

NTT DATA

SAP
Global
Partner

Connected Shop Floor

AI-Driven insights for your connected shop floor



What is it

Connected Shop Floor is NTT DATA's cloud-based plant digitalization solution designed to provide a flexible platform to support a wide variety of smart factory initiatives. It leverages SAP Digital Manufacturing for its integration and analytics capabilities, and allows manufacturers to improve and enhance a wide range of shop floor processes with AI/Machine Learning (ML).

The business case

Connected Shop Floor, based on SAP DM, offers a compelling business case for manufacturing companies that recognize the need to move beyond the islands of automation, disjointed processes and ad hoc integration that currently characterize their existing manufacturing operations.

Connected Shop Floor allows manufacturers to leverage their existing investments in SAP software and factory hardware, using the cloud-based integration, MES execution and analytical capabilities of SAP DM and specific accelerators offered by NTT DATA to create a fully integrated digital manufacturing environment that is enhanced with AI and ML technologies.



Background

The advent of Industry 4.0 is a significant milestone in the manufacturing sector, ushering in an era of profound transformation and technological innovation. Advanced technologies in areas such as robotics, AI, cloud and edge computing, and the Internet of Things (IoT), have the potential to fundamentally reshape the operational landscape for manufacturing businesses.

By harnessing the full potential of Industry 4.0 technologies, manufacturers can boost their operational efficiency, enhance product quality, and optimize their supply chain dynamics. Through the utilization of real-time data insights, predictive analytics, and automation, they gain the ability to make informed decisions, streamline production workflows, and respond promptly to the changing market dynamics.

The biggest change is happening down on the shop floor, where the previously separate areas of ERP and MES, as well as MES and equipment, are becoming more interconnected, encouraging data and information to flow more freely between these traditionally distinct layers, and making it much easier and cost-effective to embrace industry 4.0.



Enabling technologies for industry 4.0

Connecting shop-floor machines is a necessary first step in making factories smarter, but to be able to generate actionable insights and foster better decision making, manufacturers need to collect, share and analyze the data produced by their machines in real time. This is made possible by various enabling technologies:

Cloud computing

Cloud computing is fundamental to any Industry 4.0 initiative, providing the necessary connectivity and integration between engineering, supply chain, production, sales, distribution, and service. Storing and analyzing vast datasets becomes more efficient and cost-effective through cloud solutions. For large enterprises, cloud computing allows functionality and locations to be migrated progressively to the cloud at a pace the enterprise decides.

AI and Machine Learning

AI and ML technologies empower manufacturing companies to harness the immense volume of data generated across their business units, including data from partners and third-party sources. These technologies provide valuable insights, enhancing visibility, predictability, and automation of operations and business processes. For example, predictive maintenance based on machine learning algorithms helps businesses prevent breakdowns, ensuring higher efficiency and uptime during the production process.

Internet of Things (IoT)

IoT forms the backbone of smart factories, where machines are equipped with sensors featuring unique IP addresses, enabling seamless connectivity between devices. This connectivity allows the collection, analysis, and exchange of substantial volumes of valuable data from various sources on the factory floor. AI and ML technologies have the ability to augment the capabilities of IoT, as equipment and devices are able to not just exchange information autonomously, but also take their own decisions and influence the behavior of other machines.

Edge computing

Real-time production operations demand instant data analysis, often necessitating analysis at the source, known as edge computing. This approach reduces latency time, ensuring rapid responses to issues like safety or quality concerns. Performing analysis at the edge is crucial, especially when immediate action is required.

NTT DATA's Connected Shop Floor

SAP DM is the backbone for Connected Shop Floor and provides familiar MES functionality but from a cloud-based platform that also offers additional benefits in term of integration with SAP and non-SAP systems and analytical capabilities, which are provided by SAP Analytics Cloud (SAC).

SAP DM provides manufacturers with real-time data, information on production times and actual yields, consumptions, scraps, and defects, allowing them to compare productivity across the entire organization and, enabling paperless production and increasing integration of shop-floor machines and employees.

Main features

- Production process modelling.
- Visual scheduling and dispatching of production operations.
- Custom Production Operator Dashboards (PODs).
- Certifications and work instructions.
- Collects information from plant devices using SAP Plant Connectivity.
- Real-time visibility, monitoring and control of the production process.
- Generates custom and industry standard KPIs such as the Overall Equipment Effectiveness (OEE) with alert management via SAC.
- Fully integrated with SAP S/4HANA and other SAP solutions.



Because of the large installed base of manufacturers that already use SAP ERP and SAP S/4HANA, NTT DATA has chosen to use SAP DM as its shop floor digital manufacturing platform, supplementing it with additional services, solutions and accelerators that leverage NTT DATA's expertise in manufacturing and its strengths as an end-to-end system integrator. These include:

- The **intralogistics platform** is an SAP BTP development that orchestrates and facilitates the integration and management of mobile devices, such as AGVs/AMRs, enabling intelligent and autonomous automation of internal logistics processes.
- **Naka** is a smart worker platform that provides workers equipped with VR headsets with realistic, safe and scalable immersive experiences to help them perform tasks more efficiently.
- **SAKE (safety keeper)** is a smart health and safety platform using IoT and computer vision for hazard detection in different industrial shop floor environments.

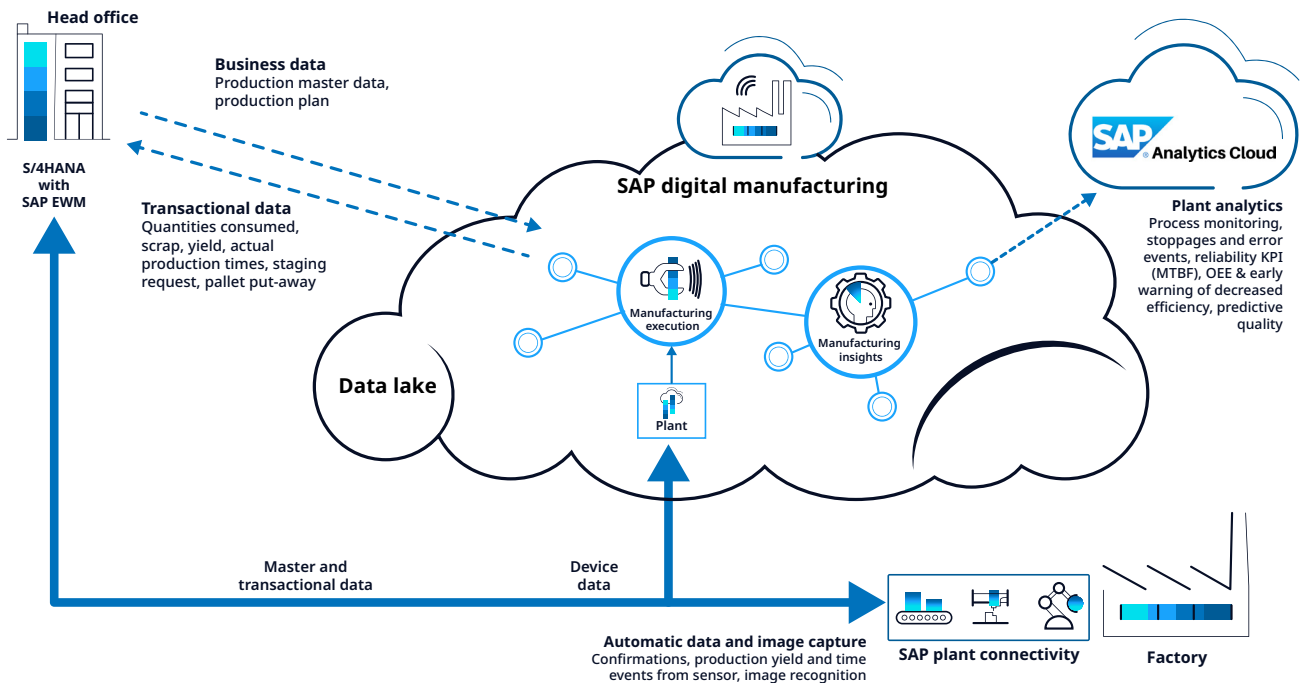


Figure 1. Connected Shop Floor Architecture.

Benefits

- **Cloud-based and extensible:** Connected Shop Floor leverages the infrastructure of commercial hyperscaler providers to create central cloud solution for orchestration of production processes in hybrid landscapes that may also use edge processing.
- **Offline resilient:** SAP DM can be deployed on the edge using Azure Stack Edge as a side service that automatically hot swaps in the case of planned or unplanned loss of cloud connectivity, so ensuring that production is not interrupted.
- **End-to-end integration:** SAP Plant Connectivity provides the end-to-end integration between plant assets and SAP and non-SAP applications, allowing a wide range of equipment to be easily connected.
- **Enhanced with AI/ML technologies:** AI/ML technologies provide greater insight into production and sensor data to enable more informed decision making, enhance visibility, predictability, and automation of operations and business processes.
- **Close collaboration:** Connected Shop Floor orchestrates production processes across business boundaries and provides a secure and robust platform for cloud-based collaboration with customers and suppliers.
- **Real-time analytics:** Through the utilization of real-time data insights and predictive analytics provided by SAP Analytics Cloud, manufacturers can make better informed decisions.
- **Reduces costs:** By increasing productivity, optimizing use of production resources and reducing waste, unit costs are reduced.



Empowering manufacturing with AI/ML

The integration of AI and ML technologies in the Connected Shop Floor makes it possible to enhance manufacturing operations by enabling automatic defect and anomaly identification, greater accuracy, improved quality and better consistency of products & processes. Here are some specific use cases that NTT DATA has developed.

Multiparametric predictive quality

By analyzing historical data, sensor readings, process parameters, and other relevant information such as ambient conditions, ML models can be created to predict the quality attributes or defects of products before they are produced or inspected.

Refining the models involves validating the accuracy of predictions against actual quality measurements, incorporating feedback from quality inspections, and adapting the models as new data becomes available.



AI-assisted production guidance

Leveraging the technologies in Connected Shop Floor, an AI-based system could easily be developed to guide factory workers and supervise their operations to improve efficiency and productivity on the shop floor, while ensuring adherence to safety protocols.

In this use case, cameras capture real-time data from the shop floor environment and monitor worker activities. An AI system analyzes the video feed from the cameras to identify objects, monitor worker movements, and detect anomalies. The system, which is trained using ML algorithms to understand optimal operational procedures, can then provide guidance to the operators in real time through a plug-in at the SAP DM POD.

As well as improving safety, the system provides proactive intervention to prevent equipment failures, optimize processes, and ensure consistency in operations.



Production guidance use case – illustrative example

System requirements

- SAP Digital Manufacturing.
- SAP S/4HANA Production Planning or SAP ERP PP module.
- SAP S/4HANA Extended Warehouse Management (optional).

Why choose NTT DATA for your SAP manufacturing project

We are experts in shop floor projects

NTT DATA has worked with the manufacturing industry for more than 40 years, and we have 15,000 professionals dedicated to serving our manufacturing clients worldwide. We provide the full spectrum of end-to-end services relevant to shop-floor projects, from technology innovation to business consulting and change management.

We have a technology stack specifically for shop-floor projects that includes our own IP, a Smart Factory Process methodology, preconfigured templates and a range of accelerators that can significantly reduce time to value and accelerate transformation.

To accompany manufacturing companies on their SAP S/4HANA journey, NTT DATA has a team dedicated to SAP S/4HANA transformation and an SAP S/4HANA Center of Excellence that establishes the most appropriate strategy for companies that want to evolve to SAP S/4HANA and other SAP solutions, platforms and technologies.



SAP Global strategic partner

- NTT DATA is a formidable force in SAP services with more than 20,000 SAP professionals, 2,700 SAP clients worldwide, 21 delivery centers and operations in 41 countries. It is a truly global organization committed to seamlessly working together with its clients to deliver SAP-centric projects that can be delivered at scale and across multiple locations.
- Our solutions leverage our business-specific expertise and skillsets in SAP technologies as well as other digital technologies, such as AI and IoT, for example.
- NTT DATA has achieved the highest accolade awarded by SAP, Global Strategic Partner, which recognizes its ability to offer a wide range of best-in-class business consulting and solution implementation services in support of SAP technology.



The NTT DATA difference

NTT DATA Global SAP S/4HANA template

- Fully customized SAP S/4HANA system including all core areas such as finance, procurement, sales, logistics and production.
- Includes new SAP modules such as EWM, IBP, TM, VMS, etc.
- SAP Business Technology Platform (BTP) and Digital Manufacturing (DM) Integration.

NTT DATA SAP Manufacturing accelerators

In addition to Connected Shop Floor, NTT DATA offers several other accelerators for manufacturing, including:

- **Digitized maintenance** enables manufacturers to use IoT and other sensor data to monitor the condition of their production machines, to schedule maintenance to avoid levels of availability, while extending machine life.
- **Assemble to Order** uses Configure-Price-Quote (CPQ), which is a powerful software toolset that enables manufacturers to target production, customize more accurately and deliver individualized products that have been accurately costed and quoted.
- **Fiori RPA-based payment automation** leverages the key SAP technologies of SAP S/4HANA, SAP Intelligent RPA 2.0 and Fiori to create an easy-to-use, cloud-based automation solution for the Accounts Payable function, eliminating the errors, delays and costs associated with manual invoice processing.



About NTT DATA

NTT DATA – a part of NTT Group – is a trusted global innovator of IT and business services headquartered in Tokyo. We help clients transform through consulting, industry solutions, business process services, IT modernization and managed services. NTT DATA enables clients, as well as society, to move confidently into the digital future. We are committed to our clients' long-term success and combine global reach with local client attention to serve them in over 50 countries. Visit us at [nttdata.com](https://www.nttdata.com)



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