Applying Theory of Constraints Tools to Focus Lean Development

National Defense Industrial Association
10th Annual CMMI Technology Conference & User Group
Software Engineering Institute
Carnegie Mellon University

Tim Oltman
Boeing Defense, Space & Security
Wichita, Kansas
Tim Oltman
Boeing Defense, Space & Security
Wichita, Kansas
Engineering Analysis & Integration
Lean Engineering
Six Sigma Black Belt
tim.j.oltman@boeing.com
Phone (316) 209-6183

Boeing Engineering Analysis & Integration Team (AIT) in Wichita Kansas, where he is responsible for Lean support of Lean+ 10X and process improvement projects across a variety of Engineering disciplines. Tim is Theory of Constraints International Certification Organization (TOCICO) certified in the Thinking Process tools, a Boeing Six Sigma Black Belt and heads the Wichita site Six Sigma Steering Committee. Tim has a B.S. in Industrial Engineering from the University of Nebraska and an M.B.A. in Operations Management from National University. Tim has over 25 years of Aerospace experience with General Dynamics, Raytheon and Boeing. Tim has been published and a presenter at the 1999 AEROFAST conference. Tim received an Institute of Industrial Engineers process improvement award for a Statistical Process Control project he implemented to reduce office process flow time.
**Theory of Constraints (TOC) Definition**

**TOC** is a management philosophy introduced by Dr. Eliyahu M. Goldratt in his 1984 book *The Goal*, that is geared to help organizations continually achieve their goal. Based upon the contention that any manageable system is limited in achieving more of its goal by a small number of constraints (& that there is always at least one). The TOC process seeks to identify the constraint and restructure the rest of the organization around it, through the use of the Five Focusing Steps.

**Key Assumption**

The underlying assumption of TOC is that organizations can be measured and controlled by variations on three measures:

- **Throughput** is money (or goal units) generated through sales.
- **Inventory** is money the system invests in order to sell its goods and services.
- **Operating Expense** is all the money the system spends in order to turn inventory into throughput.
Standing on the Shoulder’s of Giants

- Theory of Constraints International Certification Organization
  www.tocico.org

Dr. James R. Holt, PE
Professor
Engineering & Technology Management:
Washington State University
jholt@wsu.edu

Home Office: (503) 669-6676
Address: 429 SE 13th Court
Gresham OR 97080-9361

Eliyahu M. Goldratt

The Goal.
It’s not Luck.
Critical Chain
Necessary but not Sufficient.
The Choice
Isn't it obvious

_Its Not Luck_, Eli Goldratt, 1997

This textbook /novel introduces the Thinking Processes and shows their application of the Thinking Process in many different environments


This is an excellent Theory of Constraints Handbook
Applying Theory of Constraints Tools to Focus Lean Development

- Introduction to Theory of Constraints
- How to use the Thinking Process Tools
  - What to Change
    - Evaporating Clouds to identify conflicts
    - Current Reality Tree
  - What to Change to
    - Strategic Future Reality Tree
  - How to cause the Change
    - Prerequisite Trees and Transition Trees
    - Strategy and Tactics Tree
Theory of Constraints Basic Facts

- Every system is part of a larger system
- Every system has sub-systems
- A system is made up of individual elements that are linked in some interdependent fashion
- Within any complex system there is one constraint (or very few) of several possible types
  - Every system has a limiting factor, else growing systems would soon explode
- It is always possible to find the constraint and exploit it or improve it
The Five Focusing Steps

0. What is the Goal

0.5 How to Measure Progress toward Goal

1. Find the System Constraint
2. Decide How to Exploit the Constraint
3. Subordinate everything else to the Constraint
4. Elevate the constraint
5. If the constraint moves, start over at Step 1
Constraints Management

- In physical systems (machines, production, distribution, … ) the constraint is relatively easy to find
- In non-physical systems (social systems, service organizations, interactions, relationships, self-governing, not-for-profit, creative groups, … ) it is harder to find
- While we can often change our minds faster than changing equipment, getting EVERYONE to change their minds at the same time, is pretty hard
Applying Theory of Constraints Tools to Focus Lean Development

- Introduction to Theory of Constraints
- How to use the Thinking Process Tools
  - What to Change
    - Evaporating Clouds to identify conflicts
    - Current Reality Tree
  - What to Change to
    - Strategic Future Reality Tree
  - How to cause the Change
    - Prerequisite Trees and Transition Trees
    - Strategy and Tactics Tree
TOC Thinking Processes: Constructs

- Evaporating Clouds (Conflict, 3 clouds, CCC)
- Assumptions
- Undesirable Events (UDEs)
- Current Reality Tree (CRT)
- Injections on CCC
- Desirable Events
- Future Reality Tree (FRT)
- Negative Branch Reservation
- Prerequisite Tree (PRT)
- Transition Tree (TT)

Source: The Logical Thinking Process, H. William Dettmer, 2007
Different Logic Patterns

- Logic: There are two main types of logic: Sufficiency-Based logic and Necessary-Based Logic

- With sufficiency based logic, we read in the direction of the arrow and say IF A, THEN B, we mean, "It is sufficient that if A exists, then B exists." IF I have a dog, THEN I have an animal. Having a dog is sufficient to satisfy the conclusion that I have an animal. This is common sense.

- With necessary based logic, we read against the arrow and say, In Order To C, I Must Have D. In Order To make a fire, I Must Have combustible material. This is also common sense. Can you have a fire without combustible material?

- These two different types of logic are often confused, but shouldn't be. One is forward thinking, the other is backwards thinking. They are Different.

- IN ORDER TO have an animal I MUST HAVE a dog. Is that common sense? No, I could have a cat. IF I have combustible material THEN I have a fire. Is that common sense? No, there are other things necessary to have a fire. The categories of legitimate reservation make sure the logic is solid.

source: Washington State University-2010
Alternating Logic Types

- The Theory of Constraints Thinking Processes use both necessary and sufficient logic. In examining the logic tools closely, you see the tools alternate the logic types. The CRT, FRT and TT use sufficiency based logic. The EC and PRT use necessary based logic. This clever alternating logic causes the final conclusion to not only be necessary but also sufficient--the solution will be the minimum set of required conditions to be sufficient to assure success.

- These two, common logic types each discover causality in different ways. By alternating them, we clarify and better understand. We recognize that all dogs are animals. And, we need heat and oxygen besides combustible material to create a fire. The use of both makes our thinking process robust, forgiving and reliable. Using them both will help you discover new knowledge.

- Some people claim necessary based logic is right brained and sufficiency based logic is left brained. Maybe getting both sides of the brain to work together will be a boon! Anyone can learn necessary based logic. It just takes practice.

source: Washington State University-2010
Applying Theory of Constraints Tools to Focus Lean Development

- Introduction to Theory of Constraints
- How to use the Thinking Process Tools
  - **What to Change**
    - Evaporating Clouds to identify conflicts
    - Current Reality Tree
  - **What to Change to**
    - Strategic Future Reality Tree
  - **How to cause the Change**
    - Prerequisite Trees and Transition Trees
    - Strategy and Tactics Tree
Evaporating Clouds are Necessary-Based Logic

- Necessary based logic is the basis for the Evaporating Cloud (Conflict Resolution Diagram as Dettmer calls it). What are the necessary conditions to achieve the goals we desire? What are the prerequisites for the necessary conditions?

- The Evaporating Cloud is used to surface intuition, generally accepted assumptions, unspoken understanding, and established rules.
  - These areas (assumptions behind the necessary logic arrows) then become targets for challenge / change/ improvement.
  - The traditional assumptions limit the range of solutions to our problems.
  - If the traditional assumptions can be made invalid, then we have found a place where the necessary conditions no longer hold.
  - We call such a discovery, a breakthrough injection.

- The Evaporating Cloud is the most easily used logic tool. It can be used everyday to develop understanding, facilitate communication and resolve every-day conflict. Students of the Thinking Process should learn to create Evaporating Clouds in minutes. It is most better to resolve conflicts quickly, before they become chronic.

source: Washington State University-2010
Here is an Evaporating Cloud Worksheet

Story line: _____________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

A.______
________
________

B.______
________
________

C.______
________
________

D.______
________
________

D’._____
________
________

Create Step 1
Create Step 2
Create Step 3
Create Step 4
Create Step 5

Goal or Objective

Requirements

Pre-Requisites

source: Washington State University-2010
As soon as you recognize there is no room for an acceptable compromise (there is a breakdown in communication, the other side is becoming stubborn and illogical or our relationship is in jeopardy) take a break. During the break:

1. **Write down WHAT I WANT (D.)**
   
   You know this. You keep repeating it over and over out loud and in your thoughts. (Usually, this is an action or result of an action)

2. **Write down WHAT THE OTHER SIDE WANTS (D')**
   
   You know this. They keep repeating it over and over trying to convince you.

3. **Write down WHAT NEED I AM TRYING TO SATISFY. (B)**
   
   You may have to stop and think hard here. Why is it you NEED the thing you want?

4. **Write down WHAT NEED THE OTHER SIDE IS TRYING TO SATISFY. (C)**
   
   If you don't know, you haven't been listening to the other side. Think! What was their justification for their desires? That was their need?

5. **Write down OUR COMMON OBJECTIVE. (A)**
   
   Yes, you have one. You are still talking! What is the reason you are still talking to this hard headed, obnoxious, uncooperative person on the other side? What do you both want to have? What goal do you both need to satisfy? Why is it you are trying so hard to convince the other side to cooperate?

source: Washington State University-2010
Creating the Evaporating Cloud

A. (5. What is our common Goal or Objective?)

B. (3. What need am I trying to satisfy?)

C. (4. What need is the other side trying to satisfy?)

D. (1. What do I want?)

D. (2. What does the other side want?)

In order to ...  
Objective

We need to ...  
Requirement

In order to...  
Prerequisite

source: Washington State University-2010
Focusing Lean Support Group
Core Conflict Cloud

Story line: The company has limited resources to perform “Process Improvement” and support internal customer needs for Change and Improvement. These “change agents” are tasked with working with Employee Involvement Teams to create a culture of process improvement. There is an effort underway to explore TOC as an improvement tool.

**Ac.**
5. Dramatically improve our processes

**Bc.**
3. Do things that deliver significant results quickly

**Cc.**
4. Do mature, correct things that have proven to be very effective over time

**Dc.**
1. Take radical, unproven (to me), experimental procedures

2. Use the best LEAN tools and techniques, EI (Employee Involvement)

**Dc.’**
Use the Thinking Tools Process to establish priorities for Process Improvement Projects

Focus resources on where the highest savings are (largest improvement can be made – that contribute to Throughput immediately (or accelerate project management processes)

Assumptions
1. There is pressure to try something better than what we have been doing
2. Our customer has changing requirements
3. The customer wants products faster and cheaper
4. Difficult to schedule today what is going to occur more than 6 months in the future
5. Our project requirement are not all the same

Assumptions
1. We don’t know where to focus resources
2. Implementing both concepts causes confusion
3. Lean and EI don’t always deliver desired results
4. Not everyone knows TOC

Assumptions
1. We need to improve our processes
2. Stable processes makes jobs easier to manage
3. We know how to control stable process
4. If we change we might create an unstable process

Assumptions
1. Toyota like methods have been up to this point the company accepted method for continuous improvement.
2. Toyota is considered to be successful with their implementation of Lean Processes
3. The accepted site improvement methodology has been EI
4. It is easier to stay with the current culture
5. EI teams are easy to measure and control

Train Lean Facilitators on TOC

Train TOC folks on how they can benefit from LEAN (to improve the difficult processes they find – in CCPM for sure – and other bottleneck areas).

Create meaningful improvement metrics associated with Increasing Value and decreasing Time

Find other ways to implement Employee Involvement (remove the obstacles to being fast and let the work itself be the reward)

There is a method to create and maintain stable balanced processes (We become a fast, reliable source of expert knowledge and projects. We can pick and choose which, of many, contracts we will pursue. We are profitable. We can grow our capacity at a rate we choose.

In order to …**Objective**

We need to …**Requirement**

In order to…**Prerequisite**
CLRs – Categories of Legitimate Reservation

- Are tools to rigorously evaluate and critique (scrutinize) logic statements in a non-threatening manner
- Ensure the logic is solid
- Help solidify intuition or emotion into solid cause-effect relationships
- Force the discovery new knowledge to correct logical errors
- The Categories of Legitimate Reservation are the tools to validate or invalidate any argument. They are very powerful when applied in a systematic way. They are the tools to discover the underlying assumptions.
Categories of Legitimate Reservation

Source: Washington State University-2010
Scrutiny!

- What is Scrutiny?
- We want to examine each logical arrow according to eight logic rules (CLRs).
- Taken together with your intuition, they are sufficient to demonstrate the truth of your logical connections.
- Or, they will surface legitimate reservations about the logic.
- Anytime a reservation is surfaced and addressed, additional knowledge is gained. DISCOVERY!
- Use Scrutiny to gain deeper understanding/discovery.
- Use it on yourself and with others. Encourage them to scrutinize you!

source: Washington State University-2010
Applying Theory of Constraints Tools to Focus Lean Development

- Introduction to Theory of Constraints
- How to use the Thinking Process Tools
  - What to Change
    - Evaporating Clouds to identify conflicts
    - Current Reality Tree
  - What to Change to
    - Strategic Future Reality Tree
  - How to cause the Change
    - Prerequisite Trees and Transition Trees
    - Strategy and Tactics Tree
Creating a Current Reality Tree from UDE

- UDEs – Undesirable Effects
- Let’s approach these UDEs and the whole world of Team Management by taking three different situations (one UDE clouds) and combining them.
- Development (or Design) / Business / Education
- Other areas would have worked just as well; these are good enough

source: Washington State University-2010
UDEs of Lean Support Group

- The majority of BDS leadership has the perception that lean does not generate results.
- *Employee Involvement has not produced the results desired
- *Lean has not produced the results desired
- *Leadership is hesitant to apply lean to a business problem.
- *Lean results do not show up in EAC
- *Leadership feels leading Lean is not a valuable way to spend their time.
- *Leadership fears using Lean because of fear of not being able to prove the expected improved financials.
- *Lean facilitators are most comfortable with soft skills facilitation / training and not driving teams to achieve significant improvement fast
- *Lean facilitators are not comfortable not driving teams to achieve significant improvement fast.
- *Lean facilitators are conflict adverse.
- *Lean facilitators become ineffective when having to lead real change.
- *People are confused at which measure to follow
- *People are frustrated
- *People are not happy (satisfied) with their work
- *The site is not performing as well as it should
- *Lean facilitators are not sure which metrics to track and follow
- *There is general confusion about what the goals and objectives are
- *There is a general lack of focus and direction
- *Lean facilitators are not supporting all the needs of the customers
- *Employee Involvement is not capturing as much savings as possible
- *There is conflicting direction from matrix chain of command
- *There is lack of emphasis on improvements that impact the bottom line
- *There is confusion on which tools and techniques to use
Does this Conflict seem to CAUSE all the UDEs?

A: Have a Successful Team
B: Have a High Degree of Group Cooperation
C: Encourage Individual Contribution
D: Base Recognition on Team Performance

Some team members complain
Team seems out-of-control
Teams cost more

Some people are frustrated
Some work is late
Some people are over-loaded

Quality/content/scope problems exist
Team is not as effective as hoped
Team seems out-of-control
Teams cost more

Some work is late
Some people are over-loaded
Some people are frustrated
Behind Every Arrow, There is an Assumption

The assumption in Necessary Based logic was:
“In order to Eat, I must have Money Because I pay for my food.”

The assumption in Sufficiency Based logic is the same but is structured slightly differently:
“If I want to eat, And I pay for my food, Then I need money.”
Some Assumptions Behind the Arrows of the Core Conflict

Effective teams have a high degree of synergy

A  Have a Successful Team

Any individual on the team can cause team failure

B  Have a High Degree of Group Cooperation

D  Base Recognition on Team Performance

The team’s work is mostly individual effort

C  Encourage Individual Contribution

Not D  Base Recognition on Individual Performance

Individuals respond to individual rewards

Rewarding some individuals and not others always causes problems

source: Washington State University-2010
The next few steps are Dramatic Ones:

- Stand the Cloud on its point.
- Turn around the arrows
- Adjust the wording to make smooth “If … Then …” logic
- Add the Assumptions with the ‘And’ Connectors

The result is the start to the Current Reality Tree!
Start with the Conflict Cloud

A
Have a Successful Team

B
Have a High Degree of Group Cooperation

C
Encourage Individual Contribution

D
Base Recognition on Team Performance

Not D
Base Recognition on Individual Performance

source: Washington State University-2010
Flip in on it’s end

source: Washington State University-2010
Turn the Arrows Around

Base rewards on team performance

Have a High degree of group cooperation

Have a Successful Team

Base rewards on Individual performance

Encourage individual contribution

source: Washington State University-2010
Adjust the working to “If ... Then …” Logic (note the key words added to make this easier – include them)

There is pressure to base rewards on team performance

We need a high degree of group cooperation

We want to have a Successful Team

We need individual contributions

There is pressure to base rewards on individual performance

source: Washington State University-2010
Add in at least one Assumption for each arrow

- **Any individual on the team can cause team failure**
- **Effective teams have a high degree of synergy**
- **We want to have a Successful Team**
- **We need individual contributions**
- **There is pressure to base rewards on individual performance**
- **There is pressure to base rewards on team performance**
- **The team’s work is mostly individual effort**
- **Individuals respond to individual rewards**
- **We need a high degree of group cooperation**

(source: Washington State University-2010)
Check the Logic using the Categories of Legitimate Reservation

Numbers added as labels to entities to facilitate discussion

125 Any individual on the team can cause team failure

130 We need a high degree of group cooperation

145 There is pressure to base rewards on team performance

150 There is pressure to base rewards on individual performance

140 Individuals respond to individual rewards

110 Effective teams have a high degree of synergy

100 We want to have a Successful Team

120 The team’s work is mostly individual effort

source: Washington State University-2010
Connect the Core Conflict to the UDES for the CRT foundation

source: Washington State University-2010
Starting Groups and Connections

Do some UDEs seem related? One follow the other? Group them!

source: Washington State University-2010
Simple, Temporary Connections

source: Washington State University-2010
Look for the Result of the Conflict

source: Washington State University-2010
What Happens because of the Conflict and D/D'?

Widening the Base of the CRT

source: Washington State University-2010
Scrutinize the Entire Tree Using the CLR

source: Washington State University-2010
Re-Evaluate the UDES-Find New Ones/Delete Old Ones

source: Washington State University-2010
Look for Feedback Loops

source: Washington State University-2010
Look for Policy, Measurement, Behavior Issues (add them if they are not there)

source: Washington State University-2010
The Cone Shape Then Becomes...

- The addition to the Base divides the CRT quickly
- Builds upwards quickly
- The Regions help show what is missing
- Allows a Thinking Process person to view the CRT and Scrutinize Quickly

source: Washington State University-2010
Applying Theory of Constraints Tools to Focus Lean Development

- Introduction to Theory of Constraints
- How to use the Thinking Process Tools
  - What to Change
    - Evaporating Clouds to identify conflicts
    - Current Reality Tree
  - What to Change to
    - Strategic Future Reality Tree
  - How to cause the Change
    - Prerequisite Trees and Transition Trees
    - Strategy and Tactics Tree
The Future Reality Tree

- The FRT is NOT detailed. It’s a HIGHer order of abstraction
- Its purpose is to affirm direction and build confidence
- Don’t get caught up in too much minutia! Make it High Level & Logically Sufficient
- The PRT and TT will do the detail work later.
- The Core Conflict already raised your thinking to a higher level of abstraction from the UDES. Let the FRT stay near that level
- Still, you need enough detail to achieve the DEs

source: Washington State University-2010
Convert UDEs to DEs

- Convert the Undesirable Entities into a Positive Desirable Effect.
  - UDE: Behind the Scenes maneuvering (politics) is common
    - DE: People are very cooperative
  - UDE: People are frustrated
    - DE: People are happy on the job
  - UDE: Many people are valued some what arbitrarily
    - DE: People know their contribution will be appreciated

source: Washington State University-2010
We want to create our Desired Effects (opposites of our UDEs)

Will the Silver Bullet get us there?

Strategic Injection
(Silver Bullet--Silver Wedge)
Super Injection!
Finding Breakthroughs (the next step)

- Breakthrough Solutions are **Silver Bullets** (or at least **Silver Wedges**), powerful wedges that only need a crack in the wall to allow us to “work our way through”).

- How do we find them?
  - By Observation
  - By Challenge
  - By Reference Environment

- The best are often **The Impossible Ones**

- If you can’t find one, Just do the Opposite of the Rest of the World.

source: Washington State University-2010
**Relationship of the Super Injection**

- The Super Injection, may represent the strategic direction.
- In order to build a solid FRT, it may need to be broken into its component parts. The definition of the component parts then assist in the development of the FRT.

```
More Specific Injection ⇒ Mile Stone Injection ⇒ Understandable Condition Injection ⇒ Clear Direction Injection
```

**Strategic Injection (Silver Bullet--Silver Wedge)**

source: Washington State University-2010
The FRT gives the road map that confirms we are on the right track. It shows our injection(s) can succeed. It gives confidence and direction in moving into the future.
10 SinJ: Improve our processes by using tools from the Theory Of Constraints (5 focusing steps, WIP, priorities) to focus Lean resources.

30 INJ: Create meaningful improvement metrics associated with increasing Value and decreasing Time.

50 INJ: Train Lean Facilitators on the TOC 5 Focusing steps.

80 INJ: Establish priorities of Process Improvement Projects.

20 INJ: Combine Lean and TOC for fast, surgical results.

60 INJ: Process improvements are prioritized according to their potential savings.

180 DE: Lean Facilitators know which Process Improvement Projects to focus on.

111 The important Process Improvements are identified and the others are subordinated.

113 Managers are educated on TOC principles.

140 DE: There is no confusion about which metrics to follow.

110 DE: There is emphasis on improvements that impact the bottom line.

100 DE: There is no confusion on which tools and techniques to use.

102 DE: Lean Facilitators will provide desired results.

190 DE: Lean Facilitators will be more effective.

104 DE: Process Improvements will impact the bottom line.

162. SO: A management system is in place to successfully perform Process Improvements, add value and meet cost, schedule and quality expectations.

112 DE: The site has a true continuous improvement culture.

122 DE: Managers are comfortable driving teams to significant change fast.

126 DE: The most valuable Process Improvements are worked in priority order.

124 DE: There is a systemic thinking when it comes to process improvement.

116 DE: Leaders embraces TOC and Lean as a means to address business problem.

130 DE: The site is has a true continuous improvement culture.

128 TO: Process Improvement projects are completed and support Site goals.

108 DE: Lean facilitators are effective leading change.

106 DE: There is no confusion about how to focus Company Process Improvement Resources.

150 DE: Lean Facilitators know which Process Improvement Projects to focus on.

160 DE: People are happy (satisfied).

162. SO: The Site meets it’s cost, schedule and quality performance expectations.

164. SO: The Site meets it’s profit goals.

166. SO: The site consistently meets it’s profit goals.

168. SO: A management system is in place to successfully perform Process Improvements, add value and meet cost, schedule and quality expectations.

126 TO: The most valuable Process Improvements are worked in priority order.

118 DE: The needs of the customers are being supported.

104 DE: Process Improvements will impact the bottom line.

102 DE: Lean Facilitators will provide desired results.

120 DE: There is no confusion on which tools and techniques to use.

110 DE: There is emphasis on improvements that impact the bottom line.

112 DE: The site has a true continuous improvement culture.

126 TO: The most valuable Process Improvements are worked in priority order.

114 TO: TOC methods for Process Improvement are embraced.

128 TO: Process Improvement projects are completed and support Site goals.

122 DE: Managers are comfortable driving teams to significant change fast.

116 DE: Leaders embraces TOC and Lean as a means to address business problem.

130 DE: The site is has a true continuous improvement culture.

118 DE: The needs of the customers are being supported.
Applying Theory of Constraints Tools to Focus Lean Development

- Introduction to Theory of Constraints
- How to use the Thinking Process Tools
  - What to Change
    - Evaporating Clouds to identify conflicts
    - Current Reality Tree
  - What to Change to
    - Strategic Future Reality Tree
- How to cause the Change
  - Prerequisite Trees and Transition Trees
  - Strategy and Tactics Tree
The Prerequisite Tree

The purpose of the Prerequisite Tree is to surface potential obstacles (OBS) to be overcome.
### Use TOC 5 Focusing steps to Prioritize Process Improvement Projects

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Tactical (Intermediate) Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean Facilitators and Management don't know about the benefits of TOC</td>
<td>Train Lean Resources on TOC</td>
</tr>
<tr>
<td>Process with constraints are not identified or managed</td>
<td>identified and managed the priority Process Improvement projects</td>
</tr>
<tr>
<td>Key Lean Facilitators are overloaded</td>
<td>Support the Lean Facilitators working the priority Process Improvement projects</td>
</tr>
<tr>
<td>The capacity of the Lean Facilitators working Process Improvement projects is unknown</td>
<td>Identify constraints in current Lean assignment processes. Then subordinate all other Process Improvement projects.</td>
</tr>
</tbody>
</table>

### Limit the number of Lean Projects being worked at any time

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Tactical (Intermediate) Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad Multi-tasking of Process Improvement Projects is allowed and even encouraged</td>
<td>Eliminate bad multitasking and ensure management (and everyone) supports the no bad multitasking policy.</td>
</tr>
<tr>
<td>The current environment of pushing more projects on to the Lean Resources than they can handle</td>
<td>Release Process Improvement projects work to the Lean Resources using a Drum Buffer Rope methodology.</td>
</tr>
</tbody>
</table>

### Establish Clear priorities for Process Improvement projects

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Tactical (Intermediate) Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>The priorities are not clear, the Lean Resources don't know whether they are working on the most important Process Improvement projects.</td>
<td>Devise rules and policies that handles the requests that comes into the Lean support group.</td>
</tr>
<tr>
<td>There are too many interruptions, such as managers wanting their pet projects worked.</td>
<td>Ensure the work rules are followed.</td>
</tr>
</tbody>
</table>
Lean Facilitators and Management don’t know about the benefits of TOC.

Train Lean Resources on TOC

The capacity of the Lean Facilitators working Process Improvement projects is unknown.

Process with constraints are not identified or managed.

Lean Facilitators and Management don’t know about the benefits of TOC.

Identify constraints in current processes. Then subordinate all other Process Improvement projects.

Key Lean Facilitators are overloaded.

Identified and managed the priority Process Improvement projects.

Support the Lean Facilitators working the priority Process Improvement projects.

Super INJ Improve our processes by using tools from the Theory Of Constraints (5 focusing steps, WIP, priorities) to focus Lean resources.

INJ Use TOC 5 Focusing steps to Prioritize Process Improvement Projects

The capacity of the Lean Facilitators working Process Improvement projects is unknown.

Identify constraints in current processes. Then subordinate all other Process Improvement projects.

Key Lean Facilitators are overloaded.

Identified and managed the priority Process Improvement projects.

Support the Lean Facilitators working the priority Process Improvement projects.

Train Lean Resources on TOC

Limit the number of Lean Projects being worked at any time

The current environment of pushing more projects on to the Lean Resources than they can handle.

Release Process Improvement projects work to the Lean Resources using a Drum Buffer Rope methodology.

Bad Multitasking is allowed and even encouraged.

Eliminate bad multitasking and ensure management (and everyone) supports the no bad multitasking policy.

INJ Establish Clear priorities for Process Improvement projects

Ensure the work rules are followed.

Devise rules and policies that handles the requests that comes into the Lean support group.

The priorities are not clear, the Lean Resources don’t know whether they are working on the most important Process Improvement projects.

There are too many interruptions, such as managers wanting their pet projects worked.

Limit the number of Lean Projects being worked at any time

The current environment of pushing more projects on to the Lean Resources than they can handle.

Release Process Improvement projects work to the Lean Resources using a Drum Buffer Rope methodology.

Bad Multitasking is allowed and even encouraged.

Eliminate bad multitasking and ensure management (and everyone) supports the no bad multitasking policy.

INJ Establish Clear priorities for Process Improvement projects

Ensure the work rules are followed.

Devise rules and policies that handles the requests that comes into the Lean support group.

The priorities are not clear, the Lean Resources don’t know whether they are working on the most important Process Improvement projects.

There are too many interruptions, such as managers wanting their pet projects worked.
The Transition Tree CAUSES the Intermediate Objectives to exist so that the Injection will be achieved.

When all Tactical Objectives exist, the FRT becomes our new Current Reality!!!!
The Transition Tree (TT) follows a simple format to achieve:

**The Actions that Cause the Change**

New Reality (changed reality) is achieved.

- Facts of life that indicate the action will be sufficient to achieve the new reality
- The Need for Action (What is needed)
- My Action (Emphasis on the action I take to cause someone (or something) to meet the need and change reality)
- Facts associated with Current Reality that lead to the need for change.
- The Current (previous) Reality

There is a simple Five Cell Structure
There is pressure to work on all the Process Improvement Projects at once. Each Process Improvement project is put into the queue with no priority. The Lean Facilitators are always busy. We need to know many projects the Lean team can support. We have a lot of Process Improvement Projects to do.

We understand the Lean teams RAA and can measure their throughput. We need to focus our Lean Resources. We have Process Improvement project throughput measures. We need to use the new prioritization rules and measures. We need work rules and measures to control the work and the Lean Support.

Devise work rules /to handle the projects that comes into the Lean Support group. We need to use the new prioritization rules and measures. Ensure the work rules account for all types of Process Improvement Projects. Identify the categories and kinds of Process Improvement projects that the Lean Support group does & their priority.

Identify Process Improvement Projects as throughput to the Lean support group. Determine Lean Facilitators RAA. We Need to know many projects the Lean team can support. We understand the Lean teams RAA and can measure their throughput. Lean Facilitators are asked to do multiple jobs. We have categories for Process Improvements identified and know their priority. We have many managers desires for their project to be worked. There are many interruptions, with different Managers wanting different projects worked.

We need work rules and measures to control the work and the Lean Support group. We have categories for Process Improvements identified and know their priority. We need to focus our Lean Resources. We have Process Improvement project throughput measures. We need to use the new prioritization rules and measures. We need work rules and measures to control the work and the Lean Support group.

The Lean Facilitators are always busy. We have a lot of Process Improvement Projects to do. The Lean group has agreed to use the new work rules and measures in all Process Improvement projects. We need to use the new prioritization rules and measures. We need work rules and measures to control the work and the Lean Support group. We need to focus our Lean Resources. We have Process Improvement project throughput measures. We Need to know many projects the Lean team can support. We understand the Lean teams RAA and can measure their throughput. Lean Facilitators are asked to do multiple jobs.

We have many managers desires for their project to be worked. There are many interruptions, with different Managers wanting different projects worked. 1The groups priorities are not clear, we don’t always know whether we are working on the most important projects. Improvement project priorities are not established. Each Process Improvement project is put into the queue with no priority on all the Process Improvement Projects at once. The Lean group has agreed to use the new work rules and measures in all Process Improvement projects.

We understand the Lean teams RAA and can measure their throughput. We need to use the new prioritization rules and measures. We need work rules and measures to control the work and the Lean Support group. We have categories for Process Improvements identified and know their priority. We need to focus our Lean Resources. We have Process Improvement project throughput measures. We Need to know many projects the Lean team can support. We understand the Lean teams RAA and can measure their throughput. Lean Facilitators are asked to do multiple jobs.

The Lean Facilitators are always busy. We have a lot of Process Improvement Projects to do. The Lean group has agreed to use the new work rules and measures in all Process Improvement projects. We need to use the new prioritization rules and measures. We need work rules and measures to control the work and the Lean Support group. We have categories for Process Improvements identified and know their priority. We need to focus our Lean Resources. We have Process Improvement project throughput measures. We Need to know many projects the Lean team can support. We understand the Lean teams RAA and can measure their throughput. Lean Facilitators are asked to do multiple jobs.
Questions
Focusing Lean Support Group
Core Conflict Cloud

Story line: The company has limited resources to perform “Process Improvement” and support internal customer needs for Change and Improvement. These “change agents” are tasked with working with Employee Involvement Teams to create a culture of process improvement. There is an effort underway to explore TOC as an improvement tool.

Ac.
5 Dramatically improve our processes

Assumptions
1. There is pressure to try something better than what we have been doing
2. Our customer has changing requirements
3. The customer wants products faster and cheaper
4. Difficult to schedule today what is going to occur more than 6 months in the future
5. Our project requirement are not all the same

Dc.
3 Do things that deliver significant results quickly

Assumptions
1. We don’t know where to focus resources
2. Implementing both concepts causes confusion
3. Lean and EI don’t always deliver desired results
4. Not everyone knows TOC

Cc.
4. Do mature, correct things that have proven to be very effective over time

Assumptions
1. Our current date driven scheduling causes us to have to do project rescheduling
2. There is pressure to try something better than what we have been doing
3. we need to improve our processes
4. TOC takes in to account delays and resources availability
5. TOC is a good way to create process that are adaptive

Use the Thinking Tools Process to establish priorities for Process Improvement Projects

Focus resources on where the highest savings are (largest improvement can be made – that contribute to Throughput immediately (or accelerate project management processes)

Apply TOC.
1. Take radical, unproven (to me), experimental procedures

Train TOC folks on how they can benefit from LEAN (to improve the difficult processes they find – in CCPM for sure – and other bottleneck areas).

Combine LEAN and TOC for fast, surgical results!

Train Lean Facilitators on TOC

Create meaningful improvement metrics associated with Increasing Value and decreasing Time

Assumptions
1. Toyota like methods have been up to this point the company accepted method for continuous improvement.
2. Toyota is considered to be successful with their implementation of Lean Processes
3. The accepted site improvement methodology has been EI
4. It is easier to stay with the current culture
5. EI teams are easy to measure and control

Find other ways to implement Employee Involvement (remove the obstacles to being fast and let the work itself be the reward)

In order to ... Objective
We need to ... Requirement
In order to... Prerequisite

There is a method to create and maintain stable balanced processes (We become a fast, reliable source of expert knowledge and projects. We can pick and choose which, of many, contracts we will pursue. We are profitable. We can grow our capacity at a rate we choose.

- We need to improve our processes
- Stable processes makes jobs easier to manage
- We need to control stable processes
- If we change we might create an unstable process

- There is pressure to try something better than what we have been doing
- Our customer has changing requirements
- The customer wants products faster and cheaper
- Difficult to schedule today what is going to occur more than 6 months in the future
- Our project requirement are not all the same