CASE STUDY

How Caterpillar Uses aPriori to Streamline NPI Process

CATERPILLAR®

Company Details

Industry
Heavy machinery

Number of Employees
107,700

Revenue
$48.19 Billion

Website
https://www.caterpillar.com/en/

aPriori Products
aP Pro

The Problem

Caterpillar was trying to be more proactive with cost and design decisions

The Solution

Manufacturing insights gained from aPriori enabled Caterpillar to save $1.1 Million while streamlining their NPI process

Is it possible to save millions of dollars with the manufacturing insights gained from a platform like aPriori?

Companies like Caterpillar are no stranger to large, complex, interconnected, and interdependent product and part designs. In fact, they employ some of the top design engineers in the world.

Those design engineers wanted to embrace a more proactive strategy when it came to their product cost and design decisions.

In one instance, aPriori's manufacturing insights enabled Caterpillar to see more than $1 Million in savings.

In this case study, we explore how Caterpillar achieved these kinds of savings with a highly accurate digital factory setup.

Who is Caterpillar?

Caterpillar is the world's leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives.

Caterpillar has been an aPriori customer for many years. They have aPriori manufacturing insights deployments going on at the different divisions around the company and around the world.

In this customer case study, Steve Vito, a Supplier Collaboration Engineer in Caterpillar's Paving Products Division, shares examples of how aPriori is instrumental for Caterpillar's New Product Introduction (NPI) programs.

Proactive Cost Modeling Through New Product Introduction (NPI)

As a Supplier Collaboration Engineer at Caterpillar, my role is to be the mediator between our design engineers and our supply base. We strive to work towards design for manufacturability and cost.

aPriori

Caterpillar is trying to be proactive about cost and our design decisions. Being proactive means getting out ahead of cost and understanding what that cost is going to be before release to manufacture, and aPriori is helping us to do that.

"I ask the design engineer 'how can I make that part?' and then I work with our suppliers to ensure that our partners can make the part **better, more efficient, and at the right cost."**

How aPriori Saved Caterpillar $1.1 Million Annually on One Part

Caterpillar had been negotiating the cost of a part with a supplier for over a year with no success.

In less than an hour, Caterpillar used aPriori to build a product cost model, including the custom weld which was a big component of the cost.

After making small tweaks to the cost model, Caterpillar sent the design and product quote to a different supplier.

"After building a product cost model in aPriori in less than an hour, I asked the supplier if they could get close to the aPriori cost model. They came back with a quote that was within 1%, resulting in a $1.1 Million annual savings for Caterpillar."

But cost wasn't the only savings we experienced. Time savings is just as important. In just the few hours it took to build the digital factory and generate the cost model, Caterpillar was able to get a should cost quote after a short phone call. A process that had previously taken over a year.

In another example, Caterpillar's Supplier Collaboration Engineer spent about three hours building a cost model for a tube part that required weld and three sub-assemblies. Comparatively, the supplier he was working with took three weeks to build their quote. After showing his cost model to the supplier, they were once again able to quote within 1% of the cost model.

Listen in as Steve shares these successes in this short video:

Business Problems aPriori is Helping Caterpillar Solve

aPriori helps Caterpillar to solve for two business problems: should cost modeling and significantly streamlining the NPI process with aPriori digital factories. Here's how:

Manual Costing

In the past when we looked at cost, we did everything from a drawing. All of our calculations were manual and it was very time consuming. Because aPriori derives data from the CAD model, costing is much more efficient and accurate. That's helping us with time to market, making better design decisions based on cost, and improved design.

Eliminate the need for cost reduction

One of the things we're doing with aPriori in the NPI process at Caterpillar is trying to eliminate the need for cost reduction. That is our goal. If we don't have to do cost reduction projects then we don't have a need for additional resources (saving money). With aPriori we are validating the cost model, making sure it's accurate in scenarios around the world (US, China, Europe, South America – wherever we are going to manufacture our parts). We use aPriori digital factories to determine the cost.

Benefits to Caterpillar Using aPriori as a Primary NPI Tool

- DFM: Design for manufacturablility and associated cost during collaboration. Don't wait until it's too late to collaborate on manufacturability and product cost. Digital threads bring everyone together to the same dataset at the same time.
- **Identify Cost Drivers:** Identify cost drivers in early phase designs. This helps to save Caterpillar enormous amounts of time, internal resources, and headaches for late-stage manufacturbility and cost changes.
- Supplier Selection: Select suppliers that deliver a robust, feasible process at the right cost, best in quality, and best delivery performance. Customizable digital factories enable companies like Caterpillar to bui;d out processes specific to their design or specific to their supplier's capabilities. Making it easy to save and scale factories for future product costing needs.

Understanding Caterpillar's NPI Process

We follow the standard lifecycle for our New Product Introduction (NPI) programs including the following four stages: concept, development, pilot, and production. Utilizing aPriori's cost modeling software in each of these stages saves us time and money, and helps us to make better design decisions.

1. Concept

At the beginning of an NPI program at Caterpillar, our marketing department compiles the voice of the customer, puts that together into a strategy, and then conveys that strategy to our engineers. This begins the concept phase, where our engineers design based on that data. In this phase, we are looking at cost from a directional standpoint. We build a cost model based on a very immature design at this point.

Example Application of the NPI Concept Stage: If an engineer is making an adjustment (such as adding holes or changing the size of the part) in their CAD system using aPriori, they can click "cost" after making those geometry adjustments, and they can see the change in the cost right away without ever leaving the CAD system. This helps us to avoid cost directly in the concept phase, rather than waiting until the later stages when layers of details have been added to the design model.

2. Development

In the development stage, the design is becoming more mature. We work with the engineers to tighten up the design and the cost, while considering suppliers. The goal is to have less contingency in our cost rollups.

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3. Pilot

In the pilot stage, which is when we're going to actually build the machine (the first prototypes or pre-production machines), we update our cost estimate and work with our suppliers with the latest information. This process ensures we are working from a negotiated quote, using the cost estimate as a starting point.

Example Application of the NPI Pilot Stage: After completing a cost model for a part we are making in China, our buyer was able to negotiate the quote with the data retrieved from the aPriori cost model. In this particular assembly, Caterpillar was able to reduce the estimate for tooling by 65% and reduce the quote by 25%. What's most interesting is this reduction got us within 3% of the aPriori cost estimate. This amounted to a savings of 153,000 CNY. Image 3 is the email exchange between Caterpillar's engineer and the buyer.

NEGOTIATEDQUOTE RESULTS USING APRIORI

- **65%** reduction in the tooling estimate using aPriori
- **25%** reduction in the overall quote using aPriori
- **153,000** CNY totaly savings

4. Production

During the production phase, we're still updating and constantly monitoring our cost based on:

- Market conditions
- Fluctuation in material prices
- Regional modifications

Example Application of the NPI Production Stage: Caterpillar was trying to evaluate a cast version of this component (see image 4) compared to a sheet metal assembly fabrication of that part. By using aPriori, we found out that the casting was a little more expensive than the sheet metal assembly. However, Caterpillar chose the casting version. We made a successful design decision based on other factors; cost is just one part of the equation and is not always the number one consideration.

Considerations included:

- Quality of the part
- Time to manufacture the part
- Cost

Summary

aPriori's digital factory simulation provides Caterpillar with the manufacturing insights we need to get our design, quality, and cost goals right the first time. aPriori is a true partner in Caterpillar's success.

WANT TO LEARN MORE?

CLICK HERE to learn more about aPriori manufacturing simulation software for industrial equipment.

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