Digital transformation:
Raising supply-chain performance to new levels

Operations November 2017

Enis Gezgin
Xin Huang
Prakash Samal
Ildefonso Silva

Digital transformation: Raising supply-chain performance to new levels

Combining digital applications with operational changes helps yield significant performance improvements that stand the test of time.

For all the effort that companies devote to improving the performance of their supply chains, relatively few have unlocked the full potential of digital technologies. A recent McKinsey study found that the average supply chain has a digitization level of 43 percent, the lowest of five business areas that were examined. A mere 2 percent of the surveyed executives said the supply chain is the focus of their digital strategies. Are their priorities misplaced? Perhaps. The same McKinsey research suggests that, on average, companies that aggressively digitize their supply chains can expect to boost annual growth of earnings before interest and taxes by 3.2 percent—the largest increase from digitizing any business area—and annual revenue growth by 2.3 percent.[1]

In our experience, most of the disparity between potential and actual gains from supply-chain digitization can be explained by technology gaps and management choices. Technology gaps have occurred because advances in supply-chain technologies tailed off after an initial burst of innovation. This yielded technologies that enabled companies to streamline routine activities, expand the capabilities of particular systems, and enhance analytical practices. Valuable though these technologies have been, they didn't perform the sophisticated functions that transform supply-chain management. It has taken some time for technology innovations to accumulate and coalesce into new offerings. Now that better digital solutions have become available, companies can make greater improvements in supply-chain performance.

Seizing that opportunity, however, has proved surprisingly difficult for many companies.

A common error is to overlook operational changes that would let a company take full advantage of digital technologies. One major healthcare company upgraded its enterprise-resource-planning (ERP) system, with the aim of reversing a decline in supply-chain service levels. Yet its service levels continued to drop—until it reworked processes such as demand forecasting. Fixing operations without making complementary technology improvements can be equally problematic. At a large consumer-goods company, supply-chain service improved rapidly following a series of operational changes, but soon reverted to its original level because the technologies weren't in place to support the new operations.

The right approach to digitizing supply chains integrates suitable leading-edge technologies with revamped operations. Many managers will be familiar with the basic transformation approach: establishing a vision for the future supply chain, assessing the supply chain's current state, and developing a transformation road map. In a digital transformation, this approach has some new features. The vision will call for a combination of no-regrets improvements as well as more speculative changes that can be pursued over time. The assessment needs to consider whether operations and technology are sufficiently integrated, and whether the company has the talent strategy and organizational structure that will favor innovation and continual improvement. Furthermore, the transformation road map will have compressed timeframes, given the ease with which the latest digital solutions can be scaled up. In this article, we offer CEOs and senior executives further detail about each step, with

examples showing how digital transformations work in practice.

How supply-chain capabilities and technologies have evolved

The low rate of supply-chain digitization has much to do with the capabilities of the technologies that companies have had available until recently. Supply-chain management was one of the first business functions to undergo substantial technology upgrades, as developers created applications to take advantage of data generated by ERP systems. Those applications largely focused on improvements in three areas: streamlining transactional activities such as those involved in end-to-end planning, supporting major operations such as warehouse management, and sharpening the analysis on which decisions are based.

What these technologies didn't yet provide, though, were transformative capabilities for supply-chain management: linking and combining cross-functional data (for example, inventory, shipments, and schedules) from internal and external sources; uncovering the origins of performance problems by delving into ERP, warehouse-management, advance-planning, and other systems all at once; or forecasting demand and performance with advanced analytics, so planning can become more precise and problems can be anticipated and prevented.

Now, an ever-expanding ecosystem of technology vendors and service providers offers digital solutions that meet these supply-chain-management needs. Powerful and user-friendly analytical tools make it possible to compile large sets of unstructured data and extract useful insights from them. Artificial-intelligence applications can automatically trace performance problems to their root causes, and even predict declines, and then recommend corrective measures to managers. Major decisions can be put into action more quickly, with systems that convey adjustments across functions—for example, from sales and operations planning (S&OP) into other areas—and from the executive level down to business-unit or location managers.

In other words, the latest digital technologies make it possible for companies to comprehensively transform the way that their supply chains operate. At the enterprise level, digital transformation means employing analytics, artificial intelligence, robotics, the Internet of Things, and other advanced technologies to collect and process information automatically and either support decision making and other activities or automate them altogether. A supply-chain digital transformation, then, is about establishing a vision for how digital applications can improve service, cost, agility, and inventory levels and consistently implementing process and organizational changes that use these technologies to drive operational excellence.

An example from one advanced industrial company illustrates the possibility for transformation. The company had completed a major multiyear effort to integrate its supply-chain processes as it implemented a new ERP system. As part of this effort, it had set up data streams from sources within its organization and across its supply network. Yet it still struggled to monitor activity across every part of its supply chain and diagnose systemic problems affecting the supply chain's performance. The problem was that the company hadn't linked related data sets together in ways that would allow it to glean useful insights: for example, by determining that delays in the component-manufacturing stage were likely to make certain customer orders late.

It chose to feed all the incoming data into the same processing engine, where data from different sources could be connected to show how activities and decisions in one part of the supply chain would influence operations elsewhere. Within a few

weeks of deploying the data engine, the company had uncovered several systemic issues, such as mismatched lead times and past-due purchase orders that prevented reliable indicators of future demand from reaching suppliers. Since then, the data engine has enabled the company to reduce its inventory by 20 percent and improve the productivity of its planners by 20 to 30 percent.

This company's experience with analytics illustrates another benefit of the latest digital technologies: they are easier to set up and use than earlier ones. Cloud-based offerings, for example, can be piloted readily and then extended rapidly across organizations. Many new technologies are also simple to integrate with existing systems. There are now off-the-shelf S&OP software packages, for example, that can be connected to ERP systems using standard application programming interfaces (APIs).

Improving supply-chain performance isn't just a matter of buying and installing new systems or software. Supply-chain management is a collaborative endeavor. Most efforts to improve supply-chain performance should therefore involve changes to the ways that employees and teams share information, consider problems and opportunities, reach decisions, and carry out actions they agree on.

What's distinctive about the newest digital technologies is that they can integrate better methods for collaboration into a company's processes and prevent a company from regressing to its previous, less effective methods. Developing a balanced plan for supply and demand, for instance, requires input from multiple business functions. Without digital technology, those business functions likely would have submitted information to the S&OP team and left them to resolve any conflicts. But the latest digital S&OP platforms come with a standard planning process, which compels every business function to contribute to

the planning exercise in a coordinated manner. As companies prepare to transform their supply chains with digital technologies, they need to envision the business and technical capabilities they want and plan to develop those capabilities in tandem.

Planning an effective digital transformation of a supply chain

An effective transformation depends on a creative, forward-looking concept for the future supply chain. This means thinking about the outlook for the company, amid the pressures and trends that influence its competitive situation, as well as the changing expectations of its customers. Ultimately, the supply-chain vision should be aligned with the company's strategic goals. While the need for such alignment has always existed, what's new is that both the strategic goals and the vision now have to account for the pressures and opportunities that companies face in an increasingly digitized economy.

A retailer, for example, might define its supply-chain vision with respect to its aims for enhancing omnichannel customer experiences: "We will provide customers with seamless, satisfying experiences, from their first visit to a store or digital channel to the moment when they receive exactly what they ordered, when we promised it." A pharmaceutical company, on the other hand, might define a supply-chain vision that will help it adapt to the financial constraints of healthcare providers: "We will enable our customers to save money by establishing the lowest-cost supply chain among our peers and by providing them with experiences that make their operations more efficient."

Once a company sets out a vision for its supply chain, it should articulate that vision in terms of business and technical capabilities. These might include the following:

- *Better decision making.* Machine-learning systems can provide supply-chain managers

with recommendations for how to deal with particular situations, such as changing material planning and scheduling in response to new customer orders.

- *Automation.* Automated operations can streamline the work of supply-chain professionals and allow them to focus on more valuable tasks. For example, digital solutions can be configured to process real-time information automatically (for example, automated S&OP preparation and workflow management), thus eliminating the manual effort of gathering, scrubbing, and entering data.

- *End-to-end customer engagement.* Digital technology can make customer experiences better by giving supply-chain managers more control and providing customers with unprecedented transparency: for example, track-and-trace systems that send detailed updates about orders throughout the lead time.

- *Innovation.* A digital supply chain can help a company strengthen its business model (for example, by expanding into new market segments) and collaborate more effectively with both customers and suppliers (for example, by basing S&OP decisions on information that is automatically pulled from customers' ERP systems).

- *Talent.* Digitally enabled supply chains have talent requirements that can be quite different from those of conventional supply chains. At least some supply-chain managers will need to be able to translate their business needs into relevant digital applications.

Performance goals complete a company's vision for its transformed supply chain. Setting performance goals requires a company to gauge its current performance and then determine achievable improvements. Goals can be defined in terms of agility, service, capital, and cost measurements (Exhibit 1). A company that aims to reduce lost sales by a specific amount, for example, would need

corresponding supply-chain performance goals—for example, improving the speed and reliability of shipments to customers.
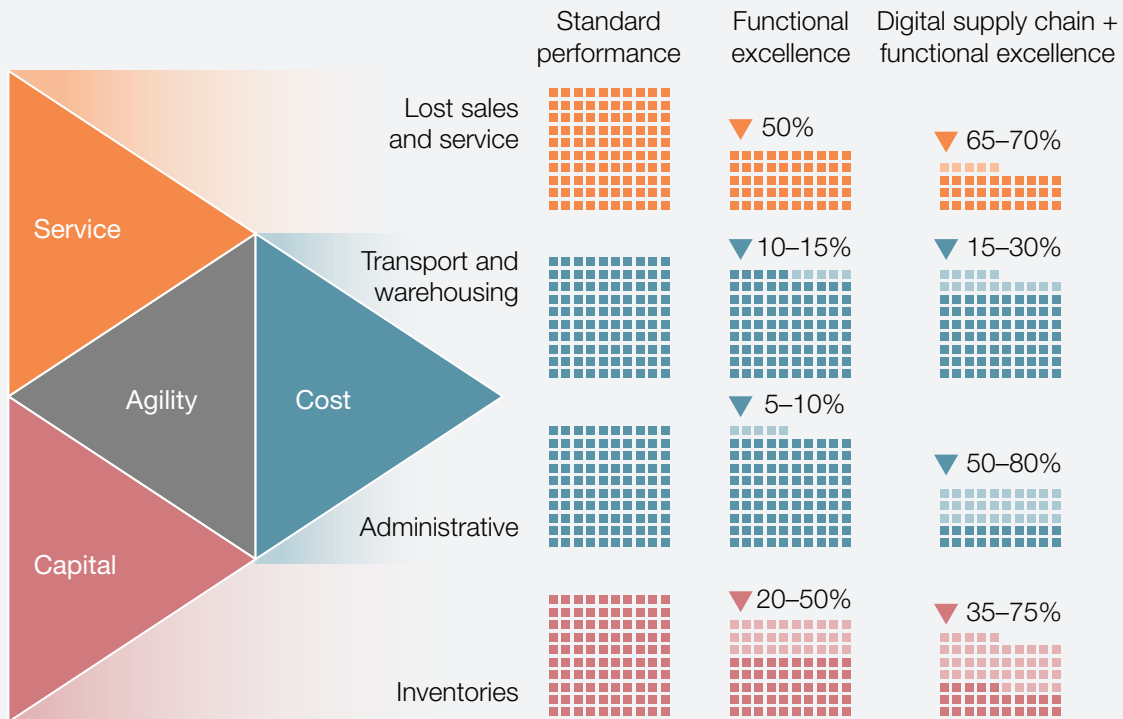
Assessing the supply chain

The vision for the supply chain provides a company with reference points for the second step in transformation planning: a comprehensive assessment of the supply chain's business and technical capabilities. To make the assessment simpler, companies might ask the following questions to find capability gaps in five cross-cutting categories:

- *Data.* Do we collect and generate all the data we need to enable our vision? Is that data stored in a manner that makes it easy to access and use?

- *Analytics.* Do we have the analytical capabilities to extract useful insights from the data that we collect?

- *Software and hardware.* Do our software and hardware systems enable the analytical and process capabilities that the company requires?

- *Talent.* Do we attract, develop, and retain the "digital native" talent needed to run and transform our supply chain? Does our culture and organizational model encourage experimentation, innovation, and continual improvement?

- *Processes.* Do we have the right processes in place across different supply-chain subfunctions? Are those processes clearly defined and well understood by everyone who is involved in them?

Traditional methods of conducting supply-chain assessments rely heavily on interviews and surveys of employees and business partners, as well as manual data analysis. With digital technologies, companies can perform deeper, more insightful assessments. Off-the-shelf analytics applications can be used to make sense of large, detailed sets

Exhibit 1

Digital supply-chain levers can unlock significant improvements across multiple performance dimensions.

	Standard performance	Functional excellence	Digital supply chain + functional excellence
Lost sales and service		▼ 50%	▼ 65–70%
Transport and warehousing		▼ 10–15%	▼ 15–30%
		▼ 5–10%	
Administrative			▼ 50–80%
Inventories		▼ 20–50%	▼ 35–75%

Service · Agility · Cost · Capital

Source: McKinsey analysis

of transactional data and extract insights that are more reliable than insights based on data samples. For example, a company can study several years' worth of order data to understand trends affecting service levels, and it can do this in just a few hours. These initial analytics efforts can have benefits beyond the assessment phase, too. Companies can leave in place the applications they install for their assessments and continue to use those applications as "one click" diagnostic tools for ongoing performance monitoring.

Creating a transformation road map

The final step in planning a supply-chain transformation is to develop a road map looking several years ahead. That means identifying

operational improvements and digital solutions that will build on the company's existing capabilities to produce the capabilities described in its vision. Root-cause analyses are essential to identifying potential changes, since they expose the problems that underlie performance shortfalls.

Once a list of possible changes has been established, the company needs to prioritize them. The traditional method of prioritization, which weighs the expected value of a change against the ease of implementation, is still effective. But it also needs to be updated according to the complexities of digital transformations. Value remains relatively easy to quantify in terms of agility, service, cost, and capital. But it is more difficult to gauge the

How one company's digital supply-chain transformation unfolded

Each company's transformation approach will need to reflect its circumstances, difficulties, opportunities, and goals. This detailed example from a high-tech company shows how it planned and carried out its transformation efforts.

Establish the vision. The company began its transformation by determining that its future success depends on making efficient use of its capital equipment, to lower product costs, and accelerating product development and delivery, since its products tend to have short life cycles. Those two goals provided the basis for its supply-chain vision.

Get the basics right. The company's transformation plan called for focusing its initial efforts on improving its supply-chain processes and IT systems. Early changes included redesigning S&OP processes, retraining workers to administer existing planning systems as they were originally intended, and reconfiguring product flows to reduce lead time. It also built systems capable of generating real-time data, as the basis for both transformation decisions and solutions to operational issues.

Set up an agile budgeting process. The company adjusted its budgeting system to enable rapid execution of digital-transformation efforts. It shortened its budget-approval process for efforts related to automation, since automation projects typically support its goal of accelerating product development and delivery. Larger investments are also screened according to whether they promote cost reduction and speed. For example, the company invested in doubling its packaging capacity because more capacity would let it prepare packages for shipment more quickly.

Add talent and build supporting capabilities. The company is increasing its capacity for digital transformation by hiring and training workers with deep knowledge of core supply-chain processes as well as advanced analytics and digitization. It also established a supply-chain center of excellence (COE) to lead changes, promote innovation, and advise on key decisions, while digitizing processes in collaboration with business owners. The COE was established with a small staff focused on a single area of the supply chain. As the COE has expanded, it has become the engine for the supply-chain transformation, systematically optimizing, automating, and digitizing such processes as inventory management, supply planning, real-time allocation, and warehouse operations.

Pursue continual improvements. At each step of the supply-chain transformation, the company focuses on the biggest obstacle preventing it from realizing its goals. Initially, its main challenge was allocating inventory to customers according to their importance. So it installed a global available-to-promise system and the corresponding order-promising process. The next roadblock was planning, a highly manual process that took several days to complete. Once the company implemented an automated planning system, planning time fell to less than four hours. Next, it installed automated packaging machines. Subsequent changes included using robots to lower the cost and increase the pace of material movement, adding a real-time algorithm for scheduling work shifts and asset usage, and using a real-time performance-management system to limit exceptions to operating guidelines.

Reinforce transformation themes. The company updates its supply-chain vision at every step of its transformation to make certain that its plan reflects recent developments in its industry and markets. For this company, digitization is a never-ending journey. The company also continues to redefine its talent model, bringing in top talent with experience in both supply-chain management and digital technology so its supply chain can incorporate the latest digital innovations and techniques.

Exhibit 2

Companies can sort their supply-chain digitization efforts into three categories, each with different levels of urgency.

	more　　　　　Certainty of value　　　　　less		
	No regrets	**Forced bet**	**Active waiting**
Definition	• Clear financial or operational benefits • Technology exists • Practical to make right away	• High potential to create value and competitive advantage—and first movers will gain the most • Technology or other limitations prevent immediate implementation • Impractical to make right away, but companies should do all they can to prepare for implementation	• Uncertain value, but low risk associated with not being a first mover • Technology or other limitations prevent immediate implementation • Impractical to make right away, but companies can wait for first movers to act before running tests and deciding whether to commit
Example, based on a vision of seamless supplier–customer connectivity	Implementing an inventory tracking and optimization tool that will enhance awareness of inventory levels throughout the supply chain	Using the blockchain to record transactions between the company, its suppliers, and its customers, as well as forecasts and other forward-looking operational information	Implementing business-intelligence software that connects supply-chain management systems with customers' systems so inventory levels can be managed according to customers' demand forecasts

Source: McKinsey analysis

ease of implementing changes, partly because technology is continually improving—what is impractical today might become practical in a year. Most companies will benefit from immediately pursuing "no regrets" changes, which have high value and few barriers to implementation, while preparing to make other changes that come with greater uncertainty (Exhibit 2).

Once the company has prioritized potential changes, it can organize them into a multiyear road map. As the no-regrets projects are progressing, a company can start making changes in other areas, such as talent and processes, that will set the stage for future digital-transformation efforts (see sidebar, "How one company's digital supply-chain transformation unfolded").

■ ■ ■

Advances in digital technology enable companies to improve their supply-chain performance quickly at a modest cost. The appeal of these technologies has led some companies to mount hasty, and ultimately disappointing, implementation projects. Our experience suggests that companies reap greater benefits when they develop a comprehensive vision for the future of their supply chains, carry out a disciplined assessment of existing performance, and draw up a long-term transformation road map. They should also recognize that supply-chain transformations must extend to both technology and operations. Companies that employ these approaches to supply-chain transformations stand a better chance of capturing the full value that digital technology can provide. ■

---

[1] Jacques Bughin, Laura LaBerge, and Anette Mellbye, "The case for digital reinvention," *McKinsey Quarterly*, February 2017, McKinsey.com. The five business areas examined in the survey were products and services, marketing and distribution channels, processes, supply chains, and new entrants at the ecosystem level. Digitization is measured in terms of survey respondents' perceptions of the extent to which digital technology has penetrated their companies.

Enis Gezgin is an associate partner in McKinsey's Washington, DC, office; **Xin Huang** is a partner in the New Jersey office; and **Prakash Samal** is a supply-chain solution manager in the Chicago office, where **Ildefonso Silva** is a partner.