



Top Use Cases for **Digital Twin Technology** to Drive Digital Transformation

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The concept of digital twins began in experimental engineering-heavy scenarios such as NASA using paired technologies for mirroring physical systems through digital simulation to understand their behavior in harsh aerospace environments.

These use cases have proven invaluable for highly specialized and cutting-edge science over the decades, illustrating the early potential of digital twin technology starting around the Apollo 13 mission in the '60s and '70s.

Digital twin use cases have come back to earth and moved out of the conceptual stage to create real-world impacts across enterprises currently executing on their digital transformation strategy. The power and availability of the enabling technologies has become ubiquitous, and much of the groundwork has been laid through implementations of industrial internet of things (IIoT) technology by embedding sensors to gather the physical world parameters necessary to drive a digital twin model. Coupled with increasingly powerful analytics, data, aggregation, and simulation capabilities common in industrial enterprises, new insights can be revealed to improve operational effectiveness, differentiate products and services, and increase worker productivity. And with augmented reality emerging as the new HMI to bring 3D content and real-time insights to workers, the time is right to assemble these digital twin models and reap the value of the vast quantities of new data available today.

What is the Digital Twin?

Digital twins are digital models that virtually represent their physical counterparts. This virtual representation of a physical product, an operational process, or a person's task is used to understand or predict the physical counterpart by leveraging both the business system data that defines it and its physical world experience captured through sensors.





Digital twin opportunities are heaviest in asset-intensive and engineering-oriented industrial industries. Historically they have been adopted most readily by discrete manufacturers who are re-evaluating the lifecycle of their product in the age of IIoT. However, opportunities for digital twins to deliver business value are expanding in scope and opening new functionality and insights. Moving beyond smart, connected products, digital twins are now being created for the users of those products within their operations, and digital twins are being developed for processes occurring within spaces thanks to the myriad of connected technologies now available. From improving outcomes such as streamlining service and maintenance processes for workers to predicting and optimizing operational and production outcomes, to improving the design and usability of the smart, connected products themselves, digital twins are quickly being developed and lenses that serve functional beneficiaries are being deployed across the value chain for industrial enterprises.

This digital twin use case eBook explores just a few of the top use cases for engineering, manufacturing and operations, and service. It is intended to showcase the value of the digital twin opportunity supported through real-world case studies from industrial enterprises.

ENGINEERING

A PRODUCT LENS

Through the lens of a product for discrete manufacturers, digital twins enable “Voice of the Product” that replace usage assumptions with facts, accelerating time to market with optimized features and designs

KEY USE CASES

- **Digital Product Traceability:** Provide universal data access around a view of product systems information, or the digital thread, from requirements to design, testing, manufacturing, and visibility into the behavior of products in the field.
- **Product Design Optimization:** The digital definition of the product is enhanced with real-world performance data, informing simulation models to improve quality and integrity of designs.
- **Usage-Based Requirements:** Analyze real-world product usage and condition data to inform feature and functionality requirements, improving fit to market and enabling value-added service offerings.

CASE STUDY | POLARIS

Polaris leverages its design data as part of a broader digital thread with feedback loops throughout the manufacturing process and product life-cycle.

This real-world customer and performance data bolsters a product lens of Polaris’ vehicles while enabling the manufacturer to utilize cutting-edge design capabilities such as simulation and additive manufacturing.

Value Metrics

- Reducing design and validation process time hastens time-to-market for new products
- Better customer experience through improved product performance and fit to customer requirements



MANUFACTURING AND OPERATIONS

A PROCESS LENS

Through the use of a process lens on a digital twin, enterprises can gain production visibility and planning that improves operational agility, increases throughput, and optimizes process efficiency throughout the supply chain.

KEY USE CASES

- **Connected Operations Intelligence:** Combine, analyze, and deliver insights from disparate and diverse silos of assets, operators, and enterprise systems into unified real-time visibility of KPIs for increased operational performance and informed decision making
- **Dynamic Step-by-Step Instructions:** Connect factory assets and ERP/MES systems to provide role-based views via augmented reality experiences or connected applications to deliver adaptive work instructions in-context for increased operator productivity and improved production quality.
- **Connected Quality and Verifications:** Validation of the correct design iterations, systems requirements and product checklists, by comparing as-designed to as-configured data through the digital twin.

CASE STUDY | VOLVO GROUP

Volvo is constantly striving for flexibility and agility in its manufacturing operations to accommodate custom configurations and shifting customer requirements. The automaker is achieving engineering excellence through implementing a digital thread from design through manufacturing processes.

Volvo is now connecting front-line worker processes to the thread, creating an opportunity to produce a twin of quality assurance tasks in its plants.

Value Metrics:

- Improving operational effectiveness, and cost savings, while getting closer to 0 Part Per Million (PPM) quality goal.
- Updating and validating engine configuration and QA checklist process reduced from more than a day to less than an hour.
- Digitization of the QA process is anticipated to save thousands of euros per workstation per year.



MAINTENANCE & SERVICE

A CUSTOMER SUCCESS LENS

Through the lens of customer success, a digital twin can create enhanced service delivery and offerings that improve customer satisfaction through increased uptime and quicker time-to-resolution.

KEY USE CASES

- **Adaptive Field Service:** Combine real-time and historical asset data to deliver asset-specific contextual work instructions via augmented reality experiences or connected applications for increased technician efficiency and first-time-fix rate.
- **Predictive Monitoring and Service:** Monitor connected products and assets for threshold anomalies with predictive analytics and provide real-time alerts to move from reactive to condition-based maintenance and increase service levels.
- **Remote Service:** Enable remote access and service including remote software updates to increase product and asset uptime and reduce on site service calls.

CASE STUDY | ELEKTA

Elekta, the global medical technology provider for treatment of cancer and brain disorders, unveiled a Connected Field Service program streamlined with digital twins of its customers' deployed equipment to improve customer experience and increase service revenue.

Value Metrics:

- Increased equipment uptime and resolved 20% of service issues without dispatching a technician.
- Improved customer satisfaction with uninterrupted treatments for more than 14,000 patients in the program's first year.
- Improved business agility by optimizing service delivery network and processes.



EXPLORE THE POSSIBILITIES

There are myriad opportunities to capitalize on the new capabilities of digital twins across multiple functions in the industrial enterprise. Getting started can be challenging as data initiatives around machines, processes, and environments can exist in discrete and siloes. Driving digital transformation requires having unified strategies and frameworks in place that break down siloes and combine multiple sources of data for greater efficiency and unlock higher order insights.

Digital twin is one such type of initiative or framework to help orient disparate resources toward these unified goals. But to bring these concepts to fruition, enterprises need to identify a business pain point, assemble cross-functional stakeholders, and identify a digital mission for the twin. From there, organizations need strong partners that understand challenges, such as creating the data uniformity necessary for a twin to function, or the cultural barriers to adoption. They also need technology that shortens the time to pilot and provides the necessary simulation and analytics capabilities to create value from the digital twin.

At PTC, our mission is to help industrial enterprises unlock the value now being created at the convergence of the physical and digital worlds. With PTC, global manufacturers and an ecosystem of partners and developers can capitalize on this promise of physical-digital convergence today and drive the future of innovation.

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