UPTAKE

Demystifying a Digital Twin for Agile Process Manufacturing

Business demands have forced manufacturers to be more agile. Smart manufacturers are adopting technology, specifically digital twins, to move faster. Using a digital twin in a manufacturing environment can fast-track discovering bottlenecks, drive efficiencies, lower costs, reduce environmental footprint, and help manage risk.

However, there is mystery around digital twins, from defining what they are and their strengths to the critical importance of an ecosystem approach to address the diversity of digital twin scenarios. The goal of this paper is to demystify digital twins, so more manufacturers can apply the technology and bring agility to their operations.

WATCH THE WEBINAR RECORDING, DEMYSTIFYING A DIGITAL TWIN FOR AGILE PROCESS MANUFACTURING, PRESENTED BY UPTAKE AND MICROSOFT.

What is a Digital Twin?

This definition of a digital twin comes from the Digital Twin Consortium:

"A digital twin is a virtual representation of real-world entities and processes, synchronized at a specific frequency and fidelity."

In short, what exists in the real world like an assembly line is represented in a digital world. Both worlds are tethered so that data can flow, and the worlds mirror each other. Digital twins use real-time and historical data to represent past and present, as well as simulate predicted futures.

Data drives the makeup of the digital twin. Many organizations use 3D models, but it's not for everyone. A manager may require a digital twin expressed as a dashboard, while an operator will need an interface fit for a factory floor.

According to the Digital Twin Consortium, "digital twins can be tailored to use cases; they're powered by integration, built on data, guided by domain knowledge, and implemented in IT/OT systems."

The potential of digital twins is endless. They can transform operations, accelerate a holistic understanding of an entire entity or process, drive optimal decision-making due to test-run scenarios, and result in proactive action. Once it works digitally, the decision will more likely generate the same result in reality.

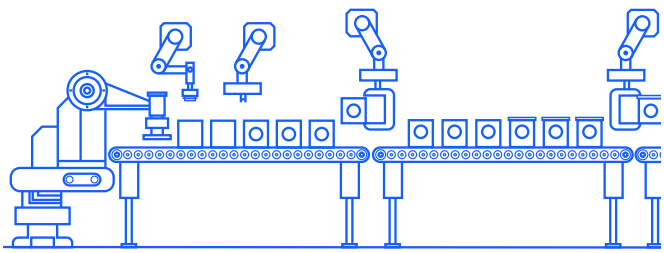
The main driver of digital twins is outcomes. They work best when serving business needs like advancing operations, transforming the workforce, and reducing carbon footprint.

Challenge: Multiple Use Cases, Single Canonical Data Model

Manufacturers typically have multiple use cases with complex tasks. As if the challenge wasn't hard enough, it's compounded by feeding the many use cases into one canonical data model.

Uptake Fusion addresses this challenge by thin slicing the use cases, allowing the canonical data model to fit specific uses and/or required industry standards such as ISO 22400, which defines key performance indicators (KPIs) used in manufacturing operations management. Or, ISO 50000, a standard for establishing, implementing, maintaining, and improving an energy management system.

It's a more ecosystem approach, enabling the manufacturer to grow using a crawl-to-run method with a much higher likelihood of success. As more canonical data models are built, the result is having a diversity of lenses or perspectives of the assets that, over time, improve the digital twin's visual representation. It's true regardless of how the data comes in, 3D, a dashboard, HMI, VR/AR, whatever the stakeholder requires.



Asset Performance Management — The Core of Digital Twins

As a virtual representation of the physical world, digital twins must respond to real-life challenges of the physical assets. Improvements in asset performance is a core use case. Across the manufacturing value chain, there may be opportunities to do more with the data collected using Uptake's asset performance management and advanced industrial analytics.

Analyzing data (time-series, real-time, and transactional) unified in a data lake environment by Fusion can produce insights into shop floor operations. Technicians can put insights to work, improving product quality, addressing production processes, measuring environmental impact, understanding yield losses, identifying risks on asset reliability, or any number of other initiatives.

By leveraging data for insights, you can also infuse your manufacturing plant's preventive maintenance program with predictive capabilities. The result is improved asset reliability (up to a 15% increase), fewer assembly line interruptions, and lower maintenance expenses (10-15%).

Uptake's Asset Strategy Library® (ASL®) can be a key accelerator of digital twins. ASL is the largest database in the world of industrial equipment types, failure modes, and maintenance strategies. As part of an ecosystem approach with Microsoft® as an enabler, manufacturers can use ASL data to accelerate the development of digital canonical models that represent assets under management. Between ASL, asset performance management, and advanced industrial analytics supported by data science, manufacturers can improve predictability and scenario analysis to the degree that it optimizes capital and operational expenses and mitigates risk from asset failures.

Digital twins' keys to success

Only sharing the promises of digital twins would ignore the perils. There are also keys to success. Here, we'll document both.

BEWARE OF PLATFORM SOLUTIONS

No single platform can serve the digital twin needs of a manufacturer. The era we're in now demands flexibility, which means assembling the best components per use case. The trick is to ensure that these components promote integration with Open APIs.

CLEANSE AND CATALOG DATA

Digital twin data comes in different types and from multiple sources. It's time-series, transactional, structured, or unstructured data. It comes from a historian, a control system, smart sensors, enterprise systems, or external sources. All that disparate data needs to be cleansed and organized.

UNIFY DATA IN THE CLOUD FOR USER ACTIONS

Unifying data in the cloud provides scalability to support new user interactions from 3D engineering tools to geospatial environments that improve logistics. Other use cases: augmented reality environments that enhance workforce connectivity and collaboration and better input of asset behaviors in operator human-machine interfaces (HMI).

PURSUE FOR BUSINESS, NOT JUST FOR INNOVATION

A digital twin excels when serving business needs. However, being viewed as a shiny object for a digital transformation program can result in wasted spending.

KEEP CURRENT WITH AGING ASSETS AND MAINTENANCE PERFORMED

Assets degrade over time and require ongoing maintenance. Whether a repair, revamp, or replacement, your digital twin must keep up with asset lifecycle changes.

Uptake for Industrial Intelligence

For process manufacturers seeking agility, digital twins that apply the digital world to reality on the shop floor can help, all while solving business problems. Having asset data unified in a cloud environment also opens the door to advanced analytics that enables asset performance management and fuels industrial analytics.

It's all about industrial intelligence, which encompasses digital twins and other strategies for knowing and caring for machines in real and digital worlds.

To learn more about unifying data in the cloud for digital twins and asset performance management, email Fusion@Uptake.com