Unlocking the power of data in factories

Leveraging IoT and data to optimize maintenance, production and quality

orange™ Business

Contents

Tomorrow's industrial winners will be those that fully exploit data

"Manufacturers face an ongoing challenge: how to increase speed and agility while simultaneously reducing costs and risks in the production process. In this series of ebooks, we explore the benefits of developing a comprehensive data utilization strategy for industrial facilities, along with practical advice on implementation.

Digitalization and automation play pivotal roles. They empower shop floor personnel to optimize continuous data flows, gaining valuable insights into product lifecycles and production processes for informed decision-making. By integrating advanced technology, companies can streamline processes, optimize resource allocation, enhance productivity, reduce errors, and enable real-time monitoring.

Effective data management provides shop floor teams with meaningful insights into production line activities and beyond, serving as a foundation for intelligent decision-making. Leveraging data collected across the production environment allows factories to secure processes and operations while optimizing overall performance to maintain a competitive edge."

Emmanual Routier,
Vice President Smart Industries,
Orange Business

Part 1: Benefiting from data as an operations manager in industry

Data can unlock many business benefits. We highlight some use cases and approaches to getting the most out of your industrial data.

According the World Economic Forum[1], effective use of data in manufacturing is essential to making businesses more sustainable and profitable. It is an abundant source of wealth, particularly for production, quality control and maintenance operations.

However, the use of data on industrial sites is far from widespread and is not yet optimized. In fact, the WEF reports that only 39% of manufacturing executives had successfully scaled data-driven use cases beyond a single product.

So how can manufacturers unlock the value of data in factories? Are they aware of all the benefits? Is the implementation of these data valuation strategies under control? Operational managers are the key to success in data projects, and in this section, we highlight the business benefits and use cases enabled by data in factories.

80% **of machine-generated data in the data economy remains unused to date, according to the European Commission[2]**

Our experts' opinions

Olivier Chapel, Manufacturing Excellence Organization group manager & Industry 4.0 at L'Oréal

"As an industry operating in a constantly evolving landscape, we face challenges such as meeting consumer expectations, competitive pressures, and aligning our production methods with increasingly ambitious environmental goals.

The key to success lies in establishing a global and harmonized approach to industrial data utilization. Several years ago, we created a substantial data lake, granting as many collaborators as possible access to our collected data. It functions like a self-service data repository!

While we did need to train operational managers in the field, the concept has gained significant traction. We no longer need to promote Power BI internally."

Managing production more effectively

The first area to leverage data is managing production more effectively; and there are three aspects to this.

1 Thinking about productivity beyond overall equipment effectiveness (OEE)

The OEE indicates the utilization rate of a machine by comparing its actual output with its theoretical maximum output. However, other factors need to be considered to assess the real productivity of industrial sites. Combined with the OEE, production data such as machine settings, raw material types, and quality control results provide an overall understanding of productivity and identify areas of improvement.

2 Improving operator's safety and motivation

Providing real-time data access to operators can significantly reduce the effort required in undertaking manual machine information checks. This not only alleviates worker fatigue but also enhances concentration, safety, and overall performance.

Even if the data already exists and is visible on the human-machine interface, delivering it to the right person at the right time requires dedicated tools and effective global data management.

Involving machine operators in reporting, quality control, and data utilization is also motivating. They benefit from a simplified daily routine and are empowered to improve key performance indicators (KPI).

3 Golden Batches and Digital Twins

"Golden Batches" enable manufacturers to consistently reproduce high-quality products. These batches represent the optimal production standards, ensuring synergy among equipment, materials, processes, and other production aspects.

However, reproducing Golden Batches is a complex process. It involves identifying the optimal setpoints on production lines and having access to robust, reliable databases.

Enter Digital Twins. By modeling the manufacturing environment, they allow for more cost-effective production with higher output. At the same time, production managers can use Artificial Intelligence (AI) to validate predictive models by identifying inconsistencies and making necessary corrections.

Read more about Digital Twins here

Anticipating and optimizing maintenance operations

The next area where data can make a difference in factory operations is through improving and optimizing maintenance activity. This includes implementing condition-based and predictive maintenance.

Analysis of multiple data points such as breakdown history, machine parameters or what type of raw material, allows factory operators to identify normal production conditions. In turn, they can then detect deviations, along with anomalies or failures that can impact the production process. Using data in this manner allows them to react quickly to a problem, or even anticipate a problem before it occurs.

To take this a step further, predictive maintenance uses a history of situations and machine learning to statistically predict the evolution of equipment deterioration and certain other events, such as machine breakdown.

Benefits of this approach include:

- Reducing machine downtime
- Cutting back the time to restart machines
- Replacing parts at the right time: preventing breakdowns while avoiding too-early replacements
- Improving team confidence
- Setting-up automatic alerts
- Facilitating equipment diagnostics: identify frequency, origin and causes of anomalies

$1.5 trillion

A Senseye report predicted that unplanned downtime cost Fortune Global 500 industrial companies almost $1.5 trillion in 2023, 11% of their annual revenues[3]

Our experts' opinions

Pablo Lluch, Senior IoT business Expert, Orange Business

"On an aircraft, changing a faulty electrical cable only costs a few thousand dollars, but the aircraft downtime can cost the operating company up to $150,000 an hour. That's a worrying thought.

By combining IoT and AI, assets can be better mobilized. Continuously collecting data from equipment an combining it with other external data, such as meteorological or historical data, allows manufacturers to better plan their maintenance operations. This anticipation increases machine availability, reduces costs and therefore increases profitability."

For further information on predictive maintenance and artificial intelligence read here

Improving quality processes

The final area where data can deliver benefits for manufacturers is in improving quality processes. There are three different ways it can does this as outlined below.

1 Optimizing production quality and reducing scrap rates

The waste issue concerns all manufacturers, especially in highly regulated sectors such as pharmaceuticals and cosmetics.

Scrap is associated with environmental factors such as temperature, humidity, machine failures, and material quality. By analyzing data related to these factors, you can pinpoint their exact causes and address them at the source. The result: improved compliance rates, time savings, and reduced financial losses.

2 Facilitating quality control through product traceability

The quality of a product is influenced by the characteristics of its raw materials. Data collected throughout the manufacturing process allows us to trace the entire value chain of the product and quickly certify its conformity. This includes details about raw materials, manufacturing dates and locations, material quantities, and production conditions.

An additional benefit is that it helps meet quality requirements set by customers and regulatory authorities.

3 Conducting more appropriate controls

Access to more data facilitates the study of a broader range of characteristics in isolation. By carefully selecting the most relevant data, precise controls can be conducted at various points throughout the manufacturing process.

Additionally, new types of controls are emerging. For example, analyzing product appearance using video data and AI enables quality managers to perform automated inspections using only computer vision.

Our experts' opinions

Virgile Dier, Product Manager, Mixed Reality and Computer Vision at Orange Business

"In industry, the risks of non-compliance are a daily problem and are becoming more complex. New standards and regulations, growing customer expectations and an increasingly competitive environment mean that production line operators are faced with new challenges. To maintain or restore their productivity levels, highly efficient and cost-effective solutions exist, such as those offered by computer vision."

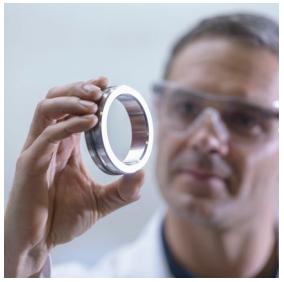
Industrial data success stories

We have worked with a wide variety of customers to realize the value of their data. We have listed some examples below.

Indoor 5G for new industry 4.0 use cases

Orange has rolled out a private, virtualized indoor network meeting industrial requirements at the Schneider Electric site in Vaudreuil, France. This co-innovation approach ensures convergence between information and operational technologies (IT/OT), and allows the company to test out innovative use cases.

Read more



Smart tracking for tooling

Thanks to IoT and a smart tracking solution, Safran Aircraft Engines is optimizing the traceability and management of its equipment in a 55,000 m2 building.

Watch the video

New services thanks to IoT data

Veolia Water is transforming its IoT data into high value visual information thanks to a dashboard-as-a-service offering. This has been realized through a strengthened business data collection infrastructure.

Read more

Machine Learning for quality

World leader in manufacturing cables for the energy and telecommunications sector, Nexans has automated its quality check process by using machine-learning to continuously monitor production lines and report any problems.

Read the article

Smart Tracking for Inventory management

The Santos Group is using data to better manage its stock of 2,500 spare parts. The lead time to find a spare part has been considerably reduced from 15 minutes to 15 seconds.

Watch the video

Part 2: A guide to starting your data project

Manufacturers must digitally transform their business to remain competitive, reduce costs, and improve agility to deal with market disruption. To do this, they need to make informed decisions based on the right data, which will be used to maximize profit and create a safer working environment.

In this section, we offer advice on setting up a data project. This includes selecting data sources, creating a data management infrastructure, choosing the best technology infrastructure, and following the recommended steps for setting up a data monetization pilot.

Emmanuelle Routier,
Vice President Smart Industries,
Orange Business

“Demystifying data represents an essential initial step. To navigate the industrial landscape effectively, manufacturers need to adopt the right mindset. Consider data as a raw material akin to any other: there are deposits to extract, refine, and ultimately exploit.

Next, prioritize user and business leadership over technology in your data projects. Ask yourself: What business outcome do you envision for your company’s future? Then explore how data can propel you toward that goal – whether through operational optimization or the provision of additional services.”

Choosing your data sources

There are many different data sources available for your data project and choosing the right ones is essential for success. We have highlighted the range of data sources and their typical applications below.

Machine data

- Fault history
- Machine parameters
- Temperature
- Humidity
- Lubrication frequency
- Material quantities
- Energy consumption

Assessing the standard and quality of ongoing production processes

Anticipating maintenance requirements

Financial data

- Equipment costs
- Scrap value
- Maintenance costs
- Product prices
- Raw materials prices

Optimizing investment and production choices

Weather data

- Air humidity
- Ambient temperature
- Atmospheric pressure

Avoiding machine malfunction or damage

Supplier data

- Raw materials origin
- Raw materials characteristics
- Raw materials anomalies rate
- Frequency of deliveries

Adapting machine parameters

Improving product traceability

Customer data

- Satisfaction surveys
- Purchasing preferences
- Customer expectations

Improving the quality of under-performing products

Aligning product quality with customer expectations

Our experts' opinions

Antoine Chevrier, Business and Innovation consulting lead for Europe at Orange Business

"Data is frequently underutilized in industrial companies. For example, we once had a customer who used data solely for reporting purposes, overlooking the potential of activating predictive maintenance – even though all the necessary resources were available. Our primary mission is to encourage clients to view data as a foundational layer and an additional means to achieve business objectives.

To foster this mindset shift, global data governance must be established, moving away from the prevalent process-driven approach common in the industrial world today. Often, the best approach is to visit other plants that have matured in this area and demonstrate what can be achieved."

Data management infrastructure

Data management and governance are key requisites for your data management project. Be sure to address all of the factors outlined below.

Ensuring data quality

Data must be reprocessed to make it 100% reliable and operable:

- Checking consistency and uniformity
- Ensuring regulatory compliance
- Making data updates and defining archiving processes

Collecting data

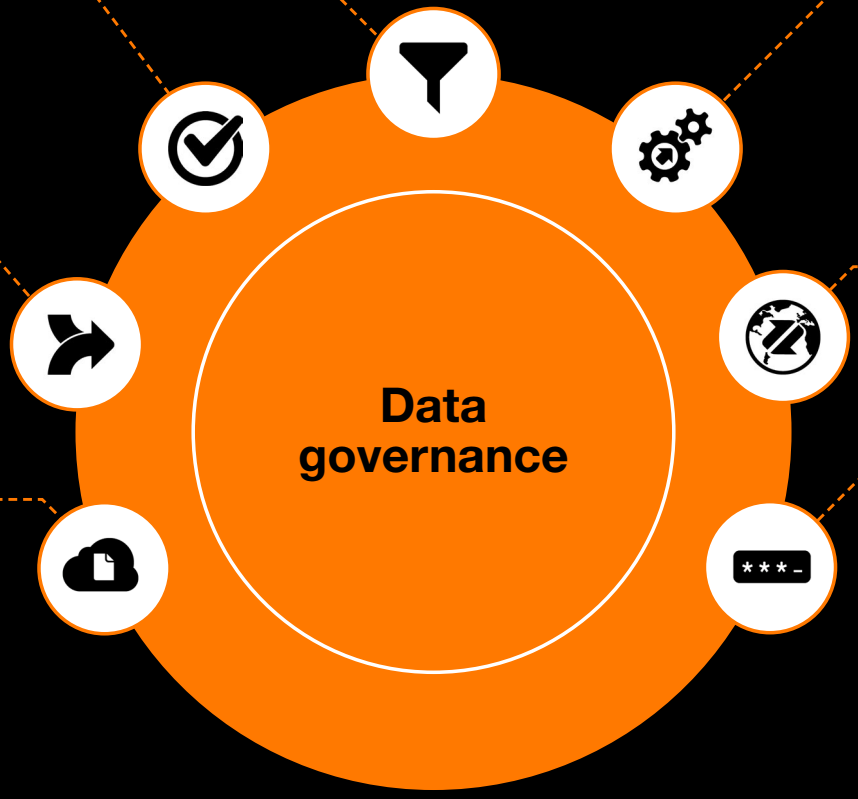
Gathering data, including digitizing paper data, is a key step to guarantee the completeness of information and the quality of indicators.

Centralizing data

To cross-analyze the data, it must be stored in one place and standardized. The choice of technology is therefore important.

Sorting data

Not all data has the same value for your business, so it needs to be sorted. The key is to keep only useful data, which also reduces storage costs and energy consumption.



Creating the right data visualization

Visualization tools must be easy to understand and make data intelligible to meet individual needs. This includes:

- Cross-referencing indicators
- Global reporting
- Configurable views
- Layout choices
- Data extraction

Facilitating data flow and sharing

Every user should be able to easily find the needed information, enabling effective use of the existing pool of data.

Securing data

Data security is a critical part in any data monetization project. Without it, there is a risk that insecure or inadequately secured data could lead to data alteration, loss or theft.

The technology foundations for industrial data use cases

The biggest challenge manufacturers face is getting data out of their fragmented systems in a scalable and secure way. Siloed data sources and legacy systems can make this difficult. The technology infrastructure is vital to success, and this includes sensors, networks, data analytics, and cyber security.

Sensors to connect machines

Data-driven factories use data from various sources to obtain insight, spot trends, and deploy resources efficiently. This isn't just data from ERP and CRM software. It also includes real-time data harvested from connected intelligent sensors and actuators across the factory floor, allowing inefficiencies and problems to be identified early.

Read more in our factsheet

Platforms to benefit from AI

Machine learning (ML) has become an essential tool enabling machines to learn from data and provide valuable insight, making them work better for longer and delivering new applications.

Read our blog

Watch our video

Our experts' opinions

Sam Waes, Head of Smart Industry Europe, Orange Business

"In the ever-changing industrial landscape, factory managers face a multitude of challenges. The macroeconomic environment is increasingly uncertain, making it difficult to navigate. Finding and retaining skilled workers for manufacturing operations is a pressing concern. The ability to adapt production setups and locations quickly has become essential to meet market demands. Moreover, technologies are evolving at a rapid pace, often outpacing implementation, while the production of goods requires specialization and adaptability, resulting in smaller batches and a greater need for flexibility.

To thrive amidst these challenges, factory managers must take decisive action. They need to prioritize the design of a robust data infrastructure that empowers their teams. This infrastructure will enable them to make informed decisions, enhance efficiency, and respond swiftly to changing market dynamics. By embracing agility and leveraging data-driven insights, factory managers can strengthen their competitiveness and ensure long-term success in the smart industry."

Live Objects: a platform to connect industrial devices and sensors

“The Live Objects platform exemplifies the benefits of modern device management solutions, integrating connectivity, cloud services, and advanced cybersecurity. This integration helps industrial companies achieve significant increases in operational efficiency by streamlining data collection and processing.

Additionally, Live Objects extends the lifespan of your devices with its low-power protocol and ensures flexibility and future-proofing by supporting industry standards, thereby preventing vendor lock-in. This comprehensive approach not only optimizes your operations but also enhances your technological adaptability.”

Read more here

Miguel Muñoz de Morales, Head of Smart Industry Consulting - Europe, Orange Business

Networks: essential for optimum connectivity

Robust and secure connectivity is essential to become a successful data-driven factory. It connects systems, allowing data to be correlated and analyzed to make factories smarter, more profitable, safer, and more sustainable.

Read more in our factsheet

Not forgetting to address industrial cybersecurity from the outset

There is no smart manufacturing without effective cybersecurity. Manufacturing is already the industry the most affected by ransomware and other cyberattacks, according to Orange Cyberdefense.

Here are the seven most common security gaps identified in more than 90% of the plants audited by Orange Cyberdefense experts:

- **Sensors to connect machines**
- **Unsecured OS and firmware**
- **No antivirus**
- **No security monitoring**
- **Permanently connected engineering stations**
- **Lack of detection capacity**
- **Unsecured protocols**

Detailed steps to set up your data monetization pilot

1 Monitoring, peer feedback and expert information

2 Building a value chain map

3 Careful choice of partner

4 On-site audit: existing VS desired data system

5 Identification of a simple and profitable process to test

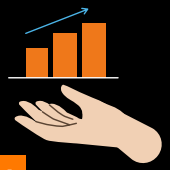
6 Choice of a process with the field teams

7 Definition of the data collection strategy for this process

8 Sensors and IT solutions deployment

9 Choice and customization of the most suitable IT solutions and dashboards

10 Establishment of regular communications of consolidated indicators to operators/technicians



11 Evaluation of first quantitative and qualitative benefits after about 3 months

12 IoT and IT model adjustment to perfect the POC

13 New benefits analysis 3 months later

14 Feedback for management and field teams

Is the POC a success? Now it's time to scale up!

Part 3: Building long-term business success with industrial data

While companies have been collecting data for quite some time, achieving meaningful business outcomes remains a challenge.

To ensure that industrial data projects create lasting value, companies must carefully select their data, contextualize it, and share it widely within the ecosystem.

Sharing data with customers opens up a whole new approach to business. It provides better visibility into product positioning and roles, adding coherence and significance to your overall business strategy. Even employees who may initially be skeptical about data will see its business benefit.

The key to success lies in fostering a mindset shift. This requires executive sponsorship and a clear message that can rally overall support. Additionally, companies should invest in “data-friendly” equipment and prioritize providing necessary feedback.

In this section we explore how to leverage data for long-term business benefits.

Our experts’ opinions

Niels Helkov, VP Smart Industries & Digital Solutions Americas, Orange Business

“Today, there is abundant data in factories, particularly the newer ones. However, this does not mean that it is being fully used. Many automated systems, for example, are not interconnected and do not benefit from the information generated upstream in the chain. Fortunately, new solutions are emerging including those using the Unified Namespace architecture, which can go some way to solving these issues.

However, there is still a long way to go before manufacturers can truly harness the power of data, going beyond simple process monitoring or factory monitoring to accelerate business outcomes such as improved output, yield, waste management and productivity.”

Democratizing internal data use

Effective data collection and analysis for decision-making requires collective ownership at all levels within the data organization. Implementing a shared vision and fostering an internal dynamic are fundamental steps. This ensures that operational staff fully comprehend the benefits, and good practices become second nature. There are five aspects to this:

1 Raising awareness

The in-depth use of data in a factory is a major operational change, and employee buy-in is crucial to its success. They must be convinced that data will simplify their daily tasks and won't be a burden. Presenting real-life use cases inspired by peers offers teams the chance to envision its potential.

2 Training

Every employee must be trained to take ownership of their job-specific data management. Everyone must be aware of the rules to follow for data quality, reliability, and security to maintain the integrity of the overall system.

Regular updates are essential, including for new arrivals. Create a reference document allowing every worker to refer to it when needed.

3 Breaking down silos

For data to be shared and used by as many employees as possible, it must not remain siloed. This cross-disciplinary approach also applies to communication, including questions, best practice exchanges and ideas.

The first barrier to break down is often the one that remains between the IT department and the operational managers.

Democratizing internal data use

4 Making access easier

For data to become an integral part of the day-to-day lives of operational staff, it needs to be easily and independently accessible, without requiring the involvement of an expert.

It should be available in multiple exportable and shareable formats. This frequently involves data exchange standards like UNS* which are well-suited to industrial systems' interoperability requirements.

5 Overcoming challenges

It is vital to involve all operational personnel and convince those who are more resistant to change. Providing those employees with specific indicators to track and optimize is beneficial – such as indicators about their production line or during maintenance operations.

Communication about overall objectives and tangible outcomes is also essential. Lastly, it's crucial to encourage and reward the spirit of initiative to enhance on-field data usage.

* What is Unified Namespace (UNS)?

Unified Name Space (UNS) is a messaging system that connects production equipment, applications and information. Rather than trying to connect systems to each other, each asset or application talks to the UNS, which in turn sends back relevant information.

Read more

Taking advantage of data monetization to meet a plant's overall objectives

There are three key areas where data monetization and AI can contribute to improving business outcomes.

1 Improving the quality of life at work

Data analytics and machine learning offer tangible benefits, including improved quality assurance and reduced monotony associated with tasks.

For example, at Audi's stamping plant in Ingolstadt, Germany cameras monitor all the components directly after manufacturing. An in-house machine learning software then analyzes these images to identify any manufacturing defects.

Given that defects can manifest in various forms, formalizing manual quality assurance tasks can prove challenging. However, thanks to AI, this can now be managed by inspection robots enhanced with machine learning, as they can identify anomalies beyond the typical range. Some manufacturers are even going one step further to make production machines correct themselves when they produce a faulty part.

2 Meeting the expectations of a changing market

"Our strategy involves leveraging our data more effectively to address the current challenges in the cosmetics sector.

Given the strong customer demand for personalization and the unpredictable impact of social networks on product popularity, we tend to produce in smaller batches. This approach allows us to remain agile and responsive to market dynamics.

By collecting and maximizing the use of our production data through analytics, we gain flexibility and empower ourselves to make swift production decisions. This includes adjusting product batch sizes promptly, increasing or decreasing them as needed, and making frequent changes to references with better-controlled equipment settings."

Olivier Chapel, Manufacturing Excellence - Organization group manager & Industry 4.0 at L'Oréal

3 Engaging in the energy transition

Let's consider an example of a metal manufacturer with 17 industrial sites and 5,200 employees. The company enhanced its Energy Performance Indicators (EPI) at one of its plants through a data-driven strategy.

The project began by deploying digital twins, which allowed operational managers to monitor batch efficiency, control processes, and optimize equipment. As data accessibility increased, numerous opportunities emerged for managing and improving energy efficiency within the organization.

Thanks to this collaborative strategy, the plant improved its planning, resulting in higher yields, while also reducing gas consumption by 16%. This example shows how using data can help improve sustainability as part of overall efficiency improvements.

Widening possibilities with AI

AI can offer even more opportunities to improve business outcomes in manufacturing operations. Here are three examples.

Imagine being able to perform specific maintenance operations without relying on technical experts.

AI provides a solution: a German start-up called Aleph Alpha is developing an industrial application that utilizes language processing and image analysis to communicate with factory employees. For example, employees can send a photo of a machine to the AI application, which can then detect errors or verify proper installation.

Imagine optimizing your quality processes by harnessing previously unconsolidated textual data.

AI offers a solution: Yxir, an EDF spin-off, has developed software that aggregates quality data from various sources—whether it's ERP, EMS, CRM data, Excel files, Word documents, or PDFs. The algorithm performs semantic analysis on this data, providing valuable insights for enhanced decision-making.

Imagine optimizing your production using digital twins – an "industrial metaverse".

Cosmo Tech offers a solution: it has developed digital twin software specifically for industrial companies. These solutions dynamically replicate an industrial company's activities, simulating demands and constraints across various levels: global strategy, processes, workflows, HR, and machines. The company can then visualize the results in 3D in the metaverse.

Five things to avoid during an industrial data monetization project

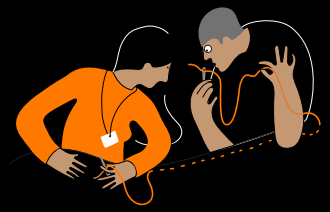
Success in industrial data projects is encompasses more than just making the right technology choice. From our experience in running these types of projects, there are five common issues that businesses should look to overcome for success.

1 Not providing the necessary resources

Most manufacturers readily acknowledge the benefits of data, but not all allocate the budget or the needed human resources to succeed.

2 Neglecting the needs of end users

There are often significant discrepancies between the objectives of plant management and end users' actual needs. Addressing these issues throughout the project is essential.



3 Considering the data project as a purely IT project

Ensure you also focus efforts on human resources rather than just IT implementation. Digitalizing a plant is a wide-ranging global transformation affecting all employees, not just the IT teams.

4 Having unrealistic expectations

Leveraging data within the plant is not a miraculous problem-solving solution. Instead, it represents a powerful additional lever that should be implemented over the long term.

5 Scaling up too quickly

Before venturing into larger-scale applications, it's essential to establish the groundwork, which includes constructing a shared data repository at your industrial site. Don't deploy the latest generation of AI solutions without proper preparation.

Why Orange Business

Orange Business has a unique skill set as a global integrator, communications operator and service provider along with genuine experience of the industrial world.

- More than 26,000 customers in the industry sector
- 33% of our key international customers are manufacturers
- Specific IoT approach for industry, its infrastructure, and its products
- Cybersecurity expertise tailored to the specific environment and challenges of industry, with expertise from 3,000 cybersecurity experts at Orange Cyberdefense
- Networks designed for connectivity that meets your production requirements, including LoRA, PMR, 4G, 5G, industrial LAN and edge computing

Recognized data and AI expertise

- European leader in Data and AI
- More than 700 IoT and data analytics experts
- More than 50 Orange-approved sensors

Nine success factors

At Orange Business we consider the following nine factors are essential for success in industrial data projects.

1. **Knowledge of the industrial sector (references, jargon, understanding of processes, etc.)**
2. **Data / AI specialization**
3. **Ability to manage the valuation data project from A to Z**
4. **Supply of resources needed to roll out a POC and scale it up**
5. **Expertise in the choice and management of fixed and wireless networks**
6. **Cybersecurity solutions tailored to industrial production environments**
7. **Consulting, global support and change management**
8. **Ability to find external funding to subsidize the project**
9. **Independence regarding industrial OT equipment set up in plants**

We have developed an Operational Xperience factory demo to show the Orange Business capabilities in delivering industrial data projects based on an example of a coffee capsule manufacturing line.

Find out more here

Sources

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