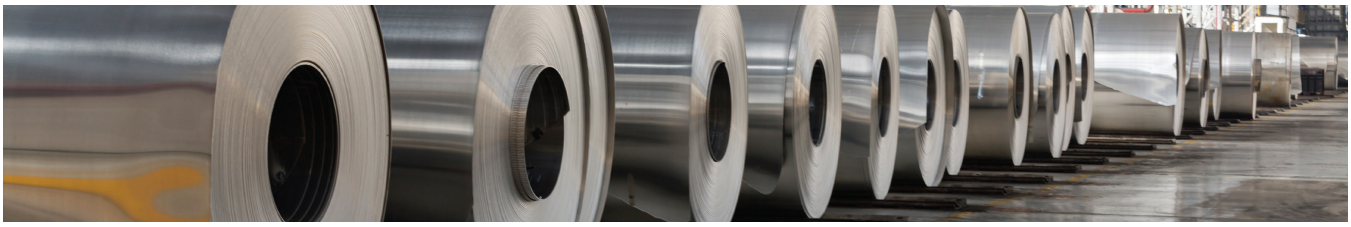
C3.ai

Steel Company Transforms Value Chain with AI



A leading North American steel manufacturer faced increasing pressure to optimize supply chain performance and enhance decision-making across its operations. Recognizing the need for advanced digital capabilities, the company partnered with C3 AI to deploy scalable, AI-driven applications across three key business units: raw materials, steel making, and steel products.

The raw materials unit, responsible for sourcing and managing raw materials for steel production, faced challenges in forecasting demand, optimizing inventory, and managing costs due to short forecasting horizons, price volatility, and manual processes. Similarly, the steel making unit, which oversees the transformation of raw materials into steel billets, struggled with manual-intensive scheduling, long lead times, and inability to quickly adapt to production changes, resulting in suboptimal caster utilization and excess inventory. Furthermore, the steel products unit, focused on manufacturing finished steel products, encountered challenges in the detailing process for steel frames, which required extensive manual effort that led to delays and increased costs.

To address these challenges, the company partnered with C3 AI to leverage the C3 Agentic AI Platform and the common supply chain object model shared across all C3 AI applications. This approach enabled the company to rapidly configure, deploy, and scale AI-driven applications across numerous interoperable use cases, each tailored with specific workflows for targeted end users.

The company implemented C3 AI Demand Forecasting in the raw materials unit to improve demand forecast accuracy. By applying novel, best-fit forecasting models across the product hierarchy, the company achieved 13% improvement in forecasting accuracy and overall forecast accuracy of over 92%. Next, the raw materials group leveraged C3 AI to deliver the second use case, C3 AI Raw Materials Optimization, by taking advantage of the existing data, infrastructure, and demand forecast models configured on C3 AI. This application optimized raw material planning and purchasing by enabling raw material and melt shop managers to generate what-if scenarios to identify lowest-cost raw materials mixes. Combined, these applications demonstrated a 1% reduction opportunity in raw material purchasing and consumption costs, resulting in $42 million in economic value.

Project Objectives

- Increase demand forecast accuracy and improve raw material inventory planning with C3 AI Demand Forecasting and C3 AI Raw Materials Optimization
- Optimize caster production scheduling with C3 AI Production Schedule Optimization
- Reduce detailing and checking time with C3 Generative AI for Detailing

Results

$50M+
In total economic value from four use cases

98%
Reduction in time to plan and schedule production cycles

0.6%
Increase in scheduled production yield

92%+
In demand forecasting accuracy

The steel making unit deployed C3 AI Production Schedule Optimization to optimize caster scheduling and improve operational responsiveness. By replacing manual spreadsheet-based planning with AI-driven scheduling models, the application enabled real-time adjustments to production schedules, increasing scheduled yield by 0.6% and reducing scheduling time by 98%.

Next, the steel products business unit deployed C3 Generative AI for Detailing, a specific configuration of C3 Generative AI, to optimize the design and detailing process for steel products. The application streamlined the information collection process by presenting detailers with the most relevant information from multiple sources, achieving retrieval accuracy of over 87%. This improvement enabled detailers to verify information faster, reducing the manual processing time and increasing overall project efficiency and throughput.

Since deploying these C3 AI applications, the company streamlined processes with AI-powered workflows, enhancing operational agility and responsiveness across the organization. The partnership with C3 AI also has laid the foundation for future digital transformation, as the company continues to scope and deploy new use cases, building on existing investments to deliver accelerated value.

Challenges

The company faced significant challenges across its value chain, such as manual processes, disparate data sources, and limited forecasting capabilities, that affected operational efficiency, production planning, and raw material purchasing. The company decided to partner with C3 AI to tackle these issues by implementing AI-powered applications across its three business units: raw materials, steel making, and steel products.

The raw materials unit is responsible for sourcing and managing raw materials required for steel production, including scrap metal procurement, recycling, and transportation services. This unit creates business value by reducing the costs of raw material sourcing and inventory. However, the sheet mills in the raw materials unit struggled with short forecasting horizons, high lead times, and price volatility. The mills relied on disconnected, manual forecasting processes that were time-consuming and inconsistent across mills. The short 60-day forecasting horizon, combined with high lead times and price volatility, resulted in suboptimal sourcing decisions that increased inventory costs and supply chain risks. Additionally, purchasing teams had to manually consolidate disparate data from multiple sources, which complicated the process of making informed buying decisions due to potential for errors. This fragmented, manual process often led to over-purchasing or stockouts, disrupting production flow and reducing profitability.

The steel making unit oversees the transformation of raw materials into steel billets and other foundational products through melt shop and caster operations. Effective caster production scheduling is critical in the process, yet it was highly manual and inefficient. Prior to engaging with C3 AI, bar mills were consolidating multiple spreadsheets to plan schedules, which would take up to five days. This time-consuming process resulted in lower yield, excessive inventory, and inability to rapidly adjust to changes in demand. The lack of real-time visibility into production constraints further led to frequent inefficiencies, delays, and increased operational costs.

About the Company

- $35+ billion annual revenue in 2023
- 35+ million tons of steel produced
- 30+ steel mills
- 20,000+ employees

Project Highlights

C3 AI Demand Forecasting

- 15 disparate data sources unified
- 23 machine learning models configured to provide 20-week order forecasting horizon
- C3 Generative AI integrated to accelerate data analysis

C3 AI Raw Materials Optimization

- 8 disparate data sources integrated into existing data model, with two reused from existing applications
- 5+ years of historical data analyzed
- Optimizer configured with 50+ parameters to help plan raw material consumption
- Custom C3 AI application

C3 AI Production Schedule Optimization

- 10 disparate data sources unified
- AI optimization models configured to balance production constraints and parameters

C3 Generative AI for Detailing

- 7 data elements integrated, including structured and unstructured data sources spanning 50+ tables and 2 unstructured document formats
- 200-hour manual process automated to reduce time
- Specific configuration of C3 Generative AI application

The steel products unit focuses on manufacturing finished steel products such as structural frames and tubes mainly used in construction and industrial applications. However, the detailing process was time-consuming and inefficient, requiring detailers to manually interpret customer requirements and technical specifications for 3D building designs. With 200 hours spent per job, delays and errors arose frequently. Detailers had to collect information from multiple sources, and the lack of automation led to repetitive, error-prone tasks, significantly slowing down operations. This inefficiency not only delayed project timelines but also resulted in higher labor costs and inconsistent product quality.

Approach

Over a two-year period, the company has deployed four C3 AI applications to tackle these challenges.

Increased Forecasting Accuracy

For the raw materials unit, the company deployed C3 AI Demand Forecasting to increase forecast accuracy and C3 AI Raw Materials Optimization to reduce consumption costs. C3 AI Demand Forecasting helps demand planners accurately forecast demand at any granularity, time horizon, and cadence by unifying disparate data such as order history, customer data, and marketing campaigns, and applying AI models to generate SKU-, customer-, and location-level forecasts. By integrating 15 disparate data sources (e.g., order pricing, expected lead times, mill capacities, steel imports, manufacturing index, etc.) and applying best-fit forecasting models across the product hierarchy (i.e., generated forecasts at the product-family level), C3 AI Demand Forecasting enabled the raw materials unit to generate reliable 20-week forecasts that informed raw material purchasing decisions.

In addition, the integration of the C3 Generative AI enabled historical and forecast data retrieval, aggregation, and visualization backed by AI-powered evidence package, accelerated data analysis and simplified forecast review, streamlining raw material inventory management worth $200 million. These improvements increased forecast accuracy by 13%, achieving over 92% overall accuracy.

Reduced Raw Materials Cost

The company further optimized raw material purchasing with C3 AI Raw Materials Optimization, a custom C3 AI application, which unifies disparate data such as demand forecasts from C3 AI Demand Forecasting, price forecasts, and production constraints to identify the most cost-effective raw material mix. The AI-driven application enables real-time scenario planning by adjusting purchasing strategies based on market conditions. With C3 AI Raw Materials Optimization, the company succeeded in analyzing over five years of historical data and configured an optimizer with 50+ parameters to determine optimal mix percentages across each mill. By facilitating precise inventory planning and cost-efficient material procurement, the application identified a reduced consumption cost potential of 1%, driving a total of $42 million in economic value combined with C3 AI Demand Forecasting.

Improved Scheduling Efficiency

In the steel making unit, the company implemented C3 AI Production Schedule Optimization to automate and optimize caster production scheduling for the bar mills. C3 AI Production Schedule Optimization helps production schedulers improve on-time completion rates, increase resource utilization, and alleviate shipyard bottlenecks by unifying disparate data such as job schedule data, on-hand delivery, and resource availability, and applying AI optimization techniques to create near-term schedules and long-term plans, with flexible time horizon and granularity. The AI-driven scheduling models enabled dynamic production planning, reducing scheduling time from five days to just hours. The application enabled real-time adjustments to scheduling, improving operational agility and resilience to demand fluctuations. The company significantly improved resource allocation and reduced overall operational waste, increasing scheduled yield by 0.6% and reducing scheduling time by 98%. The company has recognized $3 million in savings from additional sales that have come from a reduction in costs delivered by the application. Following its success, C3 AI Production Schedule Optimization is now being scaled to additional mills to improve scheduling efficiency.

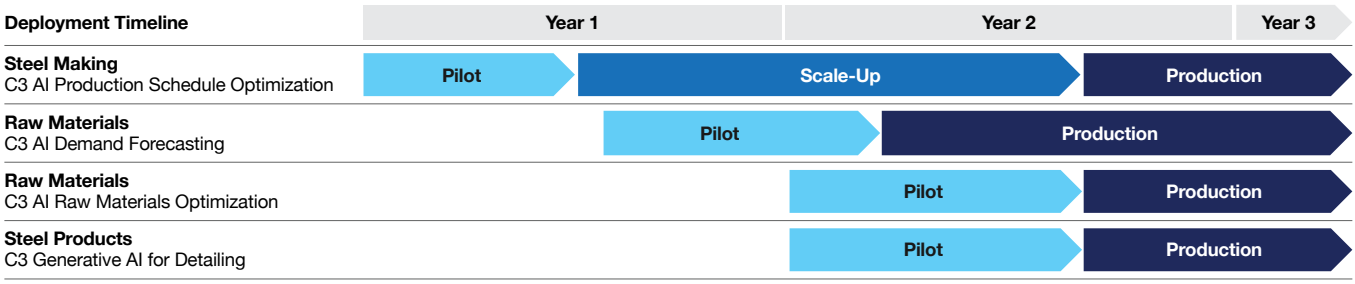
Streamlined Detailing Process

To optimize detailing and checking efficiency for the steel products unit, the company implemented C3 Generative AI for Detailing, a specific configuration of C3 Generative AI that automates information retrieval and verification for steel frame detailing. C3 Generative AI's workflow-enabled interface allows detailers to quickly validate pre-populated data instead of manually gathering information from scratch. The application achieved over 87% accuracy in retrieving relevant information for detailers and significantly reduced detailing time, thereby streamlining operations, enhancing productivity, and reducing errors in steel product design. This transformation is estimated to deliver $9 million in economic value.

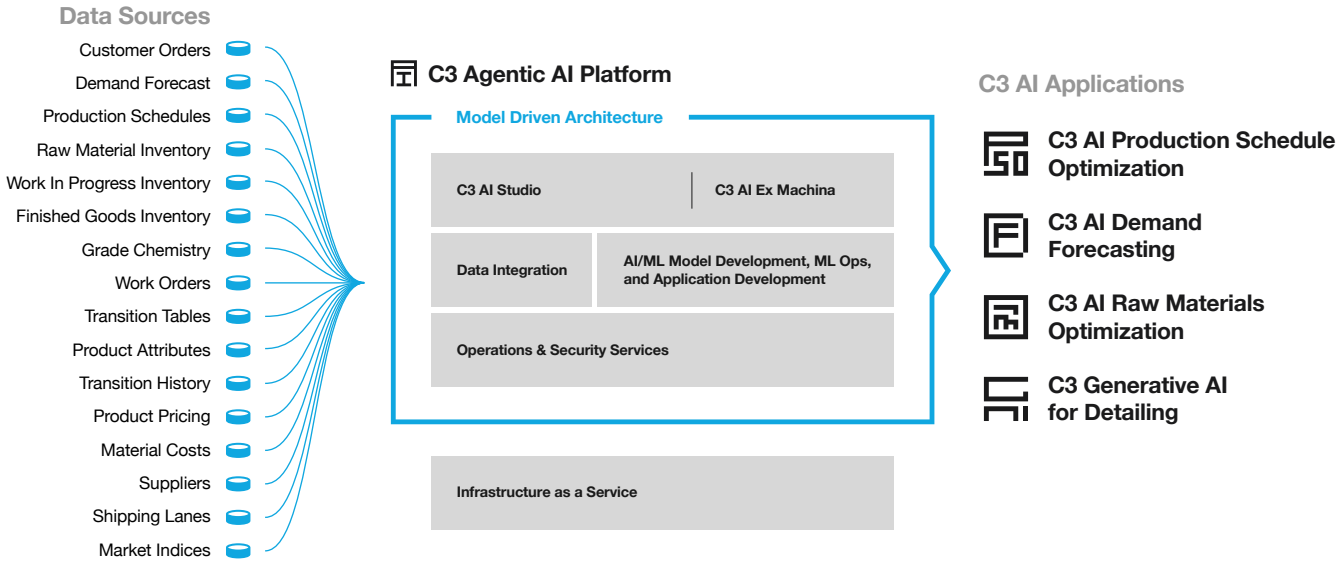
Supply Chain Agility and Responsiveness

Beyond these results, C3 AI supply chain applications provided organization-wide benefits by unifying all data sources across individual mills, providing access to data visibility at an enterprise-wide level and improving cross-functional decision-making. The applications enabled a shift from manual, time-consuming workflows to AI-powered planning and execution, standardizing processes across the organization. The steel manufacturer has improved its operational agility, enhancing responsiveness to demand fluctuations, production constraints, and market conditions. Furthermore, C3 AI's applications laid the groundwork for future AI advancements, scaling out to additional mills. The partnership with C3 AI has enabled the steel manufacturer to fully embrace digital transformation, establishing itself as a leader in AI-powered steel manufacturing.

C3 AI Deployment



Solution Architecture



Benefits

Through the partnership with C3 AI and implementation of the C3 AI applications, the company can:

Generate

$50 million+ in economic benefit across multiple mills

Reduce

production scheduling time by 98%, significantly improving operational efficiency

Achieve

92%+ in demand forecast accuracy, increasing profitability

Streamline

detailing process with **87%+ information retrieval accuracy,** reducing time taken to create and verify information in building models

Decrease

raw material **consumption costs by 1%,** optimizing purchasing strategies

Increase

scheduled yield by 0.6%, improving production output

Proven Results in 6-Month Pilot

Visit C3.ai/get-started