

DIGITAL LEAN: A GUIDE TO MANUFACTURING EXCELLENCE

Companies can achieve new levels of performance and efficiency, on the shop floor and beyond.

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EXECUTIVE SUMMARY

Across all industries, COOs and operations leaders face tremendous pressure to embrace new digital technologies. Business publications are nearly bursting with stories touting the promise of “Industry 4.0” and “industrial IoT,” not to mention continually evolving combinations of virtual/augmented/mixed reality and a host of supporting digital technologies.

In fact, the hype is so extreme that an executive might wonder whether the skills and expertise they’ve acquired over many years remain relevant. Are we about to enter an era in which a completely new approach to operations management is required, making everything that came before it obsolete?

Not quite. This new age of automation is, to be sure, ushering in a veritable tsunami of new possibilities. But the knowledge and experience you’ve acquired and applied to your company’s operations remain both valid and invaluable. Indeed, digital becomes even more powerful when it’s leveraged by leaders who understand the many complex factors that contribute to operations excellence.

That said, even the most knowledgeable executives can’t be complacent. Four major technology trends are redefining the sources of competitive advantage, while three digital enablers are amplifying the benefits of lean manufacturing. Take a few minutes to understand these trends and enablers and you’ll be better positioned to help your company chart a clear and confident path to “digital lean.”

It will be time well spent: Bain finds that while traditional lean typically produces a 15% reduction to key operations costs, digital lean adds a 100% improvement on top of that, for a 30% cost reduction.

This playbook will explain how to layer digital lean onto your traditional lean initiatives, so that you can move confidently and systematically into a new era of efficiency that will enhance your company’s growth.

FOUR TECHNOLOGIES TRANSFORMING MANUFACTURING

The movement toward digital lean is built on a technological foundation of key capabilities that continue to evolve and redefine how work gets done.

Big data: Ninety percent of the world’s data was created in the last two years, a trend that extends onto the shop floor. Big data not only gives managers a real-time view of the “life” of the plant (production, processes and equipment), it also opens up new opportunities in asset management, end-to-end supply chain visibility and planning, and many other aspects of manufacturing. Proficiency in advanced data

analytics and modeling is now mandatory, both to master increased complexity and as a response to competitive pressures.

Robotics: Robots continue to expand, both in terms of their capabilities and their presence. Over the next three years, more than 1.7 million will be installed worldwide. Most of them will be *cobots*—collaborative robots specifically designed to interact and work side by side with humans in a safer and smarter way than traditional forms of automation, or previous generations of robots. The economics are hard to ignore; while labor costs have been steadily rising, robot prices have fallen by half over the past 30 years.

Analytics: “Flexibility” is the dominant mantra for COOs today, as they struggle to anticipate market needs, quickly adjust output and produce multiple products on a single line. Those capabilities require real-time production monitoring and planning, with analytics software playing a critical role. Analytics also facilitates accelerated make-to-order manufacturing processes and nearly all other components of the manufacturing life cycle, and should therefore be deeply integrated with your other digital platforms, particularly manufacturing execution systems.

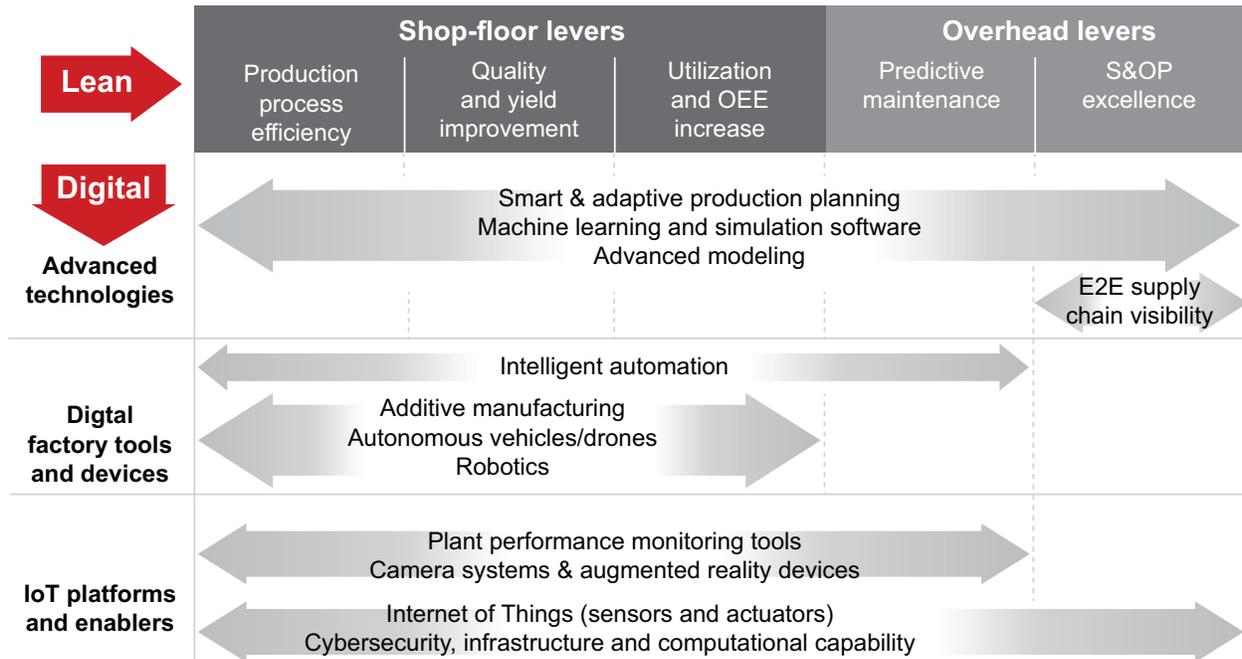
Internet of Things (IoT): The sensors and actuators at the heart of IoT are now a standard component of predictive maintenance and warehouse management, but their capabilities continue to evolve. Indeed, IoT-enabled equipment can now perform self-maintenance and automatically alert managers to problems, making maintenance activities quicker, cheaper and more effective. In the warehouse, radio-frequency identification (RFID) tags provide managers with precise real-time location and material status data, while hands-free wearables allow workers far more mobility, since they aren’t constrained by fixed workstations.

FROM TRADITIONAL LEAN TO DIGITAL LEAN

Bain has an impressive track record in helping manufacturing companies successfully implement lean methodologies, particularly for overhead and shop-floor activities. Working with companies in aerospace and defense, automotive, pulp and paper, transportation, machinery and appliances, and consumer products we have shared our expertise in value stream mapping, 5S workspace design, overall equipment effectiveness (OEE), and full potential, helping clients greatly improve operational efficiency and generate more value.

Bain provides a rich lean improvement toolkit that encompasses shop-floor and overhead levers (including production process efficiency, quality and yield improvement, predictive maintenance and more), improvement tools (appropriate KPIs, CIP/Kaizen and Six Sigma teams) and robust training, change management and performance capabilities (*see Figure 1*).

By layering our expertise in digital lean into this mix of well-established capabilities, companies can often double the benefits achieved by traditional lean approaches pursued in standalone fashion.

Figure 1: Digital lean tools at a glance

Source: Bain & Company

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Our approach to digital lean incorporates three powerful enablers:

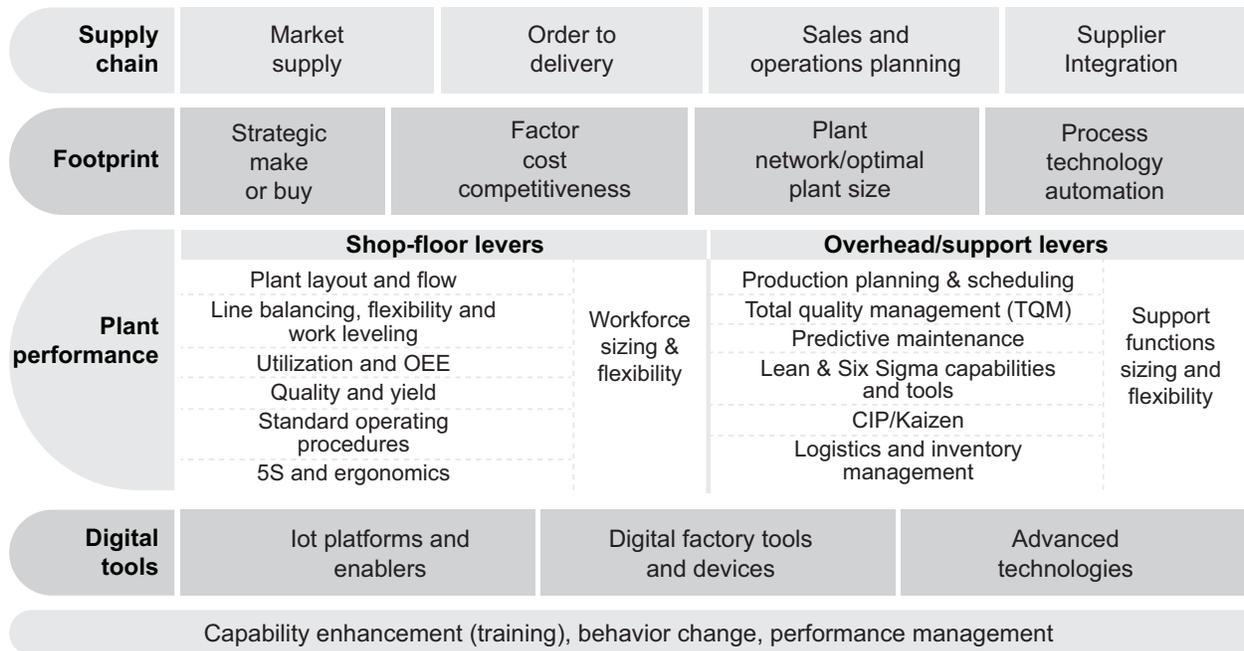
- **IoT platforms and enablers**, including plant performance monitoring tools, camera systems and augmented reality devices, cybersecurity, sensors and actuators, and more. Installed on production equipment and other assets, sensors and actuators generate real-time data on usage, maintenance history, technical condition and any other factors that may affect performance. This data supports predictive insights and root-cause analysis, helping companies spot potential breakdowns in advance, which minimizes downtime. Sensors can also monitor workforce presence on production lines, while cameras enhance quality control by detecting defects and alerting inspectors. Given that only 25% of all inspections are truly necessary, potential savings in this single application of digital are significant.
- **Digital Factory tools and devices**, including robotics, intelligent automation, autonomous vehicles/drones, and additive manufacturing. Robotics and automation are redefining how work gets done

inside plants, but can be challenging to manage well. As industrial robots progressively outperform humans in a range of activities, they facilitate standardization and higher productivity, as well as improved economics. Quality control and the ability to customize products also improve. Bain’s close partnership with Bosch enables us to offer cutting-edge digital and automation solutions combined with industrial, organizational and financial expertise.

- **Advanced technologies**, including smart and adaptive production planning, machine learning and simulation software, end-to-end supply chain visibility and advanced modeling. Traditional lean has been constrained by a shop-floor focus that limits the testing of other hypotheses or scenarios, and by lack of end-to-end visibility into the entire operations footprint. In contrast, digital lean technologies can integrate data cross the value chain and employ analytics to customize production schedules and production inputs ranging from materials and inventory management to procurement, activities scheduling and production phases.

Some of these enablers apply specifically to the shop floor, while others span the shop floor and overhead, either partly or completely (see Figure 2). Together they comprise a dozen distinct digital technologies that can transform lean manufacturing into digital lean, generating substantial gains that we’ll explore in more detail.

Figure 2: How digital capabilities provide a foundation for manufacturing excellence



Source: Bain & Company

DIGITAL LEAN: AN ACCELERATED PLAN TO SUSTAINABLE RESULTS

Now that you see how those three enabling technologies can have a profound impact on your operational efficiency, you need a plan to get there. Bain's approach begins with our proprietary Accelerated Plant Diagnostic, which establishes a specific improvement roadmap for each of the aforementioned levers (see Figure 3). This first stage in your digital lean journey will run five to eight weeks, depending on the size and scope of your plant(s) and on which levers are most relevant to your industry and competitive position.

The first stage in the diagnostic typically runs one to two weeks, and focuses on pre-visit preparation and an outside-in analysis. The goal is to develop hypotheses for initial improvements and identify areas for on-site assessment, which will help determine which initiatives (digital and traditional lean) are most worth exploring.

Figure 3: A digital lean action plan and timeline

Accelerated Plant Diagnostic – high level activities

Preliminary strategy design <ul style="list-style-type: none"> ▶ Pre-visit preparation to gather and analyze plant info ▶ Traditional and digital lean strategy outline ▶ Focus areas for on-site assessment 	Full-potential assessment <ul style="list-style-type: none"> ▶ On-site plant assessment ▶ Performance diagnostic ▶ Initiatives fit assessment ▶ Lean and step-change technology full-potential estimation 	Digital lean business cases development <ul style="list-style-type: none"> ▶ Initiatives' economic impact assessment and quick impact opportunities prioritization ▶ Detailed business cases ▶ Digital incremental impact assessment ▶ Risk-mitigation plan 	Implementation <ul style="list-style-type: none"> ▶ Quick wins launch; results tracking and sizing ▶ Capability enhancement and training ▶ Pilot projects roadmap ▶ Scale-up plan
1–2 weeks	1–2 weeks	2–3 weeks	Varies

Source: Bain & Company

The second stage also runs one to two weeks and is dedicated to a deep on-site plant assessment, which enables us to work with you to develop a detailed roadmap for improvement opportunities. During this stage we focus both on immediate step-change improvements as well as a longer-term strategy for achieving your full potential.

In the third stage, which spans two to three weeks, we work with you to develop a digital lean business case that maps all the steps needed for a plant to reach its full potential. During this stage, previously identified digital and traditional lean initiatives are carefully assessed in terms of risks, fit with the operating model, investments needed and other criteria. The goal is to develop a comprehensive plan that integrates the right combination of traditional and lean initiatives to organically improve shop-floor operations.

Finally, during the fourth stage, we address post-assessment scoping, to determine both the near-term impact of digital lean and a plan for scaling and launching quick wins. This phase is usually followed by a variable implementation period during which the full-potential program is deployed. During this phase we typically launch Bain Accelerated Transformation, which is designed to achieve results within a short timeframe. Throughout this program we work closely with you on operational efficiency, cost-saving and full-potential targets.

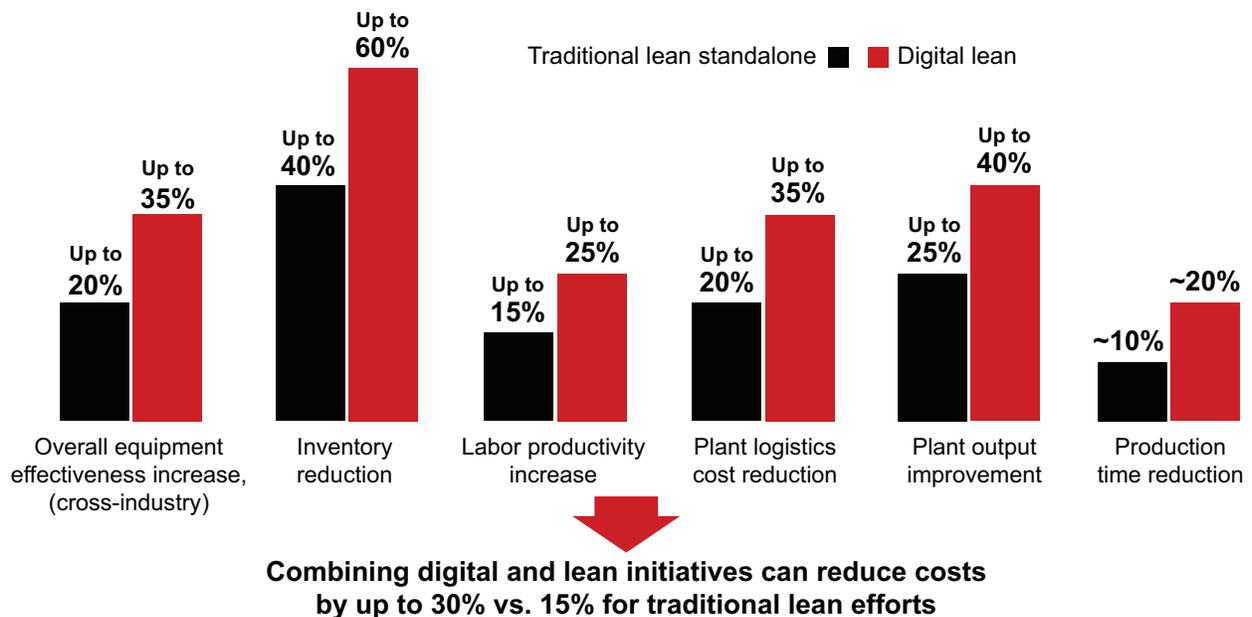
RESULTS

Digital alone is not a magic bullet. Nor is it a replacement for traditional lean. The key to driving down shop-floor costs while increasing performance is to find the right combination of digital *and* traditional lean, one that fits with your current situation and desired end state.

When you work with Bain to take advantage of both traditional and digital lean processes and technologies, you can expect strong results across every facet of operations (*see Figure 4*). Our methods are designed to improve end-to-end operations efficiency, quality and delivery performance, and achieve meaningful cost reductions in labor, materials and overhead. Bain digital lean also delivers improved OEE, capex and net working capital, and boosts supply chain performance.

Because digital lean amplifies the impact traditional lean and broader digitalization efforts, it yields a greater benefit than the sum of its parts.

That's not to say that every company should therefore pursue digital lean. There will be cases in which the level of investment required combined with an evaluation of operational and financial risks and a careful footprint assessment reveal that a standalone initiative is the more preferable solution. We will work closely with you to determine when and where digital lean makes sense, and when the wiser course is to pursue a different path to operational improvement.

Figure 4: Digital lean amplifies traditional lean benefits**A digital lean approach can double the savings of traditional lean efforts**

Source: Bain & Company

Whichever path you choose, Bain is committed to making sure that the results you achieve are sustained over the long term. So we work closely with you to build your internal capabilities, offering expert guidance on change management, employee training and other forms of support.

And if, as is often the case, your digital lean initiative would be aided by sourcing the skills of external partners in analytics and other disciplines, we can help you identify the best third-party talent available, and integrate their capabilities with your own.

Digital lean is, without question, the way of the future. And much of it is here today. If you've hesitated to pursue its many advantages for fear that the cost and complexity won't yield the desired ROI, or that digitalization is evolving so quickly that the risk of making the wrong choices is too great, talk to us. We have helped companies across many industries and geographies take their traditional lean manufacturing platforms and processes into the digital future, achieving impressive results. Our battle-tested methodology is not a one-size-fits-all solution, but is carefully tailored to meet your company's needs. And it's designed to reap benefits very quickly, as you build out the capabilities you'll need to win well into the future.

Shared Ambition, True Results

Bain & Company is the management consulting firm that the world's business leaders come to when they want results.

Bain advises clients on strategy, operations, technology, organization, private equity and mergers and acquisitions. We develop practical, customized insights that clients act on and transfer skills that make change stick. Founded in 1973, Bain has 57 offices in 36 countries, and our deep expertise and client roster cross every industry and economic sector. Our clients have outperformed the stock market 4 to 1.

What sets us apart

We believe a consulting firm should be more than an adviser. So we put ourselves in our clients' shoes, selling outcomes, not projects. We align our incentives with our clients' by linking our fees to their results and collaborate to unlock the full potential of their business. Our Results Delivery® process builds our clients' capabilities, and our True North values mean we do the right thing for our clients, people and communities—always.



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