The TWI Programs: Should you be a purist and insist on using the 1944–45 manuals?

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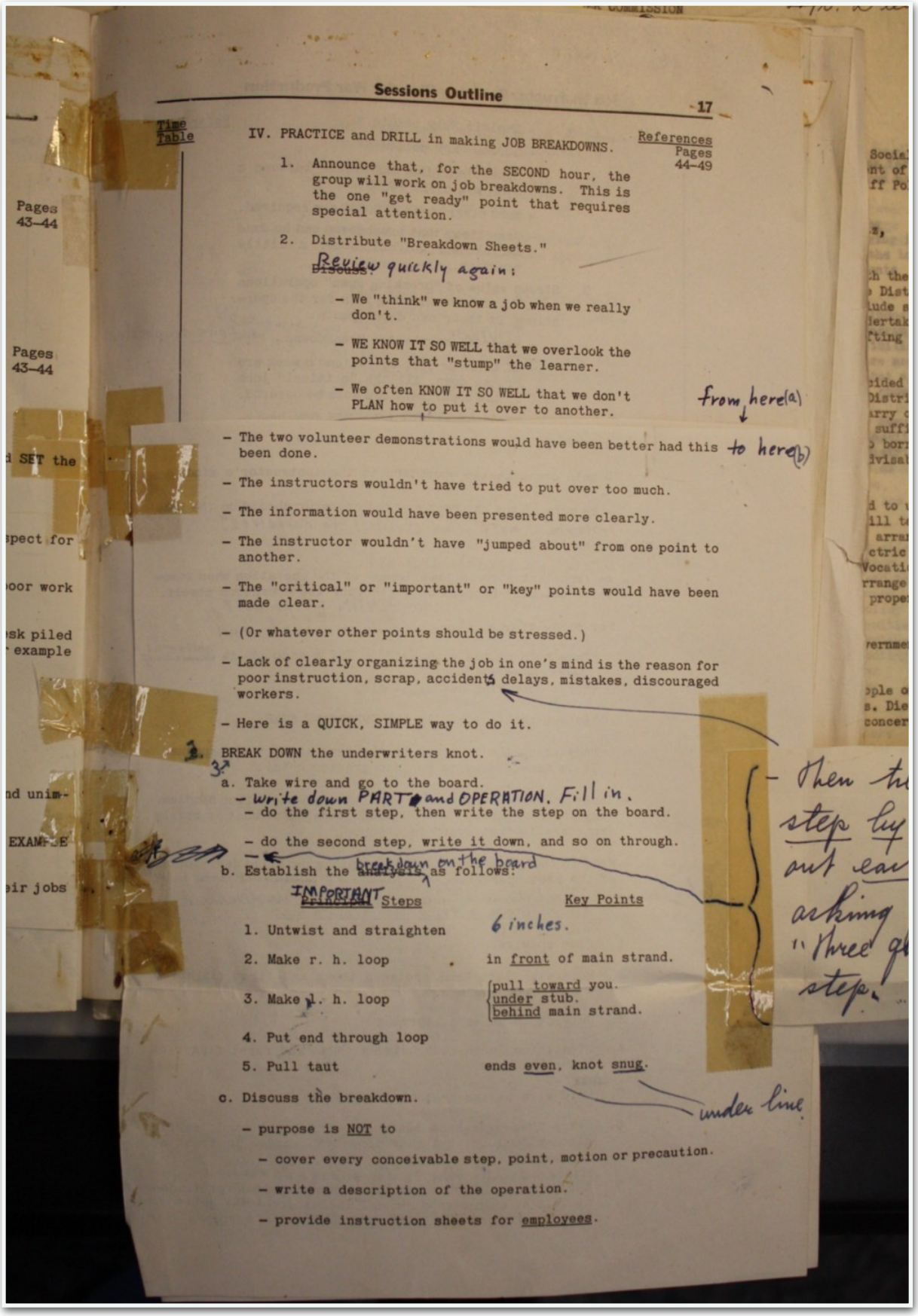
While all of the programs went through heavy editing during development, they typically had about ten revisions after their national release. This was all done within about 18 months, then the revisions stopped. The editing and revisions were not stopped because the TWI staff thought they had reached *perfection*, but by orders above the TWI headquarters… the programs were '*good enough*'. They must now concentrate on solving the problems of production, not improving the TWI programs.

In the last 18–24 months of the government funding of the TWI programs, the leading trainers were forced to do what we would now call '*point kaizen*' and not allowed to do what they recognized as full TWI implementations in a facility. They were given a list of



Sessions Outline 17

Time Table

IV. PRACTICE and DRILL in making JOB BREAKDOWNS. References Pages 44–49

1. Announce that, for the SECOND hour, the group will work on job breakdowns. This is the one "get ready" point that requires special attention.

2. Distribute "Breakdown Sheets."

Review quickly again:

- We "think" we know a job when we really don't.
- WE KNOW IT SO WELL that we overlook the points that "stump" the learner.
- We often KNOW IT SO WELL that we don't PLAN how to put it over to another.

from here(a)

- The two volunteer demonstrations would have been better had this been done. to here(b)
- The instructors wouldn't have tried to put over too much.
- The information would have been presented more clearly.
- The instructor wouldn't have "jumped about" from one point to another.
- The "critical" or "important" or "key" points would have been made clear.
- (Or whatever other points should be stressed.)
- Lack of clearly organizing the job in one's mind is the reason for poor instruction, scrap, accidents, delays, mistakes, discouraged workers.
- Here is a QUICK, SIMPLE way to do it.

1. BREAK DOWN the underwriters knot.

a. Take wire and go to the board.
- write down PART and OPERATION. Fill in.
- do the first step, then write the step on the board.
- do the second step, write it down, and so on through.

breakdown on the board

b. Establish the analysis as follows:

IMPORTANT Principal Steps	Key Points
1. Untwist and straighten	6 inches.
2. Make r. h. loop	in front of main strand.
3. Make l. h. loop	pull toward you. under stub. behind main strand.
4. Put end through loop	
5. Pull taut	ends even, knot snug.

c. Discuss the breakdown.

- purpose is NOT to
  - cover every conceivable step, point, motion or precaution.
  - write a description of the operation.
  - provide instruction sheets for employees.

underline

- Then the step by step out loud asking "Have I three steps?

Original example where they were revising the Job Instruction Sessions Outline manual (1942) - Manual part of US Archive collections.

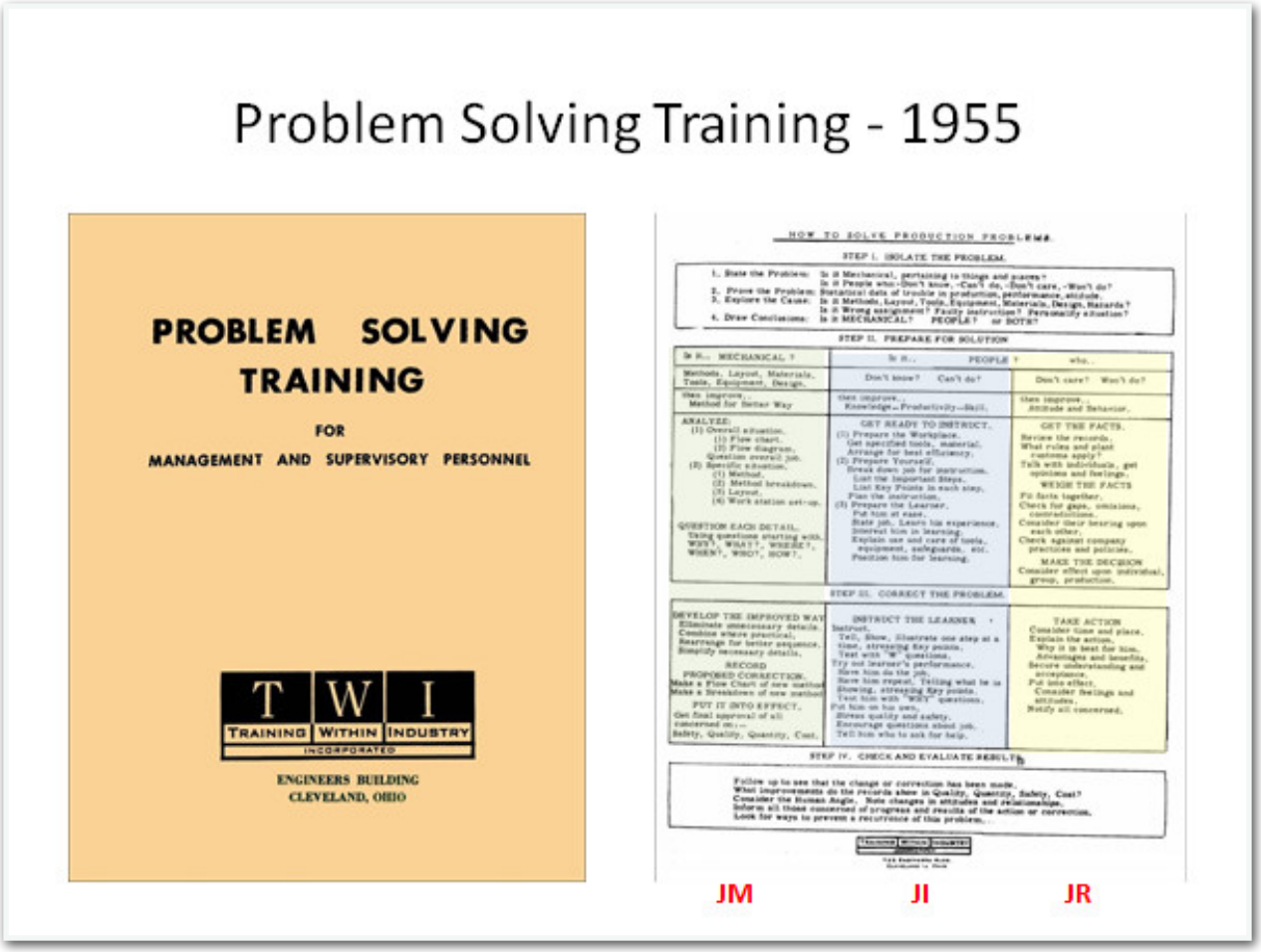
items that still had shortages. Their orders were to review the production process, zero in on the problem area and fix only that specific area, then move on to the next problem on the list. (There are letters in the US Archive collections where the trainers are moaning about this approach and promising themselves that *'after the war'* they will go back and do a proper job of '*installing*' the TWI programs.)

In January 1946, the original headquarters staff from Washington DC set up the TWI Foundation to continue their research and development of the TWI programs. Immediately they released revisions to the manuals that they were not allowed to do the previous 18 months. The biggest changes were to Job Instruction — moving the time table to session 1 , the *learning to see* exercise, and Job Methods — changing the training example to include modifying the layout.

In order to continue the development of the TWI programs the TWI Foundation leaders needed to pass the development forward to others. Their reason was primarily one of age… When they first started the TWI Service in 1940 — Channing Rice Dooley was 65 and Walter Dietz was 63… this would make them 70 and 68 when they started the TWI Foundation! Dooley died a few years later and Dietz continued running the organization into the 1950's.

In the US Archive collections, there are letters to indicate that Dooley and Dietz maintained relationships with a number of people that continued to explore the development of the TWI programs. These would be people like Herbert Doner (teaching JI at the University of Chicago's School of Business), Lowell Mellen (operating the TWI, Inc. consulting company), and Elizabeth (Betty) Huntington of New Zealand's TWI Service.

Herbert Doner is relatively unknown — his contribution was adding the third column in the job breakdown sheet in 1967. Originally the Job Instruction job breakdown only had two — Important Steps and Key Points. The supervisor that was doing the training was 'supposed to know' the reason for each key point. Even though JI clearly states to 'not leave anything to memory' and 'not rely on memory' in the training materials. The Job Methods job breakdown sheet had three columns, so to avoid confusion, JI kept the original 2-column layout for 25 years.



(The highlighting was added to emphasize the three programs.)

Lowell Mellen is probably the best known because his team taught TWI in Japan. It's actually one of his team members (Dale Cannon) that developed the combining of all three of the J programs into a unified problem solving program in 1955. This unified approach is quite similar to how Taiichi Ohno applied the TWI programs within Toyota. *Problems rarely confine themselves to a single TWI skill area.*

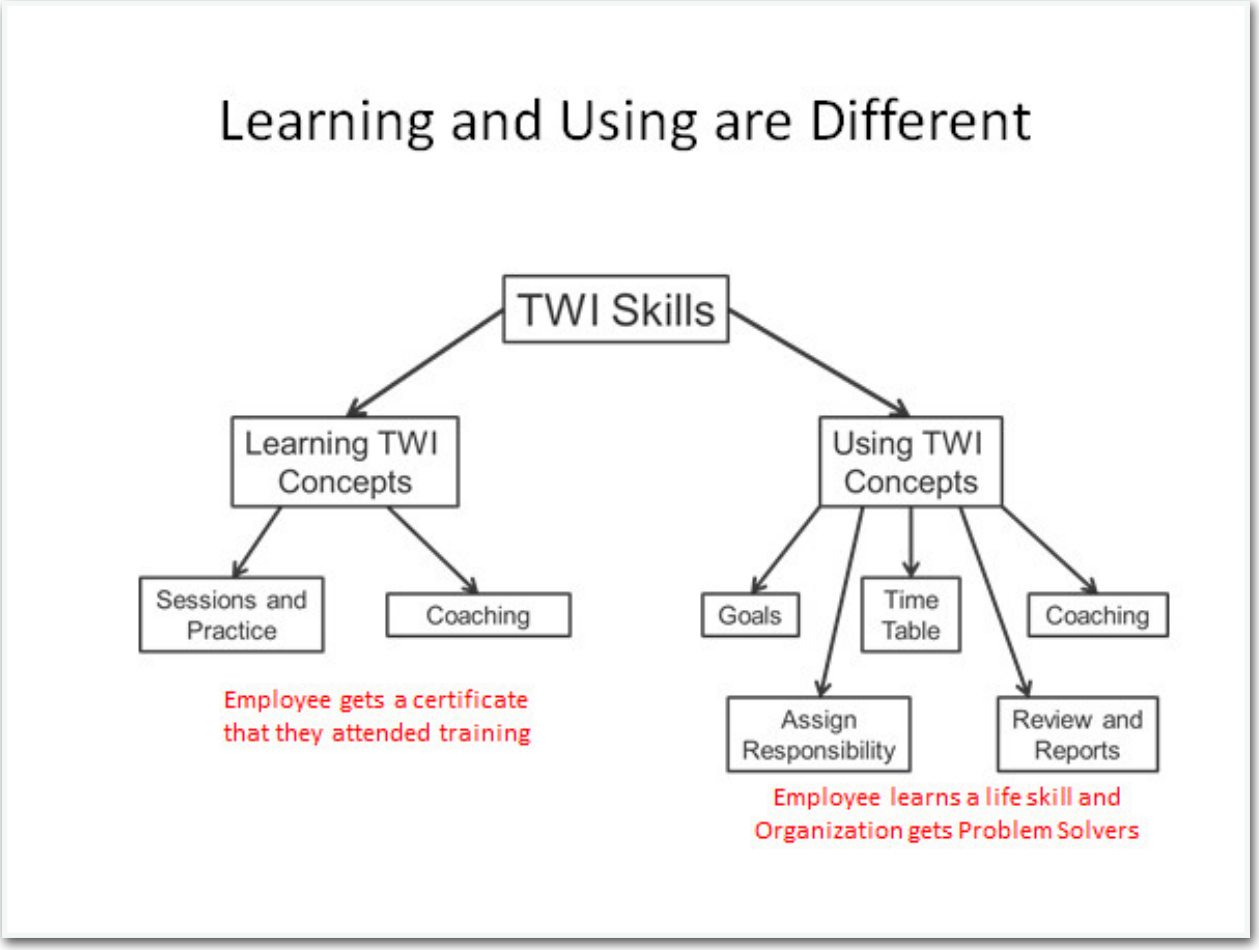
The last one, and most active mentoring that lasted for more than 20 years between Betty Huntington and Walter Dietz is the most interesting. Immediately after establishing the TWI Service in New Zealand, they established a small research group to continue the development of the programs… not just the J programs, but the critical support and development that was necessary for effective implementation of TWI. The core of this support material was developed in the US and available only to the trainers at the Regional offices and Headquarters. The last version of their Job Methods

training had finally simplified to process to the point it was easy to use and focused on getting results to resolve problems.

Modern Variations

Most of today's variations to the 5 day program format are for the convenience of the trainer (or to lower the cost), changing the format into 2 or 3 days. Coaching the skills

So, what choices do I have?



at their workplace between the sessions cannot be done when the program is compressed. Nor can the deliberate practice at your workplace to connect the sessions lessons with your work.

The two largest groups that certify TWI trainers do not follow the same format as the TWI Service did in their Institute training. Today's trainers might get a week practicing

with someone experienced (along with several others). The original format was attending the 10-hour session, then practice applying it at least several weeks, then apply for the Institute. Once accepted, you would spend a week going through all of the sessions and then return to the company where you were employed to deliver your first program. Your Institute trainer would attend your sessions and follow you to the shop floor as you coached participants. They would offer feedback on how to improve your sessions. Only after successfully delivering a complete program under the watchful eye of an Institute trainer, would you be certified. In addition, if you did not deliver the training for more than 90 days, you had to complete the certification again.

Your choices…

Option 1

Providing employees with a certificate for a single TWI skill (there are three core skills) only costs the employer a lost week of production and about $800 per person if done at your own facility.

Option 2

You can *do-it-yourself* with just about the same level as the average certified Job Instruction trainers today. The sessions are scripted, all you need is a little practice.… treat it like practicing for the lead role in your high school play.

Option 3

Or you can create an environment where the employees can learn all the skills. In 2015 a wide variety of companies hosted Dr. Vivek and myself to test if we could teach and apply the TWI skills within 10 days. The goal was to replicate Ohno's improvement curve at Toyota. The companies ranged from limited exposure to lean to those winning quality awards from Japan and connections with Toyota. The results in terms of problems found and solved are similar. This approach has since been tried in many more countries as we continue to learn and simplify the program.

Example Results — 1 to 2 weeks

Tail light assembly breaking
- New model (18 months old)
  - Scrapping about $5,000 per month after rework
  - Had been a QC project for about 6 months
    - Lots of process data, no actions
  - Light assembly not capable to tolerances
    - Supplier working to drawing that did not include assembled tolerances
  - Mounting bracket process not capable
    - Faulted supplier of subassembly that was welded to frame
      - » Issue with fixture holding subassembly at frame welding
  - Third issue discovered in side panel assembly
    - Locating tab irregular
      - » Fixture in robotic welding operation not holding tab tight in place during welding
  - Maintenance repaired problem fixtures
  - Engineering and Supplier met the next day at the assembly line to see the problems
    - Temporary sorting was developed
    - Assembly process modified
  - Rework reduced from average of 130 per day to 4 with temporary measures

Motorcycle Plant

- Oil on floor near stamping press
  - Experiment to wipe oil from strip leaving stamping press
    - 30 minutes cleaning time per shift reduced to 5 minutes
    - Deployed at all presses
- Machine changeover – deep draw stamping
  - Experiment with shims to eliminate adjustments
    - 8 hour changeover to less than 5 minutes
- Mixing of components – found in assembly
  - Experiment to reduce mixing at critical step
    - 50% improvement. Taking steps to further reduce
- Low machine OEE on bottleneck process
  - Found major contributor was absenteeism and supervisor unaware of critical role in plant output
    - Developed plan to staff bottleneck operation even with absences (operators now aware of critical need to keep this process running)

Chain manufacturing operation

- Casting porosity – can be detected only after final machining
  - Engineering claimed solution could only be determined if they could a special modeling software to identify cause.
    - Go see, observe, get facts…
      - Critical placing of "chillers" in the mold was highly irregular
        - » JBS developed
        - » Operators trained
          - Porosity failures reduced about 80%

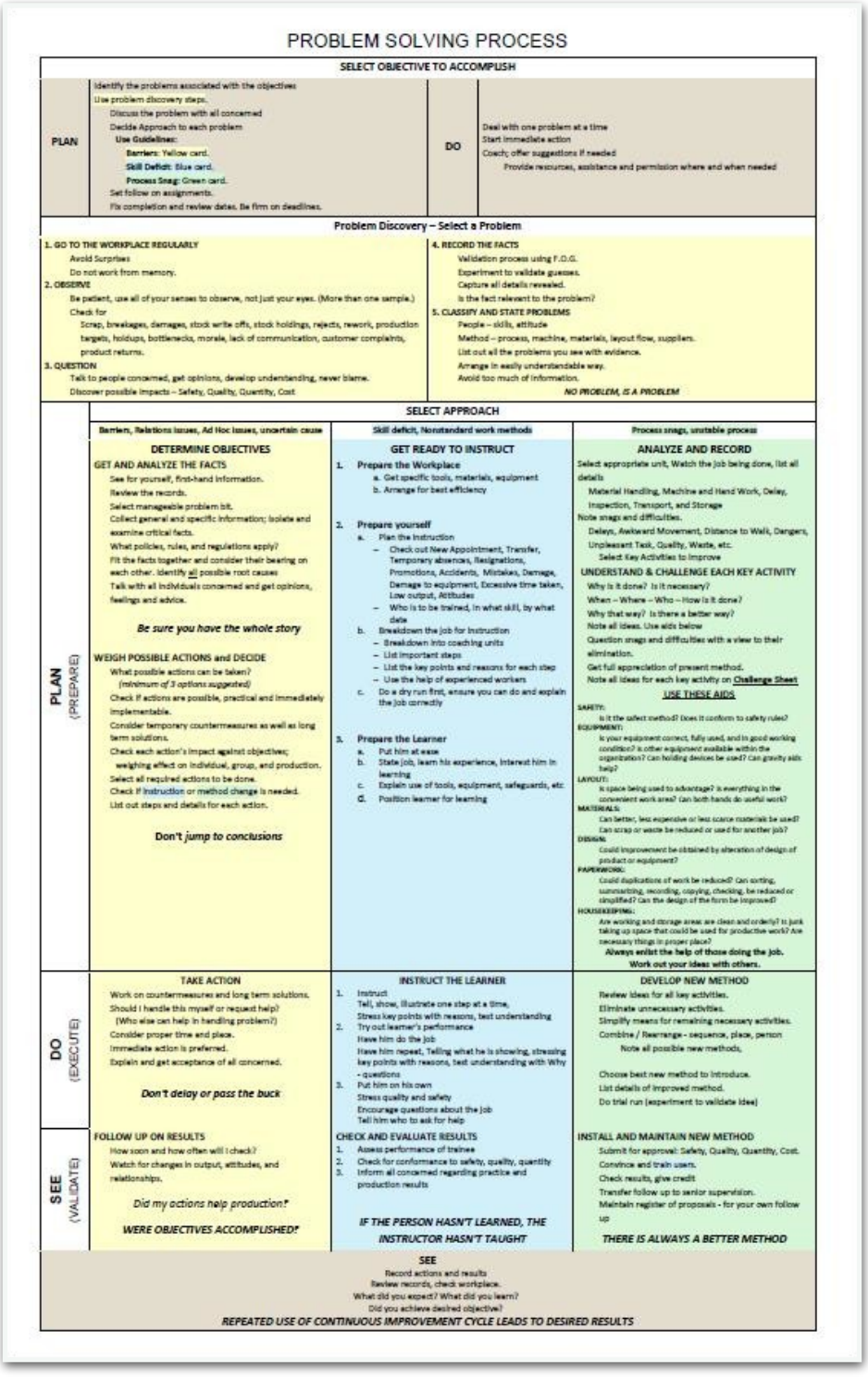
Large Iron Casting operation (5 ton part)

- Oil pump assembly
  - Parts machined, assembled and tested
  - Demand 500 per day
    - Current production is 280-350 per day (working 3 shifts – they work weekends and still can't keep up)
    - Manufacturing Engineering solution - $300,000 machining center ordered
      - Fact finding:
        - » Current machine sometimes idle
          - Supplier problems and internal receiving
          - Improved supplier communication – supplier to inspect critical areas where defects were found after machining
          - Internal inspection process modified to remove delays
          - Fixture defects repaired to eliminate scrap caused by fixture
          - Transfer process to assembly in smaller batches
          - Modified testing sequence to increase capacity
        - » Results: 500 per day achieved on two shifts, no weekend overtime

Automotive Component Supplier

Similar results have been achieved by staff in service operations (hospitals) and light

manufacturing (sewing operations). We follow a standard road-map to approach problem solving; from the discovery and selection of which problem to solve to the training of staff to the 'one best way' to experimenting as a way to validate ideas for improvements.



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

PLAN (PREPARE)

Barriers, Relations issues, Ad Hoc issues, uncertain cause

DETERMINE OBJECTIVES
GET AND ANALYZE THE FACTS
See for yourself, first-hand information.
Review the records.
Select manageable problem bit.
Collect general and specific information; isolate and examine critical facts.
What policies, rules, and regulations apply?
Fit the facts together and consider their bearing on each other. Identify all possible root causes
Talk with all individuals concerned and get opinions, feelings and advice.

Be sure you have the whole story

WEIGH POSSIBLE ACTIONS and DECIDE
What possible actions can be taken?
(minimum of 3 options suggested)
Check if actions are possible, practical and immediately implementable.
Consider temporary countermeasures as well as long term solutions.
Check each action's impact against objectives; weighing effect on individual, group, and production.
Select all required actions to be done.
Check if Instruction or method change is needed.
List out steps and details for each action.

Don't jump to conclusions

Skill deficit, Nonstandard work methods

GET READY TO INSTRUCT
1. Prepare the Workplace
a. Get specific tools, materials, equipment
b. Arrange for best efficiency

2. Prepare yourself
a. Plan the Instruction
– Check out New Appointment, Transfer, Temporary absences, Resignations, Promotions, Accidents, Mistakes, Damage, Damage to equipment, Excessive time taken, Low output, Attitudes
– Who is to be trained, in what skill, by what date
b. Breakdown the job for instruction
– Breakdown into coaching units
– List important steps
– List the key points and reasons for each step
– Use the help of experienced workers
c. Do a dry run first, ensure you can do and explain the job correctly

3. Prepare the Learner
a. Put him at ease
b. State job, learn his experience, interest him in learning
c. Explain use of tools, equipment, safeguards, etc
d. Position learner for learning

Process snags, unstable process

ANALYZE AND RECORD
Select appropriate unit, Watch the job being done, list all details
Material Handling, Machine and Hand Work, Delay, Inspection, Transport, and Storage
Note snags and difficulties.
Delays, Awkward Movement, Distance to Walk, Dangers, Unpleasant Task, Quality, Waste, etc.
Select Key Activities to Improve
UNDERSTAND & CHALLENGE EACH KEY ACTIVITY
Why is it done? Is it necessary?
When – Where – Who – How is it done?
Why that way? Is there a better way?
Note all ideas. Use aids below
Question snags and difficulties with a view to their elimination.
Get full appreciation of present method.
Note all ideas for each key activity on **Challenge Sheet**

USE THESE AIDS

SAFETY:
Is it the safest method? Does it conform to safety rules?
EQUIPMENT:
Is your equipment correct, fully used, and in good working condition? Is other equipment available within the organization? Can holding devices be used? Can gravity aids help?
LAYOUT:
Is space being used to advantage? Is everything in the convenient work area? Can both hands do useful work?
MATERIALS:
Can better, less expensive or less scarce materials be used? Can scrap or waste be reduced or used for another job?
DESIGN:
Could improvement be obtained by alteration of design of product or equipment?
PAPERWORK:
Could duplications of work be reduced? Can sorting, summarizing, recording, copying, checking, be reduced or simplified? Can the design of the form be improved?
HOUSEKEEPING:
Are working and storage areas are clean and orderly? Is junk taking up space that could be used for productive work? Are necessary things in proper place?

Always enlist the help of those doing the job.
Work out your ideas with others.

DO (EXECUTE)

TAKE ACTION
Work on countermeasures and long term solutions.
Should I handle this myself or request help?
(Who else can help in handling problem?)
Consider proper time and place.
Immediate action is preferred.
Explain and get acceptance of all concerned.

Don't delay or pass the buck

INSTRUCT THE LEARNER
1. Instruct
Tell, show, illustrate one step at a time.
Stress key points with reasons, test understanding
2. Try out learner's performance
Have him do the job
Have him repeat, Telling what he is showing, stressing key points with reasons, test understanding with Why - questions
3. Put him on his own
Stress quality and safety
Encourage questions about the job
Tell him who to ask for help

DEVELOP NEW METHOD
Review ideas for all key activities.
Eliminate unnecessary activities.
Simplify means for remaining necessary activities.
Combine / Rearrange - sequence, place, person
Note all possible new methods,

Choose best new method to introduce.
List details of improved method.
Do trial run (experiment to validate idea)

SEE (VALIDATE)

FOLLOW UP ON RESULTS
How soon and how often will I check?
Watch for changes in output, attitudes, and relationships.

Did my actions help production?

WERE OBJECTIVES ACCOMPLISHED?

CHECK AND EVALUATE RESULTS
1. Assess performance of trainee
2. Check for conformance to safety, quality, quantity
3. Inform all concerned regarding practice and production results

IF THE PERSON HASN'T LEARNED, THE INSTRUCTOR HASN'T TAUGHT

INSTALL AND MAINTAIN NEW METHOD
Submit for approval: Safety, Quality, Quantity, Cost.
Convince and train users.
Check results, give credit
Transfer follow up to senior supervision.
Maintain register of proposals - for your own follow up

THERE IS ALWAYS A BETTER METHOD

SEE
Record actions and results
Review records, check workplace.
What did you expect? What did you learn?
Did you achieve desired objective?

REPEATED USE OF CONTINUOUS IMPROVEMENT CYCLE LEADS TO DESIRED RESULTS

While the coaching has been simplified to the point where significant improvements can happen in the first week, the depth of skill to sustain takes longer. Critical to success is leadership participation in daily practice to trigger the habit building process.

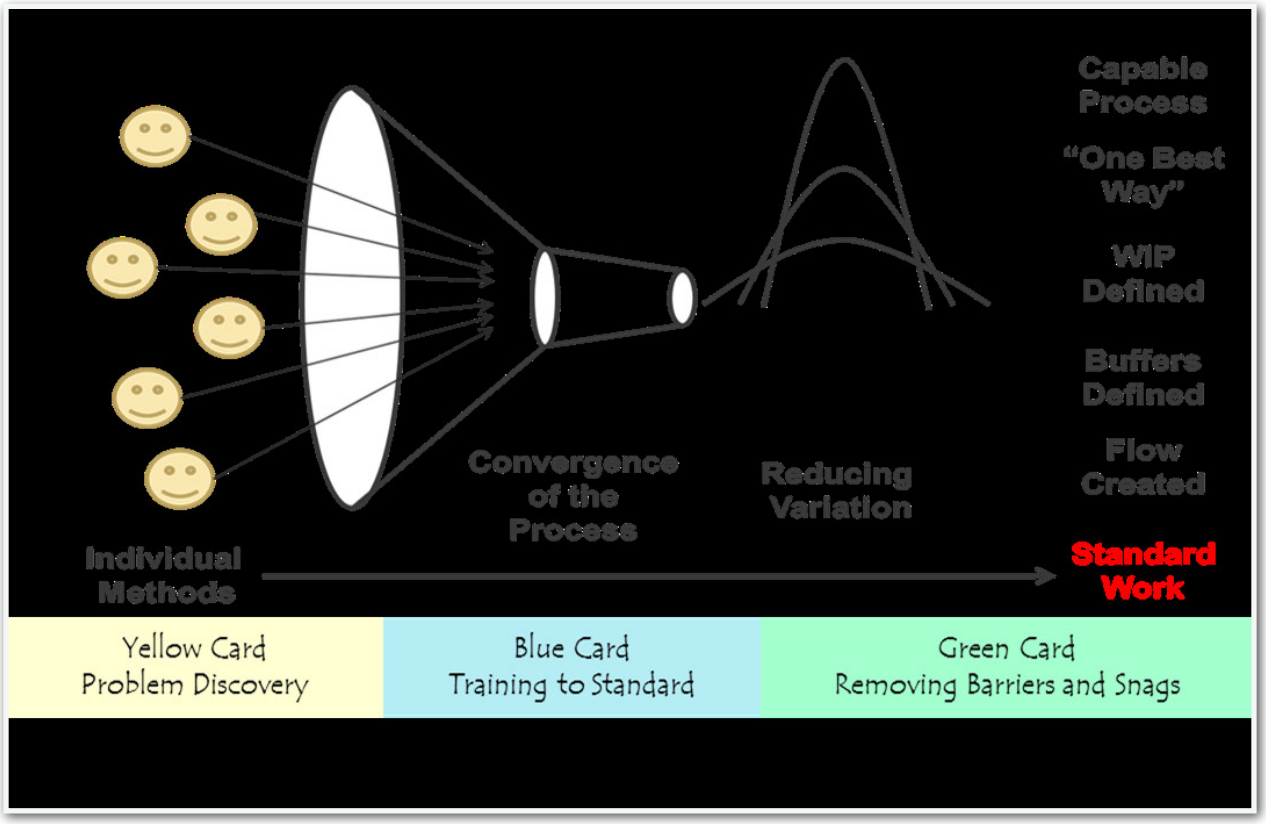
What you can expect…

The first few half-days are spent learning about the TWI skill sets and fact finding by the small teams of about 5 people. We divide the time between the conference room and the work area. Once people realize their overall objective is to create flow, it is easier to identify which problems need to be addressed first. It is typical for the teams to start with production and quality data, then do a validation step to confirm the details of the issue.

For an example, let me share with you my experience withe a compact florescent light bulb manufacturer. The pilot project selected was for the bulb that is made up of 3 U shaped tubes that are bent, then joined before final assembly. There are about a dozen machines the tube must pass through before becoming a light bulb. Each team was assigned a section of the line to investigate.

At the end of day two the teams summarized their findings of the problems each segment had and identified which problem solved would have the biggest impact. Overall, cracking and breaking of the glass tube was the largest contributor to losses. At first they said they were not that concerned because they always recycled the glass (*they ran the tube making facility as well*). However, when they began to look at the defect as a disruption to flow, which translated into lost production, their opinions changed.

Day three was spent observing all of the locations that cracked or broke the tubes. Ideas were proposed, experiments to test the ideas were developed and a to-do list was handed off to the second shift. On day four, they confirmed that most of the experiments had worked and the breakage had dropped 70%… the equivalent of an extra hour of production each day!



Problem Solving Sequence

While these examples show the possibility of dramatic improvements in a very short period of time, the real value happens when you can develop these problem solving habits into the normal day-to-day behaviors of your leaders. This is a daily effort, not events or special jobs. This is when the number of improvements will number in the thousands after a few months… most will not be as dramatic as the first big wins.