

A MANUFACTURING EBOOK

# The Power of APIs for Connected Manufacturing

Industry 4.0: Connecting  
People, Processes, and Data

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# Introduction

**Industry 4.0 ushers in a new era of connectivity for manufacturers and with it, the promise of smarter supply chains, more efficient production, and faster innovation.**

The Fourth Industrial Revolution, also known as Industry 4.0, is well underway. It's fundamentally different from its predecessors. The first, second, and third industrial revolutions were brought forth by key technological breakthroughs – the steam engine, the electrical grid, and IT automation. Industry 4.0 is shaped by what advanced technologies make possible: dramatic new opportunities in communication and connectivity.<sup>1</sup> Fourth revolution technologies including artificial intelligence (AI), analytics, the cloud, the Internet of Things (IoT), machine learning, mobile, and robotics have the potential to connect billions of people to each other, to smart machines, and to unimaginable amounts of data.

Manufacturers are embracing these new digital technologies to transform their operations, improve customer engagements, and secure competitive advantage. In fact, 87% of CIOs in the manufacturing sector have plans to adopt or have already adopted a digital-first business strategy.<sup>2</sup>

**87%**  
**of manufacturing**  
**CIOs are adopting**  
**digital-first business**  
**strategies.<sup>2</sup>**

<sup>1</sup> The Fourth Industrial Revolution, Klaus Schwab, Founder and Executive Chairman of the World Economic Forum

<sup>2</sup> 2018 State of Digital Transformation, IDG, as quoted in [Forbes](#), April 22, 2018



**Digitization can take the form of instrumenting factory equipment with intelligent sensors, employing advanced analytics to improve operational efficiencies on the plant floor, or embedding artificial intelligence into interactions with supply chain partners and customers. Smart, connected technologies can transform how goods are designed, made, and distributed. But they can also transform business operations by enabling the organization to derive more value from newly digitized processes.**

## Meet rising customer expectations

It's been a decade since the iPhone first launched, helping to shape a new generation of savvy buyers who expect to get what they want, now, and by means of a delightful purchasing experience. Eighty percent of customers say that the experience a company provides is as important as its products or services.<sup>3</sup> To deliver the products customers want, and the experiences they expect, manufacturers require seamless visibility into each digital touchpoint, at every stage of the customer journey.

## Drive greater efficiencies

Smart manufacturing initiatives have taken center stage for both process and discrete manufacturers alike.<sup>4</sup> Through the use of sensors, AI, robotics, and other Industry 4.0 technologies, manufacturers are able to do things like predict equipment failure and process-related losses, and then quickly prescribe corrective actions. New cloud-enabled applications are making it easier for engineering, production, and distribution to collaborate across geographies and silos. Mobile-enabled devices can help managers make faster, more informed decisions anywhere. The ability to aggregate data from multiple systems and sources, and deliver it to the right people at the right time is essential to IT modernization and process improvement.

## Accelerate innovation

While efficiencies and operational goals remain the top drivers for digital transformation, many manufacturers are starting to prioritize initiatives around innovation.<sup>5</sup> To remain competitive, manufacturers must deliver better products and get them to market faster. By making better use of data, manufacturers can better predict customer demand, quickly adjust to changes in the marketplace, accelerate the engineer-to-order process, and communicate more efficiently within an optimized value chain.

<sup>3</sup> [State of the Connected Customer](#), Second Edition, by Salesforce, June 2018

<sup>4</sup> [Worldwide Semiannual Digital Transformation Spending Guide](#) by IDC, June 2018

<sup>5</sup> [The Innovation Paradox](#), Deloitte Insights, October 2018



# Complexity Creates Challenges

**Industry 4.0 encompasses end-to-end digitization and data integration of the value chain. <sup>6</sup> This requires the ability to capture, harness, and process data and insights across a landscape that is growing more complex by the day.**

## Information silos

Smarter, more efficient processes depend on access to data from a growing number of sources – cloud apps, legacy systems, connected devices, and more.

The Internet of Things is generating massive amounts of data, introducing new challenges in extracting meaning from devices, sensors, and smart machines.

The move to the cloud accentuates the silo challenge. More than a third (37%) of manufacturing IT department report being under pressure to migrate all applications and infrastructure to the cloud.<sup>7</sup> This creates landscape complexity in connecting cloud and SaaS apps to legacy systems, a sprawling variety of data sources, and to a growing number of supply chain partners.

While each data silo contains important pieces of information, the integration of these data silos will help manufacturers gain a more complete understanding of their business end to end, from supply chain to customer.

## Ecosystem complexity

Business agility requires streamlined communications across a growing number of value chain partners.

In today's global economy, manufacturers operate within a dynamic, interconnected production and procurement network, coordinating and collaborating with many different suppliers and producers across multiple countries. This requires a fundamentally different approach compared to traditional, linear supply chains of the past.

Manufacturers will need to streamline integration between ecosystem partners in order to gain the visibility needed to respond quickly to changes in the market or the supply chain. This could include pricing of materials, changes in labor agreements, inventory shortages, transportation delays, compliance issues, and more. According to recent research by KPMG, full supply chain visibility has risen to become the third most important strategic priority for manufacturers.<sup>8</sup>

Visibility into every stage of the extended value chain will become overwhelming without a scalable method to connect disparate systems, share information in an automated and standardized way, and gain insights from massive amounts of both structured and unstructured data.

<sup>6</sup> Global Digital Operations Study 2018, PwC

<sup>7</sup> 2018 Cloud Computing Survey, IDG

<sup>8</sup> Global Manufacturing Outlook 2018, KPMG



## Digital disruption

Manufacturers, perhaps more than other types of business enterprises, face disruption in the form of newer, more nimble competitors that are unencumbered by physical plants, systems, and infrastructures built for an earlier era. To remain competitive, manufacturers will need to build intelligent systems that can respond quickly to changes in demand, produce quality products more efficiently, and innovate faster.

Artificial intelligence (AI) and machine learning play a pivotal role in Industry 4.0 and manufacturing. These disruptive technologies represent a big change for manufacturing companies, but hold great promise for increasing efficiency, reducing costs, and improving quality. The more data available to AI-infused business processes, the smarter they become at observing trends, spotting anomalies, and learning how to make decisions that benefit the manufacturing organization.

**30 billion**  
The number of devices  
that will make up the  
**Internet of Things by 2020.**

EMC Digital Universe with Research & Analysis by IDC

**37%**  
Of manufacturing IT  
department report being  
under pressure to migrate  
all applications and  
infrastructure to the cloud.

2018 Cloud Computing Survey, IDG

**1 out of 3**  
Manufacturing CEOs  
admit their organizations  
are struggling to keep  
pace with the rate of  
technological innovation.

2018 Global Manufacturing Outlook, KPMG



# A New Era of Connectivity

Traditional integration strategies, including middleware, enterprise service buses (ESB) and EDI have long been used by manufacturers to connect systems and exchange information both within the organization and with external suppliers and partners. These methods will remain in place for the foreseeable future, as long as they continue to perform the functions for which they were designed.

Unfortunately, these traditional integration methods often can't keep pace with the speed and scale of modern IT landscapes. Not only are ESBs and middleware hard to manage without a dedicated and centralized IT group, but they also do not offer capabilities such as full multi-tenancy, B2B integration and support of IoT, or chatbots-related integration. As the number of cloud apps proliferate and as businesses increasingly rely on Anything-as-a-Service (XaaS) offerings, the limited reach of middleware becomes a liability. As **Forrester notes**, "hard-coded interfaces between applications cannot continuously evolve the way businesses need them to."

Today, API-led integration is enabling a quantum leap forward in how manufacturers share data and streamline processes across an increasingly complex landscape of systems, applications, and data sources – on premise and in the cloud.

	Manufacturing Process Automation	Manufacturing Process Optimization	Value Chain Optimization
	Pre 1990s	1990s - 2010	Post 2010
Production Methodologies	Lean Manufacturing (JIT, Kanban, TQM)	Agile Manufacturing	Personalized Production, Additive Manufacturing
Business Driver	Improve product quality	Economies of scale	Rapid innovation, horizontal and vertical integration
Systems	Custom	On-Premise Apps (ERP, MES, PLM)	Cloud, Social, Big Data & Analytics, Simulation, Cybersecurity, IoT, Mobile, Robotics, Augmented Reality
Enabler	Manual processes, Custom integration	Middleware (point to point) and EDI	API Integration

**THE EVOLUTION OF INTEGRATION ENABLERS IN THE MANUFACTURING SYSTEMS LANDSCAPE**

*Integration methods used by companies have evolved over time. With the arrival of ERP, MES, and PLM systems, companies employed middleware to connect applications and allow data to flow from one application to another. However, with the advent of Industry 4.0 technologies and thousands of SaaS applications, companies require more sophisticated tools to easily surface data from these systems and orchestrate end-to-end business processes by moving data between them seamlessly.*





## The path forward

An Application Programming Interface (API) allows systems to communicate with each other through a documented interface. APIs allow companies to open up data to external third party developers, to business partners and internal departments within their company. APIs make it possible to compose applications, rather than build them from scratch.

For example, a manufacturer may want to track the location of a shipment to a customer, and make that information available to the customer. Using APIs, it can develop a customer service application that incorporates tracking and location services provided by the shipper.

**“We live in an API economy, a set of business models and channels based on secure access of functionality and exchange of data,” Gartner analyst Christy Pettey wrote last year. “APIs make it easier to integrate and connect people, places, systems, data, things and algorithms, create new user experiences, share data and information, authenticate people and things, enable transactions and algorithms, leverage third-party algorithms, and create new product/services and business models.”**





# The Power of API-Based Integration

**API-led connectivity is a modern approach to harnessing the value of all available data toward the goal of creating an optimized value chain.**

## Streamline product design and development

*Eliminate communication gaps between engineering and manufacturing for faster time to market.*

In the product design and development process, R&D requirements are translated into manufacturing specifications. These two functions need to communicate Bills of Materials (BOMs) and Engineering Change Orders (ECOs) quickly to limit their impact on manufacturing production. APIs between Engineering and Manufacturing Systems can automate and standardize the flow of information – structured and unstructured – and facilitate smooth and secure change notifications for faster time to market.

## Connect ERP and the shop floor

*Generate more accurate demand forecasts that can reduce inventories by avoiding overproduction.*

Enterprise resource planning (ERP) systems contain information regarding inventory and customer demand, and manufacturing execution systems (MES) control what to build. By integrating these two systems, manufacturers can become more flexible, responsive, and efficient in meeting customized and changing demands. Through real-time information exchange between the business layer and the production layer using APIs, manufacturers can increase overall equipment efficiency (OEE), reduce cycle times, and provide management with the visibility needed to make better decisions.



Virgin Orbit uses Jitterbit's API Integration Platform to move data between MES, ERP, and PLM systems for faster scheduling, costing and allocating right amount of resources for manufacturing.





## Improve procurement efficiencies

*Gain full visibility into requirements, order status, and supplier relationships for faster order fulfillment and lower materials costs.*

Procurement systems manage supplier relationships and the ordering of goods and services needed to produce products. APIs from Engineering, Supply Chain, and Shop Floor systems can be used to quickly acquire customer order information and review it against quotes or previously agreed upon contracts, and then dispatch changes to production for fulfillment. The result is faster bid processing and reduced procurement costs.

## Digitize sales and order processing

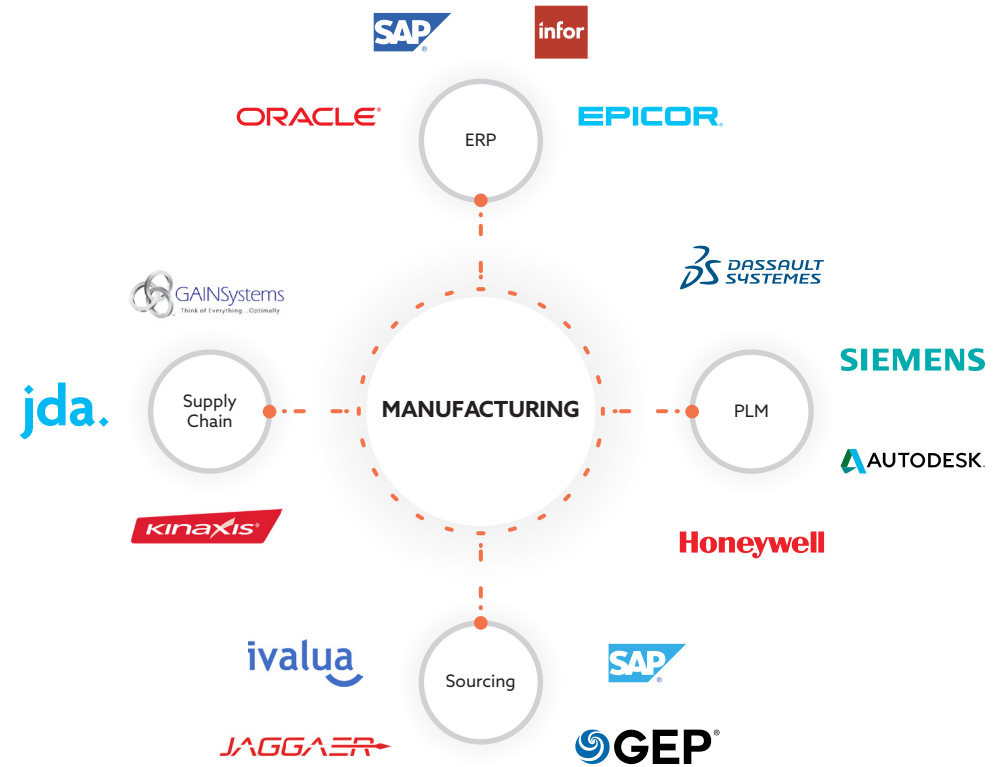
*Access all documentation in one digital workflow to reduce bottlenecks in order-to-cash and improve order turnaround time.*

Processing orders can be slowed down by the fact that sales-related documents are scattered in multiple (and often insecure) repositories. By digitizing the process using APIs to automatically pull documents together from different systems, manufacturers can reduce bottlenecks in the order-to-cash workstream, and reduce time delays in the fulfillment, delivery, and invoicing process.

## Simplify distribution and logistics

*Track inventories against demand in real time across a growing footprint of suppliers and customers for more efficient inventory management.*

Lack of visibility into Inventory can have a significant impact on manufacturers. Inventory shortages reduce cash flow, and excess inventory incurs higher warehousing costs. These challenges are exacerbated by a growing global footprint of both suppliers and customers, who demand more specialized logistics and delivery solutions. APIs can track demand in real time through e-commerce or EDI, enabling manufacturers to adjust production rates up or down as demand changes.





## Personalize customer service

*Bring all customer conversations across channels into one dashboard for real-time resolution of issues and higher customer satisfaction.*

Customers expect to have one conversation with a company, through multiple channels (phone, email, chatbots, or contact forms on websites). The challenge for manufacturers lies in integrating these conversation into one system, with the ability to reference order and account histories. APIs connecting CRM and order processing systems give front-line employees faster access to technical information so that they can resolve service issues in the first call and make customers happier.

## Ensure compliance

*Automate the collection and tracking of data needed to comply with new regulations and emerging standards.*

U.S. manufacturers became subject to an estimated 2,183 unique regulations promulgated between 1981 and April 2012.<sup>9</sup> Government regulatory complexity magnifies exponentially when doing business globally. Since 1998, growth in the cost of major regulations has far exceeded manufacturing sector growth and overall economic growth. APIs can help automate and standardize the collection and tracking of data needed to comply with new regulations and emerging standards, ensuring that all information is the correct version and up to date. Manufacturers can also leverage regulatory data beyond compliance, and use the gained intelligence for competitive advantage and quality improvement.

<sup>9</sup>Manufacturers Alliance for Productivity and Innovation (MAPI)



**Bayer**, one of the world's largest pharmaceutical companies, uses Jitterbit to quickly and easily integrate data from Salesforce in the cloud with on premise Oracle and SAP ERP data to give their sales team complete visibility into order status.



## Learn More

API integration is a powerful, modern approach for connecting people, processes, and data. To learn more about how Jitterbit can help you accelerate innovation, drive greater efficiencies in your manufacturing processes, meet rising customer expectations, and drive compliance, visit our website.

[READ MORE](#)

**\$500K**

**annual savings  
through faster,  
simpler interfaces  
between systems.**

- Virgin Orbit



## About Jitterbit

Jitterbit Harmony, the API Integration solution, enables manufacturers to rapidly connect SaaS, on-premise, and cloud applications and instantly infuse artificial intelligence into demand planning, production, and customer service processes.

Jitterbit helps businesses make faster, more effective decisions by enabling them to unify and exploit data from all sources through APIs.

Our intuitive API creation technology enables companies to reuse business-critical applications and data to bring new offerings to market in days, not months. Best of all, our team of industry experts work side by side with you to accelerate innovation beyond anything you previously thought was possible.

For more information, visit [www.jitterbit.com](http://www.jitterbit.com) or call 1-877-852-3500. You can also follow us on [Twitter](#) or read our [blog](#).

