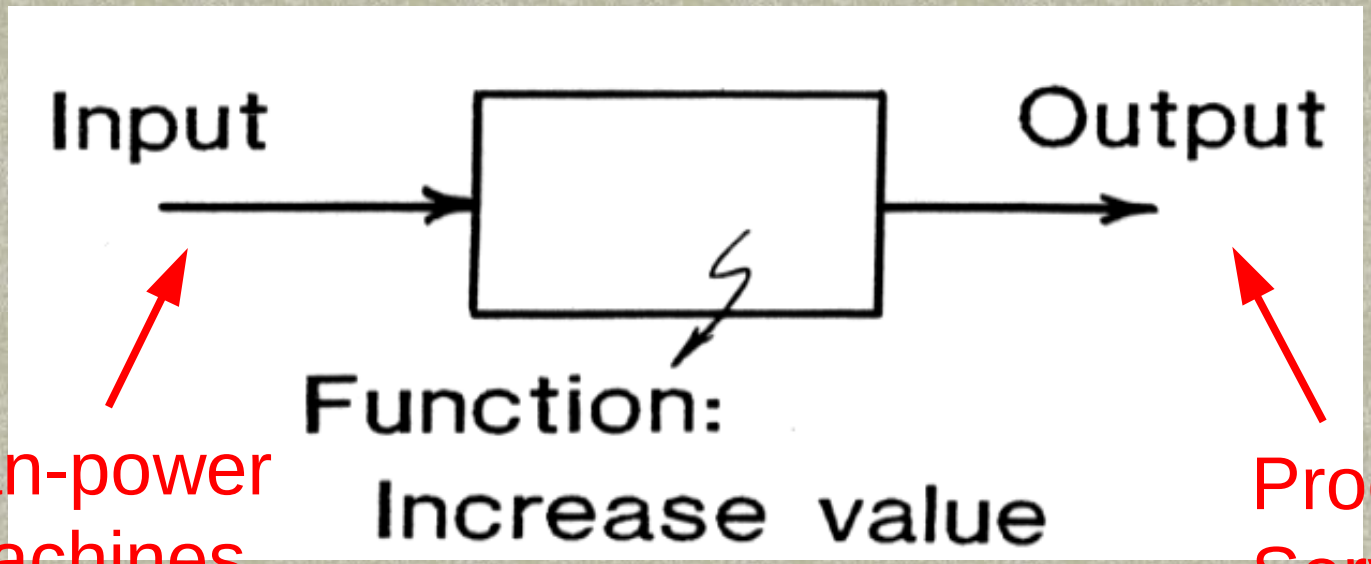
Effective Problem Solving Techniques

Identifying and resolving Problems

Mr. Hasan Haider - NPO Pakistan

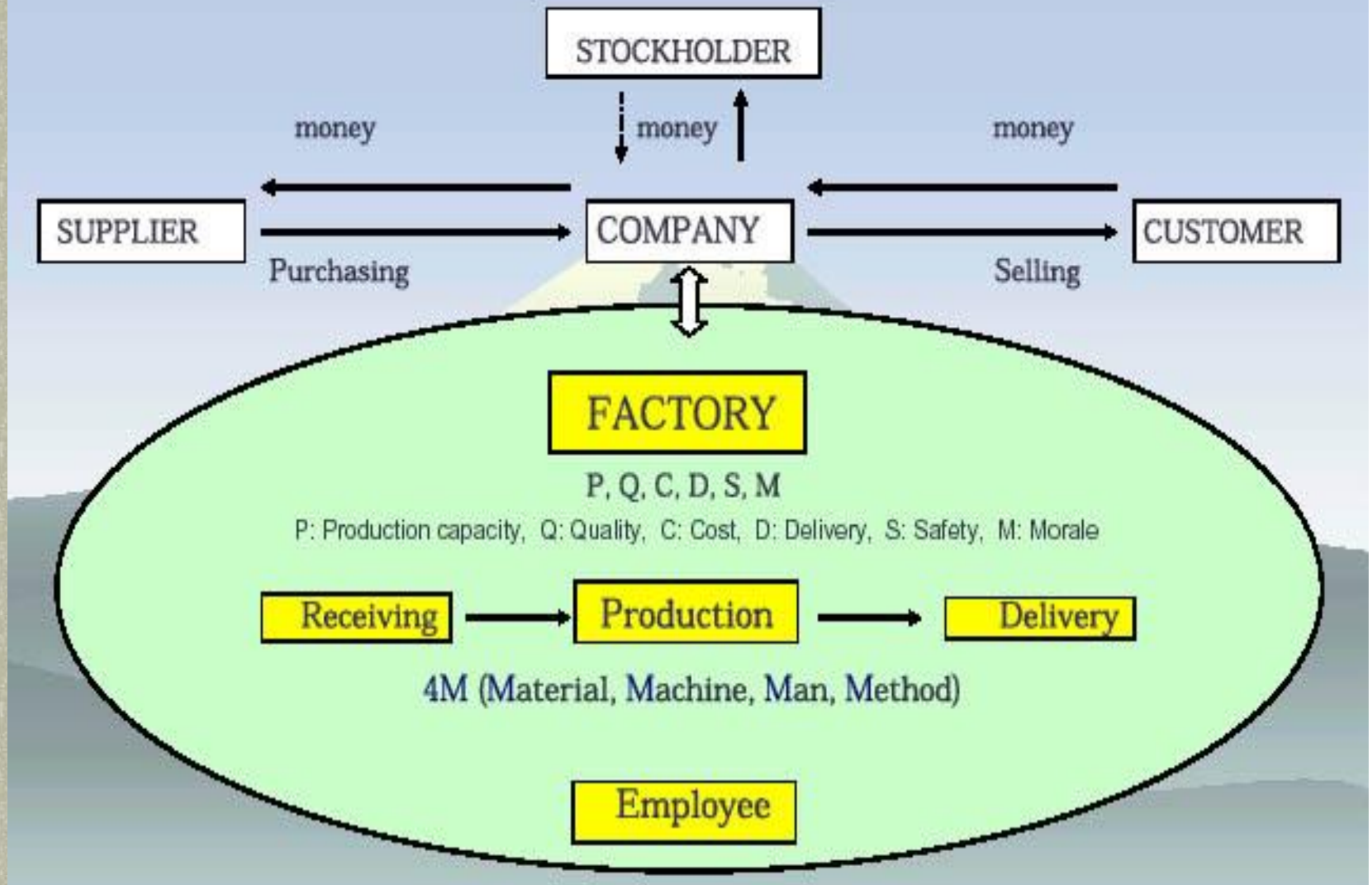
What is Industry ?



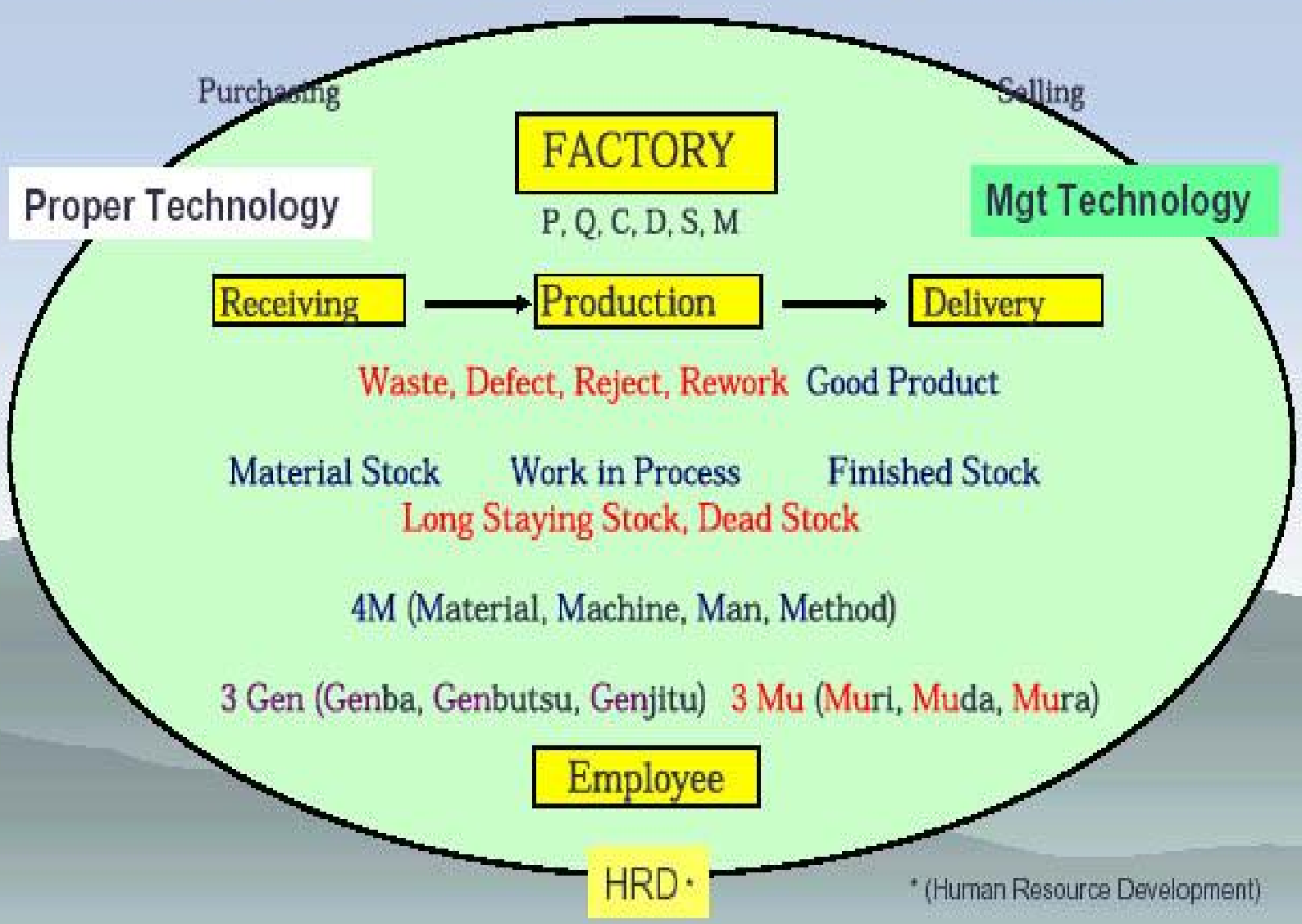
Man-power
Machines
Materials
Methods
(4M's, 1E)

Products
Services

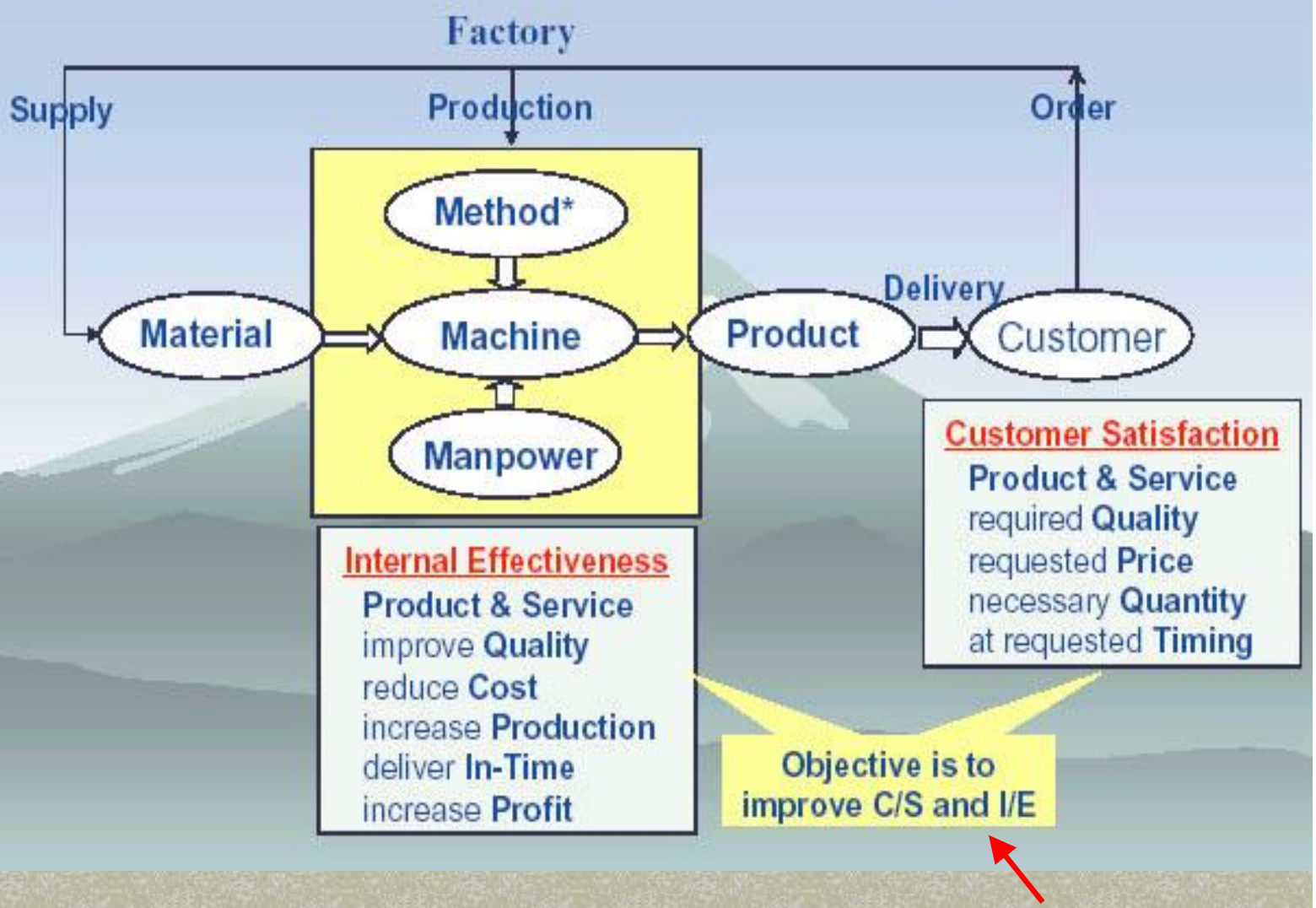
Overview of Company and Factory Operation



Overview of Factory Operation and Production Mgt



Objectives of Production Management



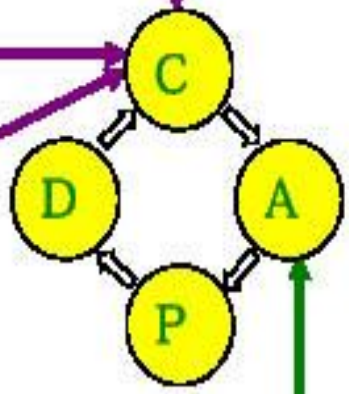
Key Points for Improving Production Mgt

3 Gen (SAF)

Genba : at Site
Genbutsu: with Actual thing
Genjitsu : find Fact

Process Analysis
Stratified Data Collection

Muri : Un-natural
Mura : Un-even
Muda : Waste



and 2 Gen

Genri : Basic Theory

Best Conditions
Flow Production
Visual

P: Plan*
D: Do
C: Check
A: Action*

Gensoku : Principle, 3 Guiding Principles
1) Securing Employment
2) Management and Labor Cooperation
3) Fair Share of Results

Plan*=existing system & method
Action*=improving system & method

The Tools of the Trade

- These slides describe various tools that are widely used in many organizations to help generate ideas, organize them, and act on them.
- However, you'll find the tools effective only if you use them within the context of a planned and organized meeting structure. These Slides offers practical suggestions about how to prepare for effective meetings.
- After that, you'll find information about what the various tools are and how to use them – both as stand-alones or to define, analyze and follow up on your issues.
- Please let us know how well this information works for you, or if you have any questions or comments.

WHEN TO USE THE TOOLS

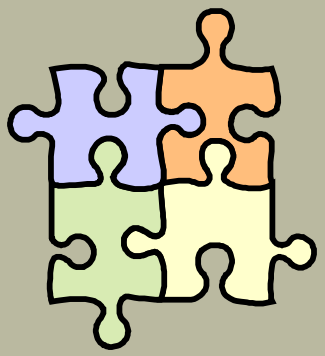
DEFINE THE PROBLEM

- Includes/ Excludes
- In the frame/out of the frame

GENERATE IDEAS

- Process Analysis
- Stratification
- 3 Gen
- 3 Mu
- Brainstorming
- The 5 Whys
- Fishbone Diagram

ANALYZE THE IDEAS



- Analyze
- Prioritize
- The Two by Two
- Interrelationship Diagraph
- The 5 Whys
- Fishbone Diagram

END OF THE MEETING

- Critical Success Factors
- Responsibility Grid
- Decision-making grid
- Stakeholder Analysis

AFTER THE MEETING

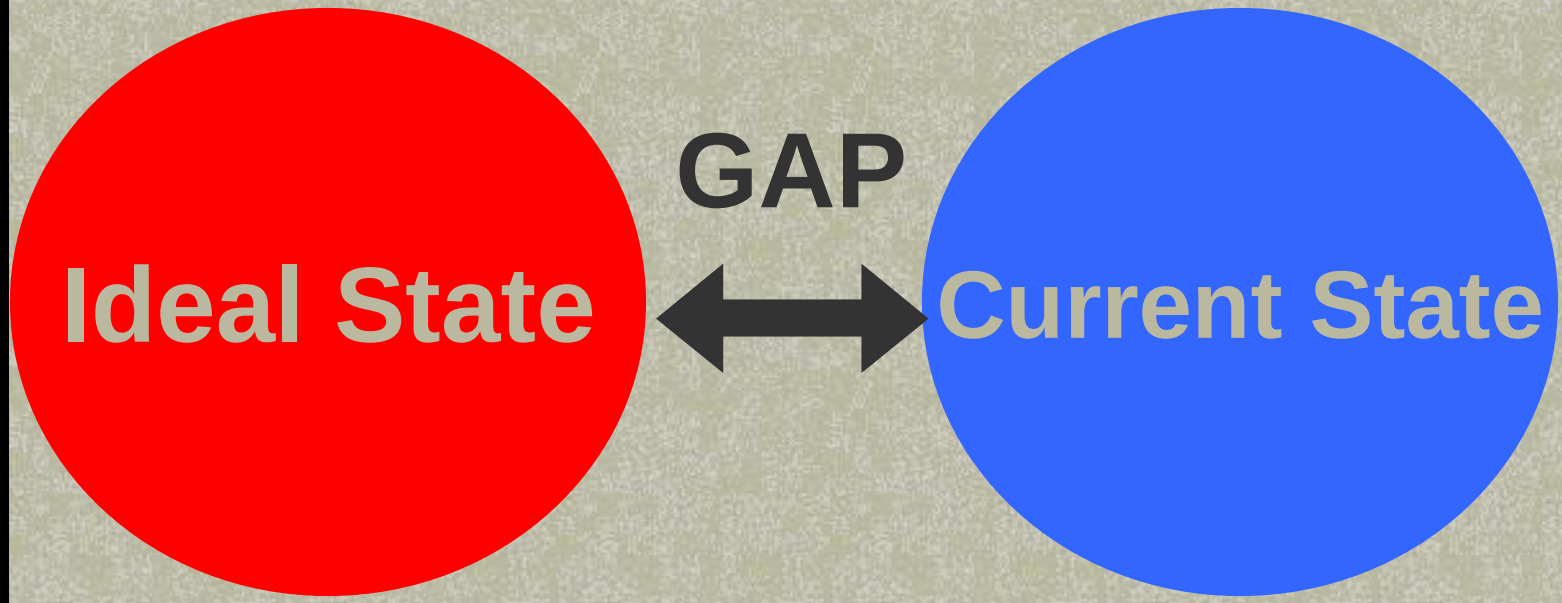
- Working Together
- Notes/minutes

What is “Problem” ?

Problem is something like ----.

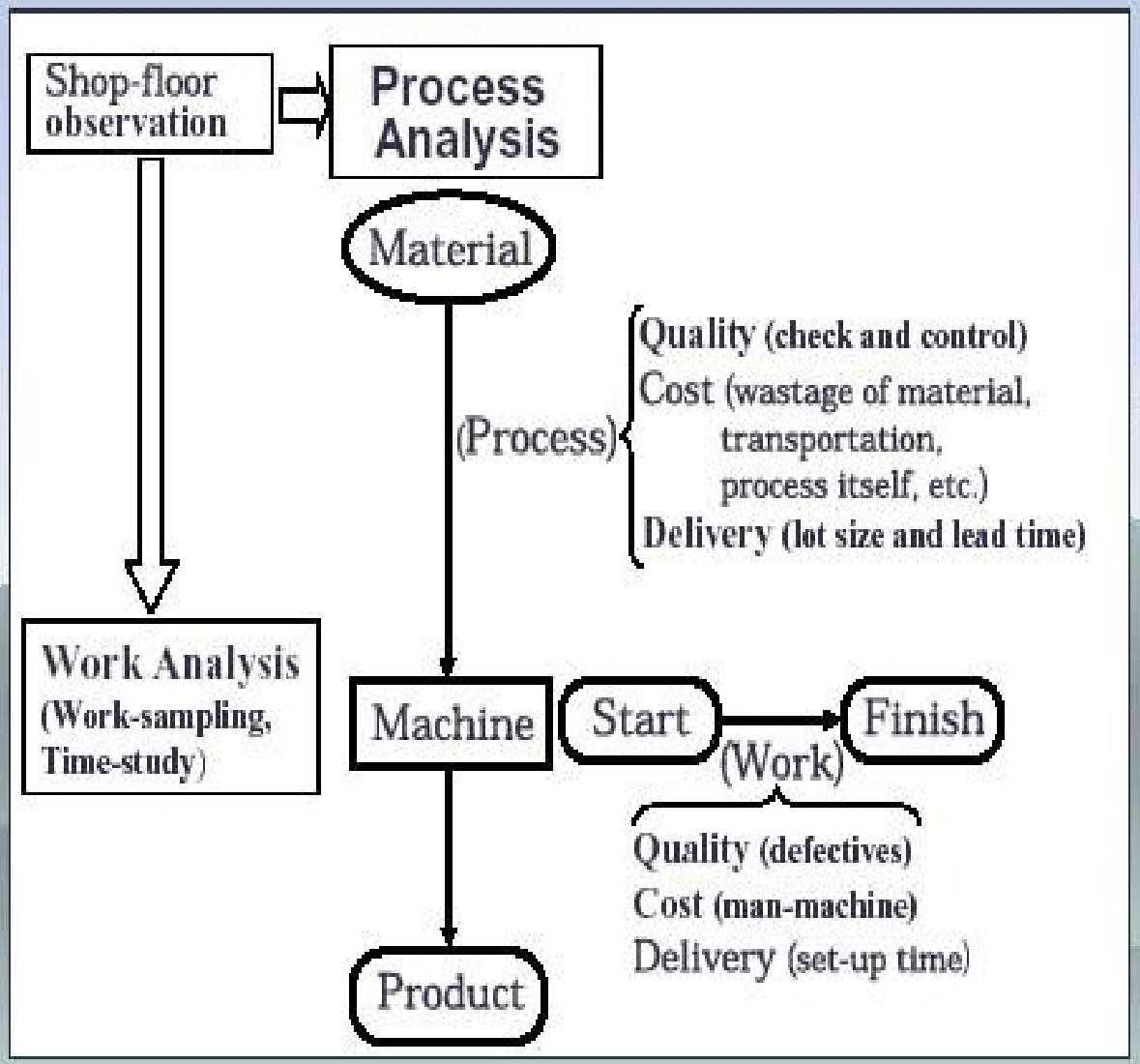
Charles H. Kepner
Benjamin B. Tregoe

“The New Rational Manager” Princeton Research Press, Shin-kanrisha no Handanryoku (Japanese Edition), 1985



Effective Problem Finding

"Process Analysis" and "Work Analysis"



In addition to
Q (Quality),
C (Cost), and
D (Delivery),

P (Production),
S (Safety), and
M (Morale)
should be
examined.

P (Product),
E (Environment)
and
E (Ethics)
should also be
examined at
Company level.

Effective Problem Finding

Stratification (The 1st of 8 QC Tools)

1. Stratification			**1. Separation of different data sources.** **To collect data separately for different sources (material, machine, man, etc.)**
Use together with 2 - 8.		2. Check Sheet	2. To collect data properly. To see abnormal operation condition
	Use together with 3 - 8.	3. Graphs	3. Broken-line graph, Bar graph. Production date or production month on horizontal axis to see the relationship between conditions and results.
		4. Histogram	4. To see variant and abnormal data.
		5. Pareto Diagram	5. To see major items, major causes.
		6. Cause and Effect Diagram	6. To list up causes of defect. To find critical causes by combining with 5.
		7. Scatter Diagram	7. To find out the correlation between the two factors.
		8. Control Chart	8. To control process within upper and lower limits.

3 Gen stands for 3 initials of the following Japanese words:

1. **Genba (On-site)**
2. **Genbutsu (Actual Thing)**
3. **Genjitsu (Fact)**

Genba

Genba

Effective Problem Finding

3 Gen (Genba, Genbutsu, Genjitsu) or SAF(Site, Actual thing, Fact)

Examples

- **Gen**ba (at **Site**):

  1) Machining process (machine #5), Painting process (inspection), Assembly line No. 1(station #9), Stockyard (material section #3, product section #6), Maintenance shop (parts stock corner) , Supervisor's office (machining), Manager's office (HRD), etc. in Manufacturing Ind.,

  2) Guest dining room, Kitchen, etc. in Restaurant

  3) Showroom, Sales floor, etc. in Sales shop

Genbutsu

Genba Genbutsu

Effective Problem Finding

3 Gen (Genba, Genbutsu, Genjitsu) or SAF(Site, Actual thing, Fact)

- **Gen**butsu (with Actual thing):

  1) Rejected product, WIP covered with dust, Semi-finished shorts with size-tag,
  Raw material/Finished product at stock yard,
  Painting defect marked on product by QC,
  Sliding part of machine damaged by chips,
  Work instruction in foreign language,
  Company's rules & regulation file, etc.
  at Manufacturing company.

  2) Foods, Material for cooking, Seasoning, Recipe, Work instruction,
  Table, Table ware and cloth, Cooking utensil/equipment, etc.
  at Restaurant.

  3) Best selling good, Showcase, Catalogue, etc.
  at Sales shop.

Genjitsu

Genba Genbutsu Genjitsu

Effective Problem Finding

3 Gen (Genba, Genbutsu, Genjitsu) or SAF(Site, Actual thing, Fact)

- **Gen**jitsu (find **F**act):

1) Major defect is crack at corner, WIP stayed 10 days after line-out for urgent order,
All size are mixed (no data collection by size),
Many of stock stayed for more than 6 months,
Most of defects look as same type,
Workers do not understand the instruction,
No written organization in the company, etc.

2) Hot food gets cold (not served quickly), Fish not fresh (kept long),
Some coffee cups have lip-mark (not washed well), Table cloth not clean (used many years),
Kitchen is not clean (not washed properly), etc.

3) Best selling goods have good combination of design and color,
Best selling shop has attractive arrangement of showcase, etc.

Effective Problem Finding, another Japanese way

3 Mu (Muri, Mura, Muda)

Muri : Un-natural

Working uneasy posture, Carrying too heavy thing, Trying to reach too high, Working too much overtime, Driving too fast, Stacking too high, etc.

Mura : Un-even

Daily production very high and very low, Defects very low and very high, Driving fast and slow, Materials coming too much and too little, Machines stop frequently, etc.

Muda : Waste

Waste of material (defective products, start-up waste, design waste, dead stock, long staying stock. etc.)
Waste of manpower (idle time, over time, reworking, etc.)
Waste of facility (broken facility, excess facility, etc.)

Pre-meeting set-up

Checklist

Meeting name:
Purpose/
essential issues:
Agenda:

Endstate/
key deliverables:
Milestones:
Scope of work:
Tools:

Participants:
Conference room:
Post-it notes and pens required?

Kick-off

1. **Meeting organizer assigns roles, including who will be the facilitator (usually self) and the scribe.**

   Team leader/facilitator:

   - Leads the meeting;
   - Decides which tools are most appropriate to use;
   - Enables the group -- does not decide for everyone;
   - Organizes the work of the team.

   Team Members:

   - Understand their expertise and role within the team;
   - Work to resolve issues within the team;
   - Own and execute on their responsibilities after the meeting.

2. **Together, the team establishes meeting rules eg:**

   - Attack the problem, not the person.
   - One person talking at a time.
   - Arrive on time.
   - Be engaged in the issue.
   - Turn off cell phones.

3. **Facilitator goes over the Agenda. Writes it on white board. Sticks to it.**

DEFINE THE PROBLEM

Includes/excludes

Objective: to define the boundaries of the project.

The team has to clarify and agree on what is included and excluded in the scope of work.

Project scope

	INCLUDES	EXCLUDES
What		
Where		
When		
Who		
Time		
Key deliverables		

DEFINE THE PROBLEM

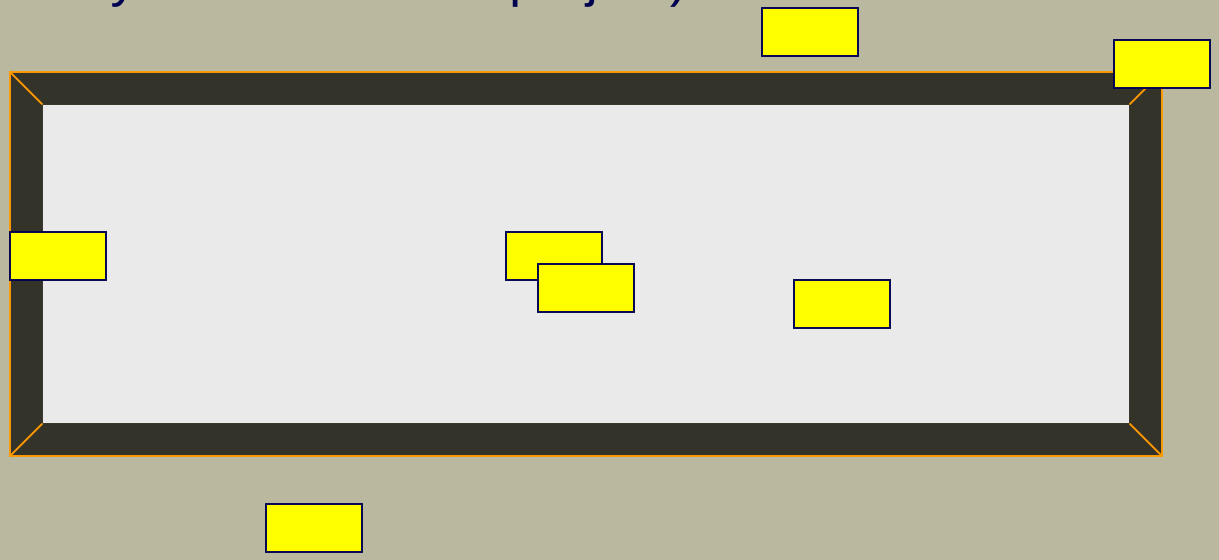
Includes/excludes chart

1. Everyone completes a chart independently.
2. The facilitator draws a large chart on a white board.
3. The facilitator distributes Post-it notes. Team members transfer a major point from each line of their chart to a Post-it note. They place their notes on the wall-sized “Includes/Excludes” chart.
4. Team members discuss their selections and resolve differences.

DEFINE THE PROBLEM

In the frame/out of the frame

Objective: Based on the analogy of a picture frame, this tool challenges the team to identify which aspects of the project are “in the frame” (clearly within the scope of work), “out of the frame” (clearly out of the scope of work), or “half-in-half-out” (meaning that the subject is up for debate, or some aspects are only partially included in the project).



DEFINE THE PROBLEM

In the frame/out of the frame

- Find a wall space large enough to accommodate the completed chart.
- Help the team get organized to complete the chart. Give them Post-it notes on which to write down their ideas. Instruct them to place notes within the frame to indicate their preferences, ie a note placed in the center indicates a strong sense that the item is clearly within the scope of work, while one placed near the border refers to an aspect that's debatable.
- In silence, team members begin to move the cards others have placed on the chart to get it right from their perspective. If a Post-it note is moved and the originator of it disagrees, he/she can move it back. The facilitator places a dot on it to signify that further discussion is warranted.
- The facilitator leads a group discussion to resolve any differences.

Brainstorming

- Brainstorming is frequently the first exercise a group takes on together. It can be used at any stage of the meeting, but is most often used to diagnose the problem(s) or to find solutions.

- Brainstorming encourages lots of ideas, differences of opinion and divergent thinking. The greater the number of ideas the group can generate, the more numerous will be its solutions and the greater its understanding.

Brainstorming

No matter what you do with the *results* of the brainstorming session, there are some fundamental rules that always apply *during* the exercise:

- **The more the merrier**. The quality of the idea is not as important as the number of ideas the group generates.
- **Do not evaluate, question or comment on ideas**. Never discourage or question an idea. Don't remind someone that we already have that idea. DON'T INHIBIT CREATIVITY!
- **Crazy ideas are welcome**. Break loose from the norms. Challenge paradigms. Think anew.
- **Build on each others' ideas.**

Brainstorming methods

Free-for-all

- As soon as ideas pop into people's heads, they shout them out loud.
- As ideas are brought up, the facilitator writes them on a flip-chart or white board.

Typically, ideas come in bursts then trickle off. It's important to push the group beyond the plateau of, "That's all we have." Humorous or abstract ideas can push a group through the plateau and into a pocket of less obvious ideas.

This is a rapid fire process where the person capturing ideas is often writing as fast as he/she can during bursts of creativity from the group.

Brainstorming methods

Round Robin

- Each person shares an idea when it's his or her turn.
- The facilitator calls on each person in order.

Some people prefer this technique, while others find it very stressful. For some, it can take the focus off of the creative process and sub-optimize results.

Individual Brainstorming

- Each person writes down all the ideas he/she can come up with.
- When everyone is finished, each person reads out loud his/her list and a master list is created.
- After all the individual lists have been incorporated into the master list, group members are encouraged to add to the list. Others people's ideas usually generate additional ideas and variations on themes.

The Five Whys

Objective: trying to find the root cause of a problem.

Step 1: The first Why. Pick the issue you want to study. Ask the first Why of the group: “Why is such and such taking place?” You will probably end up with three or four answers. Put them all on a flip chart or white board with plenty of room around them.

Steps 2, 3, 4, 5: The Successive Whys. Repeat the process for every statement on the wall, asking, “Why?” about each one. Post each answer near its parent. Follow up all the answers that seem likely. You will probably find them converging. A dozen separate symptoms may be traceable back to two or three sources.

The Five Whys

Avoid focusing on who did what. A cycle of blame and defensiveness doesn't provide the right framework for substantive change. Don't do this:

Why is there oil on the floor?
Because the maintenance crew didn't clean it up.
Why didn't they clean it up?
Because the Supervisor didn't tell them to.
Why didn't she tell them to?
She didn't know about it.
Why didn't she know about it?
Because she didn't inspect the area this morning.
Why didn't she inspect the area?
Because no one asked her to.

Try not to blame individuals for something that has gone wrong, but look instead for problems in the way things work and process-oriented solutions.

The Five Whys

When the Five Whys is done correctly, it directs people to recognize the difference between an event/people oriented explanation and a process-based explanation.

For example, if you traced a process explanation for the oil spill, it would lead to different accounts for oil on the floor. Perhaps the maintenance people were poorly trained, and that contributed to the oil puddle; or perhaps a faulty gasket was to blame, and the company needed better maintenance practices.

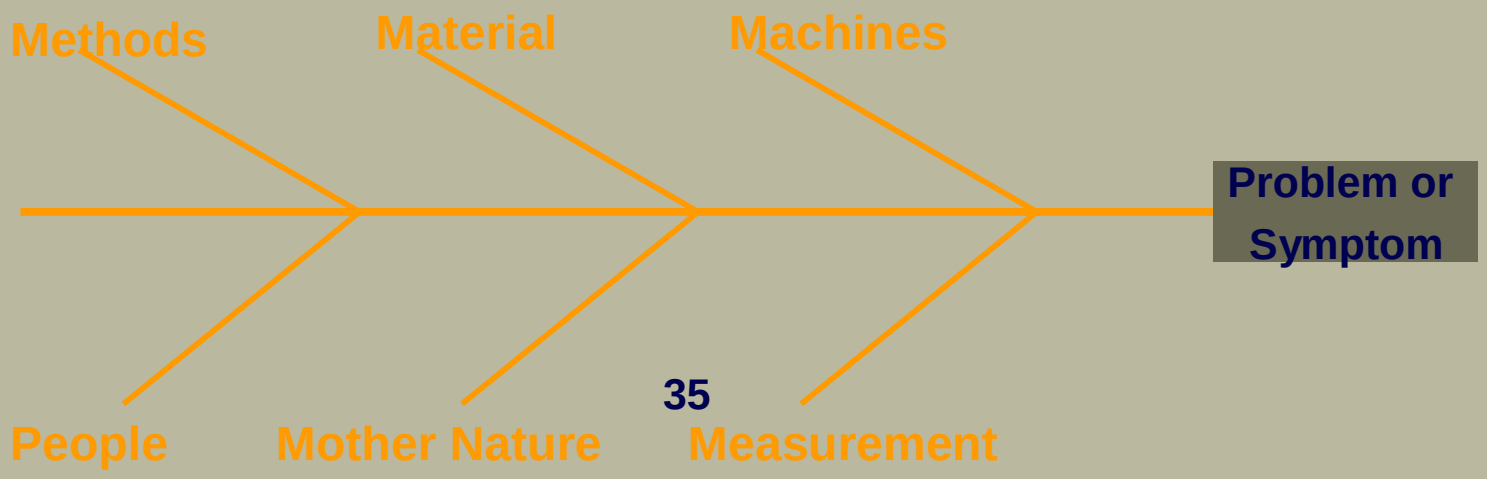
As you trace the Whys back to their root causes, you might find yourself tangling with issues that not only affect the initial problem or symptom, but the entire organization.

GENERATE IDEAS

Fishbone

Provides a structured way to analyze a problem. When one of the "bones" is empty of causes, the group can focus on those issues and uncover things previously unseen by the group.

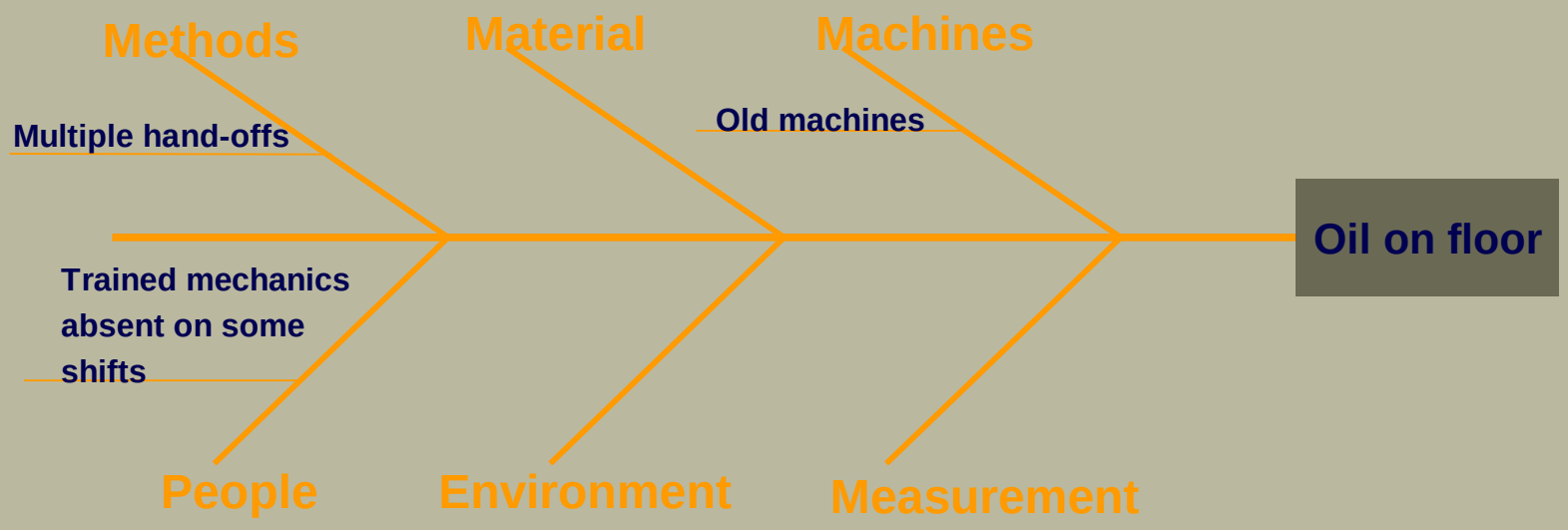
Remember that the bones (methods, material, machines, people, nature and measurement) represent the CAUSES of the problem, and the symptom box – the head of the fish -- represents the EFFECT of the problem.



GENERATE IDEAS

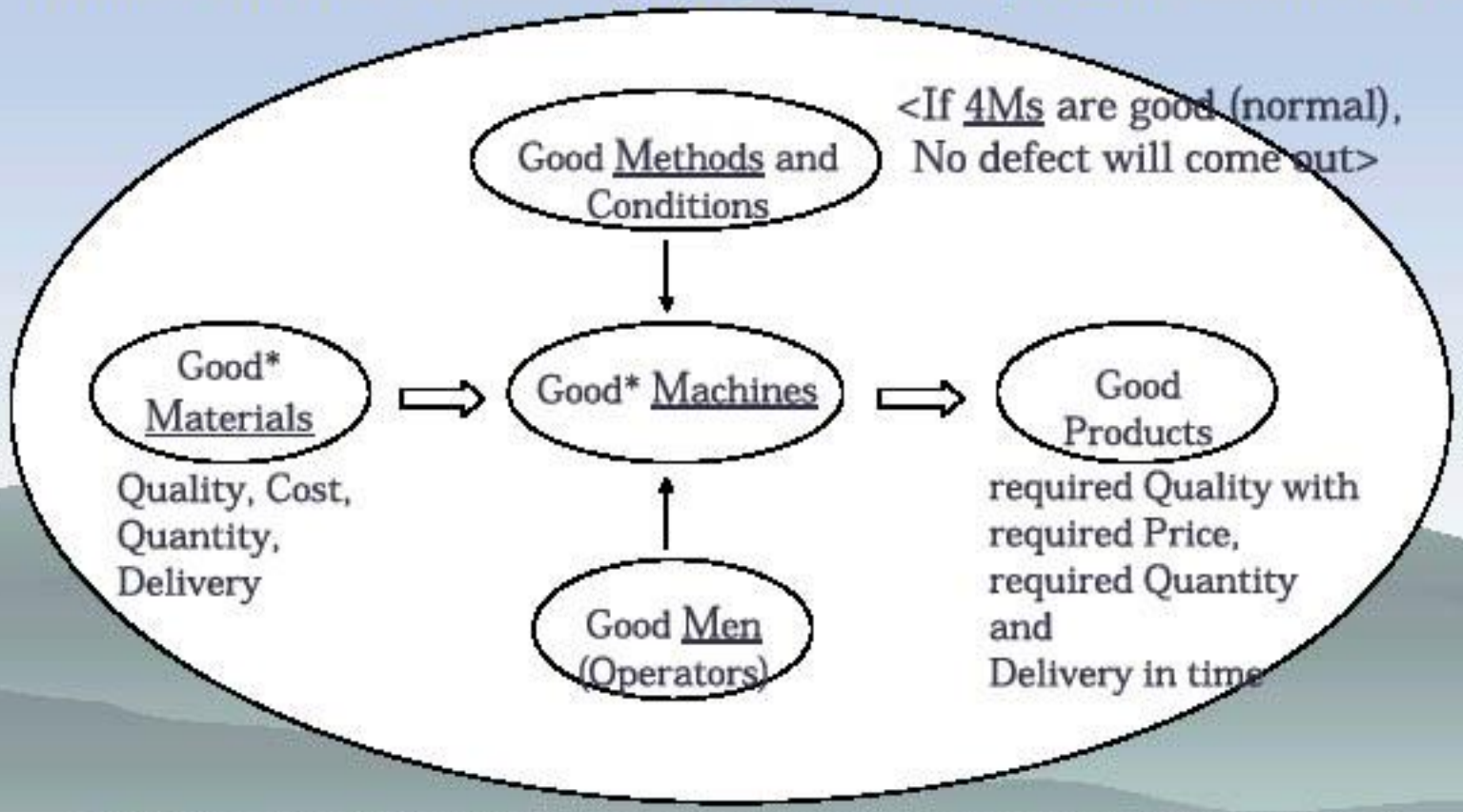
Fishbone

The titles of the "bones" usually remain the same, regardless of the project. Add causes as appropriate.



Effective Problem Solving

Basics of Production Management: 1) Best Conditions



The attribute "Good*" here does not mean expensive materials, expensive machines, but materials stored/handled in good conditions, machines well maintained.

Effective Problem Solving

Basics of Production Management: 2) Flow Production

Material : *No Long Staying/Dead stock*

⇩

Production

1st process

••

••

final process

Well controlled WIP

(Work In Process)

⇩

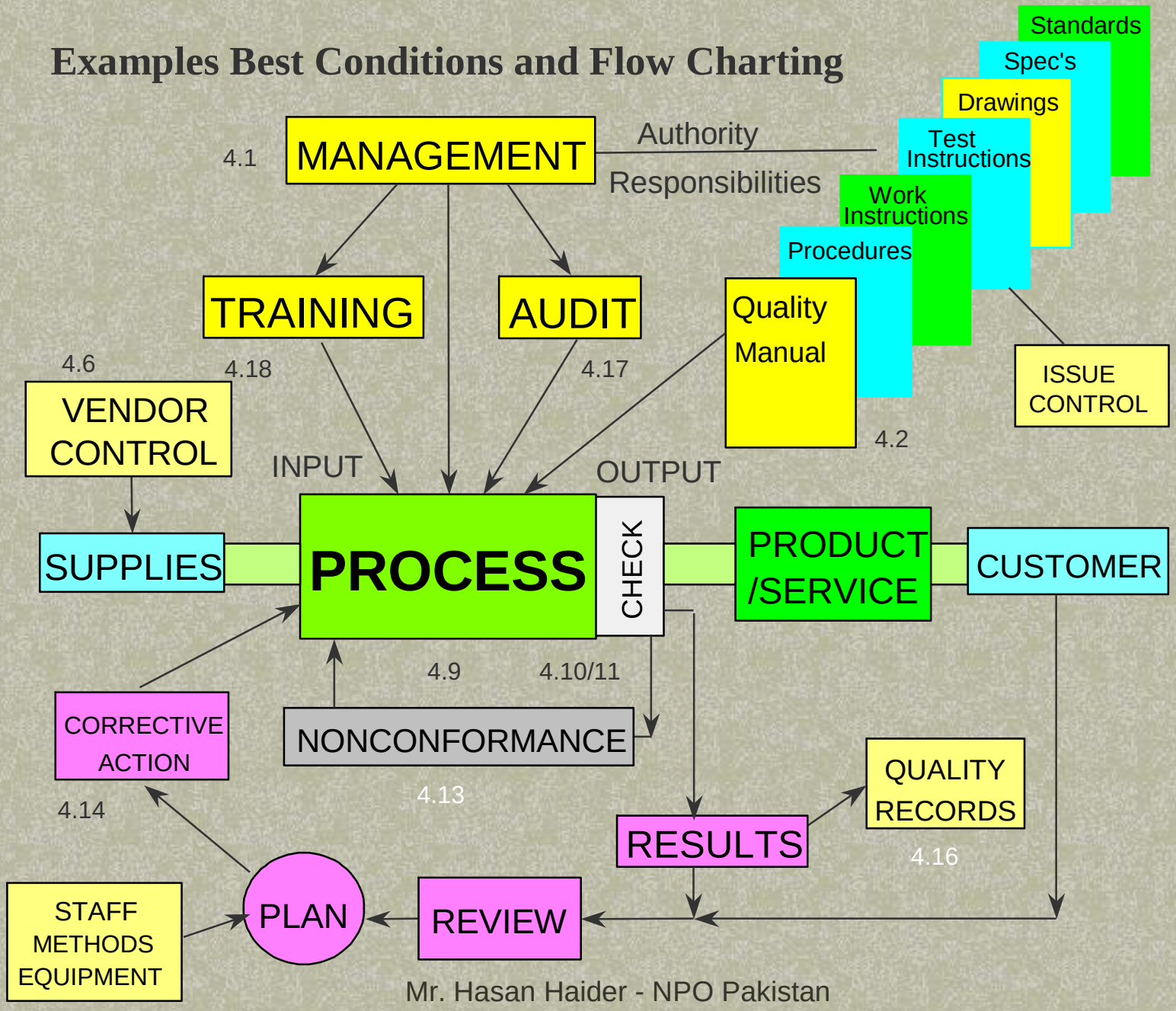
Finished Product: *No Long Staying/Dead stock*

⇩

Delivery : *Delivery in Time*

Production is flowing smooth like a river stream.

Examples Best Conditions and Flow Charting



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Effective Problem Solving

Basics of Production Management: 3) Visual Control

1. For Management

   "Visual Report" for managers to easily see important points by highlighting with red color, etc.

2. For Shop-floor Control

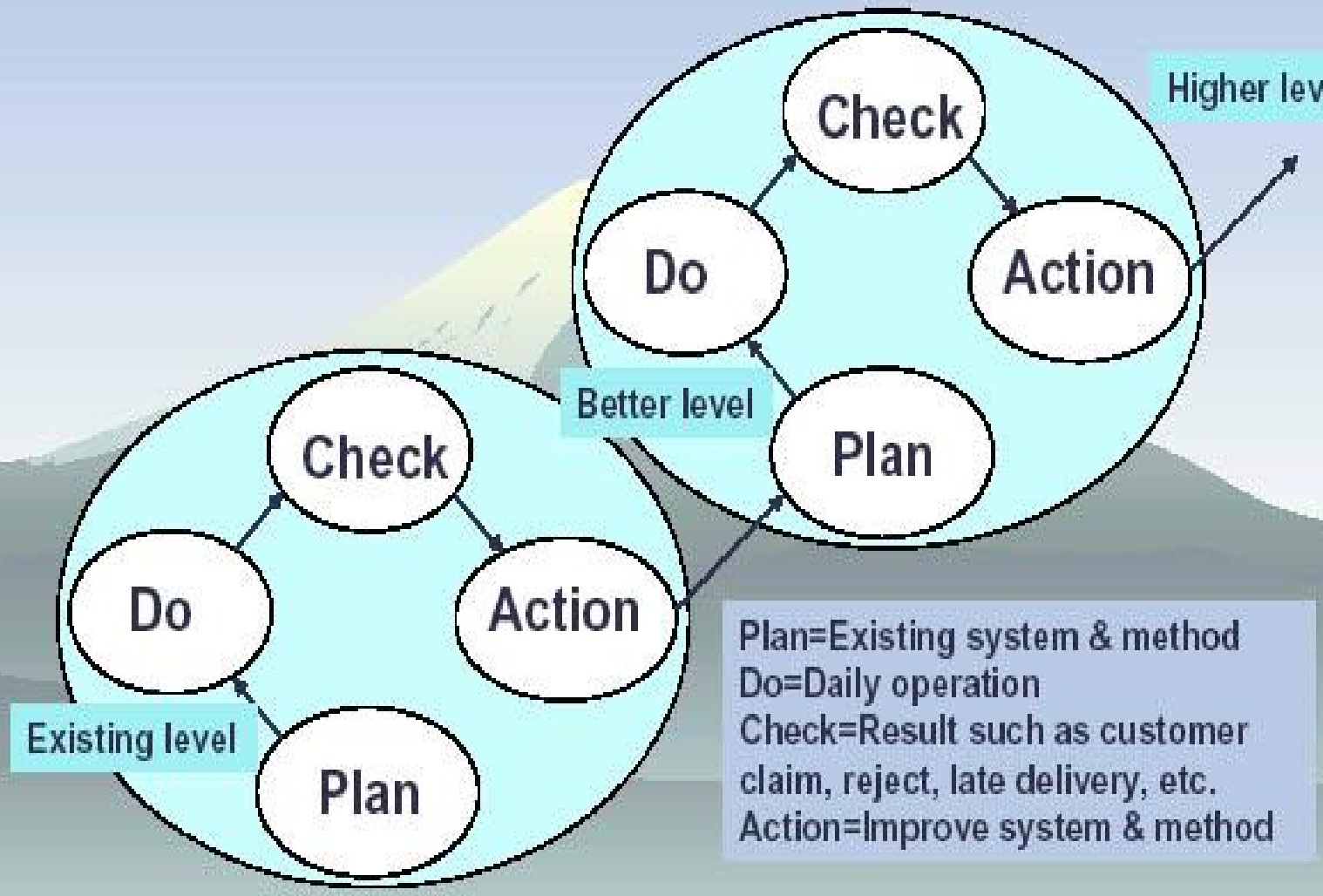
   "In-process (or in-line) Visual Control" for operators to easily follow work standard

3. For Shop-floor Motivation

   Visual Control posted on boards at shop-floor

Effective Problem Solving

Basics of Production Management: 4) PDCA

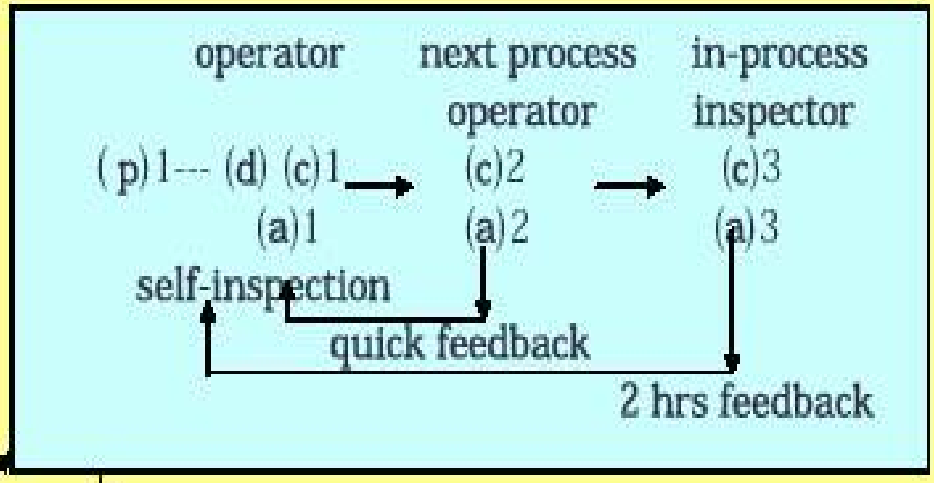


Precise PDCA for Do (Daily Operation)

P: Preparation = Best Conditions (4 M) (p)1 and Daily Target (p)2.

D: Operation =

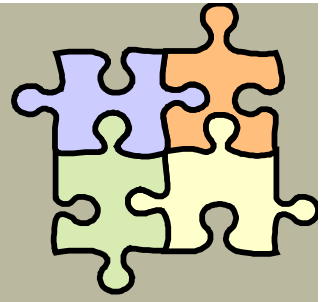
Shop-floor Control



Daily Control (p)2

(c)4: shift by shift check
1) high light too high reject, too low production
2) find abnormal conditions of the above 1)

(a)4: daily actions
1) actions to achieve good quality production
2) corrective actions to restore Best Conditions



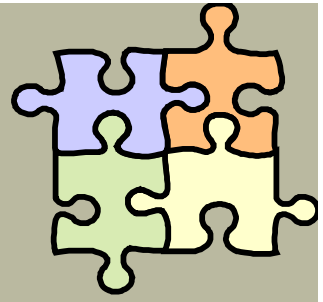
ANALYZE THE IDEAS

Affinity diagrams

Objective: Affinitizing is an excellent way to organize the results of a brainstorming session. After the group has developed the ideas on Post-it notes and placed them onto the white board, you should do the following:

Small groups of team members move the cards or notes into clusters that appear to share similar ideas. The notes can be moved as many times as the group feels is necessary until all the members are satisfied with the clusters. A cluster can contain any number of cards – even one. Often seven to ten clusters will come out of this activity.

The group then clarifies and discusses the relationship between the items and assigns a title for the cluster. Many times, one of the cards within the cluster will serve as a title for the entire cluster. If a title doesn't emerge, develop one and place it over the cluster. If a group of items falls into a miscellaneous cluster, see if they now fit into one of the designated clusters.

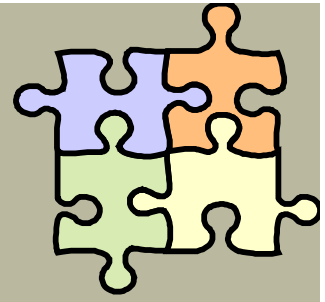


Affinity diagrams

Points to watch:

The facilitator has to play a pro-active role in driving clear, distinct categories. Look for overly large groupings or groupings with multiple subjects. A large, amorphous heading such as “Data” might contain two different subjects, such as data that’s been input to Amadeus and reports generated from Amadeus. Ask the group, “Can someone explain why these two are together?” or “Are there two different subjects in this category?”

The facilitator should push the group to find missing, redundant or overlapping categories.



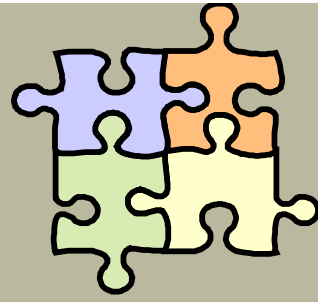
Interrelationship Diagraph

Objective: to identify, analyze and classify the cause and effect relationships that exist among items.

The interrelationship diagraph:

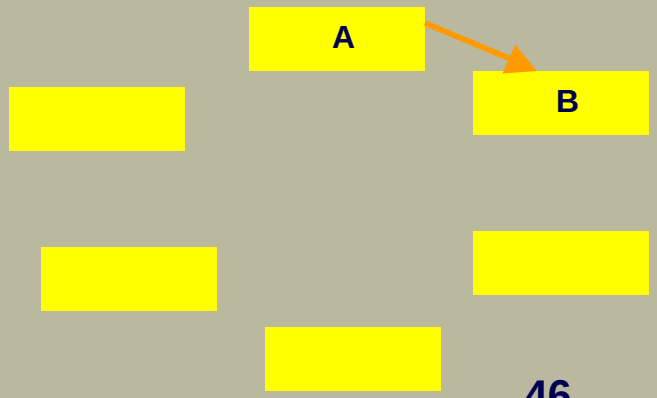
- Helps the group focus on a possible solution;
- Encourages thinking in multiple directions;
- Finds cause and effect relationships;
- Allows key issues to emerge naturally; and
- Helps to identify root causes.

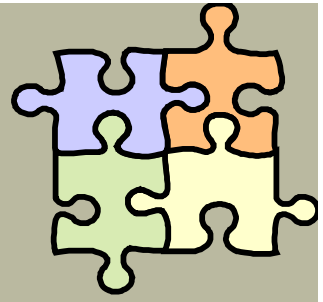
Note: This exercise can require considerable time, since ideas are continually being reviewed by the participants.



Interrelationship Diagraph

- Use the statement and header cards from the Affinity Diagram.
- Arrange the header cards in a large circular pattern.
- Compare each card with every other card.
  - Ask, “Is there a cause/influence relationship?”
  - If the answer is yes, ask, “In which direction is the cause/influence greater?”
- Draw an arrow showing the relationship.

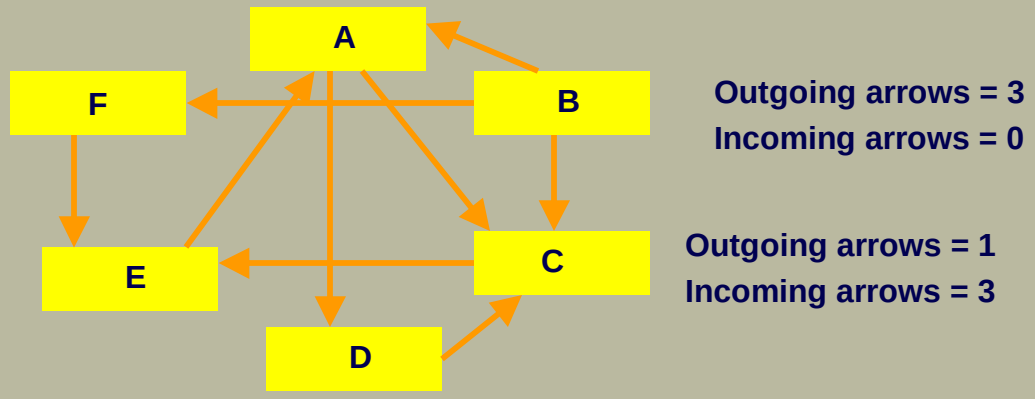




ANALYZE THE IDEAS

Interrelationship Diagraph

- Tally the number of outgoing and incoming arrows for each item.
- The item with the largest number of outgoing items is the root cause or driver. This is generally the item to focus on.
- The item with the most incoming arrows indicates a key outcome.



Practical Approach
for Improving Production Mgt

1. "Critical Issue" oriented, not tool oriented

2. "Pilot (Model) Area" with an intensive effort, not company-wide from the first*

3. "Basics of Production Management",
   1) Best Conditions, 2) Flow Production,
   3) Visual Control, 4) PDCA

*For already established factory. New factory needs factory-wide intensive system development and training at initial stage.

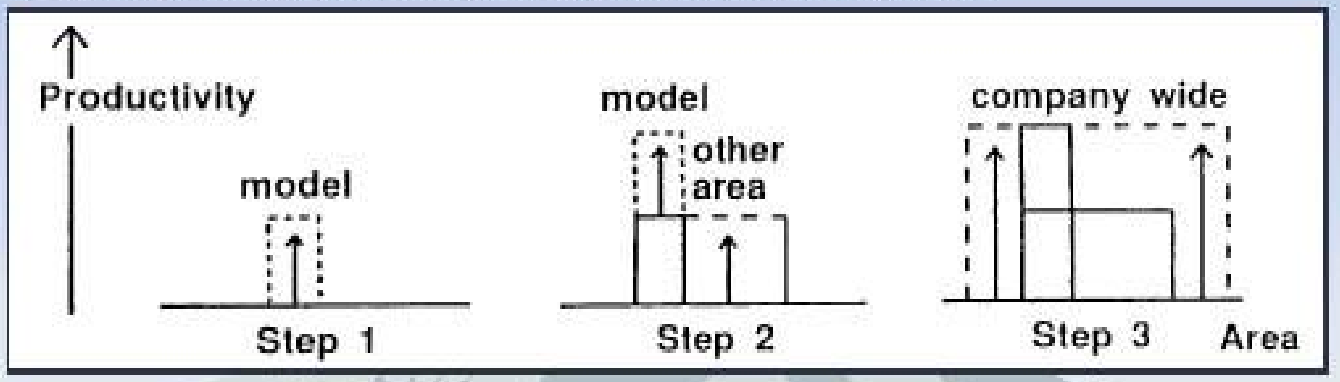
1. Critical Issue

One of **P** (Production capacity),
Q (Quality),
C (Cost),
D (Delivery)
••

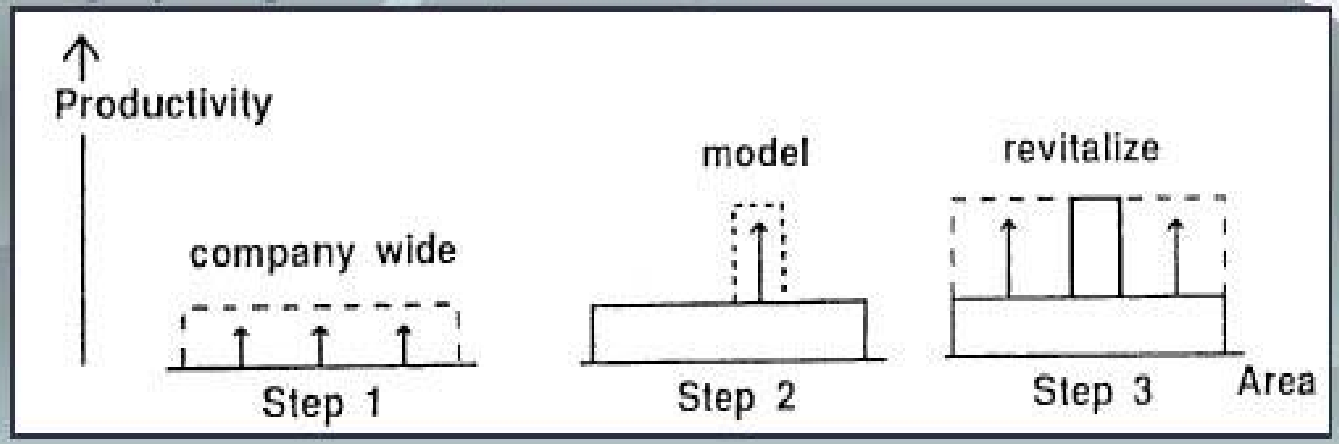
which need to be improved by
intensive effort within a certain period

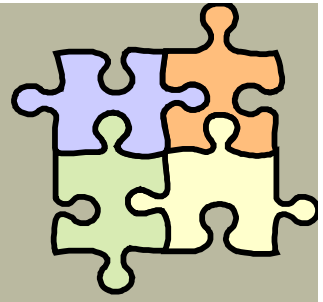
2. Pilot (Model) Area

Step by Step, starting with pilot (or model) area



Step by Step modified, effective for 5S





ANALYZE THE IDEAS

Prioritizing

Objective: to establish which problems merit the group's immediate attention.

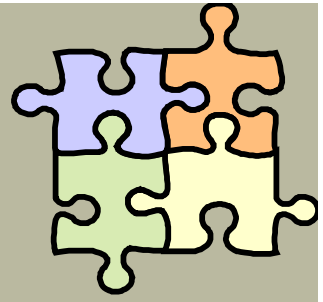
Once a problem has been brainstormed and affinitized, team members vote on which categories they deem most important.

1. Establish the criteria that will be used for prioritization:

   IMPACT – what impact do the issues have on the major problem?

   CONTROL – can members of the team take actions that will affect the problem? The most productive problems to tackle are those that require actions only by members of the group and peers at their level.

   CLARITY – Is the "problem area" category well-defined and understood by the group?

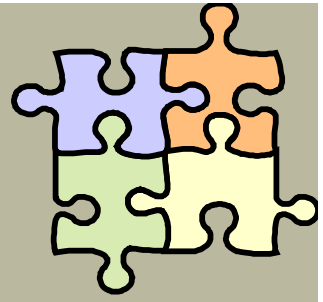


Prioritizing

2. Select the most important problems. One of two voting methods is usually used:
   - A show of hands, with each person getting only three votes; or
   - Each person goes to the board and puts a check mark next to his/her top three preferences. The three problems with the most check marks are selected

3. Review the group's selections. If you are the facilitator, push back and challenge them.

4. A key question to ask at this point is whether the problems being highlighted are beyond the scope of the group members. Ask questions such as, "Who owns this process?' or, "Can we make these changes?"

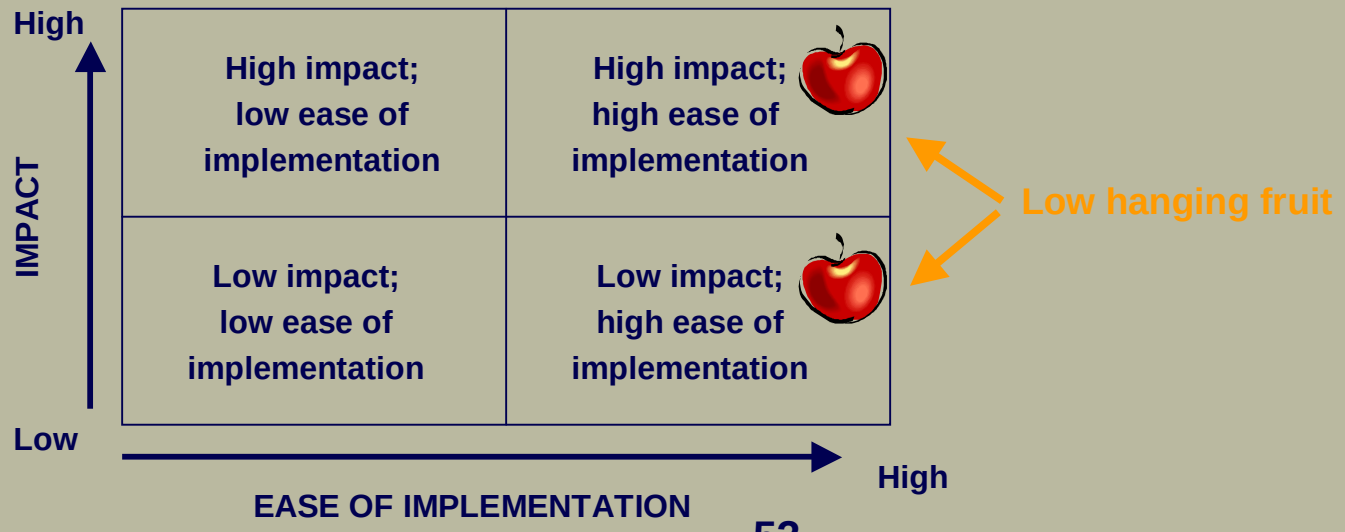


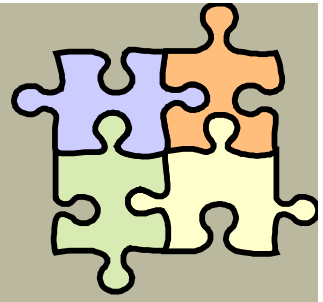
ANALYZE THE IDEAS

The Two by Two

Objective: analyze which solutions will have the biggest payoff in relation to the ease of implementation and impact.

Draw the 2x2 below on a white board. Take each of the items you need to prioritize and write each one on a separate Post-it note. Ask if each issue is High or Low in its Impact. Then ask how easy it would be to implement. Place the Post-it note into the appropriate box.





The Two by Two

After the group has placed each of the ideas into the boxes, analyze the results. Has almost everything fallen into one quadrant? Is the group overestimating the ease of implementation? Underestimating it? Keep pressing the group to refine its thinking until everyone is satisfied that the problems are represented in the correct box.

ANALYZE THE IDEAS

Establish Critical Success Factors

Objective: to gain agreement on the 6-8 critical factors upon which success depends. The focus is on what the group should do going forward**.**

Write the project name as a header card and ask the group to brainstorm the 6-8 critical success factors that have to be achieved if the project is to be successful. These might be:

- Indicators of progress
- "Must Do" to be successful
- "Must Have" to be successful
- Key Measurements
- Critical Persons' Support

ANALYZE THE IDEAS

Create a Responsibility Grid

Sometimes things don't get done when meetings are over because the group isn't clear about what each member has to do. This chart helps to overcome the problem.

Objective: Identify and agree on who will be responsible for different tasks. The team develops these decisions together.

	Names				
Project Tasks					

- Makes patterns of responsibility clear;
- Ensures an appropriate distribution of tasks;
- Helps teams to reach consensus.

ANALYZE THE IDEAS

Create a Responsibility Grid

EXAMPLE

Primary Responsibility:

Resource:

Project Tasks	Names: Sam	Jim	Tom	Ann	Jane
Type up minutes and distribute	Primary				
Research buyers			Resource	Primary	Resource
Email sellers	Resource	Primary			
Follow-up with VP				Resource	Primary
Compile marketing list			Primary		
Prepare mailing		Resource		Primary	

ASSIGN ONLY ONE PERSON AS THE LEAD ON EACH TASK.

ANALYZE THE IDEAS

Another Use of the Responsibility Grid

Objective: Identify and agree on how decisions will be made, both within the team and in terms of key stakeholders. The team develops these decisions together.

As before, write names in the top section and tasks in the left column; but this time, add numbers from the list below in the appropriate box.

	Names				
Project Tasks					

1. Should be the only one to make this decision
2. Should have veto power over this decision
3. Should be one of those who votes
4. Should be consulted before the decision is made
5. Should be told about the decision after it is made
6. Has no need to be involved in this decision

ANALYZE THE IDEAS

Stakeholder Analysis

A stakeholder is a person or group who is:

- Responsible for the final decision;
- Likely to be affected by the outcomes you want;
- Able to assist or block the outcomes you want;
- Has expertise and/or resources that can affect the quality of your project.

Stakeholder Analysis allows you to identify:

- Committed supporters
- Potential resistance
- Key influencers

and prepare a strategy to help achieve your goals.

ANALYZE THE IDEAS

Stakeholder Analysis

Names	Strongly Against	Moderately Against	Neutral	Moderately Supportive	Strongly Supportive	Issue/Concern	How do I get a win for them?

1. Plot where individuals currently stand with regard to desired change.
2. Plot where individuals need to be if you are to accomplish change successfully. Identify gaps between actual and desired.
3. Indicate how individuals are linked to each other. Draw lines to indicate who influences whom.
4. Plan action steps for closing the gaps.

Stakeholder Analysis

Names	Strongly Against	Moderately Against	Neutral	Moderately Supportive	Strongly Supportive	Issue/Concern	How do I get a win for them?
Joe	■		☑				
Jim		■		☑			
Jane			■		☑		
Julie	■		☑				

Once the group has worked out where key stakeholders stand on the issue, move onto the last two columns.

AFTER THE MEETING

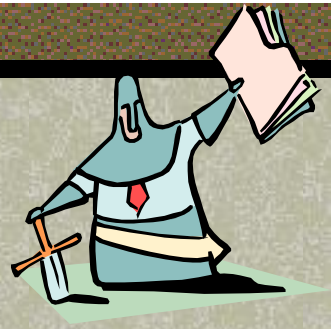
Working Together

Objective: to identify the issues affecting the stakeholders, what their concerns are, and what can be done to resolve differences.

Directions:

1. Members of the team agree who the most important stakeholders are.
2. The team determines what stakeholders' concerns or interests are.
3. In the "Issues/Concerns" column, the team writes down *why the stakeholder takes that position (*not what the stakeholder's position *is.)*
4. The team discusses and agrees on a strategy that:
   - acknowledges stakeholders' concerns; and
   - can effectively remove barriers.

AFTER THE MEETING



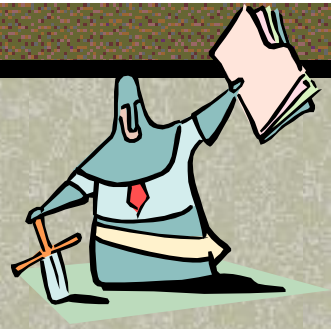
Meeting notes and minutes

Objective: to follow up on the decisions and actionable items that come out of a meeting.

All too often, decisions made in a meeting are neither documented nor conveyed to attendees or stakeholders. To avoid this pitfall:

- Ask someone in the meeting to act as the note-taker or scribe.
- Type up the notes after the meeting to document what was said.
- Fill out the following template (which you can download from the Process Excellence website on Global Net) and distribute it to all your invitees and stakeholders.

AFTER THE MEETING



Working Together

Objective: to follow up on the decisions and actionable items at the meeting.

Meeting Notes

Date:	

Attendees:s:

Agenda:	Decisions:

Action Items:	Responsible:	Deadline:

Other

Practical Tools

Practical Tools tell you

"How to Utilize KAIZEN Tools Practically"

KAIZEN Tools are

IE, QC, 5S, Suggestion Scheme, QCC, TQM, JIT, TPM, etc.

Utilize Practically means

"Produce result within a short time"

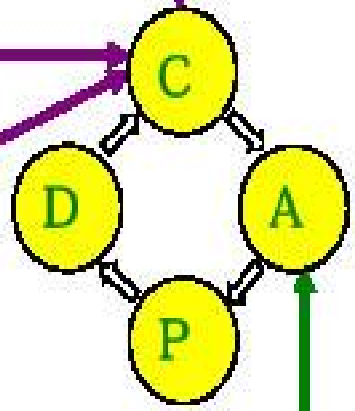
Summary of Practical KAIZEN

3 Gen (SAF)

Genba : at Site
Genbutsu: with Actual thing
Genjitsu : find Fact

Muri : Un-natural
Mura : Un-even
Muda : Waste

Process Analysis
Stratified Data Collection



and 2 Gen

Genri : Basic Theory

Gensoku : Principle, 3 Guiding Principles
1) Securing Employment
2) Management and Labor Cooperation
3) Fair Share of Results

Best Conditions
Flow Production
Visual

P: Plan*
D: Do
C: Check
A: Action*

Plan*=existing system & method
Action*=improving system & method