How to Achieve Superior Performance Improvement by Integrating Constraints Management with Lean and Six Sigma

Examples from Government, Public Services and Healthcare

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October 24, 2013, Vilnius
Agenda

- Why integrate Lean Six Sigma and Constraints Management?
- Where to Focus Performance Improvement efforts?
- Examples from Government, Public Services, and Healthcare
- Recap - Top reasons for using Constraints Management with Lean Six Sigma
An implementer of today’s most powerful performance improvement and project management methodologies.

Core Competencies:

- Performance improvement for organizations, programs and project portfolios in the public sector, military, healthcare, and maritime industries.
- Capturing emerging management methodologies from various industries and global markets and helping our clients to adopt them.
- Transferring knowledge and skills to deliver self-sufficiency to our clients.
What is the Capacity of the System?

Demand: 10 units/hr

A  
26 units/hr

B  
13 units/hr

C  
22 units/hr
A system is “not the sum of its parts. It is the product of parts’ interactions.”
- Russell L. Ackoff

“Organizations live or die as integrated systems, NOT as a collection of discrete, independent processes.”
**Integration of Best Practices**

**Complementary Features**

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**Lean** – a rapid and simple approach to drive non-value added activities, or waste, out of processes.

**Six Sigma** – a rigorous, data-driven problem-solving method that is used to reduce variation and defects to achieve near-perfect quality.

**Constraints Management** – a systematic approach to managing complex organizations by identifying and controlling key leverage points within the system or process.

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**Focusing on what is critical to the organization**
the Right Problem – the Right Time – the Right Tool
Testimony

- “It is not always about a process and looping all those processes together and fixing a piece and putting it together with another piece”
- “If you don’t deal with the system and the issues that are going on within the system and the conflicts that exist, you are never going to get to the root cause and really be able to make a difference.”
- “This is an experience that I am totally shocked at the outcome.”
- “This is by far the best event yet!”
Three Windows

- **The Constraints Management window:** looking at the forest and selecting the best tree to pick the fruit from.

- **The Lean window:** the simplest way to pick the low hanging fruits as well as the fruits on the floor with very little effort.

- **The Six Sigma window:** how to consistently pick the bulk of the sweeter fruits, without bruising them, at higher, difficult to reach branches of the tree.
## Complementary Methodologies

### Purpose
- **Constraints Management**: Helps focus improvement efforts on areas of maximum impact.
- **Lean**: Emphasizes improved flow via streamlined process efficiencies.
- **Six Sigma**: Emphasizes predictability, measurement, and control of key process metrics.

### Focus
- **System Constraint**: Maximizing throughput of the primary process bottleneck.
- **Flow**: Creating smooth process flow.
- **Control**: Decreasing rework and reducing variation.

### Application Guidelines
<table>
<thead>
<tr>
<th>Constraints Management</th>
<th>Lean</th>
<th>Six Sigma</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focusing Steps</strong></td>
<td><strong>Creating Value</strong></td>
<td><strong>Reducing Variation</strong></td>
</tr>
<tr>
<td>1. Identify constraint</td>
<td>1. Specify value</td>
<td>1. Define</td>
</tr>
<tr>
<td>2. Squeeze constraint</td>
<td>2. Identify value stream</td>
<td>2. Measure</td>
</tr>
<tr>
<td>3. Subordinate everything to the constraint</td>
<td>3. Improve flow</td>
<td>3. Analyze</td>
</tr>
<tr>
<td>5. Repeat</td>
<td>5. Pursue perfection</td>
<td>5. Control</td>
</tr>
<tr>
<td>6. Replicate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Goal Tree for Performance Improvement

High Impact Superior Performance Improvement

In order to have...

Goal (Objective)

I must have...

Critical Success Factors

Improvement Focusing Strategy

Waste Reduction Strategy

Variation Reduction Strategy

In order to have...

I must have...

Necessary Conditions

Process to Identify System Constraint

Process to Identify Waste in the System

Process to Identify Variation in the System

Working Knowledge of Constraints Management

Working Knowledge of Lean

Working Knowledge of Six Sigma

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Focusing Steps of Constraints Management

1. **Identify** the constraint
   - Or control point / leverage point

2. **Squeeze** the most out of the constraint without spending money

3. **Synchronize/subordinate** the system to the constraint

4. **Elevate** the constraint
   - Often by spending money

5. **Repeat**
Value Stream Analysis (VSA)

- A Lean tool that allows an organization to:
  - Define the entire value stream.
  - Identify value-added procedures and bottlenecks.
  - Eliminate non-value-added activities.
  - Arrange steps for continuous flow.
- Effective when used at the right time, for the right purpose.

Criteria for Non-Added Value Work

1. Moves the *thing* through the process and changes it.
2. The *customer will pay* for it.
3. It is done *right the first time.*
Where is the constraint in this process?

- If we wanted to improve the throughput of this process, we must focus on its weakest link.
<table>
<thead>
<tr>
<th>Waste</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport</strong></td>
<td>Moving material or information</td>
</tr>
<tr>
<td><strong>Inventory</strong></td>
<td>Having more material or information than you need</td>
</tr>
<tr>
<td><strong>Motion</strong></td>
<td>Moving people to access/process material or information</td>
</tr>
<tr>
<td><strong>Waiting</strong></td>
<td>Waiting for material or information, or material or information waiting to be processed</td>
</tr>
<tr>
<td><strong>Over-Production</strong></td>
<td>Creating too much material or information</td>
</tr>
<tr>
<td><strong>Over-Processing</strong></td>
<td>Processing more than necessary to achieve the desired output – too much paperwork</td>
</tr>
<tr>
<td><strong>Defects Requiring Rework or Scrap</strong></td>
<td>Errors or mistakes causing rework to correct the problem</td>
</tr>
</tbody>
</table>
What is the DMAIC Roadmap?

D: Define the business issue.
   “What is the pain?”

M: Measure the process.
   “How bad is the pain?”

A: Analyze the data. Verify root causes of variation.
   “What is the root cause of the pain?”

I: Improve the process.
   “Which solution will eliminate the pain?”

C: Control the process. Sustain improvements.
   “How do we make sure the pain will not return?”
The Best of the Breed

- Robust Design
  - Greenfield
  - Revitalization
  - New Heights
- Transitions strategic planning to tactical focus
- Integrates effective continuous process improvement approaches
- Recognizes organization-specific needs and preferences
Selection Tree

1. **System Value Stream Analysis**
2. **System Constraint Analysis**
3. **Strategic Gap Analysis**

**Problem / Opportunity Identified**

- **Is it a Flow Issue?**
  - **Yes**
    - **Solution Known?**
      - **Yes**
        - **Process Value Stream Analysis**
      - **No**
        - **Quick Hit or CM Solution**
  - **No**
    - **Root Cause Known?**
      - **Yes**
        - **Rapid Improvement Workshop**
      - **No**
        - **Six Sigma/DMAIC or CM Solution**
Example: Texas Workforce Commission

- Work Opportunity Tax Credit Program
  - # of applications exceeds capacity to make determinations in a timely manner

- The goal is to increase the number of applications processed & reduce the amount of time in days to process applications …
The ASQ Hospital Lean Six Sigma Study (2009)
- Survey of 77 Hospitals
- First study to investigate the implementation of Lean & Six Sigma in U.S. hospitals.
- 53% report some level ("minor," "moderate" or "full") of lean deployment
- 42% report some level of Six Sigma deployment.
- Few hospitals report "full deployment" of either Lean (4%) or Six Sigma (8%).

TOC is not well known in US hospitals
- Air Force Medical Service (1992)
- Univ. of Michigan Hospital (1996)
- Emory University Hospital (2009)
- DMC Detroit Receiving Hospital (2009)

TOC Applications Around the World: South Africa, New Zealand, Israel, UK, Singapore, Japan, Turkey, Netherlands

"It is remarkable how popular the TOC is in the Dutch health care...If a hospital has a process improvement methodology applied, then one third chooses TOC ... TOC is significantly more popular in hospitals than in manufacturing!"
Healthcare Example: Door to Balloon Time

- Decreased door to balloon time will improve patient outcomes as measured by quality metrics.
- In an ideal state, there is no waste…no waiting, no searching for supplies, no excess transport time, etc.
- The patient arrives, transported to an ED room and examined by the doctor.

- In the real world, waste does exist so we must minimize the waste to create a future state.
Example: Door to Balloon Time
Interference Diagram

What you want more of? (Your Goal)

- Interference #16 Time lost
- Interference #17 Time lost
- Interference #18 Time lost
- Interference #19 Time lost
- Interference #1 Time lost
- Interference #2 Time lost
- Interference #3 Time lost
- Interference #4 Time lost
- Interference #5 Time lost
- Interference #6 Time lost
- Interference #7 Time lost
- Interference #8 Time lost
- Interference #9 Time lost
- Interference #10 Time lost

30% Chart copied
10% Cardiologist arrives
30% No-shock script for CCL on call
10% 3 mins

15% EKG misinterpreted
-3 mins, 1 min

24% EKG delay in interpreting
-3 mins

30% Spasms

24% EKG delay in interpreting
-3 mins

10% Cardiologist arrives
30% No-shock script for CCL on call
10% 3 mins

Finding ED, adds EKG (initial) time
10% ED delay
10% 5 mins

Doing ED, adds ED time
10% 30-60 mins

20% ED delay
10% 30-60 mins

30% Interpreter needed
10% 3 mins

10% Length of transport to CCL
10% 3 mins

20% Spasms
10% 2 mins

20% Spasms
10% 3 mins

10% Spasms
10% 3 mins

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## Results Before and After VSA

<table>
<thead>
<tr>
<th>Metric</th>
<th>Pre-Event</th>
<th>Post-Event</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Steps</td>
<td>81</td>
<td>49</td>
<td>-32 %</td>
</tr>
<tr>
<td>% of Value-Added Steps</td>
<td>37 %</td>
<td>61 %</td>
<td>24 %</td>
</tr>
<tr>
<td># of Swim Lanes</td>
<td>19</td>
<td>14</td>
<td>-5</td>
</tr>
<tr>
<td>Cycle Time</td>
<td>66 Min</td>
<td>~53 Min</td>
<td>~ -13 Min</td>
</tr>
<tr>
<td># of Decisions</td>
<td>13</td>
<td>6</td>
<td>-7</td>
</tr>
<tr>
<td># of Green Steps</td>
<td>26 (3)</td>
<td>29 (3)</td>
<td>+3 (0)</td>
</tr>
<tr>
<td># of Yellow Steps</td>
<td>16 (3)</td>
<td>10 (4)</td>
<td>-6 (+1)</td>
</tr>
<tr>
<td># of Red Steps</td>
<td>27 (6)</td>
<td>3 (0)</td>
<td>-24 (-6)</td>
</tr>
</tbody>
</table>

For every minute delayed in inflating the balloon, much more heart muscle dies!

Note: # inside (   ) equals # of steps for Triage
Example: Outpatient Appointment & Scheduling

- Better slot planning for physicians
- Reducing waiting time for patients
- Increasing patient volume
- Addressing performance limiting policies
- Increasing call center response rates
Example: Emergency Department Critical Lab Tests

Current State

Steps: 117
Non-Value Added Steps: 73
Handoffs: 25

Future State

Steps: 45
Non-Value Added Steps: 8
Handoffs: 12
Example: CHF Discharge Current State and Future State

Current State

Future State

Total Steps = 99
NVA Steps = 30
Handoffs = 36

Total Steps = 69
NVA Steps = 5
Handoffs = 21
Where to Focus?

- Paper application
- Electronic application
- Mail processing
- Data entry
- Eligibility matching
- Staff review
- Certification determination
- Needs determination
- Denial determination
- Quality review
- Determination issued
- Document storage

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Utilized Lean Six Sigma Tools

- 5S, Visual Display, Value Stream Analysis and Quick Hits
- SIPOC, VOC measures and Root Cause Analysis
- "The pilot benefited significantly from TWC’s decision to apply the Theory of Constraints (TOC) methodology as a strategy to focus, prioritize, compel solutions, and solve problems while integrating methods and concepts of Lean and Six Sigma."
TWC Results

**Determinations**
- **48%**
  - 194 days → 101 days

**Processing backlog**
- **60%**
  - 5 months → < 2 months

**Applications processed by the tax filing deadline**
- **45%**
  - 60% → 87%

**Maximum potential tax credit value to employers**

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Example: Contracting Processes
Current – Ideal – Future States

Creating contracts that achieve agency objectives faster and faster, within the parameters of the rules.
Handoffs of Request for Proposals

BEFORE: 16

AFTER: 1

A two week long process is reduced to 34 minutes!
Examples from Government

Reduction of Cycle Time for Memorandums of Understanding

- Agency required numerous MOUs with outside agencies, including specialty services.
- The lengthy cycle time to complete and certify MOUs resulted in numerous delays in receiving services.
- The cycle time was reduced from average of 29 days to 14 days.

New Employee Check-in Procedures

- The check-in process for contractors was reduced from as long as 2 weeks to 2 hours.
- New civilian employee hires check-in was reduced from 2 weeks to 3 hours. Productivity was increased by approximately 7,680 man hours.
Why Integrate?

- 12. Focus
- 11. Leverage
- 10. Waste
- 9. Inertia
- 8. Risk
- 7. Measurement
- 6. Toolset
- 5. Analytics
- 4. Execution
- 3. Win-Win
- 2. Synergy
Why Integrate?

1. RESULTS

- Immediate significant results
- Integrating Lean Six Sigma with Constraints Management often yields 10 to 20 times greater returns than implementing Lean Six Sigma alone.
Summary

Using the right tool, on the right problem, at the right time – but always from a systems perspective

- Effective capacity of your system is determined by the capacity of the system constraint.
  - An hour saved at the bottleneck is an hour gained by the entire system

- Constraints Management, Lean and Six Sigma are complementary

- Constraints Management provides the right focus for Lean Six Sigma efforts

Integrating Lean Six Sigma with Constraints Management often yields 10 to 20 times greater returns on investment than Lean and/or Six Sigma alone
Questions?

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