

Real Time Delivery
Trend Performance
Purdue Student Labs

April 25, 2024



Agenda

- **Business Problem & Objectives**
- **Analytical Problem Framing**
- **Approach to Solution**
- **Impact**

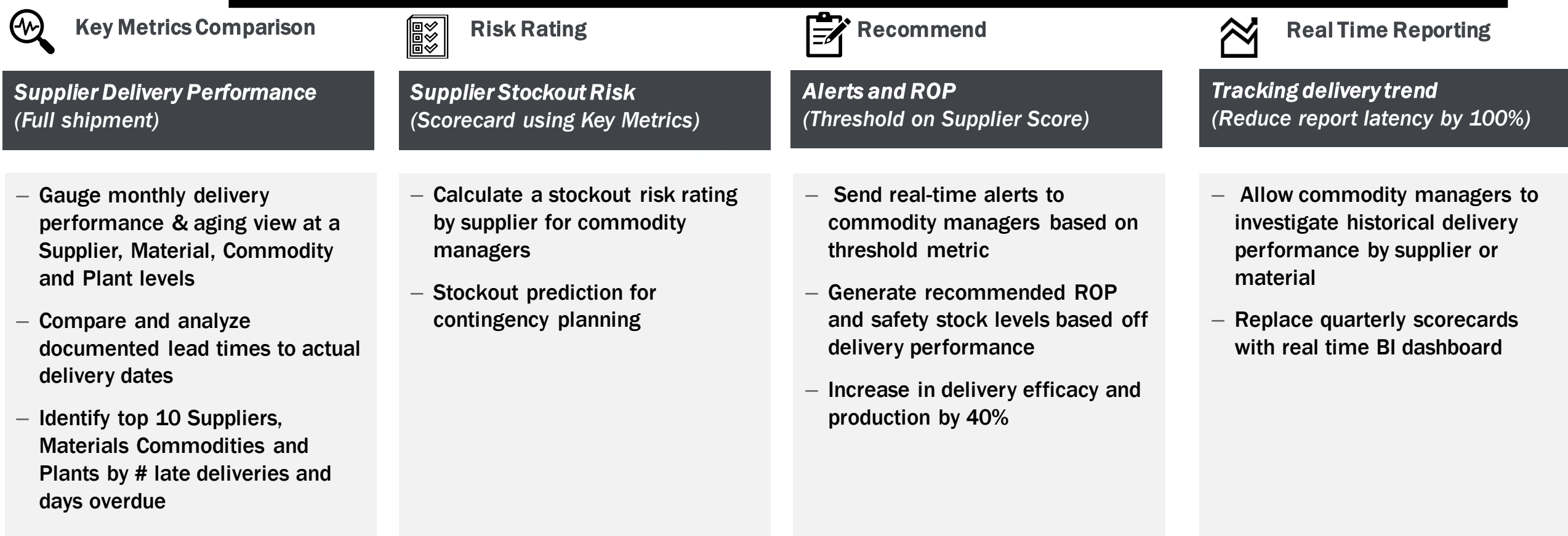
Business Problem & Objectives

Business Problem

The Problem: The commodity managers of a leading welding equipment manufacturer manually review the quarterly reports, taking a reactive approach to address supplier performance issues

- The static manual scorecards review about 10% of the total suppliers, leading to potential gaps.
- Quarterly data is outdated and can misrepresent a supplier's current delivery trends.
- The current scorecards capture suppliers score on delivery performance and is not reflective of other areas such as production planning or stockout risk analysis.

Business Objectives



Target Audience

This project is focused on creating value for two primary user groups:



Executives

(concerned with managing the broad portfolio of products and the impact to financials)

- **Real-Time Performance Insights:** Delivers instant snapshots of supplier timeliness for actionable insights.
- **Customizable Data Views:** Allows detailed data selection at various levels—Supplier, Material, Commodity, Plant—to suit specific analytical needs.
- **Data-Driven Decision Making:** Enables managers to make informed choices and effectively communicate with suppliers using data-supported insights.



Commodity Managers

(concerned with managing supplier risks and long-term relationships and personal portfolio performance)

- **Personalized Oversight:** Allows Commodity Managers to use personal filters for monitoring specific supply chain performance, across all levels.
- **Quantitative Performance Metrics:** Provides stockout scores to quantify supplier timeliness and performance.
- **Proactive Alert System:** Sends email alerts for significant performance breaches, aiding swift contingency planning.

Analytical Problem Framing

Transition to Future State

Current State

Reporting Frequency	Quarterly
Data Reporting	Manual
Scope of Monitoring	Limited to 10% suppliers
Analysis Approach	Reactive, with static manual scorecards to review of delivery trends
Metric	Only the Delivery performance (supplier scorecard) which is not applied stockout risk analysis
Impact	Limited scope of monitoring leads to minimal impact on overall supply chain efficiency.

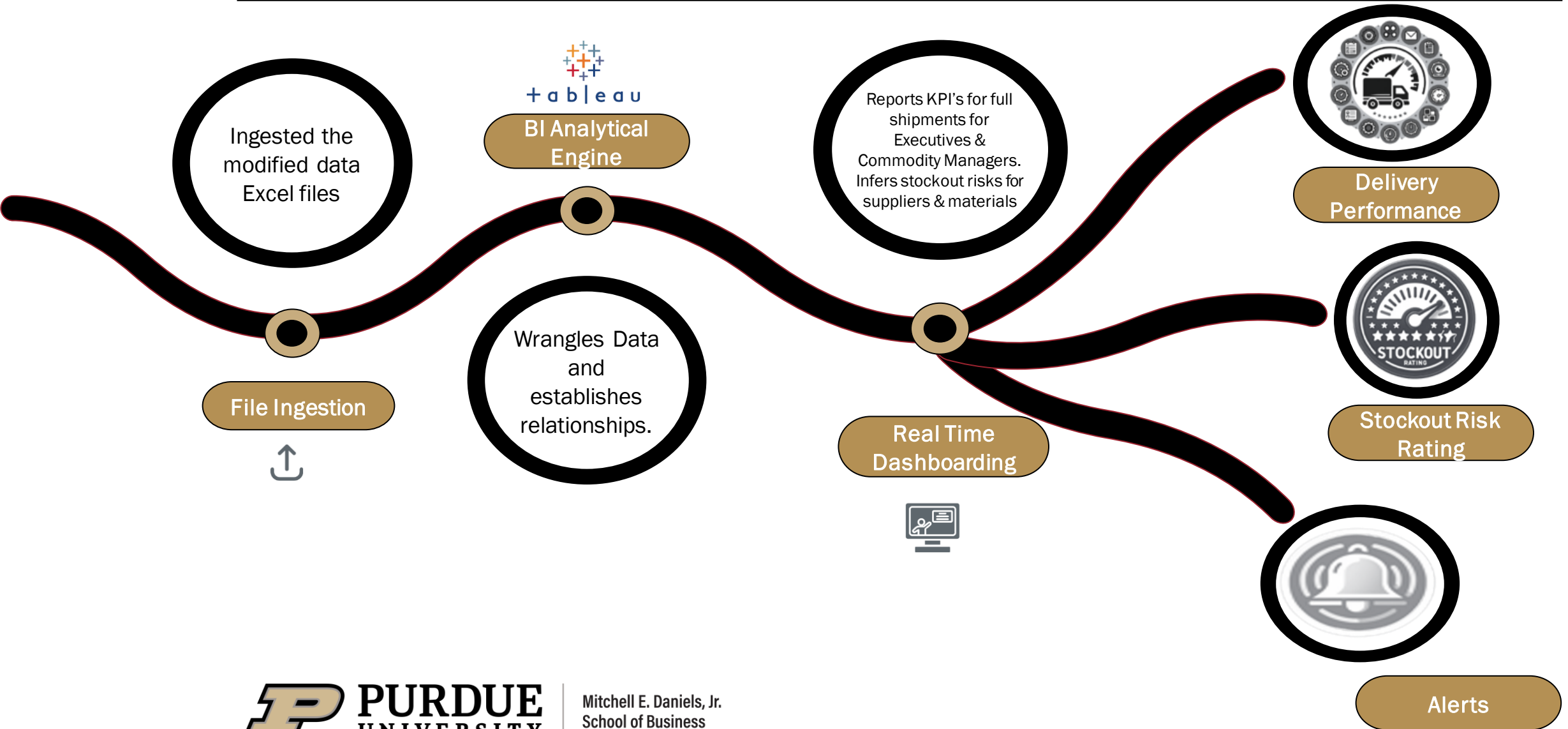


Ideal Future State

Real Time
Automated system (Dashboard)
Covers all suppliers and inventory
Proactive, with automated dashboards, KPI based alerts to pre-emptively address issues
Comprehensive analysis including delivery performance, supplier performance and stockout risk analysis
Maximized scope of monitoring leads to increased financial savings, no report latency, optimized production efficiency.

Approach

Methodology



Supplier Risk Score

Identify Metric

- Calculating Total Deliveries based on Early, On-time, Late and In progress shipments
- Considered two metrics: Frequency of Late deliveries (FLD) and Average Late Days (ALD)

Normalize

- Normalized FLD and ALD at 0-100 scale.
- Post analysis – we considered 0.5 for FLD and 42 for ALD as base maximum.

Assign Risk Score

- Assigned weights for FLD: 0.25 and ALD: 0.75.
- Calculated Risk Rating on a scale of 0-10 as below:
 - 0 to 3 – **High Risk**
 - 4 to 6 – **Medium Risk**
 - 7 to 10 – **Low Risk**

Risk Modeling

Stockout Risk Model

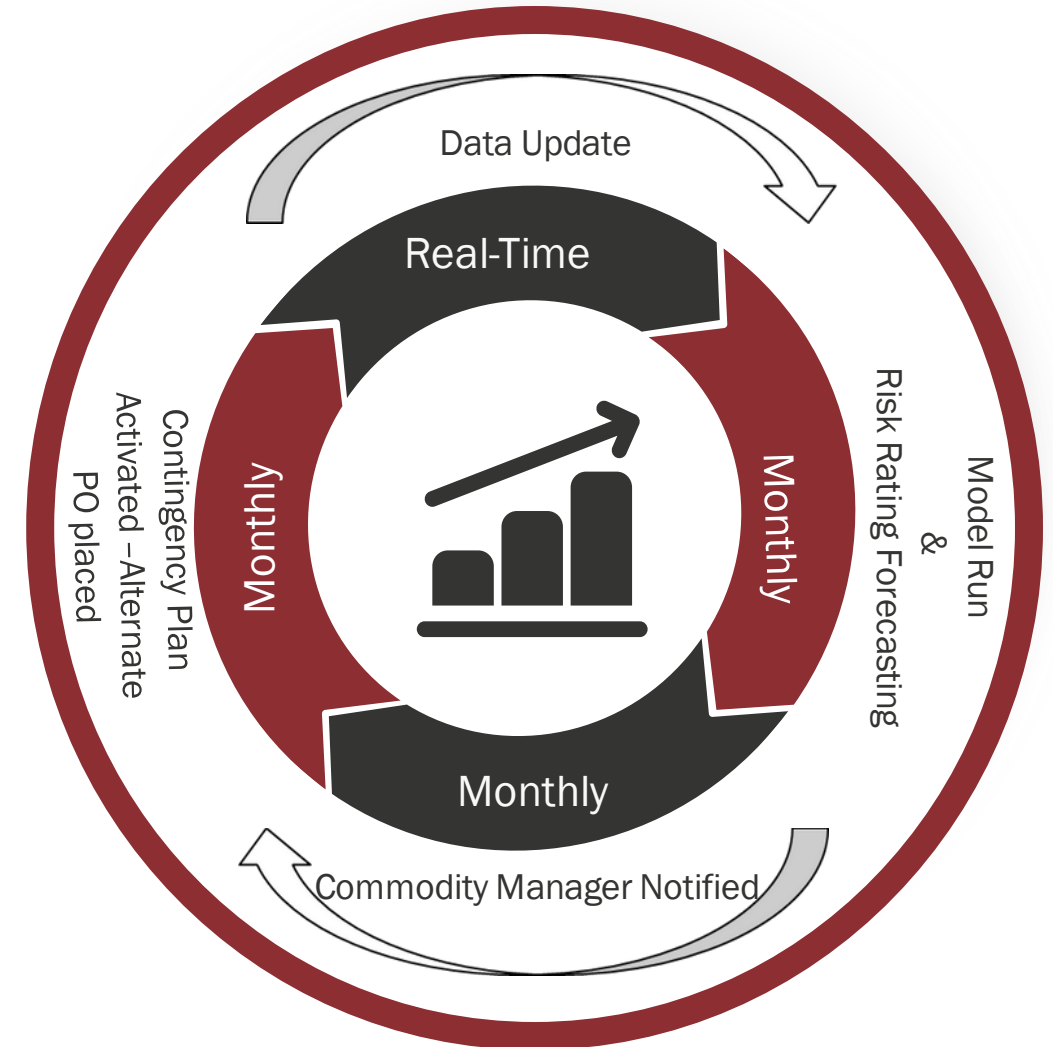
- We used XG Boost Regression model with multi-class probabilities 1500 trees.
- Hyperparameters tunings resulted in model with best result having max depth of 7 and learning rate of 0.1

Model Performance

- Model selection based on lowest RMSE & highest R Square gave following result:
 - Model RMSE : 0.36
 - Model MAE: 0.2
 - Model R Square : 98.7%

Risk Forecasting Maintenance & Frequency

Activity	Frequency
Data Update	Real-time
Risk Rating Forecasting	Monthly
Model Execution	Monthly
Notifications to Commodity Manager	Monthly



Impact



Impact



Delivery Tracking:

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



Supplier Delivery Rate

Every Supplier has been rated on a scale of 0 -10. Giving data driven knowledge to commodity managers for contingency plans



Alerts & ROP:

Optimal stock, aiming for full delivery efficacy and increase in production.



Forecasting:

Stockout prediction for contingency planning and alternative sourcing with RMSE 0.3