

A photograph of John Shook, an older man with white hair, wearing a light blue button-down shirt and khaki pants, standing at a black podium on a stage. He is looking to his left. A computer monitor is visible in the foreground, and a blue curtain is in the background.

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"



October 20, 1986

TOYOTA MOTOR CORPORATION

THE TV NETWORK, INC.

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"!))

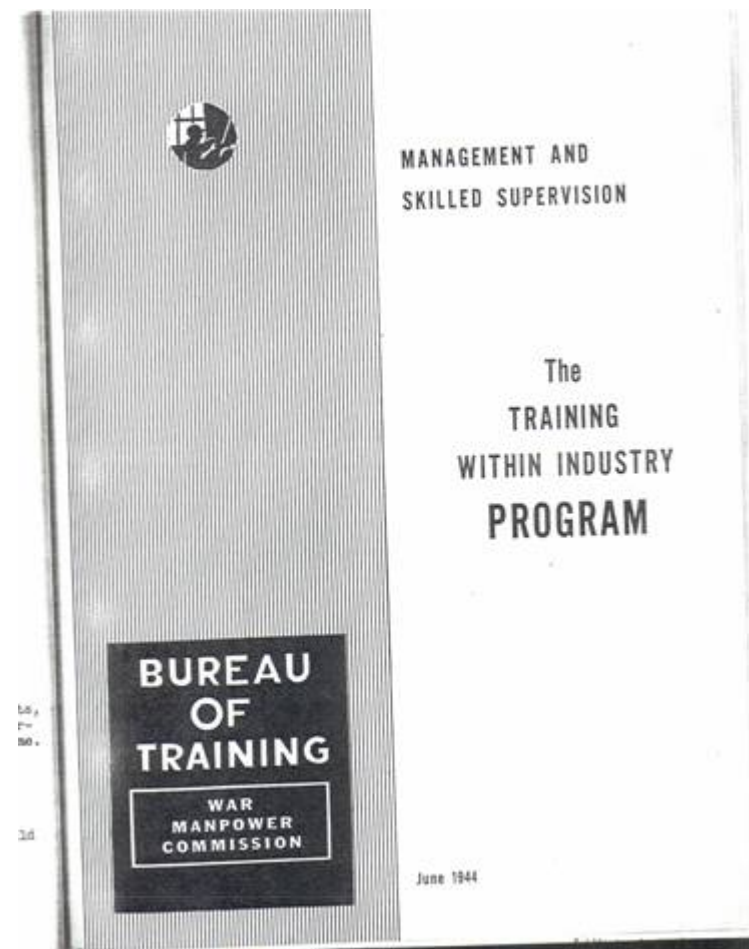
Training Within Industry

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!**



J1: Being brought back to US at NUMMI in Fall of 1984



shook

The NUMMI Case: Lean Success with a UAW Workforce

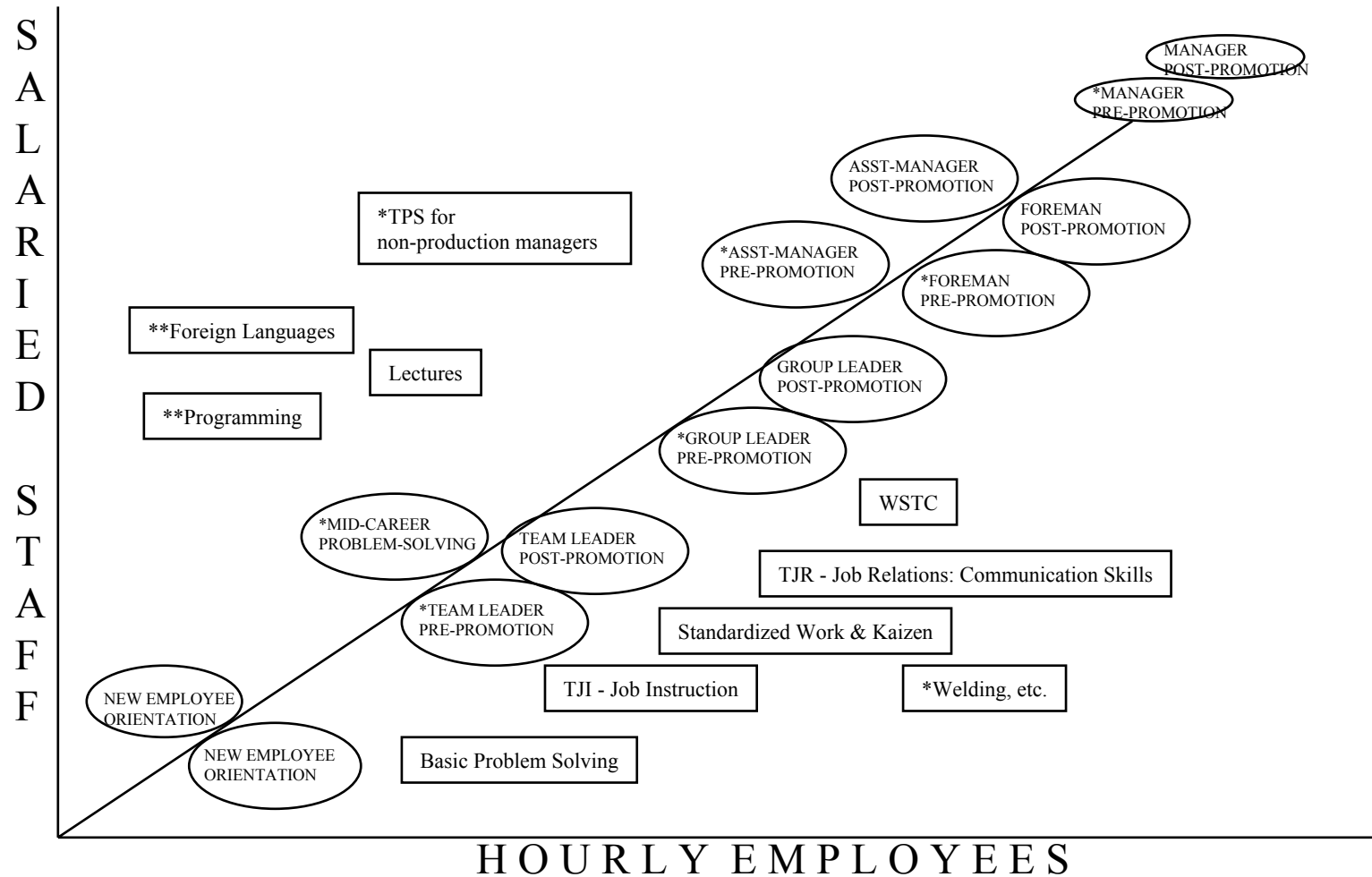
Results

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:

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

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

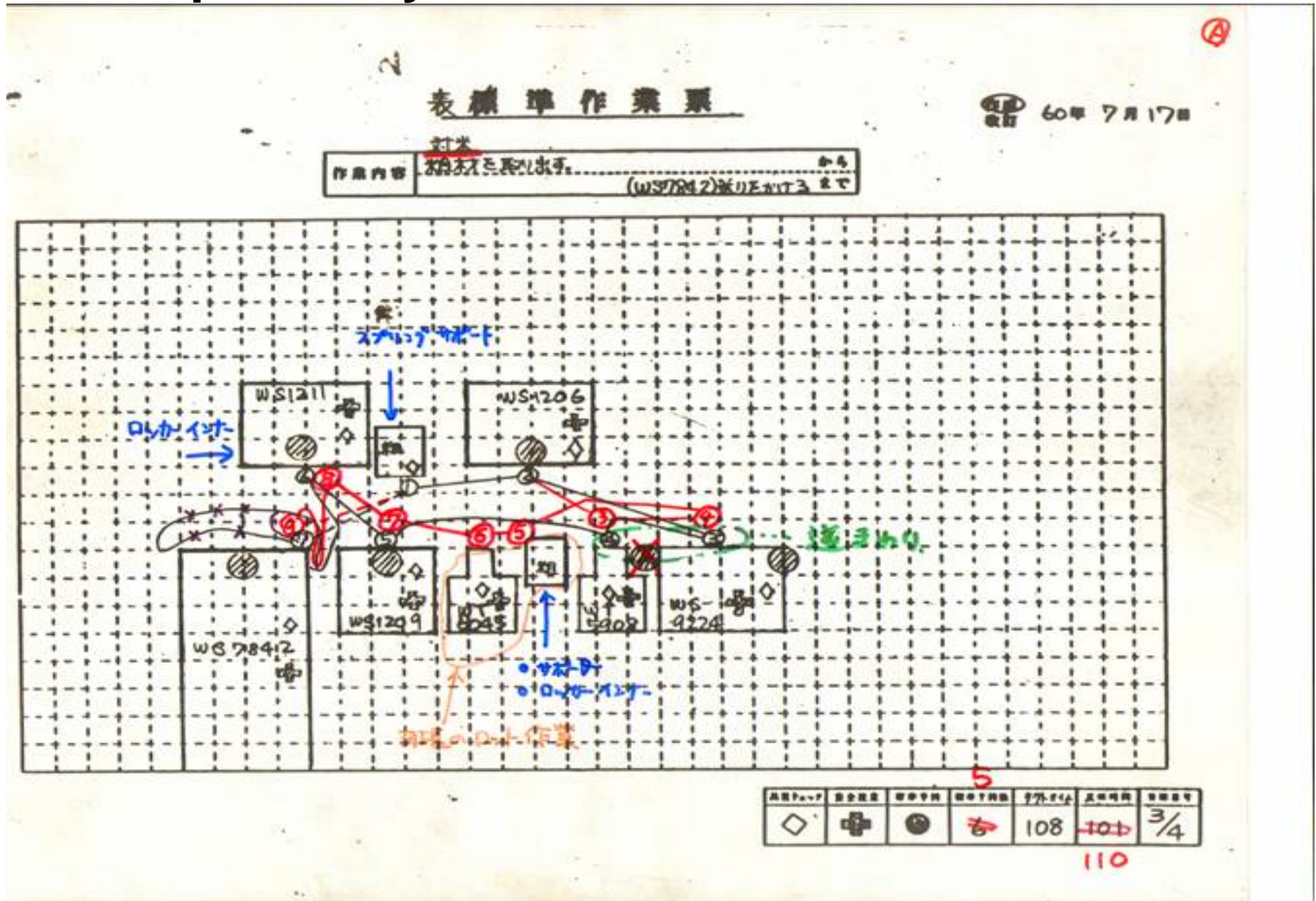
■ System focus

- (note Deming connection here...)

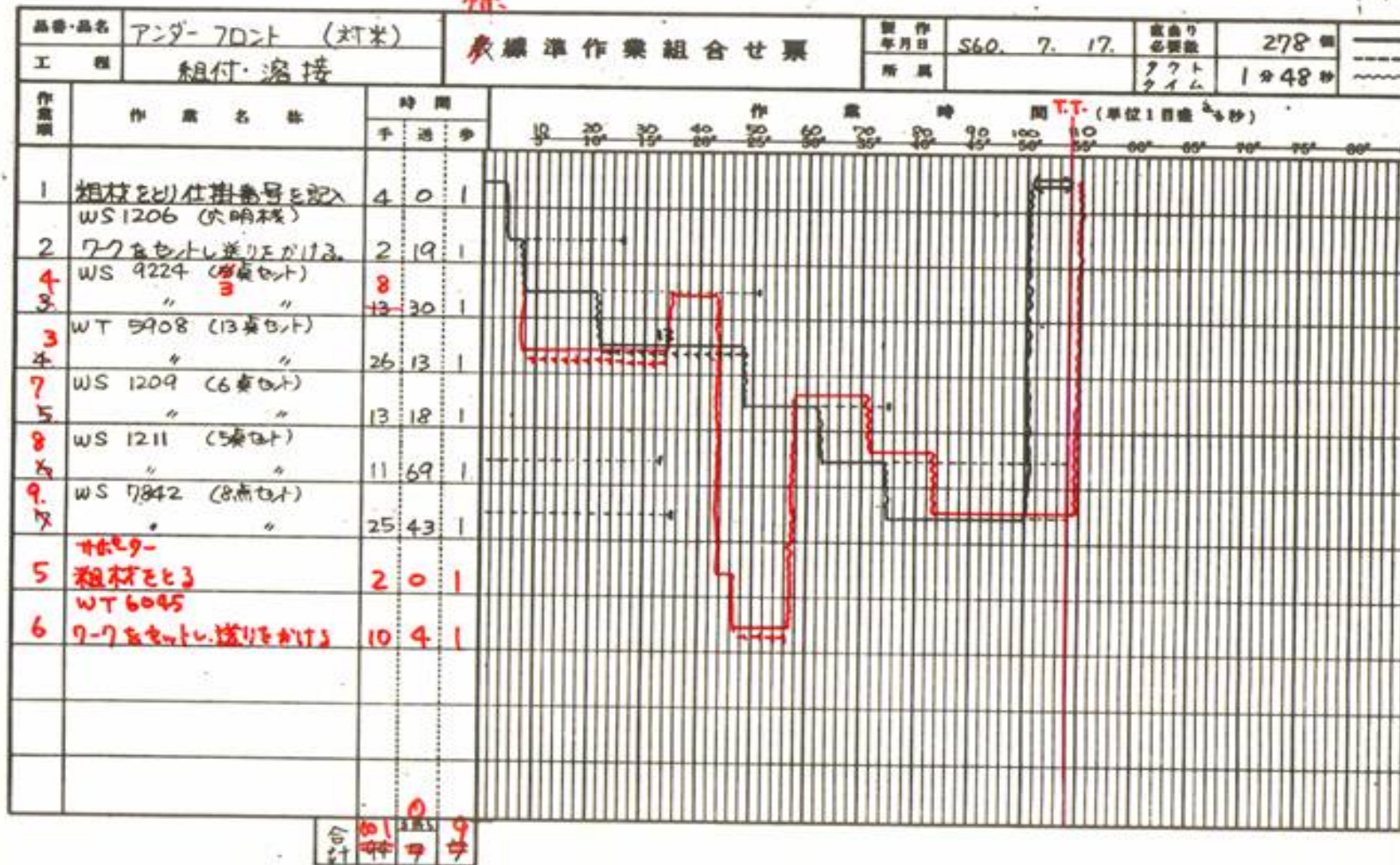
JM replaced by Standardized Work & Kaizen

Standardized Work Chart	From: Pick up bar To: Set RP in press	Analysis Number 1 / 3	5-15-95 AX	Leader: Coach:	
<p>The diagram illustrates a standardized work process with 8 steps. Step 1 is 'Pick up bar', Step 2 is 'Set RP in press', Step 3 is 'Spot welder', Step 4 is 'Robotic welder', Step 5 is 'Punch press', Step 6 is 'Quality check', Step 7 is 'In-process inventory', and Step 8 is 'Cycle time'. The process includes a SPOT WELDER, a PUNCH PRESS, and a ROBOTIC WELDER. A quality check is indicated as 1/10 [Quality check Every 10 pieces].</p>					
Takt Time	Std. In-Proc Inventory	Cycle Time	In-Process Inventory	Quality Checkpoint	Safety Precaution
56	3	54			

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

Quantity
or "Flow"
Control

The Thinking Production System

Best Quality - Lowest Cost - Shortest Lead Time
through Shortening the Production Flow By Eliminating WASTE

Quality
Control

Quality, Quantity,
then Cost

Just in Time

"The right part
at the right time
in the right amount"

- Continuous Flow
- Pull System
- Takt Time

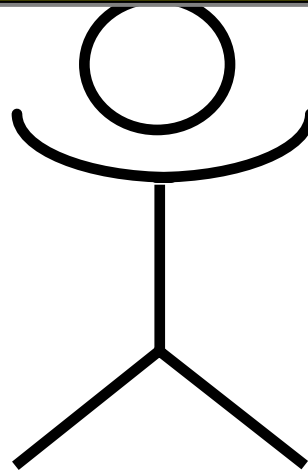
HEIJUNKA

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

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

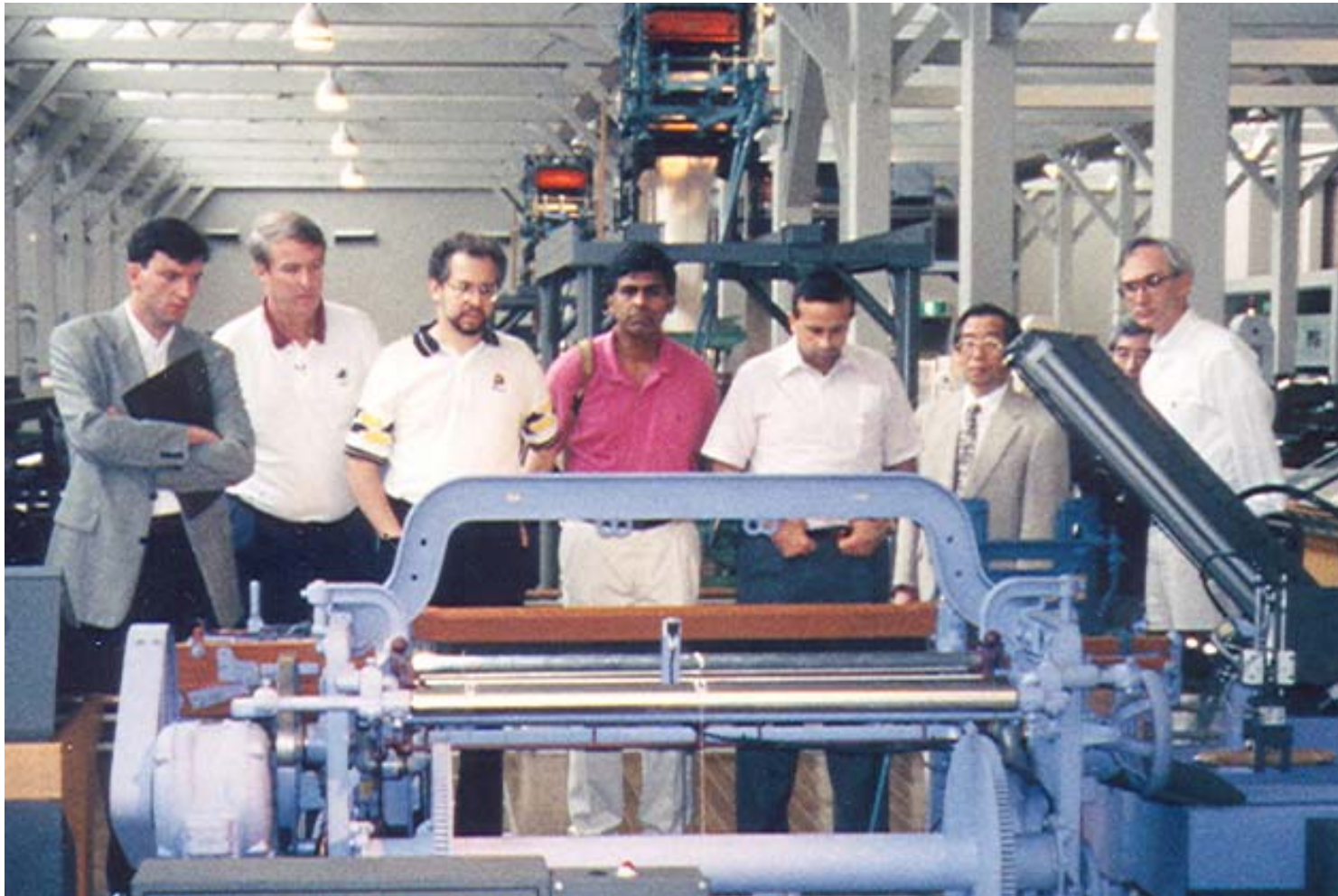
- industrial engineering

➤ 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

豊田重役 アメリカ便利

デトロイトにて

トヨタの皆様お元気ですか。
私も空つて元気です。

デトロイトの町もあらこあら見て
廻りました。デトロイトリバーと云う
闊田川より広い河の向側はカナダでニ
ューヨークへ行く汽車は河の下を通つ
てパツハローまではカナダ領を通過し
てゐます。

デトロイトの町の中はフォード
會社の完成車を運ぶトレー
ラー、完成したボデーを運ぶ
トレーラーそれからリヤーア
クスル、ホーカール、ブレーキ
ドラム等々積形機や完成品を
運ぶトラックやトレーラーが
走り廻つていて、さすが自動車
の都の感じがします。特に驚い
たのはユーズドカー（中古車）
の店で、丁度東京の神田の
古木屋の様に趣々移マイルも
軒並に中古車の店が並んでい
る通りの有ることで中には10年前の
古ぼけた車から1950年製車までず
らりと並び夜は電灯が微をあざむくば
かりであります。

當地には日本人二世も含めて150
0人位いるとの事ですが、その中に岐
原縣出身の一世で平田さんと云う人が
いて、フォードにもう35年も勤めて
いるそうです。そして工具寮の所屬者




定の主任だそうでありましたが、フォ
ードの精進は自分が責任を持つていと
云つて頑張つています。今次の戦争中
も特別成ひで、フォードにそのまゝ働
いていた様です。もう64才になるそ
うですが頗る元気です。私が平田さん
に會つた時はデフのドライブビニヨン
の情度を調べてゐましたが、この人に
會つて何となくアメリカの社
會生活の良さを感ぜしめられ
ました。

こゝから少し離れたミルブ
オードにはフォードのキヤブ
レッター工場があります。建坪
400坪、作業員300名位
で、一日に3800台分位を
生産しています。一月では
ありません。然も鋼鉄とプロ
ート以外は全部やつているの
です。流れ作業のマスプロでも
も同一な物が出来たりではい
けないと加工や組立の途中に何度も
「エアー流れ」とか「流路」とか或は
「アクセルポンプの脱力」とか一々検
査をし更に完成品は全部「真空テスト」
をしています。更に抜取り検査で
全機能の試験をしているのは、これな
らば完全な品物が出来ると私も大いに
感じ、トヨタでも色々珍める可き点だ
と思ひました。 ではいづれ又

「アメリカ便利:トヨタ新聞」(昭和25年)

One of Eiji's big finds at the Rouge – Suggestion System

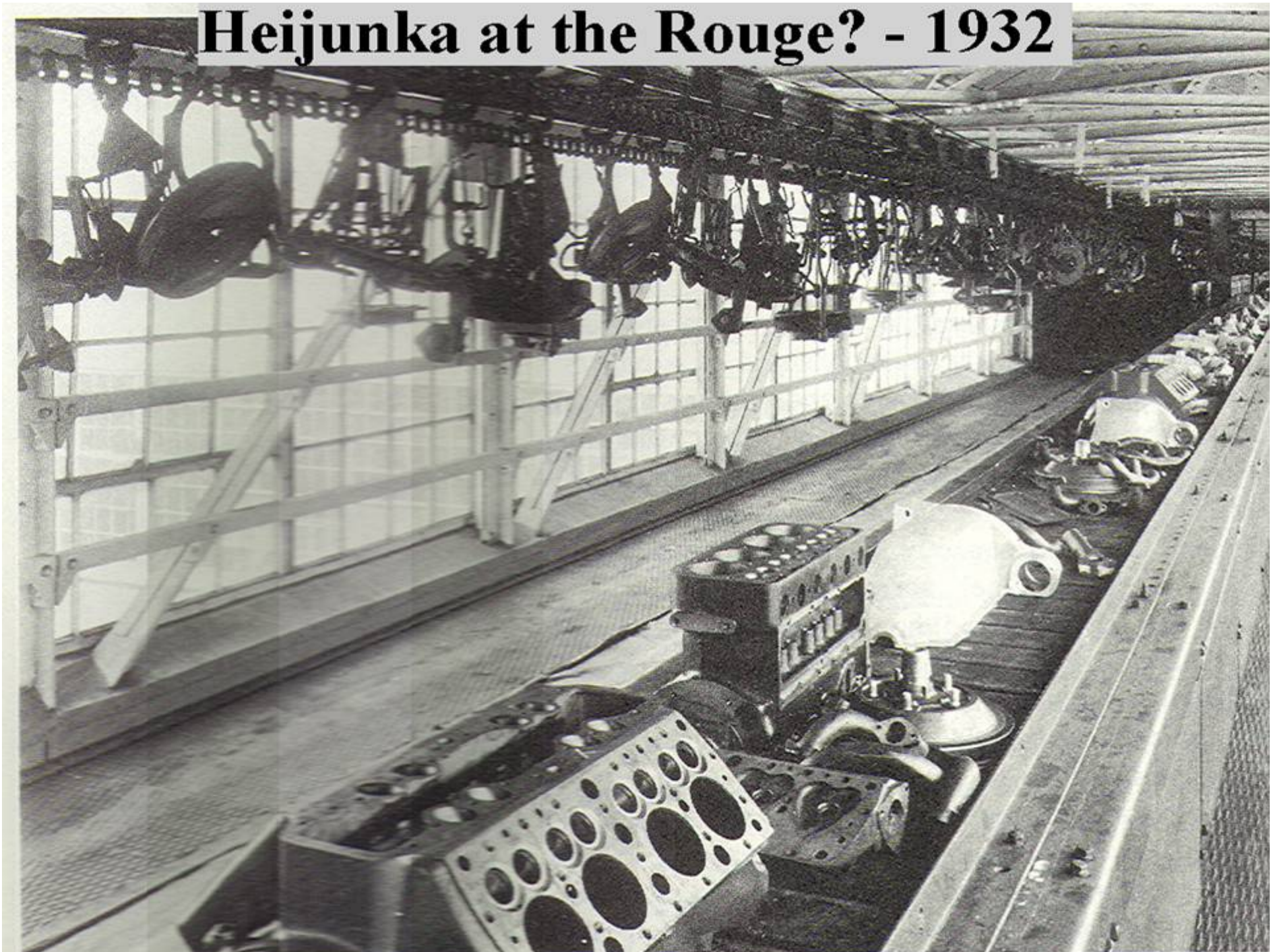
Creative Ideas and Suggestions System



'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

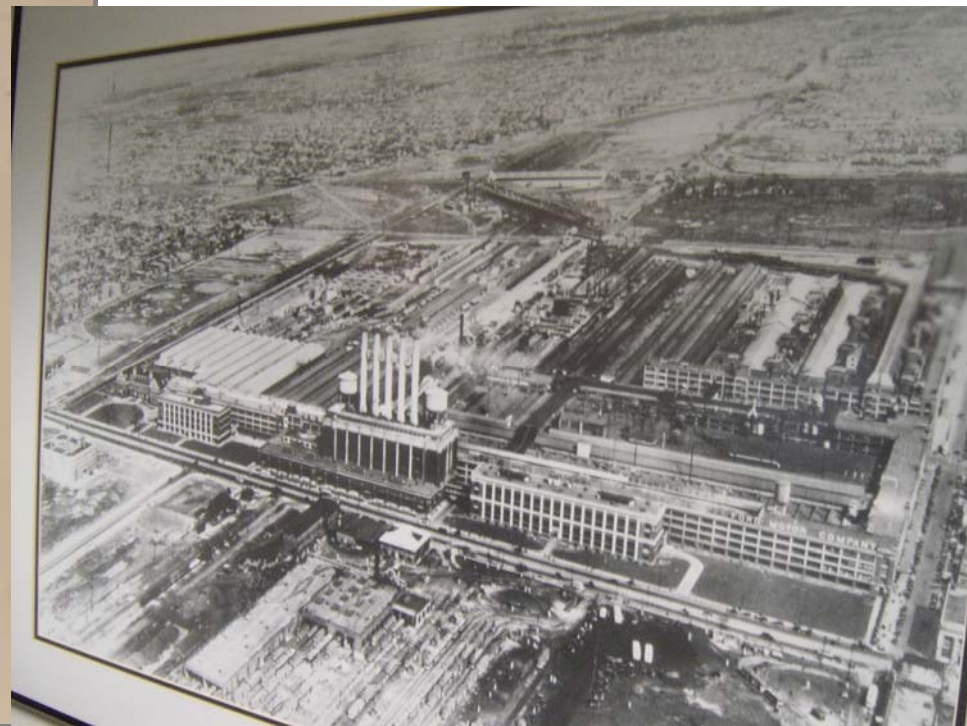
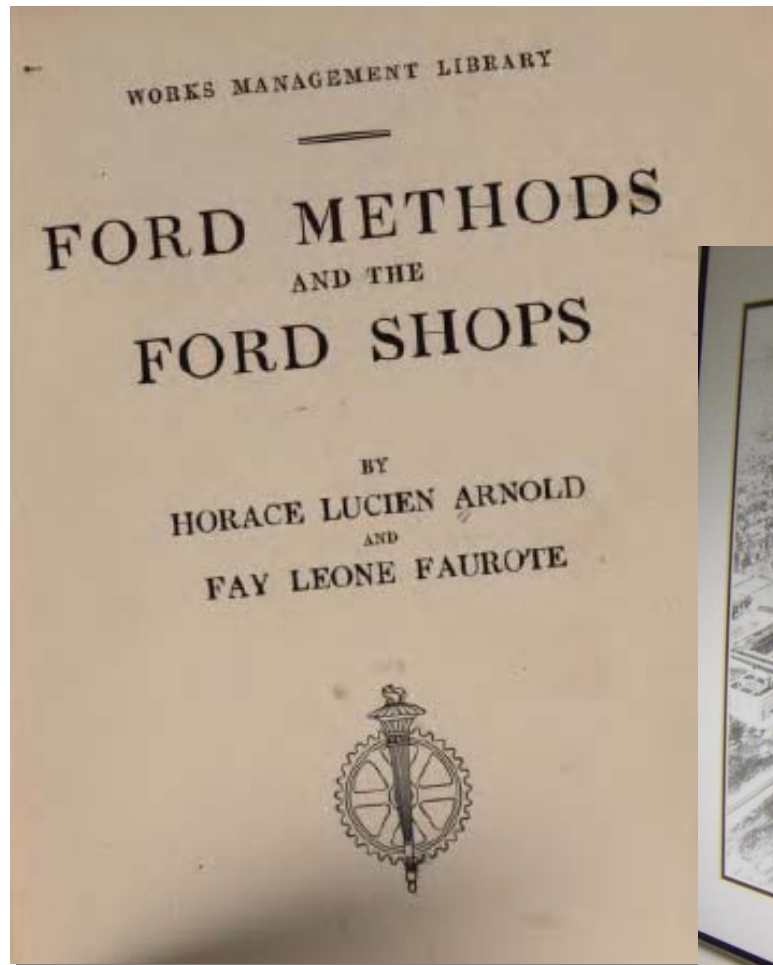


The diagram is a comprehensive site plan of the Mikano Technical School. It features a variety of buildings and outdoor spaces. Key areas include:

- Workshops and Industrial Buildings:** Machine Tool Shop, Pattern Shop, Foundry, Body Assembly & Plate Works, Dressing Room, and Men's Dormitory.
- Classrooms and Academic Buildings:** First, Second, and Third Drying Rooms, and a large central hall.
- Administrative and Support Buildings:** Office, Store, and various smaller utility rooms.
- Outdoor Areas:** Multiple Yards, a Test Course, and a large open area for physical education.
- Transportation:** A Rail Road runs along the left side of the campus.
- Orientation:** A compass rose in the top right corner shows North (N), South (S), East (E), and West (W).

The plan is drawn in a detailed, hand-drawn style with various labels and dimensions. The overall layout is organized and functional, reflecting the school's focus on technical education.

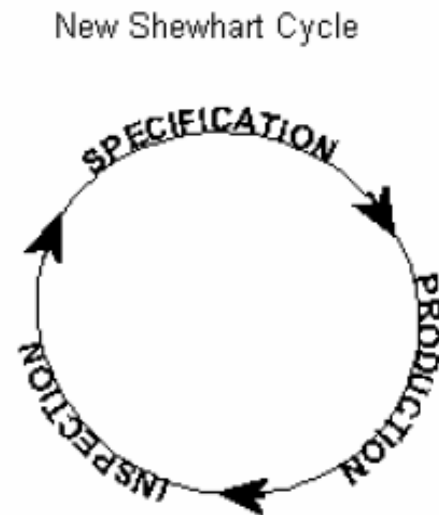
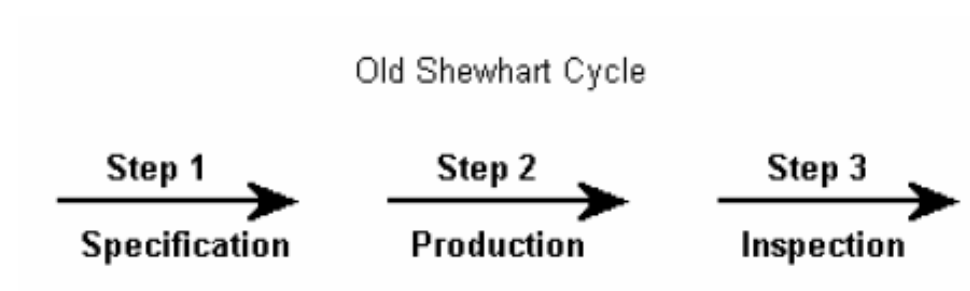
Roots of TPS: Ford Highland Park



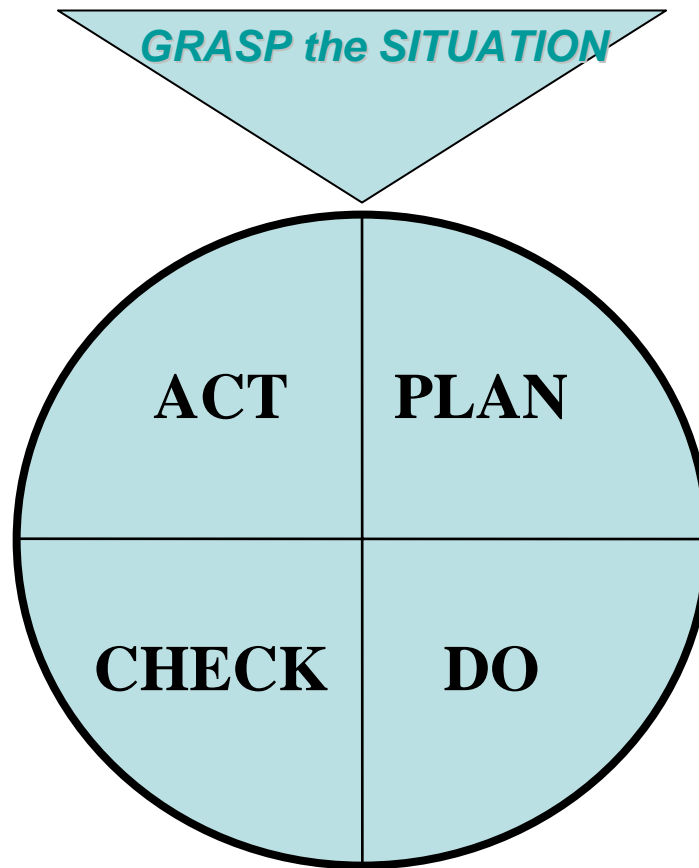


The first moving assembly. The magneto line, Highland Park, 1913

Roots of TPS: Deming and PDCA



P-D-C-A Cycle



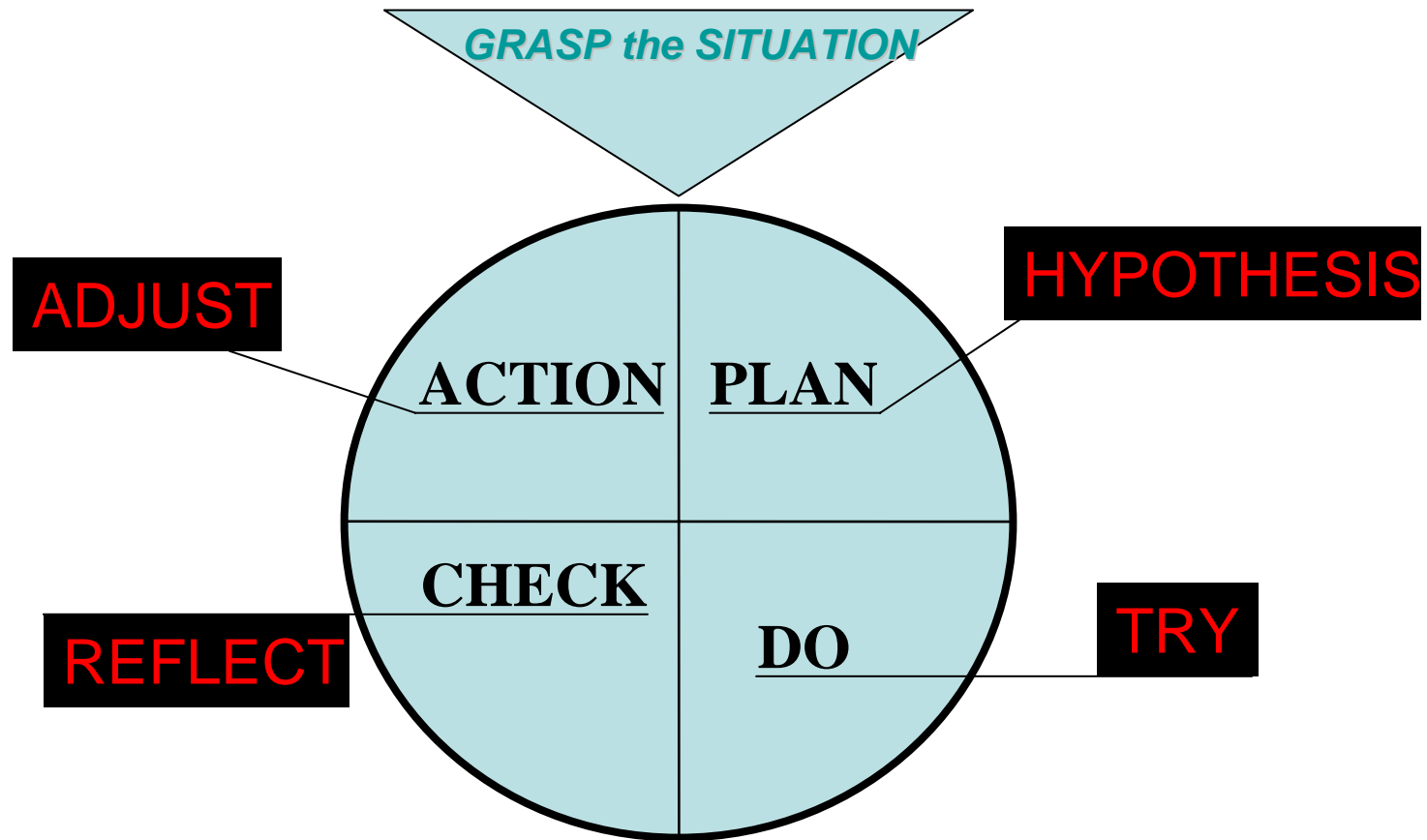
Interesting Deming statements...

- **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



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

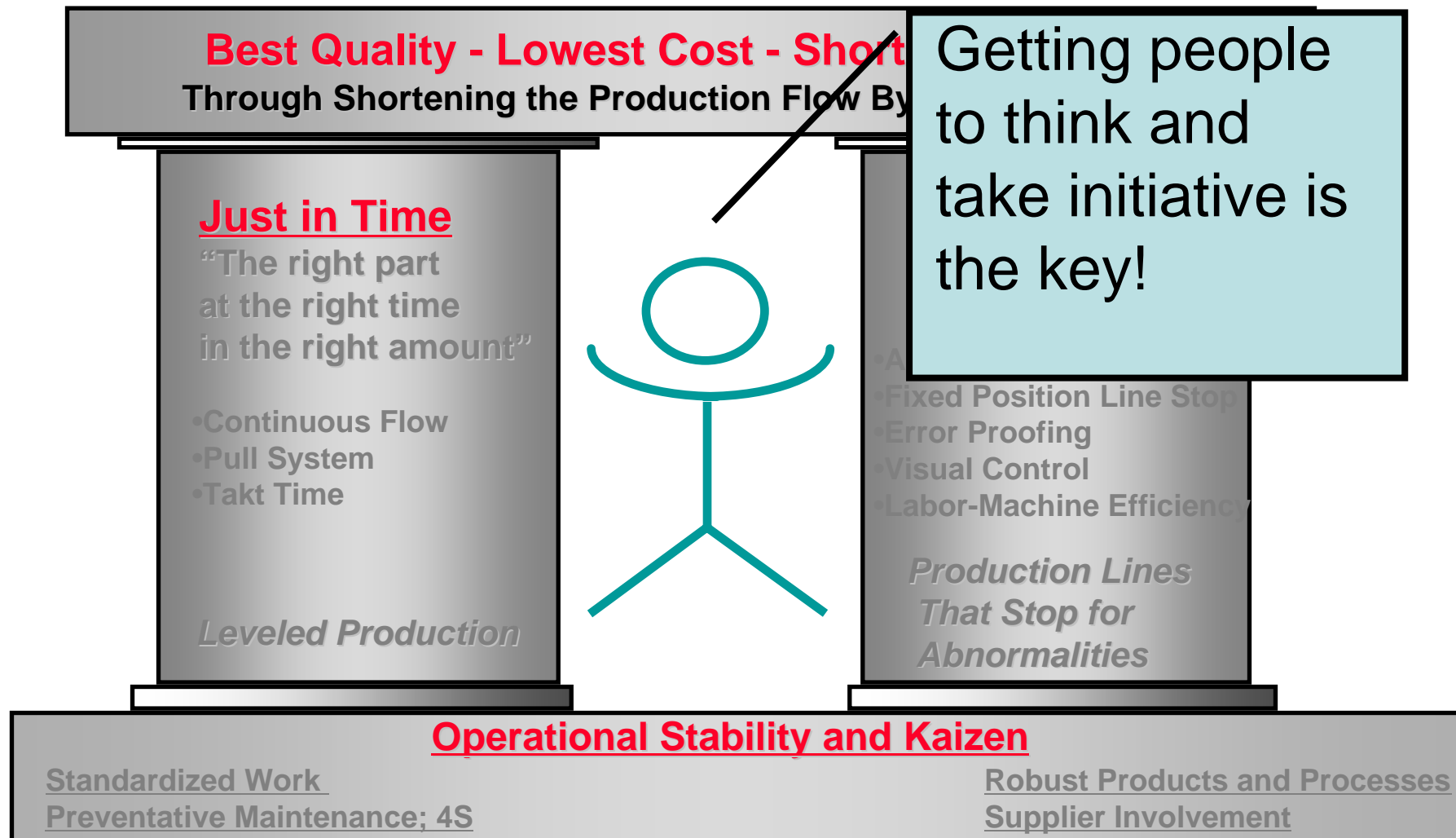
- argument from the general to the particular**
- conclusion must be true if premises are true**

■ Inductive science

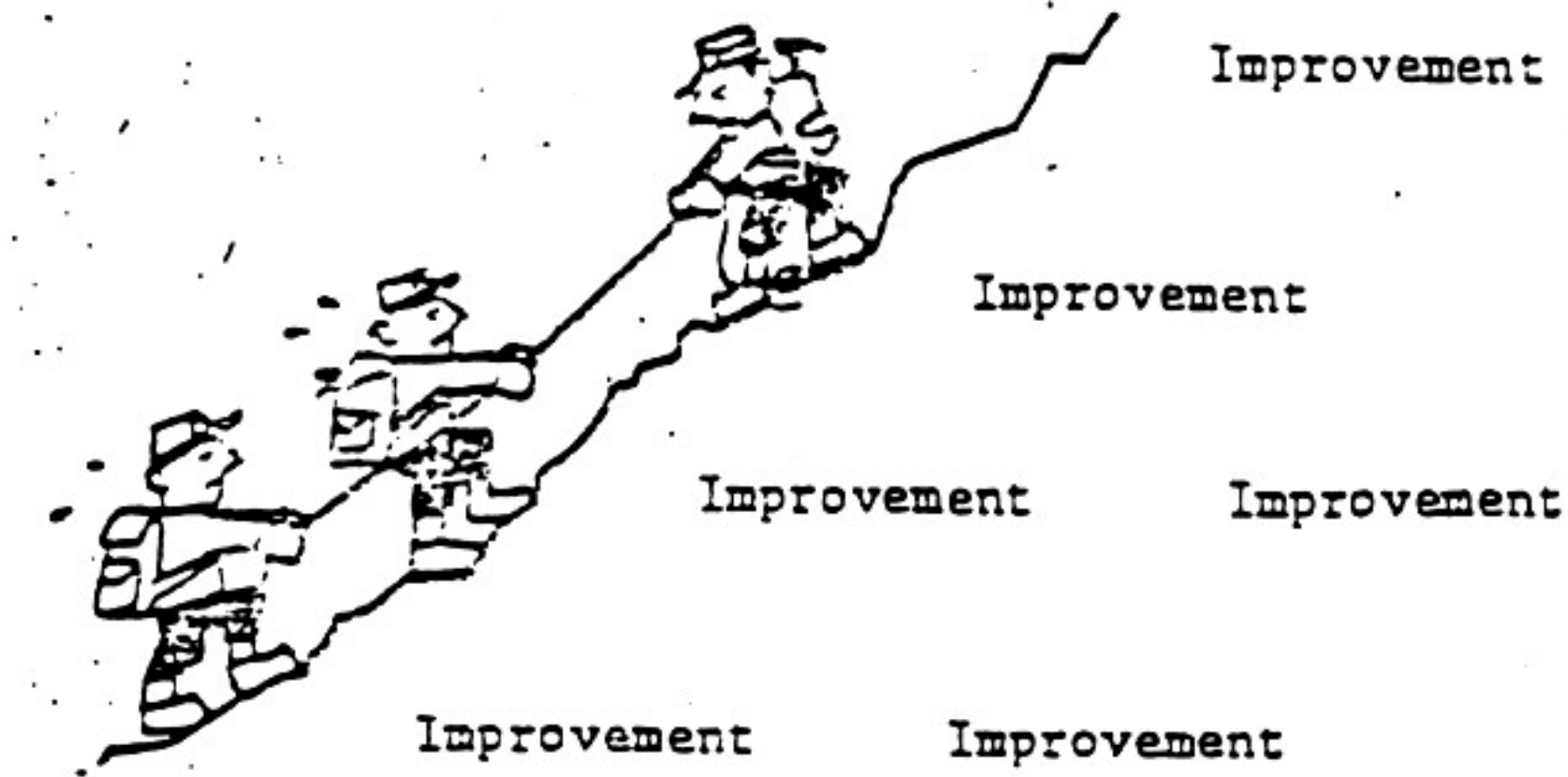
- argument from the particular to the general**
- true premises support a conclusion, but do not guarantee it**

■ Good science needs both

The Thinking Production System

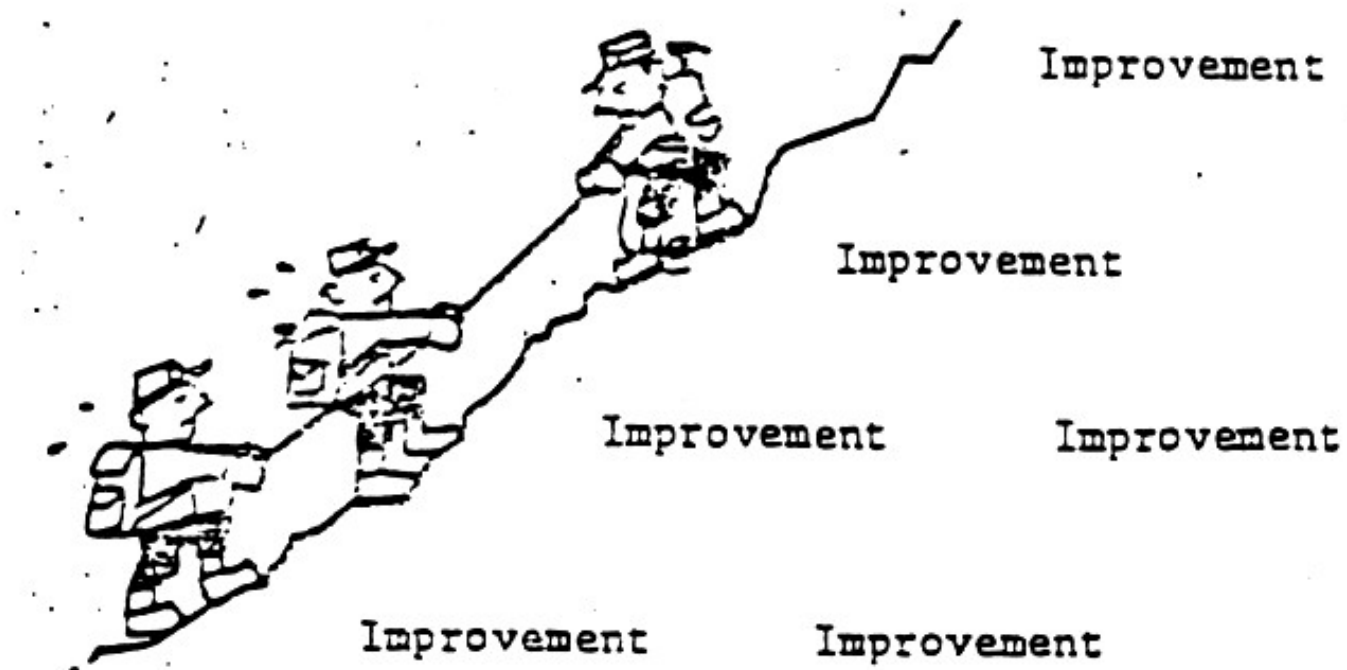


Toyota People Development



Training & Development at Toyota

- As with everything at Toyota, or with lean, it begins with some basic principles.

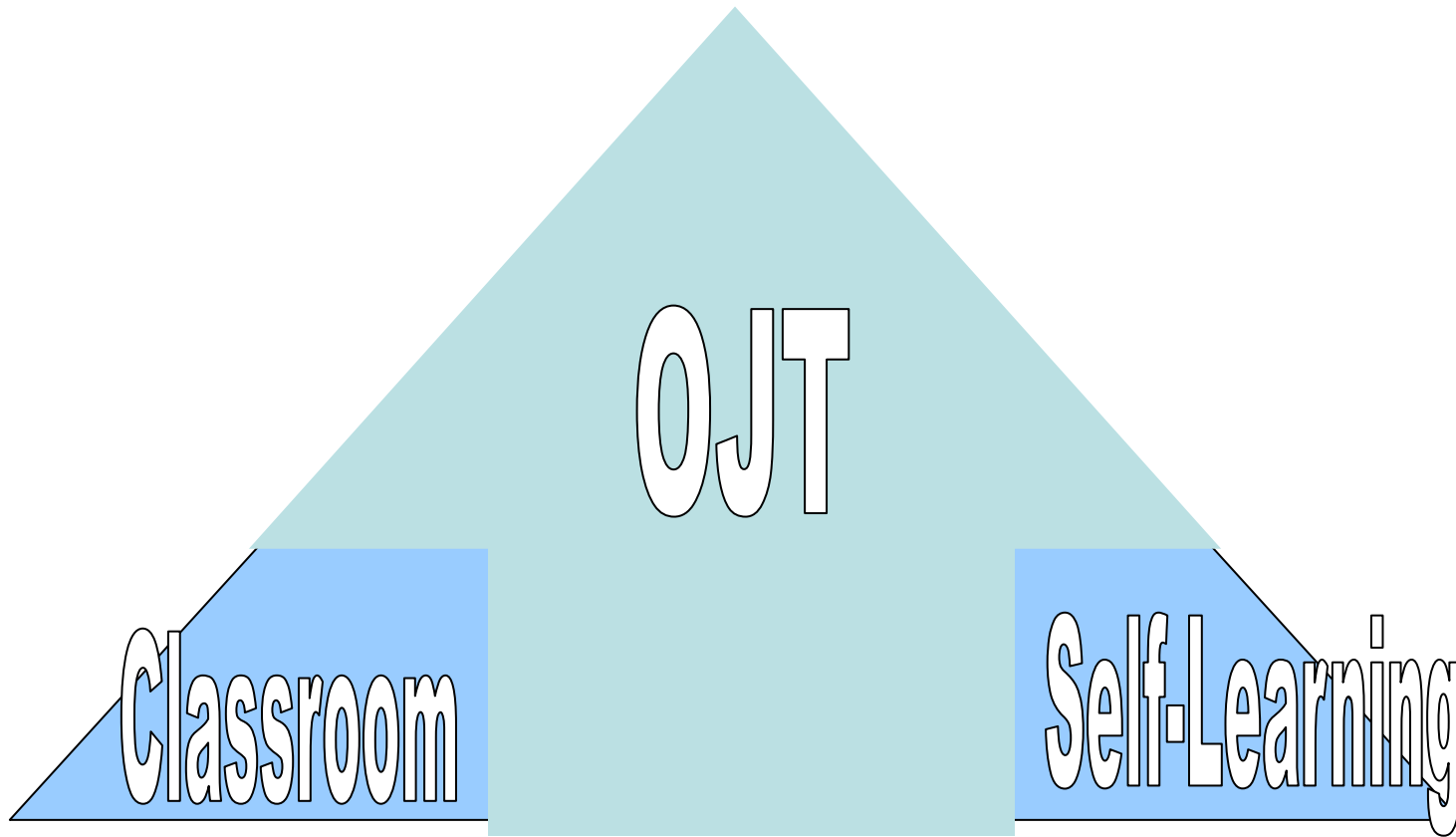


Toyota Training & Development Distinguishing Characteristics

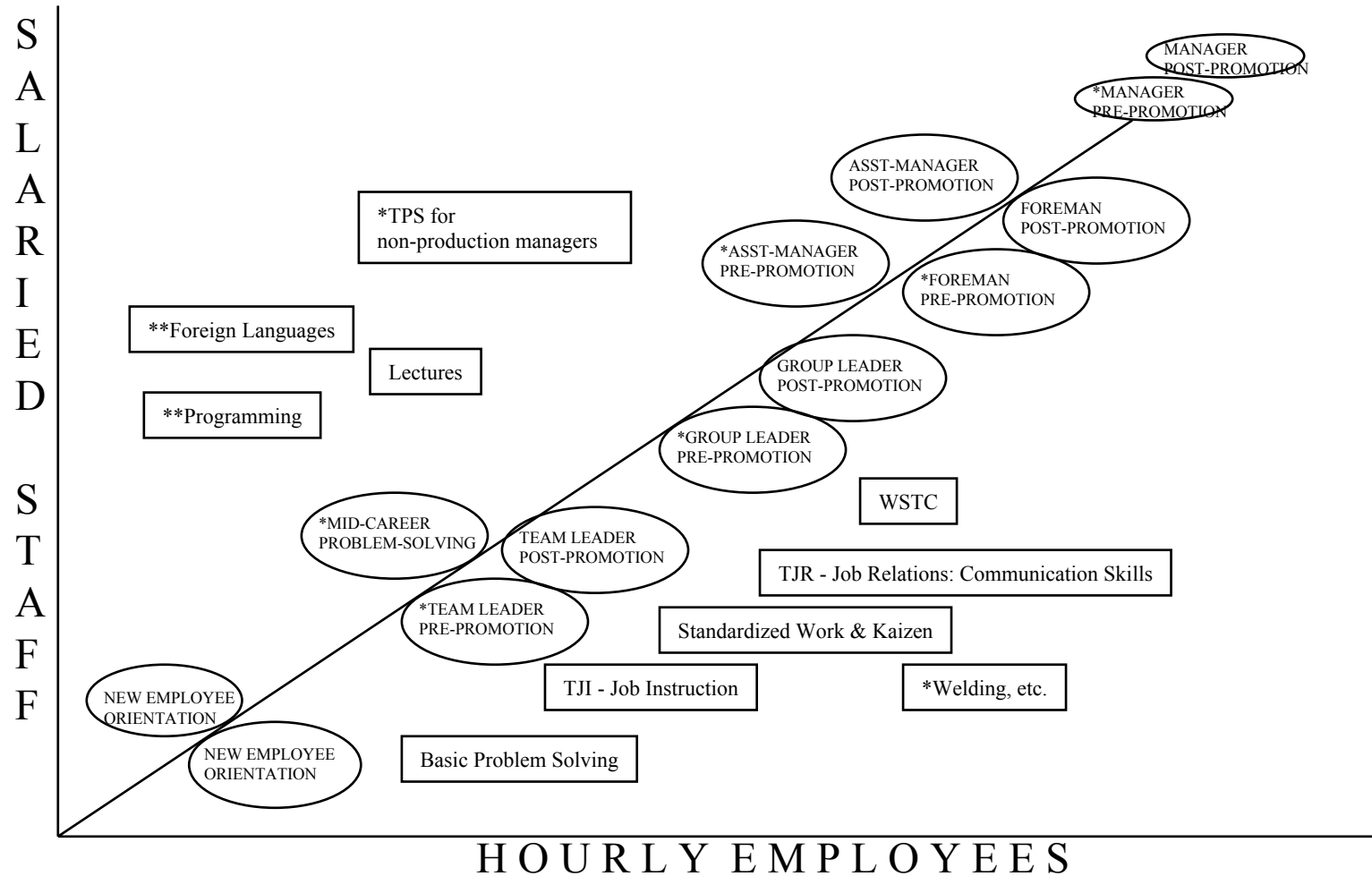


- 1. *Begin from need***
- 2. *Make people before making cars***
- 3. *Leaders job is to develop subordinates***
- 4. *OJT is primary, Off-JT secondary***
- 5. *Bring genba into the classroom, extend classroom education to the genba***
- 6. *Aim training one or two levels above the organizational training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

Toyota Education & Training Model



Toyota Training Map



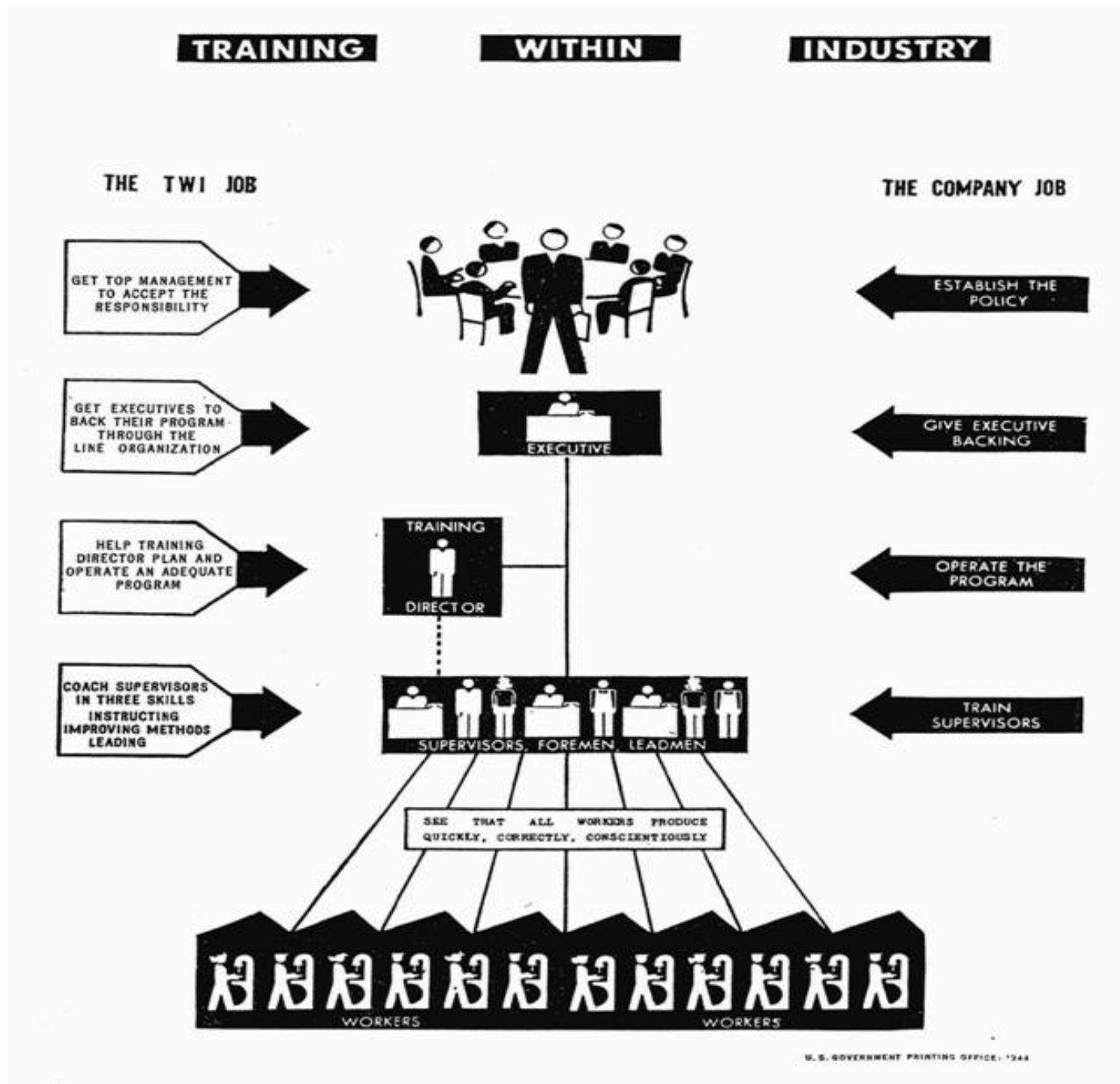
LEGEND:

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

TWI Cascade model



john shook

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

Major Steps	Keypoints	Reasons for Keypoints
Prep the patient	<ol style="list-style-type: none"> 1. Set out central line kit 2. Check lab reports 3. Lay patient on back 4. Place rolled up towel between patient's shoulderblades 	<ol style="list-style-type: none"> 1. immediate access to materials 2. prevents potential adverse affects of the procedure/check to see if procedure could be potentially harmful to the patient 3. makes access to vena cava easier 4. makes finding the clavicle easier
Apply anesthetic	<ol style="list-style-type: none"> 1. Swab chest with antiseptic 2. Inject 5cc's of lidocaine 	<ol style="list-style-type: none"> 1. prevents infection 2. keeps the patient from feeling excessive pain
Insert needle into vena cava	<ol style="list-style-type: none"> 1. Find clavicle 2. Puncture chest with right under the clavicle 3. continue to push needle into the subclavian vein with a steep angle 4. Pull back on the syringe 5. Pull syringe off, leaving the needle in place 	<ol style="list-style-type: none"> 1. makes locating the vena cava easier 2. finds subclavian vein 3. avoid puncturing the lungs 4. indicates if the needle is in the vena cava or an artery. Maroon blood indicates vena cava, red blood, artery. 5. helps to put the guidewire in place
Insert guidewire	<ol style="list-style-type: none"> 1. Insert guidewire into the needle's bore and into the vena cava 2. Do not force in 3. Do not let go 4. Do not let wire touch anything unsterile 	<ol style="list-style-type: none"> 1. serves as a placeholder for the dilator and the central line 2. prevents damaging the vena cava or the heart 3. prevents loss of the wire inside the patient 4. prevents infection
Dilate the puncture point	<ol style="list-style-type: none"> 1. Remove needle and replace it with a thick plastic 	<ol style="list-style-type: none"> 1. the plastic widens the vein opening
Put in the central line	<ol style="list-style-type: none"> 1. Remove plastic, thread the line over the wire until it is all the way into the vena cava 2. Remove wire 3. Flush the line with heparin solution with a syringe 4. Suture the central line into the chest 	<ol style="list-style-type: none"> 1. inserts the central line into the vena cava 2. wire is no longer needed 3. removes fluids out of the central line 4. keeps the line in place

