

Andreas Behrendt,
Nicolai Müller,
Peter Odenwälder,
and Christoph Schmitz

Industry 4.0 demystified—lean's next level

Operations March 2017

Amid digital disruption, five principles can help companies find tangible value in Industry 4.0 solutions.

For years, companies have pursued lean manufacturing principles and the productivity improvements they promise. Yet now that lean methods are truly ingrained in the DNA of many businesses, classical lean tools are losing some of their edge. The very success of these approaches means that further improvements are increasingly marginal and tougher to achieve. At the same time, staying profitable and competitive in today's global business environment requires continuous improvement in productivity, quality, agility, and service levels—and this pressure will never go away.

Companies in this bind may find comfort in the ubiquitous promise that "Industry 4.0" will soon bring sweeping change to industries worldwide—but may also be encouraged to simply wait and see. We believe, however, that Industry 4.0 will be less a revolution than a valuable (and welcome) evolution, making next-horizon productivity gains possible and mirroring developments that have unfolded in the manufacturing environment for more than a century.

Proven principles of lean—such as reducing waste in the form of machine breakdowns or non-value-adding activities—will remain fundamental. At the same time, advancements in data collection, sensors, robotics and automation, new technologies (including 3-D printing), and increased computing power will enable advanced analytics and give established methods a new edge.

Organizations will use these reinvigorated lean methods to implement a new way of working for three dimensions that have long been recognized as pivotal: technical systems (processes and tools), management systems (organization and performance management), and people systems (capabilities, mind-sets, and behavior). In addition, a new dimension concerned with data, IT, and connectivity will emerge as another core value driver.

In other words, Industry 4.0 can be understood as digitally enabled lean. For example, companies have long optimized yield, energy, and throughput by improving process steering. Now new sensors, more data, and advanced analytics can boost the ability to solve problems and identify sophisticated improvement measures, resulting in smarter solutions and new productivity gains. These advances can be complemented with digitally enabled transparency regarding performance. Take the case of performance management on the shop floor. At a typical plant today, performance management happens more or less after the fact, when performance is checked at the end of the shift. In a digital world, performance deviations

can be monitored in real time and addressed immediately. However, implementing the newly identified measures requires organizational transformation—new ways of working, new approaches to performance management, and new capabilities. All of these changes will bolster the pathway to the real revolution: creating self-optimizing assets that do not require operator interventions.

Beyond Industry 4.0 hype: Five core principles for creating value at lean's next level

Based on our experience working with clients on digital and Industry 4.0 transformations, we have identified five principles that can help companies successfully convert Industry 4.0 solutions into real value and bottom-line impact.

Industry 4.0 is the source of the next horizon of productivity gains

As cost pressure across all industries continually increases, companies face the need to improve productivity by two to four percentage points every year. Our estimates, based on numerous studies, show that digitally enabled advancements are unleashing the potential to create value equivalent to efficiency improvements of 15 to 20 percent. This productivity leap will not come from the application of a single solution. To generate meaningful impact, companies will have to address all elements of profit and loss while also applying a broad range of solutions at scale. For example, a reduction of total machine downtime by 30 to 50 percent—a feat possible with predictive maintenance or remote monitoring—will greatly increase asset utilization. Labor efficiency is another area with high potential. Digital performance management combined with advanced robotics and automated guided vehicles can further automate manual work (for example, in picking and in-plant transportation) and has the potential to improve labor productivity by an additional 40 to 50 percent. Advanced analysis of granular data on machining processes, generated in real time, will be fundamental to identifying and addressing the underlying causes of process inefficiencies and problems with quality—faster and more effectively. Furthermore, forecasting processes that draw heavily on big data already can drastically reduce inventories and improve service levels today.

Industry 4.0 is a topic for the business, not just the IT department

IT enables Industry 4.0 but should not drive implementation. Companies tend to start by considering how to apply the new approaches to their IT systems. They should focus instead on how they will conduct their business in the future, thinking through changes from a value-chain and business-case standpoint. For example, one global sportswear company is working to bring its shoe manufacturing closer to the customer. This move changes the traditional long cycle of production in low-cost countries and subsequent shipping to stores. As inexpensive, faster, and more flexible robots become available, manufacturing of products such as shoes and clothing can be located near customers—even in high-cost locations such as Germany. In short, time to market, delivery time, freight costs, and customer focus (based on personalization) dramatically improve when taking advantage of the new opportunities provided by digitization.

Industry 4.0 efforts need to be led by top management—they cannot be delegated

Few companies are taking a structured approach to implementing Industry 4.0 levers. According to McKinsey research, only 16 percent have a clear strategy in place, and only 24 percent have assigned clear responsibilities regarding Industry 4.0 efforts. Even companies in this select group tend to make one of two missteps: either they assign Industry 4.0 responsibility to a staff function with no direct execution power, or they place the required responsibility far too low in the management hierarchy.

In either case, realizing full impact potential is jeopardized. Ultimately, embarking on the Industry 4.0 journey means taking a risk—and risk taking cannot be delegated. Top management must therefore take ownership and apply a programmatic approach in order to drive value quickly and effectively. This high level of prioritization helps determine the success of an Industry 4.0 transformation, just as it did for lean.

Both technology and people are critical, as they were for classic lean approaches

Technological solutions, such as those including robots or advanced-analytics algorithms, are easy to access and install; in fact, such tools are already commodities in many situations. However, it takes a combination of technology and the corresponding domain knowledge (in value chains, maintenance, or process modeling, for example) to produce actions that deliver value. What's more, implementing these actions typically requires redesigned work processes and new capabilities, both of which necessitate organizational transformation. Company leaders must lay out a strategy in advance to build or buy the capabilities they will need or to partner with organizations that can provide the capabilities.

Industry 4.0 requires transformational and holistic thinking

Successful lean transformations do not focus on improving the maintenance process alone but consider the production site as a whole. Work toward Industry 4.0 requires a similarly broad approach. In this case, companies will need to address the entire value chain, apply a full set of levers or solutions, and have a clear plan for scaling up new approaches across their entire network. (For more on how companies can get going, see sidebar, “Three steps to get started.”)

Three steps to get started

Companies that are just setting out can begin with a few steps:

- Assess the opportunity with an Industry 4.0 diagnostic, identify the capabilities required, and
- Launch flagship pilots and learn while doing; don't spend time analyzing everything in advance.
- Support efforts through the creation of new mind-sets and behaviors—for example, by explaining why change is needed and generating excitement instead of fear.

Prerequisites for success at lean's next level: Priorities, capabilities, and mind-sets

In addition to the five principles just described, companies looking to achieve the next level of lean should keep in mind several guidelines:

- **Clear priorities, small steps.** Instead of spending time on extensive analysis and planning, start with the digital steps that deliver the most impact in your situation, and learn as you go.
- **Capabilities.** Most companies are eager to fast-track their development by implementing digital technologies on the shop floor but feel unprepared for the change. This concern is certainly justified, since digital—like lean before it—requires new capabilities. Companies can, however, turn to specialized capability centers or join forces with software or solution providers.
- **Mind-sets and behaviors.** Experience over the past several decades has shown that a transformation fails or succeeds due to the mind-sets and behaviors of leaders and employees. For this reason, a digital mind-set needs to permeate the entire organization, with people embracing digital lean approaches and tools, just as they did with their analog predecessors.



A successful digital evolution requires a thorough understanding of the specific starting point at each individual company, manufacturing site, or even department in order to identify and prioritize digital opportunities that add value. Companies can conduct on-the-spot diagnostics by asking themselves how well they utilize digitally enabled lean levers, and what specific improvement potential they might target. Assessing this starting point provides organizations with the basis for laying out a path to digitally enabled lean—the next level in value creation. □

Andreas Behrendt is a partner in McKinsey's Cologne office, where **Nicolai Müller** is a senior partner; **Peter Odenwälder** is an associate partner in the Hamburg office; and **Christoph Schmitz** is a senior partner in the Frankfurt office.

The authors wish to thank Simeon Mußler for his contributions to this article.