4 Types of Problems

Art Smalley
President
Art of Lean, Inc.
Keynote Outline

• Background
• 4 Types of Problem Situations
  • Type 1 – Troubleshooting
  • Type 2 – Gap from Standard
  • Type 3 – Target State
  • Type 4 – Innovation
• Summary
Background - Lean / Toyota

- Toyota Kamigo Overhead
- Kamigo Entrance
- Taiichi Ohno
- Precision & Machine Intensive
- Lower Volume & Higher Mix
- High Volume & Lower Mix
Other Background - Work

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4 Types of Problem Situations

Type 1: Troubleshooting
- Immediate corrective action oriented with limited root causal emphasis

Type 2: Gap from Standard
- Rapid occurrence oriented with strong root causal emphasis

Type 3: Target Setting
- Future oriented with a new target state emphasis and creative solutions

Type 4: Innovation Oriented
- Future oriented with a more open-ended view for problem resolution

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Type 1 – Troubleshooting

Condition based trigger
Either human or machine
Andon Response Example

1. Automated process cycling normally

2. Mechanical probe detects broken cutting tool and stops the machine

3. Probe signals an “andon” board for visual display

4. The operator immediately takes corrective action and confirms good products to the following process
4 C’s Thinking

Minimal (if any) documentation involved. No A3’s. Mainly discussion, thinking, rapid action & follow up.
Type 1 – Troubleshooting

Rapid Problem Solving
- Concern
- Cause
- Countermeasure
- Check

Time & quantity based triggers
Reviewed hourly by supervisor
Toyota Supervisor Image

Rapid response to problems and abnormal conditions by production
-Team Member
-Team Leader
-Group Leader
-Manager
-Plant Manager

“All Mighty” Supervisor Image
1. Safety
2. Job Ability
3. Team Leadership
4. Kaizen Skills / Problem Solving
5. Technical Knowledge
6. Human Relations

監督者はオールマイティである
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Type 2 – Gap from Standard

Vague Problem Understanding

Step 1
Clarify the Problem Background

Step 2
Define the Problem

Step 3
Establish a Goal

Step 4
Root Cause Analysis

Step 5
Implement Countermeasures

Step 6
Check Results

Step 7
Follow Up & Standardized

Yields

100%

Gap

94%

Target Yield

Current Yield
Problem Investigation

**A. Immediate abnormality signal**

**B. Go to actual machine and see status**

**C. Ascertain actual problem situation**

**D. Coaching Investigation Sequence**

1. Measure actual dimensional extent of problem
2. Look for obvious contamination or abnormalities
3. True and re-dress grinding wheel and observe status
4. Check actual grinding wheel (check “pores”)
5. Confirm actual (not theoretical) stock removal
6. Send part to QC Mat’l lab for hardness and HT depth check
7. Check actual cutting conditions
   - Wheel RPM
   - Feed Rate, Depth of Cut, etc.
   - SFPM
8. Confirm status of datum features
9. Measure spindle run out
10. Coolant check
    - Flow rate / pressure
    - Nozzle condition and direction
    - Temperature
    - Concentration

Cpk 1.15

Cpk 2.33
Define the Problem

- **THE STANDARD**
- **THE CURRENT TREND**

Highlight the gap between the current situation and the standard.
Set a Goal

3 Factors
From what level?
To what level?
By when?

SMART
Specific?
Measurable?
Attainable?
Relevant / Realistic?
Time bound?

Poor examples include:
1) Find the root cause! (This is the next step of the process)
2) Implement lean tools like 5S or Standardize Work, etc. (This is an action item)
3) Train the employee (This is jumping to conclusions)
Type 2 – Analysis Types

- Convergent
- Focused
- Analytic

C&E Relationship
Standard attainment
Scope control
Key Point is the Countermeasure!

**First Why**
Q: **WHY** has the machine stopped?  
A: There was an overload and the fuse blew.

**Second Why**
Q: **WHY** was there an overload?  
A: The bearing was not sufficiently lubricated.

**Third Why**
Q: **WHY** was it not lubricated?  
A: The lubrication pump was not pumping sufficiently.

**Fourth Why**
Q: **WHY** was it not pumping sufficiently?  
A: The shaft of the pump was worn and rattling.

**Fifth Why**
Q: **WHY** was the shaft worn out?  
A: There was no strainer attached and metal scraps got in.

**Recurrence Prevention Countermeasure:**
Add fine mesh strainer to inlet port to prevent cutting chips from entering the system.
Type 1 Troubleshooting is about rapid action and response to the abnormal condition...an analogy is thinking fast.

Type 2 Gap from standard problem solving is about being more deliberate and slowing down to consider what is the real problem or root cause...an analogy is thinking slow.
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Type 3 – Target State

Acceptable (Current State) Situation

Normal Status

Type 2 - “Gap from Standard”

(Future) Ideal Situation

GAP

Kaizen Methods

Type 3 - “Target State”

問題解決

改善方法

Problem Solving
Target State Concept (Time Frame)

**Type 2 Problems & Gap From Standard**

**How Things “Are”**

- Performance Trend
- Ratio of Gap
- Problem Source for the Concerns

**Key Performance Indicators**

- Safety
- Quality
- Cost
- Delivery
- Productivity
- Morale/HRD

**Type 3 Problems & Target State Setting**

**How Things “Should Be”**

- Future State
  - Customer Satisfaction
    - 100% Quality
    - 100% On Time
    - 100% Productive
    - 100% On Cost
  - Human Development
    - Safe
    - Engaged
    - Challenged
    - Professional

**Current Conditions**

- Challenge
  - Every Day
  - Every Person
  - Every Opportunity

**Timeline**

- Last Year
- Last Quarter
- Last Month
- Last Week
- Yesterday
- Right Now
- Tomorrow
- Next Week
- Next Month
- Next Quarter
- Next Year
Target State Improvement Steps

- 100% Quality
- 100% On-Time
- 100% Productive
- 100% On-Cost

- Safe
- Engaged
- Challenged
- Professional

- Depict the “as-is” current state
- Measure and analyze the process and key performance indicators
- Show the specific key details for improvement

1. BACKGROUND
2. CURRENT STATE DEFINITION
3. CURRENT STATE ANALYSIS
4. GOALS
5. TARGET STATE DEFINITION
6. IMPLEMENTATION PLAN
7. CHECK RESULTS
8. FOLLOW-UP & STANDARDIZE
Process Example SMED Example

- Dedicated Press Part A
- Dedicated Press Part B
- Dedicated Press Part C

Dedicated Machines:
- 3 Dedicated Machines
- No Flexibility
- Each 30% Utilization
- Make lots of inventory!

Flexible Press:
- 1 Machine / 3+ Tools
- Change Over Flexibility
- 90% Utilization
- Run more JIT style

TOYOTA’S SET UP REDUCTION TIMELINE:
- Average C/T Time:
  - 1945-1947: 4.5 hours
  - 1960: 15 minutes
  - 1975: 3 minutes
- Methods & Technology Improvements
- >95% Reduction
Software Example

3 Dedicated Servers
Each 30% utilized
No flexibility
Stranded resources

1 Virtual Server
Now 90% utilized
Flexibility
Less waste

Same basic principle as SMED in die exchange...

Key here is not the time change over aspect but the software ability to act and host multiple server types...
Type 3 – Target State Summary

Arubeki Sugata / Ideal State

Critical Concept:
What We Should Do
Not What We Can Do

Critical Concept:
How We Should Do It
Not How We Can Do It

Kaizen / C.I.
• 100% quality
• 100% value add
• 100% on time, in sequence, batch of one capability

AND

Respect for People
• Physical & mental safety
• Security
• Professional challenge

Everyone
Every minute
Every day

Current Condition

Divergent
Creative
Synthesis
Requires change
Longer time
Greater span
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Complexity of problem:
- Higher
- Lower

Time to resolve:
- Lower
- Higher

Categories:
- Small
- Medium
- Large

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The system was introduced by Managing Director Eiji Toyoda in 1951 when it became clear during the post Second World War economic recovery that Toyota's production facilities needed improvement. Toyoda took the idea of TCISS (the creative ideas suggestion system) from a Ford Motor Company plant which he had visited in July 1950.

Although the TCISS offered incentives to employees, the real value of the system was that it provided motivation to employees by focusing on their skills and creativity. The TCISS systemized the practices that had been customary since the time of Toyota Motor Corporation founder Kiichiro Toyoda: respecting opinions from production and sales and conducting spontaneous on-site inspections while simultaneously inviting suggestions for improvements.
Type 4 – Vision / Innovation

How you?

Profit Model: Make money
Network: Connect with others to create value
Structure: Align your talent and assets
Process: Use Superior methods to do your work
Product Performance: Employ distinguish features and functionality
Product System: Create complementary products and services
Service: Support and enhance the value of your offering
Channel: Deliver your offering to your customers and users
Brand: Represent your offering and business
Customer Engagement: Foster interaction

Doblin: 10 Types of Innovation: The Discipline of Building Breakthroughs
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The term “7 QC tools” is named after the seven tools of Musashibo Benkei the famous warrior monk. Benkei owned seven weapons which he used to win all his battles. Similarly from my own experience you will find that you will be able to solve 95% of the problems you face if you properly use the 7 QC tools.

Professor Emeritus
University of Tokyo
Session Summary

- Benkei vs. Baka analogy and be careful of experts who only know one way
- Each type has a different cadence and focal point
- Reflection after doing is key as well. However you can’t just “think” your way to improvement
- Learning by doing is key for all four types
- Problem solving, innovation and improvement require perspiration and willingness to fail more than once