Supply Chain Vigilance:
Optimizing Inventory with Stockout Risk Modeling & BI Driven Real-Time Dashboard for Supplier Performance

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informs BUSINESS ANALYTICS CONFERENCE

BUSINESS PROBLEM

Devising a stock out risk modeling supported by real-time dashboard to assess supplier delivery metrics and material tracking for a leading welding equipment manufacturer. It replaces outdated scorecards, tracks historical trends, sends alerts, recommends ROP to facilitates decision making for commodity managers across extensive 800 suppliers and 13,000 unique parts.

With the proposed approach, our partner will benefit as follows:

Fig 1. Key Business Benefits (AI image generated by DALLE)

Business Objectives:

- What are the key metrics that gauges monthly delivery performance and aging view at a Supplier, Material, Commodity and Plant level for full shipments?
- Identify top 10 Suppliers, Materials, Commodities and Plants by # late deliveries and days overdue, while also determining stockout risk ratings for Suppliers to manage inventory.

DATA SNAPSHOT

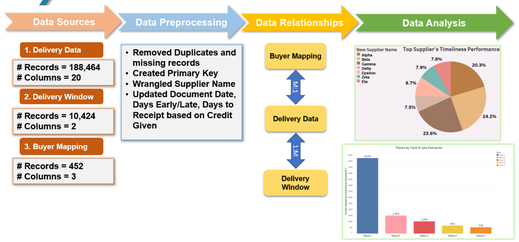
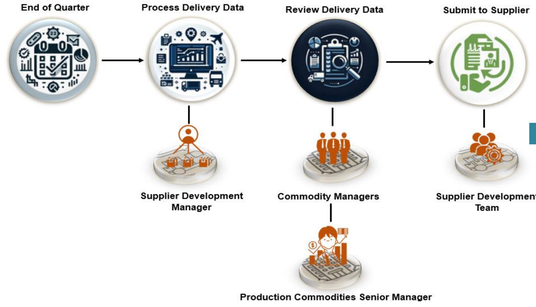


Fig 2. Data Analysis Details

ANALYTICAL PROBLEM LADDER

Analytics Approach: Tailoring the current business problem into key analytical segments:

Current State:



Assumptions:

Full shipments are measured against purchase orders for on-time delivery and complete purchase order delivery

On-time shipment is based on set delivery window for suppliers

Fig 3. Current State of the Business Problem broken into success metrics (AI image generated by DALLE)

METHODOLOGY

To manage inventory, our initiative employs stockout risk assessment through modeling using Python.

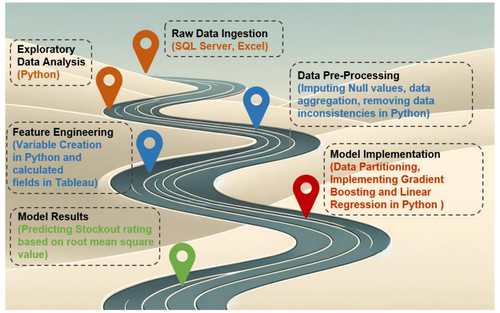


Fig 4. SEMMA Model Design (AI image generated by DALLE)

Implementing Executive and Commodity Manager view Full Shipments across Supplier, Material, Commodity and Plant with interactive time-period selection capability through Tableau Dashboard to track delivery performance on real-time.

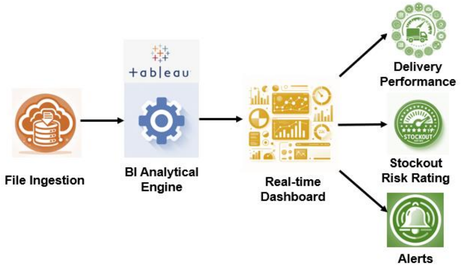
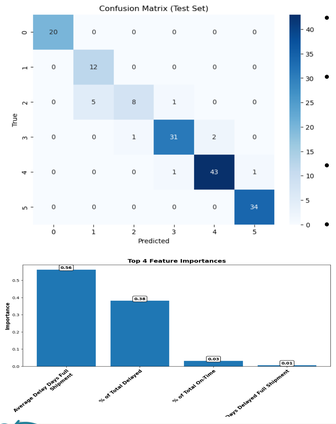


Fig 5. Reporting Methodology (AI image generated by DALLE)

MODEL BUILDING & RESULTS



- We used XG Boost classifier with multi-class probabilities 1000 trees
- Hyperparameters tunings resulted in model with best result having max depth of 7 and learning rate of 0.1
- Grid search with 3-fold cross-validation and accuracy scoring were also employed
- Model selection based on highest Sensitivity score gave following result-

Model Accuracy: 93.1%

Model Precision: 93.6%

Model Sensitivity: 93.2%

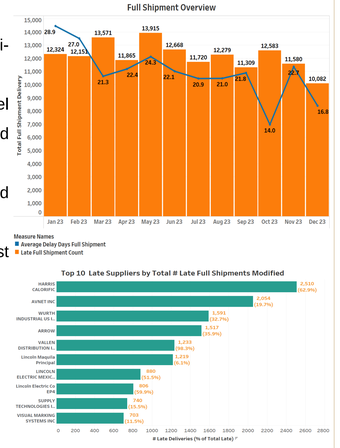


Fig 6. Dashboard & Model Results

LIFECYCLE MANAGEMENT

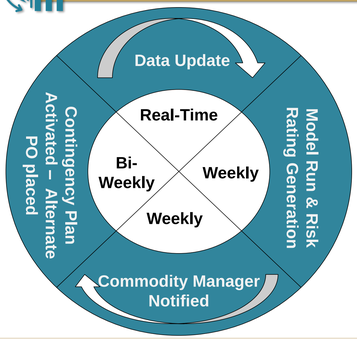


Fig 7. Project Lifecycle
(AI image generated by DALLE)

Delivery Tracking: From quarterly to daily updates, eliminating report latency by 100%

Financial Gain: Estimated savings of $1-$2 million post-deployment.

Alerts & ROP: optimal stock, aiming for full delivery efficacy and increase in production 40%

Forecasting: Stockout prediction for contingency planning and alternative sourcing with RMSE 0.3

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