

Beyond manufacturing: The **evolution of lean** production

Many nonmanufacturing sectors are rapidly adopting lean techniques. Soon they will no longer be a differentiating factor in themselves; the important thing will be how well you implement them.

Stephen Corbett

Lean principles were originally developed in industrial operations as a set of tools and practices that managers and workers could use to eliminate waste and inefficiency from production systems—reducing costs, improving quality and reliability, and speeding up cycle times. Toyota Motor pioneered lean practices, and much of their allure today stems from the fact that the phenomenal performance of this automaker, in one of the world’s most competitive sectors, rests to a considerable extent on its ability to develop and perfect these practices over the past five decades.

Recently, lean techniques have moved from manufacturing plants to operations of all kinds, everywhere: insurance companies, hospitals, government agencies, airline maintenance organizations, high-tech product-development units, oil production facilities, IT operations, retail buying groups, and publishing companies, to name just a few. In each case the goal is to improve the organization’s performance on the operating metrics that make a competitive difference, by drawing employees into the hunt to eliminate unneeded activities and other forms of operational waste.

The biggest challenges in adopting the lean approach in nonindustrial environments are to know which of its tools or principles to use and how to apply them effectively. In emerging markets such as China or India,

manufacturing managers trying to implement the lean approach also face these challenges. Differences in everything from culture to infrastructure mean that managers can't apply the lean tools and techniques used in manufacturing operations in Moline or Munich to nonindustrial environments or to manufacturing plants in the developing world; the approach must be tailored to the realities of specific environments.

What follows are excerpts from four articles (the full versions are available on mckinseyquarterly.com) that show how managers have met the challenge of applying the lean approach in a variety of operating contexts. In the public sector, for instance, we've seen managers use lean tools and frameworks with existing resources to deliver more and better services. Applications-development organizations—the units that write new software for the IT operations of large companies—have adopted an overall end-to-end perspective for the coding process. In China multinational and domestic companies are achieving positive results through frequent *kaizen* events (group problem-solving sessions) that help Chinese workers to participate in discussions more directly. Finance departments have successfully used lean principles and tools in accounting and budget processes, reinforcing a fundamental point of the lean philosophy: everything starts with the customer.

Finally, as the lean approach percolates into ever wider circles of operations, it ceases to be about best practice and starts to become a part of the fabric of doing business. Operating executives in many sectors are adopting lean techniques rapidly, so soon they will no longer be a differentiating factor; the important thing, in the heat of competition, will be how well companies implement them. This next level of the lean journey is managing the softer side of the equation—less about tools and frameworks, more about building the energy and engagement of employees from the shop floor and the office pool upward, tapping into their ideas, focusing them on constant problem solving, and keeping them open to change and flexibility.

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Applying lean production to the **public sector**

Governments at all levels must deliver more for less. The principles of lean manufacturing offer surprisingly apt solutions.

Nina Bhatia and John Drew



Governments around the world want to deliver better education, better health care, better pensions, and better transportation services. They know that impatient electorates expect to see change, and fast. But the funds required to meet such expectations are enormous—particularly in the many developed economies where populations are aging and the public sector's productivity hasn't kept pace with that of the private sector. The need to get value for money from governments at all levels is therefore under the spotlight as never before. But cost-cutting programs that seek savings of 1 to 3 percent a year will not be enough and in some cases may even weaken the quality of service.

To address the problem, public-sector leaders are looking with growing interest at lean techniques long used in private industry. From the repair of military vehicles to the processing of income tax returns, from surgery to urban planning, the lean approach is showing that it can not only improve public services but also transform them for the better. Crucially for the public sector, the lean approach breaks with the prevailing view that trade-offs between the quality of public services and the cost of providing them are inevitable.

Not surprisingly, the concept and language of lean operations, rooted in manufacturing, spark cynicism among many civil servants. Some feel that their priority should be policy, not operations; others resent the notion that they are somehow part of a production line. Moreover, without the incentive of the profit motive, government managers may believe that they have neither reasons nor levers to pursue the lean approach.

Yet practical experience suggests that they can. In a UK government office that processes large volumes of standard documents, lean techniques

achieved double-digit productivity gains in the number of documents processed per hour and improved customer service by slashing lead times to fewer than 12 days, from about 40, thus eliminating backlogs. The proportion of documents processed correctly the first time increased by roughly 30 percent and lead times for processing incoming mail decreased to 2 days, from 15. In a UK military armored-vehicle repair shop, a lean transformation raised the availability of equipment by 44 percent and “right first time” production by 40 percent and cut turnaround times by 16 percent.

Persuading people to embark on the lean journey, where the last stop may be their own removal or reassignment, isn’t easy. To succeed, public-sector organizations must find a way to align their growth strategy—providing new and better services at limited cost—with a regard for the interests of their workers. Although lean programs may cut the number of public-sector jobs, the goal is to make the remaining ones more rewarding. Incentives come from the prospect of more meaningful work, potentially with room for greater autonomy or a chance to develop new skills.

To be sure, some countries bar layoffs of public-sector workers. In other cases, union contracts make layoffs difficult. Even so, increasing the operational effectiveness of a public-sector organization can free its employees to deliver new or better services in other areas, within existing budgets and without layoffs. Organizations can apply lean principles in almost any environment where a process can be defined at the working level. The processes of many public services—military logistics, employment agencies, hospital tests, social-security benefits, airport security checks—lend themselves to efficiency and quality improvements. Lean principles even apply in specialized fields such as legal casework and the development of policy. From an operational viewpoint, the aim is to smooth out the work flow.

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Applying lean to **application development** and maintenance

IT managers are getting lean.

**Noah B. Kindler, Vasantha Krishnakanthan,
and Ranjit Tinaikar**



Application development and maintenance (ADM)—the part of IT that writes software applications and keeps them running smoothly—is an ideal candidate for a lean transformation. ADM involves lots of loose processes that can be improved; some companies develop applications much more effectively than others do, suggesting big differences in productivity; and the whole process can be seen as a kind of factory that takes raw materials (developers, code) and builds software requested by a company’s businesses. Our work shows that applying the principles of lean manufacturing to ADM can increase its productivity by 20 to 40 percent.

Each category of waste in manufacturing has a counterpart in ADM. Rework is among the most common: when a business unit that has asked for an application decides to change what it wants midstream, software developers must write and test new code while unmet requests wait. In application development as in manufacturing, eliminating this type of waste improves the delivery times, quality, and efficiency of the process.

Transforming ADM begins with a diagnostic phase to find waste. Since most groups don’t track it, managers rely on interviews and questionnaires to learn how information (such as the requirements for new applications) and materials (such as the code under development) move through the system. The wasted time is then examined to discover the root causes and to assess the opportunity for improving productivity (exhibit).

A large financial institution going through this process discovered two main causes of waste. First, the process for defining project requirements was chaotic and inefficient. IT had no standard way to get a comprehensive description of the requirements for maintenance requests, so developers had to keep asking questions to clarify them, which led to delays and rework. There was also no clear way to prioritize projects. As businesses requested exceptions and rush jobs, developers shifted focus from one application to another, and some projects were never finished.

EXHIBIT

Wasteland

Waste in application development and maintenance (ADM)

Type	Example
Overproduction/overprocessing	<ul style="list-style-type: none"> • Fulfillment of requests that won't be used within next 3 months • Unnecessary functionality
Rework	<ul style="list-style-type: none"> • Changes in business requirements during development • Application bugs
Wasted motion	<ul style="list-style-type: none"> • Requests not tied to business priorities • Ineffective prioritization of maintenance requests • Unplanned task switching
Wasted intellect	<ul style="list-style-type: none"> • Limited cross-training of developers across different applications • Poor usage of employees and offshoring resources
Wasted time	<ul style="list-style-type: none"> • Key resources not available • Developers idling because of incomplete information on the request forms
Inventory waste	<ul style="list-style-type: none"> • Maintenance backlogs • Many partially completed requests

After the diagnostic phase, IT managers launched a pilot program focused on three lean principles: improving the work flow, balancing workloads, and managing performance. To make the work flow smoother, the managers scheduled bimonthly software releases, with clearly defined steps and a capacity based on the available resources (designers, coders, and testers). This predictable schedule allowed the business to plan for current and future releases and diminished the tendency to rush late requests into the process.

To even out the workload, the managers defined work groups more flexibly. Developers and testers were cross-trained to work on projects throughout the organization. Managers could now deploy people more efficiently; when one group was busy, it could borrow developers or testers from another.

Finally, to manage performance and track waste more successfully, a new “dashboard”—essentially, a spreadsheet that tracked performance and highlighted trouble spots—was created so that problems could be recognized early. In one case, managers saw that a task was taking longer than estimated and therefore redistributed the developer's workload to minimize the disruption. The decision to track the performance of individuals encouraged developers to take on additional tasks, since their efforts were now more visible.

The pilot surpassed expectations, boosting productivity in the targeted application maintenance areas by 40 percent in less than two months. IT's

business counterparts were more satisfied with the process, and employee morale reportedly rose. As a result of this success, the company rolled out the effort to the rest of the application maintenance organization and to other parts of IT.

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Better manufacturing in China: An interview with two of **PLP's** top executives

Bill Haag and Wu Yu explain the lessons of a lean transformation at the Chinese plant of a manufacturer based in Cleveland.

James R. Hexter



Leading manufacturers in China—domestic and multinational alike—are beginning to adopt proven global-management techniques, such as lean manufacturing, to make their factories more efficient. One company that has pioneered a lean transformation in its Chinese operations is Preformed Line Products (PLP), a Cleveland-based midsize manufacturer of equipment for communications and power companies. In this interview, Bill Haag, PLP's vice president for international operations, and Wu Yu, the managing director of PLP's plant near Beijing, explored some lessons learned.

The Quarterly: *How did you decide to take a lean approach to solve your capacity issues?*

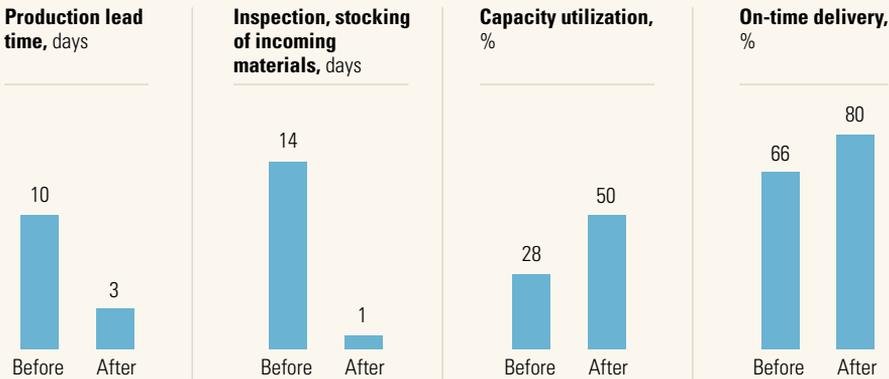
Bill Haag: We were looking at traditional ways of solving the problem—putting up another factory, buying more equipment, hiring more people. But we also knew there was another way to deal with this. Our US factories had, at that time, been spending a couple of years working on lean transformations to reduce costs.

But we wondered how we would do that in China, where there aren't many resources related to lean. Also, our situation was different in China. We have done a significant amount of lean work in our North Carolina facility in the United States and, just recently, in our Brazilian location. Neither was under the capacity crunch we had here. They were stable, profitable businesses that wanted to do something better. They had systems in place—everything from computer systems to quality and maintenance systems. They were not under significant production pressure. The goal at those locations was to reduce work in progress, reduce inventories, reduce lead times, and reduce costs.

EXHIBIT

Greater efficiency

Improvement after lean transformation



But in China we were fighting fires on all fronts. The business was growing, and every system in the business was under stress. The computer system, the maintenance and quality systems—everything was overloaded. Our people and our managers were overloaded. It's hard to step back from fire-fighting and say, "OK, now let's try to implement a structured program."

The Quarterly: *Would you say that the lean work you did here was more about creating room for growth?*

Wu Yu: Yes, but something else too. Our need to reduce lead times is a competitive strategy. The type of product we make is not an advanced-technology product. We now have many competitors in China and other low-cost countries. To be successful against them we have to react quickly in the market. How fast we can meet a massive order is important not only for PLP-China but for PLP as a whole. While product knowledge isn't the sole area where we can compete, having production capacity for global-market orders can be a focus for how we compete.

The Quarterly: *How did you begin the lean transformation?*

Wu Yu: We pulled together a team to look at the problem carefully and define a new plan. The team included production, maintenance, and purchasing supervisors. We wanted people who would be very enthusiastic about the change. We dedicated these people 100 percent to the project. Also, we wanted people who were dedicated to the company for the long term. In China there is a high level of turnover, and we didn't want people who would see this as an opportunity to gain experience and sell it elsewhere as soon as the project was finished.

Bill Haag: The team came up with the design to move from nearly four production lines to two—one for domestic orders and one for international—and to adopt a lean “pull system” to move orders through the factory. I have to say we were surprised by that design recommendation and more than a little nervous. After all, just six weeks earlier we were looking at requests for more equipment and people.

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Toward a leaner **finance** department

Borrowing key principles from lean manufacturing can help the finance function to eliminate waste.

Richard Dobbs, Herbert Pohl, and Florian Wolff

The finance function eludes a standardized lean approach. We have, however, found three ideas from the lean-manufacturing world that are particularly helpful in eliminating waste and improving efficiency. First, many finance departments can become more efficient by making external customers the referee of which activities add value or create waste. Consider how one manufacturing company dealt with late or delinquent accounts. The sales department claimed that customers were sensitive to reminders and that an overly aggressive approach could sour relations. As a result, the sales group allowed accounting to approach only a few, mostly smaller customers; for all others, accounting needed explicit approval from sales. This arrangement frustrated the accounting managers, and no one would accept responsibility when sales outstanding rose to above-average levels.

The company broke the tension by asking its customers what they thought. They understood perfectly well that the company wanted its money and were often grateful to the accounting department for unearthing their own process problems. In the end, accounting assumed responsibility for servicing all customers and for most outstanding accounts. The sales department kept responsibility for the few key accounts remaining and agreed to conduct regular account reviews to re-sort the lists.

Second, the power of an efficiency-focused mind-set is cumulative, for a single initiative frequently exposes deeper problems. At another manufacturing company, the accounting department followed one small initiative with others that ultimately generated cost savings of 60 percent. This department had entered the expenses for a foreign subsidiary's transportation services under the heading "other indirect costs" and then applied the daily exchange rate to translate these figures into euros. This approach lost detail because the parent company's consolidation program broke down transportation costs individually, but the subsidiary's costs were buried in a generic line item. Also, the consolidation software used an

average monthly rate to translate foreign currencies, so even if the data had been available, the numbers wouldn't have matched those at the subsidiary.

Resolving those problems for just a single subsidiary would have been an improvement. But this initiative also revealed that similar issues plagued most line items. The effort's real power became clear later, when the company standardized the chart of accounts, set clear principles for the treatment of currencies, and established governance systems to ensure that the changes would last.

Third, the finance function's answer to many problems is often to add a system or data warehouse. While such moves may help companies deal with difficult situations, they seldom tackle the real issues.

The experience of one company in the services industry illustrates the circuitous route that problem solving takes. Everyone involved in budgeting complained about the endless loops in the process and the poor quality of the data. The first bottom-up proposals didn't meet fundamental quality checks, let alone the budget targets. Desperate for improvement, the company's CFO requested a budgeting tool to streamline the process and a data warehouse to hold all relevant information.

Since responsibility for different parts of the budget was poorly defined, reports still had to be circulated among various departments to align overlapping analyses; the outcome was fragmented because each function translated the figures back into its own key performance indicators (KPIs) using its own definitions. The next push also fell short, even though managers agreed on a single budgeting language, defined KPIs, and assigned responsibility for different sections of the budget.

The root problem was that middle management and the controller's office received little direction from top management and had to clarify the company's strategic direction themselves. The result was a muddled strategy with no clear connection to the budget numbers. Instead of having each unit establish and define its own KPIs and only then aligning strategic plans, top management needed to link the KPIs to the company's strategic direction from the beginning. Once it did, the strategic direction and the budget assumptions were set in less than half a day. The result was a more streamlined process. **Q**

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