



Digital Twin: A Foundation for a Secure, Intelligent and Connected Enterprise

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DIGITAL TWIN – THE HEAT, THE NOISE AND THE MYTHS

Digital twin technology has generated a remarkable amount of attention in the past few years. A simple Google search on digital twin gives over 2.4 billion results! What was once considered as a “nice to have” initiative by R&D departments is now fast becoming a “must have” initiative with a wider scope in the context of a connected enterprise. There are new digital twin standards emerging such as [National Institute of Standards and Technology \(NIST\)](#), [Digital Twin Consortium](#) and [International Organization for Standardization \(ISO\)](#). Some industrial players are investing heavily to drive standardization efforts on their own.

Definitions for digital twin abound. For example, the Digital Twin Consortium defines a digital twin as “a virtual representation of real-world machines and processes, synchronized at a specified frequency and fidelity.”

But no matter which definition or standard appeals you, when there is heat and noise, there are bound to be myths surrounding it. Here are a few of the most common myths we hear about digital twin technology:

- Digital twin is an off-the-shelf and plug-n-play technology; I will cross this bridge when I get there.
- Digital twin is only for Aerospace and asset-heavy industries, and I don’t have to worry about it for the next five years.
- Digital twin is only for engineering and can be implemented for new product design/ greenfield applications.
- If I simply update my PLM system, I can reap the benefits of a digital twin technology.
- We have a Data Lake project running, let’s rename it “digital twin” and reap the benefits.
- Digital twin is the same as model-based systems engineering (MBSE).

What Is the Promise of Digital Twin in Today’s Market?

No matter the industry, most organizations are aiming to take the lead in a “secure, intelligent and connected economy.” In this economy, [the future of product development/engineering, manufacturing, supply chain and aftermarket systems](#) hinges on companies’ abilities to build and exploit information models. With IIoT and real-time analytics, we have a wide range of adaptive machines and systems capable of automatically transmitting information about their status, performance and usage. This can create new levels of operational and strategic business value with real-time data that feeds decision-making across the organization. It is here that digital twin technology becomes an absolute game changer. The pandemic has only accelerated the awareness of and the interest in investing in a holistic digital twin program.

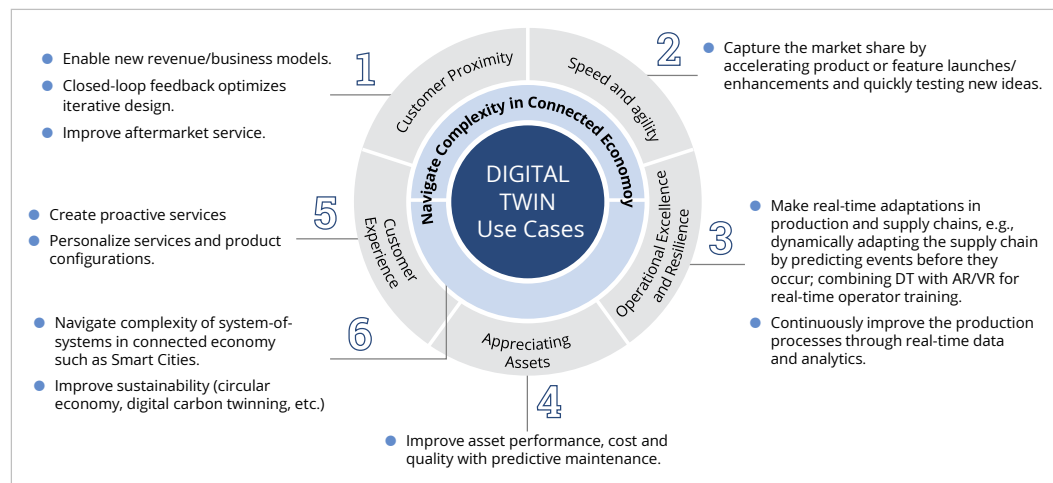
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Which Are Early-adoption Digital Twin Successes?

Business value for digital twin implementations can be found across the end-to-end business value chain of plan-build-operate-maintain. The benefits typically revolve around new business models, faster product launches and operational efficiency and resiliency.

Most digital twin use cases fall into one of the following six categories.

Figure 1: Digital Twin Use Cases



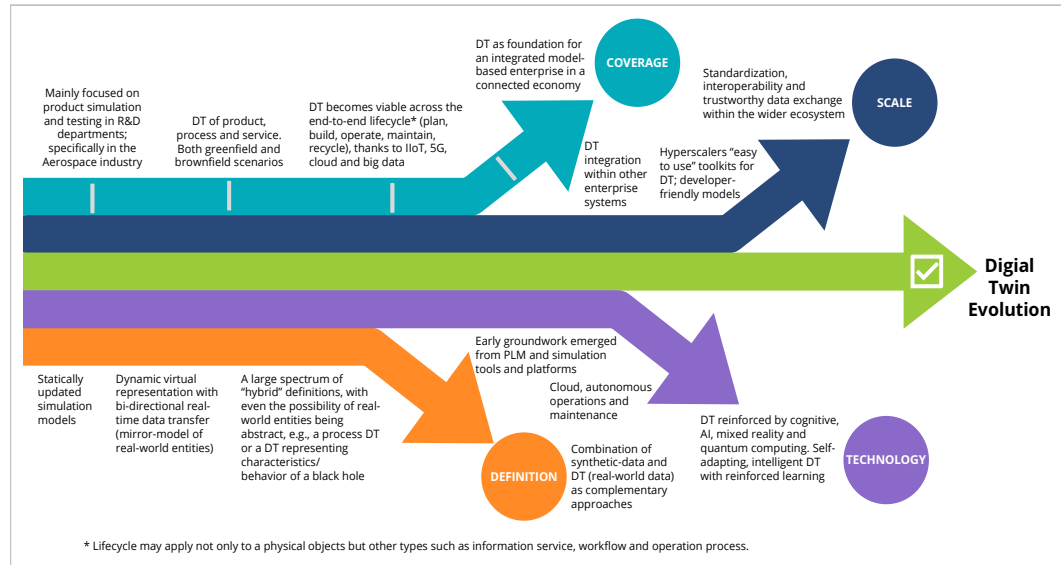
Source: ISG

How Is Digital Twin Technology Evolving?

We see digital twin technology evolving across four dimensions: coverage, definition, technology and scalability.

- 1. Digital twin coverage** has expanded from cradle to grave, infusing the full lifecycle of a product from inception across the product's value chain.
- 2. Digital twin definitions** have evolved by swinging from basic to esoteric and then to more practical and "hybrid" definitions in between.
- 3. Digital twin scalability** is expanding from a focus on increasing functionality to encompass increasing integration, interoperability and data exchange within the ecosystem.
- 4. Digital twin technology** has evolved from on-prem simulation tools to combine the power of digital twin functionality with cloud/big data, cognitive, AI and mixed AR-VR reality.

Figure 2: Digital Twin Evolution



Source: ISG

A digital twin maturity assessment can offer a multi-pronged look at a company's a) value-based strategy, b) architecture, technology and tools, c) data and models, and d) organizational and ecosystem aspects.

The Three Pillars of a Successful Digital Twin Program

To ensure your digital twin initiatives achieve business outcomes, we suggest building three essential pillars

1. Identify the value proposition of the digital twin initiative

This is a cornerstone of your digital twin program, as it affects the subsequent components. It is often neglected in many organizations, especially in environments where digital twin applications have proliferated from the "bottom up."

Typical blind spots in achieving this goal include:

- Missing a wider stakeholder alignment on business value.
- Failing to identify which processes and workflows are affected; which new roles, skills and governance mechanism are needed to track the progress/value realization.
- Identifying and involving too late external partners that can provide solutions regarding data collection, storage, analysis and the software and platforms for data management.



Recommendation: Whether you are addressing greenfield or brownfield scenarios, start by focusing on three to four use cases in which businesses and customers would appreciate the value, and build a “minimum viable digital twin.” This allows an incremental approach by demonstrating the benefits and thus delighting stakeholders and continuously improving. Involving players in the ecosystem early in the solution design is critical here.

2. Address the Magic Trio Upfront and Create a Stage for Continuous Deployment

Digital twins combine data, connectivity and processing. It’s critical to address this trio upfront at the solution design stage.

Typical blind spots include:

- Neglecting the data diversity, integration and privacy/cybersecurity issues that can pose critical challenges.
- Locking the solution early with little-to-no room for a continuously evolving digital twin solution.

Recommendation: A common approach is to **standardize the data structure and communication layers to tie diverse data** across IT, operational technology (OT), engineering technology (ET) and consumer technology (CT). A unified, developer-friendly data model is the backbone of all digital twin implementations. For cybersecurity, in addition to deploying internal safeguards, be sure to assess what security responsibility the partners are owning and ensure the digital twin implementation will not endanger enterprise systems.

Another critical step is to establish a mechanism for continuously updating the high-fidelity digital twin model from the beginning. In scenarios in which knowledge of the digital twin deployment environment is unknown, you want an incremental approach to improve digital twin maturity, as more real-world data is integrated into it.

3. Enable a Connected Organization and Ecosystem

Digital twin technology can be a game-changer in today’s secured, intelligent, connected economy. It does so by creating value for end users and finding business models that allow profit-making for various ecosystem players.

A typical blind spot here is the lack of a standardized and proven mechanism for secure data-sharing across ecosystem players, including companies, customers, suppliers and contractors. While digital twin standards are emerging, the required pull/acceptance from the end-users and markets will determine which standards bring business value. Companies tend to make the mistake of getting engineers and data scientists into a room, focusing on digital twin standards and protocols and then writing custom code.



Recommendation: While exploring emerging innovative and sometimes open-source technological solutions in the market can be helpful, especially in the data management and integration space, the integration platforms need to go one level deeper. Work to unify and automate the integration process to make it future-proof. Results here are made better by trying to make the least possible number of assumptions about the evolving use cases in the secure, intelligent, connected economy. Don't forget that it requires fundamental change management to break up siloes within the organization and beyond, in the ecosystem, to impart new skills, processes and governance required for digital twin deployments.

Most organizations we speak to are dabbling in digital twin initiatives in some shape or form and have experienced the first taste of success. However, the ability to implement digital twin technology on a large scale is still at a nascent stage. This is not just because of the technological advances but because business value from digital twin initiatives is realized only with changes on the organizational and ecosystem levels as well.

ISG helps enterprises assess, design and source for digital twin capability. Contact us to find out how we can help you.

ABOUT THE AUTHOR

Digital Twin: A Foundation for a Secure, Intelligent and Connected Enterprise



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Gaurav has more than 2 decades of experience focused on complex, transformational change across key industries, including Manufacturing, CPG, Energy, Utilities and Lifesciences and has held leading positions driving the change agenda. His experience in establishing business transformation tenets early stage, allow him to envision and define an end state strategy which can be operationalized.

As an ISG Partner, leading the Digital Engineering advisory, towards transformation programs which increasingly are assuming the shape of “Engineering led Digital transformation”, he will focus on building on the strong enterprise advisory & sourcing platform that ISG has and extend it towards the business-driven priorities. Gaurav and his team support both our Industry/Verticals and regions towards our direct-to-client models, including onshore and offshore resources.



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Digital Twin: A Foundation for a Secure, Intelligent and Connected Enterprise



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As an advisor at ISG's Smart Manufacturing practice, Vishnu helps enterprises to drive "full-stack" IoT transformation, bridging IT and OT worlds and covering business, technology and ecosystem aspects. This includes custom market research, collaborative solution shaping & service design, ecosystem development and designing new "operating model" for the software-driven world.





RELEVANT ARTICLES

The Arrival of Digital Engineering: Megatrends Driving Engineering Services

Digital engineering has gone beyond the engineering department to enable new business models, deliver superior customer experiences and realize operational efficiencies.

We see this trend cutting across multiple industries. John Deere, the tractor company, has launched what is essentially a software business. Schindler and KONE have gone beyond elevator manufacturing to sell mobility solutions. Bosch no longer just makes appliances; it taps into IoT, monitoring and analytics tools. Verizon doesn't just sell "network pipes" but offers additional services to enable a connected enterprise. A Tier-1 aerospace company no longer sells only landing gear or braking systems; it sells numbers of landings.

Engineering has become a means to a converged digital transformation across multiple domains of an enterprise. What should organizations do next to seize such opportunities?

Read the Article: [The Arrival of Digital Engineering](#)

Digital Product IT: A New Responsibility for Manufacturers on the IoT Journey

As manufacturing companies become digital enterprises, their capabilities typically mature, moving from traditional stand-alone products, to connected products, to products or offerings packaged "as a service." With the help of digital technologies like the internet of things (IoT), cloud and edge computing and advanced data analytics, enterprises are improving their business operations and creating new digital products and services to drive new business models. Manufacturing enterprises know they must take advantage of emerging technologies like IoT, but some are still struggling to find and capture the value IoT offers. In fact, many manufacturing organizations trying to apply IoT are stuck in the early phase, still trying to align their business, technology and partner ecosystems.

This ISG paper focuses mainly on the need for such a function or responsibility, which is based on the key challenges in each of the above three aspects. The modality for structuring this function in the manufacturing enterprise varies from organization to organization.

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ISG (Information Services Group) (Nasdaq: **III**) is a leading global technology research and advisory firm. A trusted business partner to more than 800 clients, including more than 75 of the top 100 enterprises in the world, ISG is committed to helping corporations, public sector organizations, and service and technology providers achieve operational excellence and faster growth. The firm specializes in digital transformation services, including automation, cloud and data analytics; sourcing advisory; managed governance and risk services; network carrier services; strategy and operations design; change management; market intelligence and technology research and analysis. Founded in 2006, and based in Stamford, Conn., ISG employs more than 1,300 digital-ready professionals operating in more than 20 countries—a global team known for its innovative thinking, market influence, deep industry and technology expertise, and world-class research and analytical capabilities based on the industry's most comprehensive marketplace data. For more information, www.isg-one.com.

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