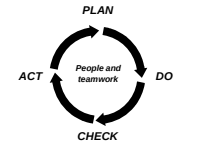
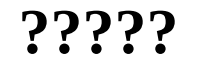
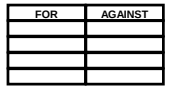
Problem Solving Tools

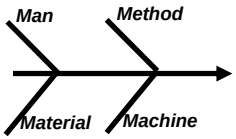
Problem Solving Tools

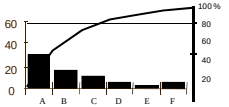
- Deming wheel of Improvement
- 5 Why's
- 5W1H
- Brainstorming
- Force field analysis
- Idea Ranking
- Cause & effect diagrams (Fishbone)
- Pareto
- 8D
- FMEA



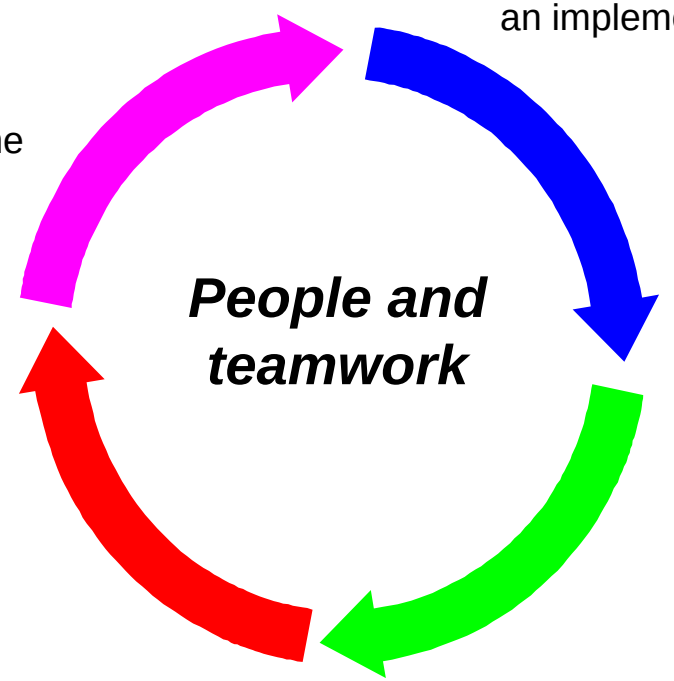








The Deming Wheel of Improvement



PLAN

Understand and measure the problem/opportunity, its root causes, develop some potential solutions and devise an implementation plan

DO

Put the plan in to action as quickly and cost effectively as is prudent

CHECK

Check that the new situation works and measure against the old situation or target

ACT

Establish the new situation/solution/system as the standard if the results are satisfactory or take remedial action if not.

People and teamwork

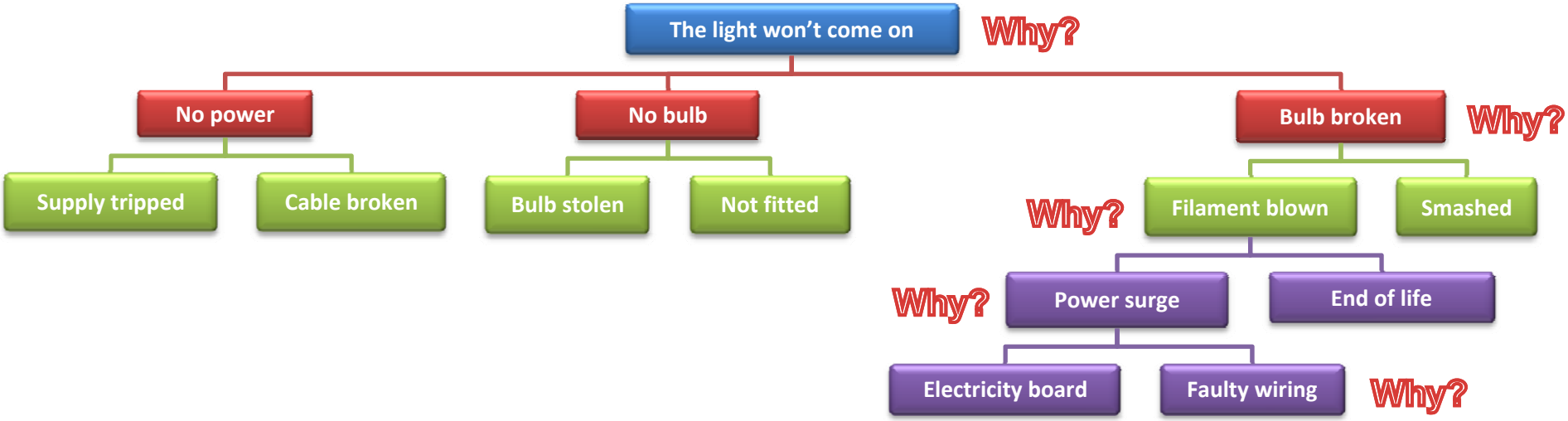
Problem Solving

The 3 steps to problem solving:

1. Develop a thorough definition of the problem
2. Define the system in which the problem occurs
3. Ask why? Five times to develop an event tree

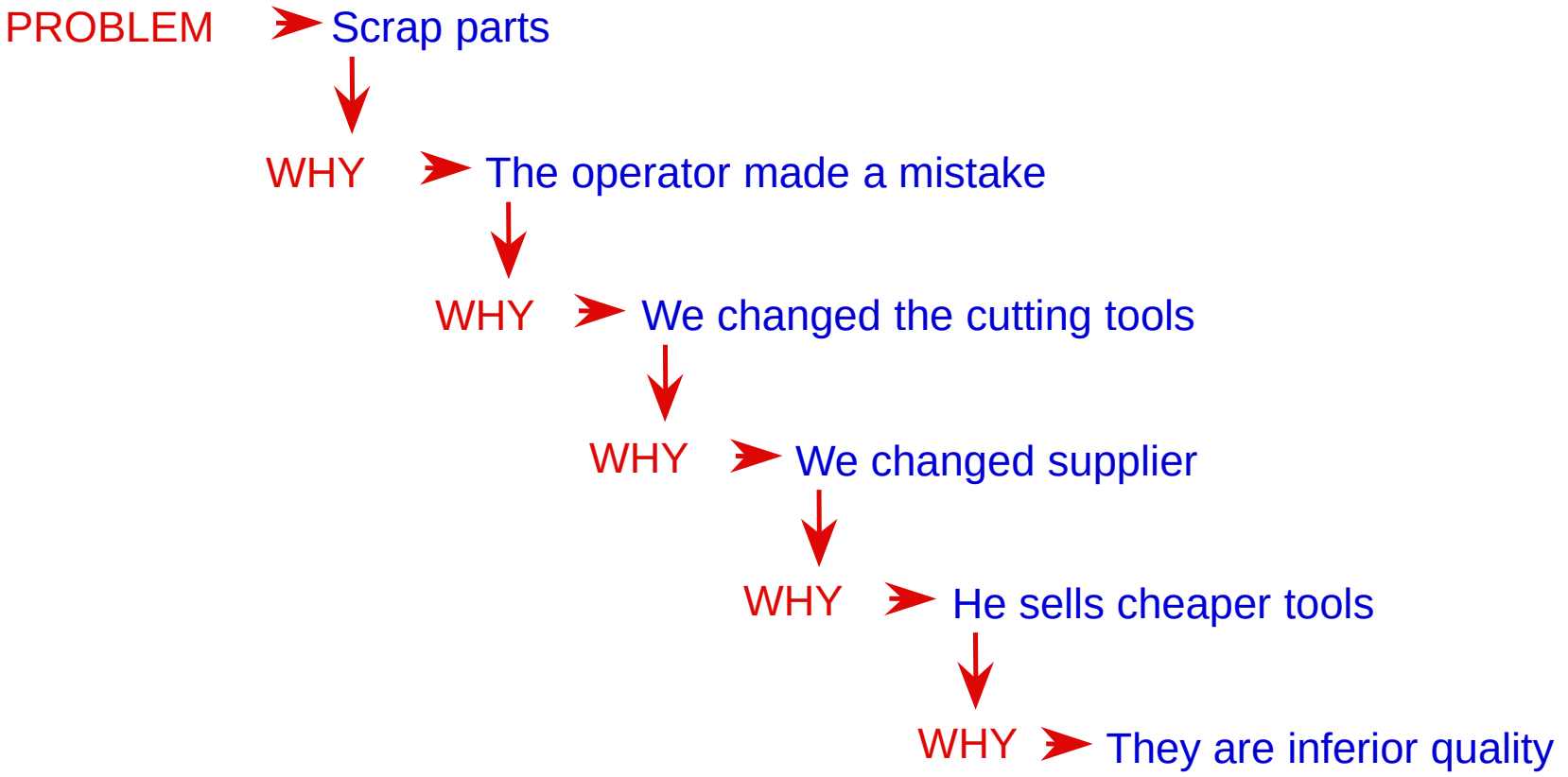
Event trees:

A structured way of identifying all the possible causes of a problem e.g.:



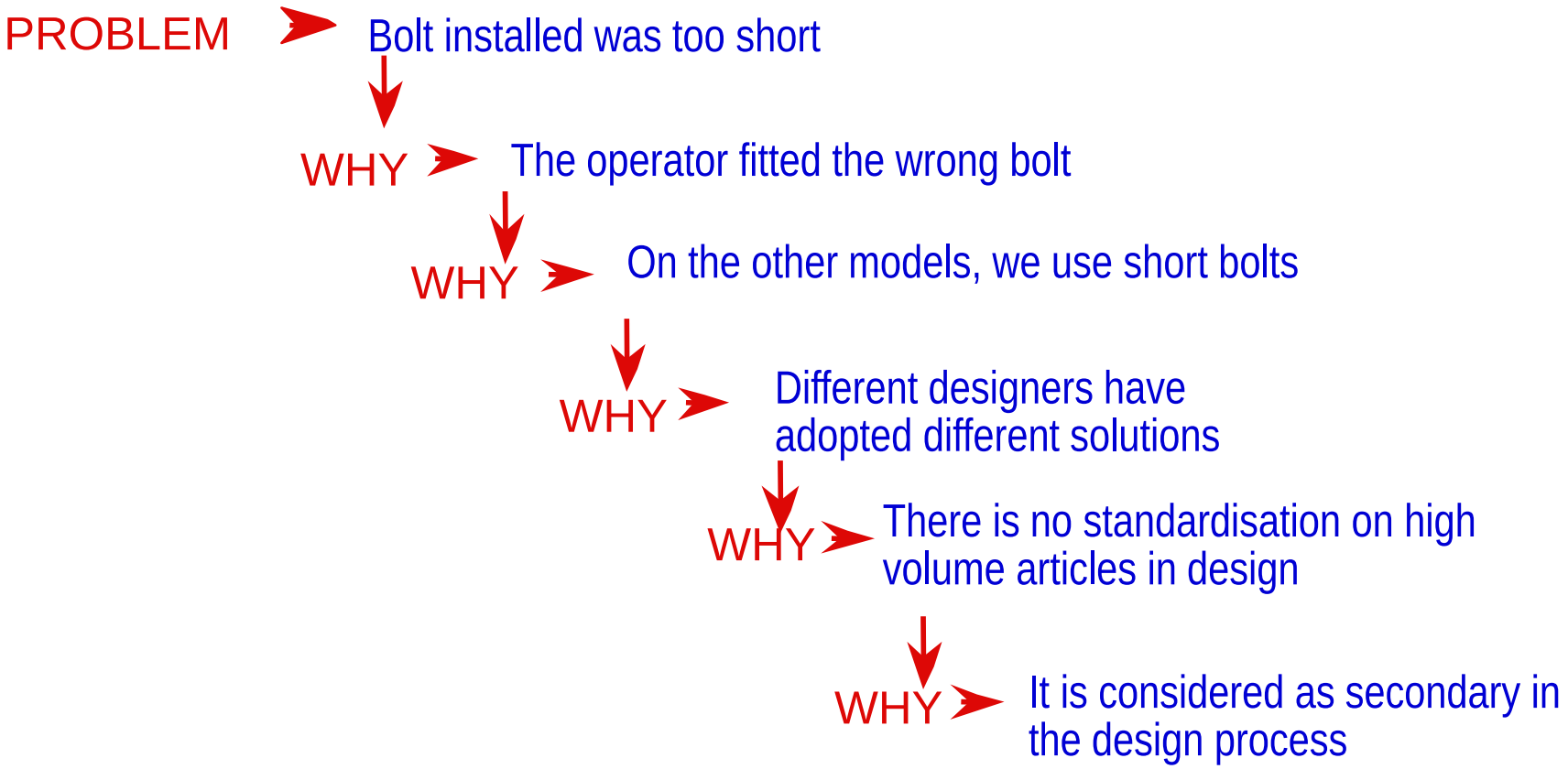
Asking why 5 times is usually sufficient to find the root causes

The 5 “Why’s”



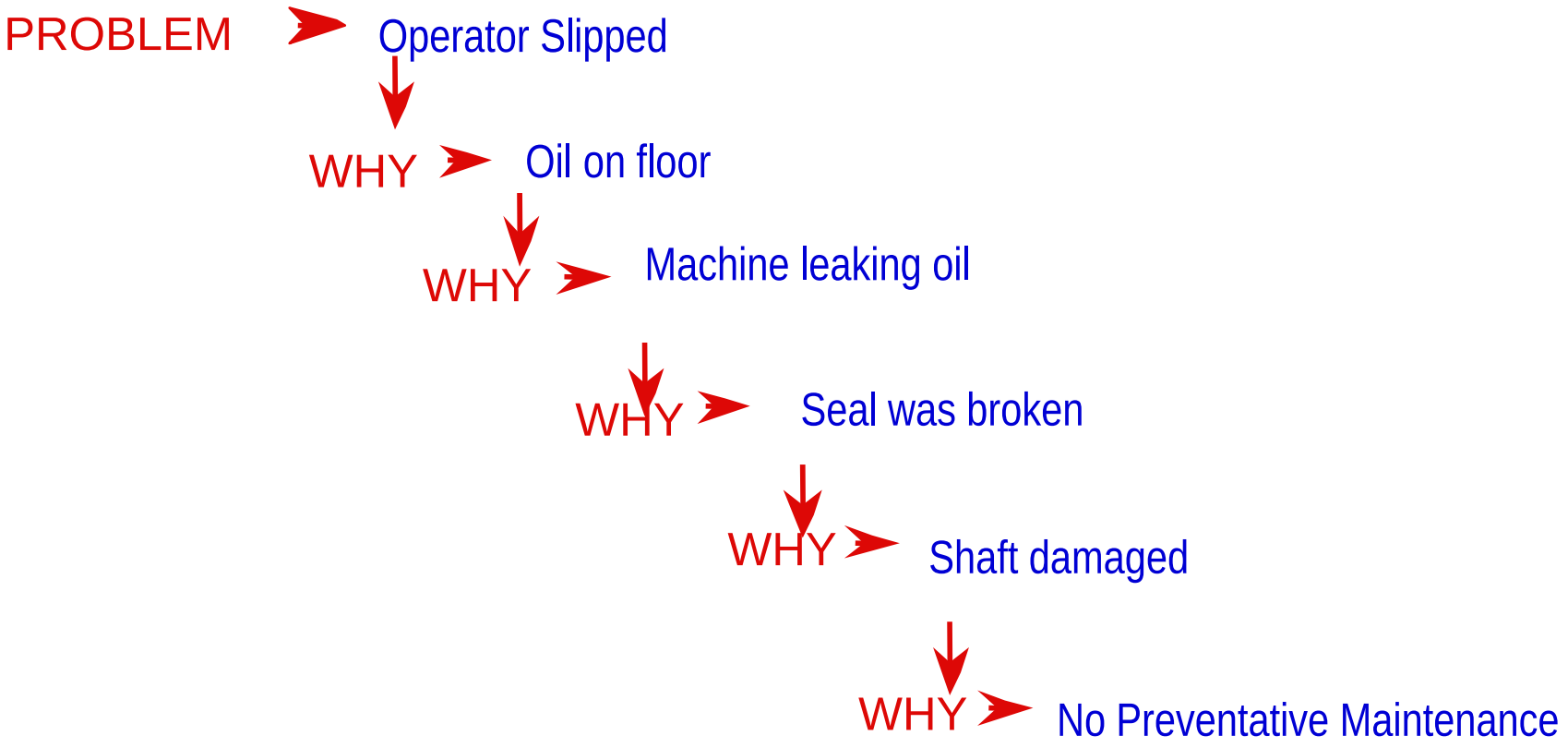
Find the root cause

The 5 “Why’s” (cont’d)



Find the root cause

The 5 “Why’s” (cont’d)



Find the root cause

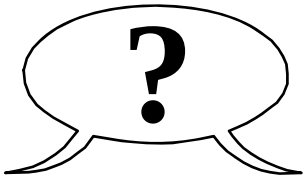
5W1H

I keep six honest serving-men
(They taught me all I knew);
Their names are What and Why and When
And How and Where and Who.

Rudyard Kipling

5W1H	Meaning	Considerations
Why	Why do we need to do it? (Objective)	· Could it be avoided? · Could some of it be left out?
When	When does it need to be done? (Time frame, point in time)	· Could the time frame be changed? · Could the implementation time be changed?
Who	Who should do it? (Person)	· Could the person be changed? · Couldn't the same person do it?
Where	Where should it be done? (Location, position)	· Could it be done somewhere else? · Couldn't it be done in the same place?
What	What do we need to do? (Target)	· Would any other object/document do? · Could the shape/form be changed?
How	How ought it to be done? (Method)	· Is there any other way? · Could it be done an easier way?

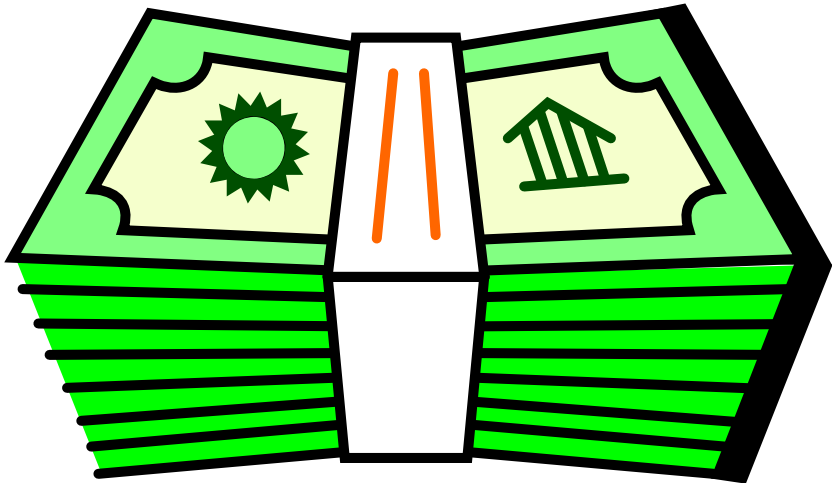
Rules for Brainstorming



- Choose a facilitator - to scribe, involve and operate ‘rules’
- Define the problem/concern - write it down
- Generate as many ideas as possible - quantity not quality
- Encourage freewheeling - don’t reject “silly” ideas
- No criticism - evaluate later
- Everyone to participate - take turns if necessary
- Write everything down - don’t edit, keep record
- Let ideas incubate - allow them to ‘hatch’
- Use pattern breaking methods to unjam
  - reverse assumptions – how can we make this worse?
  - forcing associations – what is this problem like?
  - other perspectives

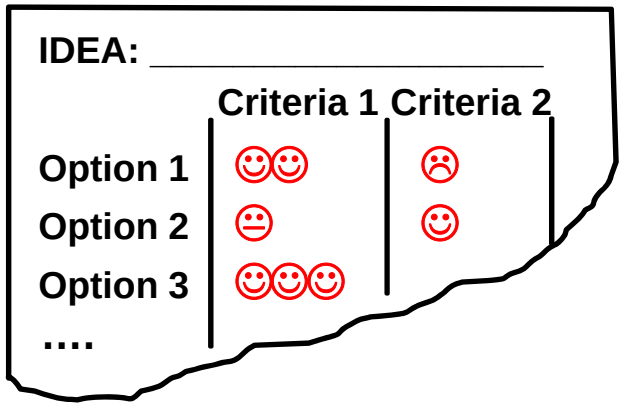
Think What? Where? When? How much/many?

Brainstorm - ways to make more Money



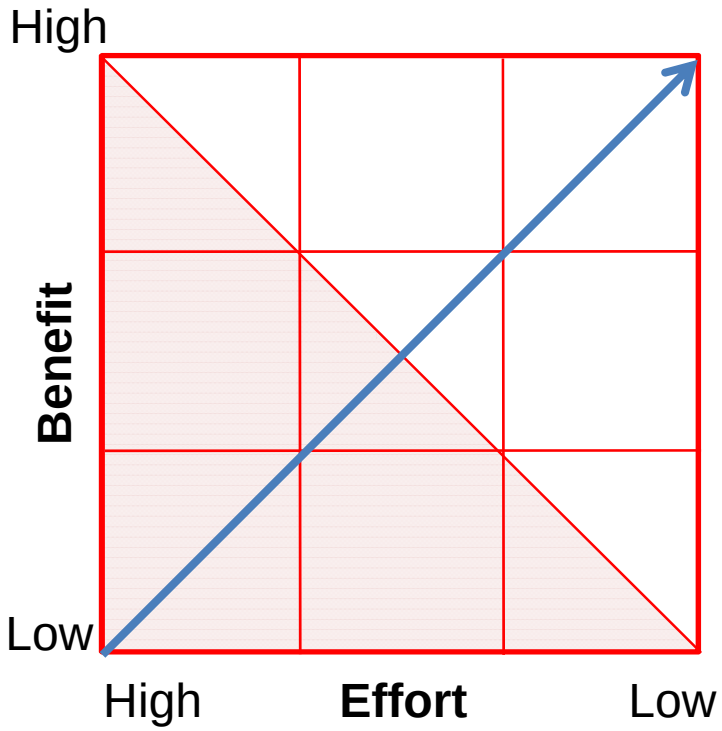
Selecting Ideas

1. Voting
   - each person to choose best three ideas
   - record number of times each idea is chosen to identify most popular ideas
2. ‘Pen dots’
   - each person to allocate 10 dots across all ideas (maximum 5 dots per idea)
   - count up scores for each idea
3. Ranking - ‘High, Medium or Low’ or 1 to 10 or ‘smilies’ ☺ 😐 ☹
   - decide as a group the score for each idea
   - criteria – easiest, best payback, most interesting



Selection Matrix

- Assess each idea as a group on a scale of low to high based on:
  - the potential benefit gained
  - the amount of effort required to implement the idea
- Mark your assessment of each idea on the matrix
- The better ideas are in the top right of the matrix



Ranking Ideas Worksheet

Concern:							
Weighting	Rating	Weight x rate	Forces which help achieve the objective	Forces which prevent achievement of objective	Weighting	Rating	Weight x rate
			1	1			
			2	2			
			3	3			
			4	4			
			5	5			
			6	6			

PUGH Matrix - Ranking Method

- List ‘things’ (concepts/projects/ideas) to be evaluated across top
- List CTSs/features down left hand side
- Rank each ‘thing’ against a standard or datum OR against each other

PUGH Matrix - Evaluating and Synthesizing Concepts

Put B, W, or S in each cell to represent if concept is better, worse, or same as the datum concept.

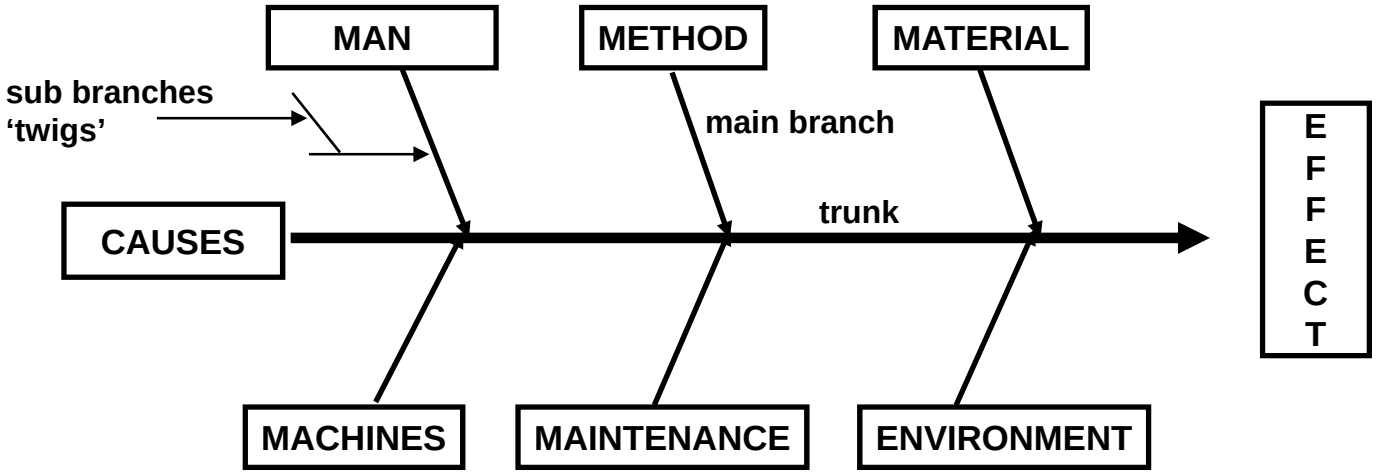
Work this way ---->

Concept / project / idea etc / CTSs / Features	Import. Rating	1 - Design Function then Merge	2 - Filter then Separate	3 - Filter then Merge	4 - Separate then Merge	5 - Ideas tool then no change	6 - Do Nothing
Fast/Slick Governance Process			W	B	W	W	W
Fit for purpose		D	W	W	W	W	W
Simple Governance process and not over engineered		A	W	B	W	W	W
Easy for originator put an idea into the process		T	S	S	W	B	W
Cost effective process		U	W	B	W	S	W
Fast delivery of IT solution after Passage through Governance Process		M	W	S	S	W	S
Process has flexibility to accommodate changing business needs / priorities.			W	S	W	W	W
Provides good feedback & communication with originator			W	W	W	B	W
ΣB's			0	3	0	2	0
ΣW's			7	2	7	5	7
ΣS's			1	3	1	1	1

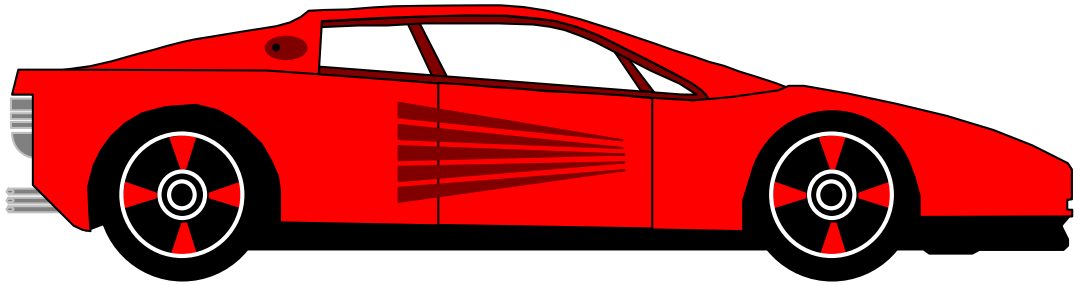
Cause & Effect Diagrams

(Fishbone or Ishikawa Diagram)

- Define the problem/concern - i.e. the ‘effect’
- Subdivide big problems - tackle each part
- Identify main causes - use ‘6M’s’ or other
- Identify sub-causes - attach ‘twigs’
- Circle biggest causes - rank them using Pareto

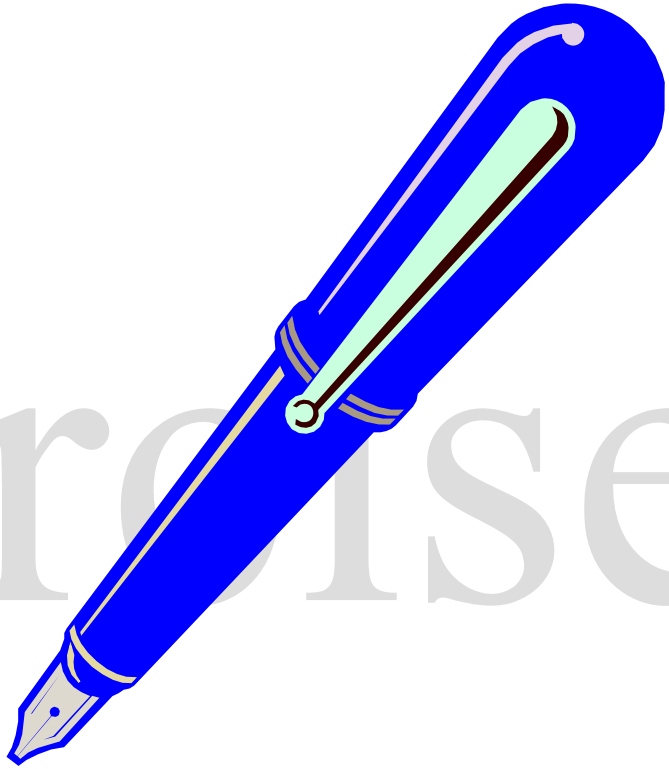


Poor Petrol Usage?



Exercise

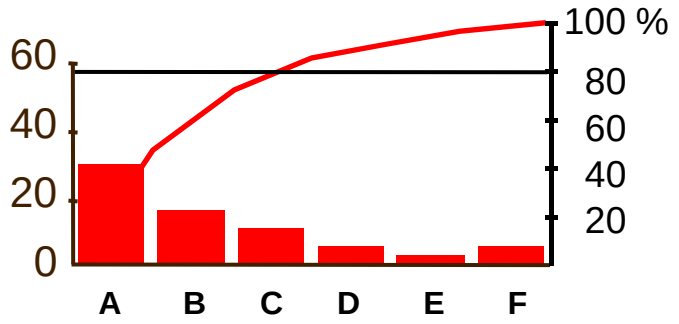
Pen will Not Write?



What makes a consistent cup of tea?

Pareto Diagrams - 'The 80/20 rule'

- Decide which items to study - causes or effects
- Collect data - check sheets, SPC, other
- Arrange in descending order - biggest first
- Calculate cumulative total and %'age
- Draw a bar chart & cumulative %'age



PARETO ANALYSIS CALCULATIONS

DEFECT	NUMBER OF DEFECTS	CUMULATIVE NUMBER	% CUMULATIVE = Cumulative Number x 100% / Total Number
1. Cold Lap	30	30	43%
2. Burn	17	30+17=47	67%
3. Porosity	10	47+10=57	81%
4. Overlap	5	57+ 5=62	89%
5. Undercut	2	62+2=64	91%
6. Other (10)	6	64+6=70	100%
TOTAL	70		

8D (eight disciplines)

1. Establish and involve ' the team '
2. Describe the problem
3. Introduce interim containment actions
4. Define & verify ' root cause '
5. Verify effectiveness of permanent corrective actions
6. Implement the permanent solution
7. Prevent recurrence on similar products / process
8. Thank ' the team ' - issue feedback

FMEA

Process or Product Name:		
Responsible:		

Process Step	Key Process Input	Potential Failure Mode	Potential Failure Effects	SEV	Potential Causes	OCC
What is the process step	What is the Key Process Input?	In what ways does the Key Input go wrong?	What is the impact on the Key Output Variables (Customer Requirements) or internal requirements?	How Severe is the effect to the customer?	What causes the Key Input to go wrong?	How often does cause or FM occur?

Prepared by:	Page ____ of ____
FMEA Date (Orig) _____ (Rev) _____	

Current Controls	DET	RPN	Actions Recommended	Resp.	Actions Taken	SEV	OCC	DET	RPN
What are the existing controls and procedures (inspection and test) that prevent either the cause or the Failure Mode? **Should include an SOP number.**	How well can you detect cause or FM?		What are the actions for reducing the occurrence of the Cause, or improving detection? **Should have actions only on high RPN's or easy fixes.**	Whose Responsible for the recommended action?	What are the completed actions taken with the recalculated RPN? **Be sure to include completion month/year**				
		0							0