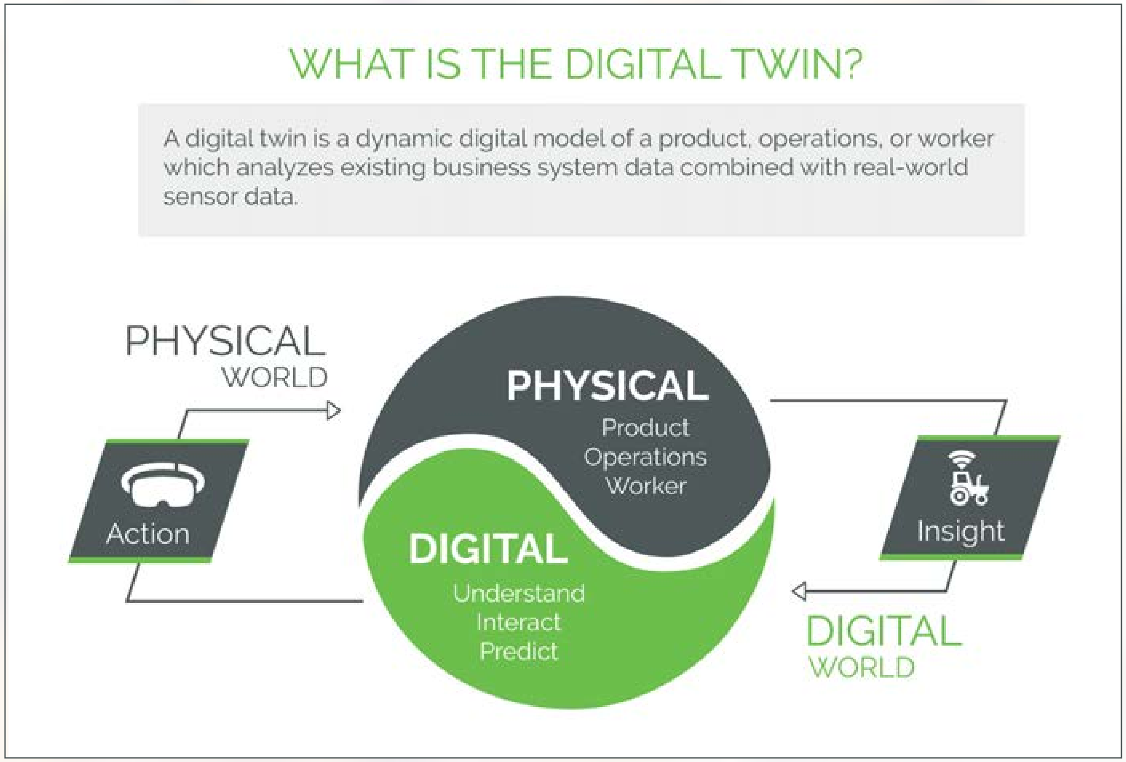
Top Use Cases for **Digital Twin Technology** to Drive Digital Transformation

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, and the time is right to assemble these digital twin models and reap the value of the vast quantities of new data available today.



USE CASES ACROSS THE VALUE CHAIN

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 from not only the designers of smart, connected products, but the users: at the product, operations, and workers levels. 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 deployed across the value chain for industrial enterprises.

This digital twin use case eBook explores the developing opportunities with real-world case studies in industrial markets.

ENGINEERING

CONNECTED CLOSED-LOOP ENGINEERING

Digital twins analyze real-world product usage and condition data with models and predictive analytics for automated root cause analysis, informed design requirements, product portfolio optimization, and to enable data-driven closed loop lifecycle management.

KEY OUTCOMES

- **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.

- **Constant Analysis:** Detect, analyze, and resolve issues for customers by continuously analyzing the as-designed versus as-used data.

- **Outcome-Based Design:** Usage and product simulation data provide engineers and business leaders with the insight required to create high-quality future products and value-added service offerings.

CASE STUDY | WHIRLPOOL

Whirlpool uses rapid, cross-functional learning loops to test out different low-fidelity prototypes – and weed out the weaker concepts – with only a light investment.

Digital twin minimizes the time it takes to validate a new concept – increasing the speed of innovation and introduction of new products to the field.

Value Metrics

- **Knocking down product and servicing data silos prevalent across Whirlpool's 70,000 global employees and 66 facilities.**
- **Reducing product development costs through closed-loop engineering.**
- **Improving deployed product servicing with lower time searching for documentation and real-world connected product sensor and customer usage data.**

OPERATIONS

CONNECTED OPERATIONAL INTELLIGENCE

Digital twins combine, analyze, and deliver real-world insights from disparate machines, processes, and other operational inputs together with enterprise systems to create unified real-time visibility of KPIs. They also apply predictive analysis for increased operational performance and improved decision making.

KEY OUTCOMES

- **Digital Thread:** Access engineering data to deploy manufacturing process improvements and develop quality plans centered around as-designed product information.
- **Predictive Analytics:** Apply predictive analytics and simulation to asset and production health through real-time monitoring and simulation.
- **Synchronized Operations:** Implement consistent KPIs and corporate-wide performance benchmarking to synchronize resources to ensure flawless execution of production.

CASE STUDY | AACHEN UNIVERSITY'S ELAB

The battery accounts for 40% of the value chain in electric vehicles (EVs), but nascent battery technology has also created a significant bottleneck in EV adoption due to high energy needs of vehicles.

Aachen University's eLAB is improving its operational efficiency to drive down energy costs through the use of a digital twin of its battery production lines.

Value Metrics:

- Lower energy costs in production.
- Improved Overall Equipment Efficiency (OEE) (availability, quality, performance).
- Reduced prototype testing and greater operational agility.

eLAB
ELEKTROMOBILITÄTSLABOR

MAINTENANCE & SERVICE

PREDICTIVE MONITORING & REMOTE SERVICE

Digital twins can monitor and manage remote connected assets and products with predictive analytics using anomaly detection, diagnostics, historical and business system data to improve the productivity and effectiveness of service workers and processes.

KEY OUTCOMES

- **Service and Maintenance Visibility:** Consolidate enterprise-wide service data into role-based views that combine service history with technician service workforce location and parts availability data to optimize service and maintenance network and delivery processes.

- **Predictive Service:** Proactively identify machine service and maintenance needs by analyzing historical machine service patterns against real-time machine data to deliver new service models and offerings.

- **Customer Outcome-as-a-Service:** Deliver service contracts based on the use, availability, or outcome of machines. Improve customer experience by simulating and orchestrating product behaviors and service experiences remotely.

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.

Contact an IIoT Expert Today.

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