White paper

Introducing the new era of Industry 4.0

How will it impact manufacturing?

rackspace technology

Manufacturers have a lot to gain by adopting innovative new data-driven technologies

The COVID-19 pandemic had a lasting impact on manufacturing. In particular, the worldwide event highlighted how interconnected the world's supply chains are. For example, an inefficiency in one country impacts product deliveries in other countries. This has added to other ongoing challenges within manufacturing, including an aging population that limits the labor supply and negatively impacts factory production and efficiency.

Further, traditional manufacturing companies are challenged with an application landscape that is largely comprised of commercial off-the-shelf (COTS) applications deployed in supply chain management, operations management, plant management and asset management. These applications are hampered by interoperability, and aging hardware and software issues.

On the process side, many manufacturing organizations have yet to take advantage of applications that deliver data-driven insights into production processes. As a result, they have not yet tapped into the potential of these systems to maximize overall production impact and value.

The Industry 4.0 solution to manufacturing challenges

Today, the manufacturing industry is entering the era of Industry 4.0 — or the Fourth Industrial Revolution. But how will Industry 4.0 impact operations and help solve the industry's most pressing challenges? Primarily, it will do so through the digital transformation of factories, which will include advances in real-time data to better inform warehouse operations, inventory management and production.

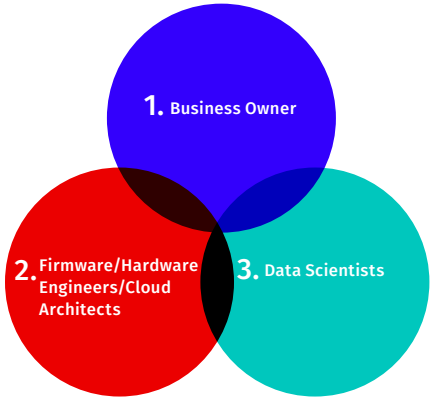
But what is Industry 4.0? In simple terms, Industry 4.0 refers to the deployment of data-driven technologies to create a smart factory. Industry 4.0 technologies enable manufacturers to achieve several business advantages, such as doing more with less, reducing waste and strengthening the value chain. In other words, manufacturers can produce more products, faster, while allocating resources more efficiently and cost-effectively. As a result, because of enhanced machine monitoring and decision making, production lines experience less downtime and deliver better customer experiences.

Capitalizing on Industry 4.0 requires an integrated approach for driving end-to-end transformation across organizations, processes and technologies. Manufacturers will need to build digital factories that react to consumer demands and personalization in real-time. This will require a new set of skills, such as understanding the potential of the Industrial Internet of Things (IIoT), the cloud, and new operating models for people, processes and technologies.

This white paper provides an overview of the changes manufacturers face, and takes a look at how Industry 4.0 and digitization is revolutionizing manufacturing around the world.

Three pillars of Industry 4.0 transformation

To enable a successful Industry 4.0 transformation using IIoT at scale requires taking action in three key areas of operation: business drivers, organizational change and technology transformation (as illustrated in the image below).



1. Develop business use cases that provide maximum benefit to manufacturing plant through operational efficiency
2. Prioritize Backlog of use cases
3. Identify IoT device, sensors and drivers to support the use cases
4. Develop firmware to collect data from device
5. Develop a solution architecture to collect, aggregate and store data in cloud services for analysis
6. Develop ML Models and visualization capability to analyze and visualize data in real time

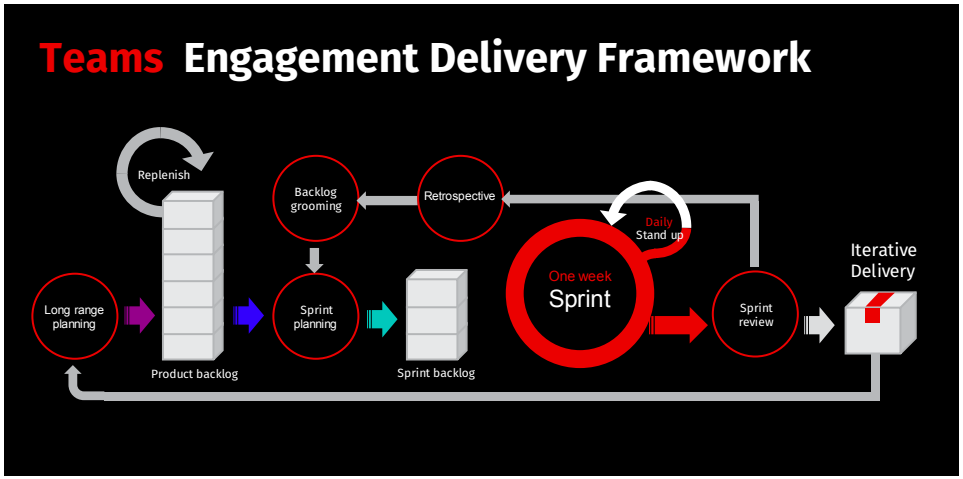
Business drivers (owners)

Business drivers will vary for every organization, but for Industry 4.0 transformation, they will likely include revenue growth, cost reduction or cash flow optimization. Leading business drivers that are accelerating many manufacturers' movement into factory digitization include the rising cost of storage, the sophistication of today's sensors, the ubiquity of real-time devices and the demand for network speed.

Organizational change (firmware/hardware engineers/cloud architects)

Digital transformations are typically multi-year, company-wide journeys that need to be driven from the top leadership. Innovative solution building requires a central transformation engine, cross-functional team engagement and rapid upskilling of thousands of employees.

Leading companies rapidly shift their way of working by running agile sprints, and simultaneously designing and implementing solutions framed by holistic governance. Manufacturers should adopt similar processes, including establishing an infrastructure team with the capability and mandate to build and manage standard templates, architectures and services for use by their development teams (such as the engagement deliver framework image).



Technology transformation (data scientists)

As manufacturers face the pressures to advance their systems, many have discovered that traditional plant-focused manufacturing, including their management systems, lack the ability to monitor equipment, predict when it will fail and send alerts to essential teams.

The future IIoT platform design and architecture should be aligned with both information technology (IT) systems and operational technology (OT) systems. This IT/OT integration needs to be empowered to enable select use cases in data collection, connection, ingestion and integration. These use cases should be driven by key performance indicators (KPI) to measure increases in operational efficiency.

Solutions for operational efficiency typically include:

- Continuous monitoring of equipment, locations and operations
- Alerting when something is wrong, responding and defining thresholds
- Predicting through machine learning and analysis of device data for preemptive actions

To achieve a technology transformation that meets their business goals, manufacturers will need to make decisions about IIoT hardware and firmware, cloud platforms and custom applications. They must keep in mind that IIoT infrastructure needs to be designed to be future-proof. In other words, it must be scalable across multiple sites and functions, while still being affordable and secure.

To achieve these demanding goals at the speed of the marketplace, today's leading companies are building strategic partnerships with key technology players.

How to enable Industry 4.0

To enable Industry 4.0 manufacturing, organizations must take an integrated approach across all steps in the value-chain, including suppliers and customers. They must also identify use cases, prioritize them for piloting and define a roadmap to roll out the use cases in IT operations across all plant locations.

The future of Industry 4.0

Industry 4.0 enables the art of the possible. In other words, it solves both the issues manufacturers face today, and those they'll likely face over the next five years, or more.

Many cloud providers are already launching industry networks that will create open data ecosystems targeted at all stakeholders along the value chain. Among those providers are SAP®, Salesforce®, Oracle® and Google. The new technologies they deliver will mitigate ongoing manufacturing issues, such as parts shortages. For example, during the pandemic, many automobile manufacturers had to shut down plants due to a microchip shortage.

If these manufacturers had been equipped with intelligent systems, they may have been able to avoid the shutdowns. Their systems would have provided early-warning predictions of potential shortages, and the businesses could have planned ahead to mitigate the risk. An Industry 4.0 approach would have ensured that the automobile manufacturers and suppliers were part of the same data ecosystem, sharing supply chain data in real-time.

These industry ecosystems deliver several critical benefits, including:

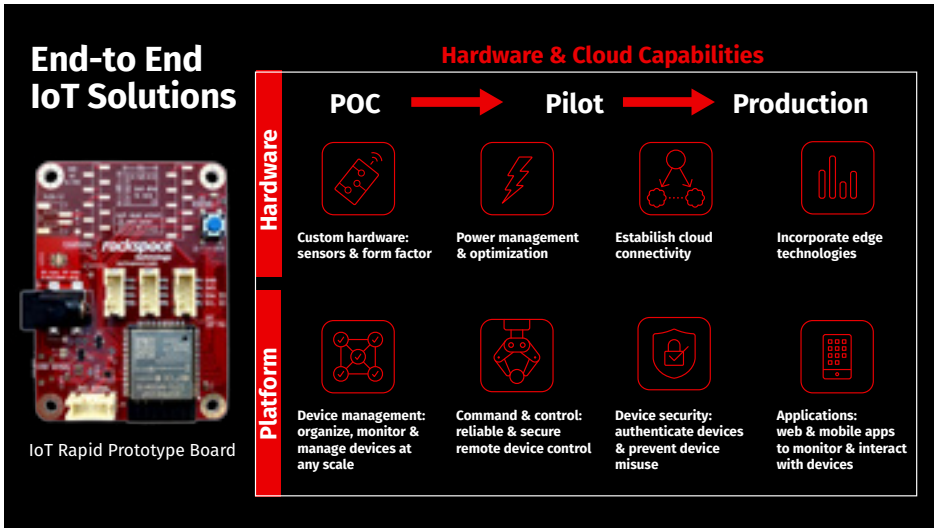
- **Market resilience:** Increased resilience across value chains, delivering greater visibility into the supply chain and predictability in the demand chain
- **Speed-to-market:** Accelerated product innovation lifecycles via better collaboration and trust between stakeholders across the value chain
- **Time-to-value:** Lowered costs and accelerated operations contribute to superior customer experiences

Journey to a connected factory solution

The first step toward building the foundation of a connected factory solution is selecting the sensors and hardware that enable data collection within plant operations. Rackspace Technology® accelerates the process by providing hardware with sensors and software for rapid Industrial Machine Connectivity (IMC) on AWS.

The primary objective of the AWS IMC starter board is to help customers deliver a proof of concept that addresses a high-value use case for their customers. For example, when a line goes down, a manufacturer might want to start by visualizing near-real-time operational metrics and analyzing root causes. After a successful proof of concept, the operation may build out the production architecture to address other critical use cases.

The next step is to develop a secure cloud landing zone that collects, analyzes and stores data in real-time. Rackspace Technology has helped many organizations achieve IoT capabilities for over-the-air (OTA) programming of device configuration, management, authentication and authorization (as seen in the end-to-end IOT solutions image).

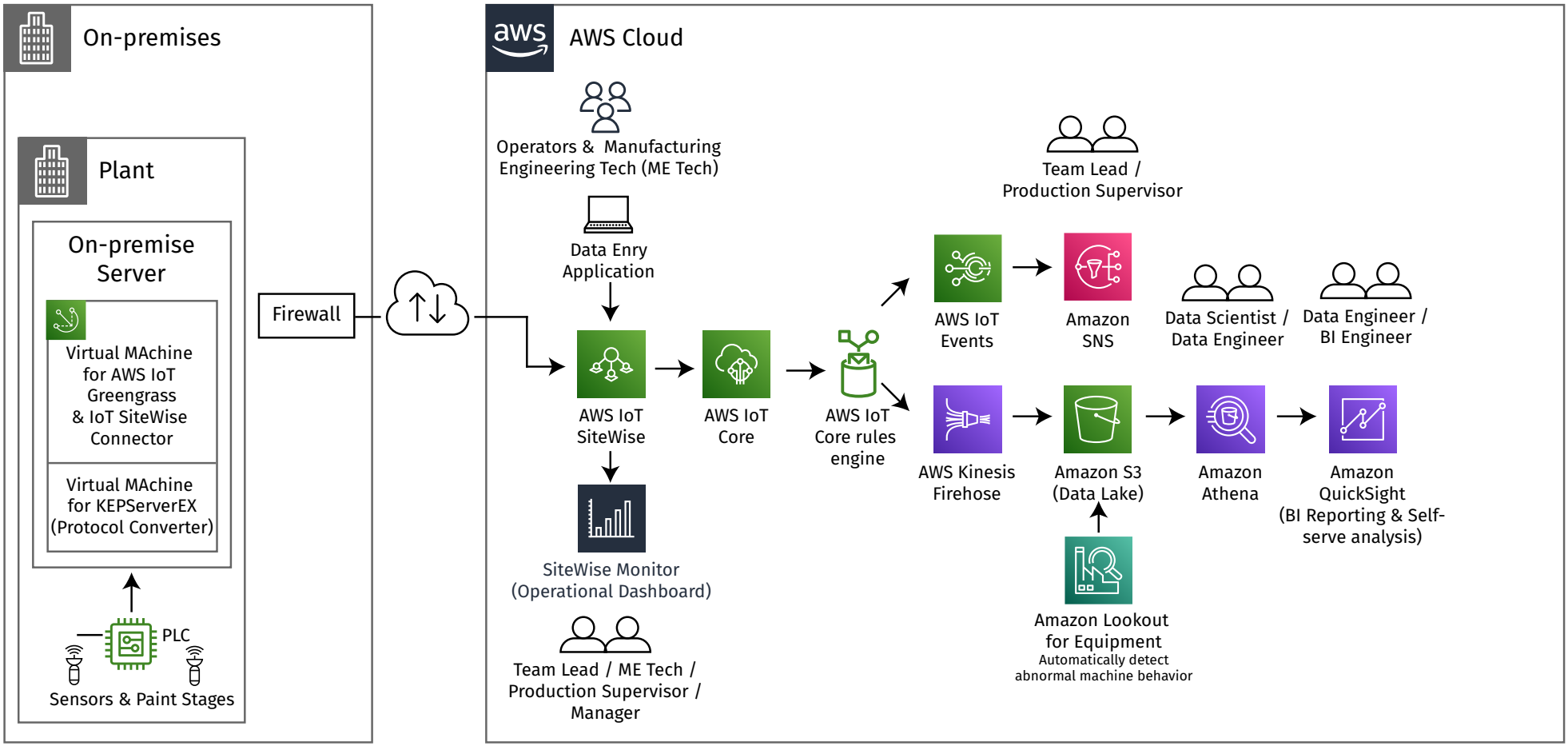


An example of the process is the AWS Connected Factory Solution architecture, which delivers real-time data ingestion and processing (as seen in the AWS Cloud image below). It is purpose-built to unlock data from equipment to optimize operations, improve productivity and deliver availability.

Successful implementation of predictive maintenance requires using the specific data collected from all machine sensors under an organization's unique operating conditions, and then applying machine learning to enable highly accurate predictions. However, implementing a machine learning solution for equipment can be difficult and time-consuming.

Amazon Lookout for Equipment was created to solve this problem. It analyzes the data from sensors on the equipment, such as the pressure within a generator, the flow rate of a compressor or the revolutions per minute of fans. Then it automatically trains a machine-learning model based on just the data and specific equipment — without machine learning expertise.

Lookout for Equipment uses unique machine-learning models to analyze incoming sensor data in real-time and accurately identify early warning signs of impending machine failures. This means companies can detect equipment abnormalities with speed and precision, quickly diagnose issues, take action to reduce expensive downtime and reduce false alerts.



rackspace technology.

Managing a smart factory transition at Cerapedics

Cerapedics is a medical device company headquartered in Colorado that makes bone graft technology for patients with spinal issues. Cerapedics wanted to modernize and automate its production process, so it could track large amounts of data in real-time and improve cost management and efficiency.

As an AWS Premier Partner with extensive expertise in IoT, machine learning, advanced data analytics and healthcare, Rackspace Technology was an ideal partner to help Cerapedics achieve its vision of real-time monitoring of the entire three-week production process.

The transition involved a wide variety of equipment that generates a tremendous amount of data. Given the length of the process and the volume of product lost if a batch failed, it was mission-critical to use real-time data and predictive analytics insight to manage maintenance in ways that could improve yield and minimize losses.

Rackspace Technology built a proof-of-concept IoT solution that connected digital and analog sensors on the sterilizer, extracted data, and sent it to the AWS cloud for analysis and display. An optimal data model was defined, and a data ingestion, enrichment and storage pipeline was built for real-time and historical analysis that is scalable, cost-effective and resilient to outages.

By supporting the transition to a smart factory using real-time data and insights, Rackspace Technology helped Cerapedics enable predictive analytics for maintenance, so that the company could improve the yield of its manufacturing batches and minimize production losses.

rackspace technology.

If you're ready to transition to Industry 4.0, but are unsure how to make the journey, Rackspace Technology can help. By combining our multicloud and cloud native application development capabilities with complementary skills, talents and technology, we can help ensure your transformational journey is a success. Reach out today to start your manufacturing transformation journey.

Jumpstart your Connected Factory Journey with Rackspace IIoT Smart Factory Accelerator

The Rackspace IIoT Smart Factory Accelerator is a pre-built and customizable solution that allows you to visualize data and act on insights in just a few weeks. We'll quickly pull siloed data off your manufacturing equipment with our IIoT hardware and visualize your factory floor data in a user-friendly dashboard and subsequently alert you when abnormal conditions arise.

Learn more: www.rackspace.com/lp/iiot-smart-factory-accelerator

About Rackspace Technology

Rackspace Technology is the multicloud solutions expert. We combine our expertise with the world's leading technologies — across applications, data and security — to deliver end-to-end solutions. We have a proven record of advising customers based on their business challenges, designing solutions that scale, building and managing those solutions, and optimizing returns into the future.

As a global, multicloud technology services pioneer, we deliver innovative capabilities of the cloud to help customers build new revenue streams, increase efficiency and create incredible experiences. Named a best place to work, year after year according to Fortune, Forbes, and Glassdoor, we attract and develop world-class talent to deliver the best expertise to our customers. Everything we do is wrapped in our obsession with our customers' success — our Fanatical Experience™ — so they can work faster, smarter and stay ahead of what's next.

Learn more at www.rackspace.com or call 1-800-961-2888.

Rackspace-White-Paper-Industrial-4-0-Manufacturing-AWS-TSK-5043 :: August 3, 2021