Lean at UC Davis

What Can Lean Do For You and Your Department

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About Your Workshop Presenter

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- Lean Six Sigma
- Business Analysis
- Project Management
- Enterprise Analysis
- Organizational Excellence

Consulting Experience, 14 year experience:

- Private Sector:
  - *sample*: Microsoft, Time Warner, Comcast, AT&T, Sprint, ING, IBM, General Electric, ABB, Tyco, Amazon.com, Fannie Mae, Bank of America, ING

- Public Sector
  - University of California, Davis
Enterprise of UC Davis

Complex enterprise with common challenges, needs and opportunities
What Can Lean do for You and Your Department

• **What is Lean?** Lean is primarily a process improvement tool. Lean is a systematic approach to identifying and eliminating waste by lining up the value creating work tasks in the best sequence, then conducting process tasks without interruptions. Simply, Lean means creating more value for "our campus customers" with less wasted time and energy.

• **What can Lean do for you?** Lean gives UC Davis departments tools to empower staff, standardizes processes, and streamlines efficiency. One of the many benefits of implementing Lean in your department is to enable UC Davis departmental staff to strive for a common goal or purpose. Lean provides tools for success as well as gives UC Davis departments an opportunity to evaluate processes from a new perspective. Participating in this Lean training will empower you to see the delays in process time, dysfunctional practices in processes, and even improper layout and structure of an office. This training will offer a way to simplify and organize processes to reach peak efficiency. Also if you participate in this Lean training, you will be able to explore process improvement opportunities and options for your department in a new and different way.
Workshop Contents

• What is Lean?
• How to identify value?
• How do I create a value stream?
• How do I create flow?
• How do I establish pull?
• What is perfection?
• What next? How can I establish Lean at UC Davis - Action Plan?
WHAT IS LEAN?
Quality: Foundation of Lean

• Quality is everyone’s job
• Lean is about the quality of business
  – Customer Quality
    • Meet their critical requirements
  – Organizational Quality
    • Deliver high quality services at the lowest cost and generate the highest business value
What is Lean?

• Management philosophy that is focused on perfection, flow, and value creation
• The core idea is to maximize customer value while minimizing waste
• Understand customer needs and wants
• Identify key waste elements that affect the performance and quality of the service or product
• Simply, lean means creating more value for customers with fewer resources
History of Lean

1500s Flow Production
Venetian Arsenal introduces floating assembly line for barrels of standard designs moving through standard assembly stations. First example of flow in history?

1780s Concept of Interchangeable Parts
French Army Ordinance pioneers the concept of interchangeable parts for weapons, a necessary precursor to high-volume, flow production.

1799 Automatic Production of Simple Parts
Marc Brunel devises water-powered equipment for the Royal Navy in England that can make simple parts like rope blocks for ships with no manual labor.

1822 Automatic Production of Complex Parts
Thomas Blanchard at the Springfield Armory in the U.S. devises 14 machines to progressively make gun stocks for rifles with no manual labor. The parts are moved from machine to machine around a room. The first instance of cellular production?

1860s High-Volume Interchangeable Parts
Samuel Colt's Armory in Hartford, CT, claims to produce pistols in large volumes with completely interchangeable parts. Later investigation by David Hounshell (1964) shows that the parts were only interchangeable for special weapons created for sales promotions. Pistols in regular production still had "fitted" parts requiring extensive manual labor. The problem of fabricating truly interchangeable metal parts without extensive "fittings" continues to baffle industrialists for another 50 years.
History of Lean, cont’d

1880s
Moving Disassembly Line
American meat packers in the Midwest introduce conveyors to steadily move carcasses past the workers who remove the meat from the bone. A provocative example to later innovators who tackled the much more difficult task of moving assembly.

1890s
Scientific Management
Frederick Taylor analyzes work in search of the one best way to do every job. He adds a piece-rate bonus system, “scientifically” setting wages to spur effort and tying complex production paths together by means of a clearly documented travel path through a factory for every part. He also introduces standard cost accounting to allocate overheads to machine and labor hours, creating the basic management tools of mass production.

1902
Jidoka
Sakichi Toyoda invents a device to detect broken threads in looms, automatically stopping production of defective cloth. With additional refinements, this permits machines to operate without the need for workers (often children) to watch each machine and uncouples workers from machines to permit multimachine operation by a single worker.

1908
Truly Interchangeable Parts
Henry Ford introduces a modular car and makes a great leap in interchangeable parts through a standard gauging system used throughout his plant and by every supplier. Ford announces, “There are no files in my factory.”
1913–1914
Moving Assembly Line with Parts Fabrication
Henry Ford’s Highland Park plant pioneers “flow production” by placing fabrication equipment in process sequence (e.g., a stamping press next to a paint booth next to a final assembly area for a single part number) and operating the whole factory at the rate of the final assembly line.

1924
Quick Changeovers
The G-type loom at Toyoda Automatic Loom Works introduces a zero-time shuttle changeover so the loom can keep running continuously. This idea leads eventually to quick changeovers in every piece of equipment at the Toyota Motor Company.

1926
Mass Production
As Henry Ford completes his vast Rouge complex he adds product variety and introduces the term “mass production.” While the flow of materials at the Rouge is automated by miles of conveyors, the complex locates different types of fabrication steps (e.g., stamping, welding, paint) in “process villages,” and most final assembly is moved to as many as 50 final assembly plants around the world.

1937
Just-in-Time
As Kiichiro Toyoda establishes the Toyota Motor Company he has the idea for just-in-time delivery of parts. A lack of basic stability in production and in supplier relations thwarts actual implementation.
**History of Lean, cont’d**

**1930s**

**Takt Time**
German aircraft-industry pioneers use takt time as a way to synchronize the movement of aircraft in assembly operations in which each major section or complete airframe needs to move to the next assembly station at the same time. A precise takt time means that the cycle time for the work at each station must be precisely analyzed to keep it below the takt time. Mitsubishi has a technical relation with the German aircraft industry and brings the idea back to Japan where Toyota embraces it.

**1941–1945**

**Training Within Industry**
The U.S. Dept. of War introduces job instruction, job methods, job relations, and program development as ways to teach millions of workers in war industries. These methods were introduced in Japan at the end of the war and were eventually incorporated in Toyota’s thinking about standard work.

**1950s**

**Kanban and Supermarkets**
Taichi Ohno develops practical methods to implement Kiichiro Toyoda’s concept for just-in-time delivery of parts.

**1960s**

**Lean Management**
Under the leadership of Eiji Toyoda, the Toyota Motor Company gradually creates a management system with a new approach to problem solving, leadership, production operations, supplier collaboration, product and process development, and customer support.

**1960**

**Deming Prize**
The Japanese Union of Scientists and Engineers inaugurates the Deming Prize to encourage Japanese companies to embrace statistical quality control and Plan-Do-Check-Act.
1965
Quality as a Key Element of a Management System
Toyota wins the Deming Prize after a multiyear campaign to teach every manager how to solve problems using a scientific method based on W. Edwards Deming’s Plan-Do-Check-Act cycle.

1965
Mass Production Management
Alfred Sloan publishes My Years with General Motors to fully describe the manage-by-metrics system he developed at General Motors from the 1920s into the 1950s. This is just as Toyota emerges in world markets to become GM’s rival.

1973
Codifying TPS
Fujio Cho, Y. Sugimori, and others create the first Toyota Production manual for internal use.

1977
First Dissemination of TPS
Fujio Cho, Y. Sugimori, and others at Toyota publish the first article in English—in a UK engineering journal—explaining the logic of the Toyota Production System.

1979
First Academic Investigations
MIT launches the Future of the Automobile Program (which became the International Motor Vehicle Program in 1985) to study new methods of designing and producing products in Japan.

1982
Full Description of TPS
Yasuhiro Monden’s Toyota Production System is translated into English and published in the U.S. by the Institute of Industrial Engineers, providing the first description of the entire Toyota Production System to a global audience.

1983
Direct Diffusion
Toyota agrees to a joint-venture factory with General Motors—New United Motors Manufacturing (NUMMI)—near San Francisco to directly transfer TPS outside of the Japanese environment.
History of Lean, cont’d

1987
“Lean” Introduced
John Krafcik, a young researcher in the MIT International Motor Vehicle Program, proposes a label for the combination of production, product development, supplier collaboration, customer support, quality, and management methods pioneered by Toyota.

Late 1980s
Widespread Diffusion
A host of writers (Robert Hall, Richard Schonberger, Norman Bodek) and consultants (former members of the Toyota Autonomous Study Group such as Yoshiki Iwata and Chihiro Nakao) promote lean methods far beyond the Japanese auto industry.

1990
The Machine That Changed the World
Jim Womack, Dan Jones, and Daniel Ross write an explanation of the fulfillment, product design, supplier management, customer support, and global management system pioneered by the best Japanese companies and provide exhaustive evidence of the competitive superiority of the complete system.

1996
Lean Thinking
Jim Womack and Dan Jones provide a simple description of lean principles—value, value stream, flow, pull, and perfection—along with stories of companies beyond Toyota that are applying them successfully in North America, Europe, and Japan. The final section presents an action plan for any company to follow toward a lean transformation.

2007
Lean Global Network
Organizations around the world promoting lean thinking through publications, education, and research join forces in a new, non-profit organization to promote lean concepts more effectively.

2007
Lean as No. 1
For the first time Toyota passes General Motors to become the world’s largest motor vehicle producer and moves ahead as the world’s most consistently successful commercial organization of the preceding 50 years.
Principle of Lean

The five-step thought process for guiding the implementation of lean techniques is easy to remember, but not always easy to achieve:

• Specify value from the standpoint of the end customer by product family
• Identify all the steps in the value stream for each product family, eliminating whenever possible those steps that do not create value
• Make the value-creating steps occur in tight sequence so the product will flow smoothly toward the customer
• As flow is introduced, let customers pull value from the next upstream activity
• As value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced, begin the process again and continue it until a state of perfection is reached in which perfect value is created with no waste
Principle of Lean, cont’d

- Identify Value
- Map the Value Stream
- Create Flow
- Establish Pull
- Seek Perfection
Principle of Lean, cont’d

- **Muda:** Identify and Remove Waste
- **Mura:** Minimize Variability
- **Muri:** Standardized Process with Controls
Two Big Objectives of Lean

• Financial Return – Return On Investment
• Cultural Transformation
  – Driven to achieve strategy
  – Thrives on change and growth
  – Manages by fact
What is Six Sigma?

• Customer Quality
  – See it through the customer’s eyes
    • Timeliness, Accuracy, and Cost
  – Meeting and exceeding customer requirements is essential for long-term success

• Organizational Quality
  – Drive out waste and costs
  – Defects prevention is a cornerstone of Six Sigma
  – Eliminate variation: variation creates defects

• Results
  – Improve processes that are critical to business results
  – Measure success from a customer’s perspective
  – Strives for dramatic breakthrough results
Six Sigma and Lean Combined

- Six Sigma Focus is *Quality*
  - Project framework
  - Methodology (DMAIC)
  - Customer focused (customer pain)
  - Financially focused (financial impact)
  - Business process management
  - Defect reduction
  - Data based (management by fact)
  - Support infrastructure

- Lean Focus is *Speed*
  - Cycle time reduction
  - Process analysis
  - Elimination of waste
  - Rapid project execution
  - Error proofing

UCDASIS
ACCOUNTING AND FINANCIAL SERVICES
State of the Higher Education Sector

- One of the country’s major employers
- Revenue pressures
- Resources are stretched to the limit
- Quest for efficient operations and cost savings
- Large impacts of rapidly evolving technologies
- Heighten risk and compliance management
Brief State of UC Davis

- Large enterprise and UC System implementations
  - e.g. UC Path, HR Transformation
- Budget cuts
- Resource limitations
- Process complexity and challenges
- Decentralized and centralized operating structure
- Diversity in Business Model and Business Practices
Lean in Higher Education Sector

- University of California, Davis Medical Center – Lean
- University of Washington – Lean
- University of Michigan – Lean
- University of Iowa - Lean
- University of St. Andrews – Lean
- University of Wisconsin-Madison – Lean Six Sigma
- West Texas A&M University – Lean Six Sigma
Lean: Value Proposition for UC Davis

- Template for problem solving
- Promotes total involvement
- Help establish measures
- Make processes visible
- Obtain Voice of Customer (internal and external)
- Identify and reduce hidden costs
HOW TO IDENTIFY VALUE?
Identify Value through VOC

• Value is determined by the *customers* who want the right service with the right capabilities at the right price (on time, right the first time)

• Lean organizations (departments) work on making their processes right by eliminating waste – something no one wants to experience or pay for
Specifying Value through Questions

- What is the problem that impacts the customer (faculty, students, staff)?
- What is the problem that the team is going to take action on?
- Why is the project so important that UC Davis should address it?
- Why is the project (e.g. UC Path, Centralized Gift Processing, HR Transformation, Course Evaluations, Instructional Planning and Administration) being done?
- Do all the stakeholders understand and agree to the problem and its impact on administration and academic processes? Do they all agree that fixing it is critical for the university? Do they all support the project?
- Are the roles and responsibilities of the project team members clearly defined?
- Are the needs of the customers (faculty, students, staff) clearly identified?
- What’s in it for the customers (faculty, students, staff)? How do they benefit?
- What’s in it for the university and other stakeholders (grant sponsors, donors)? How does the university benefit?
- Were the key parameters or the most important thing to be fixed identified?
- Does everyone describe what will be measured in the same way?
- Can the primary metric be manipulated? How does it drive the right behavior?
- What can go worse as a result of the project?
- Where does the problem occur? Did the team identify it correctly? Did the team work on this particular issue to completion?
- What does success look like? How will success be quantified?
HOW DO I CREATE A VALUE STREAM?
Identifying the Right Process(es)

• Inter-department Processes
  – Staff Recruitment
  – Stipends and Equities
  – Procure to Pay
  – Grant Administration
  – Contract Administration
  – Academic Affairs
  – Academic Personnel

• Intra-department Processes
  – Accounting and Finance processes
  – IT Services – Desktop Support, Application Development, Asset Management, Case Management
  – Marketing and Communication
3 Categories of Process Activities

1. Process steps that definitely *create value*: In any academic or administrative process, the steps that are actually transforming the fit, form or function of the transaction and/or product, and bring it a step closer to the finished transaction and/or product.

2. Process steps that *create no value* but are necessary, due to current state of the system: In any transaction and/or product process, activities like inspection, waiting and some transportation steps.

3. Process steps that *create no value* and can be eliminated: Any activity that does not fall into the above two categories.
Muda: Identify and Remove Waste

Lean Six Sigma: 8 Wastes

- **Talent**: Underutilizing people’s talents, skills, & knowledge.
- **Inventory**: Excess products and materials not being processed.
- **Motion**: Unnecessary movements by people (e.g., walking).
- **Waiting**: Wasted time waiting for the next step in a process.
- **Transportation**: Unnecessary movements of products & materials.
- **Defects**: Efforts caused by rework, scrap, and incorrect information.
- **Overproduction**: Production that is more than needed or before it is needed.
- **Overprocessing**: More work or higher quality than is required by the customer.
7 Deadly Waste + 1

1. Overproduction. Producing items for which there are no orders, which generates overstaffing and storage and transportation costs because of excess inventory
2. Waiting (time on hand). Workers having to stand around waiting for the next processing step, tool, supply, part, etc., or having no work because of stockouts, lot processing delays, equipment downtime, and capacity bottlenecks
3. Unnecessary transport or conveyance. Carrying work in process (WIP) long distances, creating inefficient transport, or moving materials, parts, or finished goods into or out of storage or between processes
4. Overprocessing or incorrect processing. Taking unneeded steps due to poor tool and product design or providing higher-quality products than is necessary
5. Excess inventory. Excess raw material, WIP, or finished goods causing longer lead times, obsolescence, damaged goods, transportation and storage costs, and delay
6. Unnecessary movement. Any wasted motion employees have to perform during the course of their work, such as looking for, reaching for, or stacking parts, tools, etc. Also, walking is waste
7. Defects. Production of defective parts or correction. Repair or rework, scrap, replacement production, and inspection mean wasteful handling, time, and effort
8. Unused employee creativity. Losing time, ideas, skills, improvements, and learning opportunities by not engaging or listening to your employees
Identifying the Value Stream Questions

• Does the team understand how the whole process works?
• Did the team manage to complete a detailed process flow diagram at this stage?
• Did the team identify the waste in the process?
• Did the team follow kaikeku – the radical improvement approach?
• Were there any particular processes that did not support the customer (faculty, student, staff) need?
• Did the team make use of the knowledge and experience within the university administration and/or academic domain to establish this?
• What constraints/flow problems exist in the process that are hurting the university, department and/or division?
• Can the team quantify any difference in people, shifts and days causing hidden constraints/flow problems?
• Does the team know the causes of the constraints/flow problems?
• What impact on the university and customers are these constraints/flow problems causing?
• When will the team have enough information/data about the issues that could be causing the problem?
• Does the information reveal anything new about the problem?
• Did the team understand the type of problem that is being faced?
• Can the team state what the current performance of the process is?
• Is it clear yet what the university entitlement is from the process?
• Is there a need to go back and refine or change what was learned in the two value steps?
HOW DO I CREATE FLOW AND PULL?
Flow and Pull

- Flow is at the heart of the lean message that shortening the elapsed time from raw materials to finished goods (or services) will lead to the best quality, lowest cost, and shortest delivery time.
- Let the customer Pull Value.
Flow, cont’d

- Physically walk (go see, gemba) the process and write down the time/distance the product travels during its process flow. The non-value-added distances are eliminated by physical layout change, which involves both human and machine. Floors are laid out in cells rather than in functional groupings, which reduces the distance the parts travel in the process flow.
- **Implement 5S**, which is the basis for Lean manufacturing and the foundation for a disciplined approach to the clean workplace.
- The five steps of 5S are (in Japanese and English):
  - Seiri/Sort: Meaning sorting or segregating through the contents of the workplace and removing all unnecessary items.
  - Seiton/Straighten: Meaning putting or arranging the necessary items in their place and providing easy access by clear identification.
  - Seiso/Shine: Meaning cleaning everything, keeping it clean and using cleaning to inspect the workplace and equipment for defects.
  - Seiketsu/Standardize: Meaning creating visual controls and guidelines for keeping the workplace organized, orderly and clean, in other words, maintaining the seiso, or shine.
  - Shitsuke/Sustain: Meaning instituting training and discipline to ensure that everyone follows the 5S standards.
Flow, cont’d
Implementing Flow/Pull Questions

- How is the impact of customer (faculty, student, staff) demand on the process being translated or understood?
- Did the team physically visit the process to realize the process steps?
- Did the team identify the non-value-added distances traveled by parts?
- Did the team identify the movements and transportations?
- Have the hot spot(s) that are constraining the process been identified?
- What steps have been initiated to stabilize the constraints before the main improvement is made?
- Has the Lean team done enough to build 5S culture in the organization?
- Has the team taken the right steps to close the loop of each 5S step?
- Did the Lean team define the sequence of operation?
- Did the team manage to achieve the balance of operation times?
- What can be put in place to support the customer supply needs?
- How will this be managed through the business?
- How will the internal inventory needs be managed?
Kaizen

• Kaizen (Japanese for "change for the better" or "improvement", the English translation is "continuous improvement", or "continual improvement.")

• Tools, techniques, and metrics aside, Toyota's greatest emphasis is on thinking through problems and solutions. At Toyota, it is said that problem solving is 20% tools and 80% thinking
Ten Basic Rules to Kaizen

1. Discard conventional rigid thinking about production
2. Think of how to do it, not why it cannot be done
3. Do not make excuses. Start by questioning current practices
4. Do not seek perfection. Do it right away even if for only 50 percent of target
5. Correct mistakes at once
6. Do not spend money for kaizen
7. Wisdom is brought out when faced with hardship
8. Ask "Why?" 5 times and seek the root cause
9. Seek the wisdom of ten people rather than the knowledge of one
10. Remember the opportunities for kaizen are infinite
Kaizen

1. Initial Problem Perception
   (Large, vague, complicated problem)

2. Clarify the Problem
   The “Real” Problem

3. Locate Area/Point of Cause

Grasp the Situation

Cause Investigation

Why?
Why?
Why?
Why?
Why?

POC

   Basic Cause and Effect Investigation

Direct Cause
   Cause
   Cause
   Cause
   Cause

Root Cause

5. Countermeasure

6. Evaluate

7. Standardize
WHAT NEXT?
Lean Action Plan: Getting Started

• Find a change agent, a leader who will take personal responsibility for the lean transformation
• Get the lean knowledge, via a sensei or consultant, who can teach lean techniques and how to implement them as part of a system, not as isolated programs
• Find a lever by seizing a crisis or by creating one to begin the transformation. If your company currently isn’t in crisis, focus attention on a lean competitor or find a lean customer or supplier who will make demands for dramatically better performance
• Forget grand strategy for the moment
• Map the value streams, beginning with the current state of how material and information flow now, then drawing a leaner future state of how they should flow and creating an implementation plan with timetable
• Begin as soon as possible with an important and visible activity.
• Demand immediate results
• As soon as you’ve got momentum, expand your scope to link improvements in the value streams and move beyond the shop floor to office processes
### Lean Action Plan: Getting Started, cont’d

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<td>Establish a sense of urgency: Examine market realities; identify and discuss major crises and opportunities.</td>
<td>Develop/communicate vision and strategies: Create a vision to help direct transformation; develop strategies for achieving vision. Communicate vision and strategies; model the right behavior. Generate short-term wins: Create visible wins in performance; recognize and reward people who made the wins possible.</td>
<td>Roll out standard work systematically: Use the kaizen method to systematically transform healthcare operations. Confront obstacles: Get rid of obstacles. Change systems or structures that undermine change; encourage risk-taking and nontraditional ideas and actions.</td>
<td>Monitor the change; reinvigorate the process: Monitor the change; ensure adherence to new methods. Spread change to support operations and suppliers. Change systems that don’t fit the transformation vision. Hire, promote and develop people who can implement change. Reinvigorate the process with new projects, themes and change agents.</td>
<td>Anchor new approaches in the culture: Create better performance through customer- and productivity-oriented behavior, better leadership and more effective management. Articulate the connections between new behaviors and organizational success. Develop means to ensure leadership development and succession.</td>
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