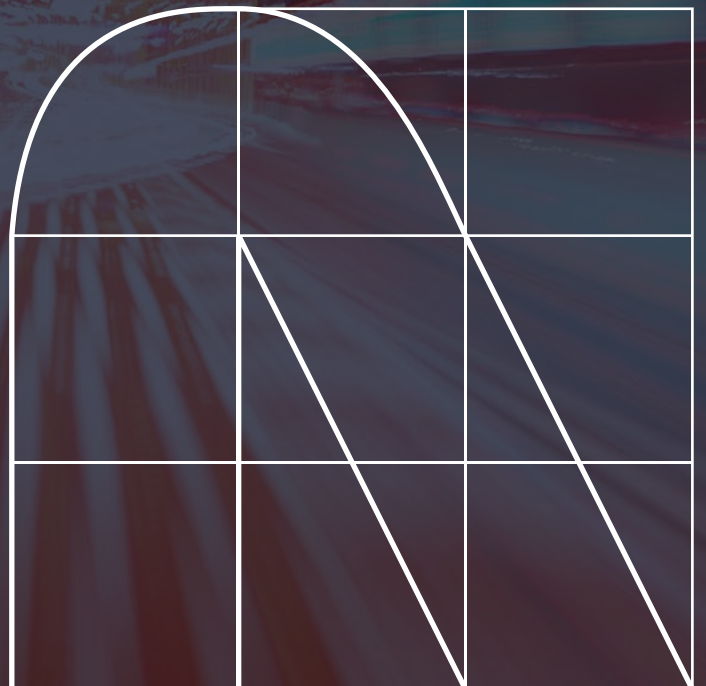


The Future of Supply Chains: Agility, Innovation, and Resilience

Improve performance and gain a competitive edge



“ This guide explores how NTT DATA’s solutions can value to businesses in virtually every sector as they work to make their own supply chains more secure, agile and cost-efficient.

Contents

04	Solutions for today’s supply chain	
05	Transforming the supply chain landscape	
07	Core technology solutions for supply chain transformation	
18	NTT DATA’s strategic advantage	
20	Next steps	



Solutions for today's supply chain

Supply chains are being rapidly transformed by a combination of factors:



New business models (reshoring rather than globalization).



The need for greater responsiveness (making supply chains more sensitive to fluctuations in demand).



Political and security issues (the prospect of tariffs and vulnerability of long sea routes).



Emerging technology (the growing ability to use digital technologies such as edge, AI and autonomous working to accelerate and derisk supply chains while making operations more efficient).

NTT DATA has conducted a detailed analysis of all these changes, allowing us to build effective solutions that add value to businesses in virtually every sector. In this guide, we explore the issues and set out the solutions that are ready for use today, aimed at helping our clients improve their performance and gain a competitive advantage through supply chain excellence.

Transforming the supply chain landscape

Supply chain management is becoming more complex, for a combination of different reasons.

4 factors making supply chain management more complex



1 Reshoring and move back from globalization

Over the past 30 years, many large manufacturers offshored key elements of their production activities to lower-wage, high efficiency locations. This had a profound effect on supply chains, which were reshaped to enable very large-scale, highly centralized manufacturing, with long sea-based routes to market.

This model, which has been highly successful, is now in the process of changing.

Geopolitical concerns have combined with smart manufacturing to make this approach less attractive. The appeal of low wages is no longer so compelling when automation and AI are reducing the involvement of human labor. New technologies are also giving management actionable insights to streamline operations.

Global transportation routes are seen as problematic for reasons of security and sustainability.

These changes are reducing risk in some ways, for example by placing less reliance on long sea routes for components, but successful long-term transformation will depend on continued investment and the optimization of smart systems by the manufacturers themselves.



2 More dynamic markets

Successful businesses respond fast to changing market conditions, which means supply chain performance must be tracked carefully, in depth and as close to real time as possible.

By monitoring every individual element within the supply chain, it becomes possible to make fast and effective changes when any variable alters the position.

These changes can affect either demand (for example, changes in timing; consumer trends) or supply (unexpected delays in transportation; shortage of specific components).

In some markets, personalization and the customization of products and services are becoming much more important, creating complexity in sourcing, production and distribution driving. To support synchronized planning and execution and meet individualized customer demands efficiently, organizations need greater flexibility, end-to-end supply chain integration and enhanced agility.

In markets that are increasingly sensitive to unexpected changes, it is becoming more important than ever to respond in highly agile ways.



3 Security issues

Manufacturers and suppliers are more alive than ever to the possibility of their supply chains being compromised or infiltrated in different ways.

No matter how strong your precautions are, risks are always higher in very complex and lengthy supply chains, as there are more opportunities to attack weak points along logistics routes.

There is a great need to protect product integrity, as any interference with items inside the supply chain can lead to extremely negative consequences. Many sectors are also becoming more open to multiple product variations.

Suppliers, vendors and retailers must be clear that the product they sell really is, in every detail, the product promised to the customers.

Beyond protecting product integrity and mitigating risks along logistics routes, there is a growing emphasis on building resilience into the supply chain.

This means developing strategies to anticipate, absorb and recover from disruptions, whether caused by cyberattacks, geopolitical tensions, natural disasters or unexpected demand shifts. A resilient supply chain incorporates advanced monitoring, flexible sourcing and dynamic risk management to maintain continuity and reduce vulnerability, ensuring both security and agility in an unpredictable world.

The ability to safeguard and track every item from end to end across the supply chain is a top priority, so the need for monitoring scrutiny and assured compliance across the supply chain is paramount.



4 Cost and environmental performance

High costs in the supply chain have always been a driving force for operational efficiency and enhanced cost management. More recently, the need to achieve and demonstrate genuine sustainability is also transforming management systems.

Long logistics chains are major sources of carbon emissions, so organizations need to take all available measures to reduce the footprint of each part of the supply chain.

Tough new measures under the Greenhouse Gas Protocol, now being enforced by regulators worldwide, require enterprises not only to reduce emissions from their own activities but also measure and enhance performance across the entire supply chain. This more rigorous approach imposes a duty to manage supply chain behaviors for everything from sustainability to ethics, including supplier emissions (scope 2) and subcontractors (scope 3) right up to avoided emission (not emission) through enhanced design (scope 4).

Cutting touchpoints while moving closer to on-time delivery reduces energy use and, therefore, cost, cuts out human error and can lead to less time in storage, which reduces the need for large warehouses a major source of both cost and energy use.

Large enterprises are looking for ways to reduce energy use, cut emissions, and ensure ethical and compliant practices from end to end. They also need audit data and comprehensive reporting to prove compliance.

The scale, speed and scope of changes will increase in the years ahead, and we need to use new technologies ambitiously to improve performance in every aspect of supply chain management. From smart-factory systems to advanced AI, NTT DATA has the tools to transform supply chain performance.

Core technology solutions for supply chain transformation

Enterprises in every industry sector are reviewing their supply chain strategies to decide which technology investments will enable them to compete successfully in rapidly changing markets. There will be some difficult decisions ahead and, as no two enterprises are identical, solutions will be varied.

NTT DATA's approach follows the supply chain logically, from initial sourcing through to rapid response, smart manufacturing and operational efficiency in the factory and warehouse.

The four priority areas, we believe are at the heart of supply chain transformation right now are:

- Hyperautomation of supply chain processes.
- Agile response solutions.
- Smart manufacturing.
- Generative AI in the supply chain.

Each of these is likely to be critically important to almost every enterprise, no matter where they start from.

NTT DATA has the global presence, expertise and technology leadership to provide a detailed analysis of these areas as they apply to the specific circumstances of an organization and sector. As this requires consultation and secure information sharing, we recommend a joint exploration of priorities as an immediate next step.



4 priority areas for supply chain transformation



1 Hyperautomation of supply chain processes

Every supply chain faces daily disruptions resulting from unexpected delays, urgent customer demands or production-line interruptions caused by defective components. These challenges are unavoidable in today’s dynamic environment, but the way companies detect, manage and resolve them defines their competitive edge.

Hyperautomation is an integrated set of options designed to build on existing supply chain processes to add value in the following ways:

- 1

Real-time data access, making it possible to track all variables as they happen and prepare a fast response.
- 2

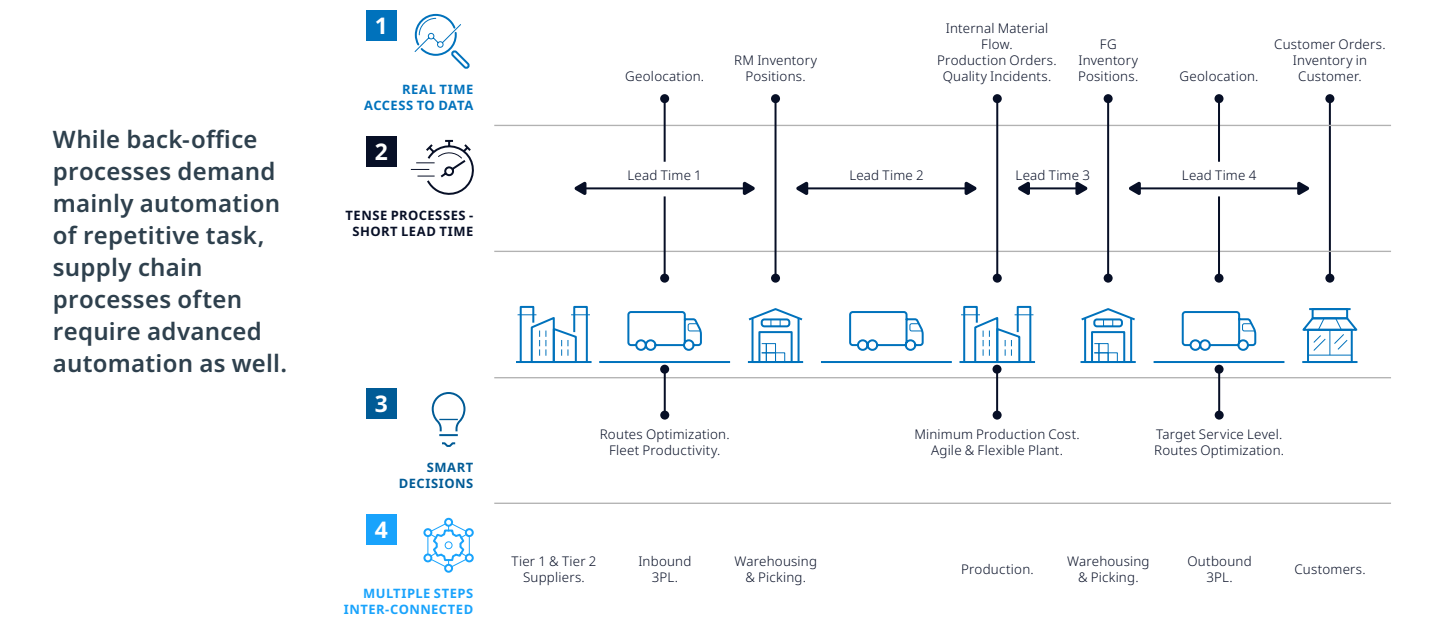
Accelerated lead times, enabling greater agility combined with improved cost-efficiency.
- 3

Smart and dynamic decision-making, with input from machine intelligence and data analytics to inform and improve decisions.
- 4

Integration and connectivity between all agents in the chain, internal and external (suppliers, transport and plant), ensuring a coherent and focused approach.

NTT DATA’s Autonomous Agents platform

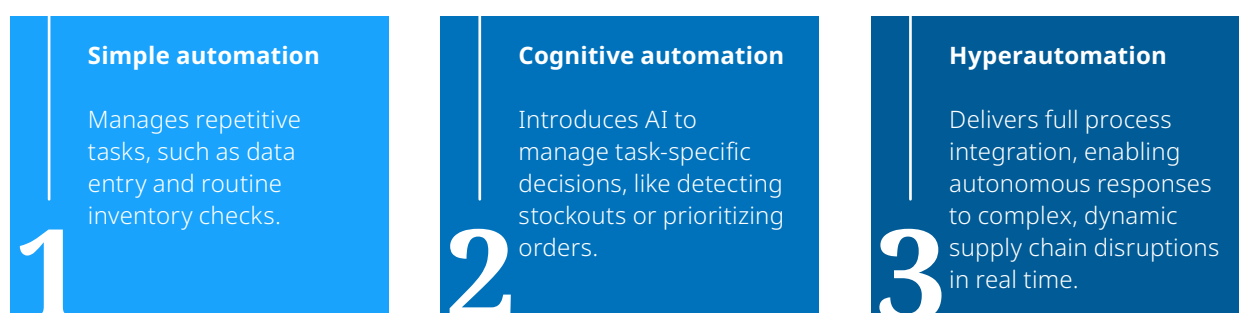
In our portfolio of intelligent solutions, NTT DATA’s Autonomous Agents platform offers a transformative hyperautomation solution designed to elevate supply chain resilience, agility and operational efficiency, as shown in Figure 1.



The goal of Autonomous Agent-based solutions is to drive automated decision-making through the extended supply chain in a way that enhances responsiveness to the market and manages costs dynamically, leading to higher satisfaction, competitive advantage and margin growth.

We have developed and enhanced the platform through our partnership with Microsoft, and our solution follows a three-stage methodology in which we move from simple automation to cognitive automation.

3 stages of automation: the NTT DATA approach



Getting to hyperautomation is a stage-by-stage journey. We work closely with our clients to develop a proof of concept and start delivering business benefits through a carefully managed pilot. This involves:

- Selecting the processes and subprocesses for transformation.
- Mapping value streams and KPIs.
- Implementing the pilot.
- Enhancing automation processes.
- Building a long-term maintenance model to support hyperautomation after launch.

NTT DATA's Autonomous Agents are designed to excel in managing disruptions through three core capabilities:



Proactive disruption detection

The platform continuously monitors signals across the supply chain, such as delays, quality anomalies or sudden demand changes, then flags risks in real time. Early detection minimizes potential cascading effects.



Impact analysis and risk evaluation

Once a disruption is identified, the system evaluates its downstream effects on costs, timelines and customer commitments. This data-driven analysis enables informed decision-making, turning potential setbacks into manageable scenarios.



Autonomous resolution

The platform's AI engine autonomously evaluates resolution options, then implements the most effective and appropriate resolution. Whether this means rerouting shipments, reallocating inventory or optimizing transport modes, Autonomous Agents should act swiftly and in alignment with business goals, reducing manual intervention and associated errors.

Areas typically covered by Autonomous Agent-enabled hyperautomation



Inbound logistics



Optimized order management



Multimodal transportation

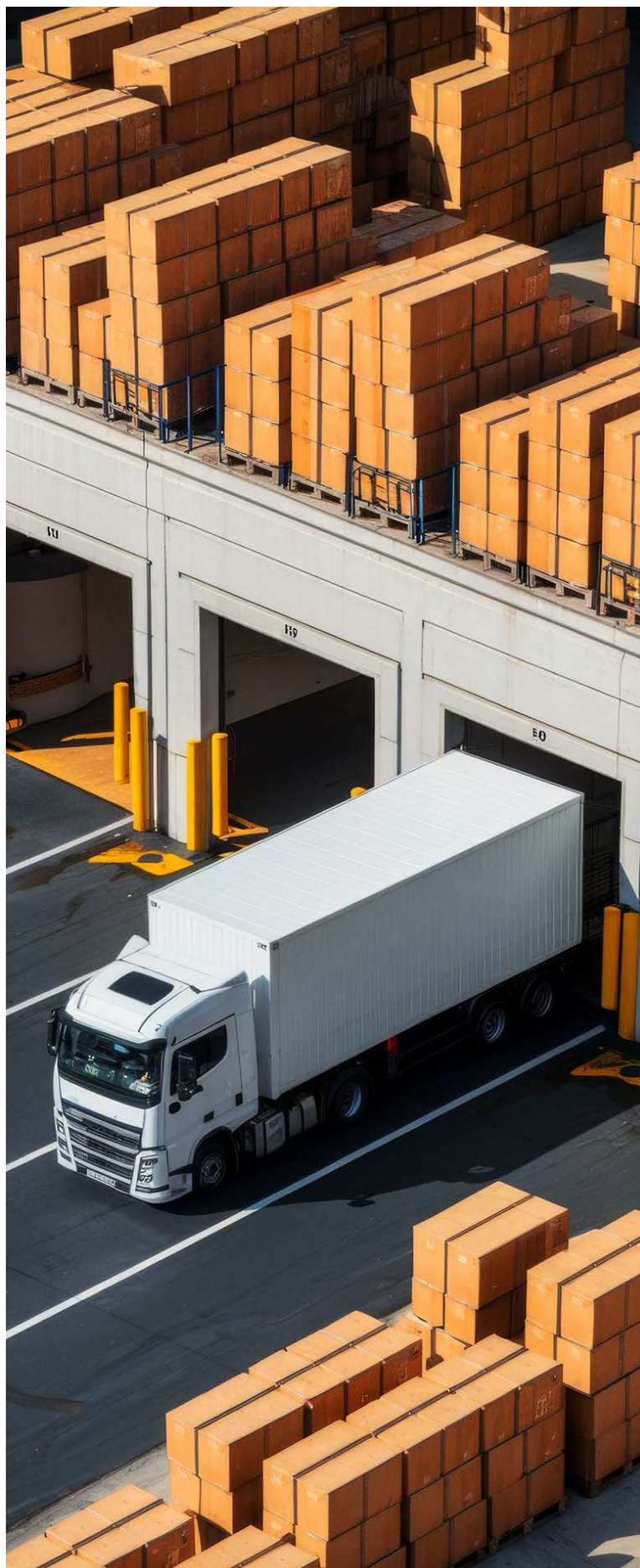


Logistics management

A process becomes a real candidate for hyperautomation when volumes are high, involving thousands of transactions an hour and thousands of measurements each second, with a clear connection between optimization and cost improvements.

“

Implementing end-to-end hyperautomation will take time. NTT DATA's Autonomous Agents solution, with strong input from our supply chain experts, is the ideal starting point. We deliver a controlled, secure proof of concept and step-by-step, very low-risk implementation.





2 Agile response solutions

Every player in the marketplace is in favor of “becoming more agile,” as long as this can be achieved with limited risk and no disruption to business as usual. Figure 2 shows why this is so important.

Volatility forces companies to complement mid term horizon with short term visibility.

But with traditional capabilities Supply Chain professionals take decisions today with many limitations and in a reactive way.

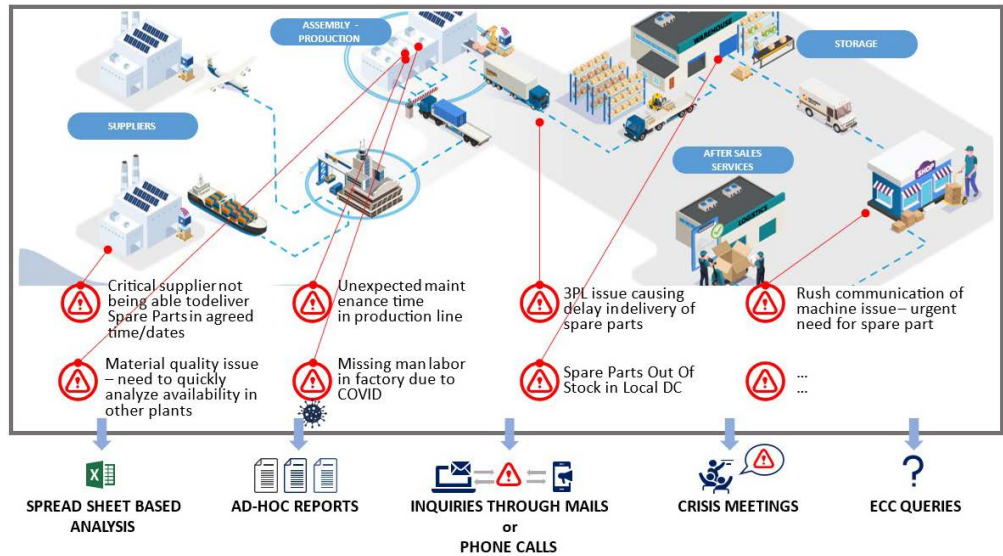


Figure 2: Intelligent visibility and agile response



Figure 2 shows some of the common reasons for last-minute or highly unexpected changes, and the conventional methods used to respond to them. All these methods have common problems: they are slow (at least, in relation to the urgency of a last-minute change) and they are not joined-up (integration happens in a purely ad hoc way).

NTT DATA's Control Tower

NTT DATA's Control Tower is designed to deliver much greater agility through a logical, low-risk implementation method. Initially built on an SAP S/4HANA IBP* module, it can be developed using other vendor solutions, when required.

Everything that can affect supply chain management, from unexpected changes in demand to unpredictable natural disasters, is noted and shared via Control Tower.

*Integrated Business Planning

The Control Tower process



The most common form of alert is likely to be a delay in the supply of materials or components for production, but others can be dealt with just as easily using the Control Tower approach.

NTT DATA leading the way in hyperautomation and autonomous agents

We are collaborating with **a leading company in the steel manufacturing sector** as part of a strategic roadmap for hyperautomation. Through this partnership, we are working to integrate real-time process sensing and hyperconnected supply chain agents, to drive significant improvements in operational efficiency and progress toward round-the-clock autonomous management.

We're also working with two leading companies in the automotive sector, leveraging Autonomous Agents to prioritize and automate tasks related to disruption management in the inbound supply chain for assembly lines. By integrating data from suppliers and ingesting real-time insights through a Control Tower solution enhanced with AI, we enable dynamic decision-making and streamlined operations. This approach has delivered significant results, including:

- Reduction in assembly-line downtime, ensuring continuity of operations.
- Lower costs for disruption management, such as urgent transport expenses.
- Optimization of time spent by inbound logistics teams, freeing resources for higher-value tasks.

NTT DATA is one of the world's leading SAP partners. Using SAP's extensibility platform, we can create highly customized solutions that meet the specific needs of an organization while maximizing existing investments.

“ It is no longer acceptable to be caught by surprise when changes take place in the supply chain. Control Tower enables enterprises to see the full picture and respond before issues become problems.



3 Smart manufacturing

This topic is, by its nature, very complex, detailed and subject to multiple variations, depending on the industry, types of system in place and even location. Despite all this complexity, however, we can state with certainty that all smart-factory strategies have to deal with these two realities:



1. The need for integration.

Manufacturing has traditionally involved a vast number of individual processes, most of them quite separate from each other, joined only at the point where different components are brought together physically on a production line.



2. The need for IT/OT convergence.

There is a great divide between IT systems and operational technology (OT), which has made integration difficult and sometimes risky.

Future smart-factory systems must address both these areas and find solutions that enable highly secure but also very efficient integration at a logical and, in many ways, physical level.

Solutions for integration

Integration is increasingly taking place across single production sites and between clusters of factories.

Within a single site, multiple processes are being driven, stage by stage, from a single set of data held within a common data hub. A factory Control Tower solution can optimize the movement of components, assemblies and other materials across what may be a very large and complex space, and between many different production areas. It can also be applied to the warehouse, postproduction storage, testing and other areas in the factory.

In addition, factories demand a much closer integration between operational information and information on the use of energy and natural resources, including waste management. A factory Control Tower can evolve its scope to add value in terms of sustainability and operations in a combined way, even integrating with external third parties such as regulatory entities or the data hubs of suppliers and even competitors.

Clusters are an increasingly relevant topic. As more industries move to a distributed and localized production model, we see secure remote monitoring and management becoming more important. Clustering enables the sharing of resources and delivers consistent output from multiple locations.

Solutions for IT/OT convergence

IT/OT Convergence is a key requirement for all smart-factory systems.

We have known for many years that data is the most valuable commodity in any factory. Yet up to 80% of the data generated by production systems is not used for operational intelligence and, in the rare cases this does happen, data is normally used only for the initial use case and never shared for other purposes, where it could potentially add significant value to the business.

To ensure smooth, integrated operations, a bidirectional sharing of data between production machinery and core management systems is needed. In the past, this has proven to be difficult and sometimes even hazardous. OT systems tend to be standalone (so they cannot be hacked). Once connected to internet-accessible IT business systems, however, they become part of a highly flexible integrated system (positive) and potentially visible to bad actors (negative).

NTT DATA’s solutions for smart manufacturing

NTT DATA manages the IT/OT convergence requirement with maximum efficiency and security in two ways (see Figure 3). The first is based on the data cycle, with the task of collecting, transforming and contextualizing information and making it reliable to ensure its usefulness for the business. The second is based on the edge and cloud infrastructures needed to mobilize large volumes of OT data in real time.

Succeeding in the IT/OT convergence demands a twofold perspective

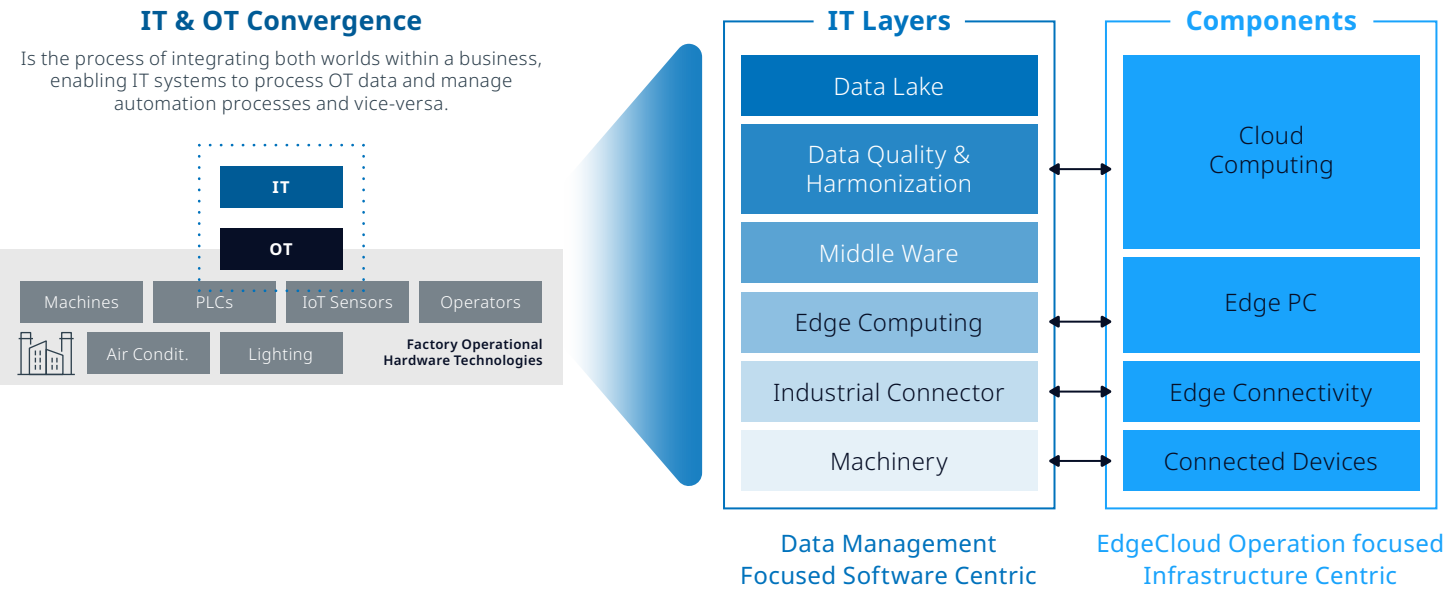


Figure 3: managing secure ad air-gapped convergence of IT & OT in smart manufacturing

Air gapping remains in place for security, but information flows south into a common data hub, which then forms the current “version of the truth” for all systems in the connected environment. NTT DATA’s IT/OT and data architecture and solutions add further value by providing an infrastructure (based on edge-to-cloud) that enables technical and semantic interoperability among a vast number of IoT sensors, actuators, facility systems, and industrial and production equipment. This takes place in real time, in line with the most relevant industrial protocols and recognized standards.

IT/OT convergence for a multinational pharma company

A multinational company in the pharmaceutical sector plans to use AI from a specialized partner to analyze its production data and determine the optimal point of its process that maximizes yield. We are working with the pharmaceutical business to execute IT/OT convergence strategy that will consolidate and provide OT data to its external collaborators in the cloud under a secure scheme, protecting intellectual property and safeguarding data sovereignty.

Our approach uses a toolset that includes everything from private 5G connectivity to digital twins and advanced management solutions that enable the fast deployment of technological innovations for OT coming from cloud and AI. The goal is to offer:

- Continuous monitoring and real-time analytics.
- Enhanced predictive maintenance for reduced downtime.
- Enhanced and accelerated design through digital-twin and test scenarios.
- Improved productivity through immersive technology.

- Automated logistics and intrafactory materials management.
- High-performance equality management.
- Optimized energy management for emissions reduction.

In this area, no enterprise is the same, so solutions are customized to an organization's exact needs. By using standard components in a highly flexible manner, NTT DATA builds solutions tailored to individual needs, rapidly and at low cost, with best-practice performance every time.

A digital twin with predictive capabilities for operations and sustainability

A leading R&D center in vehicle and automotive components has implemented an IT/OT digital twin, with the help of NTT DATA, for its smart manufacturing line. It combines the optimization of component quality and line-energy consumption simultaneously, generating a digital twin with combined operational and sustainability predictive capabilities.





4 Generative AI in supply chain

Generative AI (GenAI) is proving to be a game changer in the productive sectors, especially in supply chain and manufacturing environments. Moving beyond theoretical applications, the focus is now on tangible improvements in core processes, enabling businesses to address operational inefficiencies, mitigate disruptions and unlock new value streams.

NTT DATA leverages GenAI to tackle real-world challenges in the productive sectors, bringing lessons learned from industry use cases to drive measurable results.

GenAI lessons learned

Business-driven focus

Early implementations that focused solely on technology without a clear alignment to business outcomes failed to gain traction. Successful deployments prioritize solving specific operational challenges, such as inventory management, production planning and quality control.

Integration across processes

Isolated use cases limit the value of GenAI. The most impactful projects integrate GenAI across multiple functions, such as maintenance, logistics and production, ensuring the holistic transformation of shopfloor operations.

Adoption and change management

Frontline worker adoption is critical to success. Simplified interfaces, hyperpersonalized responses and contextualized outputs have proven essential for ensuring that GenAI tools are embraced and utilized effectively.

Scalability through standardization

A modular, scalable approach that uses proven frameworks and industrial ecosystems ensures solutions can evolve to meet future needs while minimizing implementation risks.

Operational transformation in core production processes is where we see great complexity but also very high impact from GenAI adoption.

NTT DATA's GenAI solutions

Our solutions enhance shopfloor operations by enabling smarter decision-making, optimizing workflows and empowering employees with actionable insights.

Key benefits include:

Real-time assistance

GenAI-powered shopfloor assistants provide instant access to production plans, resolve operational queries and manage work orders through a unified interface. This reduces delays and ensures alignment across teams.

Proactive maintenance and issue resolution

Predictive maintenance capabilities powered by GenAI minimize downtime by identifying potential equipment failures before they occur. Real-time troubleshooting and guided procedures ensure disruptions are quickly resolved.

Enhanced data quality and decision-making

GenAI consolidates data from multiple systems, improving shopfloor data quality by up to 350%. This enriched data enables better decision-making at every level, from production-line adjustments to inventory optimization.

Workforce empowerment

Frontline workers gain hyperpersonalized insights tailored to their roles, delivered in natural language. This boosts adoption rates and ensures GenAI tools are seamlessly integrated into daily workflows.

Quantifying results and added value: measuring the potential impact of GenAI

NTT DATA has delivered measurable improvements for organizations in the productive sectors. These include:



30% Faster Onboarding.

Simplified interfaces and personalized recommendations reduce training times for new employees.



350% Improvement in Data Quality.

Consolidated, reliable data enhances operational decision-making.



Hyper-Personalized Experiences.

AI-powered recommendations ensure that workers and managers receive role-specific insights and support.



NTT DATA's GenAI solutions are transforming productive sectors by addressing the unique challenges of shopfloor operations.

From predictive maintenance to real-time decision support, our tools empower businesses to streamline processes, reduce costs and improve efficiency. By focusing on lessons learned and scalable frameworks, NTT DATA ensures that GenAI adoption delivers sustained value across the rapidly evolving supply chain landscape.

Shopfloor Assistant transforms maintenance operations, creating a scalable model for efficiency across multiple facilities

A global automotive manufacturer partnered with NTT DATA to optimize their maintenance operations across several production facilities. Our GenAI-based Shopfloor Assistant solution empowers maintenance teams with real-time support.

Solution highlights:

- Guided maintenance procedures: Shopfloor Assistant provides step-by-step troubleshooting for production incidents, ensuring faster resolution and minimal downtime.
- Automated workflows: By integrating seamlessly with enterprise resource planning (ERP) and manufacturing execution systems (MES), the solution automates the creation of work orders and streamlines incident-management processes.

Results in numbers:

- 30% reduction in downtime due to faster identification and resolution of issues.
- 20% improvement in maintenance-resource utilization, optimizing workforce allocation.
- Enhanced employee autonomy through intuitive, natural-language queries for instant access to actionable insights.

NTT DATA's strategic advantage

We develop advanced solutions that help organizations of every kind and in every sector to optimize their supply chains and manage change. We do this through:

- Advanced intellectual property (IP) and proprietary solutions.
- A results-focused, collaborative working approach.
- High-performing technology partnerships, with proven use cases.

IP and proprietary solutions

NTT DATA is a \$30+ billion trusted global innovator of business and technology services and one of the leading providers of digital and AI infrastructure in the world. NTT DATA is part of NTT Group, which invests over \$3.6 billion each year in R&D to help organizations and society move confidently and sustainably into the digital future.

Hyperautomation solutions

As highlighted earlier in this guide, these include our Autonomous Agents platform, which enables businesses of every kind of enable fast response to disruptive events through autonomous working. As leaders in the development of intelligent networks, NTT DATA uses multi-access edge computing (MEC) with IoT, rapid analytics and other forms of distributed intelligence to identify signals across the supply chain very early. Our Autonomous Agents platform then executes the most appropriate actions without human intervention. This enables faster, more agile responses than through conventional means.

Smart manufacturing

NTT DATA has developed a portfolio of solutions designed to help manufacturers in every field transform their operational efficiency through digitized supply chains. We help them to:

- Achieve efficient, secure convergence between IT and OT infrastructures.
- Deploy edge and cloud capabilities quickly, efficiently and at low risk.
- Use private 5G to enable a high-performance factory-wide network to integrate and support every form of converged technology platform.

GenAI

NTT DATA has developed GenAI into a key tool for core production and supply chain processes. Our Shopfloor Assistant helps employees become more productive, reduces time spent on problem-solving and enables more efficient management of all supply chain activities.

Collaborative working

NTT DATA has an impressive track record of developing solutions that combine advanced technologies for a growing range of clients in different sectors. By bringing together connectivity (intelligent networks), infrastructure (cloud transformation) and vertical solutions (for example, in smart manufacturing), we can offer a unique end-to-end strategy for large industrial clients.

This has led to long-term partnerships with **leading companies in automotive, pharmaceuticals, and biopharmaceuticals** and a number of other fast-growing clients. Key use cases include our Control Tower solutions in **a leading fashion and beauty products company and a major automotive manufacturer** and Europe-wide data-management services for **one of Europe's leading robotics and factory automation businesses**.

In these cases and many more, NTT DATA has been successful because we're able to combine classic consulting services (rapid analysis, deep domain knowledge, market vision and understanding of trends) with hands-on design-and-execute capabilities. This makes us a proven "one stop shop" for solutions that are grounded in knowledge and delivered through engineering.

High-performing partnerships

As one of the world's leading global technology companies, we have top-level partnerships with all key technology companies. In some cases, we work together as long-term development partners in a way that make these relationships truly unique. To highlight just three of these:

"**Microsoft** is a key partner across various industries, including smart manufacturing. Through our collaboration, we have developed advanced data management services for Edge and Cloud environments, enabling tailored applications for smart manufacturing. This allows for agile cloud transformation and the implementation of autonomous agents, leveraging IoT data across large-scale production and storage environments"

AVEVA is a key partner in the management of industrial data, from initial design through to vertical data-management solutions, across a growing number of sectors in supply chain and production.

"Since 1997, NTT DATA, a **SAP Global Strategic Partner and Platinum Partner**, has signed several collaboration agreements with SAP SE within the SAP Partners Program, qualifying us as experts in SAP applications and technology, and in the highest quality execution of projects and services, including the development of Control Tower solutions that deliver proven value in multiple sectors. Additionally, NTT DATA has successfully qualified for the new implementation strategic partner status "RISE with SAP Validated Partner," a certification held by only 8 partners worldwide."





Next steps

The rapid evolution of supply chains will continue and accelerate.

The rise of intelligent networks and digitization means it is now possible to build solutions that give intelligent visibility from end to end across even the most broadly based and complex supply chain, and to enable autonomous responses that will make supply chains more agile, responsive and dynamic.

To stay successful in what might be a very unpredictable next decade, this is exactly what ambitious, far-sighted enterprises need to do.

To analyze the best options for your business, contact NTT DATA's supply chain practice for Europe, Middle East and Latin America.

We'll give you a fast appraisal at once, for free.

We look forward to talking soon.

[Get in touch.](#)

