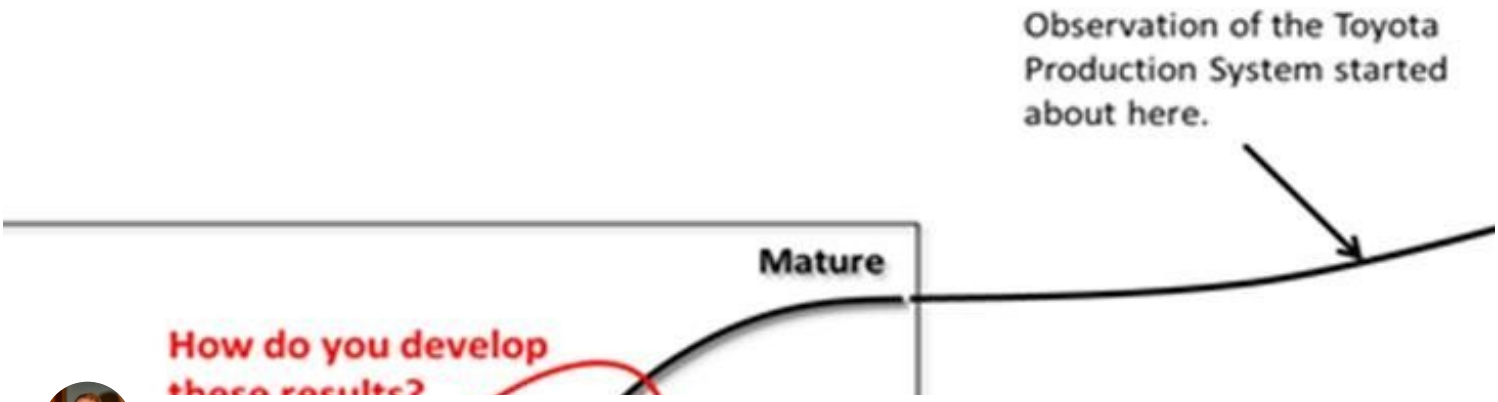


Mark Warren
Experienced Manufacturing Professional "Discovering Solutions with People"

For the Lean Experts...

June 29, 2017 • 7 Likes • 2 Comments

What if we made some mistakes in the beginning?

Yes...

There were mistakes...

But this is normal in any learning curve.

Where did we go wrong?

Our problem is that the original guesses and opinions have been repeated often enough that they are taken as fact.

Original post: 12 June 2017 (https://medium.com/@mark.tesla2/for-the-lean-experts-54bbe347900b) continuously editing for clarity in response to reader feedback.

Questions, suggestions, additions needed in the article; please send feedback to: Mark.Tesla2@gmail.com

What if you could speed up the learning curve of lean and improve the success rate measurably?

We didn't know what we didn't know

Our search for understanding *'Lean'* should be put into context in terms of the evolving American view of Japanese industry. This is not going to be in-depth, but a generalized overview. Through the 1960's, except in a couple of industries, "*Made in Japan*" was connected to cheap products that performed poorly. By the 1970's this began to change, as some of the leading Japanese brands began to displace American producers. Not only were their products less expensive, their performance and reliability began to surpass the American brands. By the 1980's, it seemed that the Japanese business model could take any segment of the market they entered.

It first, we attributed it to the special cultural environment in Japan. A handy excuse for the American CEO when they were failing to compete in their own market. Our experts (consultants and academics) started explaining the differences in our management — *Theory X vs. Theory Y*… and one even proposed a hybrid *Theory Z*. So, American companies dutifully trained their employees in leadership positions on how our *Theory X* management was bad and how we needed to change. To be honest, there was some truth in it and the workplace environment improved, but this was not the '*magic bullet*' we needed to compete with Japan.

So the experts (consultants and academics) told us that "*if only*" we improved our quality we could compete with Japan. The companies dutifully complied by starting training programs on applying SPC (Statistical Process Control) or Dorian Shainin's Pre-Control process… eventually to converting some of the British Standards (BS) into ISO, and the rush was to become ISO certified. To be honest, most companies improved their quality and reliability of the products to the consumer, but this was not the '*magic bullet*' needed to compete with Japan.

"If Only…" Thinking

So the experts (consultants and academics) told us again, that "*if only*" we used similar production systems as Japan, then we would be competitive with Japan. And the rush was on to try to understand what was so special about the Japanese production systems… not just Toyota. In 1980 Bunzaemon Inoue, (President of Sumitomo Rubber) observed in a letter to Kenneth Hopper, describing the flood of visitors as "*industrial tourists*"; that they would gain little understanding from their visits, beyond seeing some of the tools used. [1]

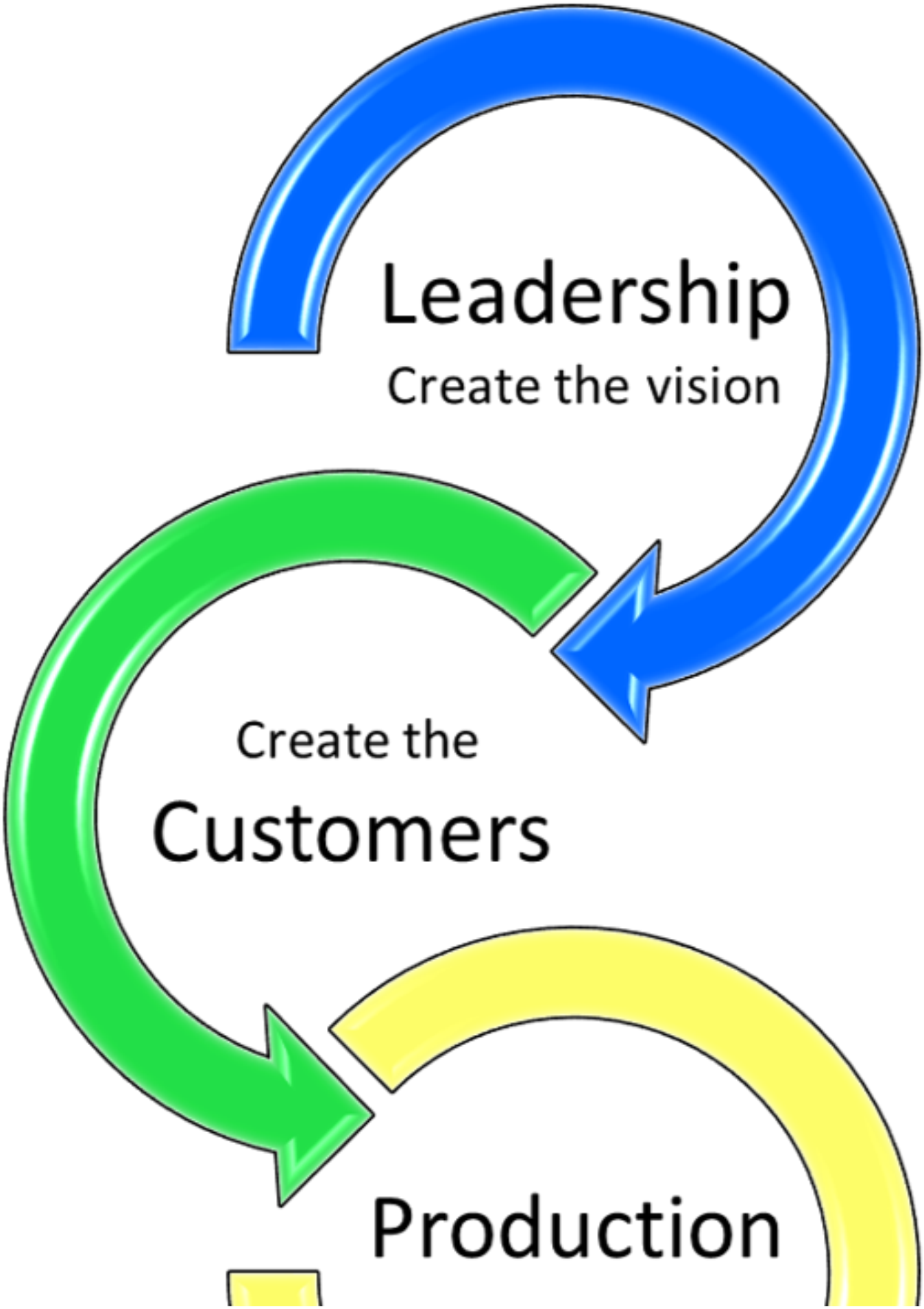
Our concentration on Toyota as the best practice for '*lean*' happened **after** the release of the book "*The Machine that Changed the World*" in 1990. I am aware of only three books available in English that specifically concentrated on Toyota before 1990: The Japan Management Association published Shigeo Shingo's *"Study of 'Toyota' Production System: From an Industrial Engineering Viewpoint"* in 1981; Yasuhiro Monden's "*Toyota Production System: Practical Approach to Production Management*" was published in 1983; and in 1988 an English translation of Taiichi Ohno's " *Toyota Production System: Beyond Large-Scale Production*" was published in the US (original release in Japan was in 1978). Norman Bodek acquired the rights to republish Shingo's *"Study of 'Toyota' Production System"* and released a revised version in 1989 that was 100 pages shorter… and much more palatable to the American public.

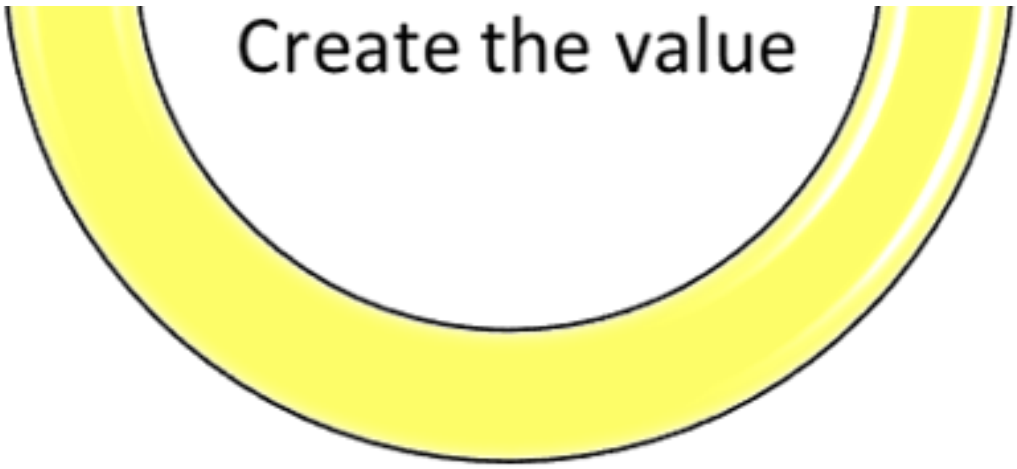
Our *"if only"* thinking led us to assuming that *"if only"* used the same tools and *'looked like'* Toyota we could have the same results. The next decade or two saw a tidal wave of Toyota and '*Lean*' centric books that concentrated on teaching people the tools that Toyota used and what the production lines looked like so we could copy them.

While the earlier published information would tend to skew our interpretation of what we think we are observing, there are missing factors that should influence our interpretation. It is now accepted that Taiichi Ohno is credited with being the '*Father of TPS*' or primary developer. He claims that the development began in earnest in 1951 and the system was stable by 1965. *We tend to overlook the 15–20 years of experimentation and learning that preceded this development period.* We overlook his references to studying Ford, as the academic community has pigeon-holed this as "*Fordism*" without realizing the vast difference between Ford's River Rouge Plant behaviors and the thinking that drove Ford's Highland Park Plant innovations. *Ohno's primary exposure was to the earlier Ford innovations.*

> *We must recognize that Taiichi Ohno did not act alone.*

Rule of Three



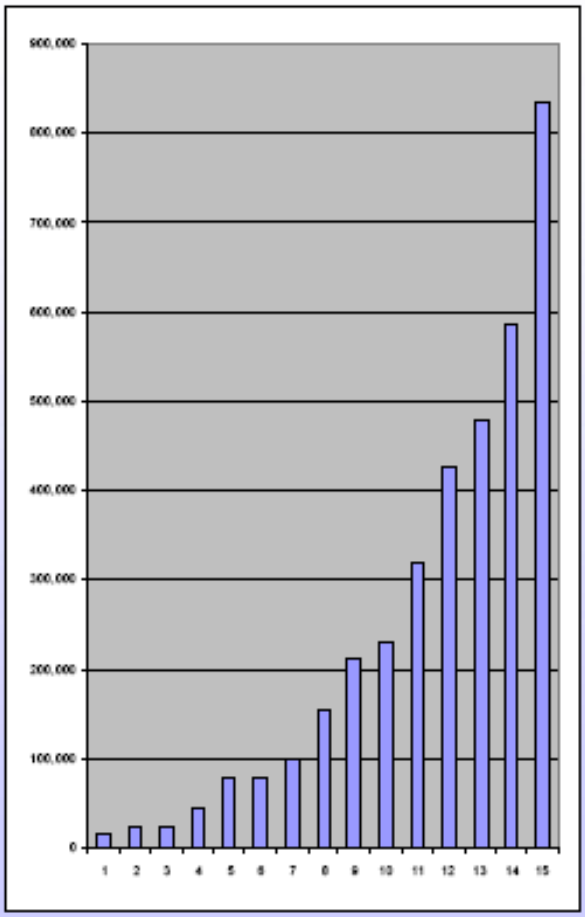


While we studied the production system closely, we mostly overlooked the other two primary contributing factors that were necessary for Ohno to develop TPS. Creating the vision that fostered a protective environment to experiment and growing customer demands that needed a better production system.

First is the leadership portion, *Creating the Vision* — Kiichiro Toyoda expressly wanted to '*catch-up*' to America's productivity levels in three years. Eiji Toyoda spent three months at the Ford River rouge Plant in 1950 and returned home realizing that Ford did not have some secret magical formula for their success. ***"Ford's not doing anything we don't already know"***.[2] This emboldened Eiji to create the environment where Ohno could thrive.

Create the Customers — Shotaro Kamiya and his team at Toyota Motor Sales should be credited with developing the customer centric model that drove growth in Toyota. They introduced the customer-centric thinking into the design side, understanding what the customer wanted and what value they put on it. So the first constraint was; how can we deliver this feature at this cost and make a profit? They were the first to create driving schools… people who know how to drive have a desire to have a car.

All Taiichi Ohno needed to do was create an efficient production system model to keep up with the demand. Ohno's team of early adopters [3] created enough success to maintain support for further development.



Over 37% annual compounded growth for the next 15 years.

(starting in 1953)

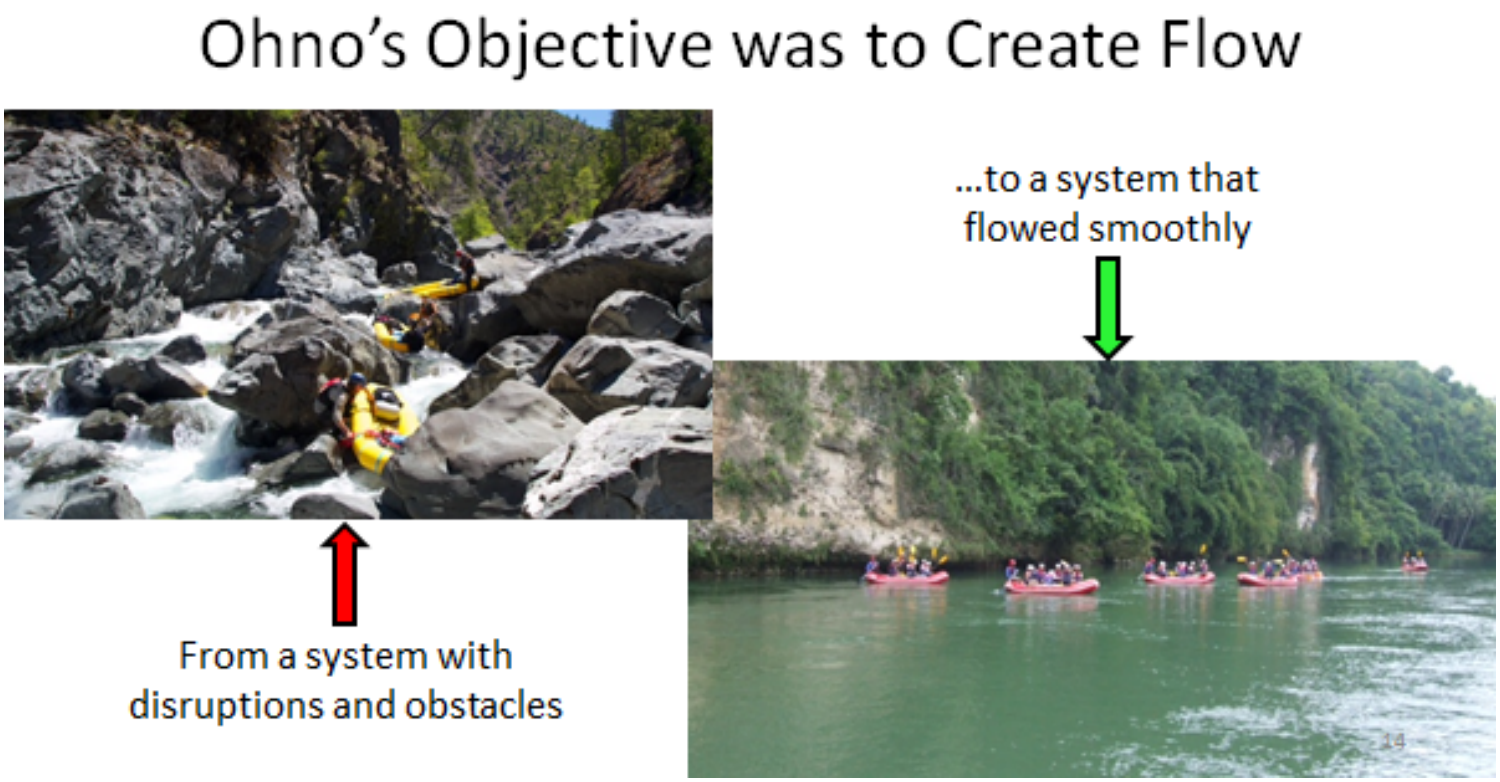
Catch up with the Americans in three years (productivity).

Attempts to create joint ventures to acquire technology failed.

Growth in demand required innovation of their production system (chart is 1953 = 16,496 to 1967 = 832,130)

Shortly after Taiichi Ohno joined Toyoda Spinning and Weaving in 1932, he was tasked with bench-marking a competitor Nichibo to understand their advantages in the market. One could consider this his first step in developing an *awareness* of flow. Now that he saw the possibilities, he reached out to learn from any source available. Over the next 15 to 20 years, he studied Ford's methods and experimented with the flow principles before adding TWI (Training Within Industry) in 1951.

> *What if the early observers knew just a little more…?*



> *"Flow where you can, Pull where you can't"... Taiichi Ohno*

Surprised? ***Pull*** is the **second choice**... the lean tools are countermeasures to implement *pull* until you can create *flow*.

Basic Principles of Flow

1. Put Processes in Sequence

2. Synchronize Processes

3. Balance Work Content

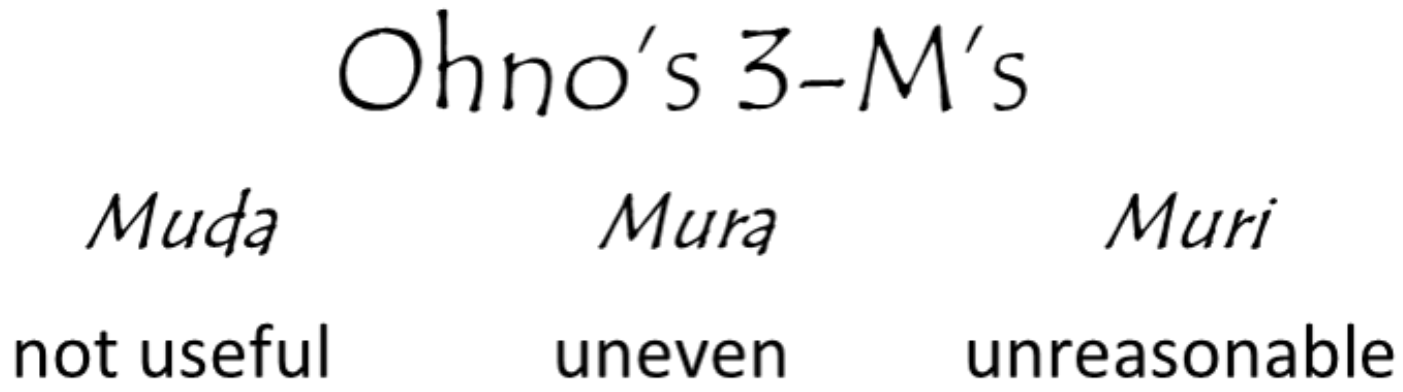
4. Balance Work Pace

What if... the early observers that wrote the first books were not academics or consults, but people with practical manufacturing experience implementing flow? People like Walter Flanders who reorganized Ford's early plants and taught a small team that went on to develop the assembly line. (The first reorganization for flow created a 10x jump in productivity. The second spurt, when they introduced the moving assembly line, saw another 10x increase in productivity.) Or Charles Sorensen, Henry Ford's "*right hand man*" that designed Willow Run... a factory that made one airplane an hour (this was done during WW2). Or Frank Woollard, who re-organized Morris Motors in England. (Wollard's flow principles were a bit more complicated than the American version, with 18 principles defined.)

What if... they understood the difficulties in explaining how to identify the hidden disruptions to flow? Creating flow in a manufacturing setting cannot be done alone. You must simplify the principles so *everyone can participate*.

7-Wastes…

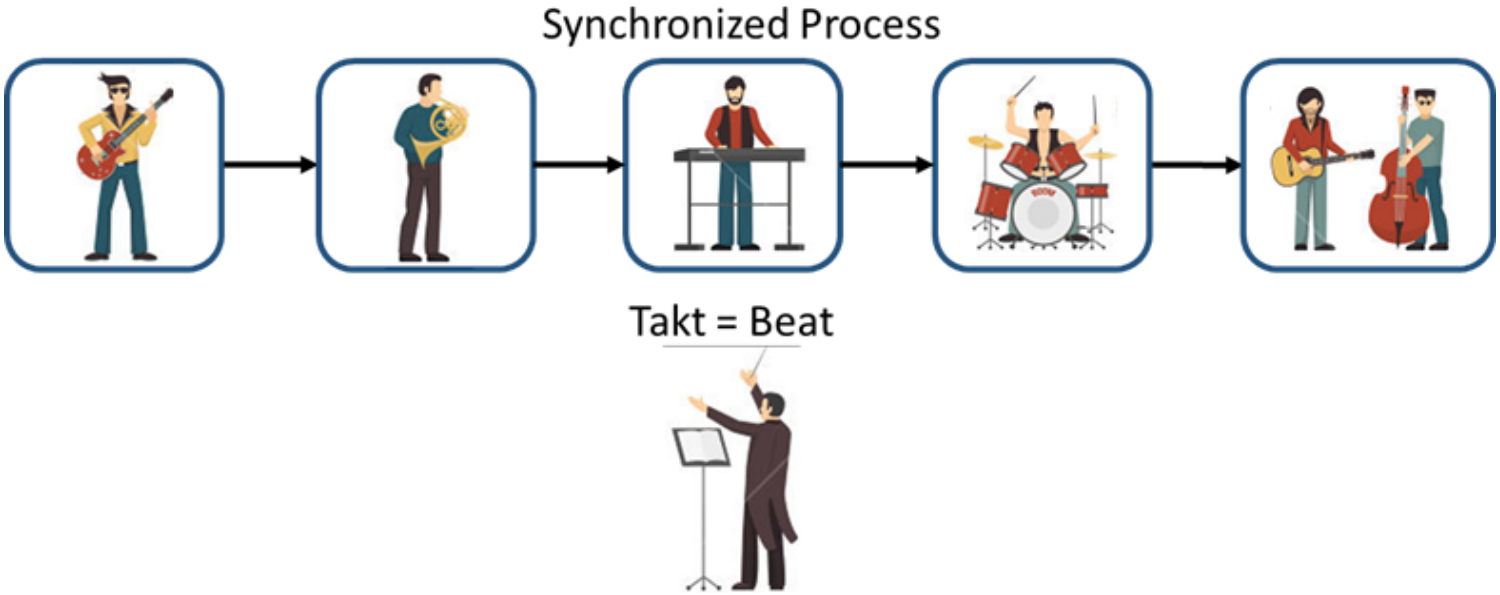
What if... they learned that Ohno's 7-wastes was a breakthrough in helping people '*learn to see*' the symptoms of disruptions to flow? (Or, that there were only four categories of waste in the 1973 TPS manual.)



Ohno's brilliance was in the simplifying the *'learning to see'* process for discovering disruptions to flow. You do want to remove '*waste*', but the objective is not waste removal directly, but creating flow. He essentially pioneered the '*stop doing*' list.

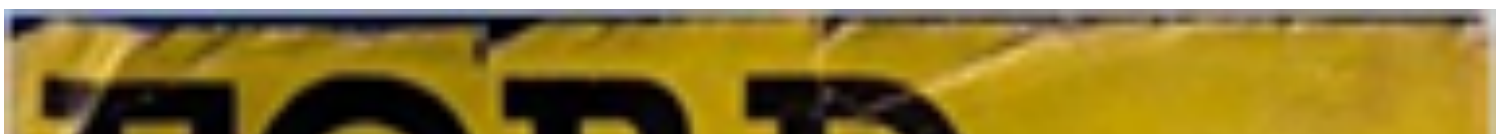
Takt Time…

What if... they were told that "*Takt*" was a German musical term for beat? That the primary reason for defining a *Takt* time was a communication tool to synchronize processes so we could achieve flow. Yes, the pace does need to be fast enough to meet customer demand.



What if... they were told that they adopted the practice from some aircraft engineers that joined the firm after the war because aircraft production was outlawed as part of the surrender? [4]

Andon Cord…



FORD

MEN AND METHODS

BY EDWIN P. NORWOOD

THIS is not the story of cylinders and fenders but of the men who work in the River Rouge plant and the methods which make this marvelous city of machinery the world's greatest industrial laboratory.

Out of a multiplicity of men, power, light and movement at the River Rouge plant and its laboratories Mr. Norwood has woven a story of absorbing interest.

What if… they were told that it was just another way to communicate quickly that the operator had discovered a problem… and they copied it from Ford?

The book was published in 1931 — has chapter detailing the "andon cord" system.

Cells…

What if… they were told that the 3–5 process steps they saw grouped together were segments of the line where they were able to create flow. The '**U**' shape was to improve performance. The processes were placed closely together to reduce the distance and the spacing eliminated the ability to accumulate stock between each step. Since the buffer stock is only at each end of the '*cell*', access to aisles is not needed for the intermediate steps. Getting the '*cell*' out of the traffic pattern also reduces the possibility of disruption to flow.

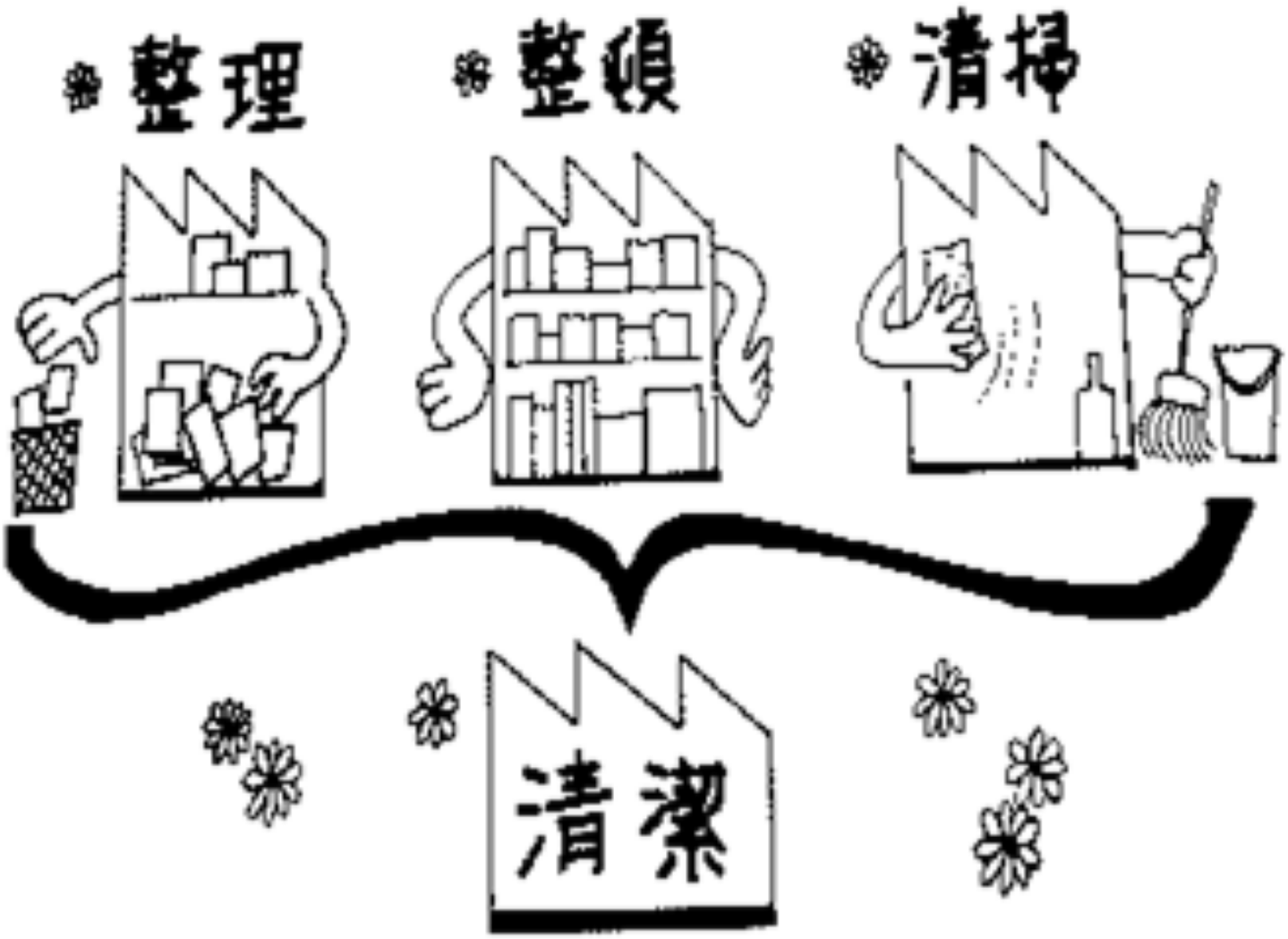
Single-Piece Flow…

What if… they were told that they were observing a '*mixed model flow*' and that the single pieces they observed were the *countermeasure* used to even out the work content to avoid creating disruptions to flow? While the ideal for a mixed model line flow would be to have balanced work content for every variation, careful mixing of the variations can yield a fairly smooth flow.

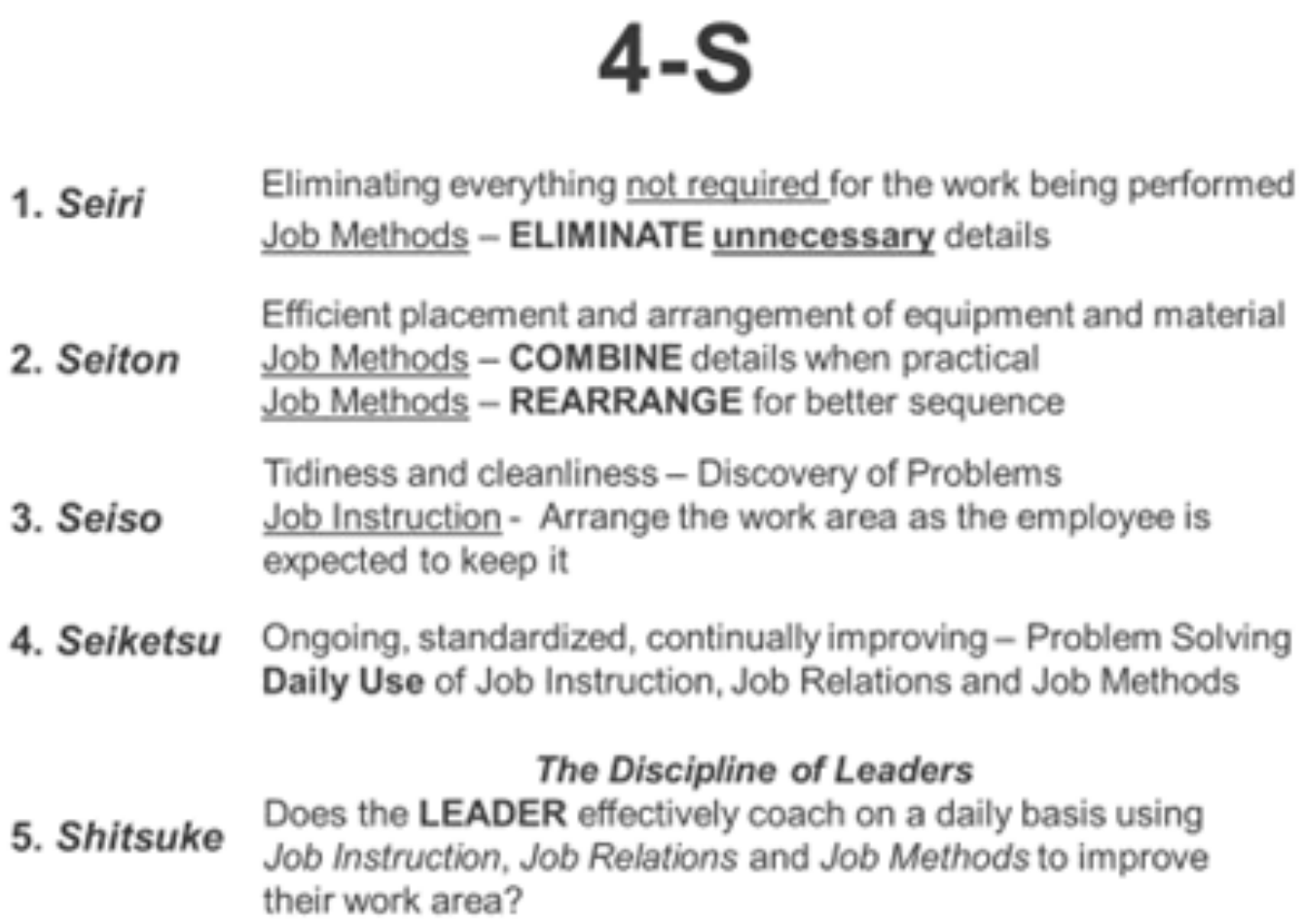
There is no 'single piece flow'… you only have, *Flow* or *Not Flow*

5-S…

What if… they had been told that Ohno was frustrated with **4-S** (not 5-S) because his supervisors had turned it into a '*lining up competition*'? Or, that the origin of 4-S was just part of a suggestion list connected with Job Methods — the process improvement skill?



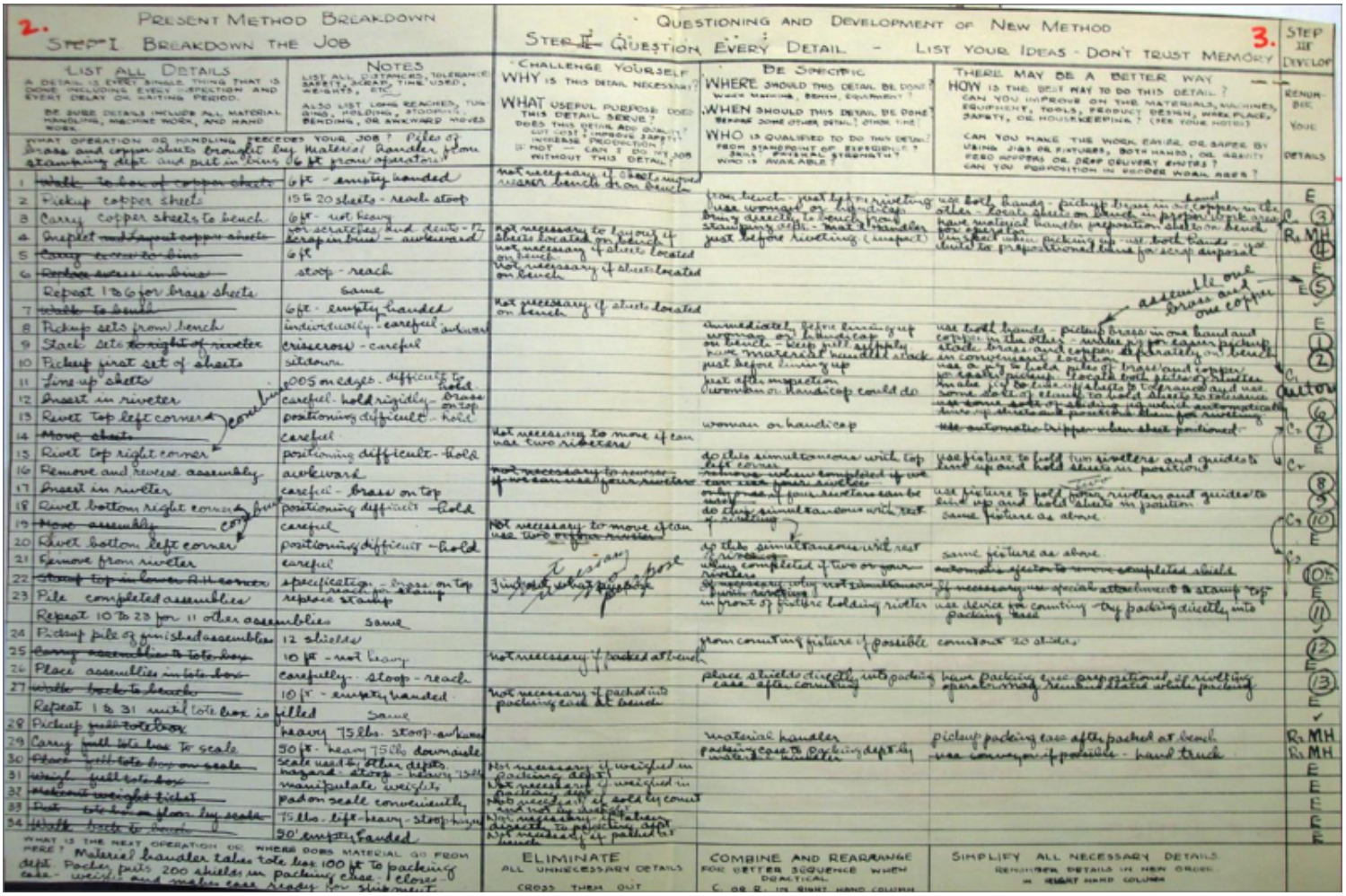
4-S illustration from 1973 TPS manual.



What if... they were told that '*real lean*' was messy… you are always experimenting and trying to improve. This means constant reorganization. The habits in 4-S helped you to see the problems that needed to be resolved.

Kaizen Event…

What if... they were told the '*kaizen event*' they thought they saw was an improvement project using the Job Methods improvement process? That it was part of the *normal day-to-day work* of a supervisor and **not** an event at all. They worked to continuously improve problem processes that were identified as disruptions to flow.



1945 Job Methods Job Breakdown Sheet

Yes, this is the original A3 form...(blank - notice the ECRS fields)

Present Method Breakdown Step 1 - Breakdown the Job			Questioning and Development of New Method Step 2 - Question every detail - List your ideas - Don't trust memory			Step 3 Develop
	List **all** details A detail is every single thing that is done including every inspection and every delay or waiting period. Be sure details include all material handling, machine work, and hand work.	Notes List all distances, tolerances, safety, scrap, time used, weights, etc. Also list long reaches, tugging, holding, stooping, bending, or awkard moves.	Challenge Yourself WHY is this detail necessary? WHAT useful purpose does this detail serve? Does this detail add quality? Cut cost? Improve safety? Increase production? If not - can I do my job without this detail?	Be Specific WHERE should this detail be done? Which machine, bench, equipment? WHEN should this detail be done? Before some other detail? Another time? WHO is qualified to do this detail? From standpoint of experience? Skill? Physical strength? Who is available?	There May Be A Better Way HOW is the best way to do this detail? Can you improve on the materials, machines, equipment, tools, product design, workplace, safety, or housekeeping? Can you make the work easier or safer by using jigs or fixtures, both hands, or gravity feed hoppers or drop delivery shutes? Can you pre-position in proper work area?	Renumber your details
	What operation or handling preceeds your job?					
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
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28						
29						
30						
	What is the next operation or where does material go from here?		**ELIMINATE** all unnecessary details cross them out	**COMBINE** and **REARRANGE** for better sequence when practical C. or R. in right hand column	**SIMPLIFY** ALL NECESSARY DETAILS Renumber details in new order in right hand column	

Setup Reduction — SMED…

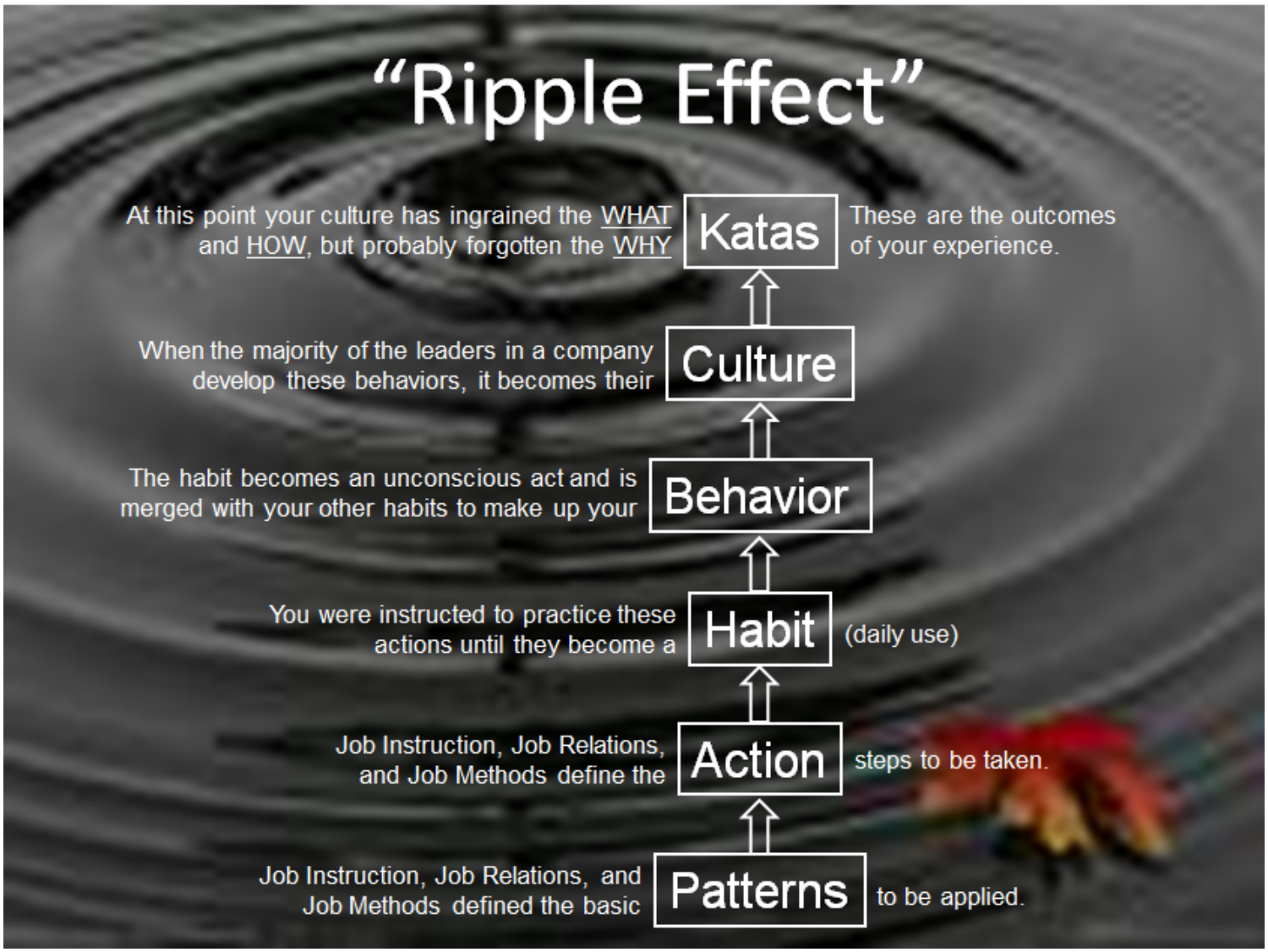
What if… they knew that about 1960, Toyota purchased several *Quick Change Die* machines from Danly Corporation (in America). Within a couple of years Toyota's *average* changeover was about 15 minutes and dropping. Single Minute Exchange of Die — meaning it took less than 10 minutes… into single digits.

Danly QDC (Quick Change Die) machine at Toyota — image courtesy of Art Smalley

What if… they were told that the focus on setup reduction times was to reduce the disruption to flow that plagues mixed model production environments? The '*get-ready*' times and '*put-away*' times for a process barriers to flow — setup reduction is a countermeasure to minimize these barriers.

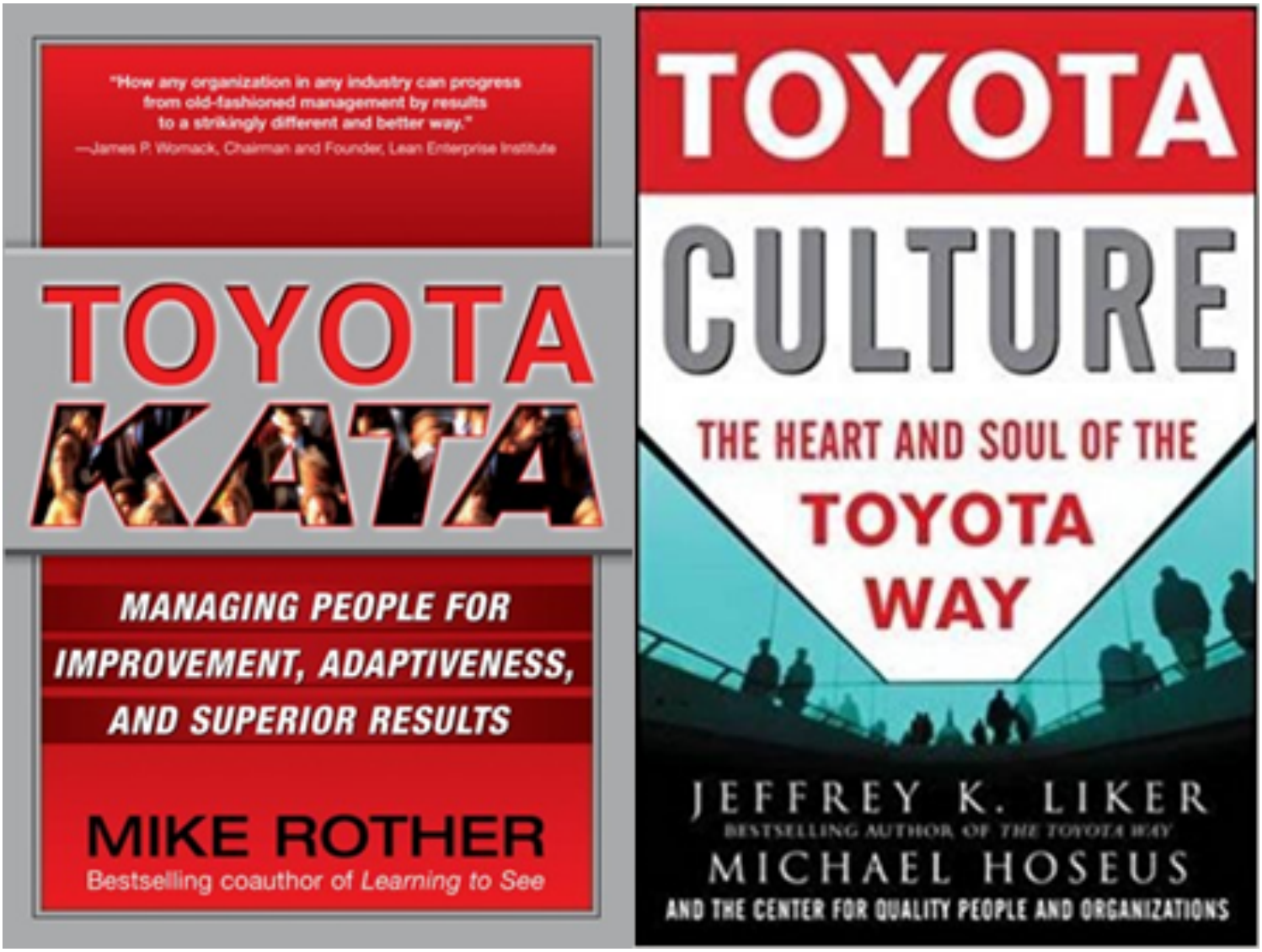
Deliberate Practice…

What if… they were aware of the effects of deliberate practice?



> *The effect of Deliberate Practice of the TWI skills creates the Lean Culture we are seeking*

What if... they were told that *deliberate practice* and daily application of the TWI skills could create a culture that we are trying to emulate? (We had more than a decade of '*lean*' Toyota books before we began to understand that Ohno used the TWI skills as a foundation for building the structure into TPS.)

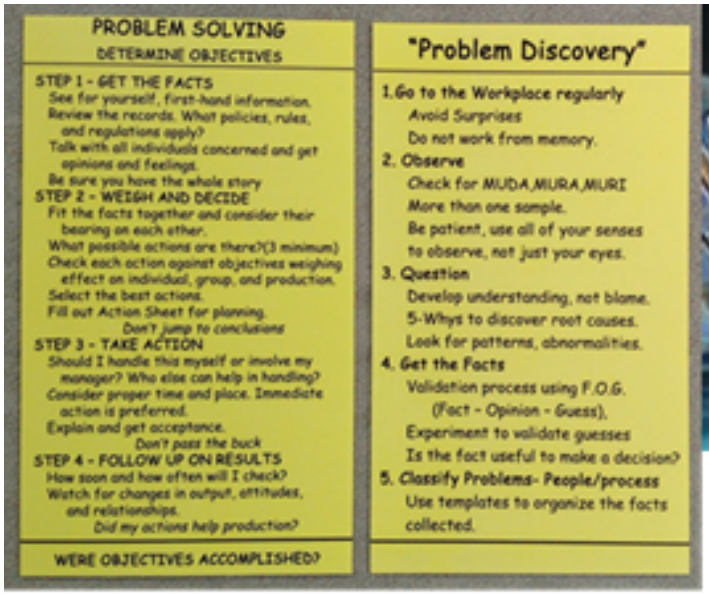


These are the outcomes of extended deliberate practice

What if... they were told that the culture was developed over time as the majority of the leaders adopted a core set of skills. These are skills they practiced as team leaders and supervisors... before becoming managers or directors.

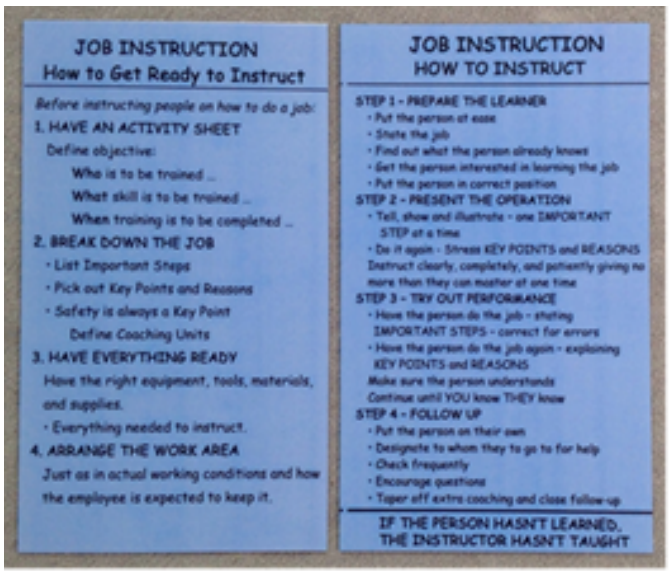
What if... people understood the mastery of the coaching kata starts with mastering the basic '*katas*' first (the TWI skills). Only after mastery are you able to improvise and coach to the current situation.

What if... there was a simple way to understand the effects of deliberate practice of the TWI skills?



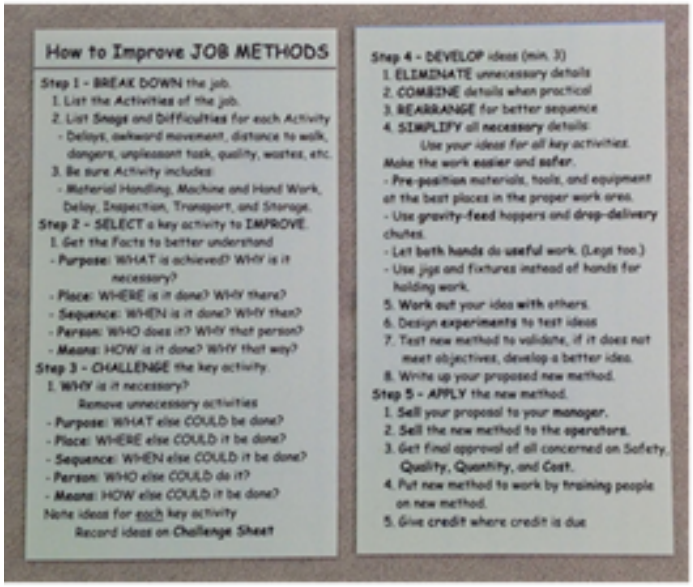
First set of practice exercises

What if... they understood the first series of practice exercises were mostly '*learning to see*' the disruptions to flow (problems) and getting facts, not guesses and opinions?



Second set of practice exercises

What if... they understood the second series of practice exercises concentrated on developing your communication skills? To clearly transfer knowledge and expectations...



Third set of practice exercises

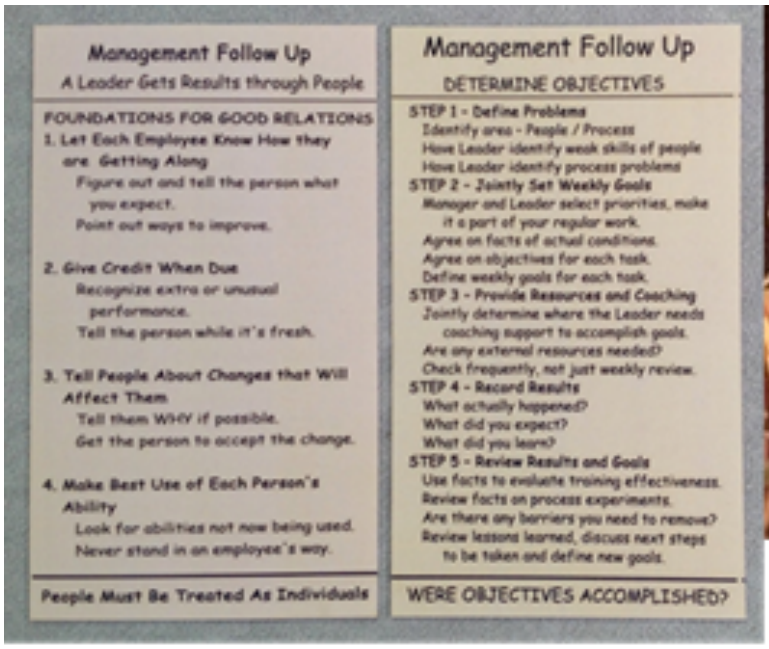
What if... they understood the third series of practice exercises concentrated on developing your improvement skills?

(*Karate Kid* movie images are owned by Columbia Pictures Industries, Inc.)

Gemba Walks…

What if... they were told that the '*gemba walk*' was a coaching exercise for the leader to observe the approach to problem solving by the people they were responsible for? The leader concentrates on *teaching* the *thinking patterns* so people can grow.

What if... they were told that this is about developing your leadership skills by showing '*respect for people*'?

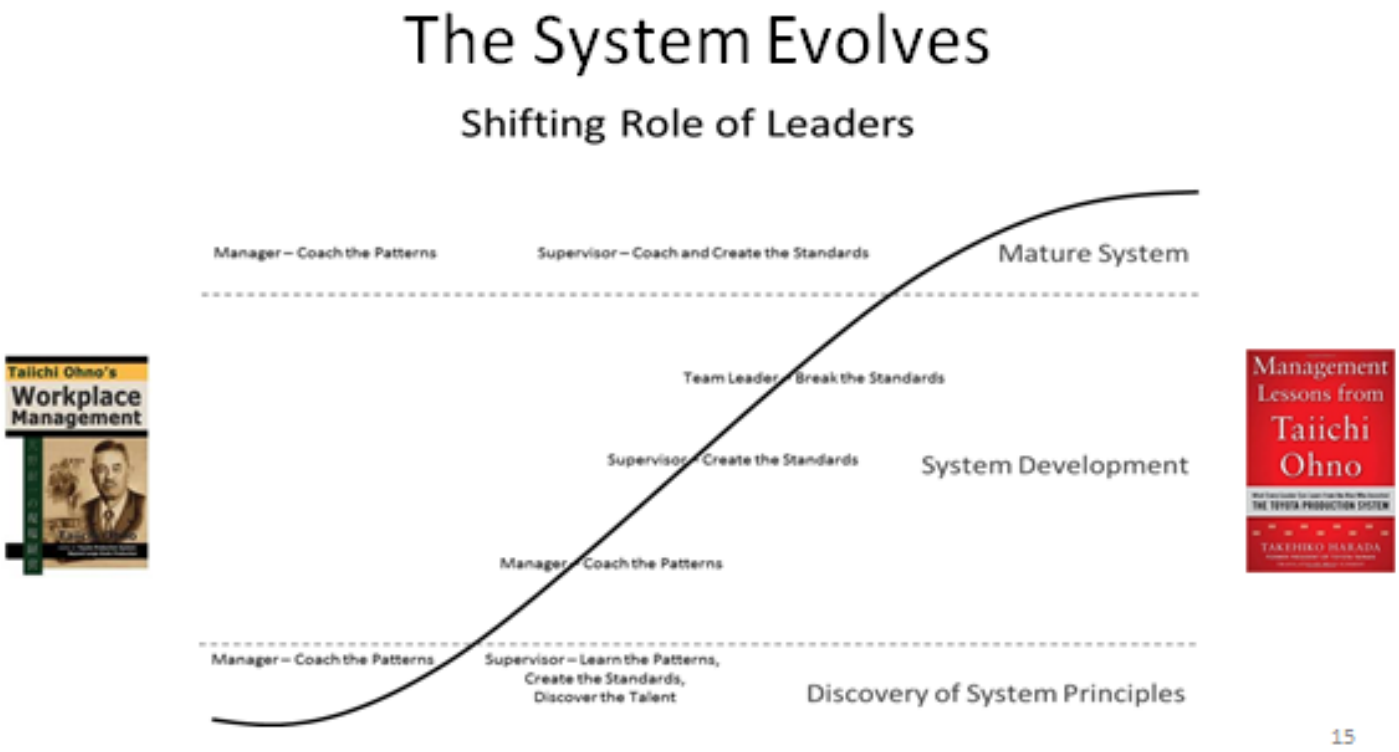


Coaching exercise

The Production System Evolved

What if... they were told that the mature system they were observing did not look the same during the development process. That first they had to create some basic structure to develop stability. When they had

process stability, then they focused on simplification.



Observation: There are a few quotes from Ohno interviews that suggest that he was concerned that people might understand the simplicity of the system… his competitive advantage. However, there is nothing to indicate that he deliberately misled people, but he was concerned that his secrets might be uncovered.

We didn't know what we didn't know… and possibly still don't.

> *"Before enlightenment chop wood and carry water. After enlightenment, chop wood and carry water." — Wu Li*

When you have mastered the secrets to creating flow… you still must practice as if you are a student.

A new starting point…

You now know that creating flow was Ohno's necessary objective to improve the production system…

What if… you had an exercise that people could practice '*learning to see*' as they walk through the process flow sequence?

The Seven Wastes

Waste Symptom	Observed
Overproduction – early or extra production of materials, and producing unordered goods.	Two weeks worth of castings have arrived from the supplier instead of two days of inventory. Casting supplier does production runs more than a month ahead of delivery dates
Waiting – idle time waiting on machine, materials or people.	The pump assembly operator spends about 2 hours a day waiting on housing from the machining department
Transportation – handling more than once, delays in moving materials, unnecessary moving or handling.	The castings are delivered to the dock, then moved to be checked by accounting, then moved to inspection before delivery to the machining department
Inventory - unnecessary raw materials in stores, work in process (WIP), and finished stocks.	Machining does not move the finished casting to assembly at regular intervals. It can be from 4 to 6 hours of production (may be causing the wait times in assembly)
Motion – extra unnecessary movement of equipment or people.	
Over-processing – unnecessary processing or procedures.	
Defects – producing and reworking, or scrap.	Machining is having about 10% scrap because they are not mounting the raw casting properly

Step 1. Discover Waste Symptom

Step 2. Understand Why it is there (5 Whys + FOG)

Step 3. Improve Flow (solve and implement countermeasures)

What if… your first questions about the problems observed were; "*Have we clearly defined our expectations for the task*", and "*Do we have a process?*" (Clear training instructions that the staff know and follow.) If the answer is no, then start by developing a Job Breakdown (JBS) that is your current '*one best way*'. The best practice is to have 2–3 of the best operators to define the job, then practice training each other until the delivery is consistent and no key points have been missed.

Name of Job:	
Materials Required:	
Tools, Supplies, Info:	
Common Key Point:	

WHAT	***Important Steps:*** Logical sequence of steps which advance the work	HOW	***Key Points:*** Make or break the job, make the job easier, can injure the worker	WHY	***Reasons:*** Explains the key points

Materials Required:	
Tools, Supplies, Info:	
Common Key Point:	Porosity defects 30%

WHAT	***Important Steps:*** Logical sequence of steps which advance the work	HOW	***Key Points:*** Make or break the job, make the job easier, can injure the worker	WHY	***Reasons:*** Explains the key points
Check Sand Core		Uniform coating		Affects finish of casting	
		Parting line cleaning – smooth		Affects finish of casting	
		Damage profile check		The blemishes may cause part to be rejected or require rework	
		Hollow of core		Break during casting	
Preheat Sand Core		To a minimum of 110° C.		Drive off any remaining moisture	
		15-20 minutes		Ensure no moisture in core – moisture contributes to porosity	
Placing Sand Core		Core print are seating position (pins in location)		To ensure that the core is properly located	
		Blowing air		To remove loose sand from mold area	
		Check core for cracks		Core can break while placing in die. Crack will leave a parting line and casting will be rejected.	

What if... you grew the employees skills as a first step, before you started changing the process or equipment? (Getting to the '*one best way*' with your local experts creates the first level of improvements.)

What if... instead if a '*kaizen event*', you continued to hone the skills that you were practicing with '*learning to see*' the seven wastes and other disruptions to flow. Use this as a starting point to recognize barriers to flow that needed to be resolved? When you walk the process flow of a department or a product through multiple departments, use the form below for making notes to yourself. **Step 1** is listing the activities. **Step 2** is listing all the snags and barriers (*7-wastes, muda, muri, mura*) for each activity. **Step 3** is to select the key activity that most needs improvement, the one that would have the biggest impact of

the outcomes (*cost, quality, productivity, safety, morale*).

Job Methods Activity Sheet

Job:

Activities	Snags and Difficulties

www.Tesla2.com "Learning by Doing" Workbook

Checklist

An **ACTIVITY** is:

Every single thing that is done:

- Operation
- Inspection
- Transport
- Storage
- Delay

It helps to find activities if you think in terms of:

Getting or Placing temporarily	**GET READY** activities
Working on or Checking	**KEY** activities
Placing temporarily Placing finally	**PUT AWAY** activities

Snags and Difficulties

- Key Points - *'positives'* you must remember
- Snags and Difficulties - *'negatives'* you work to remove.

Examples are:

- Effects of delays
- Awkward movements
- Distances to walk
- Reaching (over shoulder level, lifting below knees)
- Dangers
- Unpleasant tasks
- Quality affected (one only some people can master)
- Waste, etc.

"KEY activity"

- One that produces a significant change in the material being worked on
- KEY activities are to be tackled first
- Weak activity in system
- Bottleneck activity, limits capacity of system

www.Tesla2.com "Learning by Doing" Workbook

Step 4 — Challenge the key activity that you have selected using the questions in the form below to uncover possible improvements.

Job Methods Challenge Sheet

Key Activity: Date:

	UNDERSTAND - DEFINE	QUESTION	Ideas for a BETTER way:
Purpose:	**WHAT** is achieved?	**WHY** is it necessary?	**WHAT** also COULD be done?
Place:	**WHERE** is it done?	**WHY** there?	**WHERE** else COULD it be done?
Sequence:	**WHEN** is it done?	**WHY** then?	**WHEN** else COULD it be done?
Person:	**WHO** should do it?	**WHY** that person?	**WHO** else COULD do it?

Means:	HOW is it done?	WHY that way?	HOW else COULD it be done?

Hints for improving methods:

Don't reinvent the wheel

Is/Is Not
- Is there an internal solution for this problem?
- Is there a similar internal process that does not have this snag?
- Is there an existing external solution for this problem?

Safety
- Is this method the safest as well as the easiest?
- Does it conform to safety rules?
- Has proper safety equipment been provided to the operator?
- Does the operator understand all safety rules and precautions?

Materials
- Can better, less expensive, or less scarce materials be used? *
- Can scrap or waste be reduced, or used for another job? *
- Have defects and scrap been reduced to a minimum?
- Are the material specifications entirely clear and definite?

Machines
- Is bottleneck machine operating at maximum capacity?
- Is machine in good operating condition?
- Are they serviced regularly?
- Is this the best machine for the operation?
- Is the set up time optimized?

Layout
- Is there a minimum of back tracking?
- Are the number of handlings and distances traveled at a minimum?
- Are aisles wide enough and placed to optimize flow?
- Is space being used to advantage?
- Is everything in the convenient work area?

Workplace
- Is everything in the proper work area?
- Can gravity feed hoppers or drop delivery chutes be used?
- Are both hands doing useful work?
- Has all hand holding of material been eliminated? (clamps or fixtures)

Housekeeping
- Are working and storage areas are clean and orderly?
- Is junk taking up space that could be used for productive work?
- Do away with anything that is unnecessary.
- Are necessary things in proper place?
- See that good housekeeping reduces delays, waste and accidents.

Flow

Can you put processes in better sequence?
Can you synchronize processes better?
Can you balance work content better?
Can you balance the demand pace better?

Product Design
- Would slight change of design or specification of product or equipment improve quality, save materials or time?
- Is the quality standard correct for this job? (correct tolerances and finish)

Equipment and Tools
- Are suitable equipment and tools available?
- Have they been supplied to the operators?
- How about gauges, jigs and fixtures?
- Can holding devices be used?
- Can gravity aids help?
- Have equipment, tools and fixtures been properly positioned to permit effective work?
- Is other equipment available within the organization?

Paper Work
- Could duplications of work be reduced?
- Can sorting, summarizing, recording, copying, checking, be reduced or simplified?
- Can the design of the form be improved?
- Standardization to reduce work?

* *Material utilization* – for example, with sheet stock, using trimming pieces for another part.

Step 5 is evaluating the possible solutions or ideas that you have generated. To make sure the ideas work as planned, or you learn something new that triggers an even better idea, following a structured process to validate the idea is suggested.

Experiment Record

Investigator:	Process:
Team:	Date:
Problem (symptoms):	
(Idea) If we do...	

Then we expect...	
Experimental Design: (Site, duration, variables, procedure, resources needed) What: When: How many trials: Resources used:	
Results (success or failure)	Impact on process: Impact on system: (downstream processes and/or customer)
Approved by:	Reviewed by:

What if... you had a checklist you could follow as you practiced your '*gemba walks*'?

Coaching Action Sheet

Yellow Card – Problem Discovery Process
Describe 5 problems that need to be addressed.

1.			
□ Observe □ Blue Card	□ Question	□ Validate □ Green Card	□ Classify next step
2.			
□ Observe □ Blue Card	□ Question	□ Validate □ Green Card	□ Classify next step
3.			
□ Observe □ Blue Card	□ Question	□ Validate □ Green Card	□ Classify next step
4.			
□ Observe □ Blue Card	□ Question	□ Validate □ Green Card	□ Classify next step
5.			
□ Observe □ Blue Card	□ Question	□ Validate □ Green Card	□ Classify next step

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Blue Card – Job Breakdown

1.

2.

Blue Card – Training

What – Coaching Unit	**Who** – to be trained
1.	
2.	
3.	

Green Card – Challenge and Idea Development

1.

2.

Green Card – Experiments

1.

Did you accomplish your objectives?

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Above is a sample form that was designed to be updated weekly. The front of the form is to list the problems you are gathering data (facts) on and the back is divided into two parts — creating or updating a Job Breakdown for a process and the training that needs to be done; then the processes you are challenging to improve as well as defining the experiments you are doing to validate the improvement.

PROBLEM SOLVING PROCESS

SELECT OBJECTIVE TO ACCOMPLISH

PLAN

Identify the problems associated with the objectives
Use problem discovery steps.
Discuss the problem with all concerned
Decide Approach to each problem
Use Guidelines:
Barriers: Yellow card.
Skill Deficit: Blue card.
Process Snag: Green card.
Set follow on assignments.
Fix completion and review dates. Be firm on deadlines.

DO

Deal with one problem at a time
Start immediate action
Coach; offer suggestions if needed
Provide resources, assistance and permission where and when needed

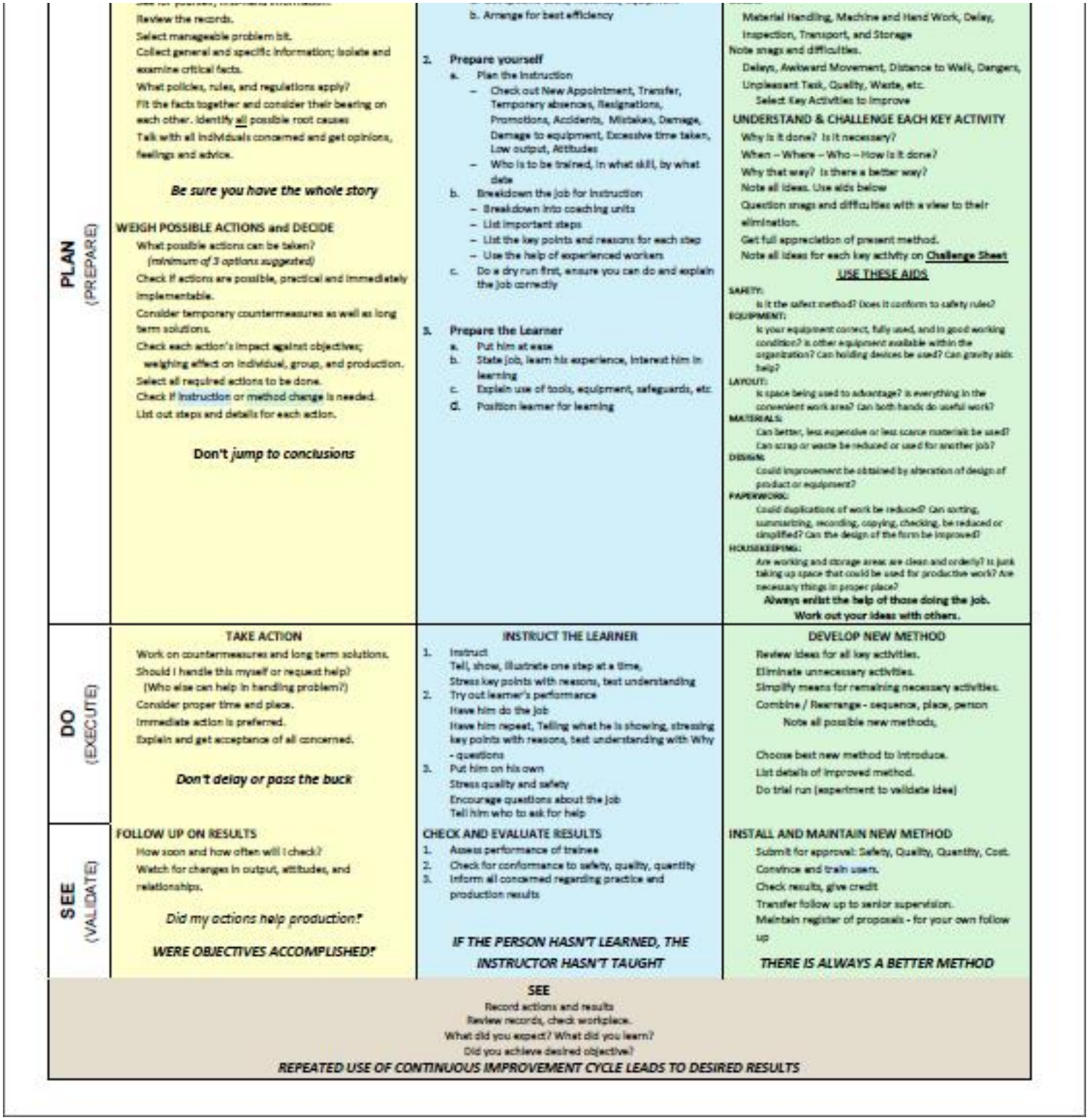
Problem Discovery – Select a Problem

1. GO TO THE WORKPLACE REGULARLY
Avoid Surprises
Do not work from memory.
2. OBSERVE
Be patient, use all of your senses to observe, not just your eyes. (More than one sample.)
Check for
Scrap, breakages, damages, stock write offs, stock holdings, rejects, rework, production targets, holdups, bottlenecks, morale, lack of communication, customer complaints, product returns.
3. QUESTION
Talk to people concerned, get opinions, develop understanding, never blame.
Discover possible impacts – Safety, Quality, Quantity, Cost

4. RECORD THE FACTS
Validation process using F.O.G.
Experiment to validate guesses.
Capture all details revealed.
Is the fact relevant to the problem?
5. CLASSIFY AND STATE PROBLEMS
People – skills, attitude
Method – process, machine, materials, layout flow, suppliers.
List out all the problems you see with evidence.
Arrange in easily understandable way.
Avoid too much of information.
NO PROBLEM, IS A PROBLEM

SELECT APPROACH

Barriers, Relations issues, Ad Hoc issues, uncertain cause	**Skill deficit, Non-standard work methods**	**Process snags, unstable process**
DETERMINE OBJECTIVES	**GET READY TO INSTRUCT**	**ANALYZE AND RECORD**
GET AND ANALYZE THE FACTS	1. Prepare the Workplace	Select appropriate unit, Watch the job being done, list all details
See for yourself, first-hand information	a. Get specific tools, materials, equipment	



Did I miss anything? Contact info: Mark.Tesla2@gmail.com

[1] Claremont Graduate University : Drucker School of Management has the archive collection of Kenneth Hopper's research and letters.

[2] *"Toyota: Fifty Years in Motion"*, pg. 155, by Eiji Toyoda.

[3] *Yukio Arima, Itsuo Mamiya, Kikuo Suzumura, Takeo Watanabe, Masanobu Morita* (list provided by Art Smalley)

[4] Aircraft manufacture especially needed to use flow because of space constraints. In 1937 the Toyota research department was studying aircraft design; by 1942 their aircraft department was copying a

Beechcraft. This department was later separated into a subsidiary, Tokai Aircraft, with Kawasaki Aircraft contributing most of the engineers and designs. Between 1923 and 1933, Kawasaki Aircraft Engineering Company's head designer was a German, Dr. Richard Vogt, who returned to Germany in 1933. (*Toyota: Fifty Years in Motion*, Eiji Toyoda, pg 66) To complicate matters, in 1944 Mitsubishi (Zero) moved in with Toyota because their facility had been destroyed. (*Toyota: Fifty Years in Motion*, Eiji Toyoda, pg 67) Mitsubishi learned lessons from Germany, first by working with the aircraft designer Alexander Baumann; then through collaboration with the German firm of Junkers. Tokai Aircraft was later renamed Aisin Seiki and changed from making aircraft engines to automobile transmissions, brakes and other components after the war. Because of Toyota's connection with the aircraft industry and the prohibition on war material related industries in Japan after the US occupation, Toyota had a unique advantage. They could hire many highly qualified engineers, which resulted in a generally unrecognized massive technology transfer. Tatsuo Hasegawa, who was the first generation Corolla project manager, was once the chief designer of Tachikawa Aircraft. Technologies attributed to the aircraft industry by Hasegawa and adopted by Toyota include aerodynamics, *monocoque* structure (which developed into what we know as the unibody), weight reduction technology, standards for structural strength, chief designer systems, and product planning methods. (*The Evolution of a Manufacturing System at Toyota*, Takahiro Fujimoto, pg. 74)

Written by

Mark Warren
Experienced Manufacturing Professional "Discovering Solutions with People"

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2 comments

NeelakanteswaraSwamy Bhavikatti
Actively seeking Sr/Mid level assignment in…

··· 1w

Each areas of improvement methodology has been thoroughly studied,corroborated which took place in different time limes.Appreciate the great research work compilation .

Like **Reply** | **1 Like**

Tony Polidori
Senior Director of TPS OMCD

··· 4mo

Really well written, Mark. Congratulations on your aggressive learning approach.

Like **Reply** | **1 Like**