Sustainability
Module 8.5

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These materials were developed as part of MIT's ESD.60 course on "Lean/Six Sigma Systems." In some cases, the materials were produced by the lead instructor, Joel Cutcher-Gershenfeld, and in some cases by student teams working with LFM alumni/ae. Where the materials were developed by student teams, additional inputs from the faculty and from the technical instructor, Chris Musso, are reflected in some of the text or in an appendix

Overview

- Learning Objectives
  - Describe the sustainability of Lean/Six Sigma implementations
  - Describe the use of Lean/Six Sigma to sustain (and improve) processes and business models

- Session Design (20-30 min.)
  - ***Part I:*** *Introduction and Learning Objectives (1-2 min.)*
  - ***Part II:*** *Key Concept or Principle Defined and Explained (3-5 min.)*
  - ***Part III:*** *Exercise or Activity Based on Field Data that Illustrates the Concept or Principle (7-10 min.)*
  - ***Part IV:*** *Common "Disconnects," Relevant Measures of Success, and Potential Action Assignment(s) to Apply Lessons Learned (7-10 min.)*
  - ***Part V:*** *Evaluation and Concluding Comments (2-3 min.)*

Sustainability…

- What does sustainability mean to you?

Three Perspectives on Sustainability

- Sustainability of a lean implementation initiative
- Sustainability of a product/service
- Sustainability of the environment

All have common "lifecycle" perspective

How Do We Implement Lean/Six Sigma in a Sustainable Way?

- Leadership
  - Top-down reinforcement
    - Training
    - Involvement
    - Establish lean as corporate culture, not as a "flavor-of-the-month" initiative
- Process Design
  - Involve key stakeholders in implementation
  - Have diverse representation in team—operators, managers, finance, logistics, manufacturing, etc.

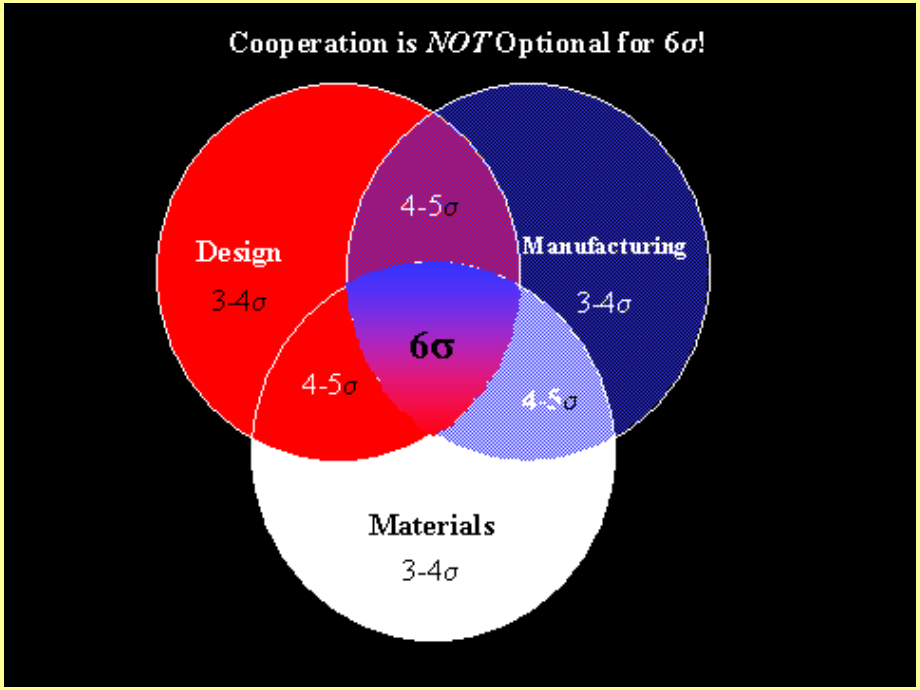
How Do We Implement Lean/Six Sigma in a Sustainable Way?

- Employee Buy-In
  - Attainable goals established and met
  - Measurable successes for employee in program
  - Rewards-both financial and work related

The work force is predominantly dissatisfied with their employers, given corporate downsizing, reduced benefits, and increasing working hours the last few years. The Gallup organization found that only 26% of employees consider themselves "actively engaged" in their work.

How Does Lean/Six Sigma Sustain the Business?

- Product Development
  - Helps to develop more capable processes.
  - Feeds high quality and manufacturable products into the factory.
  - Shortens product development time.
  - Defines product line in terms of customer value.
  - Allows quicker response to changing market demands and customers tastes



- Logistics
  - Reduces inventory requirements.
  - More adaptable to market changes.

How Does Lean/Six Sigma Sustain the Business?

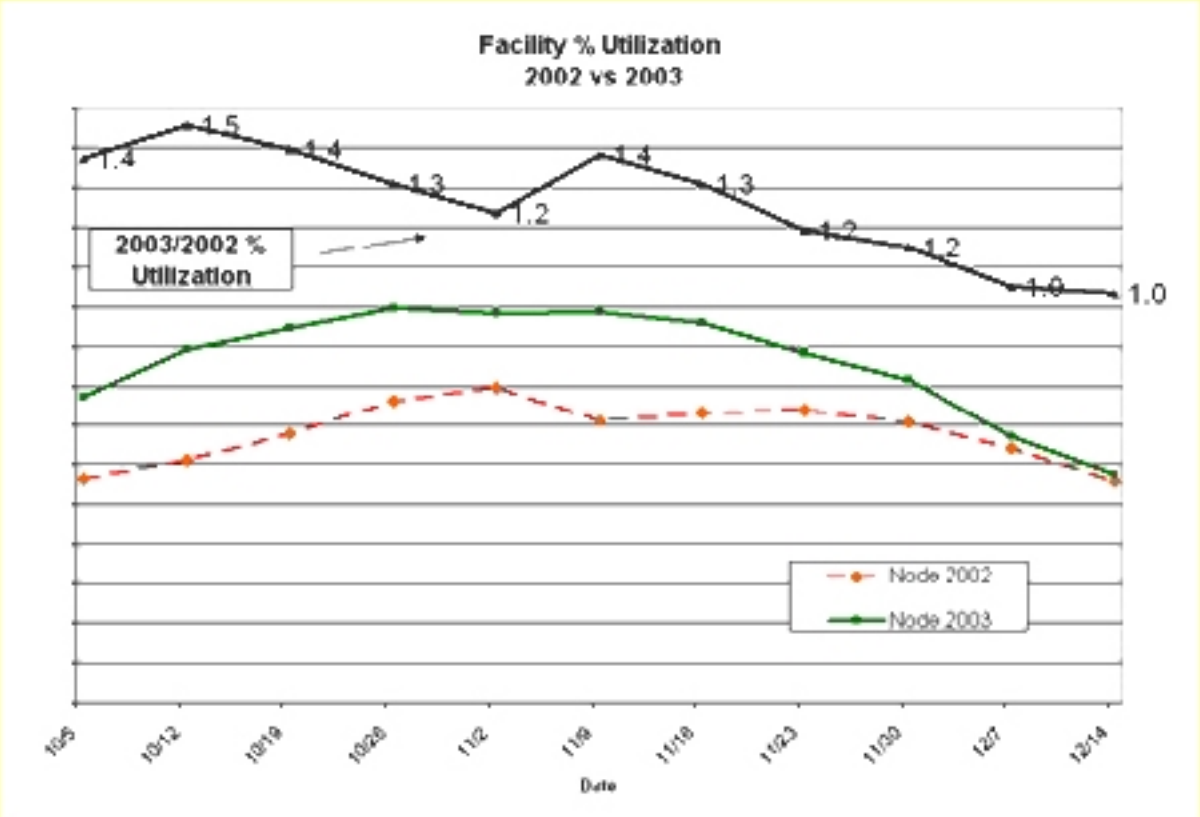
- Supply Chain
  - Failure analysis drives root cause corrective action.
  - Shared knowledge / efficiency gains.
  - Common goals.
  - Preserves supplier relationships.
  - Better SC visibility.
  - Example: Toyota, who builds tight financial and managerial relationships with its suppliers.
- Resources
  - Minimizes waste
  - Frees wasted capacity useful for supplying additional demand or adding new products
  - Retains employee knowledge
  - Preserves environmental resources

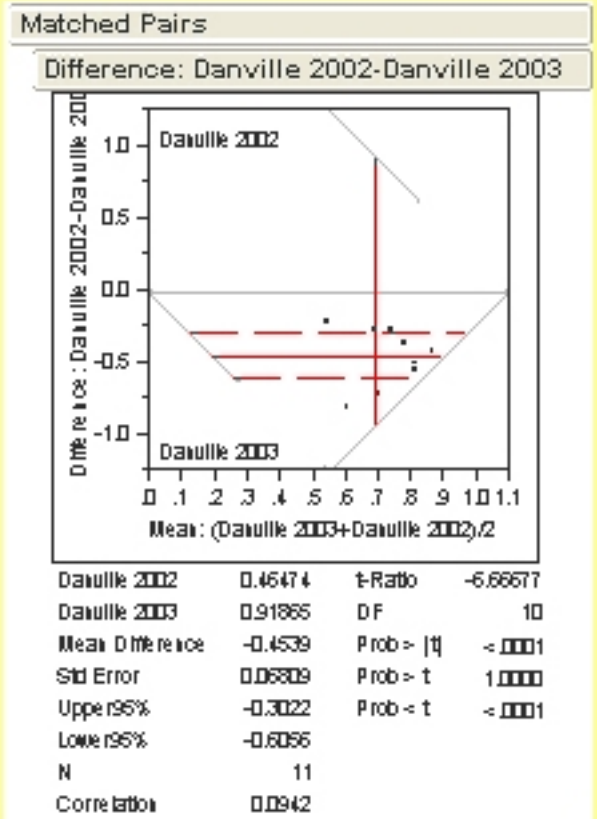
One interesting note on resources…many lean plants have higher pollution than their mass-production peers, partially because they are hesitant to adopt expensive remediation technologies before trying to incrementally improve their processes. Consequently, they are more apt to use "management" controls versus "engineering" controls.

Amazon Example: Space Utilization in Offsite Storage

- The project goal was to better utilize expensive off-site storage by more efficiently using the available space. The performance measure used was (Ft^3 used / Ft^3 available)
- The project standardized pallet packing and implemented a new database for tracking the materials stored
- First year savings were estimated at greater than $500K by avoiding the need to purchase additional storage space

Amazon Example: Space Utilization in Offsite Storage, cont.





Statistics show that there is greater than 95% certainty that the 2003 trend was a result of the project implementation, and not an outcome of random chance.

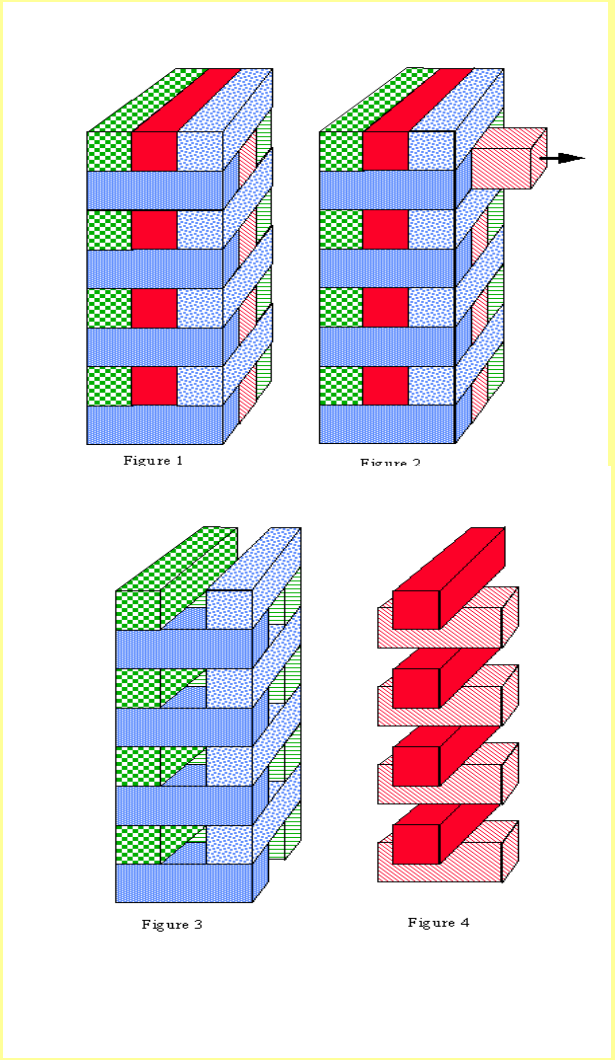
Data courtesy of Michael Miller, Amazon.com.

Sustaining Your Operation

- Your “Operation” will be modeled as a Jenga game.
  - The goal is to “lean” your operation in a sustainable way, by removing and setting aside as many blocks as possible.
  - Once a block is removed, it will not be placed back on top.
  - At least one block from each layer must be left standing.
  - If you tip over your “Operation” your company is doomed.
- The class will divide into three groups
  - Group 1 cannot talk, motion, send smoke signals, or communicate in any other way. Each person in the group can only remove one block.
  - The other two groups can talk, work out strategy, and implement in any way they see fit; however, more detailed directions should be read by each of these groups.

The “Ideal” End Results

- Starting from Figures 1&2, blocks are removed top down—to add stability to the process.
- Figure 3 shows one “Ideal” result. In this case, the process is leaner than it began, but the end result is still stable, and was relatively easy to achieve.
- Figure 4 shows another “Ideal” result. In this case, the process is leaner, but may prove unstable in the long run. More risks were taken to achieve it.



Operational Learnings

- What did your group learn from this?
- Our team learnings:
  - Open communication makes for a much more robust process
  - Clear, achievable goals make for a better end result
  - In an early implementation, it is probably better to choose a plan that has a high chance of success and will still show improvement than to implement the highest risk plan right away.

Common Disconnects

Technical Factors

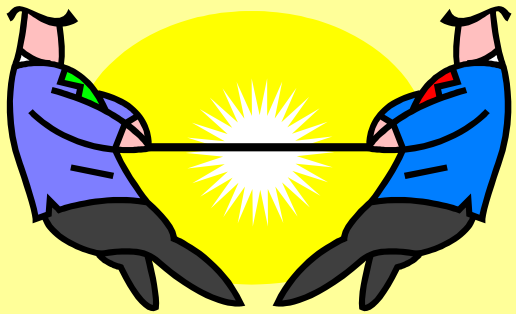
- **Scenario:**
  6σ Black Belt – Systems Refrigeration
  GE Consumer & Industrial

- **Problem:**
  * Objective – Minimize shipping damage in distribution network
  * Projects distributed by management
  * No knowledge-driven activities among employees in prioritizing customer Y
  * An alternative project may have yielded better results with fewer resources

Social Factors

- **Role Distinction & Awareness:**
  * Performance metrics & responsibilities
  * Black Belts vs. Green Belts

- **Employee Buy-in:**
  * Old vs. Young generation
  * Entrenched attitude/mindset
  * Existing culture & ways of thought



Examples from the Real World

- An attempt at 5S was attempted at a plant in a large consumer products company. It failed because:
  - No background was ever given as the reason it was being implemented. Why? Because we said so.
  - Leadership support consisted of random audits (of cubicles—not shops or control room) which were promptly round-filed by the recipient of the audit.
  - No one in the plant was consulted before the program was started—and no results were shared. So there was no incentive to support the program.

Measuring Sustaining Efforts

- Process
  - Quantity of Kaizens
  - Capacity/Resources freed up
  - Variance
    - X Bar, R, CPK
- Business
  - New model cycles
  - Inventory turns
  - Cash flow
  - Stock price

Concluding Comments

- Sustainability can mean many different things to different people
- A SUCCESFUL Lean/Six Sigma implementation requires:
  - Planning
  - Leadership Support
  - Employee Buy-In
- Lean/Six Sigma can help sustain:
  - Product Development
  - Logistics
  - Supply Chain
  - Resources

Appendix: Instructor's Comments and Class Discussion

- Long-term sustainability is very broad including:
  - Sustainability of a lean implementation, with issues of leadership turnover, follow-through in improvement suggestions, mitigation against destabilizing events, etc.
  - Sustainability of a product/service, attending to issues of end-of-life use, recycling, etc.
  - Sustainability of the environment, with issues of prevention, packaging, etc.
- Lean principles can be applied in each situation
- Metrics should be carefully considered
- Sustainability is a mindset, not a list of things to do – just like lean

Appendix: Instructor's Guide

Slide	*Time*	*Topic*	*Additional Talking Points*
1-2	2-3 min	Introduction, overview and learning objectives	• Focus on two main points of Sustainability—how to use Lean to sustain the business, and how to sustain Lean in the business
3	3-5 min	Key Concepts	• Ask the class to determine what Sustainability means to them…there are dozens of good answers to this question, depending on the situation.
4-5	3 min	Implementing Lean	• Cover information on slides.
6-7	4-5 min	Building the business	• Cover information on slides. Weave in relevant instructor examples if possible
8-9	2-3 min	Amazon Example	• See example information on slides. This is data from an actual project.
10-11	1-2 min	Game	•Group 2 should try to make the tower as lean as physically possible. Group 3 should make the tower lean, but more stable.
12-14	4 min	Application and Disconnects	• Cover information on slides.
15	2 min	Measurement	•Discuss with class the metrics that can be used to track the success of sustainability
16	1 min	Conclusion	•Cover information on slide.

Bibliography

- Venn diagram from: http://www.pyzdek.com/sixsigmafaqs_files/image004.gif (6/24/04)
- Jenga game and illustrations from: http://isis.csuhayward.edu/ALSS/Geography/mlee/game.html (6/24/04)
- Information on employee involvement (Gallup Poll) from: http://www.isixsigma.com/library/content/c020624a.asp (6/24/04)
- Information from Amazon.com, care of Michael Miller, MBB, (6/26/04)