Your digital twin is only as good as your documents

Driving innovation

assai

Introduction

You are investing in a digital twin: 2D and 3D visualizations of your assets, real-time monitoring, smarter operations. The technology is compelling. But there is a layer most organizations overlook only discover when their digital twin starts producing results that do not match reality. That layer is the document management system underneath it all.

Since 1996, Assai has helped asset-heavy industries manage the documents and data their operations depend on. Our DMS is the connective tissue between your people, your documents, and your digital twin. It ensures every decision is grounded in accurate, up-to-date information. Without it, even the most sophisticated digital twin is only as good as the data feeding it.

The digital twin revolution

The journey of the digital twin is a story of technological transformation. Although it seems like a modern marvel, its origins can be traced back over half a century to the Apollo missions, where NASA relied on physical duplication to monitor and troubleshoot space operations from Earth.

This early mirroring technique laid the foundation for what would become a digital revolution. As the decades passed, the concept matured with the rise of computer-aided design (CAD) and simulation technologies,enabling engineers to create virtual models of products and processes.

In 2002, the digital twin was formalized as a conceptual model, marking a significant milestone in its evolution. The 2010s saw its transformation from static simulation to a dynamic, real-time model driven by data and integrated with modern systems like the Internet of Things (IoT). This change allowed industries to optimize processes, predict outcomes, and make better decisions. By the time the 2020s arrived, digital twins had reached unprecedented levels of sophistication. With the help of AI, 5G, and machine learning, they became integral to predictive and autonomous systems across numerous sectors, including energy, manufacturing, and construction.

Next big thing

Digital twins have revolutionized industries by bridging the gap between the digital and physical worlds. They allow businesses to simulate, analyze, and optimize operations in real-time, providing a virtual mirror to real-world assets. In industries like energy and construction, the technology is regarded as the next big thing, unlocking new levels of efficiency and decision-making power. The real-time insights provided by digital twins help companies monitor performance, anticipate maintenance needs, and even test new strategies without risking physical assets.

The technology has evolved into varying levels of complexity, each designed for specific operational needs, but together, they form a comprehensive system that optimizes performance at every level. Whether tracking the health of a single asset or simulating entire processes, digital twins are shaping the future of industry, driving both technological and operational innovation across the globe.

Exploring the types of digital twins

Digital twins come in a variety of forms, each serving a unique purpose. While you may already know what you need, it's worth taking a moment to explore the four main categories: component twins, asset twins, system twins, and process twins. Let's have a look.

Component Twins

Component twins, often referred to as parts twins, are the most basic form. They represent individual elements within a system, like sensors or valves. These digital replicas allow engineers to track performance, simulate real-time conditions, and predict maintenance needs. By monitoring small but crucial parts, businesses can prevent larger issues down the line. For example, a component twin of a machine's motor could help identify early signs of wear and tear, allowing for proactive repairs before failure occurs.

Asset Twins

Moving up a level, asset twins, or product twins, combine data from several component twins to create a digital model of a more complex asset, such as an engine or a piece of industrial equipment. Asset twins help companies analyze how parts work together, improving overall asset performance. With insights into efficiency, maintenance needs, and potential issues, businesses can optimize metrics like downtime and repair time, ultimately reducing costs and increasing productivity.

System Twins

System twins, also called unit twins, take things further by integrating multiple asset twins to represent an entire functional unit within a facility, like a production line or power grid. By modeling these systems digitally, managers can test different configurations, explore new operational strategies, and identify ways to boost efficiency. This level of insight helps ensure that different assets within a system are working together smoothly, reducing bottlenecks and improving output.

Process Twins

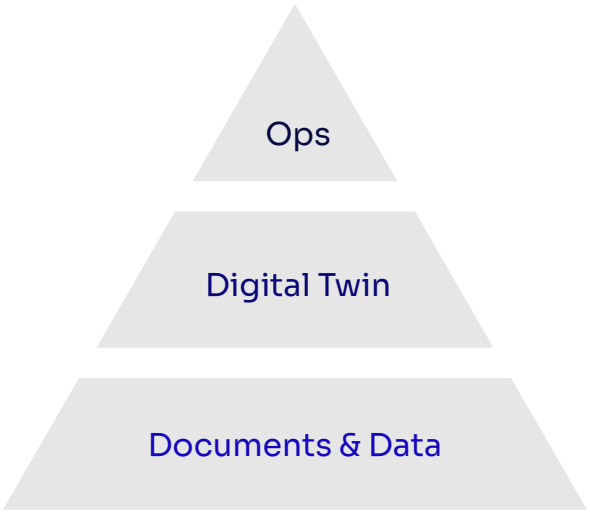
At the highest level are process twins, which pull together multiple system twins to provide a full view of operations across a facility or even an entire organization. Process twins allow companies to track and optimize workflows, ensuring that all systems are synchronized and working in harmony. With this technology, businesses can model the impact of changes — such as adjusting inputs or introducing new processes — without disrupting real-world operations. This makes process twins especially valuable for long-term strategic planning and process optimization.

Whether monitoring a single part or an entire process, digital twins are transforming how businesses operate. By creating virtual counterparts to real-world systems, companies can predict maintenance needs, streamline operations, and test new strategies in a risk-free digital environment. This dynamic technology is helping organizations become safer, smarter, and greener, driving efficiency, profitability, and sustainability in ways that were previously unimaginable.

Why a solid DMS is necessary for digital twin construction

A Digital Twin draws from many data sources: sensor feeds, IoT systems, ERP data, and operational records. But one source is foundational and often underestimated: the document layer. P&IDs, inspection records, equipment datasheets, maintenance logs. Without a structured system managing these, the rest of the twin is built on unstable ground.

Assai acts as that system. Every document is version-controlled, tagged to the relevant asset, and accessible in real time. Your digital twin always reflects the current state of your physical facility, not last month's snapshot. Whether you are working with Kongsberg Digital, Aveva, or another Digital Twin platform, Assai connects directly — keeping your document layer synchronized with your asset layer at all times.



Revision control
When a valve is replaced or a design spec is updated, Assai ensures the new revision is the only version in play. No stale documents. No team working from different versions. The digital twin pulls from a single, authoritative source at all times.

Enhanced collaboration
Assai enhances collaboration and workflow automation by ensuring efficient document routing for review, approval, or updates. In complex projects, it keeps all stakeholders aligned. Additionally, Assai ensures compliance and security for sensitive documents, which is crucial in regulated industries like energy, chemicals, mining, and construction.

Information retrieval

Teams can quickly access the right documents, enabling prompt responses to real-time events. Assai also supports the long-term storage of historical data, vital for predictive maintenance and lifecycle management of the digital twin.

Cloud-based

Cloud is now the baseline, not the differentiator. What matters is what the platform does on top of it. Assai runs on modern, high-performance cloud infrastructure built for integration: connecting directly with digital twin platforms, ERP systems, and operational tools through robust APIs. Your document layer does not sit alongside your operations. It is wired into them.

Key benefits of an advanced DMS

1. Enhanced document management

Your digital twin always reflects reality
Assai's automatic tag-document linking means that when a technician clicks on a pump in the digital twin, they see the current datasheet, the latest inspection report, and every related drawing. No manual syncing. No hunting across systems.

No more 'which version is current?'
Every document revision in Assai is logged, approved through a controlled workflow, and pushed automatically to the digital twin. Your operations team works from one version of the truth. Always the latest, always approved.

One login, everything accessible
Assai integrates with SAML-based SSO, so your team accesses documents through the digital twin using the same credentials they use for everything else. Less friction, tighter security, faster response when it matters.

2. Optimized asset management

Precise asset item updates
Utilize Assai to create or update asset items like tags, maintaining data accuracy and completeness across your digital twin.

Streamlined asset hierarchies
Efficiently manage parent-child relations between asset items for precise hierarchy representation and organization.

Automatic syncing
Establish document-to-tag relations in Assai or allow the Digital Twin application to scrape and return these relations. Automatic syncing ensures seamless integration and data consistency.

3. Streamlined Integration

Direct access links
Create direct links to detailed information and files, ensuring you always have access to the latest information without duplication.

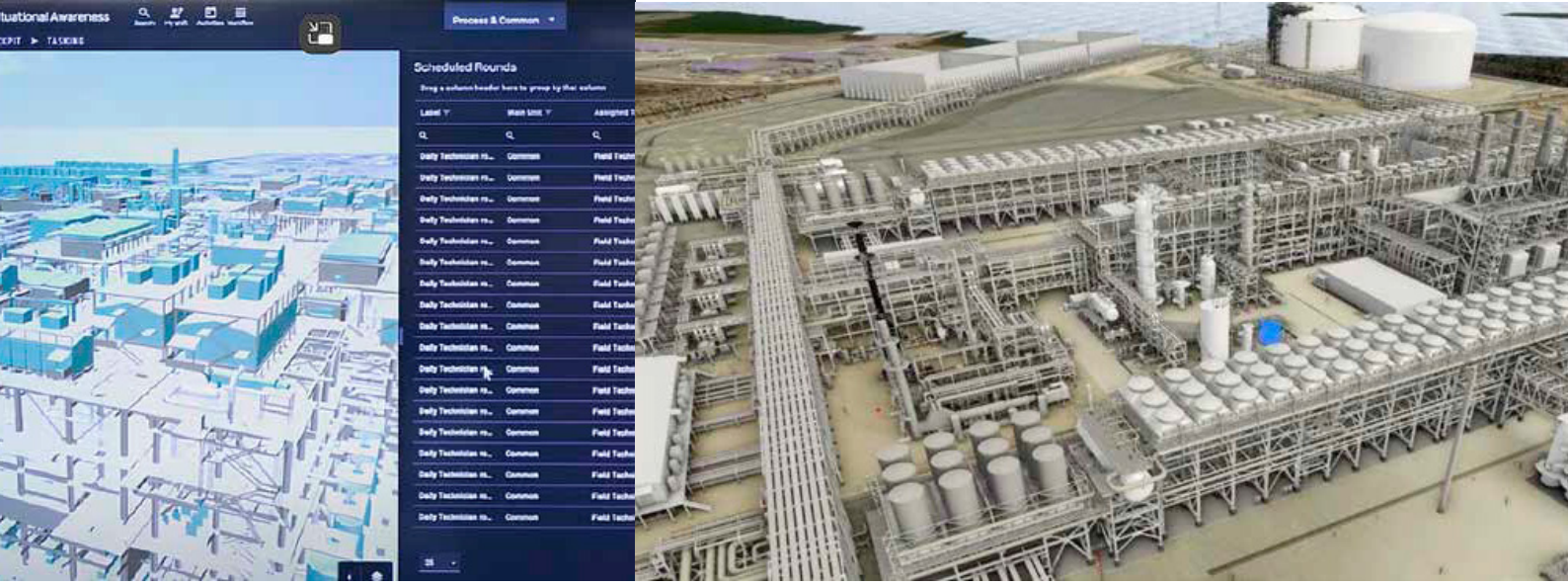
Secure Single Sign-On (SSO)
Enhance security and the user experience by integrating Assai with SAML-based login systems, enabling direct access using your existing credentials.

The Assai model

There are many document management system providers, and it is important to compare them to make the right choice. Assai has worked alongside document controllers and project engineers for over 30 years. Their feedback has enabled us to set a new standard in document management and establish collaboration with leading companies like Kongsberg Digital and Aveva.

Assai's flexible integration model enables bi-directional data exchange, ensuring that the vital connection between documents and asset tags is always maintained. With a single click, users can access linked documents directly from the digital twin. The system displays only the most relevant metadata, offering essential context for documents associated with a tag. As new tags are identified within documents, they are automatically integrated into the system, ensuring data remains synchronized and up to date.

In addition, Assai's model optimizes project handovers and operational readiness, saving time and reducing costs by streamlining information management. When everybody works with accurate data and shared objectives, the impact is significant, improving not just efficiency but the entire work experience and shaping a smarter, more connected future.



Case study: transforming LNG operations with digital twin and document management integration

Company overview

LNG Canada, a joint venture of Shell, PETRONAS, PetroChina, Mitsubishi Corporation, and KOGAS, is constructing Canada's first large-scale liquefied natural gas (LNG) export terminal in Kitimat, British Columbia. This cutting-edge facility will leverage digital twin technology combined with Assai's document management system to ensure 40 years of safe, sustainable, and efficient operations.

The challenge

LNG Canada is building in a remote location, hundreds of kilometres from the nearest major centre. Sending specialists to site for every inspection, planning decision, or document query was not viable. Remote teams needed the same situational awareness as people standing on the ground.

Digitalization was embedded from the outset to streamline operations, ensure document control, improve maintenance planning, and enhance decision-making with AI-powered models.

Solution

LNG Canada partnered with Kongsberg Digital to deploy a digital twin, enabling real-time insights, collaboration, and AI-augmented decision-making. The combined solution connects workers and stakeholders, providing a single interface for planning, managing, executing daily workflows, and maintaining rigorous document control. This technology allows remote support teams to assist on-site workers while ensuring that critical documents are accessible and updated efficiently.

Results

- A technician on-site can pull up the latest valve specification, inspection history, and related P&ID directly from the digital twin, without calling the office or waiting for a document to be emailed.
- Remote planners preparing work packages now work from the same document state as on-site teams, eliminating version conflicts before they cause delays.
- Hazard visualizations during site evaluations are backed by Assai's document layer, so safety assessments happen faster and with more confidence.
- The digital twin, enhanced with AI, simulation, and Assai's document management system, enables faster decision-making and reduces reliance on multiple systems by centralizing critical information.

How to integrate DMS with digital twin processes

Integrating a Document Management System with your digital twin is key for businesses that rely on real-time data and simulations to manage physical assets. By establishing a single source of truth, teams can work with up-to-date information, minimizing errors and boosting efficiency.

Step 1 - Connect your asset register to your documents
In Assai, every asset tag links to its associated documents. When the digital twin queries a tag, Assai returns the current revision, related drawings, and metadata automatically. Setup is bi-directional, so changes flow both ways.

Assai has proven integrations with leading digital twin platforms including Kongsberg Digital and Aveva, with bi-directional data exchange working out of the box.

Step 2 - Put document approvals on autopilot
Define your review and approval workflows in Assai once. From that point, any document update triggers the right people automatically. No chasing, no missed sign-offs, no outdated revisions reaching the twin. Assai's DMS allows review cycles and notifications to be automated, minimizing human error and speeding up decision-making.

Step 3 - Lock down your revision history
Assai logs every change to every document. Only approved revisions are visible to the digital twin. Auditors, inspectors, and regulators see a clean, traceable record rather than a folder of files with ambiguous names. Implement version control settings that log every change to critical documents like blueprints, operational manuals, and maintenance records.

Step 4 - Close the loop on predictive maintenance
One of the most impactful benefits of integrating a DMS with a digital twin is its ability to automate predictive maintenance. Assai links documents by tag number. When your digital twin detects a performance threshold being crossed, it surfaces the relevant maintenance procedures, inspection history, and equipment specs in one click. Your team acts fast, with the right information already in front of them.

Unlock the full potential of your digital twin integration

Integrating a DMS with digital twin processes goes beyond document storage. Assai takes care of document information, while your digital twin provides asset information. You have two single sources of truth for different kinds of information, each with its own capabilities.

The integration not only helps streamline workflows and enhance collaboration but also unlocks the potential for predictive maintenance, better decision-making, and regulatory compliance. Whether you are operating in energy, chemicals, infrastructure, utilities, or any other asset-heavy industry, this integration is essential for driving operational efficiency and maximizing the power of your digital twin initiatives.

About the author

Arno van Vulpen, with a background in information science and a pecialization in user experienc, draws inspiration from his scientific roots. Since joining Assai in 2013, Arno has advanced from consultantto product manager, leading innovations in document management software.

He has been instrumental in developing Assai Connect, setting new industry standards. Passionate about the role of software in engineering projects, Arno advocates for its early integration to enhance project outcomes. His philosophy emphasizes alignment between project teams and document controllers, ensuring everybody has quick access to crucial information.

Arno's journey began on the client side, where he firsthand experienced the challenges Assai could solve, leading him to join the company. He is driven by a desire to improve lives and contribute to a better, safer, and more sustainable world.

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