Training Within Industry (TWI)

Supervisor Skills Training

Center for Industrial Research and Service
Iowa State University Extension
Presentation Outline

- **Opportunities**
- History of TWI
- Basics of TWI & Case Studies
- Summary
- Opportunity #1 -
Do you have trouble sustaining your Continuous Improvement efforts?
Why Aren’t Improvement Efforts Sustained?

• There is a general lack of discipline & accountability in maintaining changed procedures.
• Many people who don’t buy in to a change, revert to old habits when trouble arises.
• Supervisors are too busy “chasing fires” or “making the numbers” to focus on sustaining improvements.
• Operators are not involved in the process.
• Even when people are involved and they want to improve they don’t have improvement skills.
- Opportunity #2 -

Question(s)

When is Standardized Work

**NOT**

Standardized Work?

**When it’s words on a page and not behavior on the shop floor!**

How can we translate our documentation into employee behavior?
- Opportunity #3 -

Have your Continuous Improvement efforts focused on...

Tools before culture?

or even

Tools before system?
Tools vs. Culture

“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 Liker

“Culture follows system.”

- Col. Chet Richards, USAF (Ret.)
Which Comes First?

Management Philosophy
(Long-Term Thinking)

System

Solutions
(Customized)

Culture
(People)

Tools
(Problem-Solving)

Process
Transforming Culture

• Changing culture means changing behavior.

• Behaviors change through practice & repetition, so we must give people a method they can practice.

• These skills must be practiced fully and on a consistent basis to have lasting effect.

• Full organizational support is needed to encourage and foster the change.
American Lean often looks like...

- Kaizen event → kaizen event → kaizen event → ...
  ...and when that doesn’t work, do another kaizen event.

- Why doesn’t some of the really successful “stuff” stick?

- If Toyota is so good at this “stuff,” how do they make it stick?

- Courtesy SME Chapter 204
HYPOTHESIS

“American Lean” is missing something in its lean portfolio.

*SME Chapter 204
Opportunity #5 - Toyota Rule: First, Stabilization

“So what is basic stability? In the simplest sense this implies general predictability and consistent availability in terms of manpower, machines, materials, and methods -- the 4Ms.”

“Under each of these basic building blocks of manufacturing, Toyota tries to establish a consistent and predictable process before getting too far down the road with the latter elements of flow and takt time.”

- “Creating Basic Stability” by Art Smalley, author of Creating Level Pull
Stabilization Begins With Training

“Basic stability starts with a well trained workforce…”

“…Toyota in the 1950’s learned some basic techniques about supervision in production and how to further improve the skills and capabilities of work teams. Specifically, they adopted an industrial training program that the U.S. used during WWII called Training Within Industry (TWI).”

- “Creating Basic Stability” by Art Smalley, author of *Creating Level Pull*
Toyota Training & Development

Distinguishing Characteristics:
1. Begin from need
2. Make people before making cars
3. Leader’s job is to develop subordinates
4. OJT is primary, Off-JT secondary
5. Bring gemba into classroom, extend classroom to gemba
6. Aim training one or two levels above organizational need
7. Focus on:
   i. Problem-solving (scientific method)
   ii. Role throughout career

- Information courtesy John Shook, co-author of Learning to See
Proposed Model: Five Basic Needs of Supervisors

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

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
What Happens When Supervisors Don’t Have These Skills?

According to a recent Gallup poll on why people leave their job:

– 80% of people who quit their jobs leave because of their immediate supervisor
– Only 20% leave because of the work itself

The average cost to replace that person?

One-and-a-half times his/her average salary!
- Opportunities #6, 7, & 8 -

How Would Your Supervisors Answer these Questions?

• Have you ever been given an effective and systematic way to deal with worker problems?

• Does your company have an effective and systematic method for quickly training employees to do a job correctly, safely, and conscientiously?

• Have you ever been given an effective and systematic method for improving individual jobs?
Presentation Outline

✓ Opportunities
- **History of TWI**
- Basics of TWI & Case Studies
- Summary
June 22, 1940
France Surrenders to Germany

TWI was one of the first emergency services established by the U.S. Government after the fall of France.

The War Production Board established a national network of professionals on loan from their companies to teach the TWI techniques, but...

“...the real job had to be done by industry, within industry.”
TWI was developed...

“...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

Actual data reported by over 600 client companies, monitored throughout the war, attributed the following results to TWI:

- 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%
TWI at Toyota

- Job Instruction (JI), Job Relations (JR), & Job Methods (JM) introduced in early 1950s
- JI still taught with virtually no modification to this day
  - Considered fundamental, critical to all other training
- JR modified in about 1980 and terminated in 2000
  - TCS (Toyota Communication System) instituted in 2004; similar to JR in many ways
- JM dropped in mid-1950s
  - in favor of Shingo P-Course, which was then dropped in favor of
  - Standardized Work (later Standardized Work & Kaizen)

- Information courtesy John Shook, co-author of Learning to See
Some Seeds of the Toyota Production System

“To be sure of the one best way the operator should do the job.”

“Operators have good ideas, too; oftentimes as many as we do—sometimes more!”

“Where is the best place to do a job breakdown? On the job.”

“People must be treated as individuals.”

“Eliminating all unnecessary details eliminates waste. This will save manpower, machines & materials that are badly needed.”

*Lines from the original 1940’s TWI training manuals!*
The NUMMI* Case

• GM’s “worst” plant in terms of quality & workforce
• Toyota manages the plant and implements the Toyota Production System
• All former GM workers are offered jobs – including the “old troublemakers”
• It has a UAW workforce

*New United Motor Manufacturing, Inc.

- Information courtesy John Shook, co-author of Learning to See
JI Returns to U.S. in 1984

- 600 employees sent to Japan for training
- 400 trainers sent to NUMMI from Japan
- 30 managers or “coordinators” from Japan

RESULTS in ONE YEAR!

- **Quality:** Best in GM history!
- **Productivity:** Best in GM!

- Information courtesy John Shook, co-author of *Learning to See*
Presentation Outline

- Opportunities
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  - Basics of TWI & Case Studies
  - Summary
Skills that are required for supervisors to perform within their role, regardless of the industry:

3. Skill in Leading \( \rightarrow \) Job Relations
4. Skill in Instruction \( \rightarrow \) Job Instructions
5. Skill in Methods Improvement \( \rightarrow \) Job Methods
Training Within Industry Program

**Job Relations Training (JR)**

Teaches supervisors how to develop and maintain positive employee relations to prevent problems from happening and how to effectively resolve conflicts that arise.

**Job Instruction Training (JI)**

Teaches supervisors how to quickly train employees to do a job correctly, safely, and conscientiously.

**Job Methods Training (JM)**

Teaches supervisors how to continuously improve the way jobs are done.
Blueprinted Procedure

A common thread runs through all TWI programs as the result of much trial and error learning during introduction:

• Each program has a similar 4-Step Method.
• The method is stated in common, straight-forward language.
• Each participant must use the method to solve a current problem in class to get immediate use and acceptance.
• Small groups of 8-10 to practice the method under guided assistance to “learn by doing.”
• An outline of what and how and time sets a universal standard.
• Ten hours of class are best delivered in five 2-hour meetings without a break.
• Compact scheduling of the 5 meetings to keep the subject fresh and not keep people away from their jobs over long periods of time.
“Learn by Doing”

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 Relations

teaches supervisors how to develop and maintain positive employee relations to prevent problems from happening and how to effectively resolve conflicts that arise.

Objectives:

– *Build positive employee relations* by effectively resolving conflicts that arise.

– *Maintain positive employee relations* by preventing problems from happening.
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
How to Handle a Problem

DEFINE YOUR OBJECTIVE

Step 1 - Get The Facts

*Be sure you have the whole story*

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?*
Results from JR Training

- Better employee relations
- Improved morale
- Fewer grievances
- Improved attendance
- Less equipment damage
- Improved quality
- Increased production
- Reduced cost
JR Results - Then

Problem:
“Because of poor morale, our labor turnover was terrific; complaints and grievances were multitudinous; production schedules lagged.”

Solution:
The Production Manager and Director of Training became JR trainers. “They came back and presented the program to all our supervisors. Within a fortnight (2 weeks), complaints and grievances ceased; labor turnover stopped, and production went ahead of schedule.”

H. L. Austin, VP Food Machinery Corp. Sept. 1945
JR Results - Now

“This would have been a perfect course when I started as a leader, 20 years ago! It is simple and based on a foundation of values. This will help build trust and understanding in the workforce.”

Team Leader, July 2002
Job Instruction

teaches supervisors how to quickly train employees to do a job correctly, safely, and conscientiously.

Objective:
Develop a well-trained workforce resulting in:

– less scrap and rework
– fewer accidents
– less tool and equipment damage.
The 4-Step Method for JI
- How to Get Ready to Instruct -

Before instructing people how to do a job:

1. Make a time table for training.
2. Break down the job.
4. Arrange the worksite
# JI Training Timetable

<table>
<thead>
<tr>
<th>Name: Jones</th>
<th>Dept.: 2nd Electrical Dept.</th>
<th>Date: (today's date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakdown No.</td>
<td>Smith</td>
<td>Lark</td>
</tr>
<tr>
<td>Assembling Parts</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Wiring</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Combining</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Knot tying</td>
<td>123</td>
<td>✓</td>
</tr>
<tr>
<td>Clamping</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Adjustment</td>
<td>✓</td>
<td>X/X</td>
</tr>
</tbody>
</table>

**Turnover**

**Work Performance**

Scheduled to retire on xxx

Needs more training
# JOB INSTRUCTION BREAKDOWN SHEET

Operation: 

Parts: 

Tools & Materials: 

<table>
<thead>
<tr>
<th>IMPORTANT STEPS</th>
<th>KEY POINTS</th>
<th>REASONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A logical segment of the operation when something happens to advance the work.</td>
<td>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</td>
<td>Reasons for each key point</td>
</tr>
</tbody>
</table>
## Job Breakdown Sheet – Insert Central Line

<table>
<thead>
<tr>
<th>Major Steps</th>
<th>Keypoints</th>
<th>Reasons for Keypoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep the patient</td>
<td>1. Set out central line kit</td>
<td>1. immediate access to materials</td>
</tr>
<tr>
<td></td>
<td>2. Check lab reports</td>
<td>2. prevents potential adverse affects of the procedure/check to see if procedure could be potentially harmful to the patient</td>
</tr>
<tr>
<td></td>
<td>3. Lay patient on back</td>
<td>3. makes access to vena cava easier</td>
</tr>
<tr>
<td></td>
<td>4. Place rolled up towel between patient’s shoulderblades</td>
<td>4. makes finding the clavicle easier</td>
</tr>
<tr>
<td>Apply anesthetic</td>
<td>1. Swab chest with antiseptic</td>
<td>1. prevents infection</td>
</tr>
<tr>
<td></td>
<td>2. Inject 5cc’s of lidocaine</td>
<td>2. keeps the patient from feeling excessive pain</td>
</tr>
<tr>
<td>Insert needle into vena</td>
<td>1. Find clavicle</td>
<td>1. makes locating the vena cava easier</td>
</tr>
<tr>
<td>cava</td>
<td>2. Puncture chest with right under the clavicle</td>
<td>2. finds subclavian vein</td>
</tr>
<tr>
<td></td>
<td>3. Continue to push needle into the subclavian vein with a steep angle</td>
<td>3. avoid puncturing the lungs</td>
</tr>
<tr>
<td></td>
<td>4. Pull back on the syringe</td>
<td>4. indicates if the needle is in the vena cava or an artery. Maroon blood indicates vena cava, red blood, artery.</td>
</tr>
<tr>
<td></td>
<td>5. Pull syringe off, leaving the needle in place</td>
<td>5. helps to put the guidewire in place</td>
</tr>
<tr>
<td>Insert guidewire</td>
<td>1. Insert guidewire into the needle’s bore and into the vena cava</td>
<td>1. serves as a placeholder for the dilator and the central line</td>
</tr>
<tr>
<td></td>
<td>2. Do not force in</td>
<td>2. prevents damaging the vena cava or the heart</td>
</tr>
<tr>
<td></td>
<td>3. Do not let go</td>
<td>3. prevents loss of the wire inside the patient</td>
</tr>
<tr>
<td></td>
<td>4. Do not let wire touch anything unsterile</td>
<td>4. prevents infection</td>
</tr>
<tr>
<td>Dilate the puncture point</td>
<td>1. Remove needle and replace it with a thick plastic</td>
<td>1. the plastic widens the vein opening</td>
</tr>
<tr>
<td>Put in the central line</td>
<td>1. Remove plastic, thread the line over the wire until it is all the way into the vena cava</td>
<td>1. inserts the central line into the vena cava</td>
</tr>
<tr>
<td></td>
<td>2. Remove wire</td>
<td>2. wire is no longer needed</td>
</tr>
<tr>
<td></td>
<td>3. Flush the line with heparin solution with a syringe</td>
<td>3. removes fluids out of the central line</td>
</tr>
<tr>
<td></td>
<td>4. Suture the central line into the chest</td>
<td>4. keeps the line in place</td>
</tr>
</tbody>
</table>
The 4-Step Method for JI
- How to Instruct -

Step 1 - Prepare the worker to learn
Step 2 - Present the operation
Step 3 - Try-out performance
Step 4 - Follow-up
Results from JI Training

• Reduced training time
• Increased production
• Fewer accidents
• Less scrap
• Less rework
• Less tool and equipment damage
• Increased job satisfaction
• Improved quality
• Increased profits
Bottom Line Impact

Wax Department Assembly Initial Defects

Defects Found

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Months

2003 vs. 2002  →  75% reduction
2004 vs. 2003  →  83% reduction
2004 vs. 2002  →  96% reduction
Bottom Line Impact

Average On-Time Release of Molds Shot Up
2002 - 73.0%
2003 - 89.5%
2004 - 98.6%

Training Time went from 2 mos. \(\rightarrow\) 2 weeks

Cycle time reduction 64%
Inventory reduction 50%
On time delivery improvement 80%
Stabilized the Wax Process

Significant leveling of month to month *Variability* of On-Time Release of Molds

![Graph showing significant leveling of month to month variability in Wax Release with lines for 2002, 2003, and 2004.](chart.png)
Job Methods

teaches supervisors how to continuously improve the way jobs are done.

Objective:
Make the best use of the people, machines, and materials now available.
The 4-Step Method for JM

Step 1 - Breakdown the Job
Step 2 - Question Every Detail
Step 3 - Develop the New Method
Step 4 - Apply the New Method
## Step 1- Breakdown the Job

### Job Breakdown Sheet

<table>
<thead>
<tr>
<th>PRODUCT:</th>
<th>MADE BY:</th>
<th>DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATIONS:</td>
<td>DEPARTMENT:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRESENT/PROPOSED METHOD DETAILS</th>
<th>REMARKS</th>
<th>IDEAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>TIME/TOLERANCE/REJECTS/SAFETY</td>
<td>WHY</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **IDEAS**
  - Eliminate
  - Combine
  - Rearrange
  - Simplify

Write them down, don’t try to remember.
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

- Why?
- What?
- Where?
- When?
- Who?
- How?

Eliminate
Combine
Rearrange
Simplify
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
5. Continue to improve the new method
The following are proposed improvements on the above operations.

1. Summary

2. Results

<table>
<thead>
<tr>
<th></th>
<th>Before Improvement</th>
<th>After Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (one worker per day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine Use (one machine per day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reject Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Operators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Content
Concrete Results from JM Training

Improvement is not a matter of impression, results are obtainable and apparent.

- Reduced cost
- Reduced WIP
- Reduced inventory
- Increased throughput
- Increased sales
- Increased profits
- Continuous improvement
JM = Immediate ROI

ROI for a manufacturing company as the result of Job Methods Training, December 2002

Investment in Training: $5,000
Employee time (est. 120 hrs.): $6,000
Total Cost (est.) $11,000

Savings realized within 30 days $34,300
Immediately Return on Investment 312%
Projected Annualized Savings $124,690
Potential Return on Investment 1134%
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- Supervisors are too busy “chasing fires” or “making the numbers” to focus on sustaining improvements.
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- Even when people are involved and they want to improve they don’t have improvement skills.
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7. Focus on:
   i. Problem-solving (scientific method)
   ii. Role throughout career

- Information courtesy John Shook, co-author of *Learning to See*
Remember this Question?

When is Standardized Work **NOT** Standardized Work?

When it is **words** on a page and not **behavior** on the shop floor!

*TWI JR & JI help translate documentation into behavior on the shop floor!*
Opportunities Revisited

• Have you focused on tools & solutions before establishing your system or culture?

• Have you skipped basic stabilization while trying to establish flow and takt time?

• Do your Continuous Improvement efforts seem to be missing some key element?
Opportunities Revisited

• Have your supervisors/team leaders been given an effective and systematic way to deal with worker problems?

• Does your company have an effective and systematic method for quickly training employees to do a job correctly, safely, and conscientiously?

• Have your supervisors/team leaders been given an effective and systematic method for improving individual jobs?
Results That Stick

“If companies would spend half the time developing these essential skills (TWI) in the supervisor ranks that they spend on conducting Value Stream Mapping or Kaizen Workshops, I am convinced that they would not only achieve more impressive results, but the results would stick better as well.”

- Art Smalley, author of Creating Level Pull
HYPOTHESIS

THE (or least one of the) missing link(s) in creating and sustaining Continuous Improvement is:

**Training Within Industry (TWI)**

- Job Relations
- Job Instruction
- Job Methods
Job Relations – utilize the productive potential of people

Proactive Leadership

Job Method – maximize the use of people, machines, & materials

- Pull/Kanban
- Cellular/Flow
- TPM
- POUS
- Quality at Source
- Batch Reduction

Job Instruction – standardize work to sustain gains

- Standardized Work
- Quick Changeover
- Teams
- Visual
- 5S System
- Plant Layout

Job Relations – utilize the productive potential of people

CULTURE CHANGE

“House of Lean” Model w/TWI

Value Stream Mapping
Opportunities Revisited

Everyday Everywhere Everyone (True Kaizen)

Strategic & Incremental Improvements (JM) with Stabilization (JI & JR)

Strategic Improvements with Stabilization (JI & JR)

Strategic Improvements Alone
TWI Resources

CIRAS

• Jeff Mohr, jeffmohr@iastate.edu
  515.294.8534 (office), 515.450.7639 (mobile)
  http://www.ciras.iastate.edu/productivity/twi.asp

OTHER WEBSITES

• TWI Institute: http://www.twi-institute.org/
• TWI Service: http://www.trainingwithinindustry.net/
• Art Smalley’s Website: http://artoflean.com/index.htm

BOOKS

• The TWI Workbook: Essential Skills for Supervisors
  by Patrick Graupp & Robert Wrona
• Toyota Talent: Developing Your People the Toyota Way
  by Jeffrey Liker & David Meier