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Adding Lean and Six Sigma to Your Ergonomics Toolkit

Lean Yellow Belt
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Six Sigma Yellow Belt
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What is Lean?

The relentless pursuit of the perfect process through waste elimination...

We Spend 75-95% of Our Time Doing Things That Increase Our Costs and Create No Value for the Customer!

Whether building a car or providing healthcare for a patient, workers must rely on multiple, complex processes to accomplish their tasks and provide value to the customer or patient. Waste — of money, time, supplies, or good will — decreases value.
Objectives

Objectives for Lean Yellow Belt

• Learn about the Foundation and Framework of Lean
• Comprehend the Principles of Lean
• Be able to Identify and Eliminate Waste
• Be able Use and Utilize Lean Tools, Techniques and Methods
The House of Lean

- **Hoshin Kanri** (Policy Deployment)
- **JIT** (Just In Time)
  - Kanban (Supermarket)
  - SMED/SUR Changeover
  - Takt Time
- **Jidoka** (Autonomation)
  - People
  - Flow
  - Andon (Line Stop)
- **People**
  - Kaizen
  - 5 Whys
  - A3
  - 5S (Stability)
  - Visual Management
  - Quality Tools
  - Standard Work (Standardization)
  - Continuous Improvement

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Note: C/T = cycle time; C/O = change-over time; EPE = every part every ____
Spaghetti Diagram Examples

Before

Representation of the location of activities or operations and the flow of materials between activities on a pictorial layout of a process. (Used in conjunction with a flow chart.)

After
Moving to Flow and Continuous Flow

**BATCH & QUEUE PROCESSING**

- Process A
  - Lead Time: 10 Minutes
  - Lead Time: 30+ min. for total order
  - Lead Time: 21+ min. for first piece

**CONTINUOUS FLOW PROCESSING, ONE PIECE FLOW**

- Process A
- Process B
- Process C
  - Lead Time: 12 min. for total order
  - Lead Time: 3 min. for first piece
The World of Lean Enterprise

- Problem Solving
- Standardized Work
- Lean Enterprise
- Lean Layout
- Total Productive Maintenance
- Error Proofing
- Kanban
- 5S / Visual Factory
- Quick Changeover
1. Current State
2. Identify Waste and Needed Changes
3. Future State
4. Design, Plan, Implement

Transformation Cycle

Step #1: Current State
Step #2: Identify Waste and Change
Step #3: Create Future State
Step #4: Design, Plan Implement

Waste & Change
Lean Supports Improvement by Attacking Waste – “TIMWOOD”

Lead time can only be minimized by the elimination of the Seven Types of Waste (Muda)

1. **Transportation** (moving material/product from one place to another)
2. **Inventory** (material/product waiting to be processed)
3. **Motion** (excess movement and/or poor ergonomics)
4. **Waiting** (delays caused by shortages, approvals, downtime)
5. **Overproduction** (producing more than is needed)
6. **Over processing** (adding more value than the customer is willing to pay for)
7. **Defects/Rework** (correcting mistakes)
   
    *Also Skill or People – unused or under-utilized talents*
Two Workplaces, Two Ways of Communicating

Hidden Workplace

We Need 75 Drums

Visual Workplace

<table>
<thead>
<tr>
<th>Batch #</th>
<th>4370168</th>
</tr>
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<tbody>
<tr>
<td>Due</td>
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<tr>
<td>Completed</td>
<td>50 Drums</td>
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75 Drums

Completed 50 Drums
Visual Management
# 5S Steps and Meanings

<table>
<thead>
<tr>
<th>Step</th>
<th>Japanese</th>
<th>English</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_1$</td>
<td>Seiri</td>
<td>Sort</td>
<td>Organize essential from unneeded, eliminate the unneeded, prioritize the rest.</td>
</tr>
<tr>
<td>$S_2$</td>
<td>Seiton</td>
<td>Straighten</td>
<td>Arrange neatly in such as way as to make the work flow with no waste.</td>
</tr>
<tr>
<td>$S_3$</td>
<td>Seiso</td>
<td>Shine</td>
<td>Clean items and work space and clean again before each shift.</td>
</tr>
<tr>
<td>$S_4$</td>
<td>Seiketsu</td>
<td>Standardize</td>
<td>Standardize the work/processes through-out the organization.</td>
</tr>
<tr>
<td>$S_5$</td>
<td>Shitsuke</td>
<td>Sustain</td>
<td>Institute the 5 S practices as a part of the culture.</td>
</tr>
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</table>
Kanban

Conceptual diagram of the Kanban System

Operational Flow of Production
Instruction Kanban

1. Production instruction kanban A is removed when an operator retrieves parts.
2. Only the exact number of parts indicated on the kanban are produced.
3. The kanban is attached to the newly produced parts, ready for the next process.

Operational Flow of Parts
Retrieval Kanban

1. The parts retrieval kanban is removed when an operator uses parts.
2. The operator carries the kanban to retrieve replacement parts.
3. The operator removes the production instruction kanban and replaces it with a parts retrieval kanban.
4. Parts displaying the parts retrieval kanban are transported to the next process.

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Push Systems vs Pull Systems

A customer controlled system that utilizes signals to authorize replenishment of material.

- Large lots, high inventory
- Poor product availability
- Problems hidden
- Waste
- Poor communication
  - "Make all we can just in case we need it"

- Small lots, lower inventory
- Better product availability
- Problems visible
- Much less waste
- Good communication
  - "Make what we need when we need it"
<table>
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<tr>
<th>PDCA</th>
<th>DMAIC</th>
<th>A3</th>
<th>8D/PSP</th>
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<tbody>
<tr>
<td>Plan</td>
<td>Define</td>
<td>Clarify the Problem</td>
<td>1. Create Team &amp; collect Information</td>
</tr>
<tr>
<td></td>
<td>Measure</td>
<td>Break down the Problem</td>
<td>2. Describe the Problem</td>
</tr>
<tr>
<td></td>
<td>Analyse</td>
<td>Set a Target</td>
<td>3. Define Containment Actions</td>
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<tr>
<td></td>
<td></td>
<td>Analyze the Root Cause</td>
<td>4. Analyze the Root Cause</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop Countermeasures</td>
<td>5. Define possible corrective Actions</td>
</tr>
<tr>
<td>Do</td>
<td>Improve</td>
<td>See Countermeasures</td>
<td>6. Implement corrective Actions</td>
</tr>
<tr>
<td>Check</td>
<td>Control</td>
<td>Evaluate Results &amp; Processes</td>
<td>7. Define Actions to avoid Recurrence</td>
</tr>
<tr>
<td>Act</td>
<td></td>
<td>Standardize Success</td>
<td>8. Congratulate your Team</td>
</tr>
</tbody>
</table>
Leading Change: The 8 Steps (Dr. John Kotter 1995)

1. Establish a Sense of Urgency: Crisis, Dream, Events, Leader
2. Form a Powerful Guiding Coalition: Leadership Team
3. Communicate the Vision: Communication, Execution
4. Empower Others to Act on the Vision: Empowerment
5. Plan for and create Short –Term Wins: Quick wins
6. Consolidate Improvements, Produce More Change
7. Institutionalize New Approaches: Standardize
   - Many change agents. Not just a few appointees.
   - A want-to, and a get-to. Not just a have-to mindset.
   - Head and heart. Not just head.
   - Much more Leadership. Not just more Management.
   - Two systems. One organization.
The House of Lean

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(Policy Deployment)

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- Takt Time

**Jidoka**
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- Kaizen
- 5 Whys
- A3
- Poka-Yoke
  (Fail-Safe)
- Andon
  (Line Stop)
- PDCA

**People**
- 5S (Stability), Visual Management, Quality Tools,
- Standard Work (Standardization), Continuous Improvement

**The House of Lean**
Objectives:
At the conclusion of the course, participants will be able to:

- Use concepts and terminology of Six Sigma, quality management and continuous improvement
- Utilize fundamental methods of Six Sigma, including DMAIC and SPC
- Formulate an implementation of Six Sigma in the organization
- Explain the benefits of implementing a Six Sigma program
Six Sigma Defined

- **Six Sigma (σ)** is a customer focused, well defined problem solving methodology supported by a handful of powerful analytical tools.
- **Continuous improvement** is driven by the execution of carefully selected projects. The goal of the Six Sigma approach is to take small steps forward and no steps backward.
Customer Supplier Relations

The purpose of all six sigma work and all improvement efforts is to better serve customer needs and expectations thereby providing increasing value to the customers and ensuring repeat business.
For Six Sigma to be Effective

a. There must be processes in place
b. The processes must be brought into control statistically
c. The processes must be improved (by reducing variation and defects)

“Six Sigma Mantra”
SIPOC Model

**Suppliers**

**Inputs**

**Process**

**Outputs**

**Customers**

**Steps**

**Inform Loop**
Types of Variation

Common Cause
Refer to situations, usually within those systems and processes that are more ongoing, chronic, and persistent.

Special Cause
Refer to sentinel events, one-time occurrences, or other unique out-of-the-ordinary circumstance.
About Variation

- **Special Cause**
  - Find special causes and address
  - Those closest to the process are most likely to find the special causes of variation

- **Common Cause**
  - Take action on the system
  - Management is responsible for the system
Control

A process is said to be in statistical control when, through the use of past experience, we can predict how the process will vary in the future.
Process Monitoring

In order to monitor any process effectively there are several pieces of information that must be known:

- Central location
- Spread
- Shape
- Relationship of variation to time
Process Monitoring

- Process monitoring is performed to determine the type and amount of variation that is present in a process as time goes by.
- The two types of variation are:
  - Common Cause
  - Special Cause
Implementation Strategy

- Top Management Support and Participation
- Project Identification
- Resource Allocation
- Data Based Decision Making
- Measurement and Feedback
Six Sigma has used the language:

- Steering Committee
- Champion
- Yellow Belt/White Belt
- Green Belt
- Black Belt
- Master Black Belt
- Master Black Belt Trainer
Yellow Belts

- Yellow Belts are individuals who have been introduced to the basic concepts and methods of six sigma.
- The objective of Yellow belt training is to introduce the language of six sigma.

Some organizations use different colors for this overview training.
Steering Committee

- Identifies projects
- Identifies black belts
- Allocates resources
- Monitors progress
- Reviews effectiveness
- Establish implementation strategy and policies
Champions

- Key management personnel who provide support, resources, and encouragement for the process
- Champions require a more in-depth understanding of the methods used, especially the measurements and the interpretation of the process measurements
Process Owner

- A **process owner** is the individual who has the ultimate authority to change a process.

- The process owner should be identified for every project or task that is entered onto an organizational metric tracking system.

- The process owner:
  - Monitors the performance of his/her process through key indicators
  - Works with all Six Sigma project teams in the area to enable them to successfully complete their projects
  - Manages the process after completion to the Six Sigma project to sustain the gains made.
  - Continues to improve and/or innovate the process through the application of the PDCA cycle.
Six Sigma has used the organizational titles:

- Steering Committee
- Champion
- Yellow Belt or White Belt
- Green Belt
- Black Belt
- Master Black Belt
- Master Black Belt Trainer
- Process owner
Six Sigma involves a series of steps designed to lead the organization through the gauntlet of process improvement. Major steps include:

- Define
- Measure
- Analyze
- Improve
- Implement
- Control (Standardize and Validate)
Six Sigma Yellow Belt

DMAIIC Overview

**DEFINE THE OPPORTUNITY**
- Improve on what matters most to the client
- Significantly impact the bottom line

**MEASURE THE CURRENT PERFORMANCE**
- Map the process, gather initial performance data and determine current “Sigma” level
- Obtain client input, factors Critical to Quality (CTQ)

**ANALYZE THE CURRENT PROCESSES**
- Perform cause-effect analysis to determine reasons for gaps in performance
- Determine breakthroughs, design future state: new process, new “Sigma” level
- Create dashboards, scorecards and plans

**IMPROVE PROCESS EFFICIENCY**

**IMPLEMENT IMPROVEMENTS**
- Execute plans, overcome barriers
- Transition to the new process

**CONTROL AND ADJUST NEW PROCESSES**
- Measure improvements and breakthroughs
- Report dashboard, scorecard data and client feedback

**CLIENT DRIVEN, CONSISTENT, METRICS FOCUSED, RESULTS ORIENTED**

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Six Sigma Project Characteristics

- Clearly connected to business priorities
- Linked to strategic and annual operating plans
- The project is of major importance to the organization
- Represents a major process improvement in performance
- Represents major financial improvement
- Reasonable scope (3-6 months)
- Defines quantitative measures of success
- Baseline and goals are well defined
- Importance is clear to the organization
- Support and approval of management
Project Structure

- Major Projects led by black belts
- Project teams include stakeholders including finance (many of whom are Green Belts)
- Each project has a champion
- Initially ‘outside’ expertise (often called a subject matter expert) may be required to assist with the analysis
- Problem statement
- Quantifiable and measurable objectives
- Achievable
- Supportive of business requirements
- Addresses critical customer needs
- Tangible or Financial payback (e.g. reduction in the cost of poor quality)
For Six Sigma to be Effective

a. There must be processes in place
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“Six Sigma Mantra”
Agenda for the Six Sigma Yellow Belt at the Applied Ergonomics Conference 3/26/18

- Section 1
  - Six Sigma Process
  - Six Sigma Objective
  - Six Sigma Approach

- Section 2
  - Six Sigma Implementation

- Section 3
  - DMAIIC

- Section 4
  - Six Sigma Structure
  - Roles and Responsibilities

- Section 5
  - Six Sigma Projects

- Section 6
  - Variation

- Section 7
  - Histograms

- Section 8
  - Control Charts

- Section 9
  - Root Cause Analysis

- Section 10
  - Case Study
Jasbir and Rich are looking forward to seeing you at the AEC in Atlanta this March!

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http://www.iise.org/AEC/
Your Questions?
Thank You!

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