



Lean in the Lab

A Primer

By Helen Kelly

Learn what being Lean means and how it was successfully implemented at the Massachusetts General Hospital Center for Comparative Medicine.

*Organisations are hierarchical;
processes flow horizontally.
It isn't surprising that process flows
get interrupted. -Matt Zayko*

Becoming Lean is an increasingly popular way to streamline service delivery and cut costs in a variety of industries. Lean is a set of analytic practices and problem-solving tools that help you identify and repair process breakdowns, just as you would use diagnostics to find out why a car is using too much gasoline and then use the right tools make adjustments, fine tune, or replace parts. Keys to success are that staff at every level participate in diagnostics and problem solving, and that improvements to the system are managed visually.

The change to Lean is a three-legged stool. First, it is a culture change, from one of fault and blame to one of problem solving. Secondly, it is a psychological change, from one of fear—where people fear being blamed for mistakes or caught for lack of required knowledge or skill—to one of opportunity for improvement, innovation, creativity, learning, and growth. Lastly, it is a practical change, from one of managing

problems to one of measurement and continuous improvement.

In this article, I'll set out the steps one takes on the way to becoming Lean—from ways of thinking through finding problems to designing solutions.

GETTING READY: LEAN THINKING

Think of your system as the way you deliver value to your customers, rather than as a set of internal processes.

Lean takes a dynamic system perspective rather than a jigsaw view of interconnected parts. “The system is a set of process flows from customer request to fulfillment”, Jon Miller of Kaizen Institute/Gemba Panta Rei who has worked directly with Lean leaders in Japan, explains. “In a research facility, it may be from start of a research project to data collection”.

Michael Pitcher, Managing Director of The Lean Laboratory, explains why a system approach is vital to Lean success. “Most approaches to continuous process improvement will bring initial results. However, a single approach to process improvement rarely produces sustainable organisational level results. For example, lab layout can be improved only to move a bottleneck further downstream”. In other words, if you keep the engine finely tuned and the car clean and waxed, but don't change the oil on time, you risk an engine failure.

GETTING STARTED: LEAN PRACTICES

Mapping the System

Obstacles to service delivery fall into three groups: waste—such as downtime, over-production, waiting, inventory excess, and extra processing; unevenness in operations;

and, overburdening of people and equipment. You find obstacles in all three groups by first mapping the system and then the processes within it.

“Lean practitioners call this type of flow diagram a Value Stream Map (VSM). It reveals Flow and Waste in your current state”, Herman Ranpuria, Principal at eVSM software, says.

“Creating a Value Stream Map allows everyone— staff, suppliers, customers, and managers—to recognise and understand how the system works. And, the map acts as a common reference point for many to take part in devising, assessing, and agreeing on improvements”.

“A typical Value Stream crosses many departments and functions”, Jon Miller says. “So the Value Stream is a mix of value—the service the customer wants to receive—and wasted time or effort such as errors and waiting, which no customer wants”. A full Value Stream Map shows your Current State—and a picture of where you want to be, called Future State.

Figure 1: Formally and informally, everyone can share thoughts about how to solve problems identified during the Value Stream Map activity.

Reprinted with permission from the Massachusetts General Hospital Center for Comparative Medicine.



Brainstorming

Here you set out the problem’s impact and your plan to address it. Multi-level and often cross-functional teams develop the plan after discovering the root cause of each problem. There are analytic tools available for root cause analysis (Figure 1).

Deciding on Improvements and Monitoring Change

Once problems have been agreed and set in priority order, those who work directly with a process come together to assess improvement options and plan the way ahead. Ordinarily the focus is to make small, daily, practical improvements rather than highly sophisticated solutions.

Those closest to the process take the lead in discussions and analysis. The term for this problem solving event is Kaizen.

To make the situation apparent to all, and allow for monitoring the impact of the improvement once it is live, Kaizen participants create wall posters, diagrams, and other visuals that alert staff to need for additional improvement (Figure 2)

“Many small experiments can be conducted at low cost”, Jon Miller explains, “speeding up the cycle of learning. Lean organisations rapidly turn to the cycle of PDCA, Plan-Do-Check-Act, learning from both failed and successful experiments”.

Monitoring is ongoing rather than scheduled. Making routine checks, and talking with colleagues about what you observe, is everyone’s responsibility.

MANAGING CHANGE

Managers are an integral part of Lean activity. Instead of learning about problems by reading reports, Lean managers spend their time at the front line getting facts for themselves. This allows managers to be directly engaged with each team, and also to be another pair of visual management eyes.



Figure 2: Monitoring for overcrowding and safety in the cage wash area. Reprinted with permission from the Massachusetts General Hospital Center for Comparative Medicine.

When something needs attention, the manager visits the area to confirm the data, understand the scope of the problem, and act as a resource for those charged with solving the problem. Are people following rules and meeting standards? If not, why not? Are the standards realistic? Do people have the resources and tools, and the training, to meet the standards? The manager's role is to coach and guide to improvement teams.

The Lean manager's work is sometimes called Go See, because managers are more often in the halls than in their offices. For some this is a big and challenging change. Here's why. As is true wherever a culture shifts from problem orientation and politics to problem solving and growth, the top manager must lead the way personally as well as professionally. Yes, he must praise and reward openness, encourage people to learn from responsible experiments and unfortunate mistakes, and see complaints as gifts of opportunity to improve. Furthermore, he must live that way himself, convinced that innovation, improvements, learning, and growth are the most satisfying way to work, and that satisfying the customer takes precedence over preferences to be less vulnerable.

OKAY ISN'T GOOD ENOUGH A LEAN CASE STUDY AT MGH

When Donna Jarrell went to work as Associate Director at the Center for Comparative Medicine, a six facility laboratory animal care department that supports the \$600 million research program at Massachusetts General Hospital, things were in disarray. We won't dwell on details, because happily the darker days faded long ago; suffice to say that although things were OK—overall staff were competent and committed—few among investigators, suppliers, managers or staff were content.

Undaunted, and determined to turn things around, Donna decided that OK wasn't good enough. She started studying organisational improvement intervention, change strategies, and management practices that might help her take the Center in a new direction. She was open to all ideas but it was Toyota's success in making high-quality cars at a reasonable cost—relying on an empowered staff and a relentless culture of continuous improvement—that inspired her to try Lean; and the rest, as they say, is history.

Background

The Center for Comparative Medicine (CCM) is a six facility central laboratory animal care department that supports the \$600 million research program at Massachusetts General Hospital, Boston, Massachusetts, USA. Services include husbandry, importing and exporting mouse lines from other academic institutions, preventive and clinical veterinary care, training in animal manipulative techniques, surgery and post-operative support, mouse breeding and rederivation, and consultation in animal modeling and protocol design—all of which are performed by 140 employees, including eight veterinarians. The average

daily census includes 100,000 mice, several hundred rats, over 100 non-human primates, and smaller numbers of hamsters, guinea pigs, rabbits, sheep, pigs, and amphibians, all housed on three campuses totaling 9,500 square meters. Steve Niemi, DVM, is CCM's Director; Dr Donna Jarrell is Associate Director.

As you will imagine, there were bridges to build from Donna's excitement about Lean to realisation at CCM. This was 2005, and Lean, along with Six Sigma, was primarily a manufacturing practice. Yes, by then an adventurous few in healthcare had put a toe in the water, but she couldn't find Lean applied to biomedical research anywhere. No matter; the more Donna read about lean principles and tools, the more she felt certain that both could be adapted to laboratory animal programs and would result in significant benefit to customers, the animals, and employees.

Donna was right. For four years, Donna, Steve and the leadership staff worked together to learn about Lean and make a start.

Starting out with Lean

CCM's first step toward organisational improvement was to develop a high-level big-picture understanding of all the current processes required to deliver services to their customers. Donna and Steve convened a multi-disciplinary team of technicians, team leads, facility managers, program managers, and veterinarians. They created a Value Stream Map (VSM) to illustrate how physical and procedural processes interact.

The teams identified more than one hundred processes or procedures that included unnecessary time or components that did not add value to the business at hand—safe, efficient delivery of high quality animal

care. After intensive analysis, from the one hundred potential areas for improvement the VSM highlighted eight areas ripe for improvement. The team created a Future State picture for each of the eight processes and an Action Plan. The next step was to make the change.

Kaizen Event: Cage Equipment Processing and Sterilisation

Among the eight, CCM Leadership identified cage cleaning as the heart of facility operations. Sterile cages, water, and feed weren't delivered on time, which had a significant impact on animal husbandry. Safety concerns existed with no solutions. Customers and employees felt frustrated. Improvements would offer important department-wide gains in efficiency, safety, and customer satisfaction.

Once again Donna called upon a multi-disciplinary team. Their remit was to portray the current state of: 1) cleaning and sterilised cage components; 2) provision of acidified water; and, 3) provision of irradiated feed in all CCM facilities. Following Lean principles, essentially invoking a way of thinking synonymous with the scientific method, they made these recommendations:

1. Standardise all processes and supplies across facilities.
2. Improve workplace organisation using 5S to visualize the standard work and support compliance.
3. Improve workflow efficiency by at least 30%.
4. Improve worker safety through effective standardised personal protective equipment (PPE) requirements.

The improvements to a process are called Kaizen. CCM identified a Kaizen team comprising principally those working closest to cage washing and associated processes.

The four improvements and associated changes designed by the Cage Processing Kaizen Team were deployed to the six-facility enterprise in three stages as mandated by Kaizen.

A Photo Gallery of Lean Improvements at MGH

PPE Required When Working in Dirty Side

	Blue Washroom Jumpsuit	Bouffant Cap	Nitrile Gloves	Surgical Cone Face Mask	Eye Protection	Boots (if available)	Shoecovers or Water-Resistant Shoecovers (if boots are NOT available)
PPE for when: Only rodent cages are being cleaned	✓	✓	✓	✓		✓	✓
MHP cages are being cleaned	✓	✓	2 pairs	✓	✓	✓	✓
No caging is being prepped and/or cleaned							✓

Improvements to Standardised PPE compliance: 100%



Elimination of cage scraping: 100%
Decrease in reworked cages: 50%



Time gained by the cage wash team from improvements: 1913hr/yr = 7.4 hrs/day
Time gained in FTEs: .93FTE
Reduction in miles team walked for items per year: 2990

Stage One is the *Pilot*. During that stage you test and prove each of the recommendations at a pilot facility. Pilot facility personnel give continuous feedback. CCM leadership stayed updated on the nature and key feedback details during a weekly walk through the facility. The Japanese word for the walk to see and learn is called a Gemba walk.

Once the pilot recommendations are tweaked where necessary and proved to be improvements, the project moves to *Stage Two—Initial Deployment*. The aim here is to determine scalability. As it sounds, two additional facilities implement the improvements, provide feedback on the process, and confirm that the waste is eliminated.

The third and final stage is *Full Deployment*, whereby the Kaizen rolls out to the remaining facilities— in this case to the remaining three. Full Deployment in action put the stamp on it: there has been a department wide improvement to quality, safety, and efficiency.

A Look at Today

In 2009 CCM was ready for, and conducted, a full Current State assessment that comprised all six facilities with an eye to full deployment—an act that ultimately required energy and reinvigoration. “CCM follows the Lean methodology because Lean builds an organisational culture of thinking and problem-solving”, Steve Neimi said. “That is simple in concept. But the reality of implementation . . . it has been tough. At first our senior leadership was simultaneously

learning and setting expectations, driving some staff to tears as they struggled to follow our lead. As you know, driving change in any organisation is never easy". Pat Kramer of the Murli Group worked with CCM as a sensei, or teacher, during full deployment, tells us that visual management was the key to success. "By visualising their processes using lean thinking", Pat said, "CCM transformed their culture and their business at all six facilities".

Today CCM are fully engaged in Lean.

The Go See approach means staff and managers all have the same up-to-the-minute picture of reality. Senior Leaders take daily one-hour Gemba walks to help staff monitor situations, discover and identify problems, assist in problem-solving by asking thought provoking questions, and to celebrate success. CCM invite customers, suppliers, support departments, and visitors from other institutions to attend daily walks. Seeing things live and talking about them together, Donna says, helps all stakeholders understand CCM's lean operations strategy, appreciate the process, and feel part of the success. And Donna's enthusiasm, which has only grown, continues to inspire all who work here.

Demonstrable Results

Over the first four years CCM made improvements in areas such as organisational development of teams, standardization of tasks and veterinary care, simplification of training documents and processes, IACUC inspection preparation, use of new technologies, capital equipment standardisation and preventive maintenance, and inventory management. Measureable benefits from these early improvements include a 40% improvement in customer responses regarding daily rodent health alerts and an 85% reduction in the time from

health concern identification to getting proper therapeutics on-board, a 27% reduction in the amount of time to resolve rodent outbreaks, a 25% improvement in cage washing operability, an 80% reduction in the number of IACUC semi-annual inspection findings, and an increase in staff technical services resulting in a 9-fold increase in department revenues and ultimately moving from operating in a deficit to annually recognising a small profit which could then be used to re-invest in the department's future.

WHY DOES LEAN WORK?

In a Lean culture, problems are opportunities to improve a troubled system and experiments are welcome. People are free to learn from one another, and managers are free to be a source of information, a coach, and a guide—roles which most managers enjoy yet for which they find little time.

Even discouraged, dispirited members of staff revive and join energetically in opportunities to make things Lean. That is in part because the organisational silos disappear and there is open communication, and because the lack of blame reduces political maneuvering and frees people to present ideas. However people become engaged principally because Lean calls forth our hard-wired preference for experimentation, and every member of staff becomes an investigator: articulate a question that arises naturally from observation, formulate an hypothesis, test the hypothesis by systematically collecting data, analyse data to identify patterns and discover relationships, draw lessons learned, develop recommendations, communicate findings, refine the experiment and repeat to refine your learning. You may be surprised

and delighted to find that employees with little formal education have impressively creative approaches to identifying problems and imagining solutions.

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