WHITE PAPER

Engineering smarter with a digital twin

Authored by:

Maria Gkovedarou
Portfolio Marketing Manager,
Engineering Information Management, AVEVA

Executive summary:

Industrial organizations are committed to reshape their traditional business models due to new technology trends and climate change. In power, chemicals and oil and gas industries, this heavy lift lies on the engineers' shoulders as they are responsible to manage time, cost, engineering data, reporting expectations across all the organisation and many more. Therefore, engineering teams are increasingly looking to use digital twin technology to help them get their updated information, make better decisions and better follow the change management.

In this whitepaper you will learn the benefits of digital twins and how these are essential to engineering teams to work smarter.

Engineers' challenges

Even before the pandemic, new technology trends and climate change were already pushing industrial organizations to reshape traditional business models. After the pandemic, this shift has only become more urgent. Today, organizations are seeking new ways to both drive their energy transition effectively and meet high-priority digital transformation needs.

Time, cost management and reporting

In heavy industry, such as the power, chemicals, oil and gas and mining industries, a large part of the planning and execution of this transition falls on the shoulders of engineers, who must manage time, cost and reporting across the organization using vast amounts of engineering data.

Invalidated data

This data is frequently siloed in spreadsheets, drawings, 3D models, laser scans, and text files, which are often distributed across teams, departments, digital tools, and on paper in filing cabinets and even in people's drawers.

This data changes throughout a project's lifecycle (design and engineering, management of change, operations, and optimization) and varies according to the type of project. In all, **engineers typically spend 30-50% of their time** just looking for and validating information.

Collaboration with all stakeholders

Aside from finding the information, engineers must also ensure that project requirements are met, data remains evergreen, and stakeholders are properly informed with up-to-date information.

Heads of engineering need to ensure that information is stored in one place, accessible, and up-to-date to encourage collaboration among stakeholders throughout the assets' lifecycles.

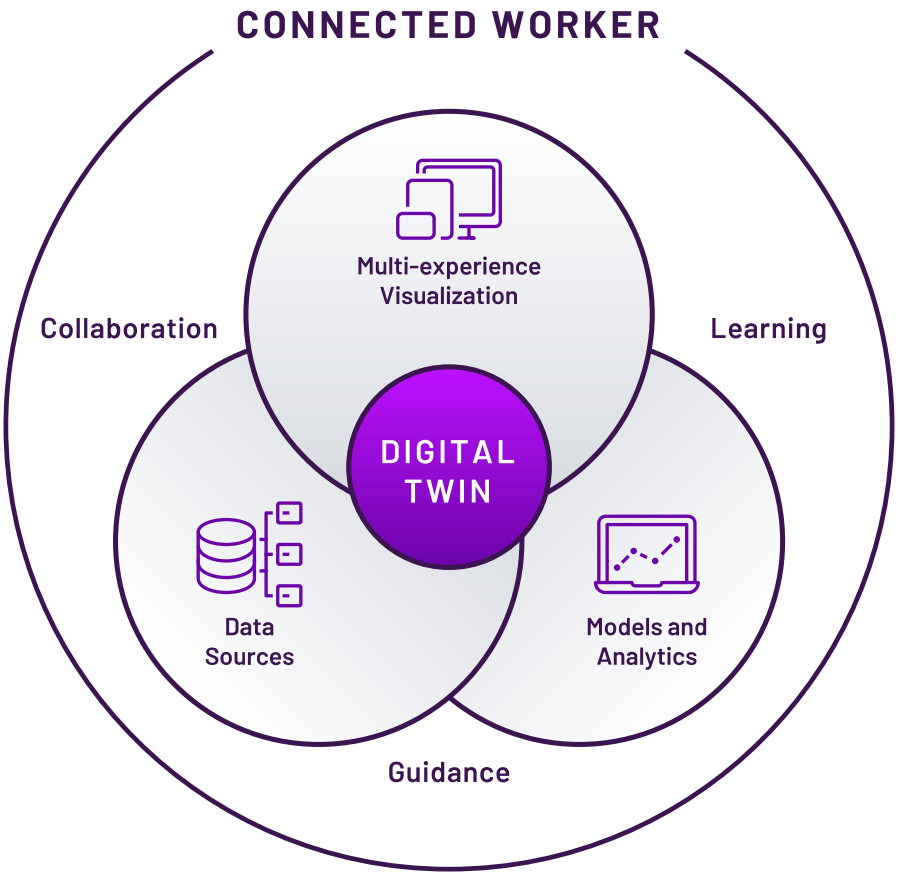
To meet all these responsibilities, engineering teams are increasingly using digital twin technology to help them keep information up-to-date, make better decisions, and improve their change management strategies.

The importance of digital twins in engineering

A digital twin is a real-time digital representation of a physical entity, such as an asset, process, system, or even an enterprise. To accurately depict the behavior of its real-world counterpart, a digital twin must be integrated with the most up-to-date information available, leveraging cloud and IoT technologies. For engineers this means that all relevant information available on a particular engineering asset – such as documents, texts, drawings, pdfs, laser scans, and 3D models of the existing physical asset – needs to be interlinked. This creates a single source of truth across the organization and enables teams to visualize information in context more accurately and collaborate more seamlessly with stakeholders.

With a digital twin, owner-operators can access information on assets operating globally, which helps companies save on travel expenses and reduce their carbon footprints.

Many industries, including manufacturing, healthcare, automotive, transport, energy, and retail, are already making large investments in digital twin technology.[1] In the Global Digital Twin Market Research Report 2021, experts forecast the global digital twin market size will continue to grow from $3,210.1M in 2020 to $184,517.4M by 2030, which will mark a compound annual growth rate of 50%.



Digitally transformed engineering

Benefits of digital twins for engineers

Helping their organizations build effective digital twins has become a top priority for engineers across industries. According to Accenture, engineering teams commonly start using digital twins first for testing during the validation phase of the design process.[2]

1. **Better and quicker decisions:** The ability to readily access real-time information helps engineers make better decisions, which saves both money and time and allows you to focus your efforts on optimizing design processes and meeting the needs of your clients. Companies that have adopted digital twin technology have managed to reduce the decision time it takes to find an optimal design to less than one minute.[5] In a handover scenario, engineers need to cross reference information from all previous and current stakeholders (mechanical engineers, electrical engineers etc). In a worst case, this information can be buried in a paper form at the bottom of a drawer or ideally it can be digitalised buried in a folder where the engineer has no access. If the engineer manages to access this information, they need to make sure this information is validated and updated. This process might take days or months and reduces the engineer's decision time. By adopting digital twin technology, engineers can reduce the decision process to a handover scenario in less than one minute.
2. **Better collaboration with stakeholders:** According to McKinsey & Company[3], a digital twin can support the engineering process by creating a digital prototype of the actual final development even in the very early stages of a project (Front End Engineering Design – FEED). This use case scenario helps in the collaboration among stakeholders including customers[3].Engineering teams can validate their complex asset designs in an early phase (FEED) and adjust accordingly through time as they can all work in a single platform. Having the confidence that their initial design is updated and has the approval of all stakeholders, engineers can safely proceed with their development and execute any adjustments that could emerge.
3. **Tackles budget and planning challenges:** Also digital twins help industrial organizations achieve 10-30% increase in planning efficiency and reduce in staff hours by 15%.[5] Industrial cloud solutions and visualization tools allow engineering engineering, procurement, and construction teams to finish their project on time and on budget. The engineers have all the information they need gathered in a common cloud solution. This creates better scheduling, reduces any extra workhours and prevents uncertainty about which information version is right.

Digital twins can help industrial organizations achieve a **1-2% growth in revenue, and a 10 to 30% reduction in expenses.**[4]

4. **Increases sustainability:** Digital twin technology has proven to increase sustainability goals by improving asset efficiency and reducing the need to travel to worksites.[6] Industrial companies among others have been commissioned with the duty to reduce carbon footprint. In brownfield engineering scenarios, 3D scan data is seamlessly integrated into the heart of the digital twin to provide invaluable context to operations and maintenance data, supporting many use cases such as maintenance planning and workforce training. Laser scans in an industrial cloud solution efficiently minimize the travel cost to the existing facility and reduce its carbon footprint by having an updated model of its facility.

Implementing a digital twin and keeping it up-to-date

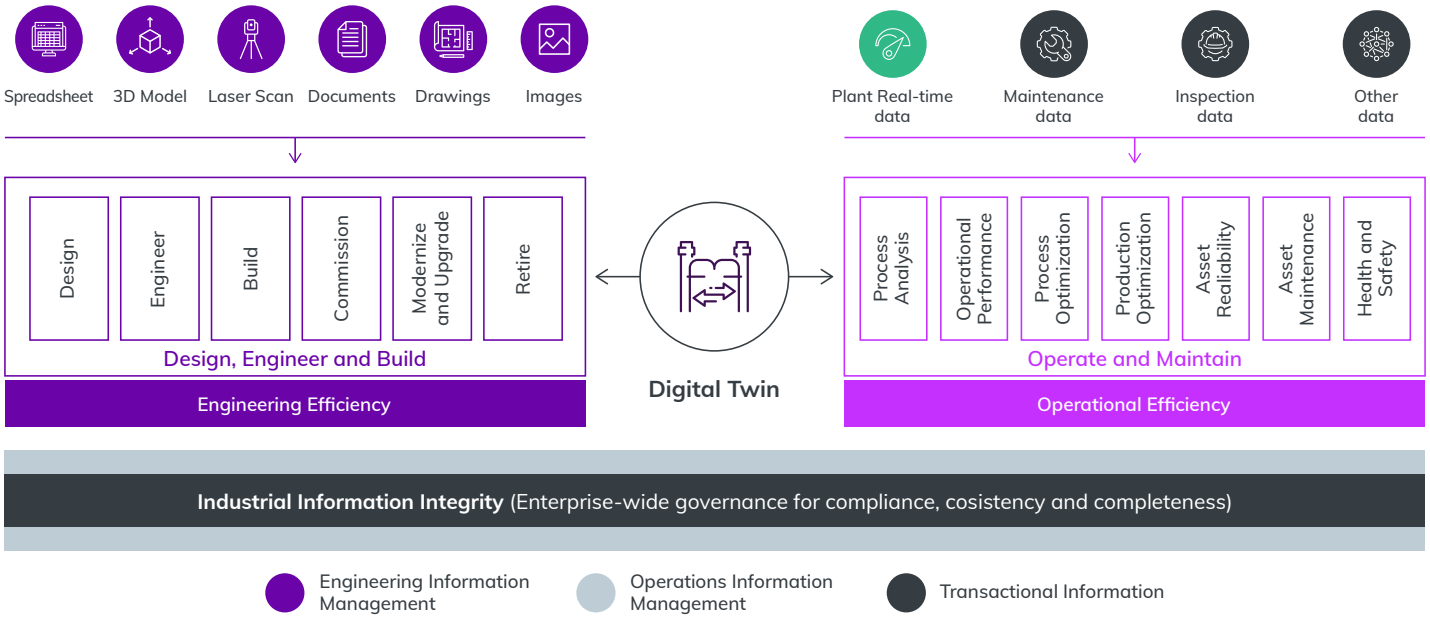
Hand over and maintain data with the help of Cloud services

Digital twins require cloud systems and IoT solutions, which reduce costs and IT resources and support communication between the physical entity and digital replica.[2,7,8] Cloud services also transmit data 50% to 75% faster and can transmit up to 97% more data compared to conventional methods.[8] Using cloud solutions to integrate digital twins with real-time data ensures that information is accurate and up-to-date, and it also improves collaboration; in one cloud-based environment, teams across the organization can easily access documents, 3D models, and all the information from assets that interact with the physical entity.

Click here to discover how you could mitigate the cloud security risks

Visualizing engineering data in 3D models and laser scanning combination

A 3D model or any other representation of the physical entity is a vital component for any digital twin. Importing 3D data either from a design model or from laser scans creates a true digital replica of the existing infrastructure, which enables owner-operators to easily access and visualize information.[6] A combination of IoT sensors and laser-scan data provides organizations with a fully-fledged, up-to-date digital twin of a physical asset.[9] By scanning a model of their facility (i.e. brownfield engineering), and integrating it with real-time data, owner-operators can access up-to-date documents detailing any asset at any point in its lifecycle. This accessibility of real-time information helps owner-operators improve decision-making, change management, and risk mitigation strategies.



Digital twins, through cloud and 3D visualization technology, help keep engineering asset information up-to-date across the project lifecycle.

Engineer a trusted digital twin with AVEVA solutions

The largest energy, chemicals, and power companies already trust AVEVA to help them build their digital twins. AVEVA's engineering information solutions are helping owner-operators reduce the time it takes to find information and to make decisions, increase productivity by as much as 10%, reduce unplanned downtime by as much as 30%, and meet their sustainability goals.

AVEVA™ Asset Information Management, with the help of AVEVA™ Information Standards Manager, collects data from multiple information sources and turns it into actionable insights, automatically detecting and cross-referencing all the relationships between equipment, documents, drawings, and various data formats.

AVEVA™ Point Cloud Manager is a cloud-enabled 3D data capture solution for registering, processing, and visualizing point cloud and 3D model data on brownfield, greenfield, and maintenance projects. The solution helps engineers ensure that the digital twin and its real-world counterpart are accurately aligned, which improves decision-making and safety and reduces rework on their most critical assets.

AVEVA™ 3D Asset Visualization (previously AVEVA™ Engage) provides instant access to asset information, improving the speed and reliability of your decision-making throughout an asset's lifecycle. AVEVA 3D Asset Visualization connects your experts to the information they need to solve problems quickly.

By integrating contextualized information into the 3D model of an asset, the solution helps users understand complex datasets with greater clarity and improve collaborative decision-making. The smartphone-style touch interface enables you to quickly unlock more value in your digital assets, reduce project risk, and reduce your teams' time spent in the field.

AVEVA Asset Information Management, AVEVA Point Cloud Manager, and AVEVA 3D Asset Visualization integrate seamlessly in the cloud to connect point-cloud and 3D design model data with all other asset information, creating deeper contextualization and better visualization of the digital twin. These solutions are all available on AVEVA™ Connect, our industrial cloud platform, as SaaS offerings.

AVEVA's engineering information management solutions are now combined with Assai's integrated document management system and powered by data captured using NavVis's wearable mobile mapping systems. As a result of the NavVis partnership, users can deliver laser scans much faster than with existing stationary scanners, while Assai's document control and management solutions expand AVEVA's digital twin capabilities with even more robust document information.

With AVEVA's support and the support of our partners, it is easier than ever to create your digital twin, keep it updated, and start gaining more valuable insights.

Case studies

In Sweden, Oskarshamn Nuclear Power Plant used a suite of AVEVA solutions to ensure that its reactors will continue to operate as safely as possible for at least the next 60 years. The company used AVEVA Point Cloud Manager to integrate laser scan data with AVEVA™ E3D Design, which enables highly accurate design work and provides detailed guidance to users, showing how necessary tasks should be performed. Oskarshamn also used AVEVA Asset Information Management to place laser scan data into the design environment, seamlessly integrating design and 'real-world' conditions. Outages once averaged 150 days at a time, but with its new AVEVA solutions, that figure fell to just 50 days.

K+S Potash was building a greenfield potash mine in Saskatchewan and needed to ensure a smooth data handover from the EPC firms to the construction site and from the construction site to the owner-operator. To enable an effective data transfer between all these parties, K+S Potash used AVEVA Asset Information Management to compile the data in one common format, using the ISO 15926 standard, and provided a single source of access through a distributed infrastructure. The company also used AVEVA 3D Asset Visualization on site to help operations and modifications teams visualize asset data via a simple, intuitive, touch-driven interface.

With AVEVA Asset Information Management, Petroleum Development Oman empowered its engineers with the ability to search by tags and instantly find all relevant information, such as process drawings, manuals, specifications, or maintenance history. The new system has saved 5% of workers' time, equivalent to employing an extra 50 skilled workers.

In Thailand, SCG Chemicals built a single platform to provide integrated, real-time visibility into its operations. The platform features a virtual, three-dimensional plant – and immersive, touch-based visualization tool that enhances interdisciplinary collaboration and provides quick access to plant information through AVEVA™ Asset Information Management. SCG's new platform has reduced the time it takes to find information to less than 10 seconds. In just six months, the company achieved 9X its ROI and drove its plant reliability up to 100%.

Speak with an AVEVA representative today to learn more about our digital twin solutions and how they can help you achieve your goals.

Engineer a digital twin | Talk to an expert

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About the author

Maria Gkovedarou is the marketing lead for engineering portfolio at AVEVA. She provides thought leadership and customer engagement to reduce risk and lead greater efficiency and profitability for AVEVA's owner-operator and EPC customers involved in digital twin creation and maintenance. Maria previously worked for Bentley Systems where she was involved in Digital Twin, Machine learning and Artificial Intelligence research projects for big organizations. Her background is in Civil Engineering and Engineering Project Management where she published her research in Artificial Intelligence. Maria completed her studies in University of Cambridge, UK on Digital Twins and her work was published in two conferences.