

Toyota Kaizen Methods

Steps for Continuous Improvement

Learning Session Outline

- Background
- 4 Types of Problem Situations
- Type 3 – Target State 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
- Summary

Background - Lean / Toyota



Toyota Kamigo
Overhead



Kamigo
Entrance



Taiichi
Ohno



Precision & Machine
Intensive

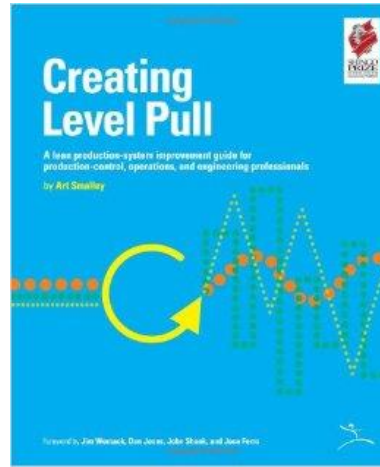
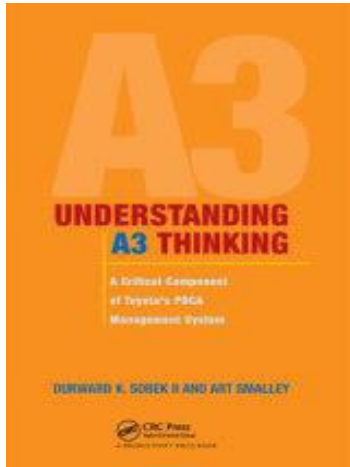


Lower Volume &
Higher Mix



High Volume &
Lower Mix

Other Background - Work



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Art of Lean

Website for Art of Lean, Inc. Information pertaining to Lean Thinking and the Toyota Production System

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Lean Leadership and Special Forces 2

I was honored to receive a request to visit United States Special Operations Command and deliver a talk on Toyota Style Shop Floor Leadership Practices at Camp Mackall outside of Fort Bragg, North Carolina. The talk was filmed and a couple of short excerpts were made available for viewing at the following Special Operations Command Website (click for link).

Search Art of Lean Site

Recent Posts

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Archives

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Leader vs Manager

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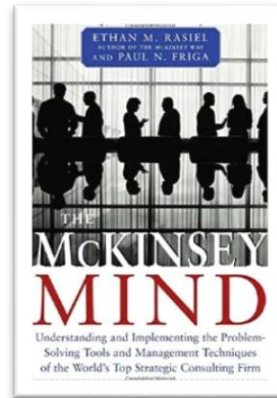
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- Problem Solving (3)
- QC Circles (2)
- Respect for people (1)
- Set Up Reduction (1)
- Sourcing Decisions (1)
- Standardized Work (3)
- TPS History (3)
- TWI Job Instruction (6)
- TWI Job Methods (3)
- TWI Job Relations (5)

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Other Background - Stuff



TPS Development Timeline

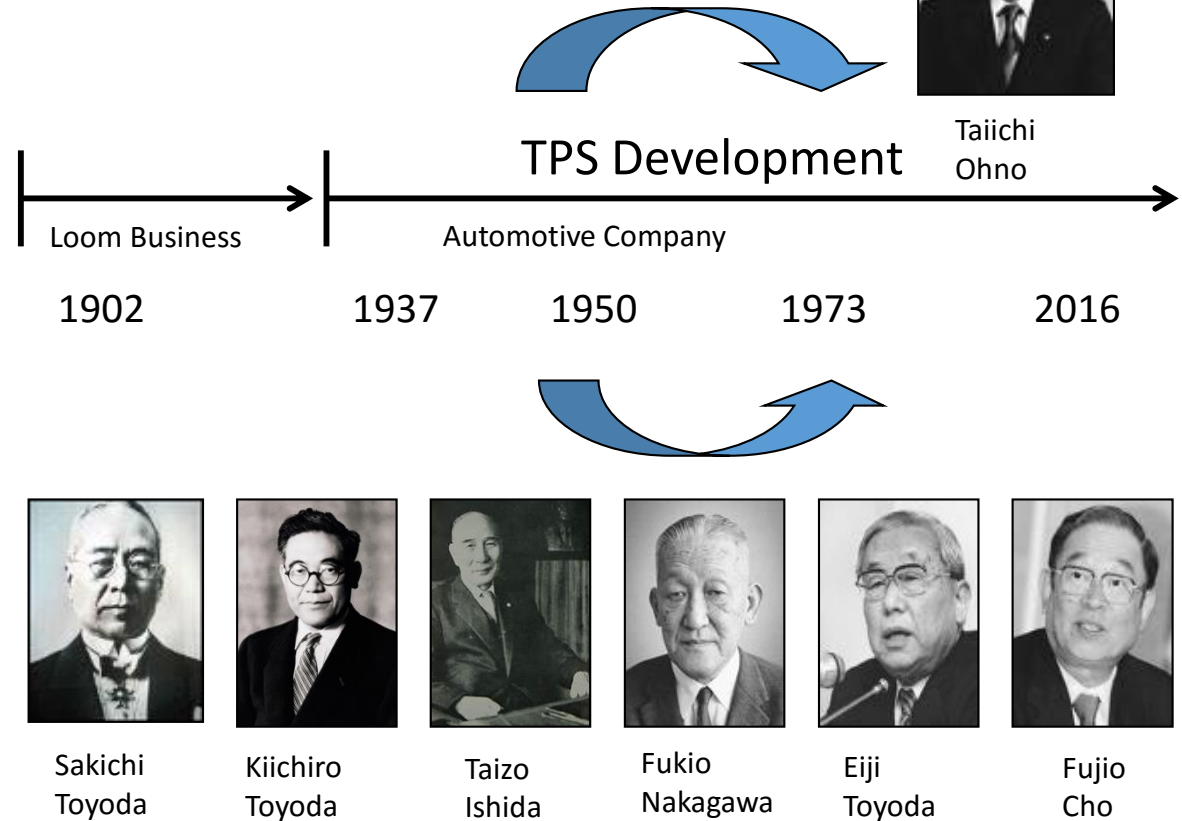
Western Influences:

Mass Production & moving conveyor lines

Scientific Principles Of Management

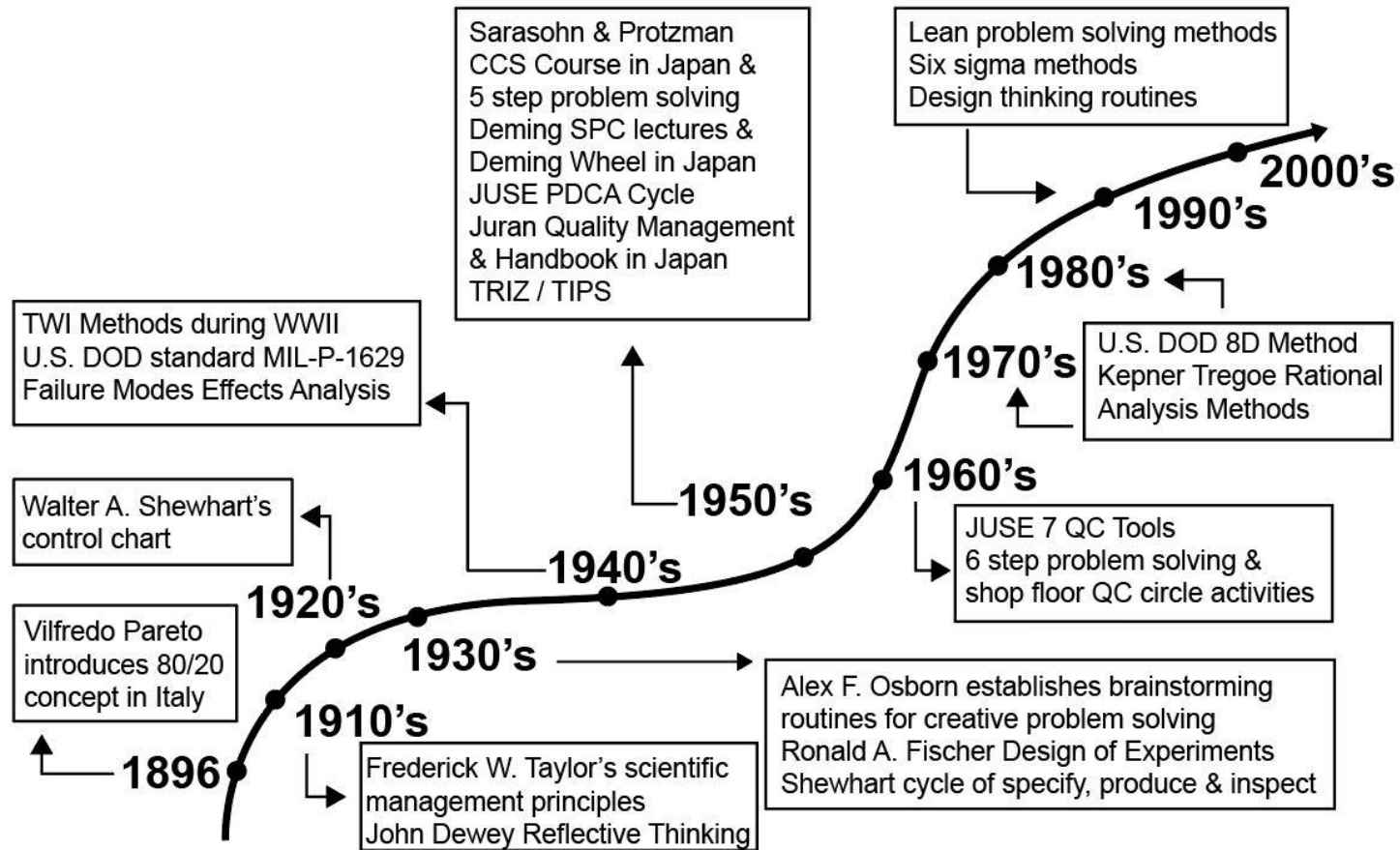
Standardization Of Parts

Many Others....



Various parties and key individuals involved over a long period of time

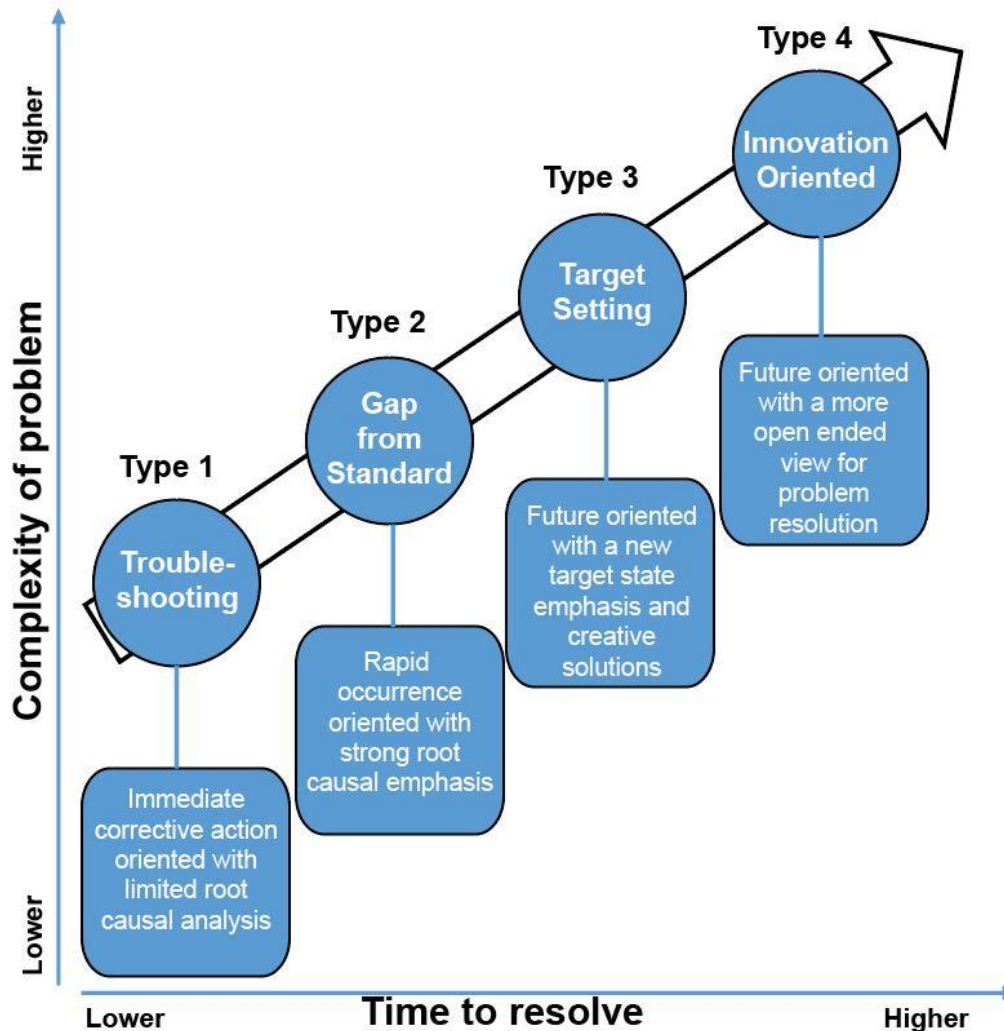
20th Century & Problem Solving



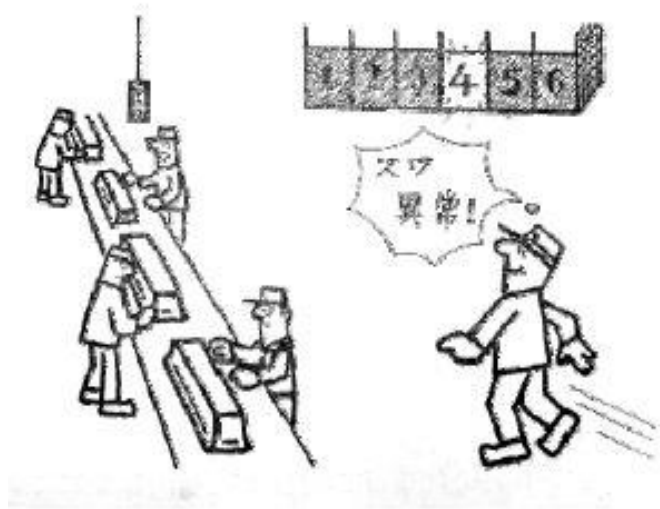
General Inputs:
Scientific Method &
Critical Thinking Routines



4 Types of Problem Situations



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 & Benkei Analogy

Benkei



7 QC Tools

1. Data Collection / Check sheets

2. Cause-and-effect diagram

3. Flow charts

4. Histogram

5. Pareto chart

6. Control chart

7. Scatter diagram

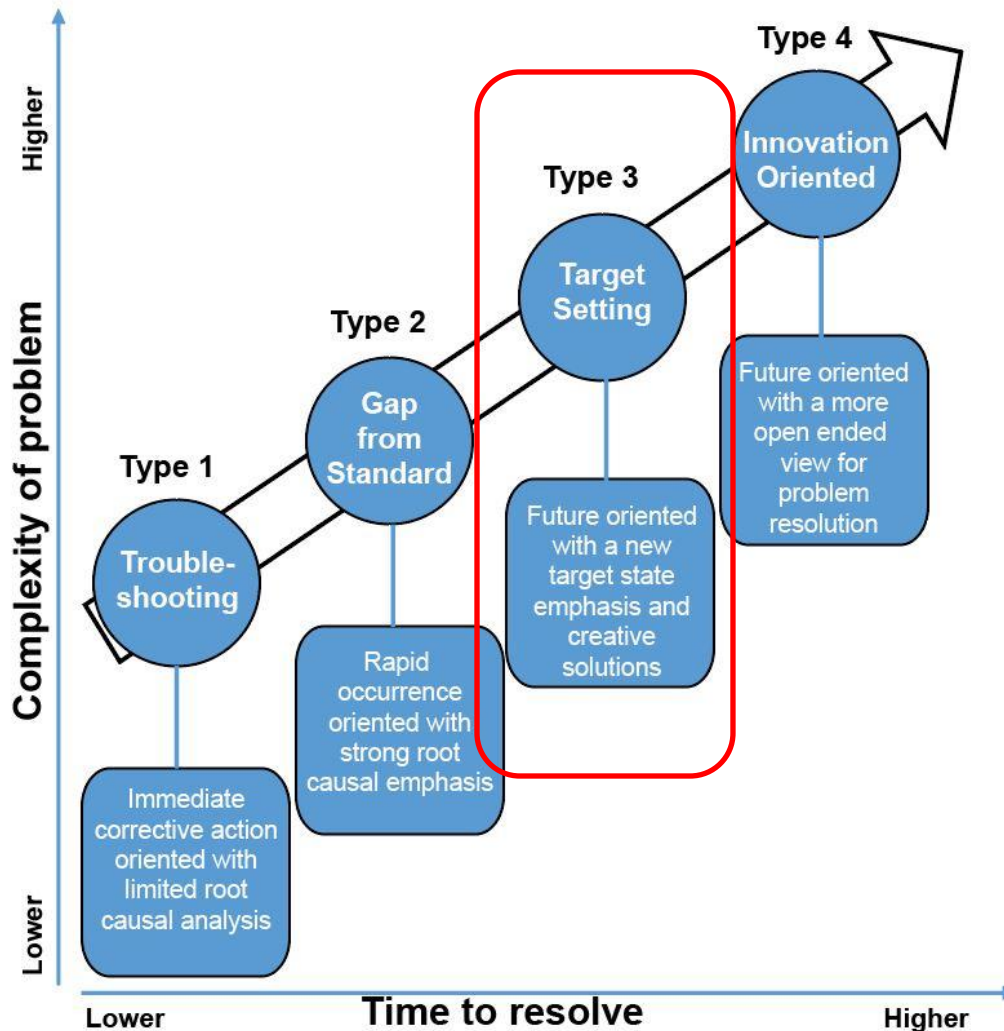
Kaoru Ishikawa



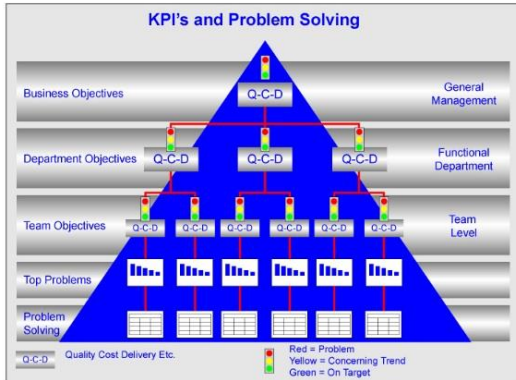
The term “7 QC tools” is named after the seven tools of Musashibo Benkei the famous warrior monk. Benkei owned seven weapons which he used to win all his battles. Similarly from my own experience you will find that you will be able to solve 95% of the problems you face if you properly use the 7 QC tools.

Professor Emeritus
University of Tokyo

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

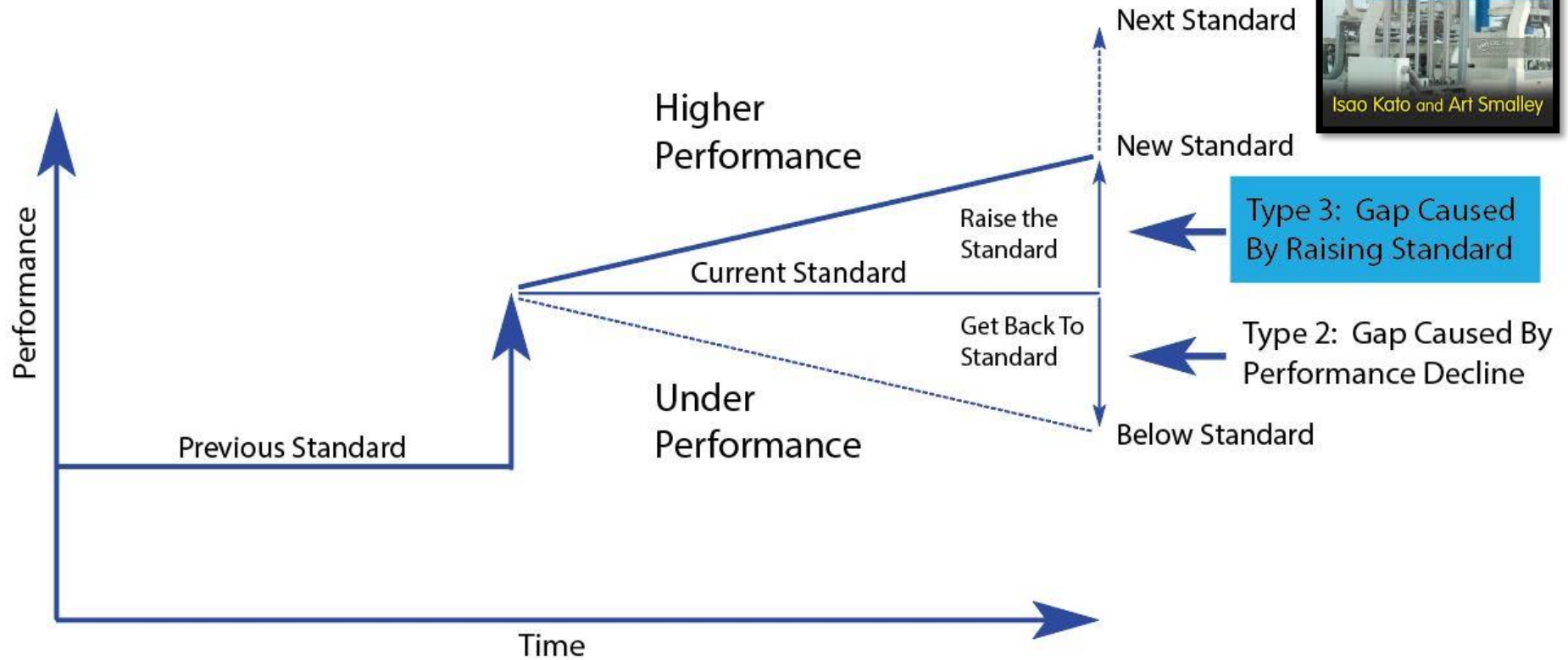
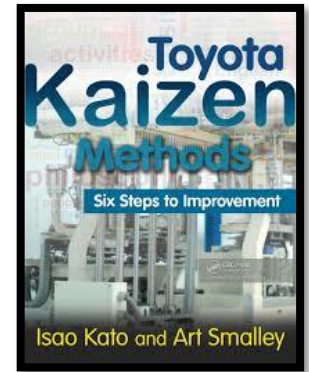
Type 3 - "Target State"

問題解決
Problem Solving

Shop Floor Management Board

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PLAN																																																																																																																				
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Type 3 – Raise the Bar

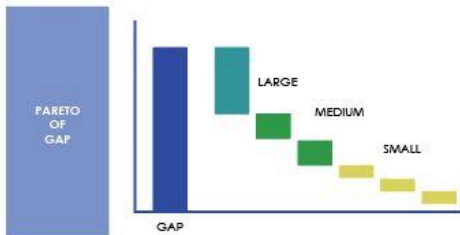
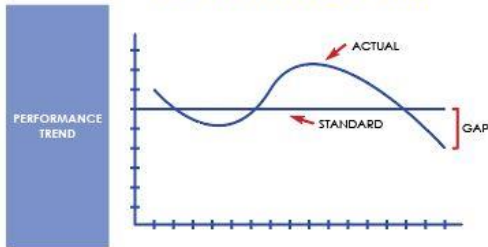


PS vs TS Comparison

KEY PERFORMANCE INDICATORS

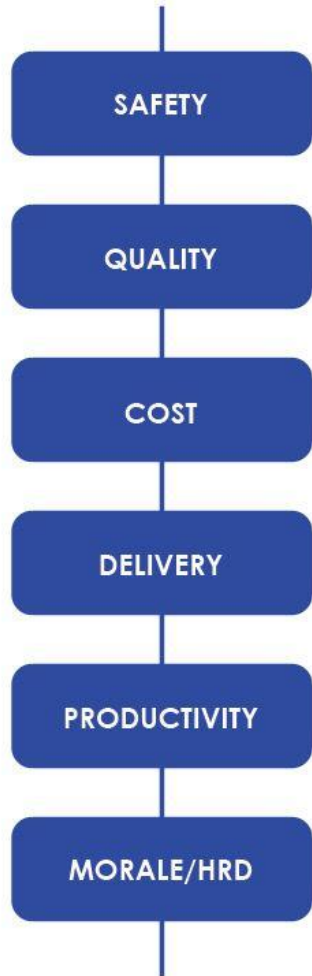
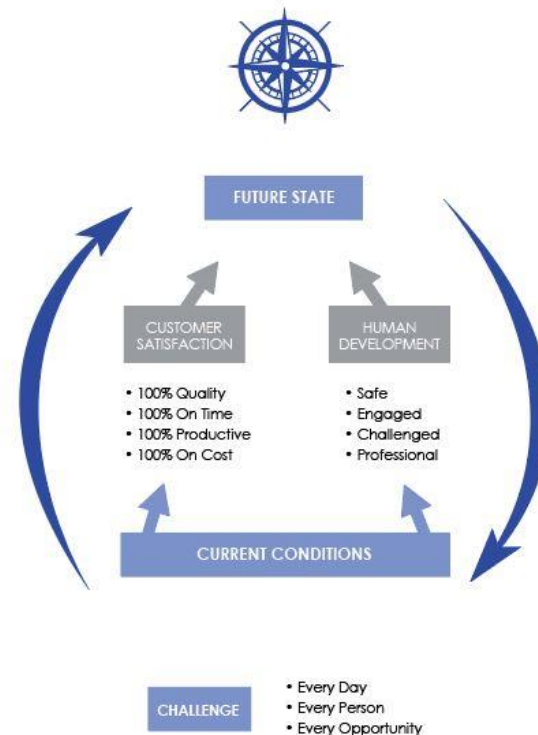
Type 2 Problems & Gap From Standard

HOW THINGS "ARE"



Type 3 Problems & Target State Setting

HOW THINGS "SHOULD BE"



Thinking Patterns

TWO KINDS OF THINKING

Critical Thinking

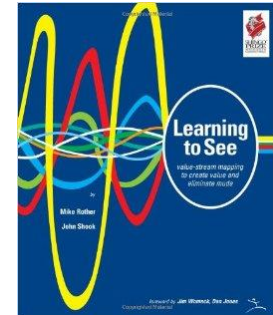
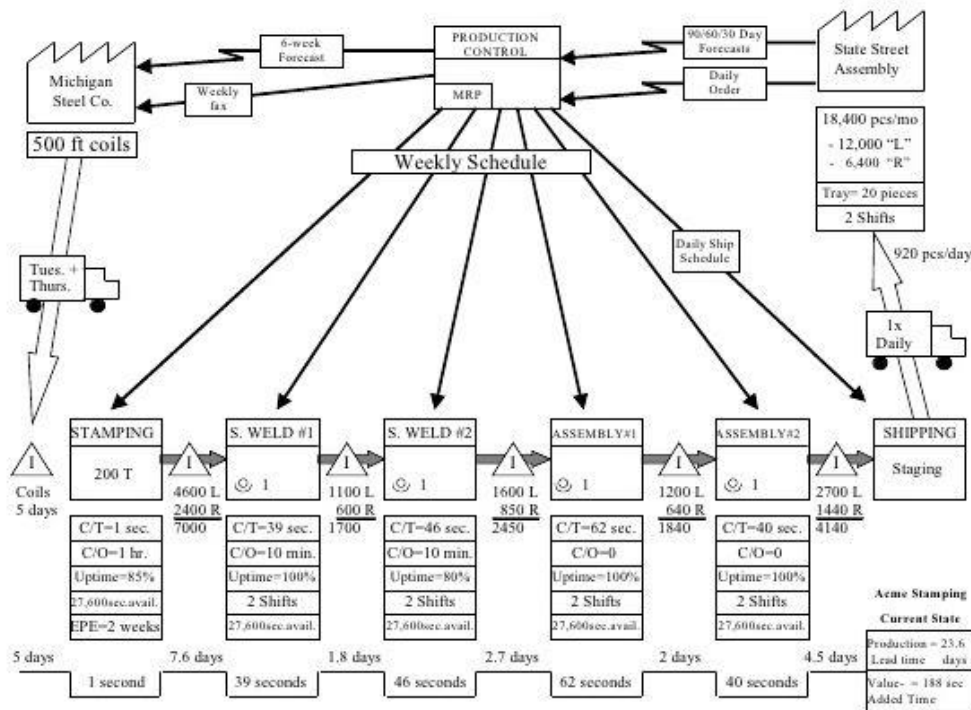
- analytic
- convergent
- vertical
- probability
- judgment
- focused
- objective
- answer
- left brain
- verbal
- linear
- reasoning
- yes but



creative Thinking

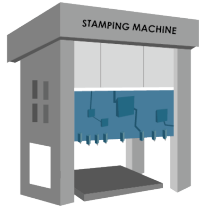
- generative
- divergent
- lateral
- possibility
- suspended judgment
- diffuse
- subjective
- an answer
- right brain
- visual
- associative
- richness, novelty
- yes and

Value Stream Example

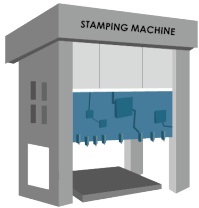


Multiple process flow depiction with emphasis on lead time reduction

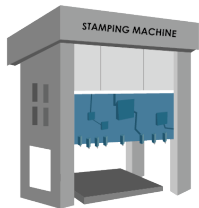
Stamping Process SMED Example



Dedicated Press
Part A



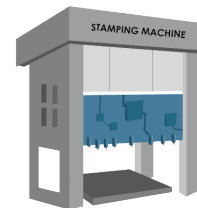
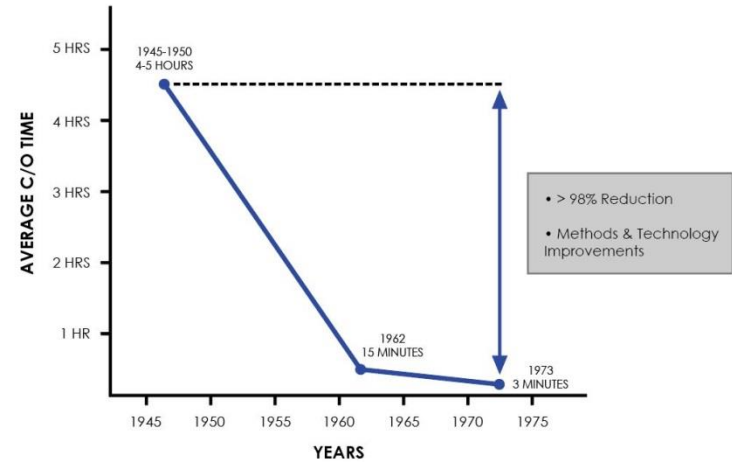
Dedicated Press
Part B



Dedicated Press
Part C

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

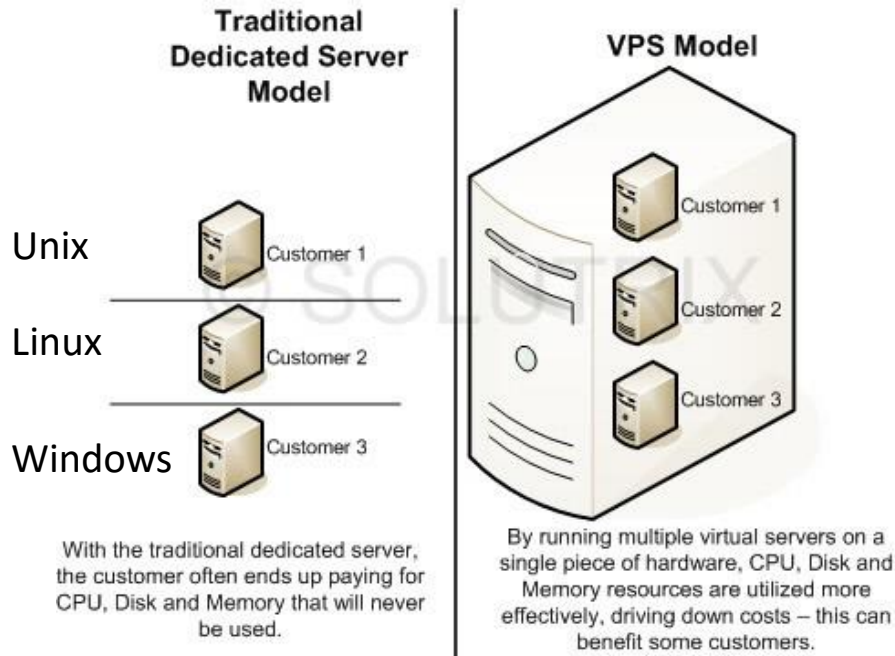
TOYOTA'S SET UP REDUCTION TIMELINE



Flexible Press
Parts A, B, & C

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

Software Server Example



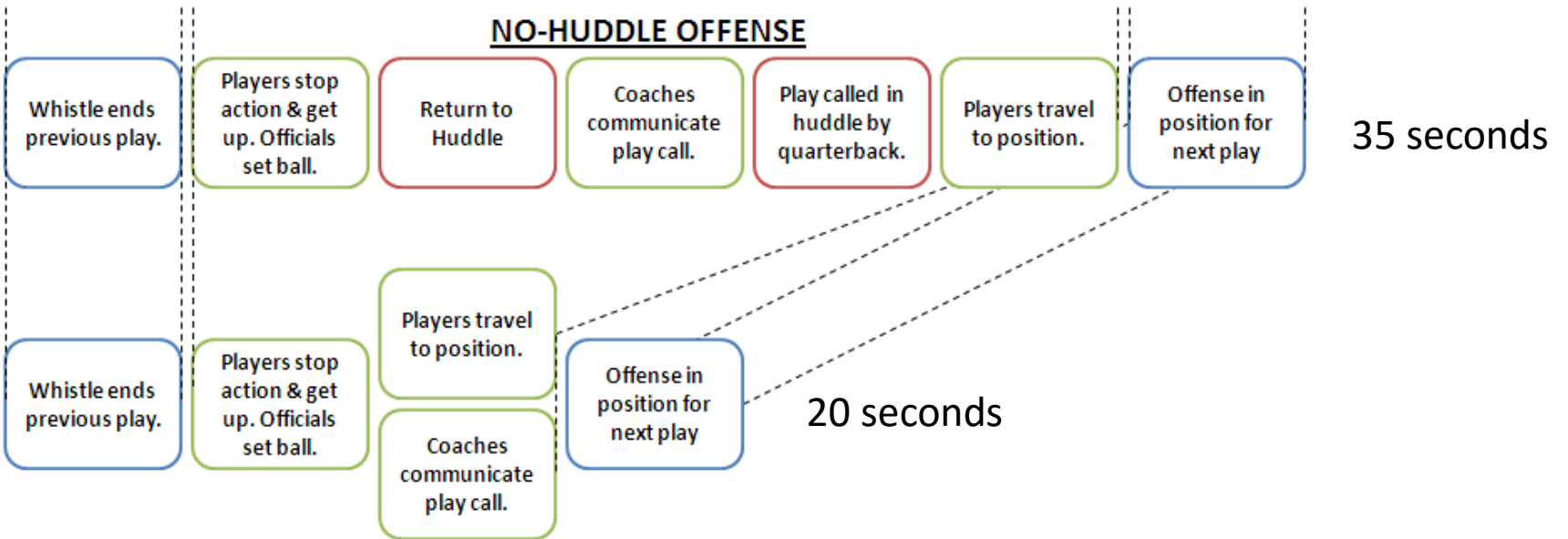
Same basic principle as SMED in die exchange...

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

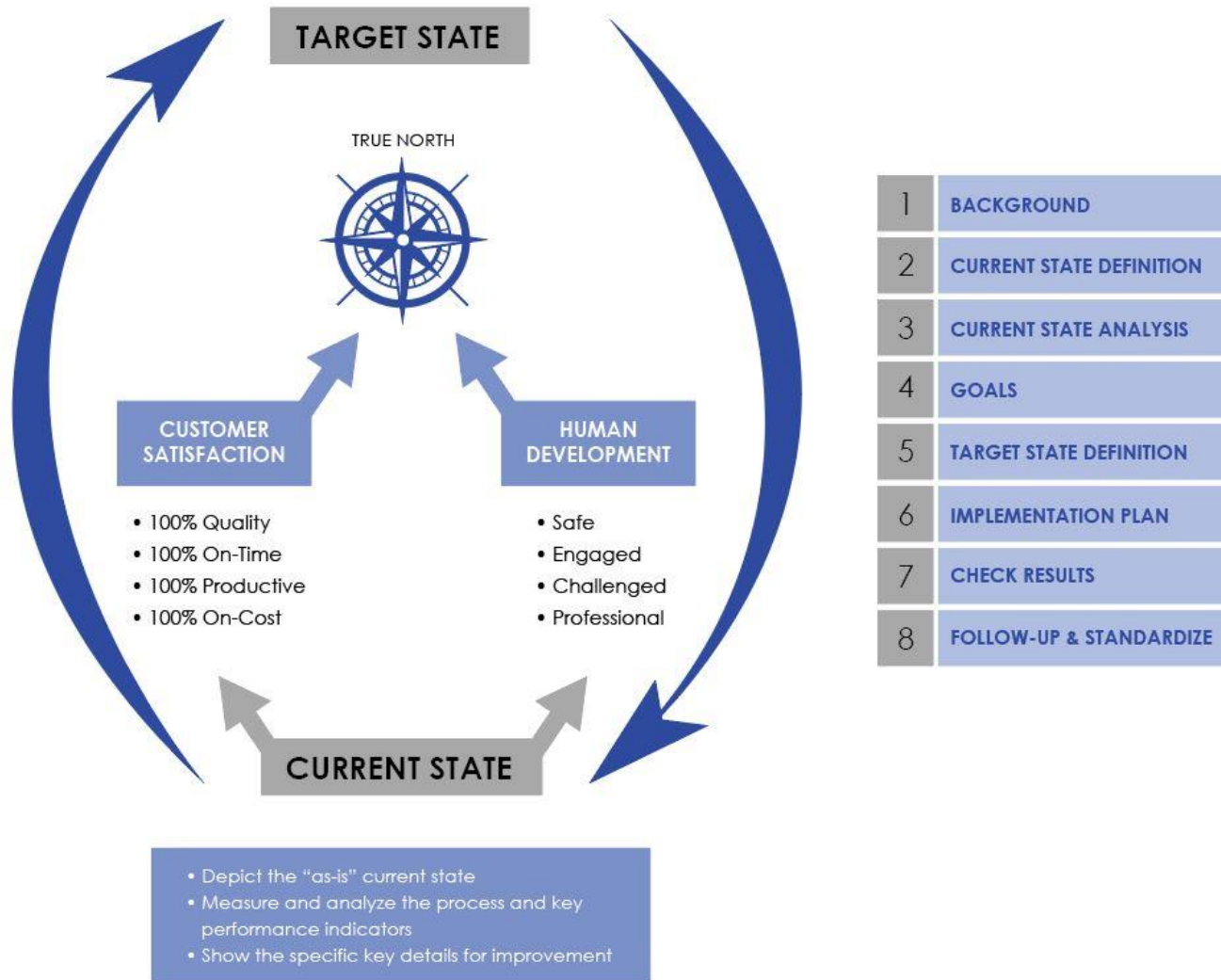
1 Virtual Server
Now 90% utilized
Flexibility
Less waste

Sports Simplification Example



Time reduction
Tempo enhancement
Alignment simplification
Multiple plays single formation

Target State Improvement Steps



Background Situation

CLARIFYING THE SITUATION BACKGROUND

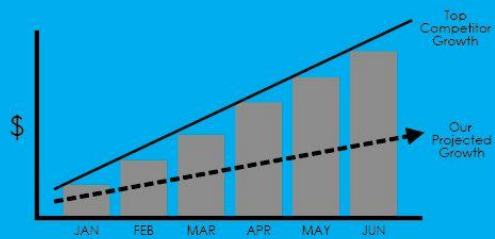
RELEVANT INFORMATION

- Historical Information
- Key Terms
- Framing Data
- Links to Annual Plan
- Etc.

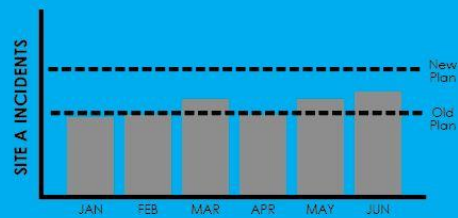
IMPORTANCE



URGENCY

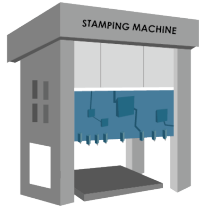


TREND

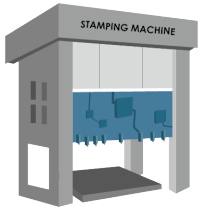


Purpose:
Provide context
Bigger picture
Relevant information
Logic for next sections

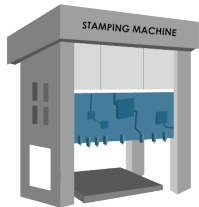
Current State Definition



Dedicated Press
Part A, B, C



Dedicated Press
Part D, E, F



Dedicated Press
Part G, H, I

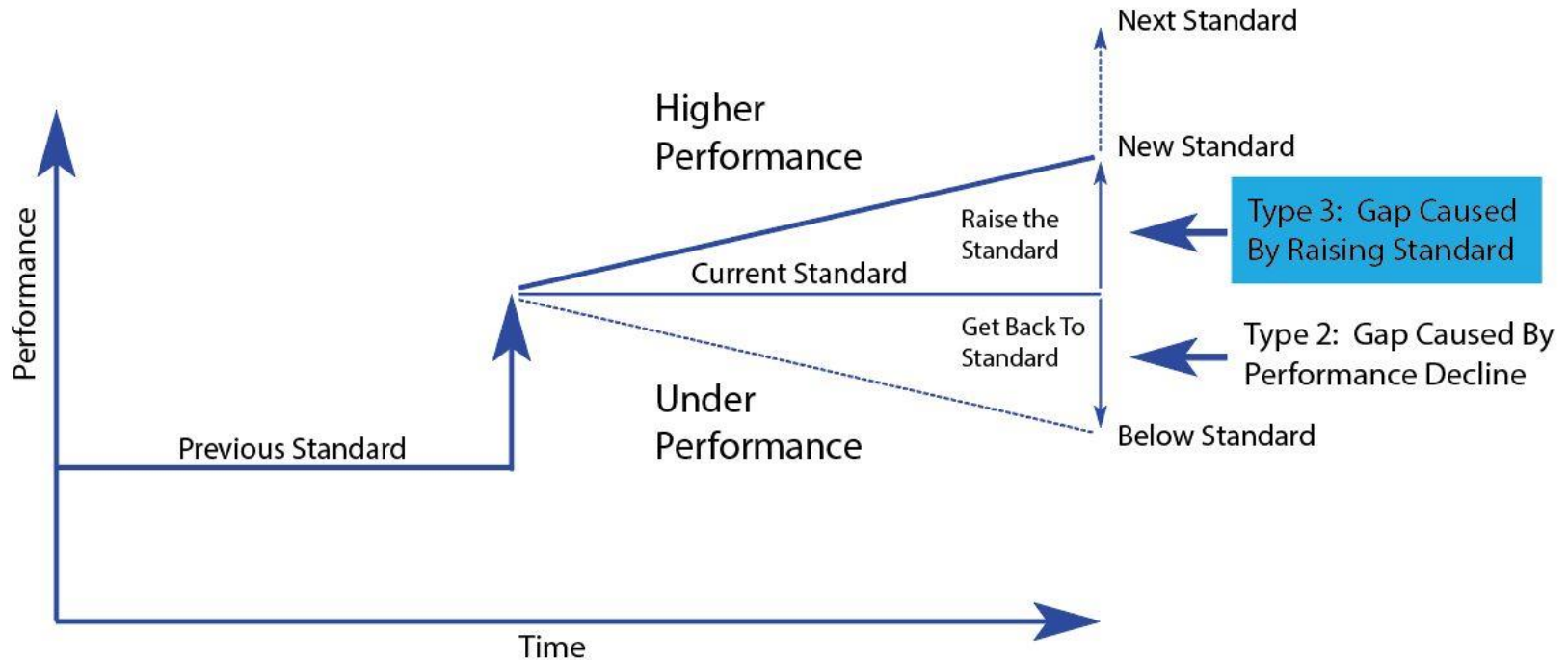


Zero safety incidents
100% On-Time Delivery
<1% Scrap
Satisfied customers
No major problems...

...However

- 3 Dedicated Machines
- Each 30% Utilization
- Minimal Flexibility
- 3 Underutilized Operators
- 75 Minute Changeover

Goal Setting



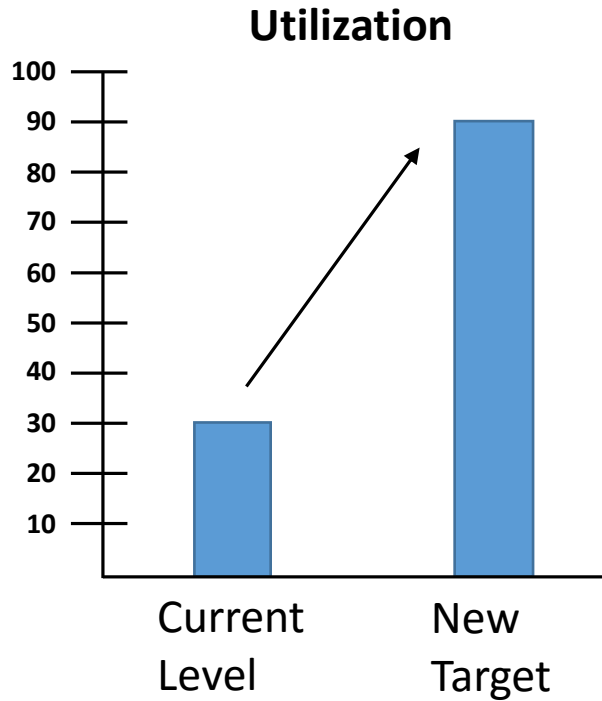
3 Consideration Points:

- From What Level
- To What Level
- By When

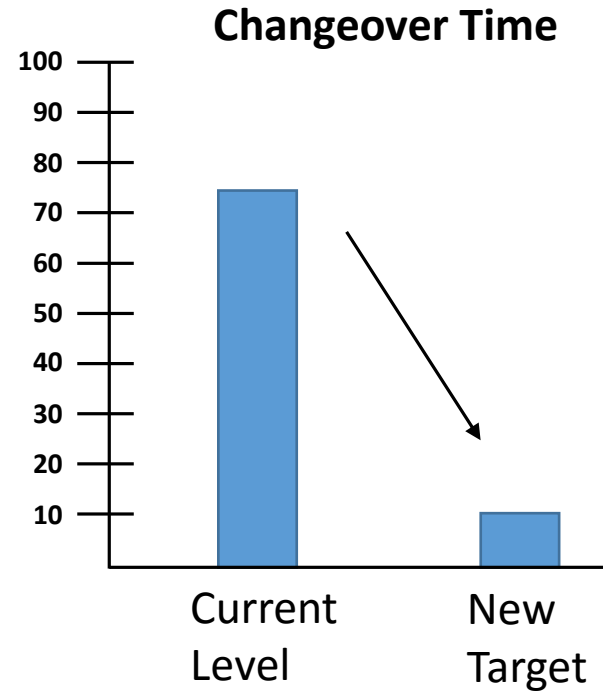
SMART Concept:

- Specific
- Measurable
- Actionable
- Relevant / Realistic
- Time Bound

Goal Setting

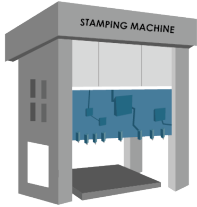


Improve utilization
From 30% to 90%
By July 15th, 2016

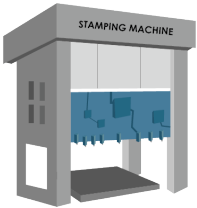


Reduce Set Up Time
From 75 Minutes to 10 Minutes
By July 15th, 2016

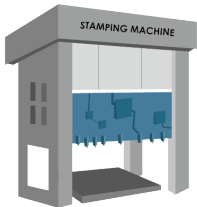
Current State Analysis



Dedicated Press
Part A, B, C



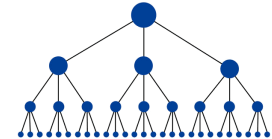
Dedicated Press
Part D, E, F



Dedicated Press
Part G, H, I



Analysis – Break it down



Quantify – Measure



Detail – Get specific facts



Two Types of Thinking

TWO KINDS OF THINKING

Critical Thinking

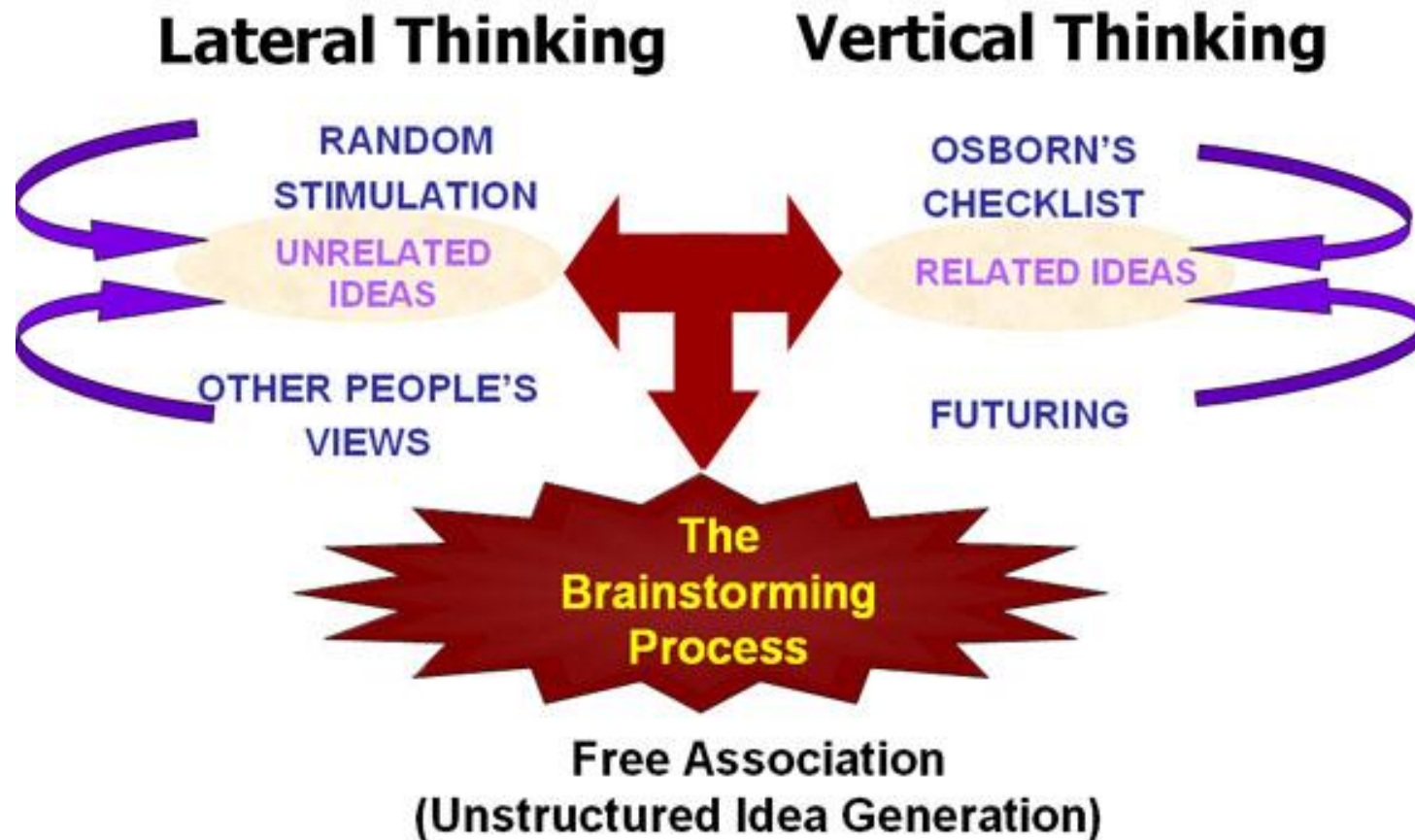
- analytic
- convergent
- vertical
- probability
- judgment
- focused
- objective
- answer
- left brain
- verbal
- linear
- reasoning
- yes but



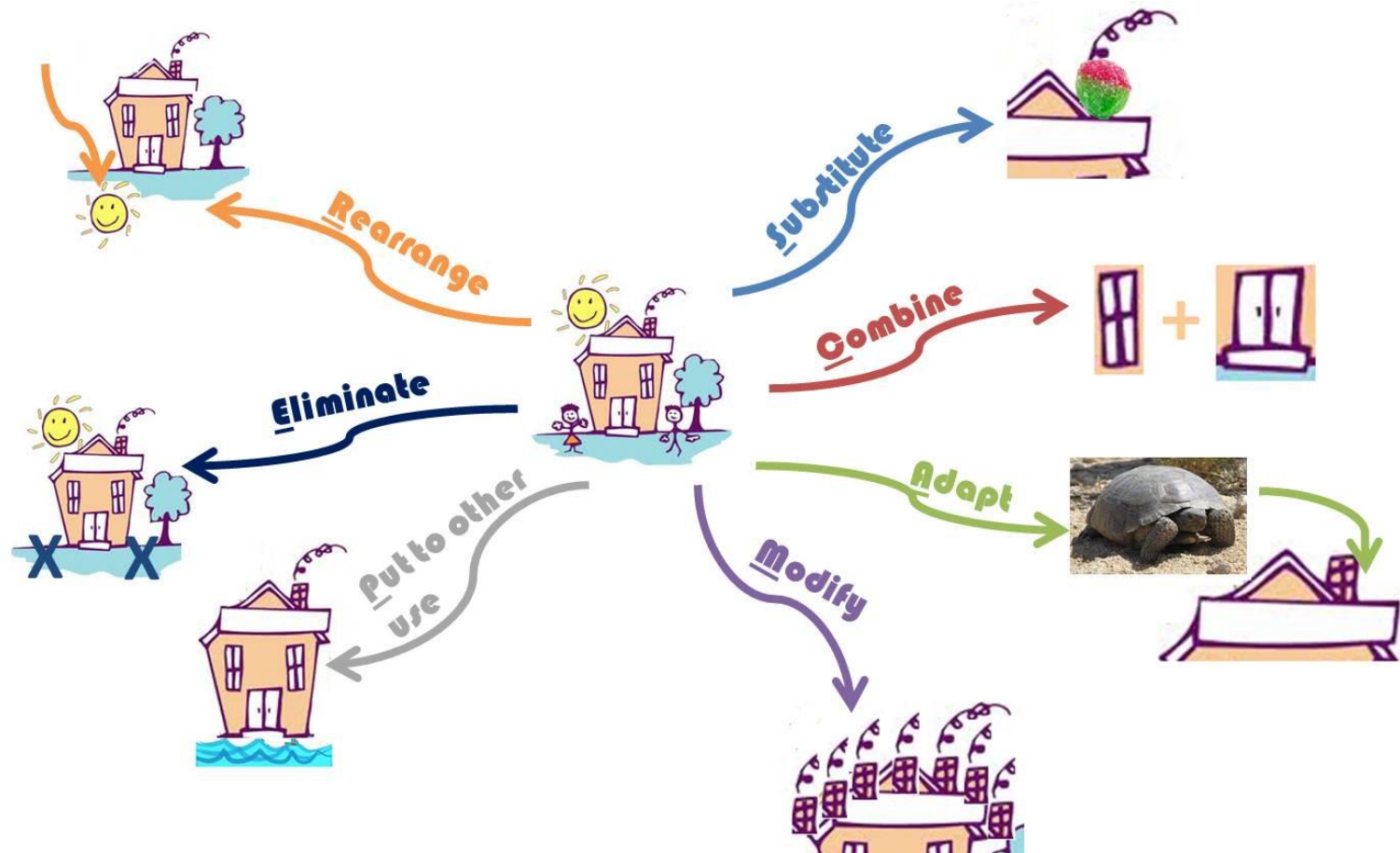
creative Thinking

- generative
- divergent
- lateral
- possibility
- suspended judgment
- diffuse
- subjective
- an answer
- right brain
- visual
- associative
- richness, novelty
- yes and

Idea Generation



Osborn / SCAMPER Checklist



Scamper Questions

Item	Meaning	Example Questions
S	Substitute	What can you use instead? What components could change?
C	Combine	What can you add or put together? What can be combined into one?
A	Adapt	What can meet other needs? What can this also possible do?
M	Modify / Magnify / Minimize	What if you alter in some fashion? What if you make it larger? What if you make it smaller or lighter?
P	Put to other uses	What other uses might this serve? How might it benefit somewhere else?
E	Eliminate	What can be eliminated or taken away? What can be omitted?
R	Reverse / Rearrange	What if something was rearranged? What if something was reversed?

Others concepts to consider:

Simplify?

Error proof?

Standardize?

Synchronize?

Lighter?

Faster?

Efficient?

5W & 1H Improvement Q's

THE 5W & 1H QUESTIONS OF IMPROVEMENT

WHO?

1. Who does the work?
2. Who is doing it?
3. Who should be doing it?
4. Who else can do it?
5. Who else should do it?
6. Who is doing it with any form of waste, overburden, or inefficiency?

WHAT?

1. What is the purpose or need?
2. What is actually being done?
3. What should be done?
4. What else can be done?
5. What else should be done?
6. What is being done with any form of waste, overburden, or inefficiency?

WHERE?

1. Where is the work to be done?
2. Where is it actually done?
3. Where should it be done?
4. Where else can it be done?
5. Where else should it be done?
6. Where is there any form of waste, overburden, or inefficiency?

WHEN?

1. When is the work to be done?
2. When is it actually done?
3. When should it be done?
4. What other time can it be done?
5. What other time should it be done?
6. When is there any form of waste, overburden, or inefficiency?

WHY?

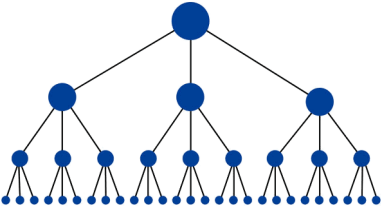
1. Why is it done this way?
2. Why is it actually done this way?
3. Why should it be done?
4. Why do it then at all?
5. Why do it that way and not another way?
6. Why is there any form of waste, overburden, or inefficiency in the process?

HOW?

1. How is the work to be done?
2. How is it actually done?
3. How should it be done?
4. How else can it be done?
5. How to eliminate, combine, rearrange or simplify?
6. How to better improve any form of waste, overburden, or inefficiency in the process?

Set Up Reduction Time Analysis

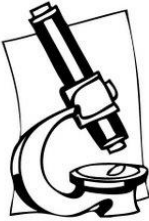
PRODUCT LINE NAME		SET UP REDUCTION WORKSHEET (Work element analysis, time study, problem identification sheet)							
PRODUCTION PART NAME									
PROCESS NAME		MACHINE NAME			PART NUMBER				
NO.	MAIN SET UP (WORK ELEMENTS)	TIME STUDY			CATEGORY		IMPROVEMENT POINT	IMPROVEMENT IDEA	
		START	END	TOTAL	INT.	EXT.			
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									



Analyze



Quantify



**Pay Attention
To The Details**

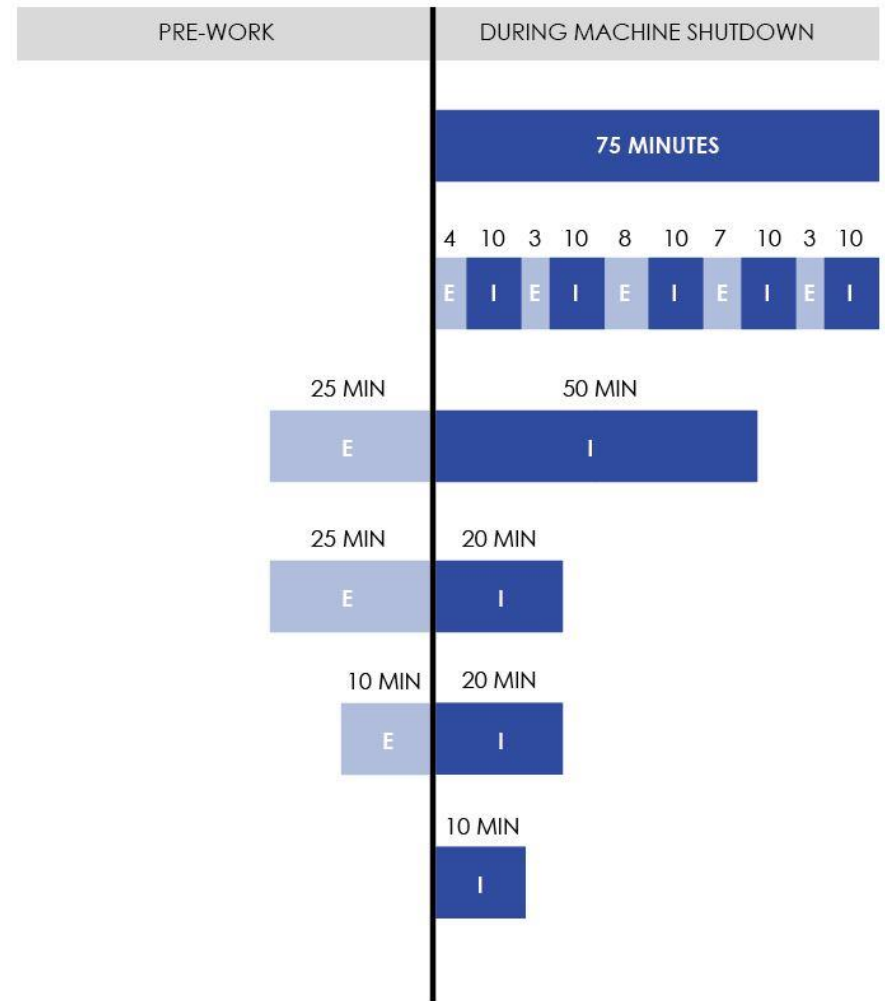
Details

Set Up Reduction Time Analysis

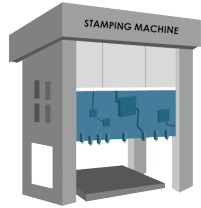
METHODS: CHANGEOVER REDUCTION STEPS

E = External • I = Internal

- 1** Measure total time required for changeover. Video tape is best.
- 2** Identify internal versus external elements and calculate individual times
- 3** Take the external elements and make sure they are done before the machine stops
- 4** Reduce and eliminate the internal elements (i.e. adjustments & fastener items in particular)
- 5** Reduce the time required for external elements
- 6** Standardize and improve the new procedure over time

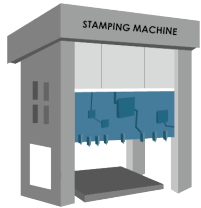


Target State Definition

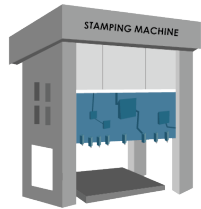


From:

Dedicated Press
Part A, B, C



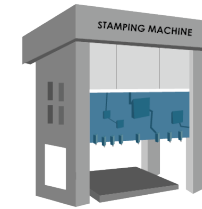
Dedicated Press
Part D, E, F



Dedicated Press
Part G, H, I



To:



Flexible Press
Parts A, B, C, D, E, F, G, H, I
On Demand / Any Sequence

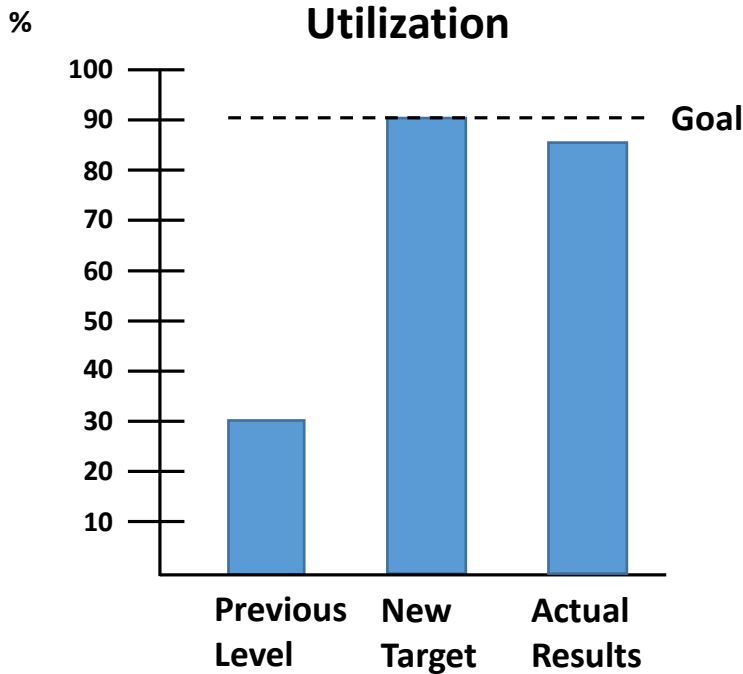
3 Dedicated Machines
3 Operators
No Flexibility
Each 30% Utilization
75 Minute C/O

1 Machine / 9+ Tools
1 Operator
Change Over Flexibility
90% Utilization
10 Minute C/O

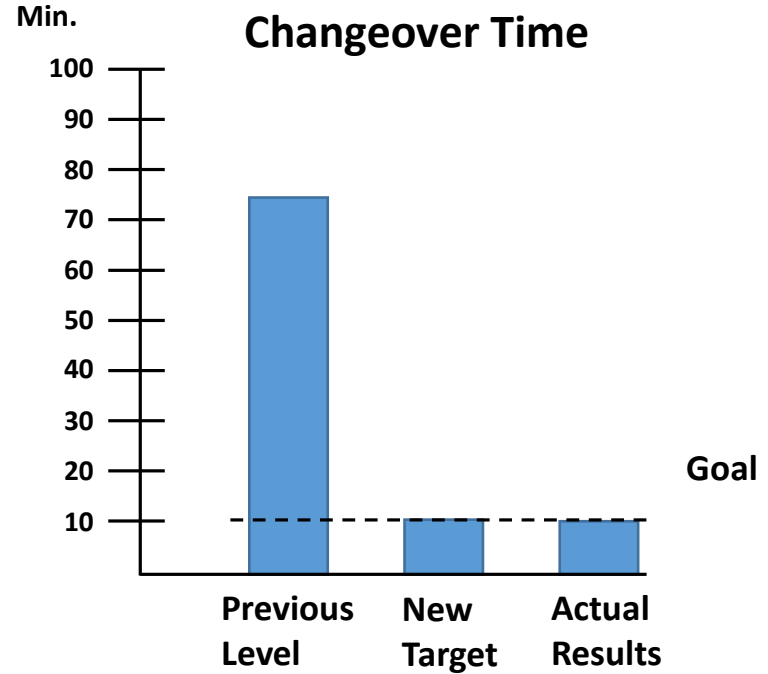
Implementation Plan

What Item	Who's Responsible	Due Date	Expected Outcome	Status Review (June 25 th IPR)
Eliminate bolts & switch to clamps	Tom M.	June 20 th	Time savings of 28 minutes	Complete. First trial showed 9 minute gain.
Preheat dies	Jeff R.	June 16 th	Time savings of 22 minutes First part quality	Complete. First trial showed 10 minute gain.
Standardize hoses, manifold connectors, & quick disconnect	Kathy L.	June 25 th	Time savings of 8 minutes	Complete. First trial showed 11 minute gain.
Create set up cart & 5S tool board	Tom M.	June 22 nd	Time saving of 7 minutes	Complete. First trial showed 5 minute gain.
Alignment aids for die insertion	Jeff R.	June 16 th	Work simplification & visual management	Confirmed easier die insertion.
Create new work instructions	Kathy L.	June 26 th	Training document	Not complete yet.
Train all operators across 3 shifts	Kathy L.	June 30 th	Same result each shift	Pending completion of new work instruction.

Check Results



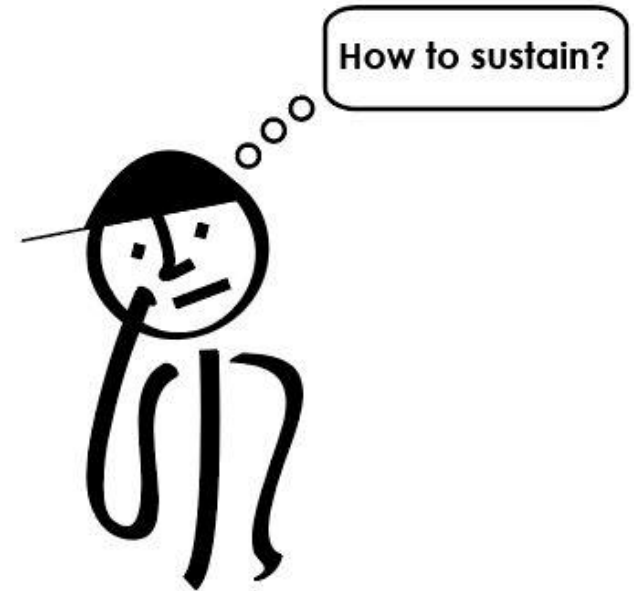
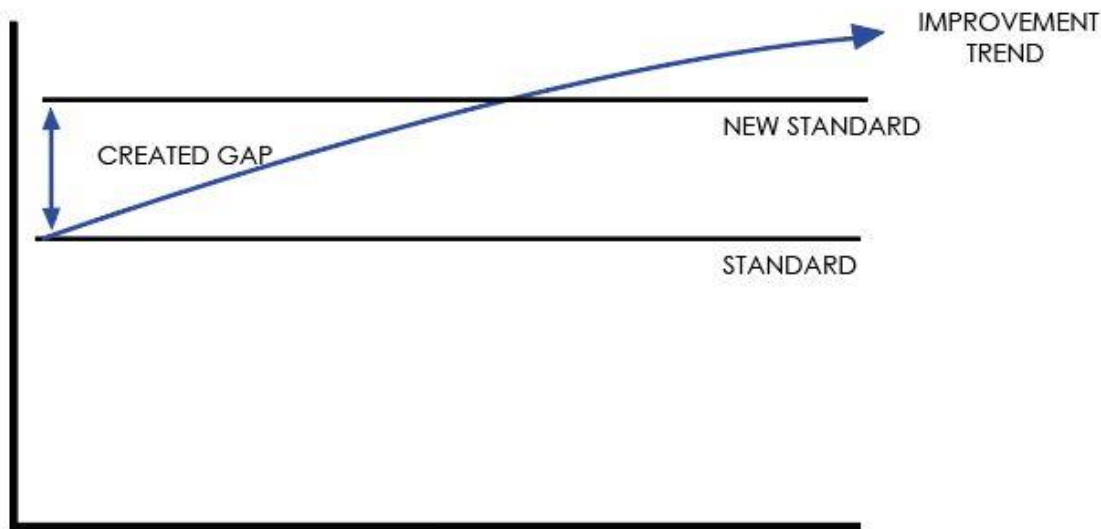
Did not achieve goal yet.
Small gap or problem remains.
Follow up & resolve



Successfully achieved goal.
Will focus on sustainment.
Follow up & sustain

Follow Up & Standardize

STANDARDIZE & FOLLOW UP



WORK
INSTRUCTIONS

FORMS

CHECKLISTS

AUDITS

SPARE PARTS

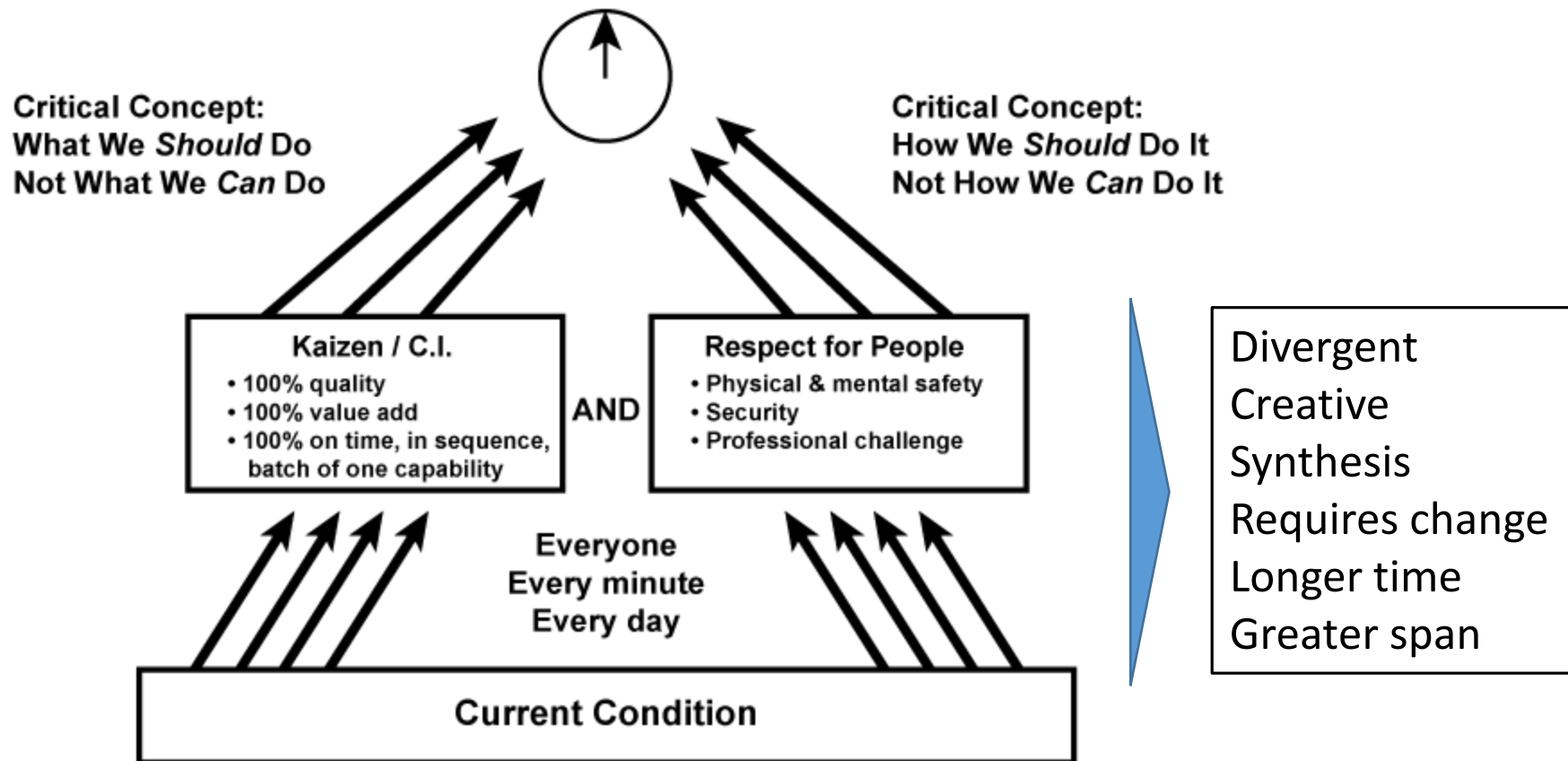
TRAINING

COMMUNICATION

MANUALS

Type 3 – Target State Summary

Arubeki Sugata / Ideal State



Session Summary

- Type 1 & 2 Problem Solving: Defense
- Type 3 & 4 Problem Solving: Offense
- Type 3 Key Success Factors
 - Challenge, Courage, & Creativity
 - Openness to exploration
 - PDCA Loop iteration
 - Rapid experimentation
 - Learning by doing
- Good luck on your improvement journey!

Appendix