Leading Building Design Firm Enhances Modeling and Simulation with Generative AI

A leading U.S.-based building designer and manufacturer specializes in the enginteering and construction of steel structures for commercial projects nationwide. With a production capacity of approximately 7,000 buildings annually, the company operates a vast network of 400 modelers and over 2,600 builders to deliver high-quality, precision-engineered structures.

One of the most critical aspects of the company's operations is the creation and validation of 3D building design models, which serve as key input during the construction of the building. This process involves translating complex engineering specifications into 3D design models while ensuring structural accuracy and compliance with project requirements and then validating the 3D design model is created to specification. Modelers start by synthesizing information from unstructured documents (e.g.,

annotated contracts, contract amendments). The modelers then create a 3D design model and validate it by cross-referencing against a structured database containing every component listed in the 3D design model. This is a highly error-prone process that requires extensive manual effort. These labor-intensive workflows can take over 200 hours per project, delaying timelines and increasing costs.

To address these challenges, the company sought to enhance its modeling and validation capabilities using C3 Generative AI for Modeling and Simulation. By automating the extraction, validation, and analysis of design data, the company reduced the time to create and validate 3D design models, reduced manual errors, and created additional capacity to design and construct new buildings.

Project Outcome

The implementation of C3 Generative AI for Modeling and Simulation transformed the company's 3D design model creation and validation process, eliminating inefficiencies and ensuring greater accuracy in commercial steel building designs. By automating discrepancy detection and information retrieval, the application streamlined workflows, allowing modelers to focus on resolving issues rather than manually identifying them.

The AI-powered solution also ingested and interpreted handwritten notes on customer contracts and contract amendments, capturing critical adjustments that were previously difficult to capture in existing workflows. This ensured that every structure met project specifications with precision, reducing rework and improving overall quality of the modeler's work.

Results

$9M
Annual economic value created at scale

86%
Response accuracy in feature validation

4
Hours saved per model verified

As a result, the company reduced modeling and validation time by 4 hours per building across 7,000 projects annually, significantly increasing operational capacity and improving building plan quality. With these improvements, C3 Generative AI is projected to deliver $9M in annual economic value at scale, allowing the company to take on more projects, accelerate time to market, and maintain its leadership in the industry without compromising precision or efficiency.

Challenges

The company faced inefficiencies in validating 3D design models, a key step in ensuring the accuracy and structural integrity of its commercial steel buildings. These buildings support major construction projects nationwide, where precision and compliance are paramount. With a production capacity of 7,000 buildings annually, any delays in the modeling and validation process directly impacted project timelines, customer commitments, and overall revenue generation.

The creation and validation of each 3D design model could require a maximum of 200 hours per project. Modelers needed to manually search through thousands of documents, including annotated contracts, contract amendments, and cross referenced these against the parts database to verify design accuracy. This labor-intensive, repetitive process created bottlenecks and slowed project timelines.

The company needed a faster, more reliable method to create and validate 3Ddesign models. The challenge was to eliminate inefficiencies, automate document analysis, and accelerate model verification – all while ensuring the highest levels of precision and compliance in its modeling and validation workflows.

Original Process

Modeler reviews customer contract and 2D building designs

Modeler creates 3D building design model based on customer contract and 2D building designs

Modeler reviews checklist to validate 3D building design model was created to spec

Pain Points:
1. Time Consuming — **200 hours+ spend per building**
2. Tedious — **repetitive and error-prone** work

C3 AI Enhanced Process

Modeler uploads customer contract to C3 Generative AI application

C3 Generative AI consolidates required information to create 3D building design model

Modeler reviews checklist only when discrepancies are identified

Advantages:
1. Time-Saving — **reduces time** spent creating and validating design models
2. Optimizes Workflows — **automates** repetitive tasks
3. Provides Clarity — **navigates complexity** within documents, links to source document for transparency in all answers
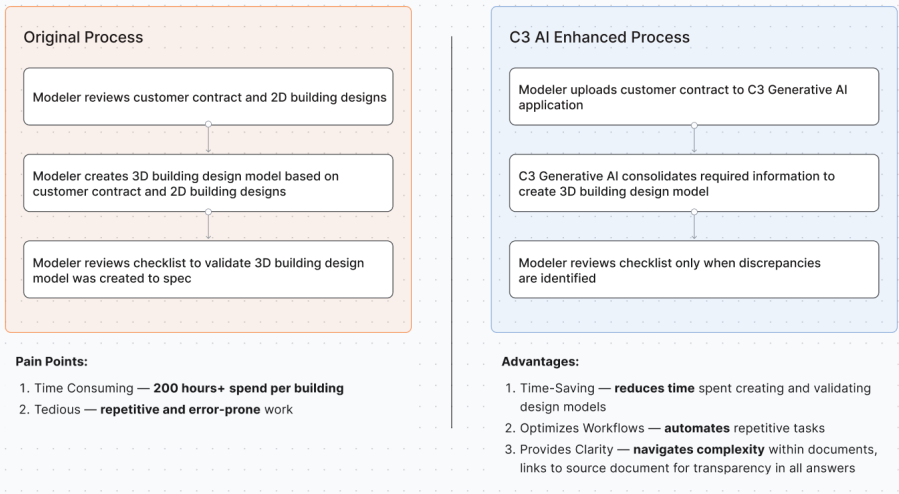
Figure 1. *Comparison of the original 3D building design process – including modelers' pain points – against the C3 AI enhanced process and its benefits.*

Solution

Recognizing the need for a more efficient and scalable approach, the company deployed C3 Generative AI for Modeling and Simulation to expedite model creation and validation, accelerate project timelines, and increase capacity. Given that the company produces 7,000 buildings annually, with millions of dollars in revenue dependent on the timely and accurate completion of these structures, ensuring fast and precise 3D design model creation and validation was a business-critical priority.

C3 Generative AI for Modeling and Simulation transformed the model creation and validation process by automating information retrieval and comparisons of customer contracts and the information specified in the 3D design models – enabling modelers to spend their time resolving

discrepancies between source documents and the models instead of identifying them. The solution eliminated manual bottlenecks by instantly cross-referencing customer contracts, contract amendments, and the parts database, ensuring that each 3D design model adheres to project-specific requirements. Additionally, the AI-powered system ingested and interpreted handwritten notes on customer contracts and amendments, capturing last-minute adjustments and annotations that were previously difficult to incorporate into the validation workflow.

By flagging inconsistencies before construction begins, the AI-driven system prevented costly errors, reduced the time needed to create and validate 3D design models, and increased operational capacity.

C3 Generative AI for Modeling and Simulation
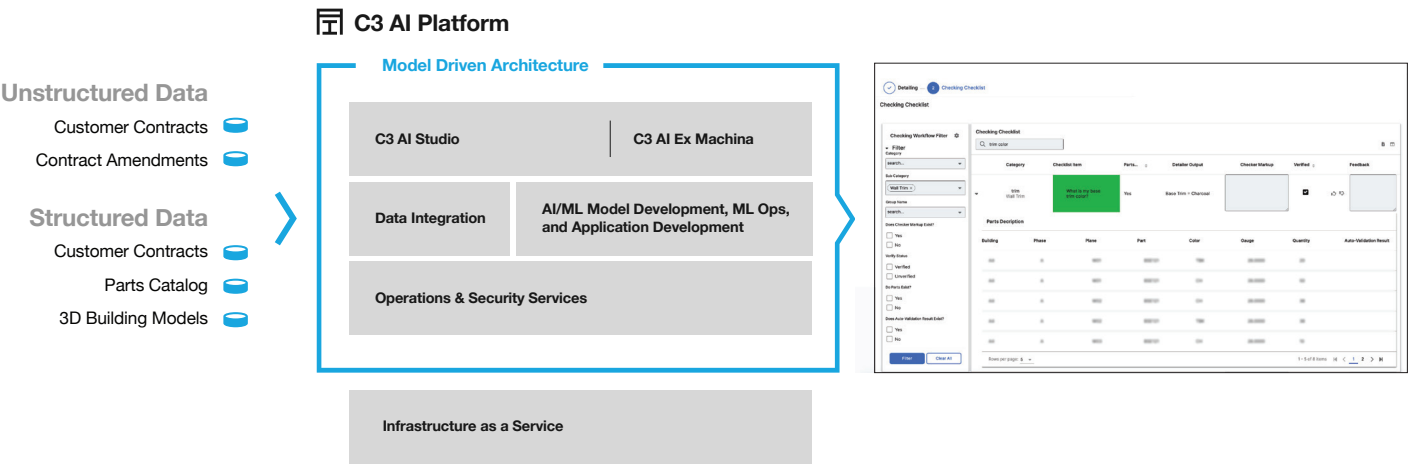

Figure 2. *During the course of the pilot, C3 AI integrated both unstructured and structured data sources into the C3 AI Platform. This integration presented users with the most relevant information from all sources through an intuitive interface. The Platform's object-oriented programming approach simplified the development of new features and capabilities, effectively addressing complex challenges such as maintaining information hierarchies within individual projects and scaling across thousands of projects annually.*

Key Capabilities

C3 Generative AI for Modeling and Simulation processed contracts and contract amendment PDFs using a custom parsing approach to extract critical insights. This included transforming contract data into images for enhanced analysis.

Ensured that the most recent contract amendments were utilized, resolving any conflicting information from earlier versions to maintain data accuracy and consistency.

Designed and implemented distributed computing logic to handle computations efficiently, enabling the application to scale seamlessly across the customer's organization.

Ingested 3D design models and cross referenced the information within the models against what was specified in customer contracts – and flagged any discrepancies.

All structured data sources were seamlessly ingested into the C3 AI data model. Relevant insights, such as 3D building design model data, are extracted to address nearly 100 predefined questions efficiently.

Conclusion

At scale, C3 Generative AI for Modeling and Simulation is forecasted to generate roughly $60M in annual economic value by increasing operational capacity and reducing quality issues. By automating information retrieval and discrepancy detection, the solution cuts 3D model creation and validation time by 4 hours per building,

optimizing workflows and eliminating manual bottlenecks. This enables teams to accelerate project timelines, reduce costs, and scale operations efficiently, ensuring greater precision and productivity in commercial steel building design.

Proven Results in Weeks

Visit C3.ai/get-started