Training Within Industry and Toyota

A look at the role of TWI in Toyota and TPS

John Shook
the First TWI Summit
Orlando Florida
June 6, 2007
Topics

- TWI and me
- TWI and Toyota
- TWI and you
The **NUMMI** Case:  
Lean Success with a UAW Workforce

Agreement between Toyota and GM:  
Toyota manages the plant and  
implements the Toyota Production System

GM’s “worst” plant:  
Quality  
Workforce

Former GM workers offered jobs:  
Including the old “troublemakers”
The NUMMI Case:
Lean Success with a UAW Workforce

Extensive training program:
Over 600 employees sent to Japan for training
Over 400 trainers sent from Japan to NUMMI
About 30 managers or "coordinators" from Japan

TPS established:
Physicals, “hard” technology
- Product, plant layout, etc.
“Soft” technologies
- Management/people systems

(Note: “soft” doesn’t mean “easy”!)
Training Within Industry

**TWI** - The training program instituted to support the U.S. war production effort from 1941 – 1945

Millions of Americans Trained over five year period.

This training is forgotten in the US.

It formed the basis of Toyota’s core training. Toyota still uses much of it to this day!
JI: Being brought back to US at NUMMI in Fall of 1984
The **NUMMI** Case:
Lean Success with a UAW Workforce

Results

In about one year…

**Quality:**
Equal to Takaoka Japan
Best in GM history

**Productivity:**
Close to Takaoka Japan
Best in GM
TWI and me: Toyota Training Map

LEGEND:
- **Foreign Languages
- **Programming
- *TPS for non-production managers
- *Mid-Career Problem Solving
- *TEAM LEADER PRE-PROMOTION
- *Welding, etc.
- Lectures
- *TPS for non-production managers
- *ASST-MANAGER PRE-PROMOTION
- *GROUP LEADER PRE-PROMOTION
- WSTC
- Standardized Work & Kaizen
- TJI - Job Instruction

NEW EMPLOYEE ORIENTATION

HOURLY EMPLOYEES

Three types:
- Required
- *Assigned
- **Optional

Training to perform role at each level: “Role of the Plant Mgr”, etc.

Training in technical skills: “SW”, “CAD”, etc.
TWI and Toyota: a few quick facts

- JR, JM, JI introduced in early 1950s
- J courses referred to with “T” prefix
  - T-JM, T-JI, T-JR (also T-JS “Job Safety”)
- JI still taught with virtually no modification to this day
- JR modified in about 1980 and terminated in 2000
- JM dropped in mid-1950s in favor of
  - Shingo P-Course,
    which was then dropped in favor of
  - Standardized Work (later Standardized work & Kaizen)
Job Instruction training at Toyota

- Taught at virtually every Toyota production site since introduction in 1953!
- Still taught in its original form!!
  - virtually no change
  - until recently – some abbreviations now taking place outside Japan
- Considered fundamental, critical all other training
Job Methods training at Toyota

- Replaced first by Shingo’s “P-Course”
  - “Production Course”
    - one-week course taught monthly primarily in latter half of 1950s
  - Content was essentially IE-based Kaizen
  - More detailed and broader than JM

- Replaced later by internally developed Standardized Work & Kaizen training
  - Education & Training Department
  - “Production Survey Department”, later re-named in English “Operations Management Consulting Division”
  - More detailed and broader (system view) than P-Course
Some things JM lacked for Toyota...

■ Focus on waste, 3 Ms of Muda, Muri, Mura
  ▪ How to identify and eliminate
    - especially overproduction

■ Focus on flow
  ▪ Product-oriented workflow
  ▪ Timing
    - lead time, Takt Time

■ Information
  ▪ to make the right part in the right amount at the right time

■ System focus
  ▪ (note Deming connection here...)
JM replaced by Standardized Work & Kaizen

Standardized Work Chart

From: Pick up bar
To: Set RP in press

Analysis Number 1 / 3

5-15-95

AX

Leader: Coach:

Takt Time | Std. In-Proc Inventory | Cycle Time | In-Process Inventory | Quality Checkpoint | Safety Precaution
--- | --- | --- | --- | --- | ---
56 | 3 | 54 |  |  | +

1/10 [Quality check Every 10 pieces]
JM replaced by Standardized Work & Kaizen
JM replaced by Standardized Work & Kaizen
Standardized Work as Structured Learning for the Operator

What is Standardized Work? What is Kaizen?

They are two sides of the same coin – if you try to have one without the other, you will encounter one of two types of very serious problems:

1. Standardized Work without Kaizen;
2. Kaizen without Standardized Work.
Job Relations training at Toyota

- Revised in 1980
  - new case studies
  - some new points of emphasis

- Terminated in 2000
  - TCS “Toyota Communication Skills” developed and instituted in 2004
  - similar format and method to JR, but different content
    - more emphasis on skills in coaching and listening
The Thinking Production System

Just in Time
“The right part at the right time in the right amount”
• Continuous Flow
• Pull System
• Takt Time

HEIJUNKA

Jidoka
“Built-in Quality”
• Automatic Machine Stop
• Fixed Position Line Stop
• Error Proofing
• Visual Control
• Labor-Machine Efficiency

Production Lines That Stop for Abnormalities

Standardized Work and Kaizen
Mutual Trust; Employee Development
Stability; TPM; 5S

Robust Products and Processes
Supplier Involvement

Best Quality - Lowest Cost - Shortest Lead Time
Through Shortening the Production Flow By Eliminating Waste

Quantity or “Flow” Control

Quality Control

Quality, Quantity, then Cost

theTWInetwork, Inc.
Some Key Influences on Toyota

- TWI
- Deming
- Shingo
- Samuel Smiles

- Ford
- GM
- Scientific method
- German aerospace engineering
- American machine tools industry
- Buddhism
- Japanese culture & society
- Mikawa culture & society
- Japanese education system
Some Key Influences on Toyota

- **TWI**
  - scientific method
  - continuous improvement
    - standards, improvement
    - individual initiative
  - employee development
    - OJT focus
    - cascaded training

- **Deming**
  - scientific method
  - quality, SPC, TQM
  - PDCA

- **Shingo**
  - industrial engineering

- **Samuel Smiles**
  - individual initiative and learning: mistakes are okay
    (“jishuken” means “self-initiated learning”)
Roots of TPS
Jidoka and the famous loom
Roots of TPS:
Emphasis on flow and timing
Roots of TPS: Eiji Toyoda spends a month Ford Rouge plant in 1950
One of Eiji’s big finds at the Rouge – Suggestion System

Creative Ideas and Suggestions System

‘86 Results
- Total Number of Suggestions Submitted → 2.65 Million
- Average Per Employee → 48 Per Employee
- Percentage of Acceptance → 96% Acceptance
- Total Prize Money → 2,100 Million yen.
Heijunka at the Rouge? - 1932
Toyota Learns from the Rouge
Roots of TPS: Ford Highland Park
The first moving assembly. The magneto line, Highland Park, 1913
Roots of TPS: Deming and PDCA

Old Shewhart Cycle

Step 1
Specification

Step 2
Production

Step 3
Inspection

New Shewhart Cycle
P-D-C-A Cycle

GRASP the SITUATION

ACT

PLAN

CHECK

DO
Interesting Deming statements…

Deming

- To Michael Brassard: “I didn’t teach the 14 points in Japan…I learned them there.”

- To H, Thomas Johnson: “Study Toyota, that’s where you’ll find your answers…”
P-D-C-A Cycle

GRASP the SITUATION

ACTION

PLAN

CHECK

DO

TRY

HYPOTHESIS

ADJUST

REFLECT

theTWINETWORK, Inc.
Root’s of TPS: Deming and TWI

- Deming and TWI also share common roots
- John Dewey is a good place to start-finish
- Deductive science
- Inductive science
Deming & TWI – common roots going way, way back

- Deductive science
  - argument from the general to the particular
  - conclusion must be true if premises are true

- Inductive science
  - argument from the particular to the general
  - true premises support a conclusion, but do not guarantee it

- Good science needs both
The Thinking Production System

**Best Quality - Lowest Cost - Shortest Lead Time**
Through Shortening the Production Flow By

**Just in Time**
“The right part at the right time in the right amount”
- Continuous Flow
- Pull System
- Takt Time

**Leveled Production**

**Getting people to think and take initiative is the key!**

**Operational Stability and Kaizen**
- Standardized Work
- Preventative Maintenance; 4S
- Robust Products and Processes
- Supplier Involvement

**Production Lines**
- That Stop for Abnormalities
  - Automatic Machine Stop
  - Fixed Position Line Stop
  - Error Proofing
  - Visual Control
  - Labor-Machine Efficiency

**Built-in Quality**
Through Shortening the Production Flow By Eliminating Waste

**Operational Stability and Kaizen**
Getting people to think and take initiative is the key!
Toyota People Development
Training & Development at Toyota

As with everything at Toyota, or with lean, it begins with some basic principles.
Toyota Training & Development
Distinguishing Characteristics

1. Begin from need
2. Make people before making cars
3. Leaders job is to develop subordinates
4. OJT is primary, Off-JT secondary
5. Bring genba into the classroom, extend classroom education to the genba
6. Aim training one or two levels above the organizational training need
7. Focus on
   i. Problem-solving (scientific method)
   ii. Role throughout career
Toyota Education & Training Model
Toyota Training Map

LEGEND:
- Training to perform role at each level: "Role of the Plant Mgr", etc.
- Training in technical skills: "SW", "CAD", etc.
- Three types: Required, *Assigned, **Optional

**Foreign Languages
**Programming

*TPS for non-production managers
Lectures

*MID-CAREER
**Problem-solving
TEAM LEADER
*PRE-PROMOTION

*TEAM LEADER
PRE-PROMOTION

*TPS for
non-production managers

*ASST-MANAGER
PRE-PROMOTION

*ASST-MANAGER
POST-PROMOTION

*FOREMAN
PRE-PROMOTION

*FOREMAN
POST-PROMOTION

GROUP LEADER
PRE-PROMOTION

GROUP LEADER
POST-PROMOTION

TJR - Job Relations: Communication Skills

Standardized Work & Kaizen

TJI - Job Instruction

*Welding, etc.

WSTC

theTWiNETWORK, Inc.

john shook
TWI Cascade model
Teach the Scientific Method

■ What is the real problem? What is the root cause? Use the “Five Why” process.
■ “Countermeasures” and “solutions”.
■ PDCA, Kaizen, Continuous Improvement, -- all are essentially the scientific method.
Teach the Scientific Method

- Scientific method = PDCA, Kaizen, CI
- Scientific method ≠ trial & error
- Countermeasures ≠ solutions
Certification??

As the Wizard of Oz said to the Scarecrow:

“I can give you a diploma... ...but, I can’t give you a brain.”
Weber: Open Source “Property”

- **Traditional focus:**
  The right to exclude

- **Open Source:**
  The right to distribute
Open Source

■ Radically inverts core notion of property
■ Around right to distribute, not right to exclude
■ Traditional rights of stewardship or guardianship fit better than traditional rights of property ownership based on exclusion
Open Source “Authority” in context of the future of TWI

- In non-authoritative settings…
- Power derives from asymmetrical interdependence
Distributed Innovation
- not just reduced transaction costs

- Enables effectiveness with geographic and functional dispersion
- Takes away “decision-maker” in that no one is telling anyone what to do
Four Principles of Open Source

- Empower people to experiment
- Enable sharing of learning
  - “enable bits of information to find each other”
- Structure information so it can recombine with other information
- Create a governance systems that sustains and nourishes
## 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 cava</td>
<td>1. Find clavicle</td>
<td>1. makes locating the vena cava easier</td>
</tr>
<tr>
<td></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>