Digitize the industrial machinery supply chain

Industry 4.0 requires digital supply chains for transparency, efficiency, and profitability

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By Gaurav Garg,
José R. Favilla, and
Spencer Lin

Talking points

Digitizing the supply chain is a competitive advantage

A digital supply chain, which provides integrated planning, value-chain visibility, and intelligent assets, addresses the large effectiveness gaps in industrial machinery supply-chain networks.

Those furthest along report outperformance

Since the supply chain accounts, on average, for over five percent of operating costs, any savings goes a long way. Organizations furthest along in executing a digital supply-chain strategy lead in financial performance and are generally more effective at addressing supply-chain challenges than their peers.

Six levers enable the digital supply chain

Organizations leading the way in digital supply chains have put in place governance and data management oversight, made appropriate investments in digital technologies, and forged the creation of supply-chain platforms. They also address the skills and security required to support a digital supply chain.

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Next-generation industrial machinery supply chain is here

Industrial machinery is a critical industry for our world. These organizations, which build tools and heavy equipment, have enabled countless human innovations and helped transform many industries. Everything from making equipment that's essential for the construction and mining businesses to the machinery necessary for the development of critical infrastructure for the production and distribution of gas and wind-powered energy. Industrial machines help build planes, ships, and other crucial transport that connects our world. One can easily argue that the future success of many industries is largely dependent on continuous innovation in industrial machinery.

Since the beginning of the first Industrial Revolution in the late 18th century, industrial machinery manufacturing has seen massive transformations. From the earliest days of Industry 1.0, which were characterized by mechanical production facilities, there has been a rapid and steep technological ascent into the modern industrial era— Industry 4.0. However, many firms today have struggled to keep up with the accelerated pace of change. Demand shifts, low-volume orders, long lead times, and specialized configurations have made it much more complicated to manage the flow of components, equipment, products, and services—also known as the supply chain.

Today, many industrial machinery supply chains are still largely analog, with processes that are mainly manual with only limited automation. Without real-time supply-chain coordination and execution, these companies have limited ability to forecast when manufacturing will be executed and schedule when components will be needed.

A digital supply chain is data driven and digitally executed to create transparency, support advanced planning, predict demand patterns, and leverage asset availability. It's predicated on real-time access to data across an enterprise and its collaboration partners, and on the use of advanced technologies. It integrates suppliers, manufacturers, and customers to help create an end-to-end view.

With input from 250 industrial machinery executives worldwide, we explore how leading organizations have developed a digital supply chain through proper management, technology investments, partnerships, and talent.

Only 37%
of industrial machinery companies say they are effective at supply-chain requirements

76%
of executives from organizations furthest along in digitizing their supply chains say they are effective at improving speed, reliability of manufacturing, and distribution

69%
of executives from leading organizations report they have realized significant return on investment (ROI) from investing in predictive analytics for the supply chain

Rejiggering the supply chain

Industrial machinery supply chains are complex networks with numerous relationships, components, products, services, logistics, and money flows to manage. The machinery production market is forecast to reach over USD 1.840 trillion by 2022.[1] With supply-chain costs comprising 5.2 percent of revenues, they account for over USD 95 billion in expenses.[2] As a result, productivity increases and cost savings can add up quickly, even before considering improvements in customer engagement.

The supply chain is a key component for industrial machinery companies to react quickly and offer engineer-to-order, configure-to-order, build-to-order, make-to-order, and make-to-stock products. Assembly integration and frequent customer-specification changes lead to issues in inventory management, production control, and product cost.

For every industrial machine order, a sales representative needs to define the configurations according to their customer's specifications. The machine also typically requires customer-specific engineering. The manufacturing of a machine, which may span several months or longer, involves many trading partners and suppliers because the necessary materials differ for each order and impact supplier lead times. In addition, once completed, these machines need to be installed and tested at the customer location, which could take over a month in some cases. Finally, these machines require long-term (over 10 years) maintenance service after installation.

In this environment, industrial machinery companies have focused on cutting expenses and increasing efficiency. An ever-growing range of potential disruptions and risks to the supply-chain can lead to lost components, waste, increased downtime, and other inefficiencies. There is also pressure to deliver a better customer experience and increase customization with the supply chain to provide improved coordination with marketing and sales.

External and internal factors are putting pressure on industrial machinery enterprises to create digital supply chains.

Industry 4.0 requires a digital supply chain

To address these challenges, industrial machinery companies need to reorient their supply chains to be a competitive advantage and to support the shift to aftermarket services. What's more, a different mindset is required as cash flows shift from large one-time outlays to continuous operating expenses. Industrial machinery companies will also need to set up the supply chain for spare parts and aftermarket services to generate a constant revenue flow over their products' lifecycles.

However, supply chains continue to be challenged by "pre-digital" processes that are manual, siloed systems with disconnected teams. Insufficient visibility on post-shipment operations leads to fluctuations in revenue forecasts. The lack of accuracy in machine data management at a customer location can also cause traceability problems.

Compounding these issues are an overwhelming amount of data from inside and outside the business, including new sources of information like weather forecasts, social media posts, and the Internet of Things (IoT). Without real-time supply-chain coordination and execution, industrial machinery companies can have limited ability to schedule when work will be done and when components will be needed.

As such, it is vital that these companies take action, because both external and internal factors are putting pressure on industrial machinery enterprises to create a digital supply chain. From an external perspective, supply chains need to manage supply and demand disruptions from various vendors, fluctuations in resource availability, and the impact of weather. Increasing competition, speed to market, and the ability to shift from being a supplier to becoming a solutions provider make digital supply chains essential. From an internal perspective, demand variations require different engagement models to reduce shocks to the supply chain. Moreover, inefficient processes need to be addressed.

In order to support production uptime, a heavy machinery manufacturer may have several weeks of inventory in its warehouses that could be worth up to USD 100 million. By moving to three weeks of inventory coverage from four, the savings associated with the carrying cost would be USD 65 million in one year.[3]
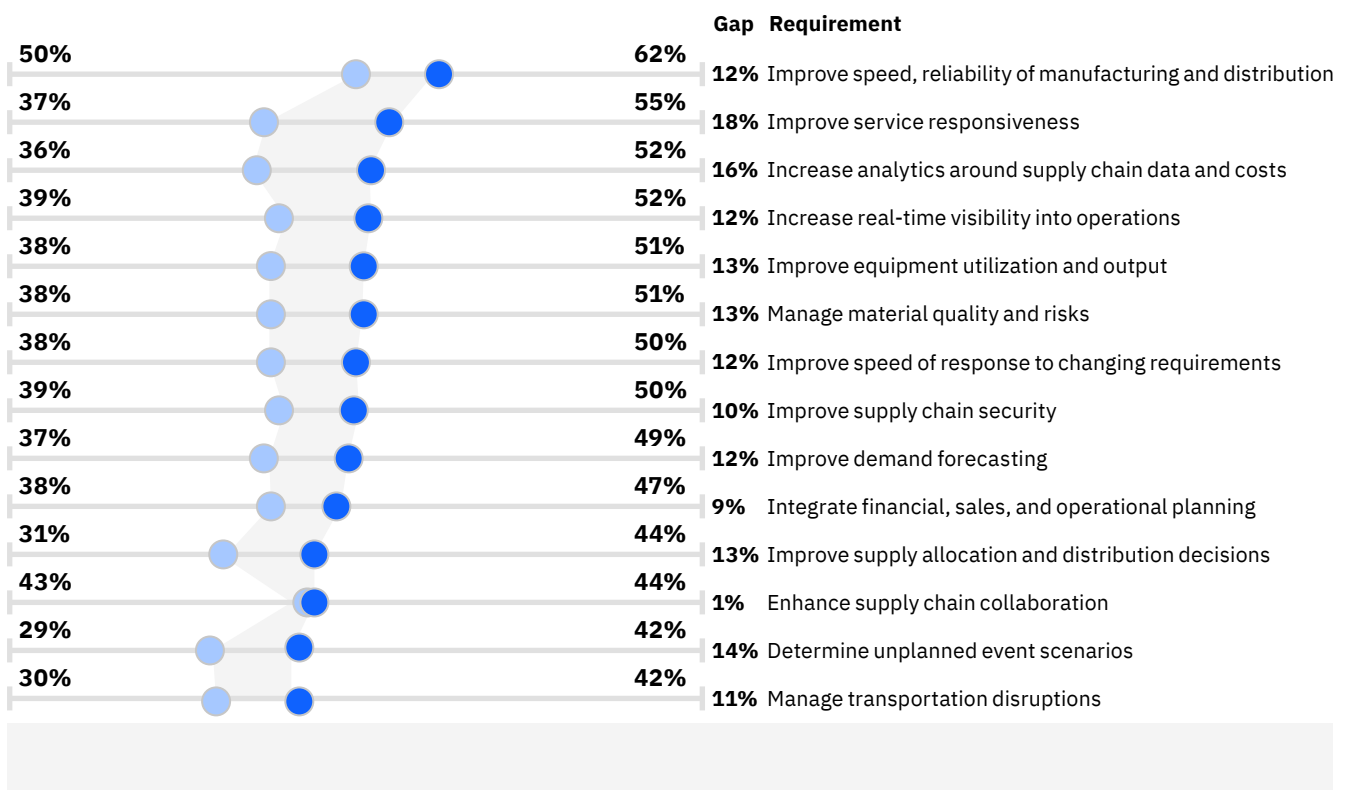
The supply chain also needs to address operational challenges caused by raw material quality and availability, scheduling and plant maintenance constraints, research and development timelines, and the lack of integration across the network. Further, field-service management is difficult, with service-engineer allocation and planning being cumbersome and time consuming. These needs are exacerbated by gaps in the effectiveness of the most important supply-chain requirements (see Figure 1).

Over half of the 250 industrial machinery respondents surveyed say it's vital to increase real-time visibility in operations. Yet, only 37 percent say their supply-chain functions are effective at it. Large gaps also exist between the importance that industrial machinery companies attribute to advancing imperatives—such as improving speed of response to changing requirements, determining unplanned event scenarios, and improving demand forecasting—and their current proficiency at acting on these requirements. Across the 14 requirements shown in Figure 1, the average effectiveness gap is 12 percent. These gaps are driven by complexity and variability. Components are scattered across the multi-faceted value chain: at the production factories, in transit, at warehouses, and in the suppliers' distribution centers. Any shifts in demand, change orders, or unforeseen events such as a severe snowstorm can cripple the supply chain and disrupt already-complex manufacturing and resource management processes.

A digital supply chain can dynamically predict demand patterns while improving visibility and leveraging asset availability.

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Figure 1

The shortfall between importance and effectiveness of supply chain operating requirements averaged 12 percent

		Gap	Requirement
50%	62%	12%	Improve speed, reliability of manufacturing and distribution
37%	55%	18%	Improve service responsiveness
36%	52%	16%	Increase analytics around supply chain data and costs
39%	52%	12%	Increase real-time visibility into operations
38%	51%	13%	Improve equipment utilization and output
38%	51%	13%	Manage material quality and risks
38%	50%	12%	Improve speed of response to changing requirements
39%	50%	10%	Improve supply chain security
37%	49%	12%	Improve demand forecasting
38%	47%	9%	Integrate financial, sales, and operational planning
31%	44%	13%	Improve supply allocation and distribution decisions
43%	44%	1%	Enhance supply chain collaboration
29%	42%	14%	Determine unplanned event scenarios
30%	42%	11%	Manage transportation disruptions

● Effectiveness ● Importance

Note: Some numbers may be rounded to nearest number.
Source: Questions. "How important are each of the following requirements to your enterprise's supply chain?";
"How effective is your digital supply chain function in addressing the following requirements?" Percentages
represent the number of respondents who selected 4 or 5 on a 5-point scale.
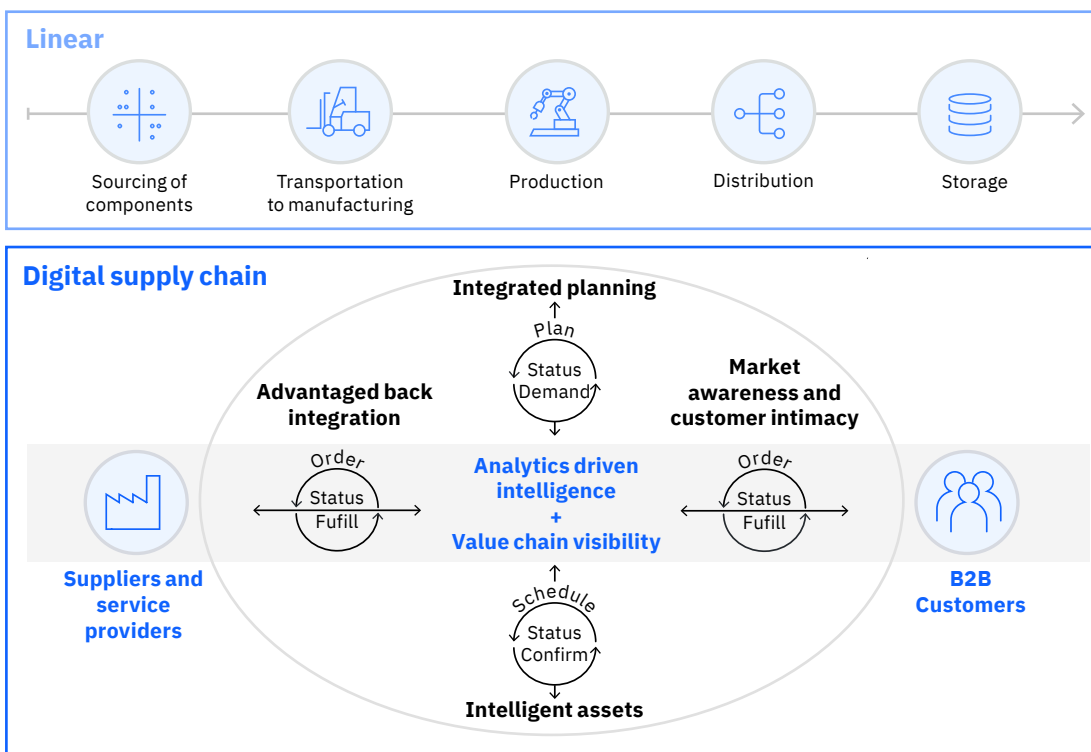
The digital supply chain

Successful industrial machinery companies will need to embrace advanced supply-chain technologies to shift to a digital model from the current linear one (see Figure 2). While the linear model has discrete, sequential, and event-driven processes, a digital model can deliver end-to-end, orchestrated, and insight-driven processes. A digital supply chain can lead to a 20 percent reduction of procurement costs, a 50 percent savings in supply-chain expenses, and an increase in revenue of 10 percent.[4]

A digital supply chain can dynamically predict demand patterns while improving visibility and leveraging asset availability. It includes three capabilities: integrated planning, value chain visibility, and intelligent assets.

– *Integrated planning* aligns operational and financial performance goals and enables rapid decision making based on forecast variance, order changes, market intelligence, and the like. It can optimize manufacturing plans, reduce setup disruptions as a result of variations in products or formulations, and help reduce and hedge commodity costs on a broad array of base inputs.

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Figure 2

The digital supply chain leapfrogs an antiquated model

Linear

Sourcing of components → Transportation to manufacturing → Production → Distribution → Storage

Digital supply chain

Integrated planning — Plan — Status Demand

Advantaged back integration — Order — Status Fufill

Market awareness and customer intimacy — Order — Status Fufill

Analytics driven intelligence + Value chain visibility

Suppliers and service providers

B2B Customers

Schedule — Status Confirm — Intelligent assets

Source: IBM Services.

– *Value-chain visibility* helps maintain control of highly regulated products from inbound order to customer receipt. It can identify risks and react to developing global supply disruptions. It also helps collate information from key supply-chain nodes and makes it available for reporting, real-time decision making, and collaborative-exception handling.

– *Intelligent assets* use the IoT and cognitive insights to help improve reliability and performance of equipment and assets through better visibility, predictability, and operations. They can improve quality and yield of manufacturing operations from design through support and increase resource-consumption efficiency—for example, workforce or energy—while reducing costs.

Combined, these three capabilities enable a digital supply chain that can enhance performance across multiple dimensions:

– Optimized inventory

– Reduced logistics costs

– Higher customer fill rates

– Reduced operating costs

– Incremental revenues

– New market opportunities.

Impact of improving inventory turns

Supply-chain disruptions can impact all types of inventory including components, works-in-progress, and finished goods. An industrial machinery organization can gain a competitive advantage by using insights from data to require less inventory on hand in order to service sales. As a result, working capital is released, and other cost savings may also be achieved through reduced warehousing and storage space needs.

IBM benchmarking data shows that machinery and equipment manufacturing organizations report average inventory turns of 5.9 per USD 1 billion in cost of goods sold for median performers.[5] Performance levels rise to 8.8 turns and higher for the 80th percentile performers.[6] In this scenario, a machinery and equipment manufacturing organization that improves its inventory turns to 8.8 from 5.9 could potentially release USD 56 million in working capital for every USD 1 billion of costs of goods sold.[7]
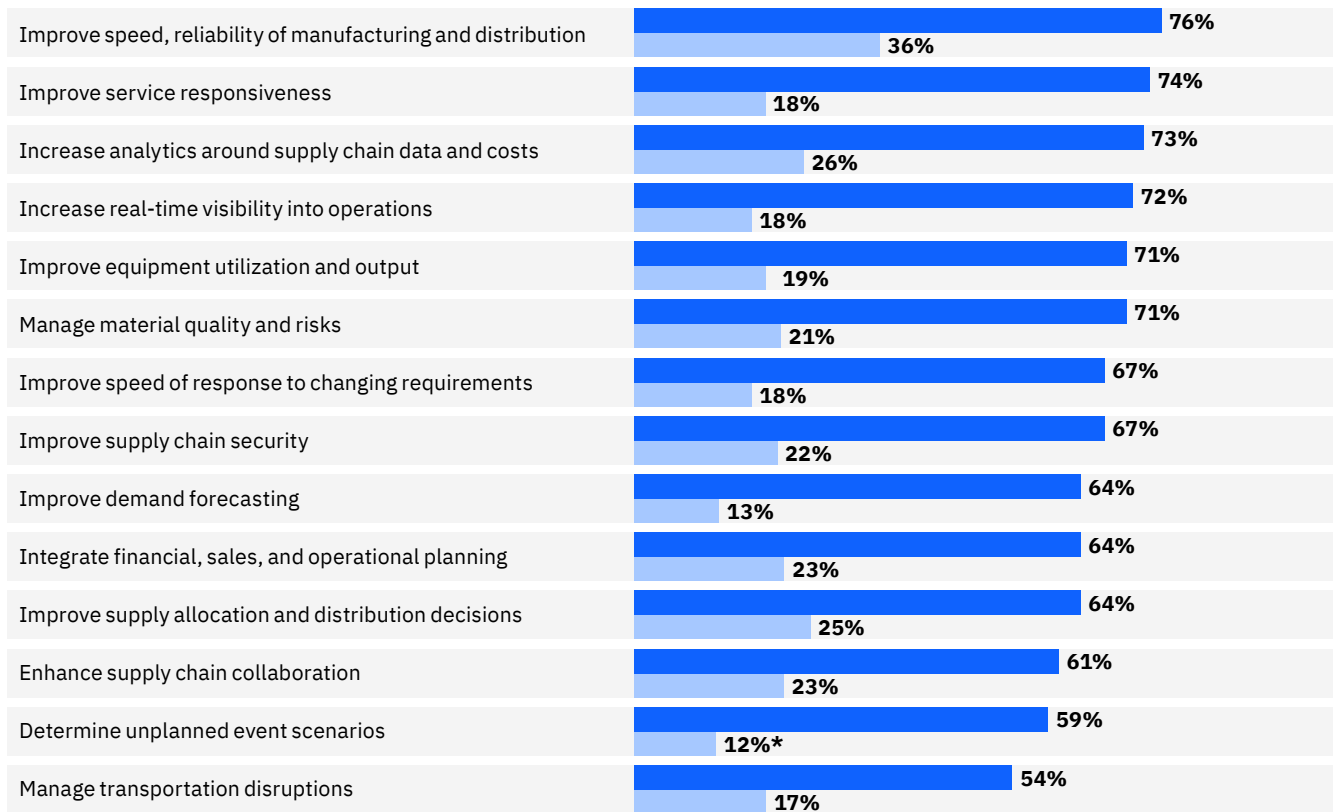
Digital supply-chain leaders

We analyzed survey responses and identified a small group of industrial machinery "leaders" that make up 36 percent of our research sample. Leaders report that their organizations are furthest along in executing a digital supply-chain strategy, whether they be fully transformed or in the midst of implementing their execution plan.

Companies can learn from these leaders, who report that their enterprises delivered better financial performance over the past three years than industry peers. Seventy percent of leaders say their revenue growth outperforms the industry, versus only 15 percent of peers. What's more, the leaders' profitability is more than five times the rest of the pack. Leaders are also two-to-four times more effective at satisfying supply requirements than their peers (see Figure 3). Also, leaders have realized a higher return on investment (ROI) from outlays for advanced technologies to digitize their supply chain—12 percent ROI compared to 7.5 percent for their peers. (See "Siemens: Tapping artificial intelligence in the supply chain.")

Leaders are two-to-four times more effective at satisfying supply-chain requirements than their peers.

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Figure 3

Leaders excel at addressing supply-chain requirements

Requirement	Leaders	All others
Improve speed, reliability of manufacturing and distribution	76%	36%
Improve service responsiveness	74%	18%
Increase analytics around supply chain data and costs	73%	26%
Increase real-time visibility into operations	72%	18%
Improve equipment utilization and output	71%	19%
Manage material quality and risks	71%	21%
Improve speed of response to changing requirements	67%	18%
Improve supply chain security	67%	22%
Improve demand forecasting	64%	13%
Integrate financial, sales, and operational planning	64%	23%
Improve supply allocation and distribution decisions	64%	25%
Enhance supply chain collaboration	61%	23%
Determine unplanned event scenarios	59%	12%*
Manage transportation disruptions	54%	17%

■ *Leaders*   ■ *All others*

* Results using low counts are statistically unreliable but can be considered directional.
Source: Question. "How effective is your supply chain function in addressing the following requirements?"
Percentages represent the number of respondents who selected 4 or 5 on a 5-point scale.

Siemens: Tapping artificial intelligence in the supply chain[8]

Siemens is a leading supplier of systems for power generation and transmission, as well as for medical diagnosis.

Artificial Intelligence is a key element of the company's BOLD Moves+ strategy for its supply-chain management. Siemens want to use it as another important lever to work more effectively as an artificial intelligence (AI) driven business and create a competitive advantage for the company. The company is developing AI applications known as "digital companions" to assist the various procurement roles in making data-driven decisions, by answering the question, "What is my next-best action?"

A pilot called the Digital Supplier Manager Companion (DSMC), which makes suggestions about supplier qualifications and development, is already being used at more than 100 Siemens locations. The DSMC is a PC-based application that evaluates hundreds of sets of data and patterns. It helps supplier managers make strategic decisions about which suppliers to develop next, when to qualify and evaluate them, and what particular risks to consider.

Enabling a digital supply chain

Fissures in the supply chain are usually caused by changing B2B customer requirements, unforeseen delays, and the inability to see what suppliers and service providers are doing. A digital supply chain gives insight into the information needed to respond quickly to obstacles in the supply chain. It is enabled by six levers (see Figure 4).

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Figure 4
Leaders enable a digital supply chain through six levers

Governance

Data management

Technology

Talent and culture

Platforms

Security

Source: IBM Institute for Business Value.

Seventy percent of leaders have a governance team in place to help drive the implementation of digital technologies for the supply chain.

Governance

For leaders, a digital supply chain starts with a cross-functional governance/steering team. Is this unique? No, but it is absolutely critical. In reality, most organizations recognize the importance of governance but fail to execute on this critical element. Without a team that oversees product development, supplier-relationship management, procurement, production, distribution, customer relationship management, marketing, sales, and IT, companies cannot see the big supply-chain picture.

Seventy percent of leaders have this type of team in place to help drive the implementation of digital technologies for the supply chain, compared to 14 percent of their peers. To support execution, leaders have established performance management/key performance indicators (KPIs) for their supply-chain digital activities. To react to market dynamics and meet ever-shifting customer expectations, these companies use quality and cycle-time metrics to measure digital supply-chain success (see Figure 5). As a result, they can improve inventory management, invoice accuracy, and customer feedback.

Given the complexities of multiple relationships, these leaders have also put in standards to manage information flow internally and externally. Sixty-two percent have implemented common standards across the supply chain, versus just 17 percent of peers. And nearly two-thirds of leaders have established common standards with collaboration partners. This enhances communications and, ultimately, productivity.

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Figure 5

Leaders use these metrics to track the success of applying digital technologies to the supply chain

Customer satisfaction
70%

Inventory accuracy
67%

Invoice accuracy
58%

Inventory turns
51%
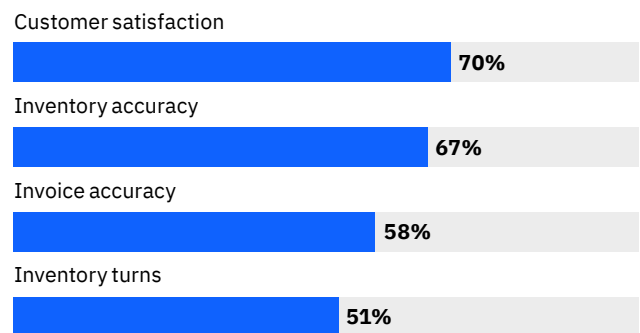
Source: Question. "What metrics are you using to track the success of applying digital technologies to your supply chain?"
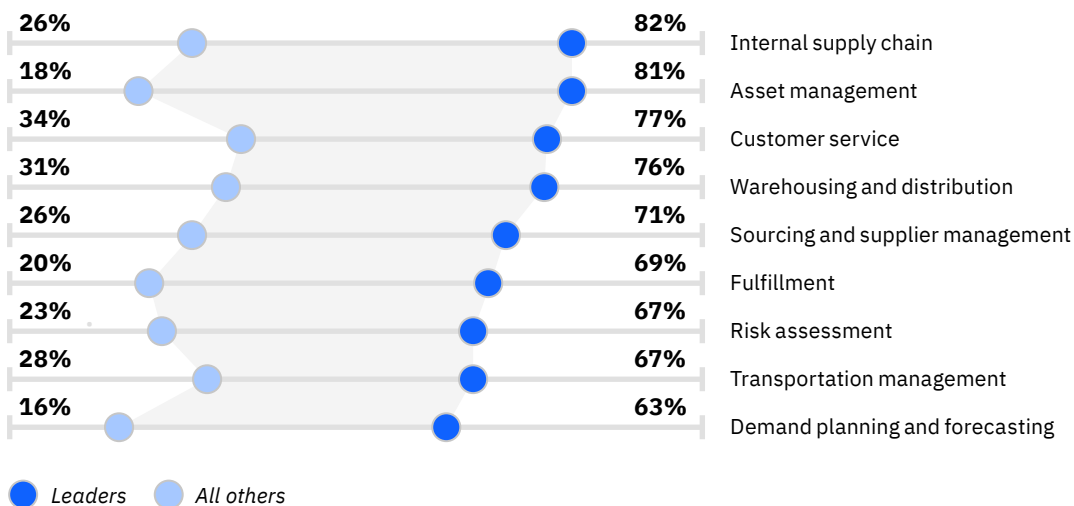
Technology

Industrial machinery companies will need to digitize their supply chains to create fully integrated, flexible, and agile operating environments. (See "Terex: Selecting Kuehne + Nagel for digital supply chain management.") Nearly three-quarters of leaders expect to invest most prominently in technologies for the supply chain. They view a combination of technologies as critical, including cloud computing, AI, predictive analytics, and IoT. Cloud computing improves sourcing and supplier management. AI can be applied for customer service. Predictive analytics enhances demand planning and forecasting. IoT provides connections across ecosystems and helps with asset management. These technologies can be used across supply-chain activities (see Figure 6).

Overall, leaders who have implemented specific digital technologies say they have achieved significant ROI in their supply chains (see Figure 7). They see predictive analytics improving demand forecasting and boosting the speed and reliability of distribution. Over three-quarters of leaders say predictive analytics and cloud computing help improve speed of response to changing requirements.

Leaders also report that cloud computing and IoT assist in enhancing supply-chain collaboration to provide visibility and improve sourcing. AI-enabled comprehensive data and analysis can boost forecast accuracy by as much as 50 percent while reducing inventory costs. Meanwhile, an AI-powered digital B2B network can retrieve order and transactional data up to 90 percent faster and reduce time-to-value by as much as 85 percent.[9]

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Figure 6

The gap between leaders and all others is wide when considering the importance of investing in digital technologies for supply chain activities
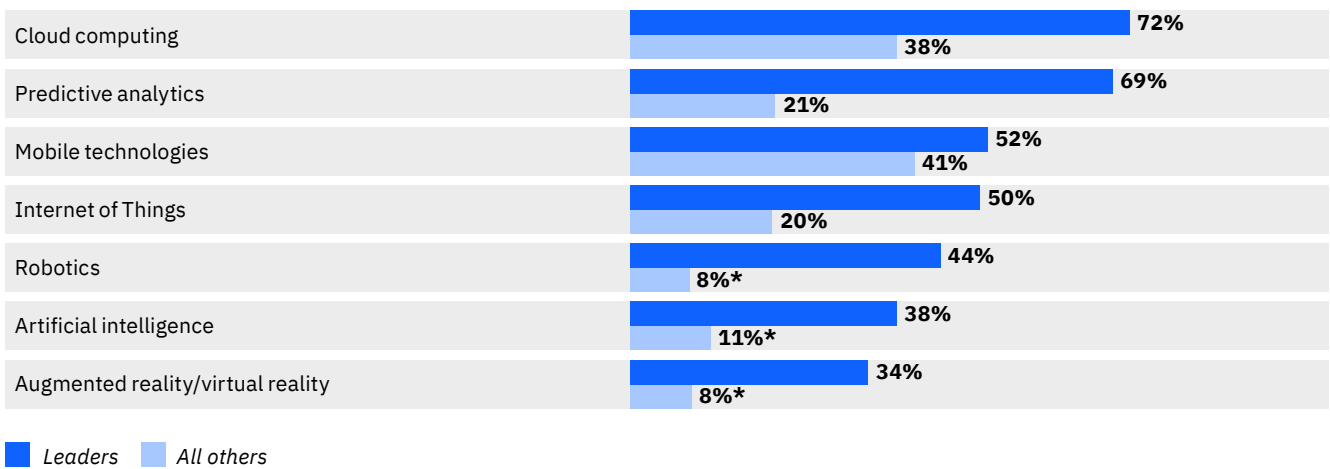

	Leaders	Activity
26%	82%	Internal supply chain
18%	81%	Asset management
34%	77%	Customer service
31%	76%	Warehousing and distribution
26%	71%	Sourcing and supplier management
20%	69%	Fulfillment
23%	67%	Risk assessment
28%	67%	Transportation management
16%	63%	Demand planning and forecasting

● Leaders ● All others

Source: Question. "How important is investing in digital technologies for the following supply-chain activities?" Percentages represent the number of respondents who selected 4 or 5 on a 5-point scale.

Nearly three-quarters of leaders are participating in supply-chain platforms, compared to only six percent of their peers.

Figure 7

Significant/substantial level of ROI realized from the application of digital technologies in the supply chain

Technology	Leaders	All others
Cloud computing	72%	38%
Predictive analytics	69%	21%
Mobile technologies	52%	41%
Internet of Things	50%	20%
Robotics	44%	8%*
Artificial intelligence	38%	11%*
Augmented reality/virtual reality	34%	8%*

■ *Leaders*   ■ *All others*

* Results using low counts are statistically unreliable but can be considered directional.
Source: Question. "What level of ROI have you realized based on your application of these technologies in your supply chain?" Percentages represent the number of respondents who selected either significant or substantial.

Platforms

For industrial machinery companies, platforms (see Insight "What is a platform?") are an increasingly tangible way of supporting the supply chain. Platforms can connect companies with customers and partners to share supply-chain information and conduct transactions. Nearly three-quarters of the leaders from our study are participating in supply-chain platforms, compared to only six percent of their peers. And 79 percent of them said they have created the platforms to work with customers, partners, or both. They recognize the many advantages of participating in platforms to both top and bottom lines. Meeting customer expectations and funding opportunities can manifest themselves in increased revenues. Decreasing infrastructure costs and increasing operational efficiency can improve the cost structure. Specifically, the leaders are providing significant value propositions to supply-chain platforms (see Figure 8).

A combination of digital technologies helps connect platform participants. Platforms powered by AI can predict problems and proactively direct automation to improve quality. An AI-based platform can review more than 3,000 weather and transportation data points across the delivery cycle rather than relying on the forecast of one or two locations. An AI-based system can use that information to help mitigate the effects of delayed components by automatically checking in-house, partner and other suppliers' inventories, and then advising the user and recommending a resolution.[10] The combination of AI with cloud computing and IoT helps integrate participants on a platform and support the continuous learning required to succeed. Digital technologies also enable a constant roll-out of new services in the platform.

Terex: Selecting Kuehne + Nagel for digital supply chain management[11]

Terex Corporation is one of the world's leading manufacturers of lifting and material processing equipment. Kuehne + Nagel International AG is a global transport and logistics company. The relationship between the two started in 2013. A new agreement enlarges this relationship by including all Terex business segments, expanding the geographical scope to Europe and Asia and embedding the complete supply chain from raw material to end customers. Kuehne + Nagel serves as a single point of contact for Terex.

This arrangement allows Terex to improve its transport-management control and visibility by leveraging the KN ControlTower capabilities. KN ControlTower is a Kuehne + Nagel Integrated Logistics product that provides managed services to simplify supply-chain complexity through integrated end-to-end solutions. It combines the company's industry expertise, logistics resources, and innovative technology to provide essential network coordination that delivers enhanced visibility of the flow of goods, data, and payments. This enables Terex to optimize logistics operating costs, lead times, and inventory levels.

Additional digital solutions will allow Terex to include predictive analytics and digital supply-chain modeling to create a faster and more predictable supply chain.

Insight: What is a platform?

A platform connects two or more participating sides, facilitating interactions between producers and consumers. Platforms consist of three elements:

1. A marketplace or ecosystem
2. One or more applications
3. Infrastructure.

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Figure 8

Services or intellectual property leaders provide to a supply chain platform

Intelligent contracts	75%
Real-time tracking	65%
Visibility	63%
Exception management	60%
Settlement	56%
Prediction	49%
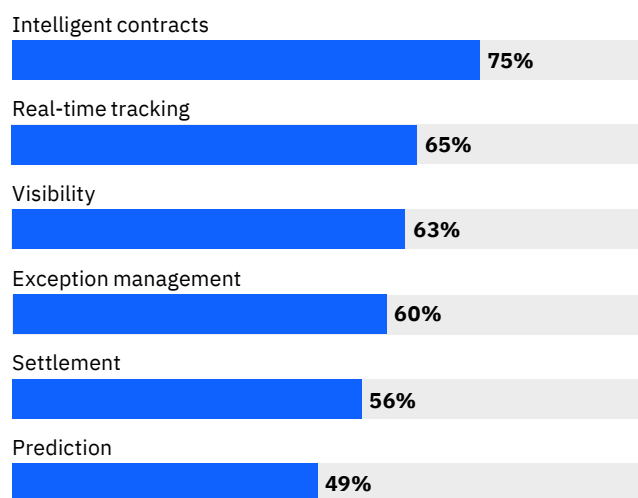
Source: Question. "Which services or intellectual property does your organization provide to a supply chain platform?" Percentages represent the number of respondents who selected 4 or 5 on a 5-point scale.

Data management

Data is the lifeblood of supply-chain visibility. The proper data management helps improve decision making on planning, sourcing, manufacturing, warehousing, logistics, and customer service. Over two-thirds of leaders have implemented data lifecycle management, established data interfaces, and created a flexible data architecture to support a digital supply chain. This robust-but-flexible data foundation allows them to take advantage of digital technologies. This infrastructure also allows the supply chain to nimbly respond to new market dynamics, customer demands, and user needs (see "AGCO: Overhauling its supply chain").

Over three in four leaders have a strategy in place to help supply-chain employees adapt to changes.

Leaders are far outpacing other respondents in data sources—the more data, the better the information, and the more impactful the insights. Four times as many leaders than their peers are integrating information gathered across a variety of sources to realize value from digital technologies in the supply chain. Customer and supplier data assist leaders in transforming the performance of their supply chains to help predict demand, improve forecasting, and enhance sourcing. Data on track and trace, transportation modes, routes, and rates allow them to adjust for events impacting the supply chain, resulting in more timely and accurate information for customers.

Talent and culture

Industrial machinery leaders recognize that employee roles and skills will continue to evolve in the digital era. Over three in four leaders have a strategy in place to help supply-chain employees adapt to changes, versus just 17 percent of their peers. And 76 percent of these leaders say their supply chain's shift toward digital-reinvention technologies is being supported by change management. The ability to build and maintain a skilled workforce is critical. Those organizations that fail to address talent and culture needs will become a relic of the industrial past.

Leaders have acted to address skills and create a culture that supports a digital supply chain. Over three in four leaders have trained employees to engage with digital technologies, and 72 percent have established a formal process to identify crucial digital skills. Five times as many leaders have built a data-driven culture to take advantage of the supply-chain information coursing through their organizations and across the ecosystem.

AGCO: Overhauling its supply chain[12]

AGCO is a global leader in the design, manufacture, and distribution of agricultural equipment.

The company launched a global material-management transformation initiative called GMMT. A vision was in place to have a globally integrated network for all inbound and outbound transportation and all B2B information (forecasting, releases, order confirmations, and advanced shipping notices, to name a few) required for supplier relationships.

Technology helps AGCO interact with every faction of the supply chain, from freight-management tracking through the company's performance measurement system, openly sharing its performance statistics. Whether it's purchasing, quality control, logistics, materials, or engineering, there is one transparent, standardized way that supplier performance is evaluated and made easily visible both internally and externally. AGCO has seen great strides in its direct-material suppliers and freight carrier performance with measuring, tracking, and driving delivery improvements.
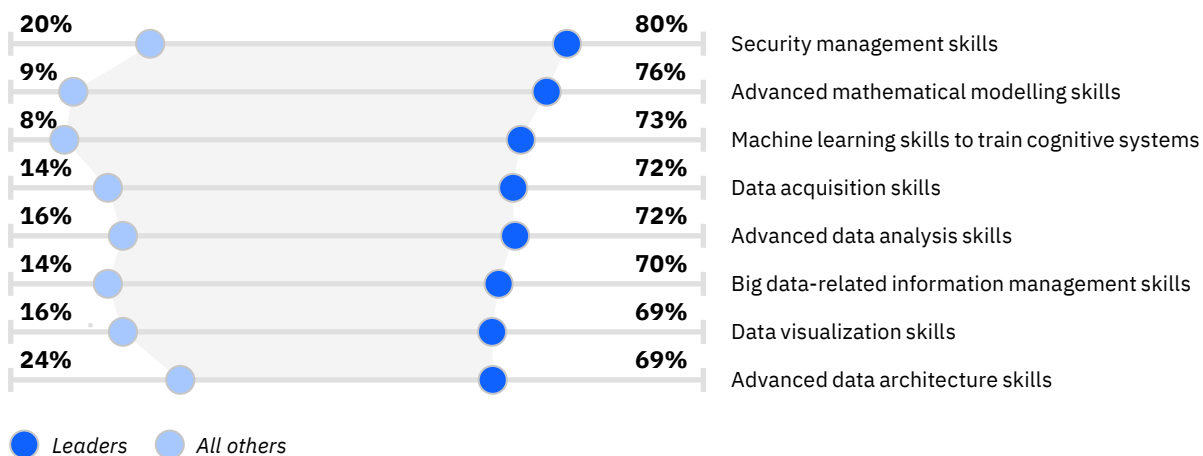
Seven in ten leaders report forming centers of excellence/shared services for supply-chain optimization.

Leaders have invested in specialized skills to support digital supply chains (see Figure 9). With the importance of using supply-chain insights, companies now need both technology- and data-minded talent. Nine times as many leaders than their peers have acquired machine-learning skills to train cognitive systems. These AI-related skills help them improve supply-chain efficiency and reduce risks. Four times as many leaders have invested in skills such as advanced data analysis and data visualization. These skills mean leaders can support setting the digital agenda and driving the supply chain as a core differentiator.

Leaders have also made changes to their operating models. Seventy percent report creating service scalability by forming centers of excellence/shared services for supply-chain optimization, versus eight percent of other respondents. This aggregation of skills helps reduce costs and improve customer service by analyzing supplier relationships, supply-chain flow paths, transportation efficiencies, route planning, component inventory, and resource utilization.

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Figure 9

Leaders have "upskilled" their organizations for digital supply chains

20%	80%	Security management skills
9%	76%	Advanced mathematical modelling skills
8%	73%	Machine learning skills to train cognitive systems
14%	72%	Data acquisition skills
16%	72%	Advanced data analysis skills
14%	70%	Big data-related information management skills
16%	69%	Data visualization skills
24%	69%	Advanced data architecture skills

● *Leaders*   ● *All others*

* Results using low counts are statistically unreliable but can be considered directional.
Source: Question. "What skills has your organization invested in to take advantage of digital technologies in the supply chain?" Percentages represent the number of respondents who selected 4 or 5 on a 5-point scale.
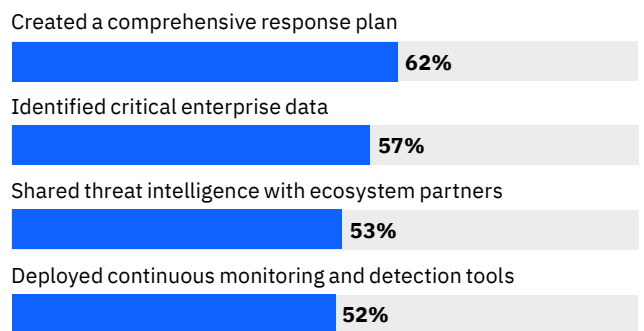
Security

Supply chain terrorism has gotten worse, with the absolute number of attacks increasing 8.5 percent last year, averaging 3.1 terrorist attacks on supply chains per week.[13] In 2017, the cyberattack known as NotPetya affected Maersk, the world's largest shipping-container company. This ransomware attack brought down the entire global IT network of a company responsible for nearly one fifth of the entire planet's shipping capacity.[14] It is estimated that approximate damages to Maersk reached USD 300 million.[15]

A digital supply chain inexorably links industrial machinery companies with suppliers and customers. The vast amount of data and intellectual property shared among the partners creates vulnerabilities and cybersecurity risks. Only about 75 percent of leaders surveyed— compared to 20 percent of their peers—have addressed cybersecurity issues as part of implementing digital technologies for their supply chains. Nearly a quarter of leaders are still highly vulnerable.

Leaders have taken specific actions to create good security cultures and clear crisis protocols (see Figure 10). And they consistently practice, plan, and prepare for many different supply chain situations. Technology tools such as blockchain and AI-enabled cognitive security solutions help detect security concerns and respond faster to breaches. Organizations that have not deployed security automation experience breach costs that are nearly twice as much as those with fully deployed automation (USD 5.16 million average total cost of a breach without automation versus USD 2.65 million for fully deployed automation).[16]

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Figure 10

Leaders address supply chain security through planning, monitoring, and sharing intelligence

Created a comprehensive response plan

62%

Identified critical enterprise data

57%

Shared threat intelligence with ecosystem partners

53%

Deployed continuous monitoring and detection tools

52%

Source: Question. "What actions have you taken to address security in your digital supply chain?"

Action guide

Becoming a digital supply chain leader

Industrial machinery firms who are leaders in supply-chain digitization have holistically addressed six levers to enable a digital supply chain. Their leadership in financial performance, effectiveness at addressing supply-chain requirements, and higher return-on-investment on digital technologies showcase their business outcomes. The journey to a digital supply chain will require a well-thought out strategy and flawless execution, led by a cross-functional governance/steering team. This strategy will need to include a prioritization of risks such as suppliers, service providers, and potential interruptions or delays.

1. Uncover new intelligence

Data is the key to supply-chain visibility and intelligence. Organizations must establish a comprehensive and consistent enterprise architecture and leverage a hybrid-cloud approach to support open flexibility and allow security-rich data integration. Application program interfaces (APIs) should be used to share data with the ecosystem partners.

A data strategy and governance are needed to target the information required, including legacy enterprise resource planning (ERP) and planning-application data, customer-specific news, economic indicators, commodity prices, and track and trace. The real-time signals and information sources from weather and social need to be collected in a platform. Simulation, modeling, and predictive analysis can then tap the data to evaluate inventories, networks, demand volatility, and supply availability.

2. Create supply chain processes that can "think"

Standardized supply-chain processes and systems are the foundation to overlay digital technologies, help optimize workflows, and provide the integration with ecosystem partners and platforms. Decisions will need to be made to set parameters of working performance metrics and acceptable trade-offs with disruptions. Digital technologies should be used to help optimize the end-to-end process and understand trends to improve demand planning while simultaneously communicating changes and disruptions throughout the supply chain. IoT monitors asset performance in real time. Predictive analytics can see what components are available, predicts failures, and provides recommendations to adapt to disruptions. Mobile allows ubiquitous data access. Supply-chain AI assistants help with customer service.

3. Ready your digital skillset

Expertise may not exist in the enterprise to take advantage of the combination of predictive analytics, cloud, AI, and IoT to track and improve supply-chain execution. Tactics to close the gap include reskilling existing employees, leveraging apprenticeship/internship programs to train talent, and taking advantage of new and emerging educational programs/platforms that enhance employee skills.

In addition, new talent should be acquired with data management, visualization, analytical, and problem-solving skills—or these skills can be obtained from ecosystem partners. AI and analytics will play an important role to help analyze and predict skill supply and demand and provide personalized learning. With the skills in place, the need for strong change-management capabilities should not be underestimated given the magnitude of the change required. Finally, the aggregation of skills into a center of excellence is critical to build the necessary models to help optimize the supply chain.

Are you ready for a digital supply chain?

– In what ways does your supply chain optimize costs and increase speed to market? How can they be improved?

– What real-time information do you have on your supply-chain assets? Do you have the information you need to outthink your competition?

– How will your analytics support decision-making across inventory management, supply and demand forecasting, distribution costs, and manufacturing?

– What skills are employees equipped with to solve supply-chain challenges in real time when or before they occur?

About the authors

Gaurav Garg
linkedin.com/in/gargaurav
gauravgarg@dk.ibm.com

Gaurav Garg is a Business Development Executive and Associate Partner in IBM Services. He is the Global Lead for Industrial Machinery and Heavy Industry and is responsible for industry strategy, partnerships, and business development. He serves as the go-to-market leader for IBM's aftermarket services solutions. Gaurav is a member of the IBM Industry Academy.

José R. Favilla
linkedin.com/in/josefavilla
jfavilla@us.ibm.com

José R. Favilla is Worldwide Director for Industrial Products at IBM. He has over 30 years of experience helping global clients drive major business transformation programs. José is a member of the IBM Industry Academy.

Spencer Lin
linkedin.com/in/spencer-lin-35896317
spencer.lin@us.ibm.com

Spencer Lin is the Global Chemicals and Petroleum, and Industrial Products Lead for the IBM Institute for Business Value. Spencer has more than 25 years of experience in financial management and strategy consulting.

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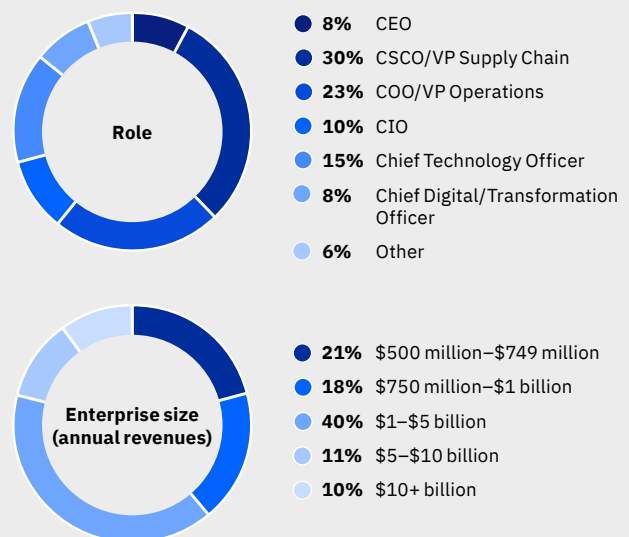
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Study approach and methodology

In cooperation with Oxford Economics, the IBM Institute for Business Value surveyed 250 industrial machinery leaders in 19 countries between January and February 2019. We collected responses from Chief Executive Officers, Chief Supply Chain Officers, Chief Operating Officers, Chief Information Officers, Chief Digital/ Transformation Officers, VPs of Operations, and VPs of Supply Chain. Industrial machinery was defined as manufacturers of industrial machines for a variety of purposes: heavy equipment (for example, construction, mining, oil and gas, maritime, forest, and demolition), special-purpose machines (for example, elevators, escalators, wind turbines, metal working, paper mill, and packaging, ships) and general-purpose machines (for example, HVAC, materials handling, and power tools).

Role

- **8%** CEO
- **30%** CSCO/VP Supply Chain
- **23%** COO/VP Operations
- **10%** CIO
- **15%** Chief Technology Officer
- **8%** Chief Digital/Transformation Officer
- **6%** Other

Enterprise size (annual revenues)

- **21%** $500 million–$749 million
- **18%** $750 million–$1 billion
- **40%** $1–$5 billion
- **11%** $5–$10 billion
- **10%** $10+ billion

Note: Other includes Vice President Distribution, Vice President Logistics and Director Supply Chain Questions. What is your job title?; What was your organization's revenue in US$ for the last fiscal year?

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