



Lean Operational Improvements That Last
From Islands of Improvement to Enterprise-Wide Excellence



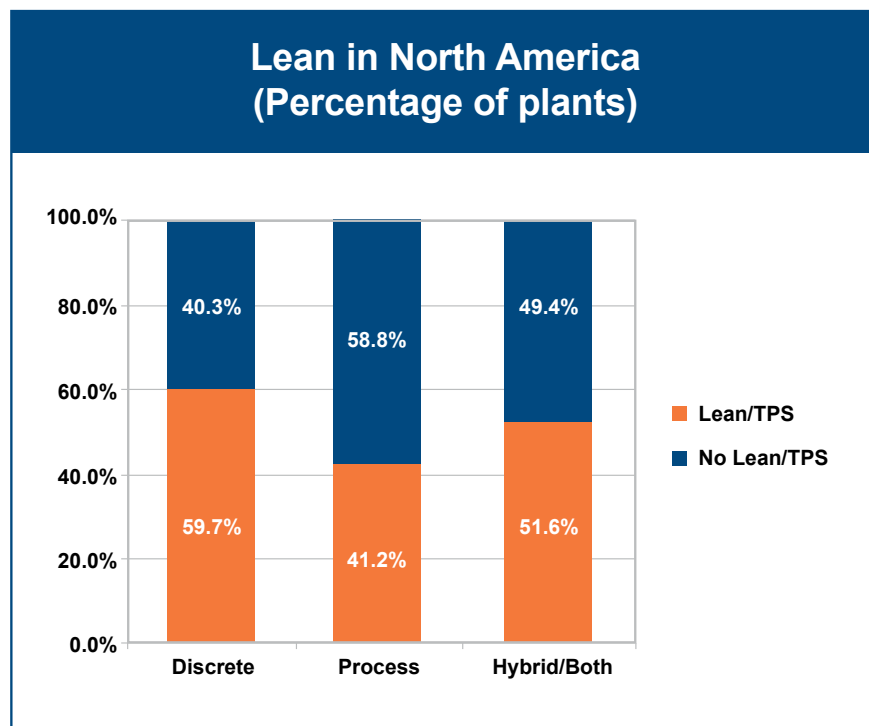
Introduction

Ever since Jim Womack, John Krafcik and colleagues at MIT's International Motor Vehicle Program introduced the term "Lean Manufacturing" in 1987,ⁱ thousands of companies around the world have adopted the improvement methodology and its tools, first pioneered by Toyota Motor Corp. Yet despite impressive achievements by companies that have implemented Lean, many discrete manufacturers haven't pursued Lean improvement methods, even though these tactics typically provide large returns with initial low-cost investments. Then, too, even discrete manufacturers that *have* adopted Lean often realize only small, local benefits, unable to generate the lasting, widespread benefits earned by companies such as Toyota.

Discrete Manufacturers On The Leading Edge — Sort Of

The good news is that approximately 60 percent of discrete manufacturers in North America currently report using either Lean Manufacturing or the *Toyota Production System (TPS)*. Discrete manufacturers are more likely than either process manufacturers or manufacturers with a mix of process and discrete processes to deploy Lean and/or TPS (See diagram below titled "Lean in North America").ⁱⁱ

See the end for a brief glossary of Lean terms used within this report.



Not surprisingly, many of these Lean discrete manufactures report better operations and financial performances than their non-Lean peers. For example, sales per employee among discrete manufacturers using Lean and/or TPS is \$176,000 (median). Among discrete manufacturers not using Lean and/or TPS, sales per employee is \$54,000, and among discrete manufacturers without any improvement methodology, sales per employee is just \$37,125. Similarly, on-time delivery is 95.6 percent (median) among Lean and/or TPS users, vs. 90 percent among non-Lean discrete manufacturers and 85 percent among firms without an improvement methodology. Two-thirds of Lean discrete manufacturers (66 percent) report increases in inventory turns over the last three years vs. 36 percent of non-Lean discrete manufacturers and manufacturers without improvement methodologies.ⁱⁱⁱ

In some ways, then, discrete manufacturers who go Lean are becoming more Toyota-like. And yet, good as some of these results are, other metrics are comparable to – or even worse than – non-Lean organizations. For example, median gross margins are 10 percentage points lower (median) among Lean discrete manufacturers than non-Lean discrete manufacturers.^{iv} This is not exactly Toyota-like performance, but Toyota has been at Lean for more than 50 years. Sustaining Lean improvement among discrete manufacturers with more recent adoptions may take time.

Why haven't current Lean adopters differentiated their companies as much as Toyota and others? One reason is that many firms now applying Lean often choose the simplest, easiest-to-use tactics – with correspondingly low-level results. Stories abound, for example, of discrete manufacturers falling in love with 5S — basic Lean organization practices — and turning their plants into showrooms, with each tool in its place and well-marked walkways differentiated from work areas. Yet, while 5S is a necessary concept within Lean's mandates to stabilize, standardize, and improve, merely rearranging tools provides little bottom-line impact.

Even more advanced Lean methods such as *quick changeovers*, *poka yoke*, or *single-piece flow* are too often wielded as hammers looking for obvious nails, perhaps generating local improvement, but not providing organization-wide results. This is especially true among discrete manufacturers. While the vast majority of Lean discrete manufacturers (97 percent) report using Lean in their production areas, far fewer take Lean outside of production: 23 percent use Lean in finance and accounting, 26 percent in customer relations, and 29 percent in administration. In fact, Lean discrete manufacturers report that only 60 percent (median) of their organizations' overall processes have been addressed with Lean Manufacturing.

Comprehensive Approaches To Lean

Lean is ultimately focused on customers — external as well as internal — which means that satisfying customers is the highest priority goal within a Lean discrete manufacturer. Often, that perspective, so clear at the start of a Lean initiative, begins to get lost within the organization as individual departments seek their unique solutions, instead of supporting the few key goals that set the stage for how Lean is applied within an organization. Lean initiatives need to be implemented in the *right* areas for improvement, relying on the concept of strategy deployment (*hoshin kanri*), which identifies goals and cascades them throughout the organization into targets and actions at the smallest increments of work.

Unfortunately, only 37 percent of Lean discrete manufacturers report using strategy deployment.^v This causes problems. What good is a financial or quality measure if an individual employee can't see how his or her own work contributes to achieving it? How much more effective is a production associate, for example, if he or she understands that every single flawed product equates to an increase in warranty costs? Similarly, if a shipping clerk recognizes the cost of mislabeled packaging, he or she is much more likely to implement process improvements, such as poka yoke, to ensure that shipments match invoices.

This requires a workforce willing and able to seek out problems and apply fixes or solutions (many Toyota purists use the term "countermeasure" rather than "solution," to indicate that problems disappear only to make room for new, different problems). In *Managing to Learn*, author John Shook, a Toyota veteran and well-known Lean sensei, writes that the Toyota Production System is not a well-planned, meticulously designed method to transform organizations. Instead, it is the cumulative result of possibly the world's finest problem-solving and learning corporate culture. "Many elements of the Toyota system have been held up as the key to its tremendous success, but the most important accomplishment of the company is simply that it has *learned to learn*," he writes.

For Toyota, the tools of Lean/TPS are countermeasures, nothing more or less, adapted to particular needs. Other organizations should embrace this concept and use the fundamentals of Lean/TPS to uniquely address their own problems. To determine if your organization is ready to do this, ask yourself:

- Does the organization embrace the need for improvement — from top management down to frontline workers?
- Have we identified the few meaningful and measurable corporate goals (e.g., customer satisfaction, employee satisfaction, high quality) that can rally the organization to improve?
- Are goals deployed throughout the organization at all levels? Do we even have the skills and structure to do so?
- Does our workforce have the problem-solving skills to translate corporate goals into local targets relevant to their own work, and then achieve them?

Few discrete manufacturers respond affirmatively to all of these questions. More typically, they use the means they think are best to improve, applying their favorite tool where they think it is needed (and then firefighting when problems arise). Goals and targets are established independently of overall corporate strategy, or never get properly communicated to all levels. Even worse, some targets for improvement, regardless of importance, are ignored altogether.

Organizations closest to answering “Yes” to all these questions focus not on individual tools or tactics, but on implementing Lean in its broadest sense for enterprise-wide improvement (from innovation and product development to accounting practices, etc.). They’re also focused on developing and deploying systems (including business software solutions) that communicate goals and objectives more effectively, enhancing the organization’s overall performance.

Holistic Lean, More Impact

Toyota and other leading proponents of Lean view management through the perspective of the scientific method, as adapted by W. Edwards Deming via the *PDCA cycle*. Toyota’s problem-*seeking* culture— “No problem *is* a problem”^{vi}— is exemplified by the PDCA cycle:

- 1. Plan:** Identify a problem, find the real root cause, and then plan how to address it. (Lean companies often use a method called “Five Whys,” in which employees or teams question the easy answers, asking “Why?” until they reach the real root cause. Only then do they “plan” — establishing a series of countermeasures to improve the situation.)
- 2. Do:** Execute the plan according to a well-defined schedule of events and responsibilities.
- 3. Check:** Is the plan working? If not, what can be done to improve it?
- 4. Adjust:** New or unfixed problems receive scrutiny, setting the PDCA cycle in motion again.

Toyota and other leading Lean organizations instill PDCA thinking and build problem-solving cultures by using two distinct but related Lean concepts: *A3 reports and value-stream mapping*.

An A3 report is a sort of storyboard on a single piece of paper that addresses a problem, project, proposal or issue in an organization. The problem can be as specific as a recurring production issue on a particular shift (e.g., excessive scrap), or as broad as a company-wide strategic failure (e.g., poor employee morale and retention). A3 reports vary by organization, but they typically include areas in which an individual “owner” will:

- Clearly state the problem (using aids such as histograms or fishbone diagrams);
- Report on the background of the problem (what’s known to date);
- Identify a root cause with the help of employees affected by the problem and by examining the problem where the work happens (the gemba);
- Quantify the problem by identifying a target state of improved performance vs. the current state;
- Propose countermeasures to close the gap between current and target states;
- Detail a thorough plan for execution; and
- Outline ways to check on progress, as well as anticipate what could go wrong (as well as what can go right, in order to leverage successes for even greater improvement).

At Toyota, A3 reports are not only functional devices to attack problems or launch new initiatives, but also “organizational currency” for establishing authority, consensus and mentoring.^{vii}

The other concept, value-stream mapping, typically involves a team of employees (often across functions and departments) examining how a process really functions in satisfying the customer (downstream), and analyzing the work steps (the value stream) all the way back to suppliers (upstream). This is important because when Lean fails to receive broad attention in an organization, it is frequently because of the inability to reach (or even see) across the silos that separate functions and departments. Significant improvements in efficiency only occur when the value stream itself is visible to all who touch it. Surprisingly, only a bare majority of Lean discrete manufacturers use value-stream mapping (56 percent).^{viii}

In *Learning to See*, Mike Rother and John Shook put the concepts of value-stream mapping (called “material and information flow maps” at Toyota) before the Western industrial world.^{ix} The way these maps are developed varies by organization, but their purpose remains consistent: Diagram how value is **currently** delivered (identifying where wastes occur), then diagram how value **should** be delivered (finding ways to improve processes).

Value stream maps typically focus on eliminating particular types of waste (TPS identifies seven categories of waste — *see Seven Wastes*), such as excess inventories, poor delivery performance, or production failures (equipment, safety, quality problems). The map correlates production inputs (time, material, and information signals) to the value stream, often incorporating hundreds of steps in multiple processes that comprise a single value stream. Problems are highlighted, and the team then creates a future-state map — how the value-stream should ideally function. With the two maps in front of them, they can prioritize where to apply Lean to close the gap between the current and future states. (*See table below titled “Seven Wastes”*)

Seven Wastes ^x	
Waste	Example
Overproduction	Producing more than what's needed by the customer.
Waiting	Idle operators waiting for material to arrive.
Conveyance	Unnecessary movement of materials.
Over-processing	Unnecessary or incorrect processing.
Inventory	More than minimum required to meet safely pull system demand.
Motion	Unnecessary or strained motion by operators.
Correction	Inspection, rework, and scrap.

One of the most important benefits of value-stream mapping is that employees begin to understand the entire value-creation process, recognizing that their work influences many other steps. This usually leads to increased respect for the actions of other employees and partners both upstream and downstream, and often serves as a catalyst for collaborative efforts to eliminate waste and improve the value stream for the benefit of the customer.

One important note: As organizations and their value streams stretch around the globe, even simple Lean techniques such as A3 reports and value-stream maps — once confined to paper documents — are now being digitally adapted, using information technology systems to incorporate findings, disseminate plans, and trigger action across the extended enterprise and supply chain for greater efficiencies. This represents a significant change within the Lean community; many Lean thinkers once dismissed information technology (IT) as an important tool, going so far as recommending the disconnection of old-line, hard-coded IT systems that fueled large-batch production. Today, modern and flexible enterprise resource planning (ERP) and customer relationship management (CRM) systems work together with Lean across plants, companies and countries to bring real-time visibility to planning, scheduling and tracking (checking) capabilities.

Improvement Path

A frequent question among discrete manufacturers interested in Lean is “Where do we start?” In public companies, this question is often influenced by the need to hit a year-end or quarterly target; at private companies, an owner’s needs may inform corporate objectives. Regardless of your organization’s particular situation, the best way to answer this question is by using the Lean approach itself. Focus on the situation at hand:

- 1. Stabilize:** It is impossible to apply lasting fixes to chaotic situations. First things first: Get things in some semblance of order so that problems can be clearly seen (much like 5S for organizing a work area). Only then should you choose a plan or system for improvement.
- 2. Standardize:** Apply the plan or system. Focus on developing documented current best practices for work throughout the organization (standard work) in order to achieve acceptable outcomes (quality, costs, productivity, etc.). Until a better way is found to work, standard work is the *one*, best way.
- 3. Improve:** Continually apply the PDCA process, developing new standards for work and aiming for higher levels of performance.

Most importantly, remember that Lean and other improvement methods are not isolated, short-term initiatives or approaches. Improvement tools and systems (Lean and others) must be supported with organizational learning and changed corporate cultures. Doing so requires ongoing investments in training and information technology systems that support Lean and promote process visibility throughout the enterprise. In fact, the real question for most executives isn't, "Where do we start?" but instead, "Why haven't we already?"

What will it take for *your* current culture, learning approaches, information technology and equipment to support Lean?

"Today, modern and flexible and enterprise resource planning (ERP) and customer relationship management (CRM) systems work together with Lean to bring real-time visibility to planning, scheduling and tracking (checking) capabilities — across plants, companies and countries."

ⁱ *Breakthrough Moments in Lean*, Lean Enterprise Institute, 2007.

ⁱⁱ North America data on 572 discrete manufacturing plants from The *IndustryWeek*/Manufacturing Performance Institute 2007 Census of Manufacturers; 2007 Canada Manufacturing Study, conducted by *Advanced Manufacturing* and the Manufacturing Performance Institute; and Estudio De Manufactura Mexico 2007, conducted by the Manufacturing Performance Institute with support of CS Events.

ⁱⁱⁱ Ibid.

^{iv} Ibid.

^v Ibid.

^{vi} John Shook, *Managing to Learn*, Lean Enterprise Institute, 2008.

^{vii} John Shook, *Managing to Learn*, Lean Enterprise Institute, 2008.

^{viii} North America data on 572 discrete manufacturing plants from The *IndustryWeek*/Manufacturing Performance Institute 2007 Census of Manufacturers; 2007 Canada Manufacturing Study, conducted by *Advanced Manufacturing* and the Manufacturing Performance Institute; and Estudio De Manufactura Mexico 2007, conducted by the Manufacturing Performance Institute with support of CS Events.

^{ix} Mike Rother and John Shook, *Learning to See*, Lean Enterprise Institute, 2003.

^x Adapted from "Seven Wastes," *Lean Lexicon*, edited by Chet Marchwinski, John Shook, and Alexis Schroeder, Lean Enterprise Institute, 2008.

^{xi} John E. Boyer, President, J. E. Boyer Company, Inc. *Six Ways to Make Your Lean Operation More Lean (whitepaper)*

Glossary*

A3 report: A storyboard that describes a problem, project, proposal or issue in an organization, which, through a process of exploration and review, identifies root causes, proposes countermeasures, and establishes a plan for execution and review.

Lean manufacturing: A manufacturing approach — from product development and procurement through manufacturing and delivery of goods — for providing customers precisely what they want when and how they want it while minimizing the resources, costs and materials to make that happen.

PDCA cycle: An improvement concept introduced by W. Edwards Deming that relies on the scientific method and consists of a cycle of plan, do, check, and adjust.

Poka yoke: Mistake-proofing a process whereby it is difficult if not impossible for a defect or error to occur.

Quick changeovers: The changing of equipment set-ups to rapidly accommodate a different product with very little downtime.

Single-piece flow: Processing only one unit at a time, with zero inventory build-up — one step works on the product/unit, which is transferred to the next for work, and to the next, etc.

Strategy deployment/hoshin kanri: A management process for identifying critical corporate goals and cascading those goals down through the organization as targets relevant to each division, unit, department, and, ultimately, person.

Toyota Production System (TPS): The method of production developed by Toyota. Jim Womack and colleagues at MIT's International Motor Vehicle Program observed Toyota and other Japanese companies and brought many key TPS principles and concepts to the Western world as lean manufacturing.

Value-stream mapping: Individuals or teams (often across functions and departments) diagramming an end-to-end process for satisfying customer demand (value stream). Current-state maps identify how a value stream currently operates and where problems exist; future-state maps propose an improved value stream.

* For more information and perspective on these terms and an array of many other lean terms, please see: Lean Lexicon, Fourth Edition, edited by Chet Marchwinski, John Shook and Alexis Schroeder, Lean Enterprise Institute, 2008.

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