

4 Types of Problems

Art Smalley
President



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

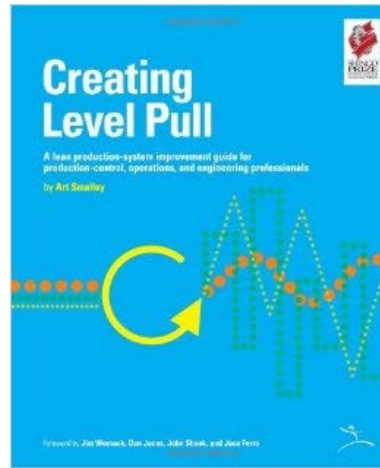
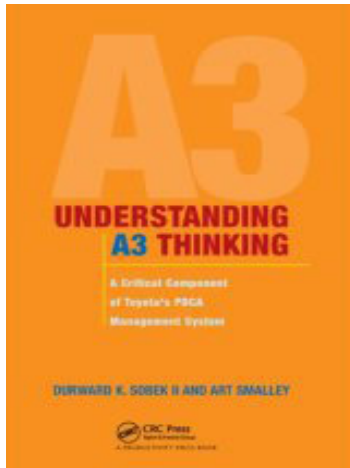


Lower Volume &
Higher Mix



High Volume &
Lower Mix

Other Background - Work



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WELCOME TO ART OF LEAN

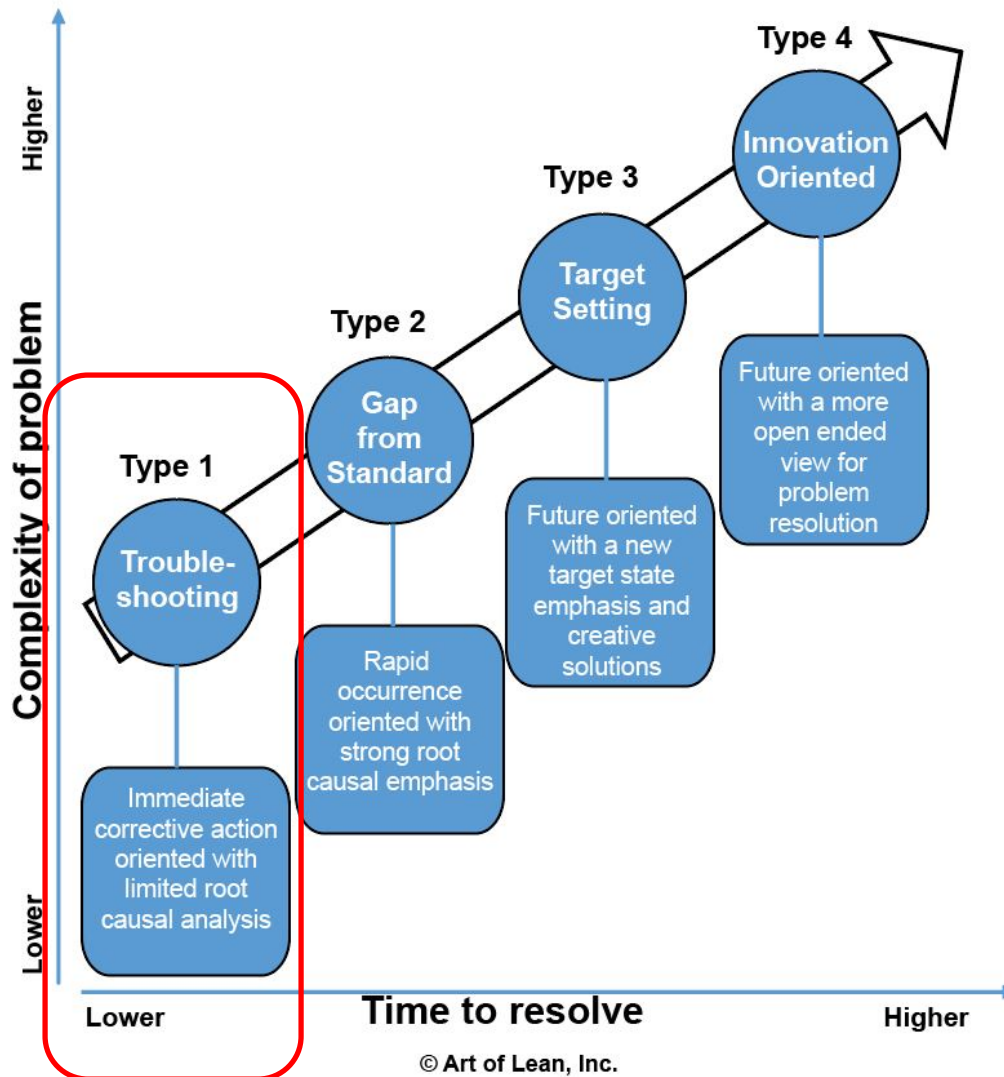
Leadership Development, Lean Thinking, and Continuous Improvement.

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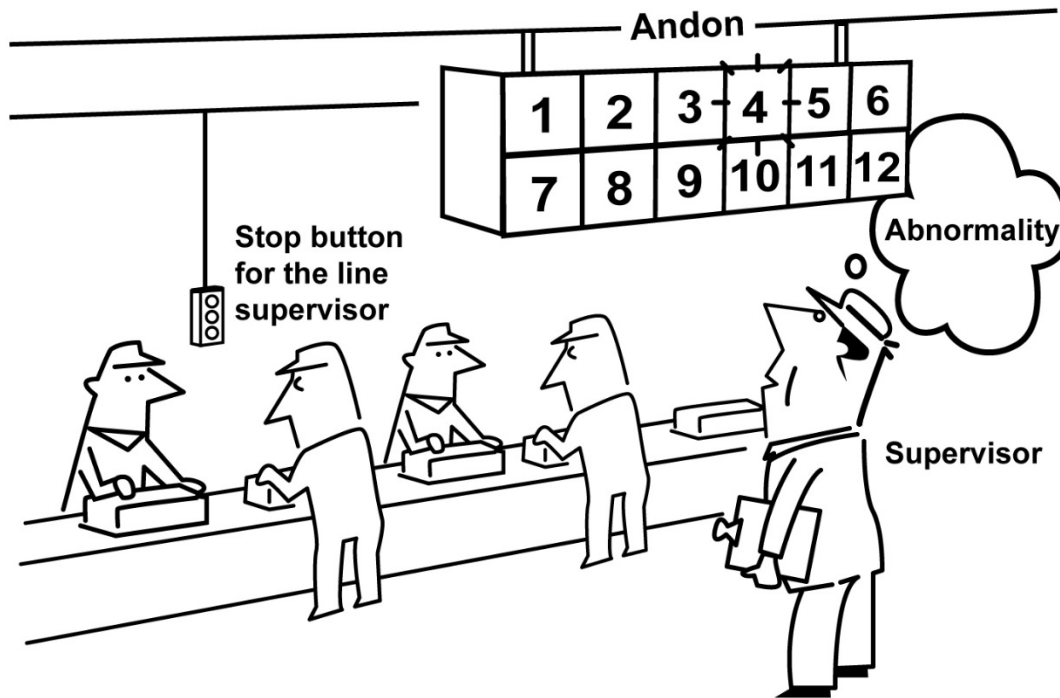
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4 Types of Problem Situations

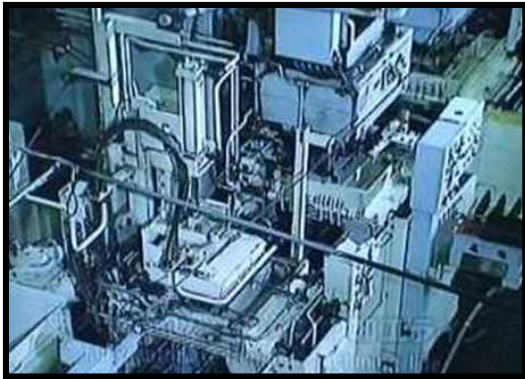


Type 1 – Troubleshooting



**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

Type 1 – Troubleshooting

Production Analysis Board

Line/Cell Name:		Team Leader:		Date:	
Quantity Required:		Takt Time:		Shift:	
				Num of Operator:	
Time	Hourly	Cumulative	Problem/Causes	Sign-off	
	Plan / Actual	Plan / Actual			
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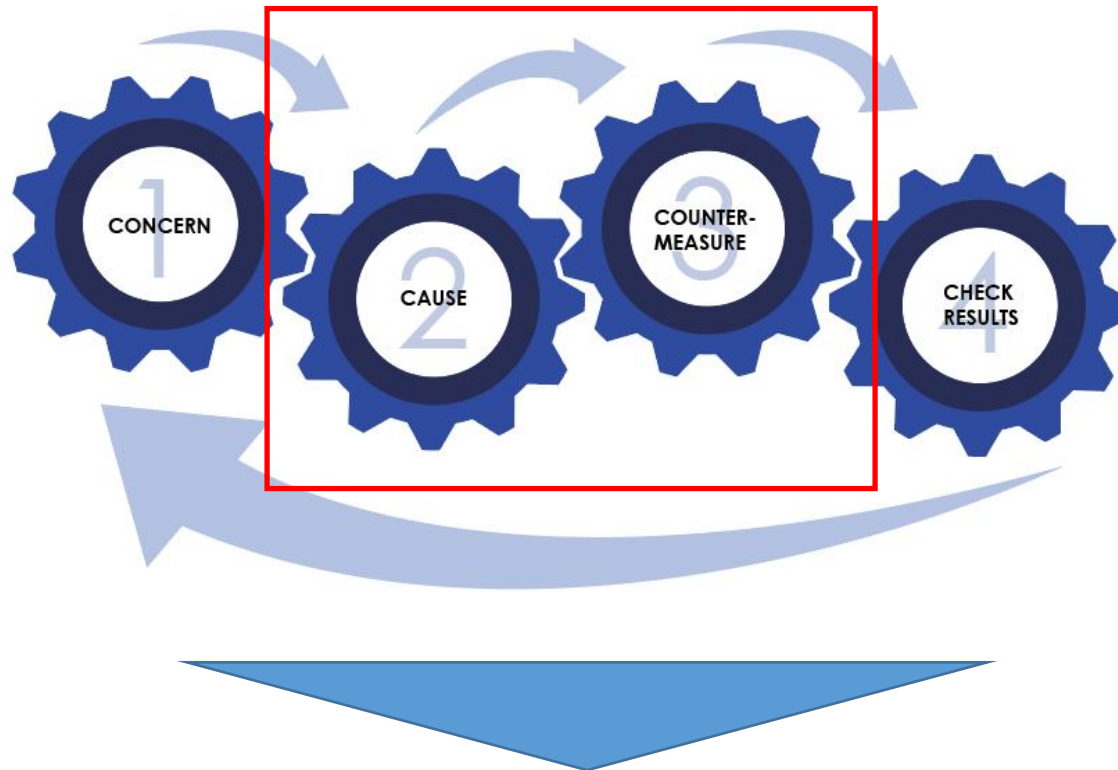
Rapid Problem Solving

- Concern
- Cause
- Countermeasure
- Check



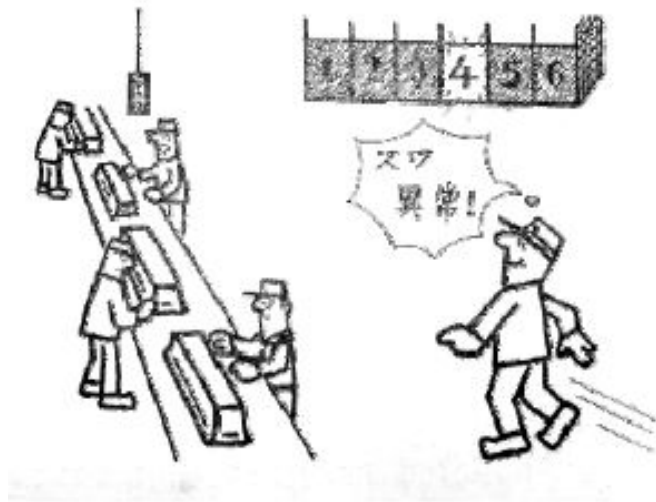
Time & quantity based triggers
Reviewed hourly by supervisor

4 C's Thinking



Minimal (if any) documentation involved. No A3's.
Mainly discussion, thinking, rapid action & follow up.

Toyota Supervisor Image



Rapid response to problems and abnormal conditions by production

-Team Member

-Team Leader

-Group Leader

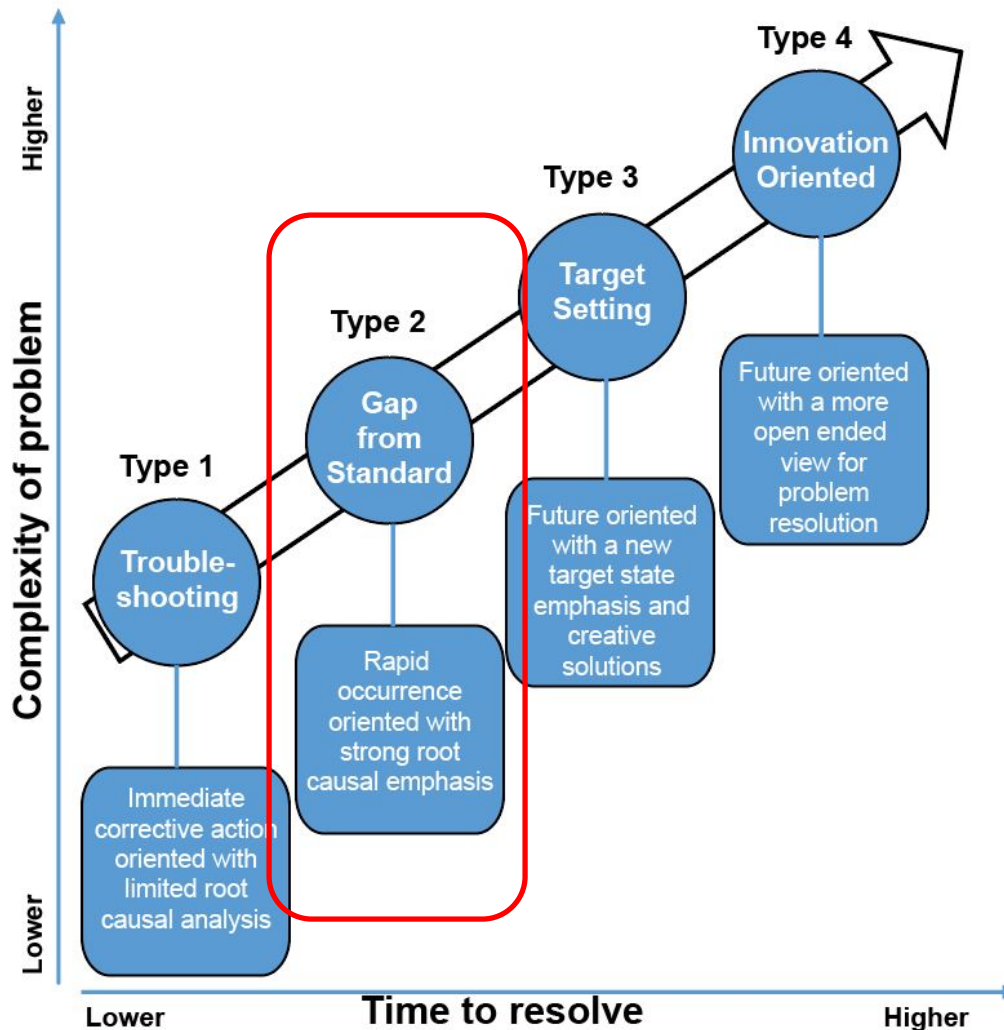
-Manager

-Plant Manager

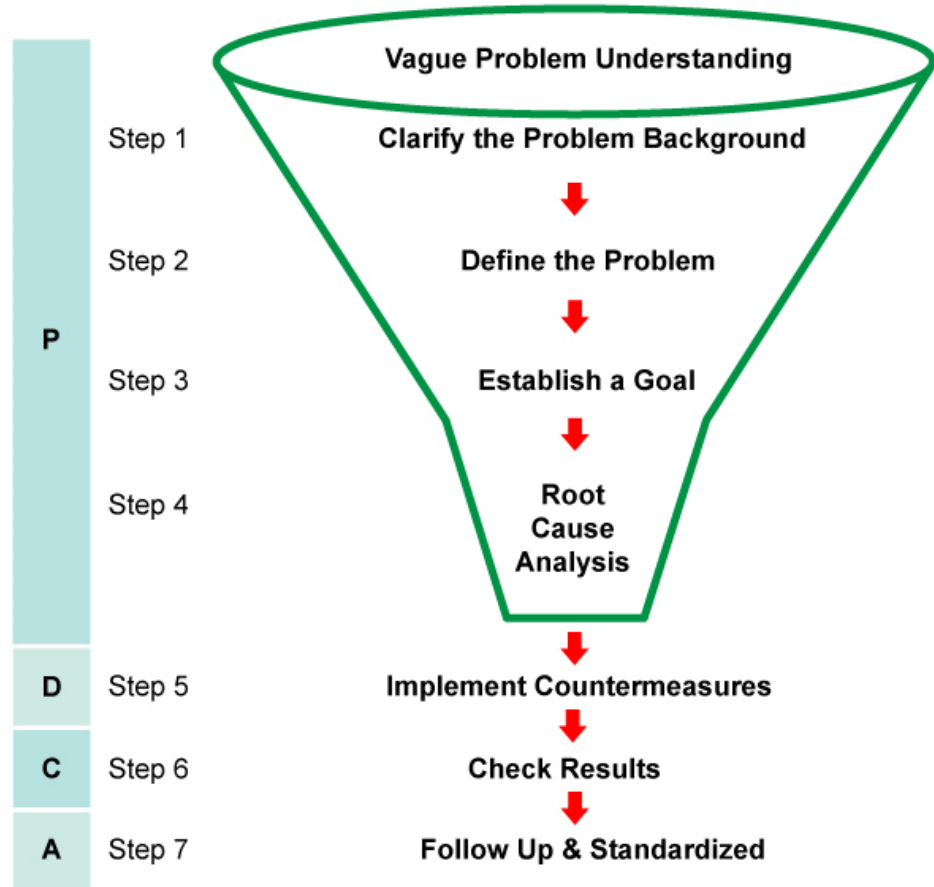
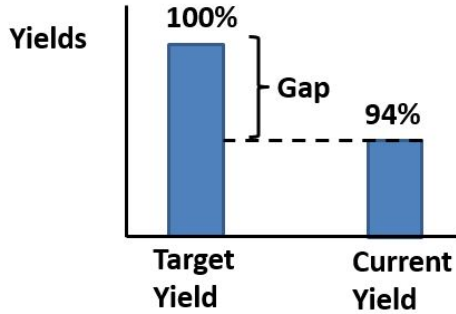
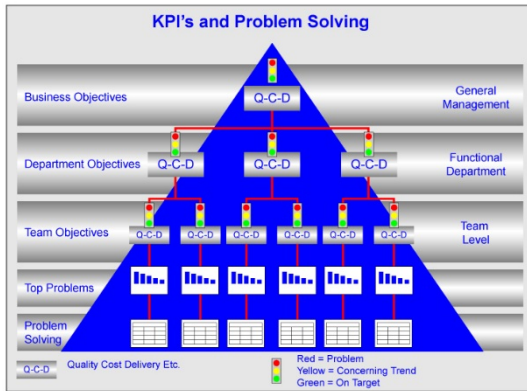
“All Mighty” Supervisor Image

1. Safety
2. Job Ability
3. Team Leadership
4. Kaizen Skills / Problem Solving
5. Technical Knowledge
6. Human Relations

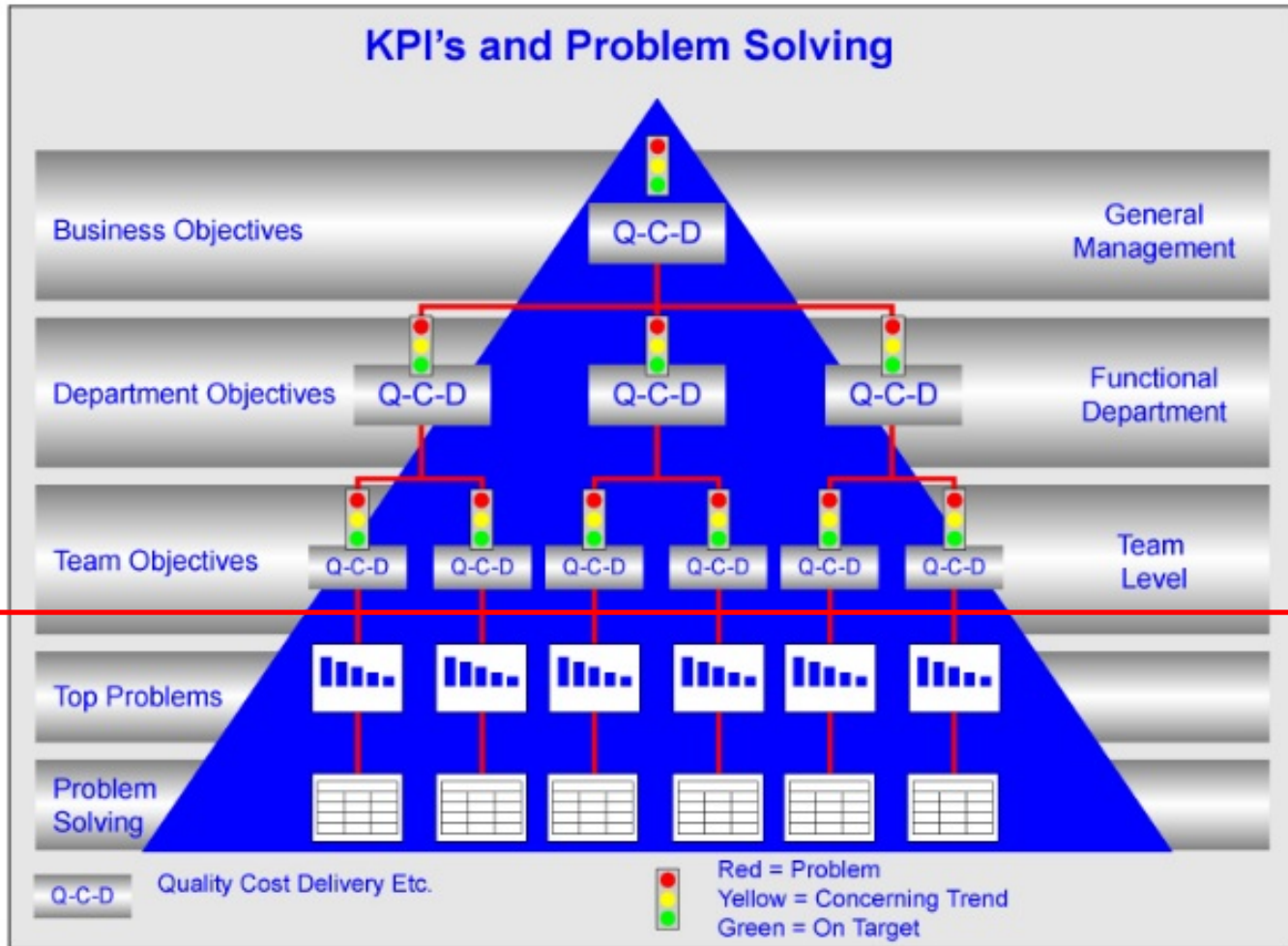
4 Types of Problem Situations



Type 2 – Gap from Standard



KPI's & Problem Solving



Problem Investigation

TPS

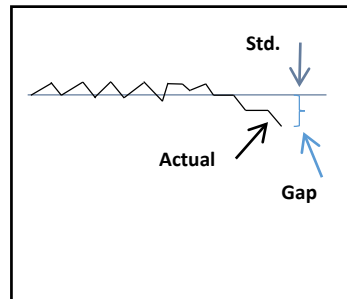
TPS



A. Immediate abnormality signal



B. Go to actual machine and see status

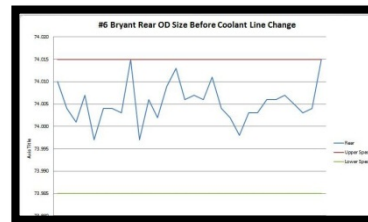
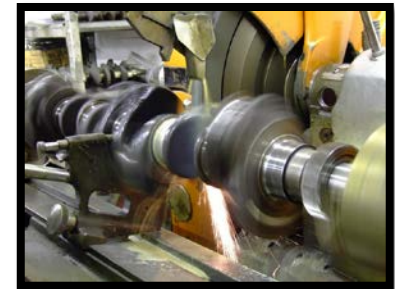


C. Ascertain actual problem situation

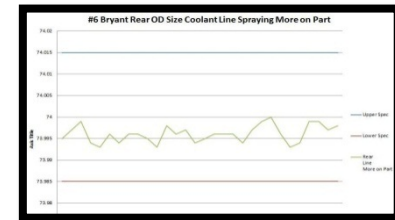
TPS

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

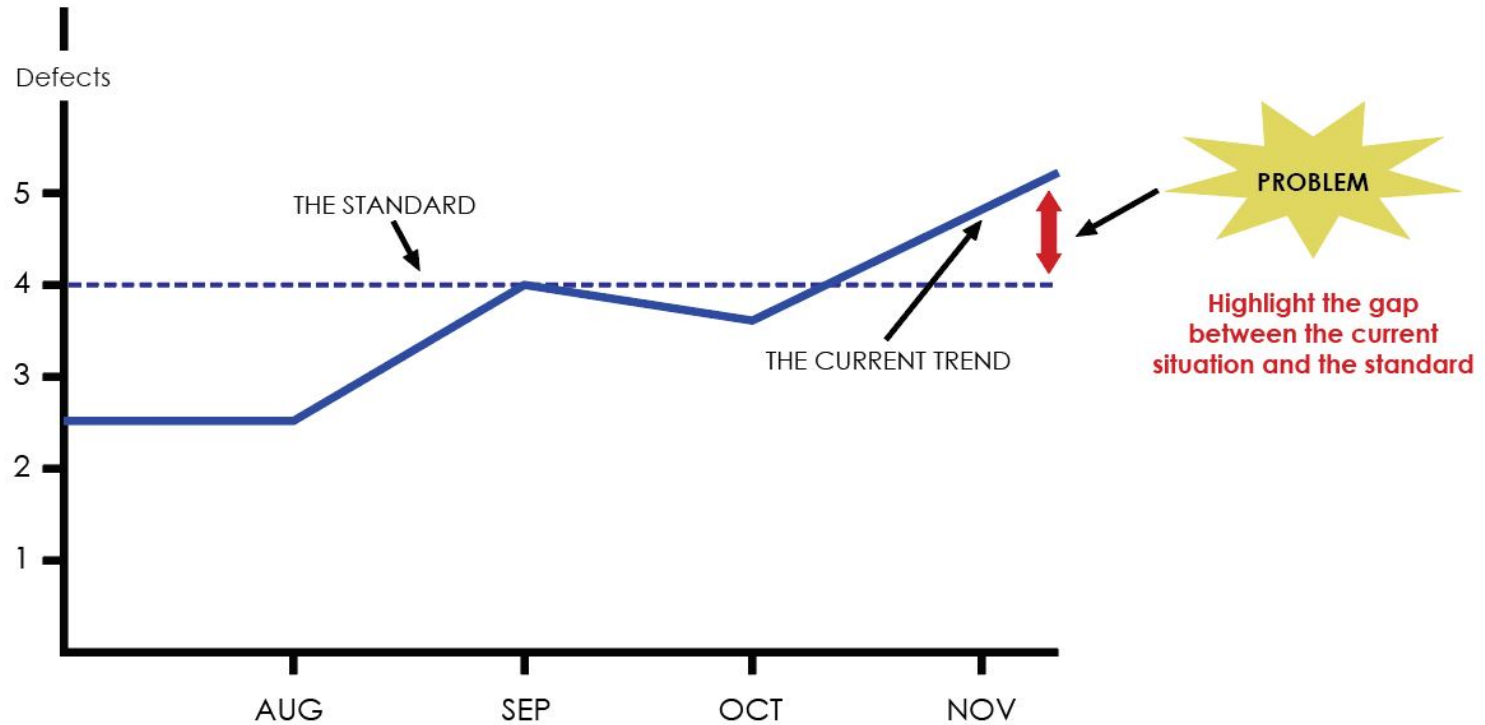


Cpk 1.15

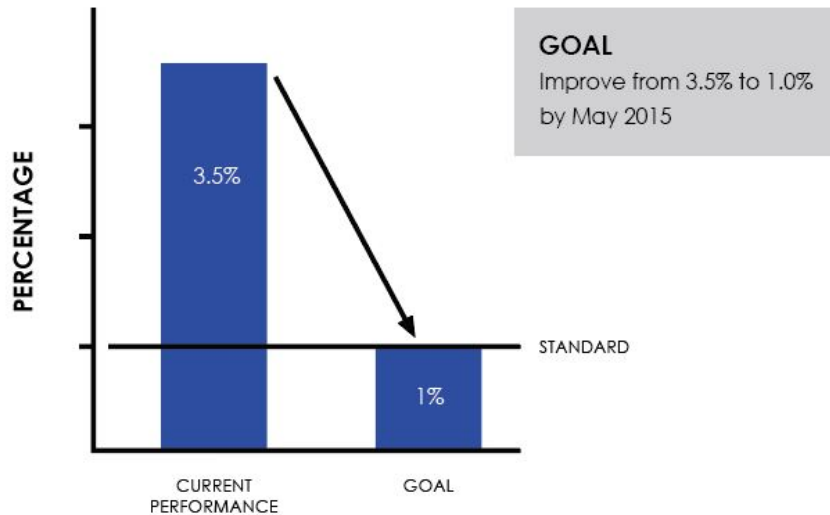


Cpk 2.33

Define the Problem



Set a Goal



3 Factors

From what level?

To what level?

By when?

SMART

Specific?

Measurable?

Attainable?

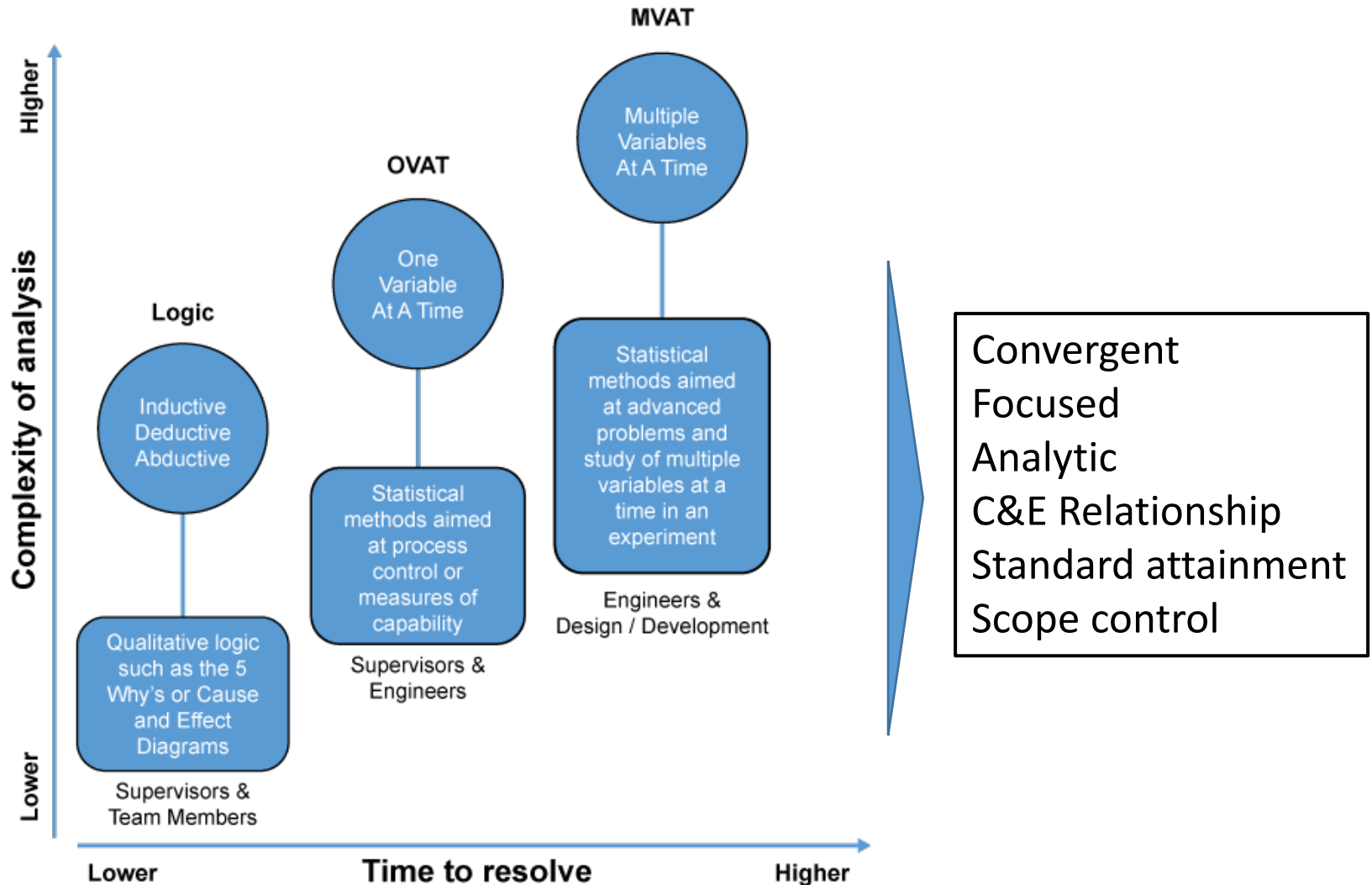
Relevant / Realistic?

Time bound?

Poor examples include:

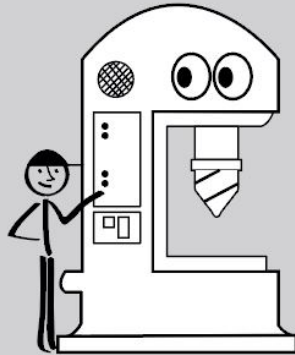
- 1) Find the root cause! (This is the next step of the process)
- 2) Implement lean tools like 5S or Standardize Work, etc. (This is an action item)
- 3) Train the employee (This is jumping to conclusions)

Type 2 – Analysis Types



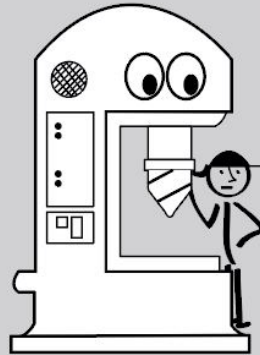
Key Point is the Countermeasure!

FIRST WHY



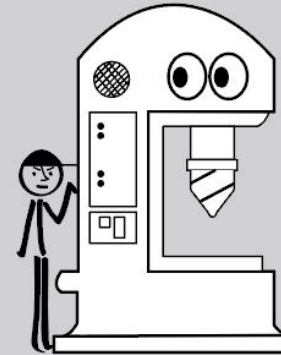
Q: **WHY** has machine stopped?
A: There was an overload and the fuse blew.

SECOND WHY



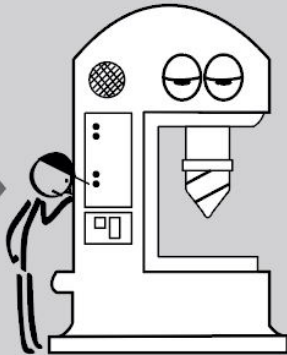
Q: **WHY** was there an overload?
A: The bearing was not sufficiently lubricated.

THIRD WHY



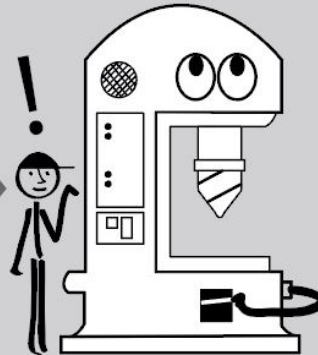
Q: **WHY** was it not lubricated?
A: The lubrication pump was not pumping sufficiently.

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.

**RECCURENCE PREVENTION
COUNTERMEASURE:**

Add fine mesh strainer to inlet port to prevent cutting chips from entering the system.

Type 2 – Countermeasure Types

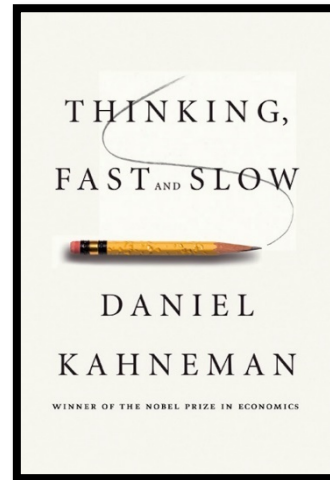
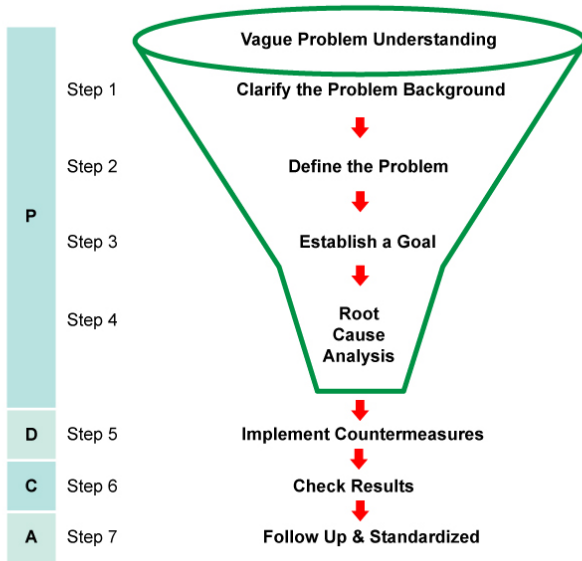
ADMINISTRATION	DETECTION	PREVENTION
<ul style="list-style-type: none">• Examples include increasing inspection duties, adding training or altering work instructions for the operator.• These controls are generally weak and mainly acceptable as temporary short term countermeasures.	<ul style="list-style-type: none">• Examples include any instances of sensors or alarms used to signal that an abnormality has occurred in the product or process and stops the defect from moving downstream. Mistake or error proofing in the process.• These controls are stronger in nature and contain defects internally better than administrative ones.	<ul style="list-style-type: none">• Examples include creative usage of techniques to prevent the defect or abnormality from occurring in the product or process. Or elimination of the underlying condition or potential.• These controls either alone or in conjunction with detection for the strongest type of defect control.



Weaker

Stronger

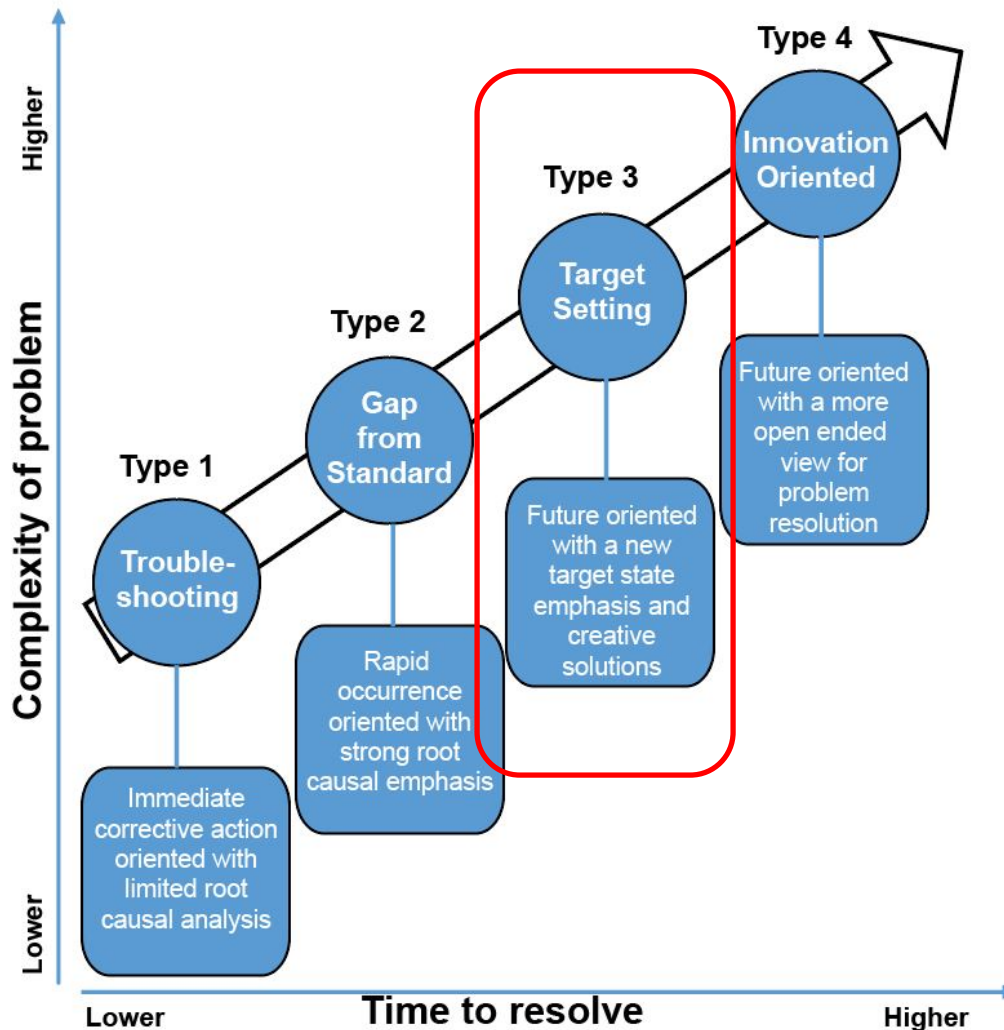
Type 2 Summary



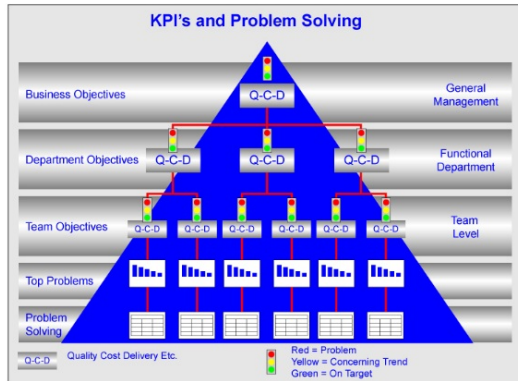
Type 1 Troubleshooting is about rapid action and response to the abnormal condition...an analogy is thinking fast.

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.

4 Types of Problem Situations



Type 3 – Target State



Acceptable (Current State) Situation

(Future) Ideal Situation

GAP

Normal Status

Current Situation

Type 2 - "Gap from Standard"

Kaizen Methods

改善方法

Type 3 - "Target State"

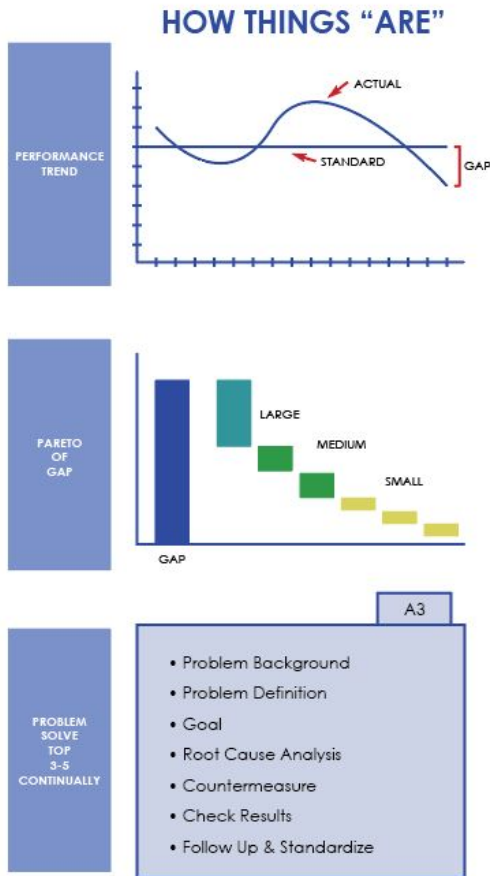
問題解決

Problem Solving

Target State Concept (Time Frame)

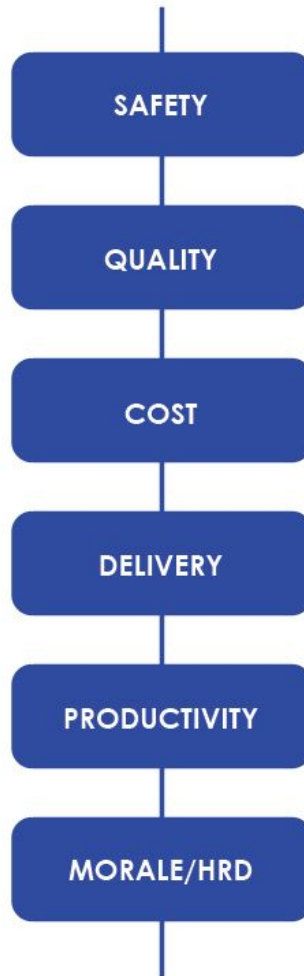
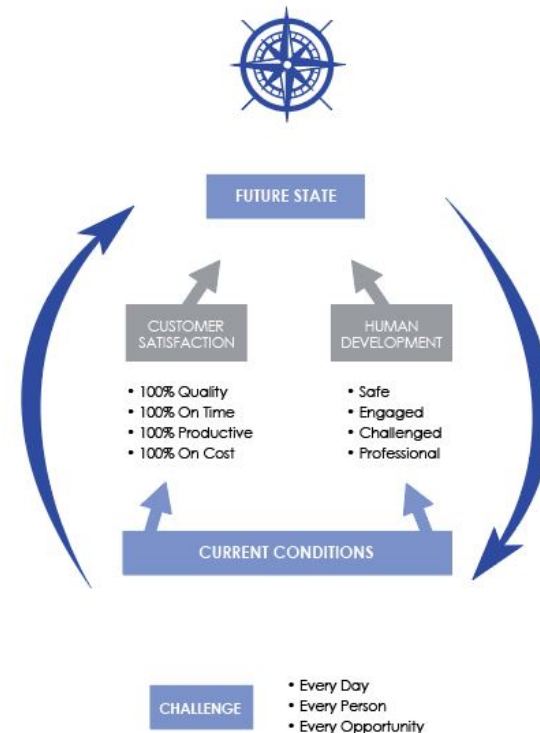
KEY PERFORMANCE INDICATORS

Type 2 Problems & Gap From Standard

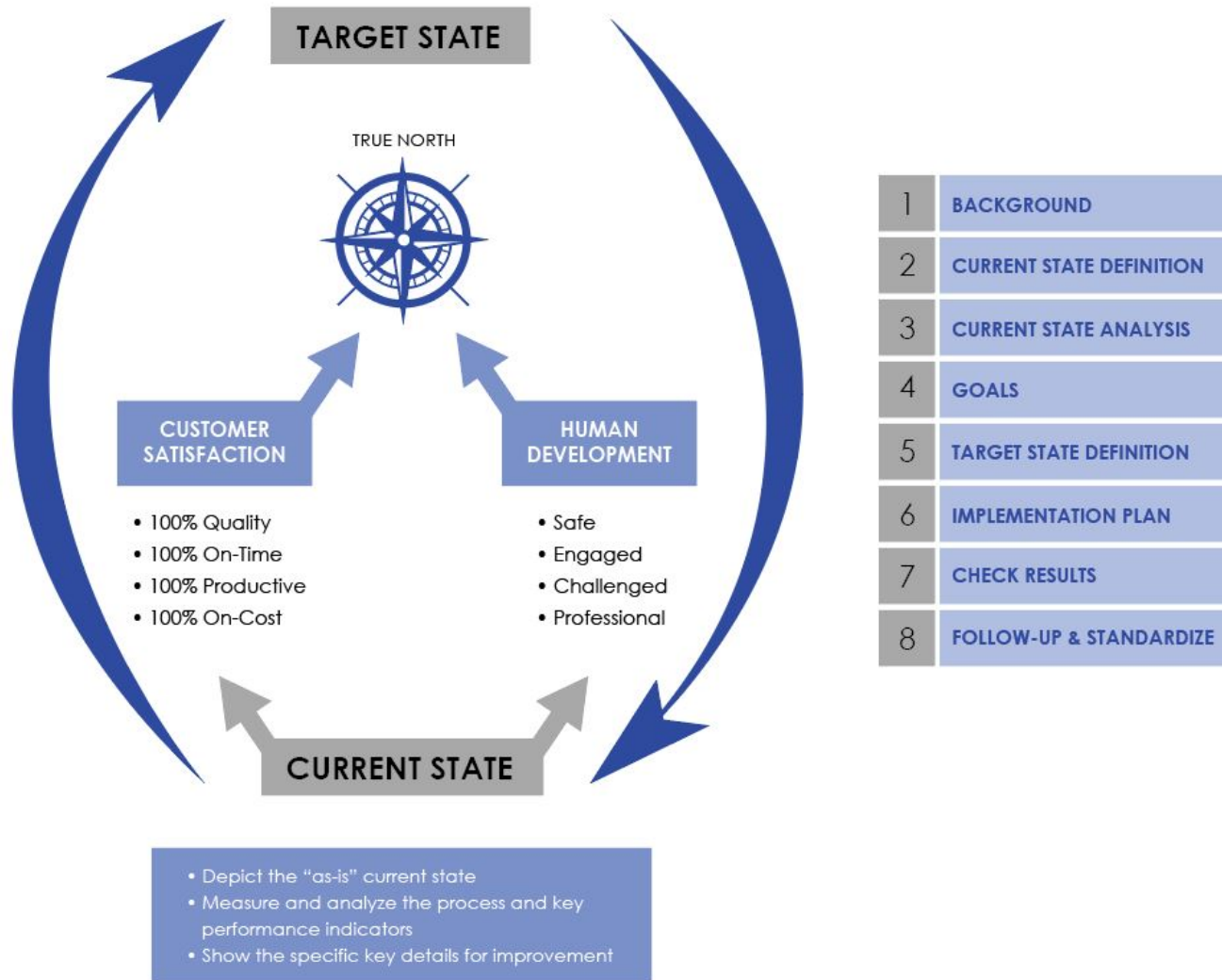


Type 3 Problems & Target State Setting

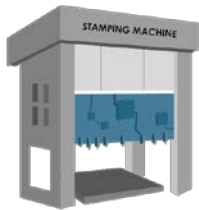
HOW THINGS "SHOULD BE"



Target State Improvement Steps



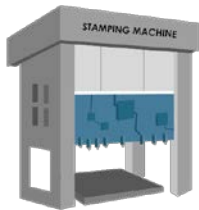
Process Example SMED Example



Dedicated Press
Part A



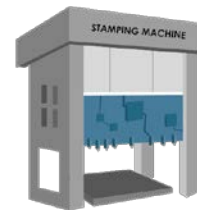
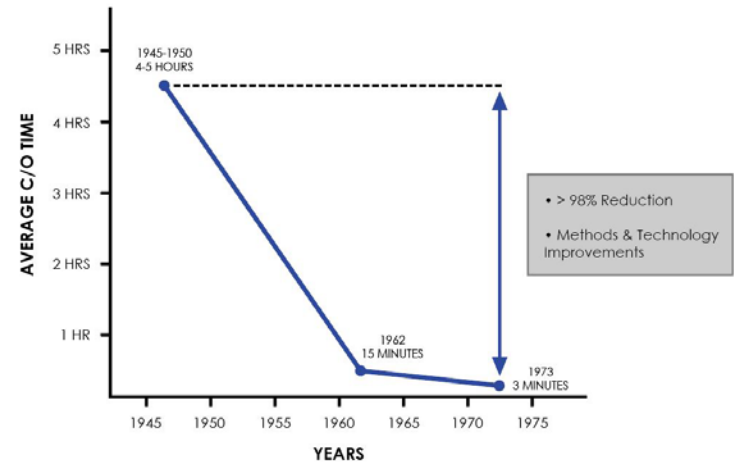
Dedicated Press
Part B



Dedicated Press
Part C

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

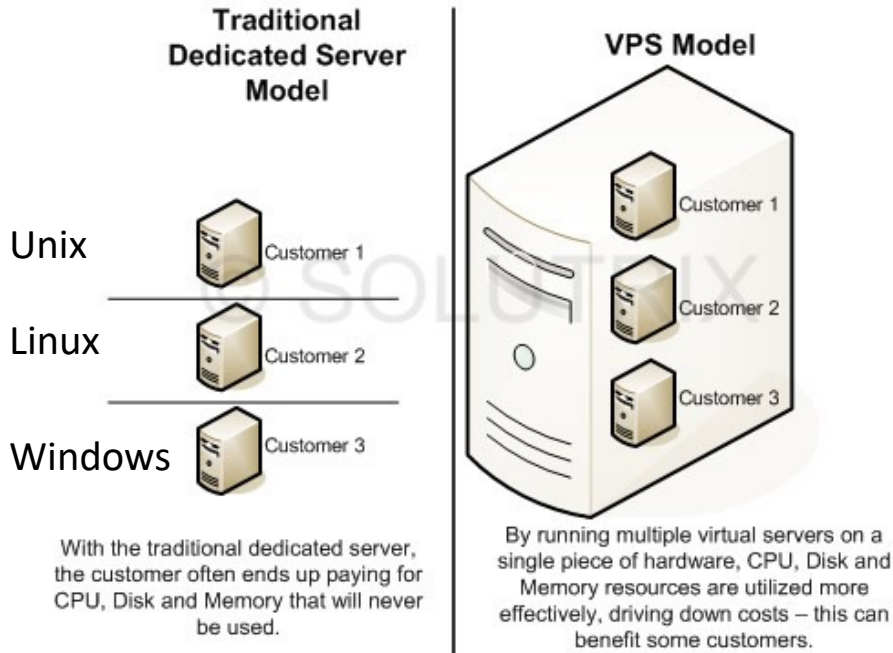
TOYOTA'S SET UP REDUCTION TIMELINE



Flexible Press
Parts A, B, & C

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

Software Example



Same basic principle as SMED in die exchange...

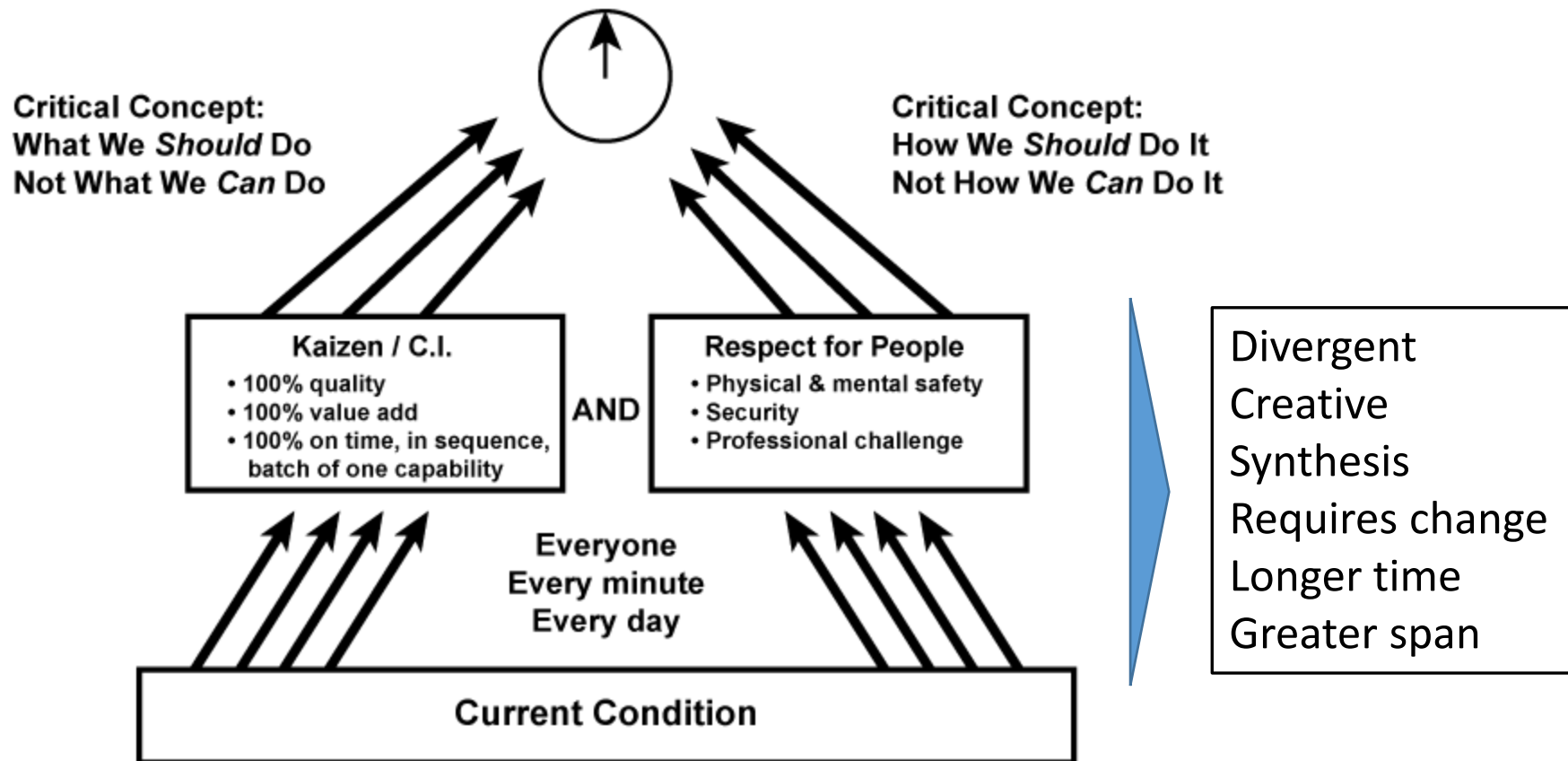
Key here is not the time change over aspect but the software ability to act and host multiple server types...

3 Dedicated Servers
Each 30% utilized
No flexibility
Stranded resources

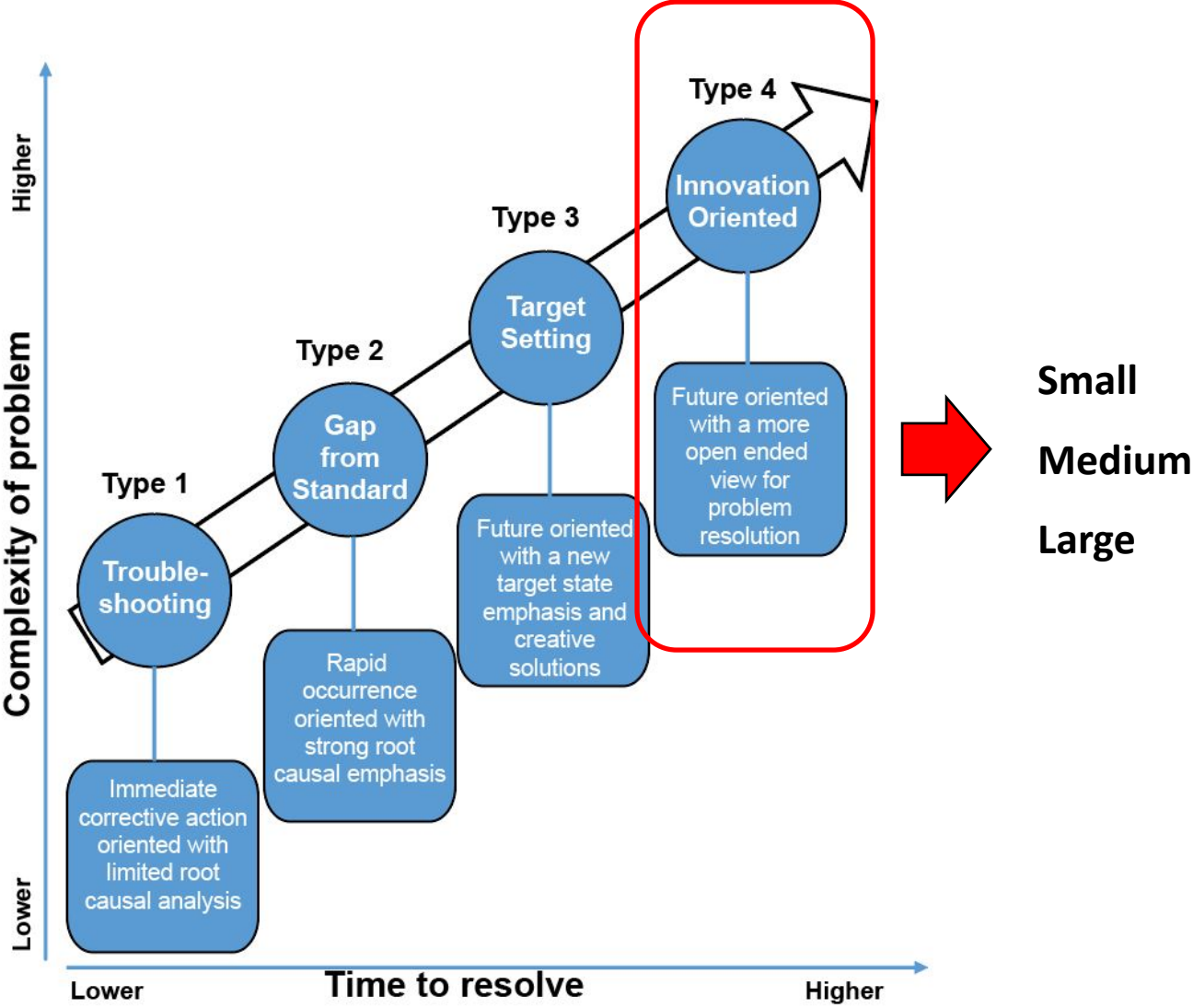
1 Virtual Server
Now 90% utilized
Flexibility
Less waste

Type 3 – Target State Summary

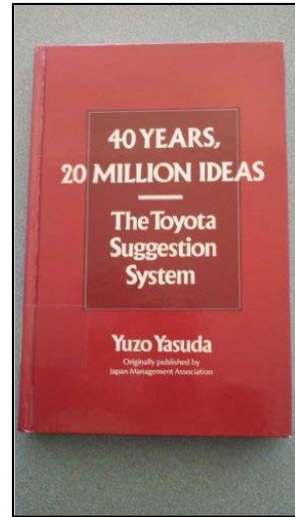
Arubeki Sugata / Ideal State



4 Types of Problem Situations



Toyota Suggestion System 1951



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.

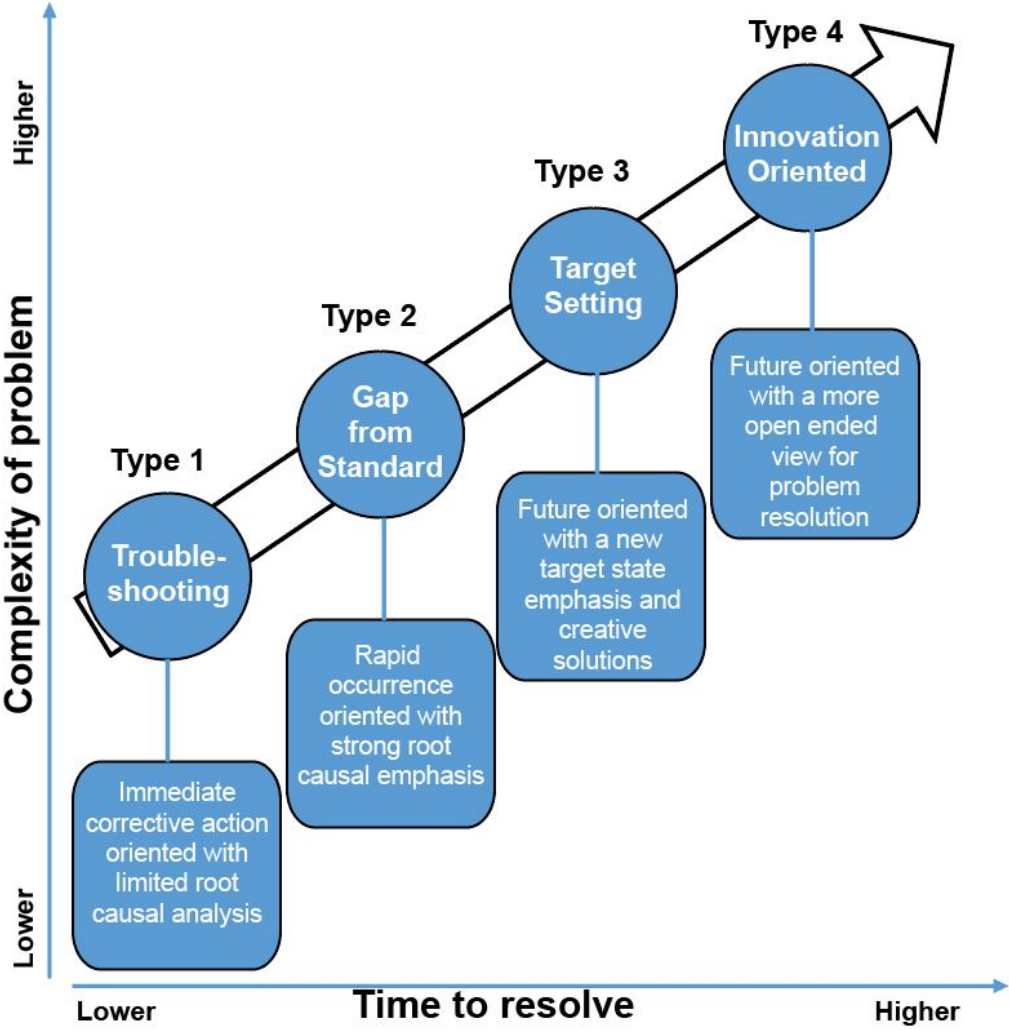
Although the TCISS offered incentives to employees, the real value of the system was that it provided motivation to employees by focusing on their skills and creativity. The TCISS systemized the practices that had been customary since the time of Toyota Motor Corporation founder Kiichiro Toyoda: respecting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

Type 4 – Vision / Innovation

		How you?	
CONFIGURATION	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	
OFFERING	Product Performance	Employ distinguish features and functionality	
	Product System	Create complementary products and services	
EXPERIENCE	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

4 Types of Problem Situations



4 Types & Benkei Analogy

Benkei



Kaoru Ishikawa



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

Baka / バカ / 馬鹿

馬鹿の一つ覚え
[ばかのひとつおぼえ,
baka no hitotsu-oboe

A fool remembers only
one thing

A fool knows only one way
of doing things

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