Eaton's Generative AI Cuts Product Design Time by 87 Percent

Company Details

Industry
Intelligent Power Management

Number of Employees
92,000

Revenue
$23.2 billion

Website
www.eaton.com/us/en-us.html

aPriori Products
aP Pro

⚠🔍 The Problem

Conventional product design processes create long development cycles and impact profitability and time to market.

💡 The Solution

Eaton accelerates time to market and strengthens its competitiveness with generative AI and aPriori.

Eaton's power management solutions are central to technologies that improve how we work and live – from handheld electronics and electric vehicles (EVs) to emergency communications systems. To meet growing customer demand, Eaton uses generative artificial intelligence (AI) to accelerate new product development and simultaneously achieve product targets for cost and performance.

Eaton's generative AI results include reducing new product design time by up to 87%. Explore how Eaton's AI-driven capabilities—built with quality aPriori data—are lowering costs and accelerating time to market.

Who is Eaton?

Eaton Corporation plc (Eaton) is a $23.2 billion intelligent power management solutions provider for industrial and manufacturing industries, including aerospace, building (commercial and residential), data centers, mobility, transportation, and utilities. Headquartered in Dublin, Ireland, Eaton's 92,000 employees span 175 countries.

To accelerate its growth, Eaton is focusing on electrification, energy transition, and digital transformation. It is also taking steps to become carbon neutral by 2030.

Problem

Long Product Development Lead Times

Customers regularly require customized Eaton components/products for their new product development initiatives. Requests to Eaton include creating a unique passenger car valve stem and developing a new lighting fixture.

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Traditionally, it takes Eaton months to complete a manual product design that is cost-effective and meets manufacturing specifications. Cross-functional engineering requirements are a big factor in the lead time. A lighting fixture design, for example, can require input from thermal, electrical, mechanical, optical, and manufacturing engineering. Additionally, increasing product complexity, ongoing margin pressures, and sustainability mandates provide additional challenges to accelerate new product development and associated supply chain operations.

This process also restricts customers' ability to shorten their product launch schedule, resulting in delays to market and a negative impact on cash flow.

Solution

Apply Generative AI for Rapid, Accurate Product Design

Eaton is using generative AI to accelerate new product development while maintaining high quality. The manufacturer's generative AI capability is built on a robust set of actual historical product design data and insights from the company's simulation software portfolio – including aPriori for cost modeling, design for manufacturing (DFM), and sourcing.

Eaton combines this information to create detailed model-based design specifications and properties to support generative AI development.

"Eaton's vision is to take our **traditional design processes** from months to minutes."

Uyiosa Abusomwan, Senior Global Technology Manager of Digital Design and Engineering at Eaton

With generative AI, Eaton runs thousands of design iterations in minutes (or less) and proposes the top five designs. Next, Eaton feeds the top designs through a high-fidelity simulation. Then, the Eaton digital design and engineering team will analyze the proposed designs to ensure that the generative AI product designs meet the associated requirements.

This workflow empowers the Eaton engineering team to review AI outputs for product validation and quality control and to streamline decision-making.

Watch Eaton's Uyiosa Abusomwan outline the company's generative AI initiative at our Manufacturing Insights Conference:

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Harnessing aPriori for Generative AI

Since 2017, Eaton has been using aPriori to reduce costs, improve DFM, and increase supply chain resilience. aPriori analyzes 3D CAD designs for cost, manufacturability, and sustainability issues.

And aPriori can also simulate multiple design scenarios simultaneously – enabling the Eaton design team to evaluate the implications of alternative designs, raw materials, production processes, manufacturing locations, and more. This enables Eaton to mitigate cost drivers and potential DFM issues early in the design process and get design options from aPriori that they may not have considered.

aPriori's deterministic AI capabilities ideally position themselves to drive value for generative AI. This is because the aPriori analysis engine applies pre-programmed rules and algorithms to make decisions in real time. Eaton uses aPriori to programmatically run product design simulations in the cloud for its generative AI initiative. This is important because some software applications can't run in the backend due to a lack of automation/deterministic AI capabilities.
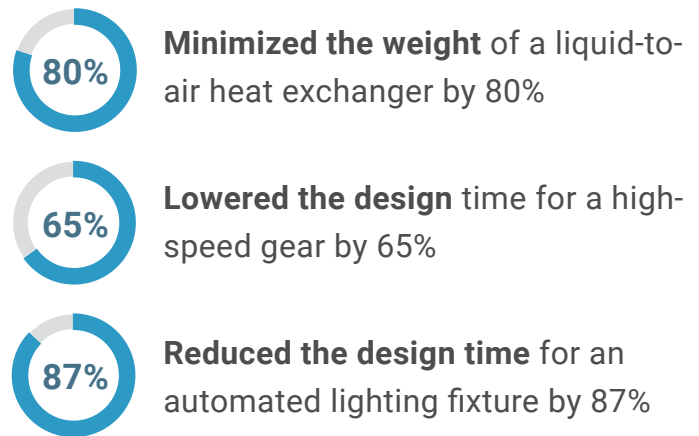
"We rely on modeling and simulation to **optimize our generative AI capabilities**. With aPriori, we can model for manufacturability and cost, and we're also looking into sustainability."

Results

Reduce New Product Design From Months to Minutes

In a short amount of time, Eaton is achieving impressive results from its high-fidelity generative AI initiative, including:

80% — **Minimized the weight** of a liquid-to-air heat exchanger by 80%

65% — **Lowered the design** time for a high-speed gear by 65%

87% — **Reduced the design time** for an automated lighting fixture by 87%

Here's a closer look at the automated lighting fixture developed by Eaton's generative AI. Using a traditional design process, it can take up to 16 weeks to design this type of product because it requires expertise from thermal, electrical, mechanical, optical, and manufacturing engineering.

Eaton digitized this process and trained the AI algorithm using actual historical product data and simulated insights to create a high-fidelity model. Eaton uses information from aPriori and other sources to evaluate designs that meet cost, performance, and other requirements. Now, Eaton can process a new design request in two weeks – cutting design time by 87%.
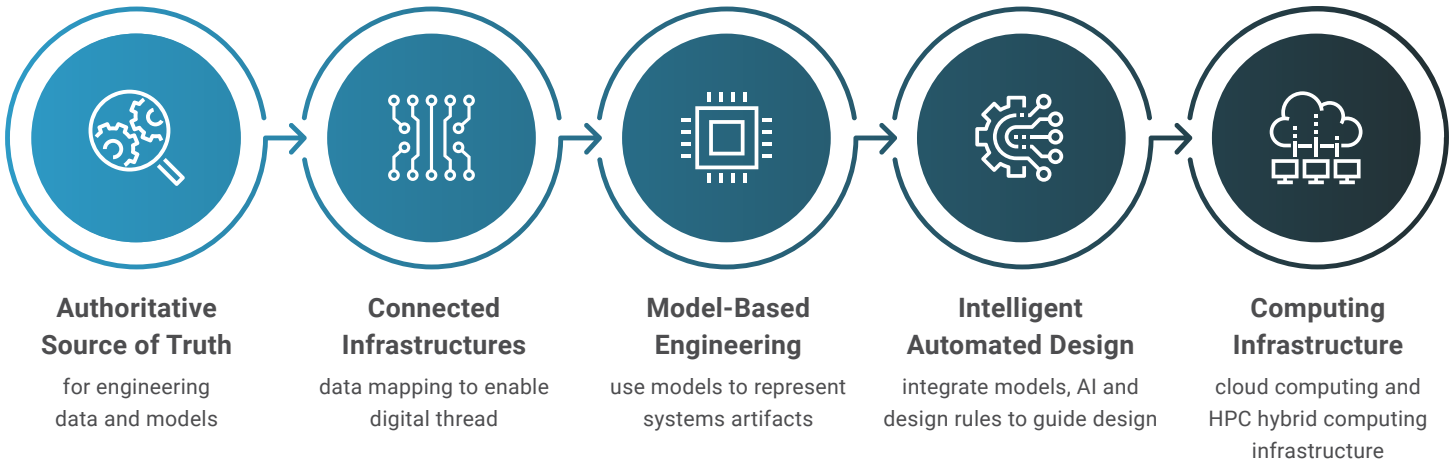
Eaton plans to double the output of its new product innovation investments. This data-driven strategy aims to improve the company's ability to achieve its zero lead-time objectives.

In addition to using generative AI to grow, Eaton further reinforces its position as a trusted, go-to supplier for customers in automotive and other manufacturing industries.

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How It Works

Eaton's Five Generative AI Pillars

Authoritative Source of Truth	**Connected Infrastructures**	**Model-Based Engineering**	**Intelligent Automated Design**	**Computing Infrastructure**
for engineering data and models	data mapping to enable digital thread	use models to represent systems artifacts	integrate models, AI and design rules to guide design	cloud computing and HPC hybrid computing infrastructure

Eaton's digital engineering team established five pillars for its AI solution to support myriad manufacturing industry use cases by providing access to robust datasets and ensuring flexibility across its machine learning algorithms and its generative AI models:

Establish an authoritative source of truth
Accurate data is the foundation for generative AI success. Eaton provides product engineering teams – and its generative AI systems – with quality product data from multiple systems and applications, including size, weight, tolerances, and cost.

Apply model-based engineering
Provide the generative AI system with robust simulation and modeling insights to optimize quality and accuracy. This includes aPriori's simulation for cost and manufacturability, along with product design simulation for fluidics, thermal analysis, etc.

Intelligent automated design
The AI algorithm uses available data and the defined programmatic processes/workflows to develop product designs. This process includes using simulation data to determine which manufacturing processes and other product parameters will have the greatest impact on design options.

Connect manufacturing ecosystems
Use digitalization (including digital twins and the digital thread) to integrate multiple systems and applications. This pillar also includes automated workflows that span 3D CAD software, aPriori simulation for cost and design for manufacturing (DFM) insights, product lifecycle management (PLM), and enterprise resourcing planning (ERP) systems.

Computing infrastructure
Global scalability is essential to support the evolving needs of the company and its customers. Eaton incorporates cloud computing, edge computing, and other solutions to provide a robust, secure infrastructure for its digital design and engineering team.

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CLICK HERE to meet with an aPriori expert and learn how we can help you eliminate product costs, improve productivity, and reduce your carbon footprint.

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