



# The Supply Chain Manager's Guide to **Industry 4.0**

How to Move Your Organization to the Future of the Supply Chain Industry

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## Introduction

The introduction of steam power effectively revolutionized industry. So did Henry Ford's assembly line. These revolutions resulted in radical new approaches that brought unprecedented capacity to production and manufacturing. Since then, we've entered the age of automation and robotics, which many experts consider the third industrial revolution.

The next phase of industry represents not a revolution, but an evolution; Industry 4.0, as it's been named, is truly a new vision for an industrial economy that's both seamlessly digital and self-conscious.

## The Origin of Industry 4.0

Unlike previous revolutions, which were predicated on the introduction of a single invention, Industry 4.0 is a deliberate framework launched in 2011 in anticipation of new technology. Seeking to capitalize on Germany's competencies in engineering, logistics and IT, the German federal government finalized the concept in 2013.

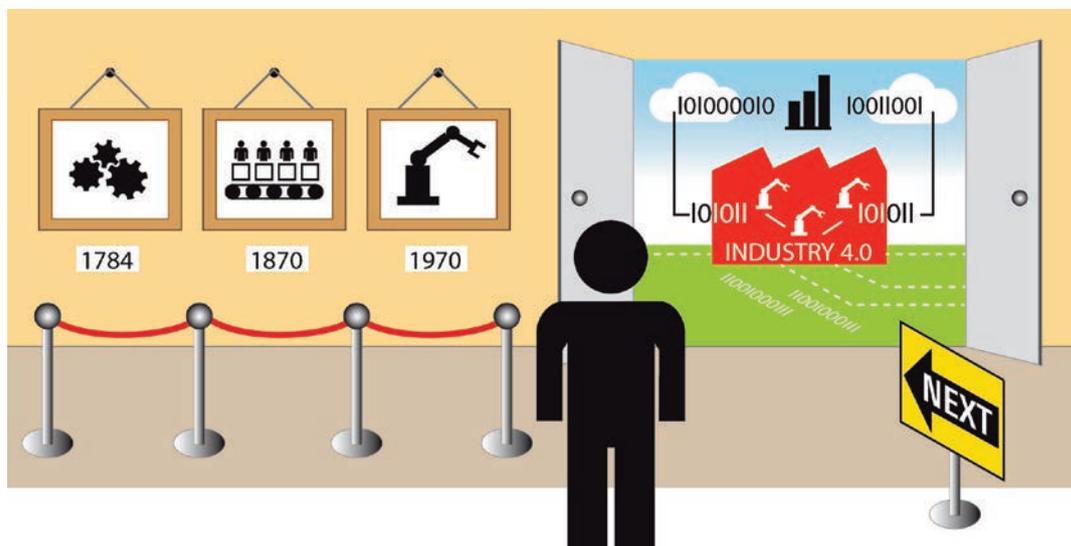
Today, Industry 4.0 acts as a sort of roadmap to high-tech, industrial digitalization. Its foundation is a digital convergence of operations, where process and data can be integrated across multiple supply chains and product life cycles. It isn't a magic pill, but rather a guideline for improved organizational and process performance. Because Industry 4.0 builds on existing revolutionary steps and brings them to a new level, it requires lean setups as a starting point. When efficient, well-structured processes are in place, Industry 4.0 can emerge.

### Key Moments in the History of Industry

Some call Industry 4.0 the Fourth Industrial Revolution. The preceding industrial revolutions occurred following the introduction of new technology that radically shifted manufacturing capabilities and processes:

- **1784: Water and steam power were harnessed to mechanize production, drastically reducing production time.**
- **1870: Thanks to the introduction of electricity, Henry Ford introduces the assembly line, leading to divisions of labor and more efficient manufacturing.**
- **1969: With the invention of the computer, industry begins to incorporate automated production. This also paves the way for the fields of IT and robotics.**

Industry 4.0, then, does not represent another revolution, so much as it represents an evolution. Industry 4.0 leverages existing technology and builds on it in new ways, resulting in increased capacity, interdependence, and efficiency, ultimately leading to increased productivity.



## Benefits of Implementing the Industry 4.0 Framework

Manufacturing leaders around the world are already moving to create more flexible, efficient, productive supply chains that embody the principles of Industry 4.0. In the short term, supply chain managers will need to look closely at critical domains like demand planning and supply network design. Facilitating an evolution to the Industry 4.0 framework has multiple benefits:



- **Direct cost savings:** Increased technological integration increases efficiency, while predictive analytics ensure fewer supply chain disruptions.
- **Enhanced speed:** Industry 4.0 allows faster reaction times and greater flexibility in production systems, both necessary as customer expectations in demand satisfaction rise and multichannel distribution channels become more prevalent.
- **Increased profitability:** Industry 4.0 systems allow you to offer more customized products, which generally yield a higher profit margin.
- **Competitiveness in the global market:** The interdependence of the global economy means that Industry 4.0 will eventually be the standard practice, rather than the exception.
- **Increased employee productivity:** Improved user experience in operating systems will reduce training time and improve operation speed.

## Key Components of Industry 4.0

With the introduction of Industry 4.0, the German government issued a call to action to the global manufacturing industry, one that pushes the industry to evolve beyond conventional boundaries of technology, communication and capacity. The true Industry 4.0 enterprise offers the following functionalities.



**Industry 4.0  
calls for a truly agile  
supply chain that  
integrates IT systems  
both vertically and  
horizontally.**

### Greater Customization through Additive Manufacturing

Commonly known as 3D printing, additive manufacturing is the process of building an object by depositing materials in multiple layers. The use of additive manufacturing has certainly become trendy, but it has yet to reach its full potential. Industry 4.0 provides the technological infrastructure for manufacturing enterprises to use 3D technology at scale, producing smaller numbers of more customized products. And because additive technology can be done on demand, production time for these customized products is also significantly shorter. One hallmark of a true Industry 4.0 enterprise, therefore, is the robust integration of additive manufacturing throughout the supply chain, not only to produce products for end users, but also for the manufacture of customized machine parts within the supply chain itself.

### Full Integration of Advanced Analytics

Virtually all supply chain leaders currently rely on analytics to inform and optimize production. Indeed, the implementation of advanced analytics consistently yields higher production quality, along with reduced downtime and improved customer experience – all contributing to a better bottom line. But these analytics are often disjointed or orphaned, existing without cohesive connection to an overarching system. As the manufacturing world continues to evolve toward Industry 4.0, analytics systems are simultaneously evolving. The Industry 4.0 supply chain uses advanced analytics and Big Data to inform end-to-end (E2E) visibility. Up-to-the-minute data are available to support real-time decision-making and bring visibility to the entire supply chain, both within and without individual organizations.



### Visibility for All Stakeholders

Supply chain leaders have long sought greater visibility, and Industry 4.0 delivers exactly that. All stakeholder groups have access to real-time data for their specific tasks. Furthermore, thanks to aggregation schemes, companies can be controlled from the individual machine view all the way up to global corporate controls. All of this is implemented in a unique “single point of truth” enhanced by your business rules. This approach not only eliminates the need for duplicative and potentially flawed manual data aggregation, but it also increases process speed and supports continuous process improvement. Furthermore, this E2E visibility within a company positions the organization for E2E visibility across the entire supply chain, from the raw materials supplier to the end user.

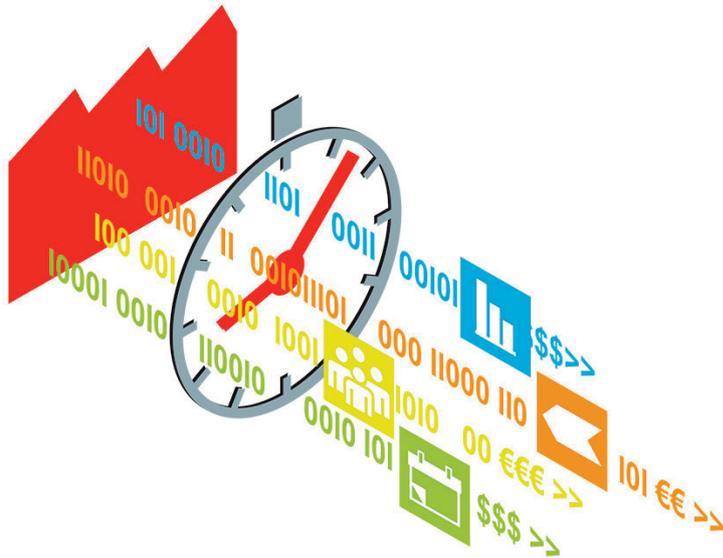
### A Move Beyond Postmodern ERP

The manufacturing industry’s approach to enterprise resource planning (ERP) has been evolving alongside technology. Innovative supply chain leaders are looking beyond the “best of breed” approach that characterizes modern ERP. Instead, they are adopting ERPs that foster strategic collaboration between business and IT leaders and set organizations on the path to thriving in the Industry 4.0 environment. This Postmodern ERP mindset has just begun to catch hold in the supply chain industry, yet Industry 4.0 pushes the boundaries of even this cutting-edge approach. Industry 4.0 calls for a truly agile supply chain that integrates IT systems both vertically and horizontally. Using robust data-integration networks that span usually disconnected departments like engineering and customer service, the Industry 4.0 company is much more cohesive. And because these data systems can communicate beyond the boundaries of the company, they provide unprecedented integration, resulting in a much more agile supply chain.



### Widespread Incorporation of the Internet of Things

Another aspect of that integration is the incorporation of networked machines and sensors throughout the supply chain. The Internet of Things (IoT) refers to computing technology embedded in devices, which can communicate with other devices and people through the internet. Currently IoT is most often found vertically within an organization; for instance, the supply chain’s devices and sensors communicate with each other, providing useful but limited intelligence to the manufacturing control system. The next phase, however, incorporates the IoT to communicate across departments as well. Much like IT system software will be integrated, so too will devices, sensors and humans throughout the organization. The Industry 4.0 supply chain fully leverages the IoT for streamlined, agile operations with far greater visibility and transparency.



### Industry 4.0 Calls for Novel Definitions of Partnership

We often associate Industry 4.0 with the adoption of new software, cutting-edge devices and machine learning. But Industry 4.0 is not just a technology issue. It is also about processes and people. Supply chain leaders of the future need to understand that as the manufacturing industry evolves, classic understandings of supplier and producer structures will not survive.

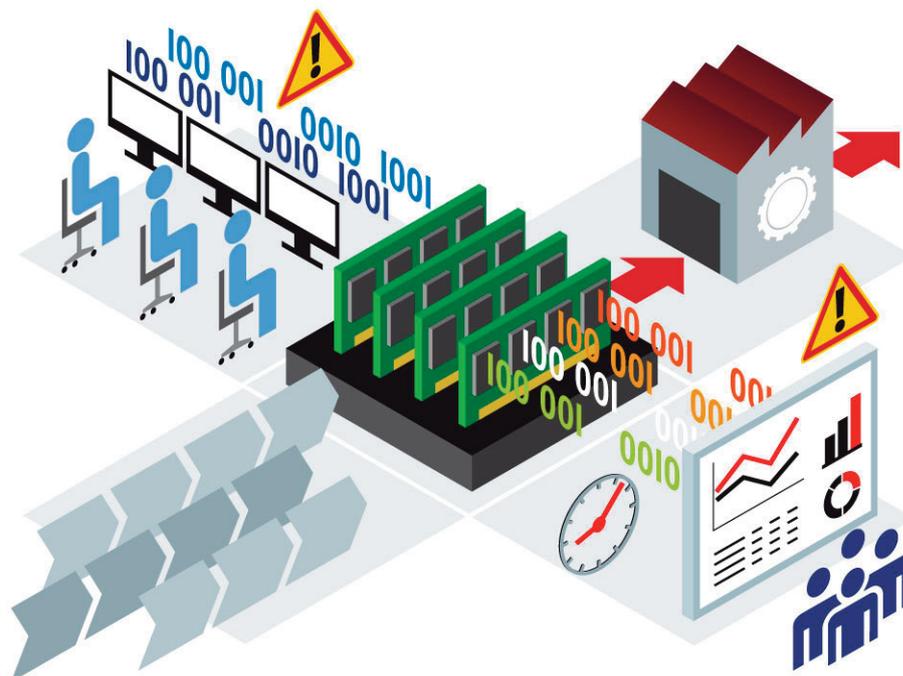
A new definition of partnership is already emerging, creating new value networks. To succeed in the era of Industry 4.0, supply chain leaders must integrate supplier into their corporate structure. They need to adeptly manage their suppliers' data support and production design, as well as their supply chain risks. This will also mean a new approach toward purchasing decisions: instead of product price-driven models, supply chain leaders must embrace partnership models that take into account risk figures and optimization potential for the future of product development.

### Increased Reliance upon the Cloud

The Industry 4.0 supply chain is a data-generation machine. It's constantly producing insights in real time, requiring incredible speed and precision, not to mention the capacity for instant access and E2E visibility. Those demands are best met in the Cloud. As Cloud technology continues to improve, the Industry 4.0 enterprise will increasingly deploy it for data management and functionality. Coupled with seemingly endless storage capacity and an ever-shortening reaction time, the Cloud offers the necessary agility for the supply chain of the next generation.

### Robust In-Memory Databases

To complement the endless storage capacity of the Cloud, supply chain leaders must also rely on in-memory databases (IMDBs) to handle ad hoc optimization and analytics. Sometimes also called a main memory database (MMDB), the IMDB uses the computer's main memory (as opposed to a disk) for data storage. Data stored on IMDB is more readily accessible than data stored in the Cloud because it need not be procured via online transaction – which can cause delays in the process. Thus the IMDB improves speed, workflows and data quality. The most efficient supply chains rely on both the Cloud and IMDB to maximize the organization's storage capacity and agility.





## Evolving Toward Industry 4.0

As your organization moves toward Industry 4.0 readiness, you'll face countless decisions about the integration of new technologies, along with updates to current systems and processes. These decisions can be expensive, such as when your enterprise selects new manufacturing logistics software. To ensure that your decisions will position you well to evolve toward Industry 4.0, focus on four key concepts:

- **Information transparency:** Industry 4.0 systems create a "cyber-physical system," where the physical world is quantified into contextual, accessible data. Systems seamlessly and instantly share that data as required, ensuring that all systems cooperate using real-time information. Any new technology your company adopts should offer this transparency.
- **Interoperability:** In an Industry 4.0 system, it's possible for people, machines, sensors and devices to connect and communicate with one another. This facet of Industry 4.0 generally requires supply chain managers to take a broader perspective on compatibility requirements for software, machines and other devices.
- **Decentralized decision making:** Currently most supply chains operate using centralized decision making. But Industry 4.0 has brought a new level of autonomy, where systems will be able to make simple decisions on their own. This has the potential to increase efficiency by reducing time and resources allocated for centralized oversight.
- **Technical assistance:** Automation and robots already provide vital support in environments that are too treacherous for humans. The next phase is building a system that can support humans in decision making and problem solving. This interdependence of systems and humans is a key feature of Industry 4.0

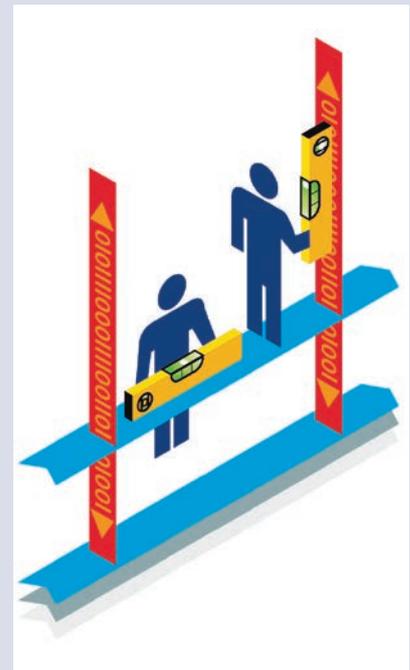
While the sweeping impact of Industry 4.0 may not be obvious for five to ten years, the impact on supply chain management is already visible today. As supply chain managers look to the future, they should look to Industry 4.0 as a foundation.

## A New Concept of Corporate Integration

A critical dimension of successful Industry 4.0 initiatives is vertical integration. Traditional companies are structured in hierarchies that do not allow interaction between layers. This often leads to high efforts in synchronization processes and even more to large gaps between corporate planning processes and execution.

In these organizations, production plans aren't synchronized with logistics. Production planners perform detailed planning tasks that often drastically differ from real outcomes because there is no structured back-loop of execution information and no real-time re-planning process in case of deviations.

flexis provides environments to synchronize these layers, even including IoT devices for operational feedbacks. flexis also allows drill-ups and -downs from a part level through execution.



## About the Author



**Robert Recknagel** is Vice President of Manufacturing and Logistics at flexis AG. Robert Recknagel graduated in Service Administration management at University of Trier and worked as solution consultant in Europe and South East Asia at alphabet AG, a leading vendor of Enterprise Architecture Management solutions. Following that time, he implemented major international logistics concepts at Rhenus Logistics and built up their 4 PL business.

Recknagel has been a significant player in automotive and manufacturing initiatives. He's the recipient of the eLogistics award 2015 from AKJ as well as an Industry 4.0 award by the state of Baden Württemberg, Germany. For more information about how flexis can help you manufacturing organization evolve toward Industry 4.0, please contact Recknagel at [Robert.Recknagel@flexis.de](mailto:Robert.Recknagel@flexis.de).

## Glossary

**Advanced analytics:** Advanced analytics are those that provide information about the future, allowing the user to imagine future scenarios and make strategic predictions. Advanced analytics fall into two primary categories: predictive and prescriptive. [Read more about advanced analytics.](#)

**Big Data:** The term "Big Data" refers to extremely large data sets that can be used to determine patterns, establish trends and illustrate associations. For manufacturing leaders, harnessing Big Data represents both a challenge and a new route to increased profitability. [Read more about Big Data.](#)

**Cloud computing:** Commonly referred to as "the cloud," cloud computing is the use of internet-based software and storage. This frees up enterprise-based hardware and exponentially expands storage – necessary in the age of Big Data. [Read more about the cloud.](#)

**Demand planning:** Demand planning is the supply chain management process used to generate forecasts about future product demand. The integration of advanced analytics will invariably change the demand planning process. [Read more about demand planning.](#)

**E2E visibility:** Industry 4.0 requires a move toward end-to-end (E2E visibility), meaning that every aspect of the supply chain is "visible" through open, real-time data. True E2E visibility doesn't end with your organization, but every part of the supply chain from your raw-material suppliers to end users. [Read more about E2E visibility.](#)

**Internet of Things:** Often abbreviated as "IoT," the Internet of Things refers to machines, sensors and other "things" that are internet-enabled. These devices can then communicate with each other and with humans, providing vital data and feedback for supply chain management. [Read more about the Internet of Things.](#)

**Machine learning:** Machine learning is an analytics technology that can teach itself to predict and make decisions based on analysis; it can analyze past performance in the context of new data to continually refine its activities. [Read more about machine learning.](#)

**Predictive analytics:** This category of analytics assists with activities like supplier risk management, demand forecasting and network simulation. Predictive analytics include machine learning and causal forecasting, in addition to simulation and scenario management. [Read more about predictive analytics.](#)

**Postmodern ERP:** The Postmodern ERP model uses a core ERP solution, bringing operation efficiency and business standardization. The core ERP is supplemented and complemented by specialized solutions, which are usually accessed either through the cloud or via business process outsourcers that can add value through innovation, differentiation and user-centered design. [Read more about Postmodern ERP.](#)

