

# Virtual Twin Experiences: Virtual Drives Real | Real Drives Virtual

## Supporting Continuous Innovation

### Key Takeaways

Global competitive pressures and dynamic customer and stakeholder requirements demand that companies be “right first time” with products and related services.

Modeling and simulation provide a useful basis for collaboratively testing new products, manufacturing and support processes, and business arrangements to ensure rapid success.

Digital and virtual twins have proven their worth and their potential applications are endless.

Virtual Twin Experiences enabled by Dassault Systèmes **3DEXPERIENCE** business platform and its application portfolio can help their clients experiment in the virtual world to predict performance and business results in the real world and use real world data to power innovation in the virtual world.

### Introduction

Manufacturers today face a range of daunting challenges. Product complexity continues to grow with smart, connected products being the norm in most product markets. Supply chain disruptions wreaked havoc during the pandemic and markets are just now recovering. Selling globally means competing locally, increasing competitive pressure overall. It also means complying with local consumer preferences as well as evolving local regulatory requirements. This ramps up time, cost, and quality pressures to meet these new requirements.<sup>1</sup>

At the same time, while the global movement toward sustainability is being driven by general guidelines such as the United Nations Sustainable Development Goals (UN SDG), this same set of goals has very different impacts and requirements in each market that ideally must be understood before market entry. For example, in some parts of the world the notion of the circular economy has taken hold, with governments and individual companies setting aggressive circular requirements, goals, and regulations. Companies are also being pushed on sustainability by their customers, value chain partners, and employees, all key stakeholders who are difficult to ignore. Optimizing products and value chains for sustainability almost demands a modeling and simulation approach.

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The need to assess the real-world performance of products and services as early as possible in the product lifecycle has never been stronger. To understand the impacts of product, process, and business decisions earlier and earlier in the product lifecycle companies are increasingly turning to modeling and simulation. While this is often physics-based, it can take many forms, including leveraging business software to run “what-if” scenarios to test alternative business processes and product concepts. As a result, modeling and simulation is becoming more central across the product lifecycle and business/value chain functions. Supporting these broader data requirements means that enabling platforms must support integration with a broad range of engineering and business applications, including enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM), among others.

Virtual and testing of product concepts has a long lineage in engineering. The digital twin emerged from product design and engineering. CIMdata defines the digital twin as “a virtual representation (i.e., digital surrogate) of a physical asset or collection of physical assets (i.e., physical twin) that exploits data flow to/from the associated physical asset(s).” While the initial emphasis was on the virtual product, digital twins of product, process, and business can provide even more value. This has become essential with the advent of the Internet of Things (IoT)/Industrial IoT (IIoT), which can provide the real-time data to animate the various twins to support product, process, and business simulation.

Dassault Systèmes, an early leader in digital twin applications, is addressing these demanding requirements with Virtual Twin Experiences.

## Virtual Twin Experience

What is a virtual twin? A recent whitepaper by Accenture and Dassault Systèmes offered the following definition: “A virtual twin is a real-time virtual representation of a product, platform, or ecosystem that can be used to model, visualize, predict, and provide feedback on properties and performance. Virtual twin technologies provide an untapped opportunity to reduce operational costs and drive sustainable, circular, end-to-end disruption in value chains.”<sup>2</sup> Dassault Systèmes believes that their focus on supporting “what-if” scenarios in their model-based platform helps differentiate Virtual Twin Experiences from digital twin offerings from other solution providers.

To Dassault Systèmes, a focus on modeling and simulation in virtual twins ensures that science is driving product development. The virtual data created during innovation and real data from the field are critical to optimize decision-making. Their Virtual Twin Experiences are model- and data-driven offerings as shown in Figure 1 that leverage Dassault Systèmes’ considerable applications portfolio and data science capabilities and are delivered on the **3DEXPERIENCE** platform. This role-based platform is designed to deliver these capabilities across the value chain providing a consistent user experience. Delivering these capabilities on the cloud enables collaboration spanning the extended enterprise to include the widest possible range of stakeholders. Dassault Systèmes claims that their unified model-centric platform replaces the “patchform” of applications that many companies try to link to support their own virtual twin use cases.

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<sup>2</sup> Accenture (2021), “Designing Disruption: The critical role of virtual twins in accelerating sustainability”



**Figure 1—Virtual Twin Experiences:**  
**A Combination of Science, Real-World Evidence and Collaboration**  
*(Courtesy of Dassault Systèmes)*

Figure 1 shows the breadth and depth of the Dassault Systèmes vision to harmonize product, nature, and life with functional, logical, and physical models from broad-based mission engineering to molecular modeling to support drug and materials development. The company was the first to posit the importance of such modeling breadth and depth and, over time, has built out this vision using a combination of organic development, mergers and acquisitions, and strategic partnerships. Their strong focus on life sciences and nature is unique among their PLM competitors. Dassault Systèmes believes that they can bring the learnings from their strong position and experience in manufacturing to the life sciences. This approach has some value, particularly since their target industries lag their traditional manufacturing client base in digital technology adoption and deployment.

Dassault Systèmes Virtual Twin Experience spans a range of model-centric domains: product, production, and enterprise. Model-based systems engineering (MBSE) is core to the product domain which includes systems modeling and simulation, physical modeling and simulation, lifelike experience (virtual reality/augmented reality), and field operations feedback. The production domain's organizing principle is model-based manufacturing and includes systems and process modeling, physical modeling, process and physical simulation, lifelike experience, supply chain planning (leveraging their Quintiq and Ortems acquisitions), and operations execution feedback (leveraging Apriso). Virtual Twin Experiences combine all these domains under one platform, including:

- System modeling and simulation: System, functional and logical architecture, mechanical, electrical, electronics, mechatronics, embedded software, and controls.
- Physical modeling and simulation: Structural, fluid dynamics, acoustics, electromagnetics, thermal, crashworthiness and durability, and manufacturing processes such as injection molding and additive manufacturing.
- Production process modeling and simulation: Factory architecture, material and people flow, robot programming, NC programming, ergonomics, etc.
- Lifelike experiences: Immersive experiences like virtual and augmented reality, lifelike simulation, product demonstrations, virtual factory, maintenance review, etc.
- Field operations feedback: Collection of field data, data analytics, representation of data in appropriate contexts, pattern recognition, time series analysis, machine learning, correlation detection, and statistical analysis.
- Supply chain planning: Demand and workflow planning, logistics, production and fabrication scheduling, line balancing, and resource management.

- Operations feedback: Asset, line and production monitoring, maintenance management, in-process quality and non-conformance management, warehouse management, and resource analysis.

The enterprise domain leverages many long-available solutions, like project management, portfolio management, and requirements management. Their offering also includes newer functions like ideation management, materials compliance, risk management, and data security. Their enterprise data science and analytics capabilities span social data, business data, and product lifecycle data of various types to support cost management, sourcing, sustainability, quality, and other important topics. Dassault Systèmes broad portfolio of PLM-enabling solutions, as reflected in Figure 2, can support a wide range of Virtual Twin Experiences, depending on the needs of the customer.

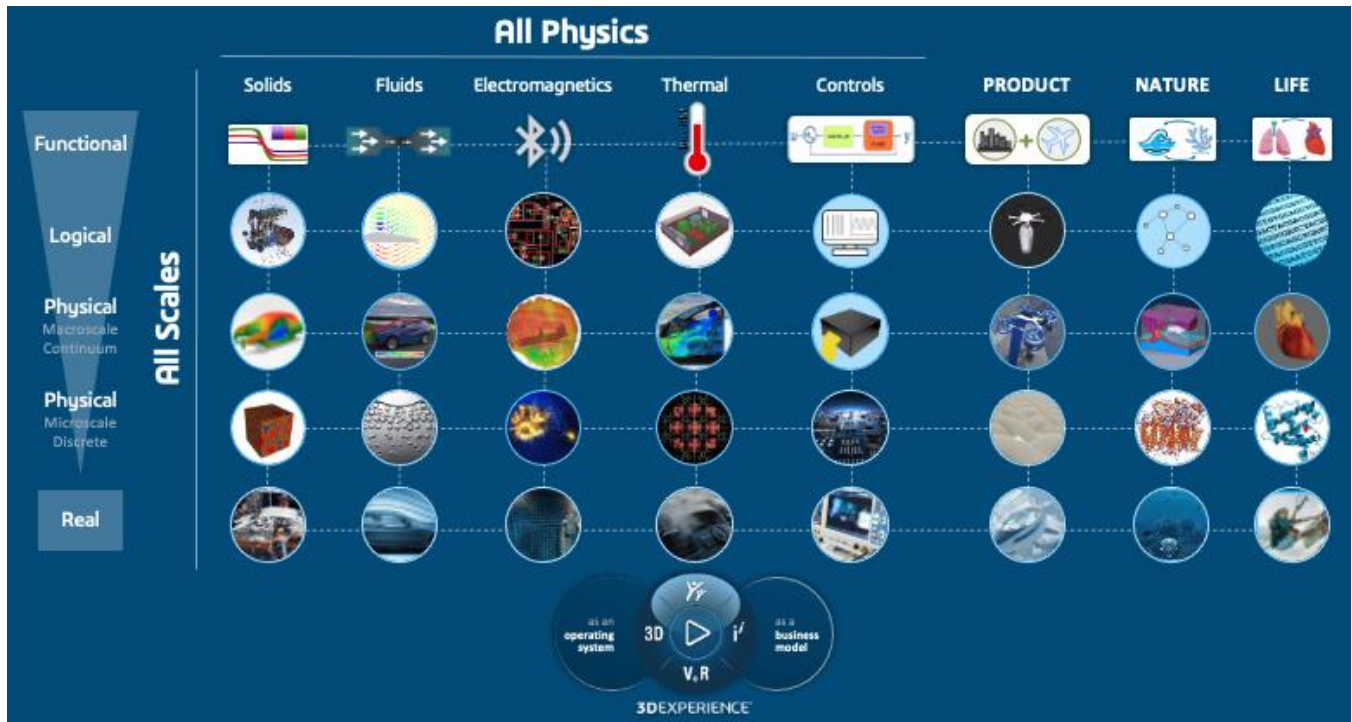


Figure 2—The 3DEXPERIENCE Platform:  
A Platform for Knowledge and Know-How  
(Courtesy of Dassault Systèmes)

The Dassault Systèmes **3DEXPERIENCE** platform is designed to house all of the relevant information in one place in a single, unified definition, simplifying collaboration across teams to support innovation and experimentation in a multi-scale, multi-discipline approach as shown in Figure 2. When deployed in a Software-as-a-Service (SaaS) environment Virtual Twin Experiences can more readily support extended enterprise collaboration on those twins. SaaS environments allow for seamless access for all users (anytime, anywhere, and on any device) with high availability. Leveraging cloud infrastructure makes it much easier to deliver these capabilities to far-flung value chain partners and remote customer sites to support real-world data capture and lifecycle collaboration.

As suggested in the commentary title, virtual drives real and data from the real should drive innovation defined in the virtual world, as shown in Figure 3. Companies innovate in the virtual world, often leveraging existing product information as part of new product definition. The products, their manufacturing and logistics processes, and their operational usage are modeled, simulated, and evaluated in the virtual world. These loops can help during product definition to support short-term corrective actions, avoiding issues that used to only become apparent later in the lifecycle. Once these products are realized and deployed, field data collected on usage will be combined with other product, production, and enterprise data and analyzed to support future innovation cycles.

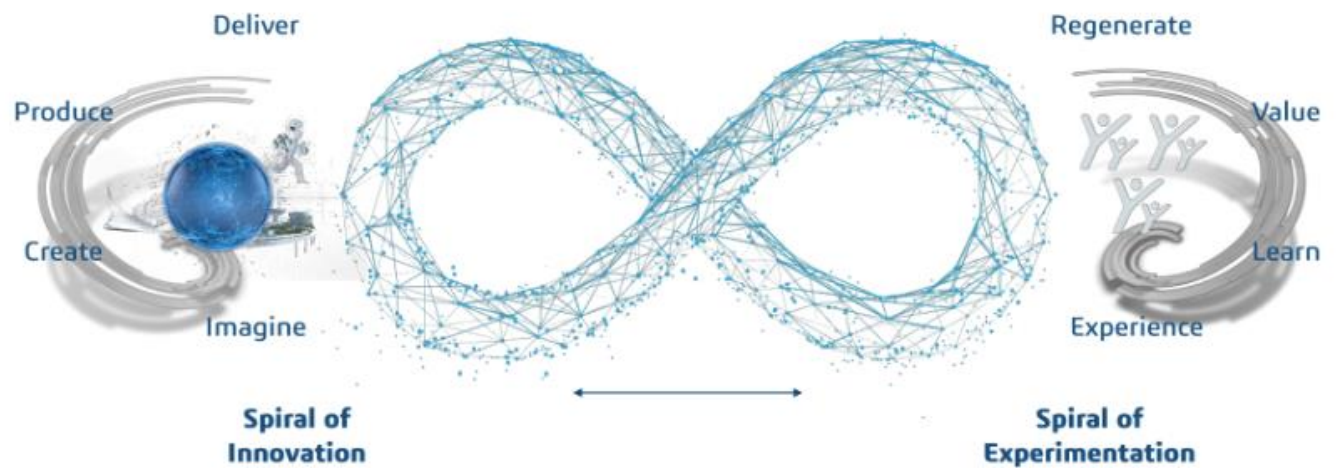


Figure 3—Virtual Twin Experience: A Holistic Approach  
(Courtesy of Dassault Systèmes)

Dassault Systèmes Virtual Twin Experiences can support use cases across their broad range of industries. Interstellar Lab, a French-American start-up, develops AI-enabled biofarming platforms which can be deployed on Earth and in space. Interstellar Lab uses the **3DEXPERIENCE** platform on the cloud to support its design and development processes. Interstellar Lab’s virtual twins focus on product development, but 3D models are the basis for their initial product twins, which will evolve to track changes in their real products. Interstellar Lab also sees virtual twins of their products as essential assets to support manufacturing, execution, operation, and maintenance.

csi entwicklungstechnik GmbH, a German automotive supplier, conducts Life Cycle Assessment (LCA) studies to better understand a product’s environmental impact throughout every lifecycle phase. The **3DEXPERIENCE** platform offers native LCA capabilities. Since environmental impacts are “designed-in” early in the product lifecycle, csi wanted to embed LCA into their design process, a great application for Virtual Twin Experiences. Digital simulations support rapid evaluation of different scenarios, without the need to build expensive prototypes. This will help csi’s automotive clients to enhance their sustainability strategy, while also helping them drive reduced production costs and time to market.

These are but a few examples but highlight the value that Virtual Twin Experiences can bring to customers in a wide range of industries.

## Conclusion

Digital twins are ubiquitous in many industries and are often enabled by many types of engineering and business solutions. There is a reason for that. The exploding complexity of ensuring success when bringing products and services to market almost demands modeling and simulating them as part of product and process development. As suggested in this commentary, these simulations can range far beyond just traditional computer-aided engineering. In addition, most companies also expect to leverage real-world data to animate their twins to support continuous innovation based on real-world experience. To support these critical needs, Dassault Systèmes offers Virtual Twin Experiences, model- and data-driven offerings that leverage their considerable applications portfolio and data science capabilities and are delivered on the **3DEXPERIENCE** platform. The breadth and depth of their modeling methods are impressive and can deliver real value to customers. CIMdata research over the last several years has shown the breadth and depth of industrial firms interest in digital twins and the introduction of these twin offerings seems to be well-timed to meet this growing market need. Early adopters are benefitting from their current offerings today and CIMdata eagerly awaits more success stories going forward.

## About CIMdata

CIMdata, a global strategic management consulting firm, provides services designed to maximize an enterprise's ability to design, deliver, and support innovative products and services. For more than forty years, CIMdata has provided industrial organizations, providers of digital technologies and services, and investment firms with world-class insight, expertise, and best-practice methods on a broad set of product lifecycle management (PLM) topics and the digital transformation they enable. CIMdata also offers research, subscription services, publications, and education through certificate programs and international conferences. To learn more, visit [www.CIMdata.com](http://www.CIMdata.com) or email [info@CIMdata.com](mailto:info@CIMdata.com).