are we losing money due to defects or delays?

By analyzing 100 data records across more than 30 supply chain-related features, this dashboard enables improved decision-making, reduces cost inefficiencies, and enhances visibility into real-time operations. It's a powerful demonstration of how Power BI can be used to create professional business intelligence solutions.

Objective & Scope

Objectives of the Project:

1. To visualize the complete supply chain process from order to delivery.
2. To identify the products, routes, and suppliers contributing most to revenue and delays.
3. To evaluate defect rates, delivery times, and shipping performance.
4. To quantify inventory cost, quality-related cost, and overall supply chain cost.
5. To support strategic business decisions through an interactive Power BI dashboard.

Scope of the Dashboard:

The scope of this Power BI dashboard includes analysis of the following key dimensions:

Area	Description
Products & SKUs	Analysis of revenue, units sold, and profitability per item.
Inventory	Monitoring of incoming stock, current levels, and defective units.
Suppliers	Lead time, quantity produced, and pass/fail inspection rate.
Shipping & Transit	Mode of transport, carrier usage, cost, and on-time delivery rates.
Quality Control	Failure rate in inspections, impact on defect cost and delays.
Customer Info	Segmentation by gender and city to assess buying patterns.
Cost Analysis	Combined costs from manufacturing, inventory, shipping, and defects.
Performance KPIs	Revenue, cost, lead time, delivery metrics, and average transit duration.

Target Audience:

This dashboard is designed for supply chain managers, analysts, procurement officers, and decision-makers who need real-time visibility into operational efficiency and business performance.

Dataset Description

The data used in this project was provided in a CSV format named SUPPLY_CHAIN.csv. It contains **100 unique product records (SKUs)**, each with detailed attributes spanning from manufacturing to customer delivery.

Here's a breakdown of the most important fields in the dataset:

Field Name	Description
Product Name	Unique name of the SKU
Category	Category to which the product belongs (e.g., Haircare, Skincare, etc.)
Price	Selling price per unit (INR)
Units Sold	Number of units sold
Manufacturing Cost	Cost incurred in manufacturing each product
Inventory Cost	Cost associated with storing inventory
Current Inventory	Remaining stock levels (some negative → overselling)
Defective Inventory	Number of defective or unusable units
Production Volume	Total quantity produced by the supplier
Supplier	The vendor responsible for supplying the product
Manufacturing Lead Time	Time taken (in days) for the supplier to produce the product
Inspection Result	Result of quality inspection (Pass, Fail, or Pending)
Defect Rate (%)	Percentage of production marked as defective
Defect Cost	Financial loss due to defective units
Route	Route taken for shipment (A, B, or C)
Carrier	Shipping service used (Carrier A, B, or C)
Mode of Transport	Shipping type (Air, Road, Rail, etc.)
Shipping Cost	Cost incurred during shipment
Transit Time	Time (in days) taken for delivery
Delivery Status	Whether the order was delivered on time
Customer Gender	Demographic info of the end user
Customer Location	Final destination city of the shipment

Key Dataset Stats:

- **SKUs**: 100 unique entries
- **Categories**: 4 main categories
- **Avg. Price**: ₹49.46
- **Avg. Lead Time**: ~13.5 days
- **Defect Rate (mean)**: 2.27%
- **Shipping Cost Range**: ₹1.01 to ₹9.93
- **On-Time Delivery**: 83 products were delivered on time

This rich dataset helped in designing 10 interactive Power BI pages that collectively visualize operational efficiency and cost drivers across the supply chain.

Dashboard Page Breakdown

A navigation-style overview of all dashboard tabs:

1. Overview Dashboard
2. Sales Dashboard
3. Inventory Management
4. Supplier Analysis
5. Shipping & Transportation
6. Quality Control
7. Customer Demographics
8. Cost & Profitability
9. Delivery & Performance
10. Summary & Strategy

KPI Deep Dive – Overview Page

From the **Overview Page**, we tracked:

- **Total Revenue**: ₹5,77,604 overall from 100 products.
- **Average Manufacturing Cost**: ₹47.27
- **Average Inventory Cost**: ₹3,020 per SKU.
- **Average Total Supply Chain Cost**: ₹3,389.94
- **On-Time Delivery Rate**: 83%
- **Total Defect Cost**: ₹31,650 overall, which is ~5.5% of total cost.

These KPIs show that while revenue is stable, significant cost leaks occur from **inventory management** and **quality defects**.

Sales & Product Insights

- **Top 5 SKUs** account for over 40% of revenue.
- **Skincare** is the leading category (40 out of 100 SKUs).
- **Customer Behavior**: 'Unknown' gender dominates (likely data collection issue).
- High-selling products have longer **lead times**, possibly due to demand pressure.
- **Price correlation**: Higher-priced items aren't always the top sellers — value-for-money items dominate.

Inventory Control Analysis

From the Inventory page:

- Current Inventory has a **negative mean (-413 units)** – demand exceeds stock.
- **Incoming Inventory** and **Defective Inventory** are nearly equal (~102 units), raising a red flag.
- Items with **high stock levels** also incur **high costs**—overstocking inefficiency.
- Suggest implementing **Just-In-Time (JIT)** inventory strategy.

Supplier & Production Analytics

- **Supplier 1** is used most (27 products).
- **Manufacturing lead time** ranges from 1 to 30 days; median is 14.
- **Production Volumes** are concentrated in the 400–800 range.
- Some suppliers have high costs with poor inspection results — need performance audit.

Shipping & Logistics Evaluation

- **Carrier B** is most used (43%) but not always fastest.
- **Average shipping time**: 5.75 days.
- **Mode of Transport**: 'Road' is most common, but slower than air/rail.
- **Transit Time vs. Cost**: Some fast deliveries are disproportionately expensive — optimization needed.
- Suggest experimenting with **route-mode-carrier combinations**.

Quality Control & Defect Analysis

- **Defect Rate** average: 2.27% (very high for fast-moving consumer goods).
- **Pending Inspections**: 41% → delays in QA cycle.
- High **defect cost items** are also highest in **production volume** — check root cause.
- Correlation between **Supplier**, **Lead Time**, and **Defect Rate** observed.

Customer Demographic Analysis

- 31% of records marked as “Unknown” customer type → poor segmentation.
- **Female** customers have slightly higher purchase value than males.
- Customers from **Kolkata and Mumbai** contribute 50%+ of total revenue.

Recommendation: Clean and enrich customer data to enable personalized marketing or targeted stocking.

Cost and Profitability Breakdown

- **Inventory Costs**: Up to ₹9,372 per SKU.
- **Defect Costs**: ₹0 to ₹2,007 per product — highly variable.
- **Shipping Costs**: ₹1.01 to ₹9.93 — highest for fastest deliveries.
- Suggest setting **threshold-based alerts** when cost/defect per unit exceeds a limit.

What-If Scenario: Operational Strategy

Scenario: What if all products currently marked “Pending” for inspection were delayed by 5 extra days?

- This would increase **Total Delivery Time** from 22.83 days to over **27.83 days** average.
- Could lead to missed SLAs and **loss of customer trust**.
- Use **Power BI slicers** to simulate reducing inspection backlog and observe delivery time gain.

Alternatively:

What if we **switch all air shipments to road**?

- Cost reduces, but delivery time may increase by 2–3 days.
- Use matrix visual + route filter to assess impact.

Strategic Recommendations

The dashboard provides complete visibility into the operational health of the supply chain. Key recommendations:

- Reduce defect rates with better supplier selection and QA controls.
- Implement **inventory balancing** to avoid over/understocking.
- Optimize logistics by combining cheaper carriers with efficient routes.
- Clean customer data to unlock marketing value.
- Use dynamic Power BI filters for **interactive what-if planning**.

Conclusion

This Power BI project provided a comprehensive view of the supply chain by transforming raw CSV data into a powerful and interactive dashboard. Through visual analysis of 100 product records and over 20 key metrics, we were able to extract valuable business insights across all operational areas — from production and inventory to shipping, quality, and customer behavior.

The dashboard revealed that while the company is generating consistent revenue, it is also facing significant challenges such as:

- High defect rates impacting quality and cost.
- Negative inventory values indicating stockouts or poor planning.
- Variations in supplier lead time and inspection status.
- Delivery delays influenced by mode of transport and route optimization.
- Gaps in customer data, limiting personalized decision-making.

The use of Power BI enabled real-time tracking of KPIs such as revenue, lead time, delivery performance, and cost per unit. With slicers and filters, users can drill down by product, supplier, location, and time — making this dashboard a **strategic tool for decision-making**.

Key Takeaways:

- Focus on supplier evaluation and quality control to reduce defect costs.
- Optimize shipping routes and carrier selection to improve delivery times.
- Improve inventory planning to prevent both overstock and stockouts.
- Clean and enhance customer data to unlock deeper demographic insights.
- Use the dashboard as a live monitoring tool for operational efficiency.

In conclusion, this project demonstrates the **power of data visualization and analytics** in modern supply chain management. The insights generated can directly support smarter decisions, reduce operational costs, and improve customer satisfaction. This Power BI dashboard is not just a project—it is a blueprint for smarter, data-driven supply chain operations.