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Digital in industry: From buzzword to value creation

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From supply chains to production to customer experience, digitization is transforming the way industry functions—and unleashing global opportunities for value creation.

In the past few years, we have seen digitization bring its first benefits to the industrial sector, particularly in processing and manufacturing, yet enormous untapped potential remains. Digital capabilities such as e-commerce platforms can significantly improve traditional customer-supplier experiences. Additional advances in automation, big data and analytics, and the Internet of Things create additional opportunities for substantial gains along the entire industry value chain.

Another industrial revolution

Early signs of the digital revolution are already here. Amazon Business, a B2B e-commerce platform launched in April 2015, turned over \$1 billion in sales in its first year, growing at an impressive 20 percent per month. B2B buyers increasingly prefer digital, with 94 percent conducting some form of online research before purchase.

Further changing the rules of the game are the decreasing costs of new processing technologies such as additive manufacturing and advanced robotics. For example, 3-D printing costs came down by 60 percent between 1990 and 2014, and industrial robot costs decreased 5 percent annually between 2000 and 2012.

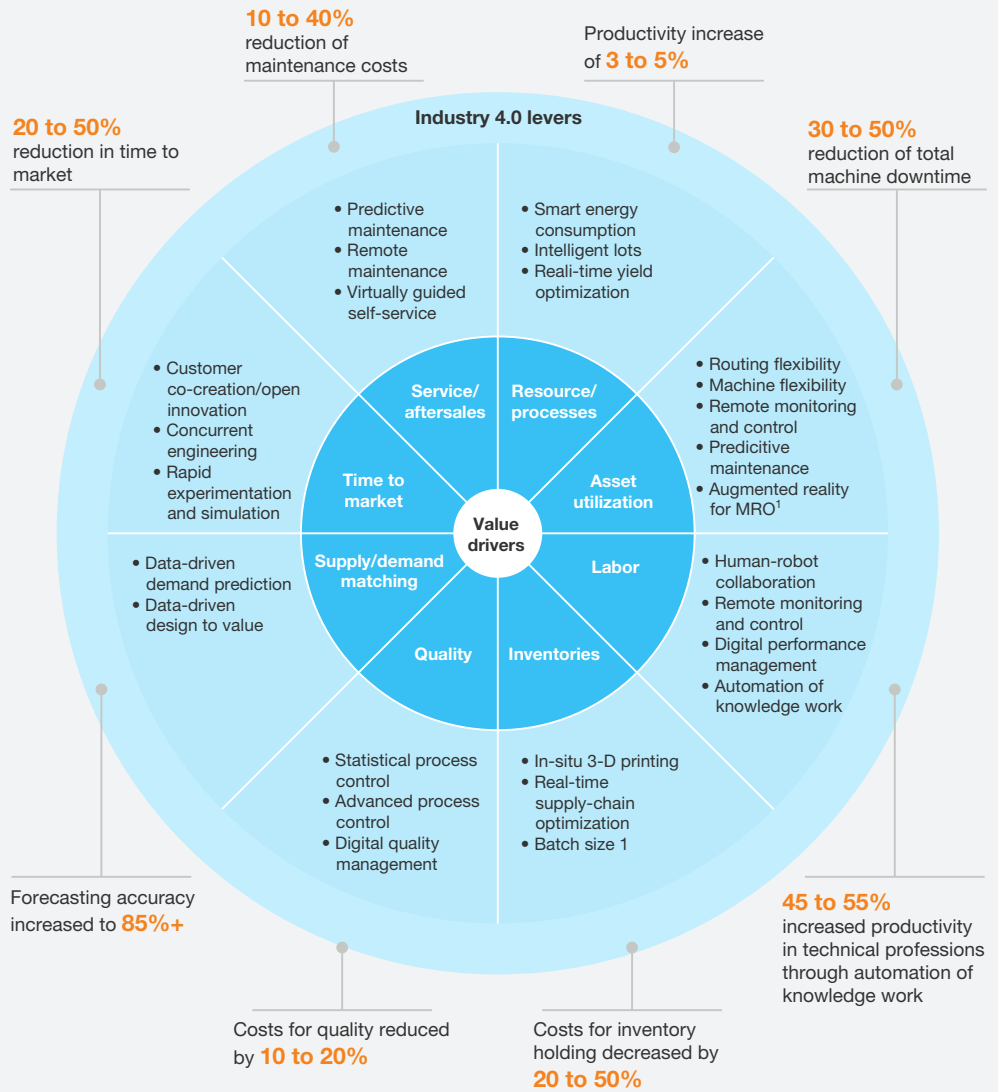
Put concretely, what does digital bring in terms of performance jump across functions? Let's start by looking at operations, where our experts have recently shown that the impact potential is significant across all functions (Exhibit 1).

And this is not science fiction! Pockets of excellence exist across industrial sectors that have proven it can be done (see also Sidebar 1, "Complex operations' optimization"):

- In the oil and gas industry, predictive maintenance is eradicating unplanned downtime and costly repairs. Connected plants use remote sensors to forecast and report on the condition

Exhibit 1

The McKinsey Digital Compass maps Industry 4.0 levers to the 8 main value drivers.



¹Maintenance, repair, and operations.

Source: "Industry 4.0: How to navigate digitization of the manufacturing sector," McKinsey Digital, 2015
McKinsey&Company

and performance of machinery. Early signs of problems are detected and corrected, maintenance resources are directed at the areas of greatest need, and machinery availability is maximized.

- The pulp and paper industry has seen significant increases in productivity through the use of remote temperature monitoring. Kiln sensors monitor lime mud temperature, a leading indicator of calcination. Sophisticated tools aggregate and analyze the temperature readings and automatically optimize the shape and intensity of the flame driving heat through the kiln. The process has resulted in fuel savings as high as 6 percent and a lime throughput increase of 16 percent.
- In manufacturing, repetitive, strenuous, and complex tasks are performed by robots working alongside operators on the shop floor. The operators themselves spend less time waiting for goods or processes or filling in routine documentation, because information systems optimize materials flows and track key performance indicators. Real-time analytics and advanced process control enable errors and quality lapses to be picked up immediately, minimizing rework and scrap, and automated inventory systems—such as wireless-connected boxes with cameras that automatically reorder when their fill level drops below a certain limit—ensure that inventories are accurate, goods can be easily located, and safety stocks are adequate but not excessive (Exhibit 2).

Complex operations' optimization

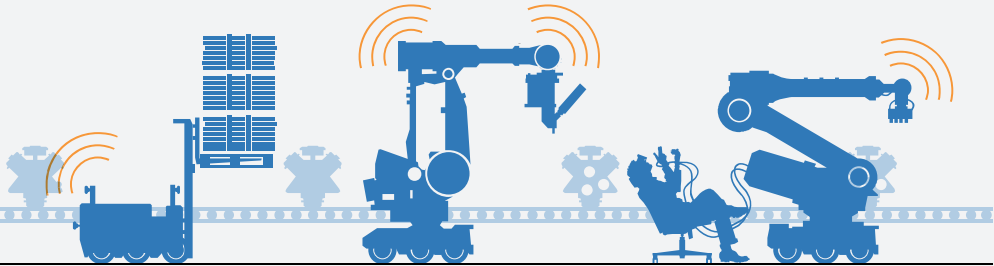
Advanced modeling techniques for optimizing complex manufacturing sites and supply chains

Working with a basic-chemicals manufacturer with complex operations, we designed an end-to-end advanced model that generates a holistic optimization of the entire supply chain from procurement to commercial. By incorporating detailed price and cost curves into this model and leveraging the latest advanced optimization engines, we developed a systematic optimization tool that was embedded into the company business process.

The company saw a recurring EBITDA margin increase of roughly 5 percent, equal to approximately 6 percent of overall manufacturing, logistic, and raw-material costs. Application of these techniques on more than ten other cases in the process industry suggests a recurring EBITDA margin increase in the range of two to five percentage points, with value creation being proportional to supply-chain complexity.

Exhibit 2

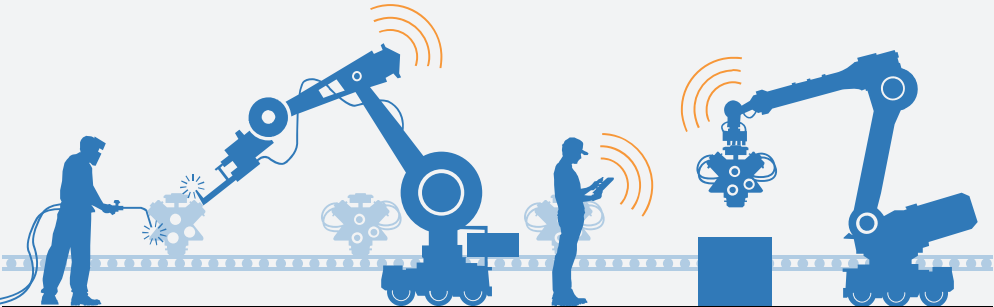
Smart automated plant illustration



1. Full process and end-to-end material-flows automation

2. Data collection across the supply chain; full M2M and M2Cloud communication

3. Called by the machines, maintenance uses augmented reality tools



4. Operators working safely with robots on the shop floor

5. Real-time monitoring and adjustment of all plant operations



6. Remote controlling and management based on full visibility of operations



7. Finished products going to the mass market, semi-finished going to a customer-centric plant

Source: "Industry 4.0: How to navigate digitization of the manufacturing sector," McKinsey Digital, 2015
McKinsey&Company

Let's not forget the customer: digital has the potential to profoundly reshape the way industrial companies interact with and serve their customers. Let's have a closer look:

- Where customer access was once constrained by minimum order sizes and the cost to serve in a particular market, e-commerce and web shops allow companies to reach customers they could never have reached before; hence cost to serve can be cut by 50 to 70 percent. Online marketplaces such as Amazon Business and Alibaba virtually connect unlimited buyers and sellers, and established players like Grainger are leading the way with their own platforms, capitalizing on 2015's estimated \$1 trillion in B2B digital commerce sales in the United States.
- Suppliers who once relied on subjective analysis and historical knowledge to determine prices can now use faster, data-driven tools to optimize pricing. For example, a leading technical gases company with a large and highly fragmented product portfolio used advanced data analytics and modeling to design a more strategic and logical approach to pricing. The newly developed value-based pricing led to an increased return on sales of 5 percentage points (see Sidebar 2, "Pricing"). Emerging markets can tap the potential of digital in the food chain through innovations such as precision agriculture, supply-chain efficiencies, and agriculture-focused payment systems.
- Sales directors can make smarter resource-allocation decisions based on timely inputs from sales reps, individual performance data, and automated recommendations from tools. Reps making sales recommendations no longer have to rely on hunches about what their customers want, but instead make use of targeted insights about products to sell, customers' success stories, and simulations run with the customer during the sales visit. The ability to attract new customers, improve cross-selling, and reduce leakage can increase revenues by 5 to 15 percent, while customer satisfaction can be increased by 20 to 30 percent.

Digital's disruptive power

But digital is not only a means to optimize a company's existing operations. It also gives both attackers and incumbents the power to disrupt value chains, enter new sectors, and create innovative business models. Established companies face threats from new competitors like Amazon Business, which offers millions of products, from automotive components, industrial lifts, and ramps to lab products, protective gear, and electrical equipment.

To get ahead of threats like this, industrial companies can use digital to transform and extend their own business models before change is imposed on them by attackers reshaping

Pricing

Impact of value-based pricing

For a leading technical-gases client with a large and highly fragmented product portfolio, we deployed an innovative B2B value-based pricing approach to replace its existing method of setting prices according to customer size. We scanned the entire portfolio of more than 450 SKUs and over 1,300,000 transactions using a value-based pricing tool that sets

price bands. We also performed a risk assessment for 183,000 product-customer combinations. With this more data-driven strategy, we reset 100,000 product-customer prices, covering 150 SKUs and addressing 92 percent of sales. As a result, the client saw an increased return on sales of five percentage points.

their industry. Some incumbents are joining digital platforms and B2B marketplaces to aggregate demand and sell direct to end users. BASF, for example, was the first chemicals company to sell products online through Alibaba. Other businesses, such as the 3-D printing start-up Sculpteo, are selling services rather than products. Still others are offering their manufacturing capacity as a service to third parties.

But are companies ready?

Compelling though the opportunities are, our analysis indicates that industrial sectors in general are lagging behind other sectors in terms of digitization: the MGI Industry Digitization Index¹ shows that while advanced manufacturing and the oil and gas sectors have already gone some way in their digitization journeys, basic goods manufacturing and chemicals and pharmaceuticals are still in the early stages.²

Moreover, the McKinsey Industry 4.0 survey of more than 300 manufacturing experts in Germany, Japan, and the United States from January 2016 shows that only 16 percent of manufacturers have an overall Industry 4.0 strategy in place, and just 24 percent have assigned clear responsibilities to implement it.

¹ "Digital Europe: Pushing the frontier, capturing the benefits," McKinsey Global Institute, June 2016; "Digital America: A tale of the haves and have-mores," McKinsey Global Institute, December 2015.

² "Industry 4.0 after the initial hype: Where manufacturers are finding value and how they can best capture it," Digital McKinsey, April 2016.

Five ways to win

Companies that want to get ahead of the digital pack would be wise to take five key steps:

- **Prioritize and scale up.** Use structural assessments to determine the customer appetite versus willingness to pay by using mockups to conduct interviews with potential customers and external experts. In addition, weigh the potential impact against the ease of implementation by assessing the degree of innovation or disruption (Is it a substitute? an extension? a breakthrough?), defining the scalability, studying the feasibility of the pilot and full solution, and ascertaining the fit with existing assets and capabilities.
- **Adopt a test-and-learn approach.** As technology-driven change accelerates, forecasting and planning are becoming less relevant and reliable. Agility—remaining open to learning and experimentation—is key. And it is crucial when investing in digital solutions to adopt the mind-set of a venture capitalist. This includes trying out ideas quickly with target customers as soon as they exist to check market interest and price points. It also means being ruthless: if the idea isn't worth it, kill it immediately. In addition, successful ventures think about monetization potential as soon as interactions with potential customers start, and they proudly copy from other sectors. A focus on scale is also essential, with the ambition being a tenfold increase.
- **Put foundations in place.** To maintain the efficiency and stability of existing operations while providing the processing capacity and speed required by new data-driven activities, smart companies move to a two-speed IT infrastructure—overlaying a fast, next-generation cloud-based IT system on their secure, robust, resilient legacy systems. New talent is another priority, especially data and process experts who can connect up various functions, systems, and levels of management; draw insights from all the information generated across the enterprise; and use their knowledge of the whole production chain to help design new products. Meanwhile, job profiles must be rethought to meet new needs, such as maintenance staff who oversee predictive maintenance rather than acting as troubleshooters, and quality specialists who intercept quality issues online rather than detecting faulty parts after production (Exhibit 3).
- **Treat data as a competitive advantage.** Data fuels the algorithms that provide insights into markets, customers, and business processes, so ensure that data management has a clear structure and governance. And considering that even tech giants such as Google have been vulnerable to malicious attacks, be sure to put cybersecurity high on your management agenda. Physical targets such as connected machinery and systems installed for remote access could also be highly susceptible to sabotage by hackers and other attacks.

Exhibit 3

Example of required shift in job profiles for connected factory

	From...	...To
Worker (production)	Carries out production tasks, large share of manual tasks	Exception handler in production line, operator in automated environment
Maintenance expert	Troubleshooter and exception handler	Overseer of predictive maintenance, planning and steering based on data-driven analysis
Quality specialist	Inspects parts and controls quality standards after the fact	Smart engineering of process to online control for quality issues
Production planner	Top-down planning and steering of linear processes (50 percent build-to-stock)	Supply-chain planner <ul style="list-style-type: none"> • Develops flexible self-steering value stream (100 percent build-to-order) • Becomes a planner on a fully integrated supply chain from order to delivery
Logistics planner	Plans supply in segmented approach (inbound, line delivery, outbound)	
Team leader	Focus on leading people based on visible waste on shop floor	Leads team based on identified digital waste, brings insights to action

McKinsey&Company | Source:McKinsey analysis

- **Work across functions, and manage change in the organization.** Digitization requires that all departments work together to capture joint benefits for the whole business. Moreover, because these innovations have a major impact on how people work, it is essential to anticipate concerns and build a persuasive case for the employees. When thinking about digital priorities, identify the technologies and applications that would have the greatest potential impact. But also make sure not to ignore possible barriers to adoption: devise a plan for helping employees use the new technologies and the related new methodologies most effectively. Remember that no organization achieves a successful digital transformation without taking a thoughtful approach to change management, and that it's the people applying the technology in their daily jobs who will create the additional value.



Digital's potential in industry is massive, not only in operations, but across all functions of the sector, and the levers that make the most difference to a company's bottom line vary—from e-commerce to automation to advanced analytics. But industrial companies must begin

taking advantage of digital opportunities in order to avoid losing the value to others. A commitment to digitization from top management is critical to succeeding, as is a systematic method of defining priorities and the ability to leverage early success to drive change. □

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