



Training Within Industry (TWI)

Essential Skills for Supervisors

TWI Institute

The TWI Institute is the center for education, trainer certification, and networking for the growing community of practitioners, trainers and organizations in various industries that include manufacturing, construction, services and health care.

With over 250 trainers trained to date, TWI Institute has created a rapidly expanding network of certified trainers who now deliver the TWI Program across the globe.

June 22, 1940

The Birth date of TWI

TWI was one of the first emergency services established by the U.S. Government War Production Board on the day that France surrendered to Germany.

A national network of professionals was “drafted” from industry to teach the TWI techniques, but,

“The real job had to be done
by industry, within industry.”

The TWI Mission

“to help industry to help itself to get out more materials than have ever been thought possible, and at constantly accelerating speed”
to win a global war.

Impact of TWI on the War Effort

Of the 600 client companies monitored throughout the war:

- 86% increased production by at least 25%
- 100% reduced training time by 25% or more
- 88% reduced labor-hours by over 25%
- 55% reduced scrap by at least 25%
- 100% reduced grievances by more than 25%

The Boeing challenge in 1940

To quickly manufacture the B-17 Flying Fortress bomber in quantities that would be needed by the Allied nations to take the war to Germany and Japan.

Cornerstones of Boeings' Success *

- ***Management Support***

Committed to having a high-morale, people-dependent system with teams, a great suggestion system and intense training.

- ***Lean Production System***

Engineers “invented” lean concepts with a moving U-shaped final assembly line for flow, Takt time, minimized material handling, max use of dies, etc.

- ***TWI Training***

Half of the new workforce of 33,000 were cowboys, farmers, fishermen, and lumberjacks. The other half were mostly area housewives.

* *What You Can Do When You Have To*, Bill V. Vogt and Robert (Doc) Hall, Target Magazine, First Quarter 1999

The roles of the supervisor changed

Problems had to be solved fast to keep lines moving

- The pace of production and frequency of engineering changes required supervisors to be on the shop floor checking and coaching constantly.
- Because they had to show people how to do the work, supervisor training and knowledge of standard work instructions was doubly important.

Supervisors lacked the essential skills that were taught on the job by Training Within Industry (TWI) for them to

- Break down common industrial tasks into easily digested, easily mastered steps to train new people.
- Cross-train employees to promote teamwork and for people to learn how to take on a broader responsibility within their work area.

Impact on production of the B-17

- 60% reduction in man hours per airplane.
- Fly-a way's went from the initial quote of 75/month in 1941 to a peak of 364 in one month (one every 1.6 hours) before shutting down production in 1944.
- Initial cost of \$242,000 per plane in 1940 was reduced to a final cost of \$139,254 in March 1944,
a reduction of 42.46% in 32 months

Impact of TWI on Shipbuilding

Consolidated Steel Corp., Orange, Texas - May 3, 1945

- 18,749 employees
- Every supervisor was certified in one or more of the "J" programs
- The company attributed the following results to TWI over a four year period:
 - Increase in production 45%
 - Reduction in tool breakage 75%
 - Reduction in training time 78%
 - Saving in manpower 45%
 - Reduction in scrap 69%
 - Reduction in accidents 69%

Impact of TWI on Shipbuilding

Oregon Shipbuilding Corp.

reported that Job Instruction increased output in one department from 800 rivets per man to 3,200 rivets, per man, per day, per shift and that workers were doing the work easier and were happier doing the work.

Electric Boat Company, Groton, CT

credited TWI for getting more and better production of aircraft carriers with 21,000 employees than they formerly got with 29,000.

Impact of Shipbuilding on WWII

In the two years following the Battle of Midway,

- Japanese shipbuilders splashed only 6 additional carriers to add to the 2 that survived.
- During the same period, the US shipbuilders added:
 - 17 additional carriers
 - 10 medium carriers
 - 86 escort carriers

“Such numbers, to be repeated in myriad categories of war materiel, spelled doom for Japan.” *

* James Bradley, *Flyboys* (Boston: Back Bay Books/Little, Brown), 120.

Why then was TWI dropped after War II?

- Industry viewed TWI as being a war program.
- TWI provided grass-roots attention to how people were treated and how work was performed which made management uncomfortable at this time in history.
- US infrastructure was one of the few undamaged in the world so the focus quickly shifted to producing consumer goods.
- The composition of the workforce changed dramatically as millions of people returned to their jobs after leaving the military.



We Did It!



TWI finds a new life in Japan

- TWI trainers from the US went to Japan in 1951 introducing TWI throughout all industries
- Toyota embraced TWI at the start
- Sanyo Electric began putting on these “train-the-trainer” programs in the early 1980s for their expanding overseas subsidiaries
- Patrick Graupp participated in this effort as their first foreign employee
- After 20 years with Sanyo, Graupp began replicating these TWI programs in 2001 U.S. in cooperation with the TWI Institute

Nixon Gear Implementation

9 ½ minute video

The Five Basic Needs of a Supervisor/Team Leader

Knowledge

unique to the Company and/or the Industry

that supervisors must know to do their job:

1. Knowledge of the Work
2. Knowledge of Responsibilities

Knowledge training is the responsibility of each company and therefore not the focus of TWI.

The Five Basic Needs of a Supervisor/Team Leader

Skills

that are required for supervisors to perform within their role, *regardless of the industry*:

3. Skill in Leading
4. Skill in Instruction
5. Skill in Methods Improvement

Job Relations Training (JR)

How to evaluate and take proper actions to handle and to prevent people problems.

Job Instruction Training (JI)

How to teach people to quickly learn to do jobs correctly, safely, and conscientiously.

Job Methods Training (JM)

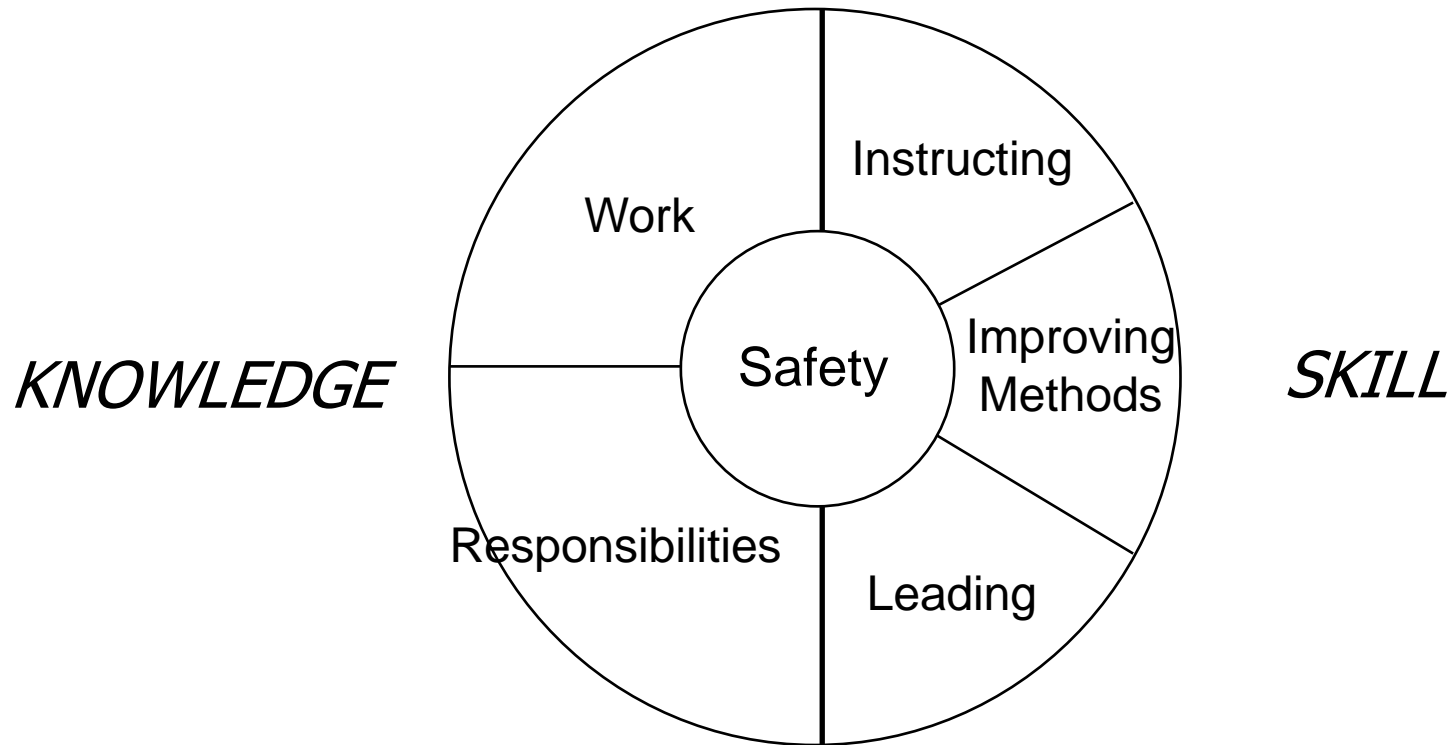
How to analyze jobs to make the best use of the resources currently available.

The TWI JR program for Union Stewards reduces the expense of arbitration by training union representatives how to discriminate between real grievances and those they can handle by themselves

"ACCIDENTS ARE CAUSED, BREAK THE CHAIN"

Created in Japan in the standard "TWI Format" with the purpose to prevent incidents from happening and not to resolve the aftermath of an accident.

Five Needs Model



The TWI Four-Step Learning Process*

1. Preparation

Make the learner think to aid comprehension of the new idea.

2. Presentation

Add the new idea to those already in the learner's mind.

3. Application

Train the learner to apply what was presented and check the results.

4. Testing

Test the ability of the learner to apply the new idea on their own.

Blueprinted Procedure

- Each program has a similar 4-Step Method.
- Each method is stated in shop terms.
- Compact scheduling of five 2-hour meetings to keep the subject fresh and not keep people away from their jobs over long periods of time.
- Small groups of 10 to “learn by doing”.
- Each participant must demonstrate in class that they know how to use the method.

“Learn by Doing” process

The TWI approach is not a matter of schools or classes or lessons –

it is individual and/or group work on *current day problems* of output, quality, lost-time, scrap, re-work, maintenance, and working relations.



Job Instruction Training (JI)

How to teach people to quickly learn to do a job correctly, safely, and conscientiously.

JI Training Results in:

- Reduced training time
- Increased production
- Fewer accidents
- Less scrap
- Less rework
- Less tool and equipment damage
- Increased job satisfaction
- Improved quality
- Increased profits

The 4-Step Method for JI

Step 1 - Prepare the Worker

Step 2 - Present the Operation

Step 3 - Try-out Performance

Step 4 - Follow-up

No. _____

JOB INSTRUCTION BREAKDOWN SHEET

Operation: _____

Parts: _____

Tools & Materials: _____

IMPORTANT STEPS	KEY POINTS	REASONS
A logical segment of the operation when something happens to advance the work.	Anything in a step that might— 1. Make or break the job 2. Injure the worker 3. Make the work easier to do, i.e. "knack", "trick", special timing, bit of special information	Reasons for each key point

The JI method of breaking down a job

Important Steps

What

A logical segment of the operation when something happens to advance the work.

Putting a new blade in hack saw.

Key Points

How

Anything in a step that might—

- Make or break the job
- Injure the worker
- Make the work easier to do, i.e. “knack”, “trick”, special timing, bit of special information, etc.

That 5 or 10% of a the hard or tricky parts of a job.

Reasons

Why

The reason for each Key Point

People learn better when they know why they do things.

Job Instruction Training Timetable

Name: Jones Dept.: 2 nd Electrical Dept. Date: (today's date)	Breakdown No.	Smith	Lark	Morse	Taylor	Massy	Peters	Baker		Changes In Production
Assembling Parts		✓	✓	✓	✓		✓	✓		
Wiring		✓	✓	✓	✓					
Combining		✓	✓	✓		✓	✓			
Knot tying	123	✓	✓	✓	✓	✓		X/X		Need 1 more worker at end of (month).
Clamping		✓	✓	✓	* x/x	✓	✓			
Adjustment		✓	X/X	✓						
Turnover Work Performance				Scheduled to retire on xxxx	Needs more training					



Job Relations Training (JR)

Trains supervisors/team leaders on how to evaluate and take proper actions to solve and to prevent problems with people.

JR Training Results in

- Better employee relations
- Improved morale
- Fewer grievances
- Improved attendance
- Less equipment damage
- Improved quality
- Increased production
- Increased profits

How to Handle a Problem

DEFINE YOUR OBJECTIVE

Step 1 - Get The Facts

Get the whole story (opinions & feelings)

Step 2 - Weigh And Decide

Don't jump to conclusions

Step 3 - Take Action

Don't pass the buck

Step 4 - Check Results

Did your action help production?

DID YOU ACCOMPLISH YOUR OBJECTIVE?

How to Prevent Problems

- Let each worker know how he/she is doing
- Give credit when credit is due
- Tell people in advance about changes that will affect them
- Make the best use of each person's ability



Job Safety (JS)

Teaches people how to identify the causes of incidents and injuries and then to prevent accidents from happening by eliminating those causes.

The 4-Step Method for JS

Step 1 – Spot the Causes of Accidents

Step 2 – Decide on Countermeasures

Step 3 – Enforce Countermeasures

Step 4 – Check Results

Job Methods Training (JM)

Trains supervisors/team leaders on how to analyze jobs to make the best use of the *people, machines, and materials now available.*

JM Training Results in:

- Reduced cost
- Reduced WIP
- Reduced inventory
- Increased throughput
- Increased sales
- Increased profits
- Continuous improvement

The 4-Step Method for JM

1. Breakdown the Job
2. Question Every Detail
3. Develop the New Method
4. Apply the New Method

Step 2 - Question Every Detail

Why is it necessary?

What is its purpose?

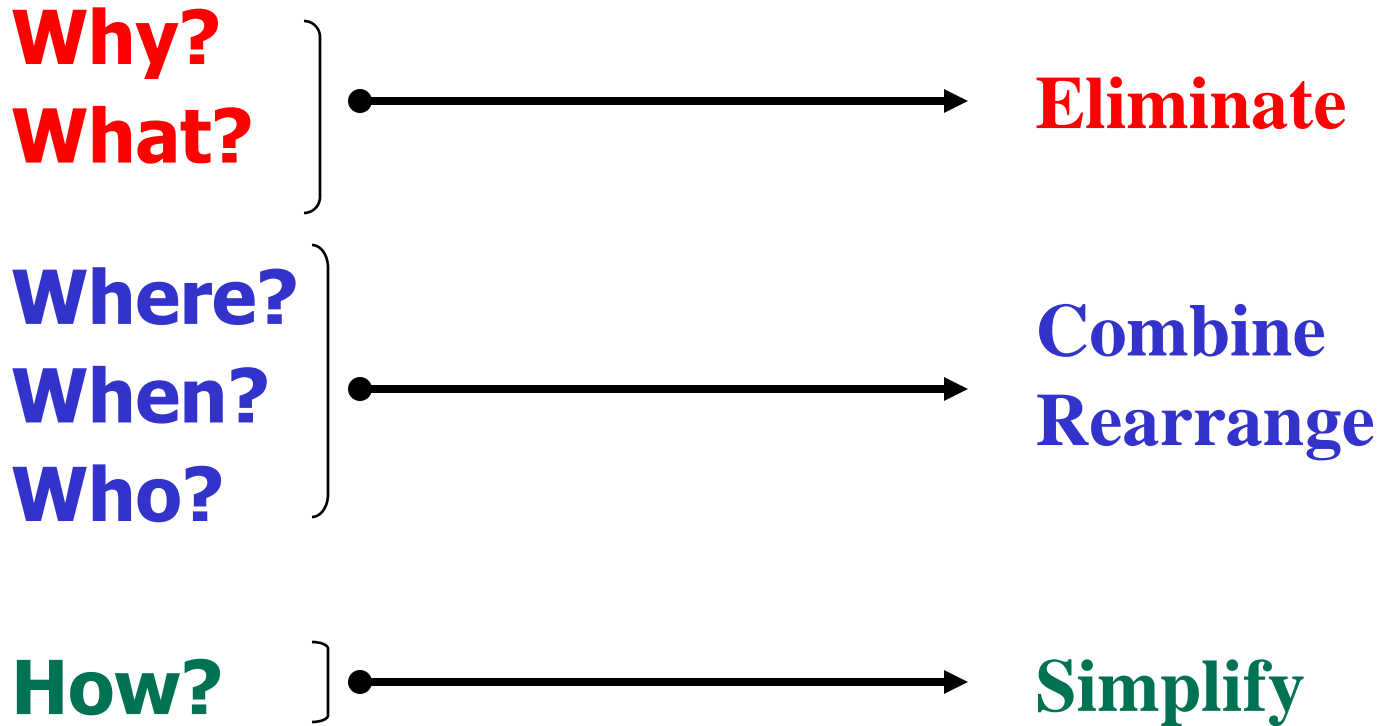
Where should it be done?

When should it be done?

Who is best qualified to do it?

How is “the best way” to do it?

Step 3 - Develop the New Method



JM Improvement Proposal

Improvement Proposal Sheet

Submitted to:

Made by:

Product/Part:

Operations:

Department:

Date:

The following are proposed improvements on the above operations.

1. Summary

--

2. Results

	Before Improvement	After Improvement
Production (one worker per day)		
Machine Use (one machine per day)		
Reject Rate		
Number of Operators		
Other		

3. Content

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Step 4 - Apply the New Method

1. Sell the change to others
2. Obtain necessary approvals
3. Put the new method to use right away
4. Credit those involved

The three TWI programs work together like a three-legged stool — take one leg away and the stool falls down.

- JR – Positive Culture
- JI – Standard Work
- JM – Continuously Improve
- JS – The Vital Element



The Reality of Tactical Lean

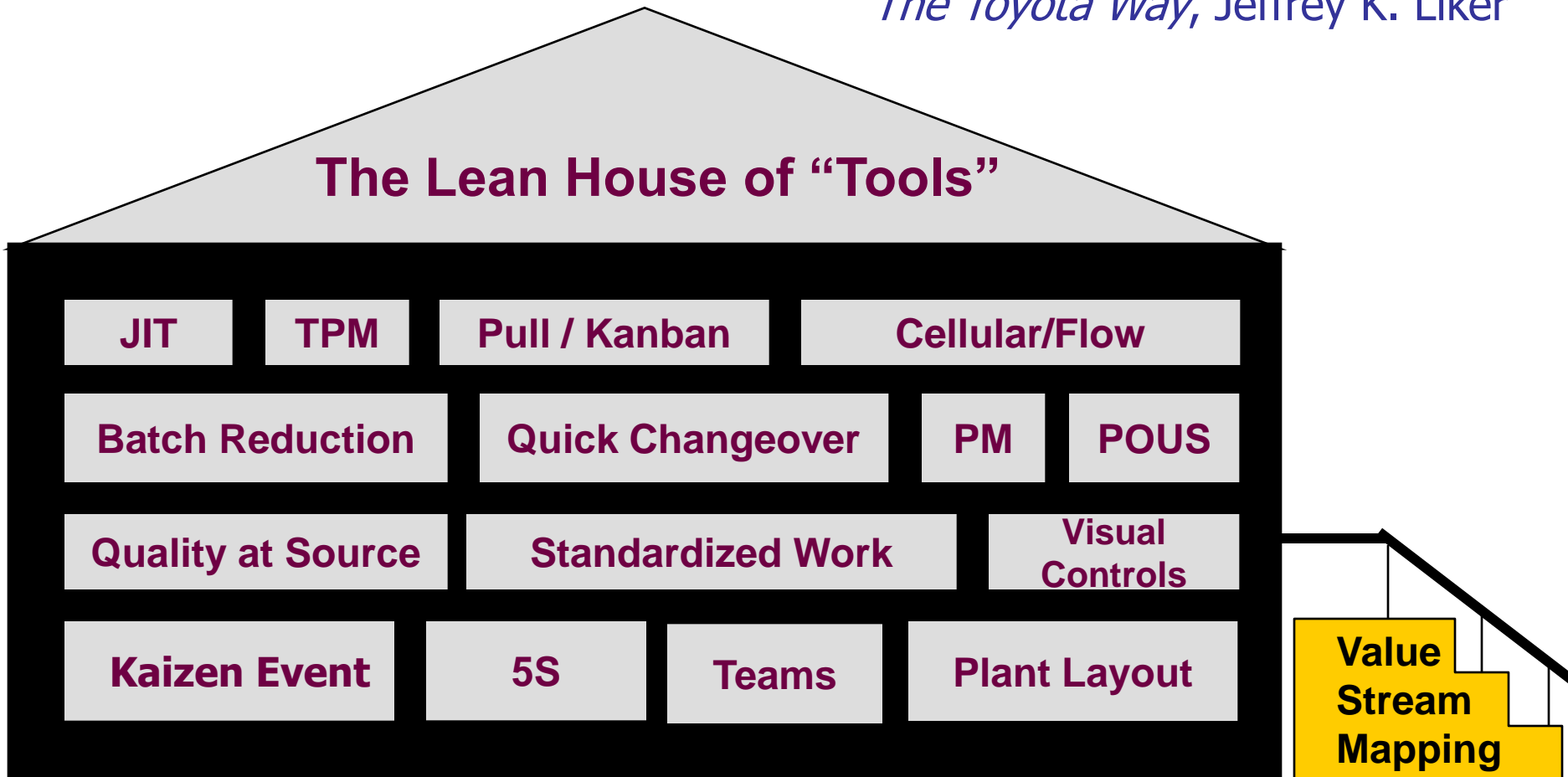
Continuous Improvement

never seems to be continuous

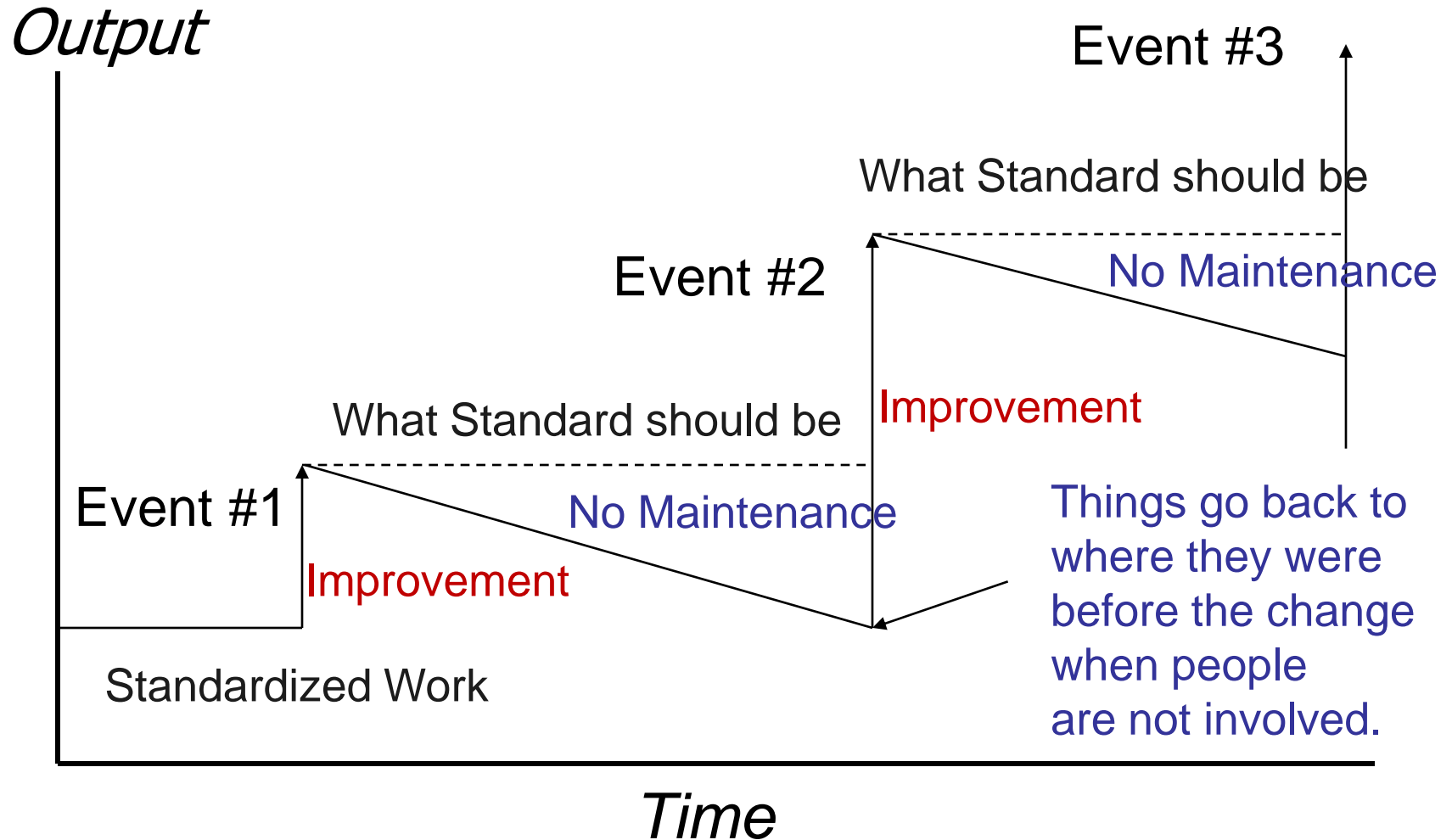
- People resist change and this mindset will cause people to backslide and abandon improvement.
- People typically rely on others for improvements.
- Even when people want to improve they don't have improvement skills.
- Companies tend to rely on "scheduled events" to make even small changes.
- Supervisors and operators end up leaving improvement until after "making the numbers."

“Most companies have focused too heavily on tools...without understanding lean as an entire system that must permeate an organization’s culture.”

The Toyota Way, Jeffrey K. Liker



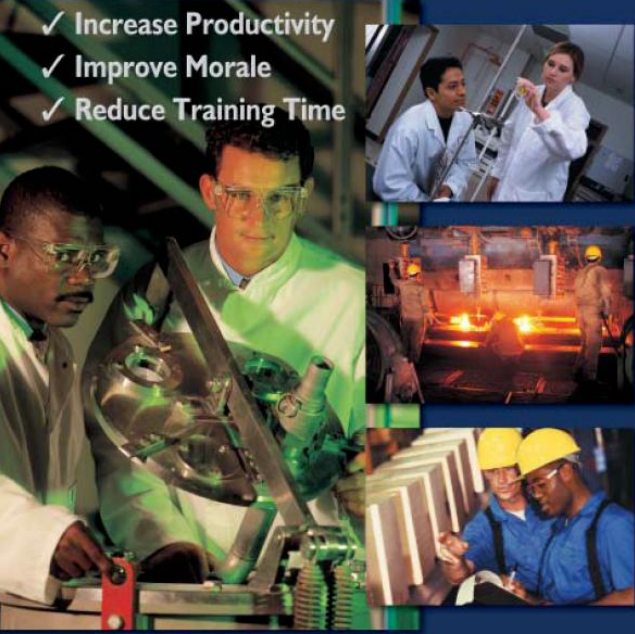
Lean Event Saw Tooth Strategy



The Countermeasure

TWI ...Leveraging the Role of Supervisors and Team Leaders
Training Within Industry

- ✓ Increase Productivity
- ✓ Improve Morale
- ✓ Reduce Training Time



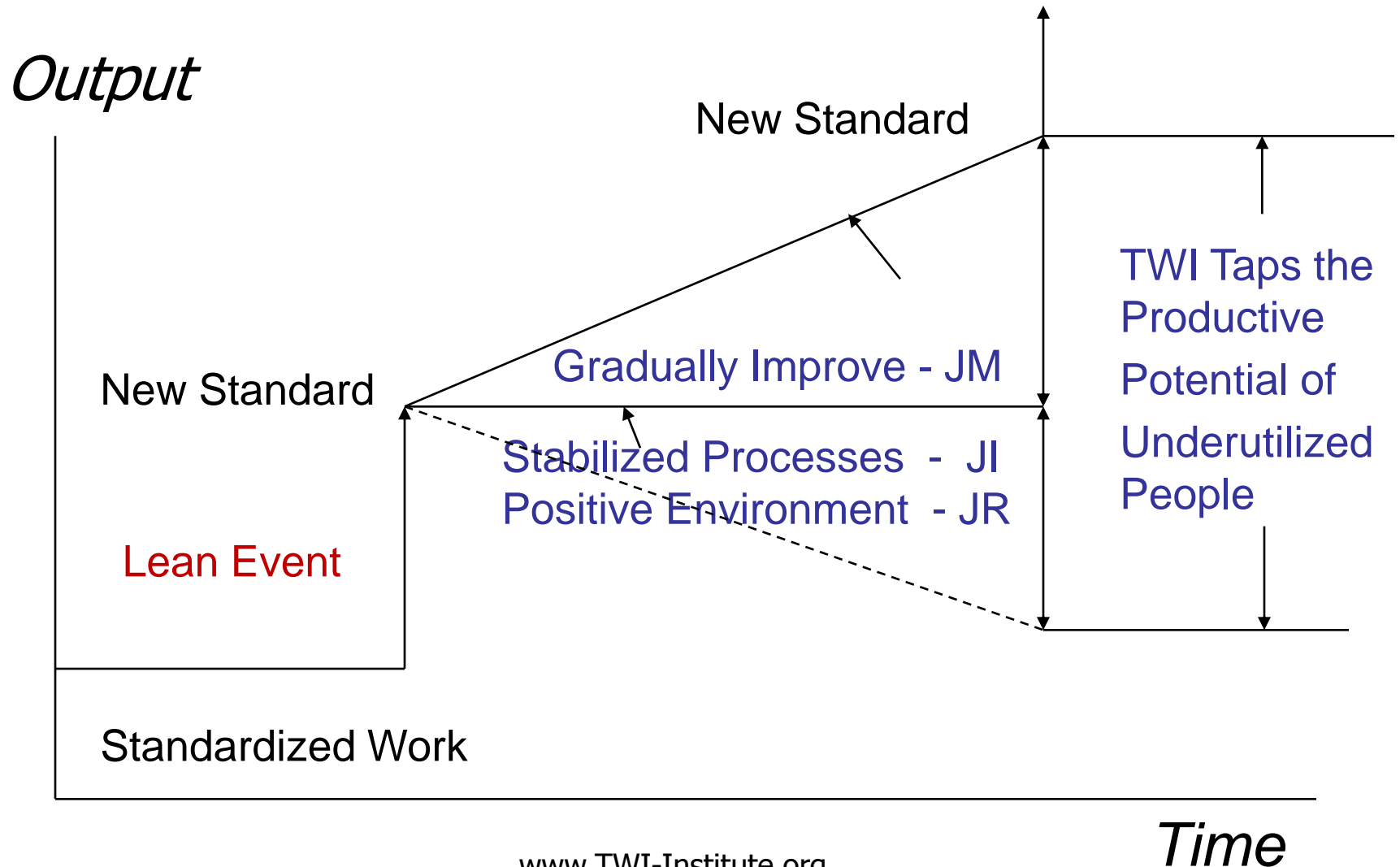
Proven Results in
Manufacturing
Hotels & Restaurants
Construction and Medical Services

TWI
The TDO Training Within Industry Program

- Indoctrinates people into an “improvement” frame of mind.
- Teaches people how to identify opportunities for improving their jobs.
- Trains people how to generate ideas to take advantage of these opportunities.
- Shows people how to get these ideas into practice right away.
- Creates ownership for people to maintain standard work.

“The Origin of Kaizen.”

Stabilize, Standardize, Sustain



The Roles of Supervisors in Lean

Supervisors must spend a majority of their time dealing with people and process issues like:

- Motivating others
- Encouraging cooperation
- Settling disputes
- Addressing performance problems
- Promoting planned change

TWI Leverages the Roles of a Supervisor



■ For them to:

- Accept responsibility for Improvement
- Learn how to communicate
- Develop teams to involve their people
- Delegate responsibility and train others

■ So production people can:

- Accept responsibility for their work
- Participate in the improvement process
- Learn how to interact as part of a team
- Increase their level of job satisfaction

Benchmark with the TOYOTA WAY

“The Toyota Way of going to the source, observing in detail, and learning by doing were all very much influenced by TWI and became the backbone of Toyota’s standardization philosophy....

that standardized work should be a cooperative effort between the foreman and the worker.”

The Toyota Way, Jeffrey Liker 2004, pg. 141

Supervisors' Roles in Gemba *

JI



- Prepare work standards
- Provide training to ensure operators do their work according to standards

JM



- Improve status quo by improving standards
- Notice abnormalities and address immediately to keep the process under control

JR



- Create a good working environment
- Dealing with abnormalities at the worksite

* *GEMBA KAIZEN*, Masaaki Imai, 1997; page 113

Standardized Work or Work Standards? *

“The establishment of standardized processes and procedures is the greatest key to creating consistent performance.”

Work Standards – traditional unit-cost-focused manufacturing

Creating a cost standard as the objective to achieve. Viewed as the ultimate level of performance which precludes the possibility of improvement.

Standardized Work – the basis for lean waste reduction at Toyota

“...creating the best possible work method, with the least amount of waste, producing the best quality product at the lowest cost.” Future results are expected to improve providing a baseline for continuous improvement.

Standardized Work

Combined sheets with single operator and no automatic cycle

STANDARDIZED WORK CHART		PROCESS		Cycle Time	TAKT Time	SAFETY	QUALITY	IN PROCESS
		Glost Kiln Operator Cycle		30-minutes	1-cycle / 90-minutes	+	◆	●
Element Number	Description	Work Time	Walk Time	WORK AREA LAYOUT				
1	Walk to GK #3 Exit		1.0					
2+	Discharge Car from GK#3	5.0						
3+	Discharge Car from GK#4	5.0	1.2					
4	Record GK#4 car numbers and temps	1.0	0.7					
5◆	Charge GK#4	5.0	0.3					
6◆	Charge GK#3	5.0	1.0					
7	Record GK#3 car numbers and temps	1.0	0.6					
8	Return to loading		0.6					
Total (min):		22	5.4					
COMMENTS: Safety: Use high temp gloves, pusher to move cars and be mindful for oily/slick surfaces Quality: Inspect kiln cars and repair downed ware and refractory. Use care not to damage glass								

TOYOTA MOTOR MANUFACTURING CANADA INC.

STANDARDIZED WORK CHART

REVISION DATE	SIGNATURE	KEYPOINT	JOB ELEMENT

OPERATION NAME: Rail Loading Process OPERATION NUMBER: _____

TAKT TIME	440	CYCLE TIME	430	SEC.
ELEMENTS OF PROCESS				
KEYPOINT	ELEMENT #	DESCRIPTION	WORK TIME	WALK TIME
◆	1	Exit van at loadline, proceed to car	5	5
+	2	Verification Prior to Exiting Loading	20	0
+	3	Follow Driving Pattern in Yard	75	0
+	4	Pull up to terminal, 'Load' car in NPPS	25	0
+	5	Drive up ramp and enter railcar	16	0
+	6	Drive through railcars at a maximum speed of 15 km/h <i>Environmental - Significant Noise Impact</i>	40	0
+	7	Park car to CPAAR/TLS audit specifications	5	0
+	7a	Car in 'home position', transmission in neutral, parking brake on (AAR standard)	5	0
+	7b	Exit car with door under control	5	0
+	8	Chock down front tire of vehicle	45	4
+	8a	Chock down rear tire of vehicle	45	2
+	9	Spot following T.M. before exiting railcar	5	0
+	9a	If required, lower hingedecks (loading A-deck)	10	0
+	9b	If required, remove bridgeplates from C-deck (loading B-deck)		
+	9c	If required, remove bridgeplates/close up railcar (loading B-deck)		
+	10	Exit Railcar	5	
+	10a	Get ride from shuttle	115	
•		During inactivity or downtime, SS or do jobs as assigned		
●		Repeat procedure until break, take-down or shift end		
			411	19

KEYPOINTS:
 *Do not spin tires *Radios are not to be on while loading *Do not lean or place hands on vehicle *Place door edge protector at top of door frame when loading C deck (Corolla) *Drive at 35 km/h in yard *Keep 2 car lengths away from vehicle in front *No stopping on bridgeplates *Keep vehicle positioned in railcar 1' to 2" from tie-down rail. If unsure of positioning STOP vehicle and check. *Rail loading at high speeds may cause a high noise impact *Make sure chock strap is centered on tire and not touching the strut behind tire (check with hand) *Ensure straps are not twisted *Ratchet chocks firmly but do not bulge tire *Visually check to see if pin is locked in *Use the 3 point contact rule when climbing down the ladder *Carry ratchet in hand away from vehicle, put in pocket when climbing down ladders *Make sure hinge decks are locked in when lowered
 *When Loading 2 Destinations with 2 Crews:
 *Be aware of other crew, know what they are loading and drive with caution when approaching loadline or terminal scanners
 *Concrete loadline areas with red dots to ensure safe approach to same


NOTE PLACE: i ● ◆ + A ENVIRONMENTAL "SIGNIFICANT NOISE IMPACT"

PAGE 1 OF 1

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Use JI to teach operators the standard

No. _____		
		
JOB INSTRUCTION BREAKDOWN SHEET		
Operation: <u>Glost Kiln Operator Cycle</u>		
Parts: <u>None</u>		
Tools & Materials: <u>Kiln Gloves</u>		
IMPORTANT STEPS	KEY POINTS	REASONS
A logical segment of the operation when something happens to advance the work.	Anything in a step that might— 1. Make or break the job 2. Injure the worker 3. Make the work easier to do, i.e. "knack", "trick", special timing, bit of special information	Reasons for the key points
1. Discharge GK #3	1. Use kiln gloves 2. Pull at correct time	1. Burn hazard 2. Kiln control
2. Charge GK #3	1. Fix downed ware 2. Do not slam transfer	1. Defect prevention 2. Defect prevention
3. Record car data		
4. Check kiln temperatures	1. Call Ceramic Tech if 50°F delta in zones	1. Proper kiln control
5. Charge GK #3	1. Fix downed ware 2. Do not slam transfer	1. Defect prevention 2. Defect prevention
6. Discharge GK #3	1. Use kiln gloves 2. Pull at correct time	1. Burn hazard 2. Kiln control
7. Record car data		
8. Check kiln temperatures	1. Call Ceramic Tech if 50°F delta in zones	1. Proper kiln control

- Include others in developing each Job Instruction Breakdown
- Train all operators to use best method and monitor
- Refocus on quality at the source versus just keeping up
- Eliminate variation

By combining, rearranging, eliminating details

Job Breakdown Sheet

PRODUCT: Glost Ware
 OPERATIONS: Glost Kiln Operator

MADE BY: Lanno
 DEPARTMENT: Lean Team

DATE:

	CURRENT/PROPOSED METHOD DETAILS	Distance traveled in feet	REMARKS					IDEAS						
			TIME/TOLERANCE/REJECTS/SAFETY	WHY-	WHERE	WHEN	WHO	HOW	Write them down, don't try to remember.	Eliminate	Combine	Rearrang	Simplify	
1	Discharge GK #4													
2	Walk to control panel	148	45	x		x					Eliminate special trip to record this data point	x		
3	Record car number					x		x			Can bar codes be used to eliminate this manual step?			x
4	Walk to control panel	145	40	x							Eliminate trips to control panels (back tracking)	x		
5	Check kiln readings					x		x			Can kiln check be put on a 90-minute check as routine?			x
6	Walk to GK #4 loading	137	35	x							Eliminate trips to control panels (back tracking)	x		
7	Load car													
8	Walk to GK #4 entrance	135	35			x		x			Item #5			x
9	Charge kiln													
10	Walk to control panel	41	15	x							Item #6			
11	Record car number													
12	Walk to GK #3	242	60			x		x				x		
13	Discharge car													
14	Walk to control panel	138	45	x							Item #6			
15	Record number					x		x			Item #3			x
16	Walk to GK #4	137	35											
17	Load car													
18	Walk to GK #3	236	60											
19	Charge kiln													
20	Walk to control panel	99	25	x							Item #6	x		
21	Record data													
22	Kiln check					x		x						
23	Walk to control panel	145	60	x							Item #6	x		
24	Record kiln data							x			Install ANDONs to eliminate 90-minute kiln checks			x
25											
		2024-ft	555-seconds (travel only)											

TWI/Lean Integration

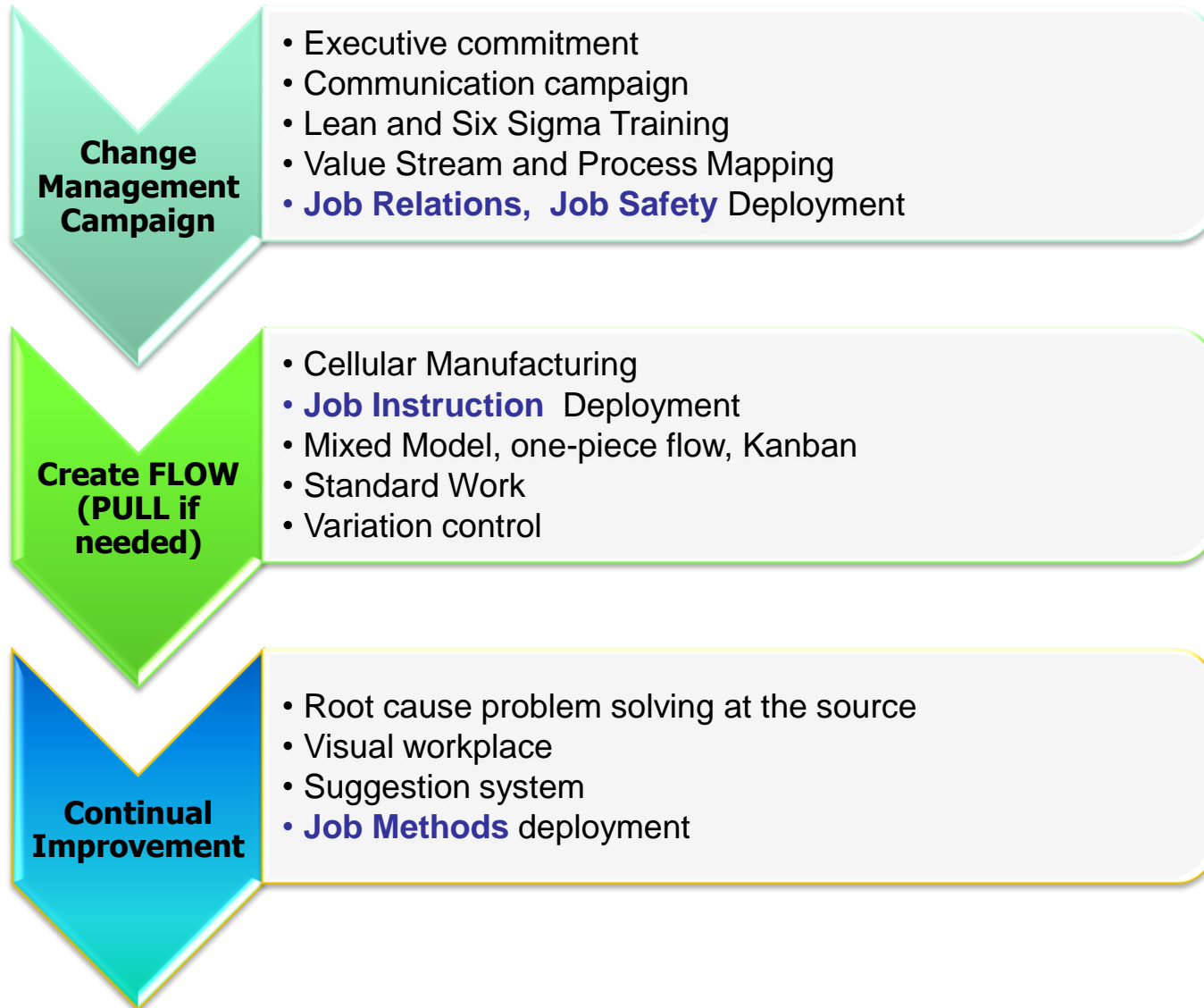
- Clean, safe, positive work environment
 - ***Job Relations, Job Safety***

- Stabilize work methods
 - ***Job Instruction***

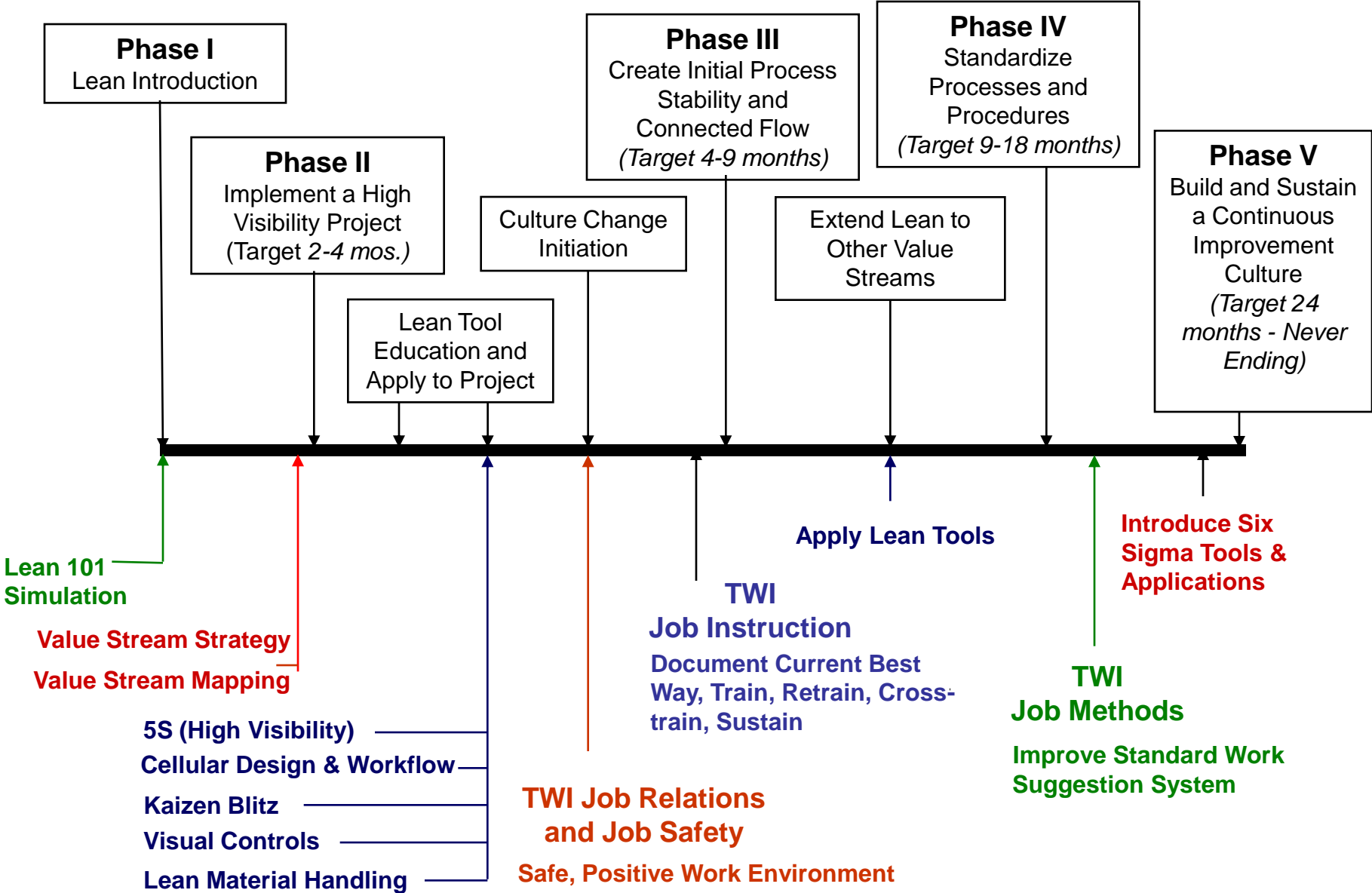
- Standardize work methods
 - ***Takt Time, Standard in-process inventory, standard work sequence***

- Sustain and Continuously Improve work methods
 - ***Maintain Standardized Work, Job Methods***

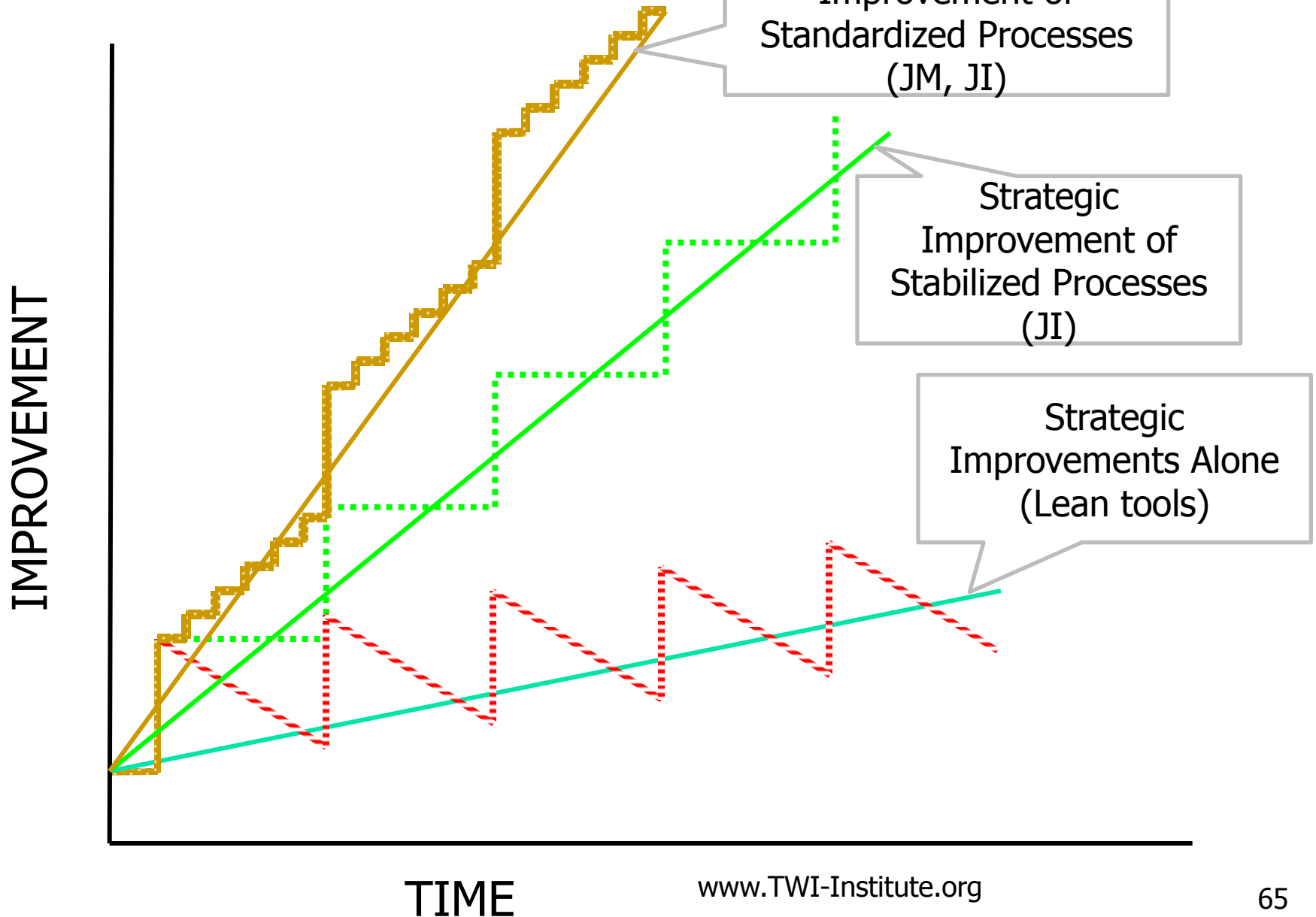
Plan to Integrate TWI into the Production System



Implement the Plan



Reduce Total System Cost

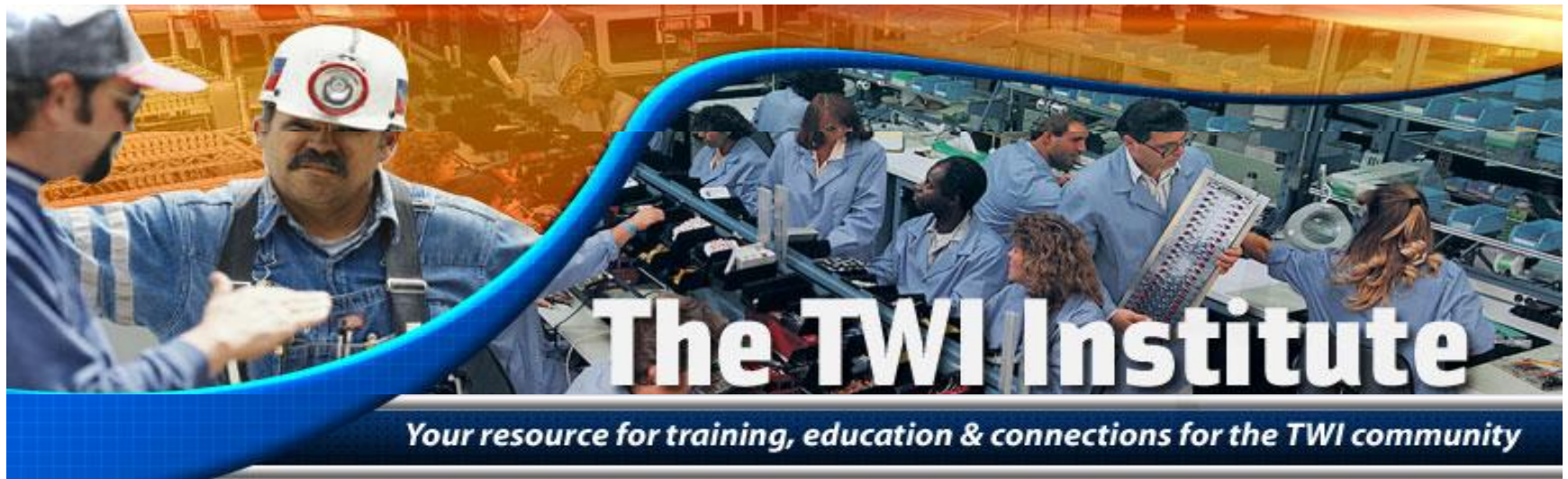


TIP *

“Create a Structure to Support Standard Work

Toyota has a system of group leaders and team leaders. The team leaders are hourly and are responsible for supporting about five to seven associates. They audit the work procedures of employees to detect deviations from standard work...and provide the necessary structure to fill in for absences. They are often involved in developing standard work for new models. They are a key to turning standard work from good looking wall hangings to true tools for continuous improvement. Interestingly, the team leader role is exactly what is missing in most companies.”

* *The Toyota Way Fieldbook*, Jeffrey K. Liker and David Meier, McGraw-Hill, 2006, pg 117



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The TWI Workbook: *Essential Skills for Supervisors*

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