

WHITEPAPER

Amplify Lean performance gains with digital Lean management

Leveraging digital technologies to empower people with information, new insights, and collaboration tools accelerates the gains of Lean management and continuous improvement practices.

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Executive Summary

In a digitally changing world, manufacturers must systematically improve the effectiveness and flexibility of their operations to maintain or elevate their competitiveness. Lean management is a proven practice to establish a continuous improvement culture and drive organizations towards higher operational performance.

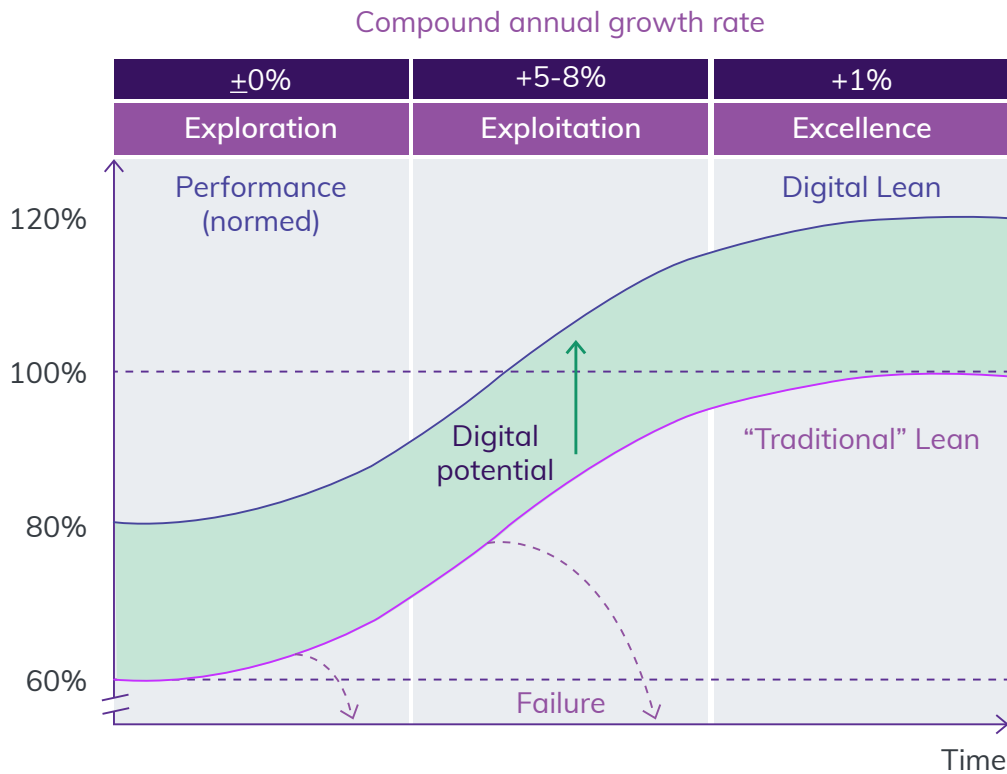
Today's emerging technologies offer to digitize Lean practices and empower employees with a new level of actionable, relevant information and workforce engagement to continuously improve effectiveness and productivity. This whitepaper discusses how digitalizing Lean practices through Industry 4.0 concepts helps drive operational performance in manufacturing, accelerating the performance gains and cost savings compared to traditional Lean management initiatives.

Digital Lean management offers faster and greater performance improvements

Companies that have adopted Lean management as part of their culture to continuously improve manufacturing and business performance have set themselves apart from their competition with world-class performance and operational excellence. Today's emerging digital technologies elevate these benchmarks.

According to the consulting company Arthur D. Little, digital Lean management unlocks significant additional performance growth rate potential. It offers additional improvement potential for Lean excellence companies, but significantly accelerates the time-to-value and savings potential for companies aiming to catch up through the adoption of Lean management principles and methodologies today.

Performance growth rates along the Lean lifecycle



Source: Athur D. Little, digital Lean management viewpoint¹

What is digital Lean management in manufacturing?

Manufacturers are constantly challenged to lower costs, improve productivity, and increase their manufacturing flexibility while securing product quality and customer satisfaction.

This challenge has been addressed through both automation and digitalization of business and manufacturing processes, and by applying continuous improvement and operational excellence practices such as Lean Manufacturing and Six Sigma.

Where process automation targets improving the speed and enforcing repeatability of processes for higher throughput performance and consistent quality, Lean management principles focus on process simplification and responsible, knowledgeable employees as the keys to continuous improvement.

Lean management aims for the systematic elimination of non-value-added activities and reduction of unnecessary seven (or eight) forms of lean “waste” to reduce the costs, time, and resources to satisfy customer demand while maximizing value to the customer.

Digital Lean uses digital technologies for increasing the effectiveness and efficiency of Lean management principles and methods. Moving Lean into a digital format creates a focus on empowering workers and manufacturing stakeholders with information and data in context, for better situational and systematic problem-solving.

Today’s technologies are defining a digital transformation towards Industry 4.0 or Smart Manufacturing architectures for new ways of working and new interoperability between machines, systems, and people.

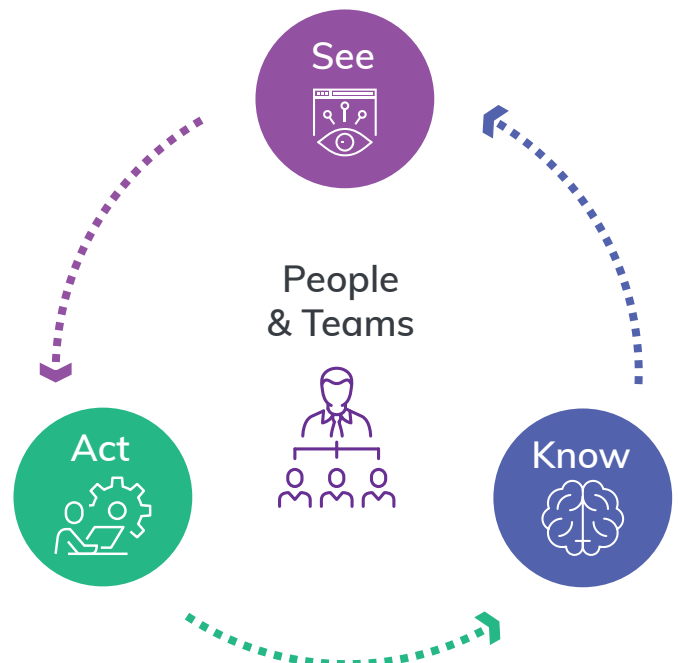
The digital transformation of processes and services is happening at the business level through the deployment and evolution of ERP systems, but has often stopped or slowed down at the gates of manufacturing plants. Manual, process-oriented plants, labor-intensive production plants, and many automated manufacturing plants still maintain traditional, paper-based work management and reporting practices.

This digital gap reflects the potential to either increase existing Lean manufacturing gains or creates a large opportunity to elevate operational efficiency for companies looking to invest in adopting Lean manufacturing and operational excellence practices.

Manufacturers will find support in industrial technology and software platform vendors with commercial offerings and services. Industrial platforms and applications have captured and digitalized industry-standard Lean management practices such as calculating and visualizing operational KPIs (OEE/OLE), root cause analyses, and data-driven continuous improvement. Today’s technologies and applications facilitating Lean manufacturing, combined with professional, experienced services, allow for rapid, cost-effective adoption of proven Lean and continuous improvement practices without companies having to be Lean experts.

The benefits of digitizing Lean and manufacturing operations management practices

In many manufacturing plants, paper or Excel sheets still seem to play an important role for managing work through the distribution of paper prints with work schedules, providing work instructions and reporting work completed.



Moving to a paperless manufacturing environment offers more than just eliminating time-consuming, labor-intensive and error-prone paper-based systems with a digital equivalent. Replacing paper forms with an intuitive digital user interface can help make reporting production results and events more efficient and less time consuming. Even more importantly, it makes all entered data instantly available for calculating and displaying performance metrics or for sending notifications of detected production issues.

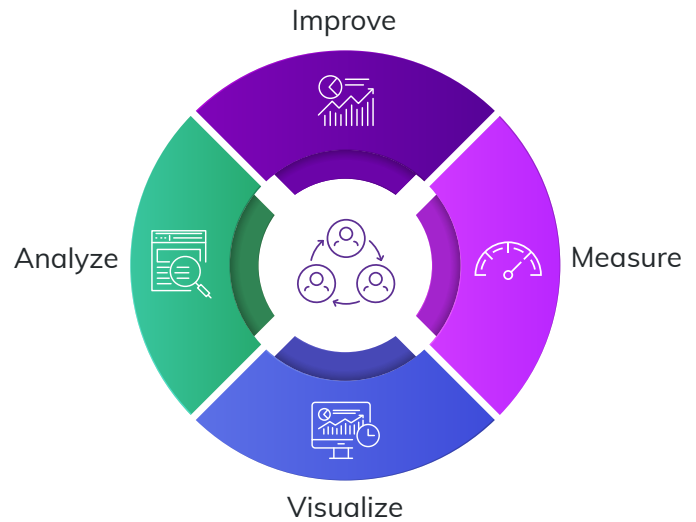
In a paperless manufacturing environment, the push of a button on a screen connected to an automation system will fetch a realistic lineup of work at each workstation or send alerts on problems as they occur.

Near real-time visibility of operational performances vs. plan and general visibility of current production issues enable better decision-making and problem-solving. This visibility across the value chain promotes team collaboration, minimizing the impact and waste of unplanned events and providing a new understanding and intelligence to maximize operational efficiency.

Managing all production data in a central location allows for enterprise-wide accessibility and instant visibility into all shop-floor activities, as well as systematic collaboration across workstations, lines, and departments. This centralization helps to eliminate the impact of delays and after-the-fact reporting, which can be considered “waste” in Lean terms, while waiting for or in absence of up to date information.

Digitizing and centrally storing manufacturing data has additional strong benefits beyond instant access and visibility, as paper records do not provide the ability to easily analyze or correlate the collected data. A common approach is extracting data into spreadsheets to calculate and analyze performance and sustainability metrics for insights. Using spreadsheets is recognized to be hard to sustain, often generated after the fact, and not effective or too complex for collaborative use like monitoring and decision support across an organization. But production results reported into Enterprise Resource Planning systems (ERP) often lack the details for effective day-by-day problem solving and systematic improvement of shop-floor operations.

Access to accurate, detailed production history data is the foundation for continuously improving productivity and utilization of assets and resources by performing root cause analyses that correlate production performance and production events. Capturing and storing all manufacturing data in a central place allows companies to measure, visualize, analyze, and improve manufacturing effectiveness.



Lean management reporting and data collection is inseparable from daily plant operations and work practices, which suggests approaching the digital transformation of work and of Lean management in close context.

The digital transformation of work instructions on paper into media files or videos offers several benefits over paper prints. It transforms how work is executed, as it can guide workers through the work and changeover or problem-solving processes with or without procedural enforcement.

Digital work instructions facilitate Standardization of Work – which is a Lean principle to document procedures for manufacturing. By managing work instructions centrally, they can be easily changed with a product change, or for continuously improving instruction. Standardization of Work also relates to the standard time to execute the manufacturing procedures for producing a product. This standard time should be used as the target rate for measuring and analyzing equipment and labour effectiveness when producing different products or product variations.

Centralized digital work order management and distribution helps to optimize production performance and flexibility by arranging the sequence of workorders according to priority and products to minimize changeover. The combination of digital work (order) management and work instructions enforces the use of the correct work instructions for producing a product. This removes the task of seeking the most correct and up-to-date work instructions from operators and increases manufacturing flexibility, as it helps to reduce the changeover time and gets a product right first time.

In summary, enabling digital collaboration and eliminating information management waste through the digitalization of all information and data collection is the key to Digital Lean management in manufacturing operations.

What are the digital technologies accelerating Lean management and Lean manufacturing gains?

Today's digital transformation is driven by a world of interconnected things, where "things" means everything that's a part of industrial process – data, systems, processes, devices, and people. This connectivity is enabled through smart, mobile and wearable devices while cloud and edge computing is complemented by advanced analytics, artificial intelligence, and extended or augmented reality.

Modern technology allows access to information everywhere, but also provides higher levels of information generated from more complex data relationships. More effective data collection, easier access to information, new insights, and augmented work offer new ways to empower and educate workers to identify and continuously reduce "waste" in manufacturing.

In existing manufacturing plants, digitalization is all about aligning digital technologies with physical production and value-added processes. It also empowers the workforce to execute their work more efficiently and effectively with personalized access to the right information. At the same time, digitalization delivers data and analyses that capture, standardize, and continuously improve best practices.

One commonly established practice is the use of web technology and mobile devices for a paperless factory, with flexible access to information, augmented work, and digital team collaboration everywhere in the plant and beyond.

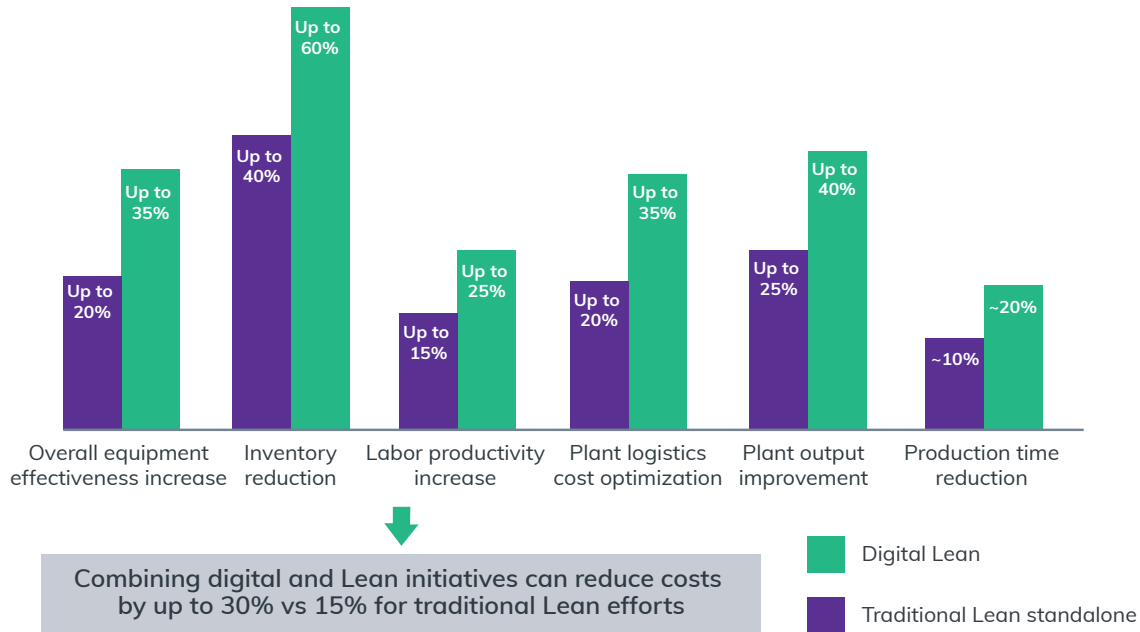
Internet of Things (IoT) devices and wireless connectivity options enable automatic production, performance data collection, and problem detection and notifications at low cost.

Central data management and modern analytics provide new insights into improvement potential and for further continuous improvement.

Real-world examples of digital Lean management practices:

- Measuring and monitoring of Key Performance Indicators (KPIs) in near-real time to facilitate decision support and engaging employees to continuously improve
- Notifications and escalation of critical shop floor events (Andon) via email, push notifications, or other electronic communication to reduce the time to corrective actions
- Digital factory wall KPI and Andon dashboards to facilitate team collaboration
- Access to work task information and dashboards on workstations and mobile devices
- Automatic data collection using Industrial IoT (IIoT) devices helps keep the workforce free from data collection tasks
- Data-driven root cause analyzes using big data analytics
- Standardization of Work through digital work instructions or workflow management

Digital Lean management enables companies to improve their performance and reduce costs with higher results compared to traditional Lean deployments:



Source: Digital Tools Can Double Lean Six Sigma Savings, Bain & Company, April 18, 2019²

Digital Lean management tools allow for the adoption of Lean practices without being a Lean expert

Several Lean practices and methods have been captured in software tools and applications (such as MES or process historian applications) for production performance management as commercial, off-the-shelf digital Lean tools.

The most prominent Lean Practice that can be found in many industrial applications today is the Overall Equipment Effectiveness (OEE) Key Performance Indicators (KPI) for continuous improvement of plant asset utilization and operational effectiveness. Several Lean practices beyond OEE are available and/or supported with industrial software offerings, such as measuring KPIs, digital dashboards for a visual factory, digital Andon, manufacturing intelligence for root cause analysis, and Kanban tools.

The great advantage of Lean practices captured in commercial, off-the-shelf software is the ability to quickly deploy and apply the standard practices, gaining benefits without being a Lean expert.

Commercial software offerings also come with services such as training programs, deployment support, and professional consulting for the adoption of the

Lean Practice and to help with the change management process.

With digital Lean tools designed for ease of use and intuitive visualization, users will quickly learn to leverage and adopt the methodology on the go and while harvesting the low-hanging fruit.

Proven digital tools and vendor services reduce the risk of project failure, as the traditional adoption of Lean practices often required additional workload for the operators.

Digital tools that allow for automatic data collection avoid this additional workload through manual data collection tasks. Wireless communication and smart sensors capture production not only on equipment, but also on production performed by human resources.

When data is turned into complementary information, this helps drive the adoption of Lean Practices. Once the workforce realizes the value, they will be supportive of further adoption and will be engaged to further improve the productivity and sustainability of production lines.

Information visibility and employee empowerment from a digital Lean approach have been shown to drive engagement around reducing the amount of unplanned downtime and to improving productivity.

Smart manufacturing at Schneider Electric – a digital Lean management case study

Schneider Electric is the leading industrial manufacturer of power management solutions for medium voltage, low voltage, secure power, and automation systems that enable energy management and automation in homes, buildings, data centers, infrastructure and industries.

Lean manufacturing was a standard practice at all Schneider Electric sites. Plant performance was mostly measured based on ERP information, which was lacking the detailed shop-floor data to analyze and understand the causes of performance loss and design improvement plans.

Schneider Electric identified a large opportunity for further performance improvements by digitizing its largely paper-based operational processes, providing visibility into shop-floor events and collecting data to analyse the root causes affecting plant performance.

The Schneider Electric global supply chain team collaborated with AVEVA to capture and digitize Lean best practices for standardization across the business. The project leveraged AVEVA's software platform, with its rich visualization and device integration capabilities. The collaboration resulted in a lightweight, flexible software system to rapidly digitize Lean management, enabling data-driven performance improvements with the following capabilities:

- Performance management – measuring and improving labor and equipment efficiency by capturing, visualizing, and analyzing OEE /OLE KPIs, downtime, and quality loss information
- Digital Andon – production issue notification, visualization, and escalation, reducing the time to corrective actions and enabling team collaboration to minimize the impact of production events
- Paperless Orchestration of Work with access to work schedule and work instruction information, and for production reporting
- Root cause analyses and data-driven intelligence providing insight and understanding of the relationship between operational performance and production events

The digital Lean system laid the foundation for complex analysis of Schneider Electric's vast manufacturing operations, resulting in 70% faster response time for downtime mitigation and 10% increase in productivity. Following pilot projects, Schneider Electric scaled deployment to 70 manufacturing sites in two years and continues to roll out the solution across the business.

The result of the collaboration between Schneider-Electric and AVEVA has been productized and is offered as AVEVA Discrete Lean Management software today.³

Schneider Electric deployed AVEVA Discrete Lean Management to more than 70 of its factories around the world.

Following implementation, sites reported:



10%

productivity improvement due to downtime mitigation



70%

decreased response-time due to automated escalation of issues



90%

elimination of paperwork



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