

DIGITAL TWINS



WHAT IS A DIGITAL TWIN?

A digital twin (DT) is a virtual model of a physical object, process, system, or environment that looks and behaves identically to its real-world counterpart.

The twin uses real-time data sent from sensors on the counterpart to simulate its behavior and monitor operations. A digital twin can provide valuable insights into the counterpart's performance, maintenance needs, energy efficiency, and areas for potential improvements.



WHAT IS XR TECHNOLOGY?

XR (extended reality) technology encompasses spatial and immersive computing such as virtual, augmented, and mixed reality.



Virtual Reality (VR) VR fully occludes the user's view of their physical environment, replacing it with a virtual one.



Augmented Reality (AR) AR layers digital content onto the user's view of the real world, providing a composite view.



Mixed Reality (MR) MR blends augmented and virtual reality, allowing the user to experience simulated content within their physical space and to manipulate and interact with virtual elements in real time.

HOW ARE DIGITAL TWINS AND XR INTERCONNECTED?

XR provides an interactive 3D environment which facilitates intuitive, natural engagement with the digital twin. XR allows individuals to not just visualize, but also navigate, manipulate, and analyze the digital twin in a spatial context and in real-time. This can lead to deeper insights and more effective problem-solving.

DIGITAL TWINS IMPROVE PROBLEM-SOLVING & INCREASE EFFICIENCY



Decision-Making: By providing a comprehensive, real-time view of an asset, system, or environment, digital twins support more informed decision-making. Stakeholders can evaluate various scenarios and outcomes, leading to better strategic planning and risk management.



Operational and Energy Efficiency: Digital twins can optimize the operations of complex systems by providing insights into performance, identifying inefficiencies, and suggesting improvements. DTs can also increase energy efficiency. For example, [FRYER Battery and Siemens](#) are working together to develop a DT of the sustainable battery cell FRYER makes, as well as the facility that produces it. This model helps FRYER identify areas where energy consumption can be reduced during facility operations.



Cost Savings: Digital twins can help organizations identify and address operational problems before they occur, reducing downtime and maintenance costs. Digital twins also simulate how an asset or process performs under various conditions, thereby obviating the need for costly physical prototypes and expediting time-to-market.

DIGITAL TWINS ARE SUPPORTING KEY INDUSTRIES



Automotive: DTs are revolutionizing the way vehicles are designed and tested. [Volvo, for example, is using digital twins to test in-vehicle interfaces](#) to make sure they are optimally designed for comfort, accessibility, and safe use. In the realm of autonomous vehicles, automakers are using digital twin technology to leverage vast quantities of self-driving car test data to simulate complex scenarios and hazardous conditions like traffic accidents and inclement weather.



Infrastructure: [DTs support urban planning](#) by providing dynamic, detailed simulations of an environment to help professionals evaluate the impact of proposals before they are implemented. For example, DTs can help to inform decisions about traffic management and public transportation; maintain the electric grid; and improve public services through predictive analytics and real-time data.



Logistics: [DTs enable real-time monitoring and management of supply chains](#) from start to finish, providing a detailed virtual representation of logistics operations to optimize routes, reduce downtime, and foresee potential disruptions.



Manufacturing: Across the manufacturing sector, DTs are being integrated to transform the product lifecycle from design, to assembly, to maintenance, and also to train operators. For example, [Accenture and Mars Inc.](#) are using DTs to simulate new manufacturing processes before allocating time and resources in the physical factory. The use of digital twins has also helped Mars to spot problems such as package over-filling and identifying machines that need repair.

ABOUT THE XR ASSOCIATION

The XR Association promotes the dynamic growth of the XR industry. We convene and educate policymakers, thought leaders, researchers, developers, civil society, and the public on XR's infinite potential and serve as the premiere resource for anyone interested in learning about the applications of immersive technologies. Our member companies are united in our mission to champion the responsible development and thoughtful advancement of XR solutions that foster positive societal outcomes.