



Whitepaper

Building the Smart Factory of the Future:

# How AWS modernizes manufacturing operations

The manufacturing sector is undergoing a pivotal shift, requiring leaders to adopt digital transformation, automation, and scalable infrastructures to stay competitive. Learn how to leverage cloud architectures, IoT, AI, and automation to make the future a reality today.



In an era marked by rapid technological advances, the manufacturing sector faces unprecedented challenges and opportunities. To remain competitive, industry leaders must undergo a digital transformation, embrace automation, and build scalable infrastructures. The Smart Factory of the Future is a digitally driven, optimized manufacturing ecosystem powered by advanced cloud architectures, the Internet of Things (IoT), artificial intelligence (AI), and automation.

And the future is now.

The key enabler for this transformation is cloud computing, which provides the flexibility, scalability, and real-time data management capabilities necessary to support modern manufacturing operations. A well-designed cloud architecture not only optimizes operations, improving efficiency and scalability, but also enhances security, ensures reliability, and reduces costs and downtime. In this whitepaper, we will explore how to build a resilient cloud architecture that enables the Smart Factory of the Future and outline the key components, technologies, and strategies that manufacturers must implement to succeed in this digital landscape.

---

## The importance of cloud architecture for manufacturing

Cloud computing has become an essential component of modern manufacturing, enabling organizations to move beyond traditional on-premises infrastructure and problematic data silos and take advantage of the flexibility and scalability of a centralized, customized cloud-based system. As manufacturers undergo digital transformation, cloud-based systems allow them to manage complex production processes, gather data from connected devices and machinery, and analyze it in real-time to optimize decision-making and allow for immediate intervention.



According to Gartner, by 2028, 70% of workloads will run in a cloud computing environment.

# Benefits of cloud adoption

Cloud-based systems, particularly cloud-based ERP solutions, offer manufacturers numerous benefits, including:

1

### Agility

Cloud computing enables manufacturers to scale their IT infrastructure up or down based on production demands, reducing the need for upfront hardware investments.

2

### Real-time data access

A customized cloud architecture provides manufacturers with access to real-time data from IoT devices, PLCs, production lines, and other systems, enabling immediate, more informed decision-making.

3

### Operational efficiency

With integrated cloud systems, manufacturers can streamline operations, automate routine tasks, and improve collaboration across departments.

4

### Cost savings

Moving to the cloud reduces the need for expensive on-premises hardware and allows organizations to pay for only the computing resources they use, optimizing cost structures. Plus, it can reduce machine downtime due to its predictive maintenance capabilities.

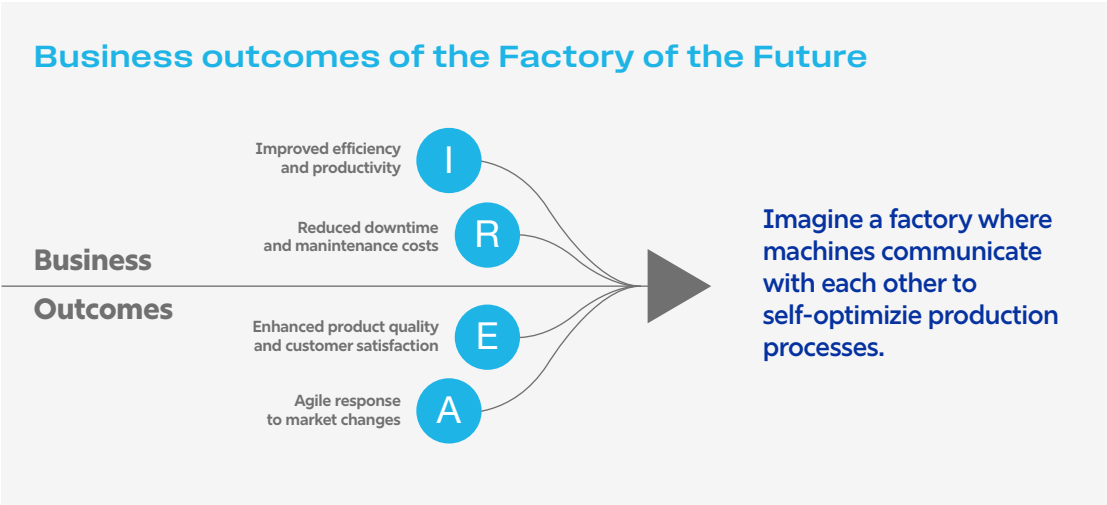
5

### Security and compliance

Leading cloud providers, such as Amazon Web Services (AWS), offer built-in security features, including encryption, multi-factor authentication, and comprehensive compliance frameworks.

In the highly competitive manufacturing world, these benefits can mean the difference between breakthrough and bankruptcy. To evolve, manufacturers must optimize their operations while managing costs and ensuring agility.

According to Gartner, 67% of manufacturing CIOs view improving operating models as their top digital technology priority.



# Cloud architecture for the Smart Factory of the Future

To create a smarter factory, manufacturers must focus on building a cloud architecture that integrates key elements and technologies, including IoT devices, real-time data processing, AI-driven automation, and enhanced security protocols.

## 1

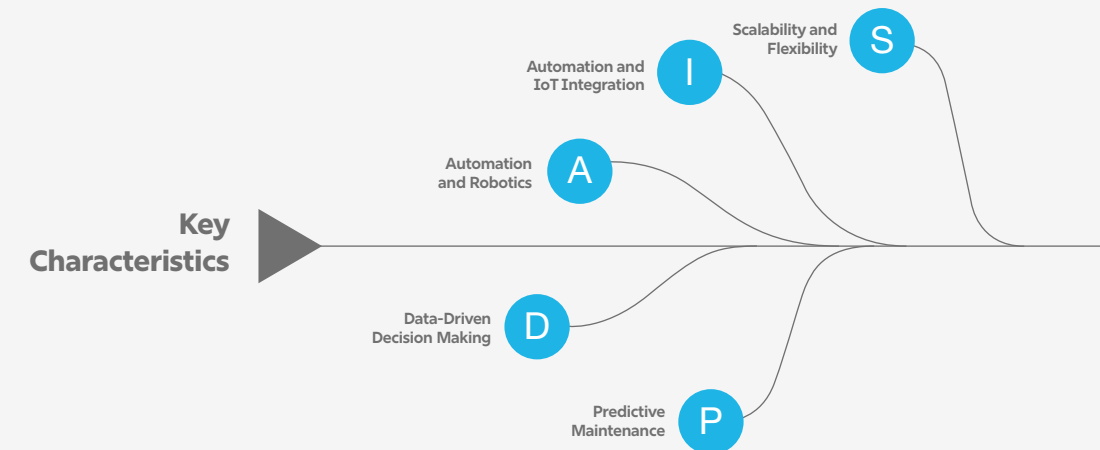
### IoT integration

IoT technology is fundamental in the Smart Factory of the Future. IoT devices enable manufacturers to collect real-time data from machines, sensors, and production equipment. This data is essential for monitoring equipment health, tracking production performance, and making real-time data-driven decisions.

A strong cloud architecture must support the seamless integration of IoT devices across the production environment, and should include:

- **A data hub:** A centralized data repository that aggregates and processes data from IoT sensor information, PLCs, MES, SCADA, and ERP systems in real time. When everything is connected and talking to each other, manufacturers are more agile and responsive.
- **Event-driven architecture (EDA):** Designed to detect an “event” (i.e., a change in state or update), an EDA allows IoT devices to communicate asynchronously, ensuring that critical data is processed with minimal latency.
- **Scalability:** As factories expand, cloud architecture must support the addition of new IoT devices without sacrificing performance.

### Key characteristics of the Factory of the Future



Due to technological breakthroughs like smart sensors, manufacturing is one of the top five fastest-growing industry of the IoT market. Allied Market Research predicts that IoT for manufacturing will reach \$525 billion by 2027 (growth rate of 22%), and the sector will see a 14.3% compound annual growth rate through 2028.



## 2

### Real-time data processing and analytics

The ability to process data in real time is necessary for the Smart Factory of the Future. Cloud architecture provides the necessary computational power to handle large volumes of data from IoT devices and production systems.

A resilient cloud-based system features powerful tools that optimize operations, reduce costs, and allow manufacturers to act on insights and react to issues immediately:

- **Machine learning models:** AI-driven machine learning models detect patterns and analyze real-time data from production systems to detect anomalies, predict equipment failures, and optimize operations.
- **Predictive analytics:** Like machine learning models, predictive analytics help manufacturers anticipate future events and outcomes, optimize inventory management, and improve demand forecasting. According to Deloitte, when manufacturers implement a predictive maintenance system, they can:
  - Increase equipment uptime by 20%
  - Reduce breakdowns by 70%
  - Decrease maintenance costs by 25%
- **Digital twins:** Digital twins are virtual replicas of physical assets or systems that provide real-time insights into the performance of machines. Manufacturers can use digital twins to simulate different scenarios, optimize production processes, and reduce operational inefficiencies.



# 3

## Automation and robotics integration

The Smart Factory of the Future must feature streamlined automation, and cloud architecture plays a key role in enabling the integration of robotics and other automated systems. Cloud-based systems provide real-time control and monitoring of automated processes—production is efficient, precise, and scalable.

To become a smarter factory, your cloud infrastructure must reduce errors, increase productivity, adapt to changing marketing conditions, and include:

- **Real-time control:** Manufacturers can use cloud-based platforms to monitor and control automated systems in real-time, ensuring that production lines run smoothly and efficiently.
- **Robotics as a Service (RaaS):** A strong cloud infrastructure allows manufacturers to deploy and manage robots without requiring significant investments in on-premises hardware.
- **AI-driven automation:** AI algorithms integrated into cloud platforms can enhance automation systems by optimizing workflows and improving decision-making.

## Syntax cloud application highlight

Powered by cloud technology, **Syntax's Visual Inspection for Manufacturing** software leverages AI-driven image recognition to enhance quality control and efficiency in manufacturing processes. By using advanced computer vision, it detects and classifies defects in real time, reducing the need for manual inspections and increasing accuracy. This solution seamlessly integrates into manufacturing workflows, helping teams quickly identify and address potential issues, which minimizes downtime and boosts productivity. With its adaptability to various production environments, SAP's Visual Inspection offers a robust tool for maintaining high-quality standards while optimizing operational performance.





# 4

## Security and compliance

While highly beneficial, the rise of connected devices, cloud platforms, and digital twins introduces new vulnerabilities that must be addressed to protect sensitive data and intellectual property.

Cloud providers like AWS offer a robust security framework designed to safeguard manufacturing systems, including:

- **Encryption:** Data in transit and at rest is encrypted to prevent unauthorized access.
- **Identity and access management (IAM):** IAM controls restrict access to cloud resources based on the principle of least privilege, ensuring that only authorized personnel can access sensitive data.
- **Compliance:** Cloud providers comply with industry standards such as ISO 27001, GDPR, and regional manufacturing regulations, ensuring that manufacturers meet their legal and regulatory obligations.

According to Gartner, more than 85% of companies will adopt a cloud-first policy by 2025, highlighting the importance of secure, sustainable cloud architectures.



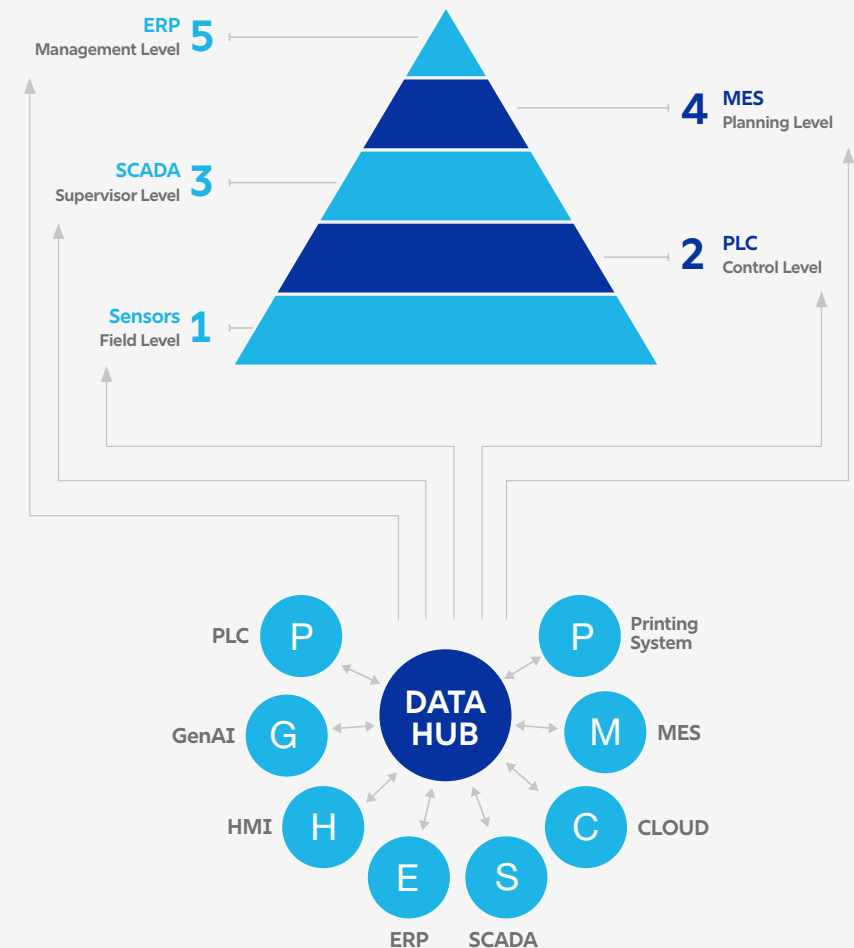
# The automation pyramid: enabling the Smart Factory of the Future

The Automation Pyramid is a widely used model for understanding the flow of data in a manufacturing environment. It outlines the different layers of automation and data aggregation, from sensors on the shop floor to ERP systems at the business level. The pyramid consists of five layers:

- 1. Field level (Sensors and actuators):** The field level includes IoT sensors and actuators that collect real-time data from machines and production lines. Cloud infrastructure enables manufacturers to gather and process this data centrally.
- 2. Control level (Programmable logic controllers - PLCs):** PLCs automate the control of equipment based on data from sensors. Cloud-based control systems provide the flexibility to monitor and control machines remotely, enabling real-time adjustments.
- 3. Supervisory level (SCADA systems):** SCADA systems aggregate data from PLCs and provide a centralized view of production processes. Cloud-based SCADA systems offer enhanced data visualization and remote monitoring capabilities.
- 4. Manufacturing execution systems (MES):** MES solutions bridge the gap between the shop floor and business systems, coordinating production activities and ensuring alignment with business objectives. Cloud-based MES solutions provide real-time insights into production, allowing manufacturers to optimize resources and improve efficiency.
- 5. Enterprise level (ERP systems):** At the top of the pyramid, ERP systems manage business processes such as finance, procurement, and supply chain management. Cloud-based ERP systems enable manufacturers to integrate data from all levels of the automation pyramid, providing real-time visibility into production and business operations.

By integrating cloud architecture into the automation pyramid, manufacturers can create a more agile and efficient production environment that enables more informed decision-making, enhanced process control, and greater scalability.

Automation pyramid





# AWS Well-Architected Framework

To ensure that cloud architecture is optimized, manufacturers can leverage the **AWS Well-Architected Framework**. This framework provides a structured approach to designing and operating secure, high-performing, and cost-efficient cloud systems and is based on six pillars:

1. **Operational excellence:** Manufacturers can use cloud-based monitoring tools like Amazon CloudWatch to gain real-time insights into production performance and machine health.
2. **Security:** AWS offers built-in security features, including encryption, identity management, and multi-factor authentication, protecting critical infrastructure, manufacturing data, systems, and applications against cyber threats.
3. **Reliability:** Cloud infrastructure provides built-in redundancy and disaster recovery mechanisms to minimize downtime, guarantee continuous operations, and ensure systems are resilient and can recover from failures.
4. **Performance efficiency:** AWS allows manufacturers to use computing resources efficiently and scale resources based on demand, optimizing performance and cost reduction.
5. **Cost optimization:** AWS also offers tools such as Cost Explorer that allow manufacturers to identify and eliminate unnecessary expenses and ensure that cloud resources are used in the most cost-effective way possible.
6. **Sustainability:** Through efficient and optimal use of resources, migrating to the cloud enhances sustainability, helping manufacturers achieve lasting benefits for the environment, economy, and society.

The AWS Well-Architected Framework is essential in building cloud architectures that are secure, scalable, and optimized for performance and cost-efficiency. Plus, regular Well-Architected Reviews allow for continuous improvement of cloud systems and ensure alignment with best practices, and long-term success.



# The role of AWS in continuous improvement

Once your cloud architecture is in place, continuous improvement is essential to ensuring that your cloud infrastructure stays relevant, scalable, and optimized for future growth. AWS offers a range of tools and services designed to support system refinement and optimization, including:

- **AWS Well-Architected tool:** This tool allows manufacturers to assess their cloud architecture against best practices and receive actionable recommendations for improvement.
- **AWS CloudWatch:** This tool provides real-time monitoring of cloud infrastructure, enabling manufacturers to track system performance, identify issues, and implement optimizations in real time.
- **AWS auto scaling:** Auto Scaling allows manufacturers to automatically adjust cloud resources based on demand, ensuring that systems remain efficient and cost-effective without manual intervention.

By leveraging these tools, manufacturers have implemented continuous improvement processes that optimize system performance, reduce costs, and enhance operational efficiency. Let's explore how.





# The future is now

The Smart Factory of the Future is a reality that manufacturers can, and must, start building today. As manufacturing continues to evolve, the organizations that embrace cloud architecture will be better positioned to capitalize on new opportunities, drive innovation, and achieve sustainable growth.

By integrating IoT, AI, and automation into cloud-based systems, manufacturers can optimize their operations, reduce costs, and improve scalability. The AWS Well-Architected Framework serves as a blueprint for manufacturers to design and operate secure, high-performing, and cost-effective cloud environments, and partnering with a proven cloud service provider is the key to unlocking the full potential of the Smart Factory of the Future, today.

By integrating IoT, AI, and automation into cloud-based systems, manufacturers can optimize their operations, reduce costs, and improve scalability.





## Case Study

# Building a Smart Factory of the Future, today

## Problem

A mid-sized manufacturer in the pharmaceutical packaging industry was struggling with operational inefficiencies, largely due to disconnected systems, outdated infrastructure, and poor data management.

## Solution

By partnering with Syntax, a leading cloud and ERP service provider, and leveraging AWS cloud solutions, the manufacturer implemented an IoT-driven architecture that integrated real-time data from shop floor devices into a centralized data hub. This new architecture resulted in several key improvements:

- **15% reduction in downtime:** The company implemented predictive maintenance technologies that monitored equipment in real time, allowing them to identify potential issues before they led to breakdowns.
- **30% improvement in operational efficiency:** Real-time data from IoT sensors allowed the company to optimize production workflows and reduce waste.
- **Affordable and agile scalability:** With a cloud-based architecture, the company was able to scale its operations across multiple manufacturing sites without the need for significant infrastructure investments.



# How Syntax can help

As a leading cloud and ERP service provider, Syntax is uniquely positioned to help manufacturers build and optimize cloud architectures that power the Smart Factory of the Future. Syntax specializes in guiding businesses through the complexities of digital transformation, offering end-to-end support in implementing cloud-based ERP systems, integrating IoT solutions, and leveraging AI-driven automation. With expertise in both cloud platforms and industry-specific needs, Syntax ensures that manufacturing organizations can scale their operations, enhance security, and optimize costs while keeping pace with technological advancements. Their hands-on approach to cloud migration, ongoing system optimization, and predictive maintenance solutions enables manufacturers to continuously improve their operations, ensuring long-term success in an increasingly competitive market. Whether transitioning to a composable ERP system or integrating real-time data analytics, Syntax's team of experts can help manufacturers future-proof their businesses and fully realize the potential of the Factory of the Future.

As a leading cloud and ERP service provider, Syntax is uniquely positioned to help manufacturers build and optimize cloud architectures that power the Smart Factory of the Future.





## Take the next step

Find out how Syntax is helping manufacturers get the most out of their operations by leveraging AWS services.

From reducing workflow complexities and risk to enhancing reporting, analysis, and the user experience, partner with Syntax to implement cloud-based solutions powered by AWS.

[Learn more now.](#)



### Why Syntax

Syntax provides comprehensive technology solutions and trusted professional, advisory, and application management services to power businesses' mission-critical applications in the cloud.

With over 50 years of experience and 900+ customers around the world, Syntax has deep expertise in implementing and managing multi-ERP deployments in secure private, public, hybrid, or multi-cloud environments. Syntax partners with SAP, Oracle EBS, JD Edwards, AWS, Microsoft, and other global technology leaders to ensure customers' applications are seamless, secure, and at the forefront of enterprise technology innovation.



[syntax.com/contact](https://syntax.com/contact)