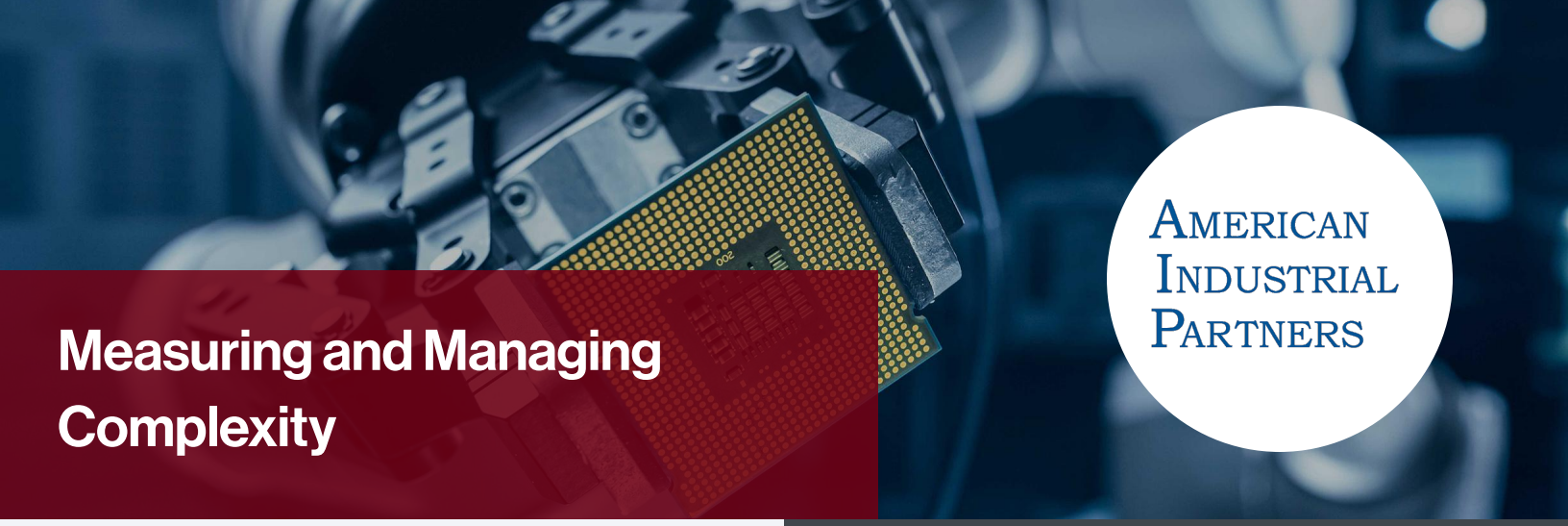

Measuring and Managing Complexity

American Industrial Partners

BUSINESS PROBLEM

Grain Equipment Company's facility operates in a highly seasonal, high-mix manufacturing environment. Product proliferation, configurable grain bins, deep bills of material, and consolidation of multiple businesses into one site have increased complexity. Despite strong market positioning, the plant has experienced missed ship dates, incomplete shipments, expediting, and strain on dealer/customer trust. The core issue is not simply capacity; it is a mismatch between complexity and a largely uniform make-to-order planning and execution model.

DATA SOURCES

ERP/MRP extracts, historical demand and production records, item-master and COGS data, BOMs for grain-bin configurations, routing and work-center information, cell-level observations, and interviews/gemba walks with operations, supply chain, scheduling, and shop-floor teams.

Data Types and Format

Boolean, Count (integer), Numeric, Ordered (ordinal), Relational Data, Time series (Dynamic)

APPROACH

A data-driven complexity diagnosis was used to convert the broad problem of 'too many parts' into actionable manufacturing policies. The analysis segmented SKUs through ABC-XYZ logic, studied BOM modularity and component commonality for high-running grain-bin configurations, mapped material flow across fabrication, welding, paint, and assembly cells, and evaluated how SIOP scheduling translated customer orders into shop-floor execution. The output is a complexity- aware operating model that differentiates make-to-stock, make-to-order, and seasonal pre-build policies.

AX **Part profile:** High value part with stable demand **Policy recommendation:** MTS + Safety Stock	**AY** **Part profile:** High value part with seasonal demand **Policy recommendation:** MTO + No Safety Stock	**AZ** **Part profile:** High value part with volatile demand **Policy recommendation:** MTO + No Safety Stock
BX **Part profile:** Medium value part with stable demand **Policy recommendation:** MTS + Safety Stock	**BY** **Part profile:** Medium value part with seasonal demand **Policy recommendation:** MTO +No Safety Stock	**BZ** **Part profile:** Medium value part with volatile demand **Policy recommendation:** MTO + No Safety Stock
CX **Part profile:** Low value part with stable demand **Policy recommendation:** MTS + Safety Stock	**CY** **Part profile:** Low value part with seasonal demand **Policy recommendation:** MTO + Safety Stock	**CZ** **Part profile:** Low value part with volatile demand **Policy recommendation:** MTO + No Safety Stock

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IMPACT

This project provides GEC with a practical framework to manage complexity without eliminating customer configurability. Recommendations include using off- peak capacity to pre-build high-frequency demand, adding cross-cell capacity checks before committing production dates, and implementing a 'strategy for every part.' The expected benefit is higher delivery reliability, reduced peak-season congestion, fewer incomplete shipments and expedites, and better alignment between shop-floor metrics and the company-level goal of ship-complete-on-time performance.

DRIVERS	GEC needed to restore delivery reliability and customer confidence after years of missed ship dates, incomplete orders, and market share erosion. Rising SKU proliferation, seasonal demand spikes, and a one-size-fits-all MTO model made complexity a strategic operations problem.
BARRIERS	Key barriers included highly seasonal demand, 70k+ active make parts, low component commonality, limited cross-cell capacity visibility, dynamic inventory locations, and shop-floor metrics that rewarded local utilization rather than schedule adherence or customer delivery.
ENABLERS	The project was enabled by ERP/MRP and BOM data, production and shortage history, ABC-XYZ segmentation, BOM commonality analysis, support from AIP/GEC leadership, and collaboration with plant, scheduling, operations, engineering, and shop-floor teams.
ACTIONS	Analyzed SKU demand using ABC-XYZ segmentation, mapped BOM commonality across high-running grain bin configurations, traced material flow through key cells, identified scheduling gaps in SIOP, and developed recommendations for off-peak pre-builds, cross-cell capacity visibility, and a strategy-for-every-part policy.
INNOVATION	The approach translated “complexity” from a broad operational complaint into measurable parameters: value, demand variability, BOM commonality, routing burden, and capacity consumption. It linked SKU-level analytics to concrete manufacturing policies, allowing GEC to selectively apply MTS, MTO, and seasonal postponement strategies.
IMPROVEMENT	The project identified a focused path to improve on-time, complete delivery by prioritizing the small subset of parts and configurations that drive most revenue and capacity load. Proposed changes are expected to smooth seasonal production, reduce peak bottlenecks, improve schedule adherence, and free capacity for lower-volume MTO demand.
BEST PRACTICES	Do not treat all SKUs equally. Segment demand, understand part commonality, and align inventory policy to customer impact and capacity consumption. Pair data-driven policy changes with shop-floor execution metrics, static inventory locations, and cross-functional SIOP visibility to make improvements sustainable.
OTHER APPLICATIONS	This framework can be applied to any high-mix, seasonal manufacturing system with configurable products, shared resources, and intermittent demand. Examples include industrial equipment, automotive components, HVAC systems, construction materials, and aftermarket parts operations.