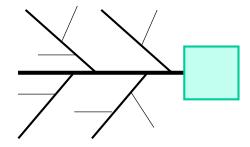
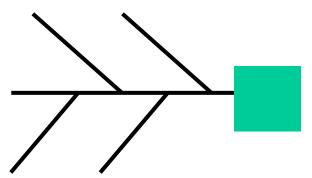
Continuous Improvement Toolkit



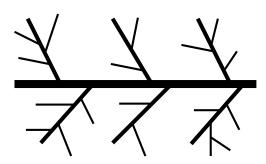
The Continuous Improvement Map

Managing	Deciding & Sele	ecting Plan	ning & Project Management*			
Risk PDPC	Decision Balance Sheet Impor	rtance-Urgency Mapping [Daily Planning PERT/CPM			
FMEA RAID Log*	Force Field Analysis Cost B	Benefit Analysis <u>MOST</u>	RACI Matrix Activity Networks			
Risk Assessment*	Break-even Analysis Voting	TPN Analysis <u>SWOT</u>	Analysis Stakeholder Analysis			
Fault Tree Analysis	Decision Tree Pick Chart Foເ	ur Field Matrix Project Cl	harter Improvement Roadmaps			
Traffic Light Assessme	Critical-to Tree QFD Portf	folio Matrix PDC	CA Policy Deployment Gantt Charts			
Lean Measures K	ano Analysis Matrix Diagram Paired	Comparison DMAIC Kai:	zen Events Control Planning			
Bøttleneck Analysis**	obst of addition	ation Matrix A3 Thinking	Standard work Document control			
Process Yield	EE KPIs Pareto Analysis C8	RE Matrix Understanding	Cross Training Implementing			
	escriptive Statistics ANOVA Chi-So	quare Cause & Effect	Value Analysis Solutions**			
·	Probability Distributions Hypothesis Te	esting Design of Experiment	Mistake Proofing Ergonomics			
	tograms & Boxplots Multi vari Studies		Simulation TPM Automation			
	Graphical Analysis Scatter Plots Co	orrelation Regression	Pull Flow Just in Time			
Understanding Performance	SA Run Charts 5 Whys Root Cau	se Analysis Data Snooping	Visual Management 5S			
	Control Charts Fishbone Diagram		Waste Analysis Quick Changeover			
Data collection planner* Sampling Morphological Analysis How-How Diagram** Process Redesign Time Value Map						
Check Sheets Intervi			ti Diagram Value Stream Mapping			
Questionnaires Foot	Affinity Diagram Relat	ionship Mappi <mark>ng* Flow P</mark> i	rocess Charts Service Blueprints			
Data		al Thinking Flowcharting	IDEF0 Process Mapping			
Collection Obse	rvations Suggestion systems Creat	ing Ideas Desig	ning & Analyzing Processes			

- Identifies and organizes the potential causes of a business problem.
- Uses an easy and understandable format.
- Used to identify the sources of process variation.
- □ It is also called **Ishikawa Diagram** and **Cause and Effect Diagram**.

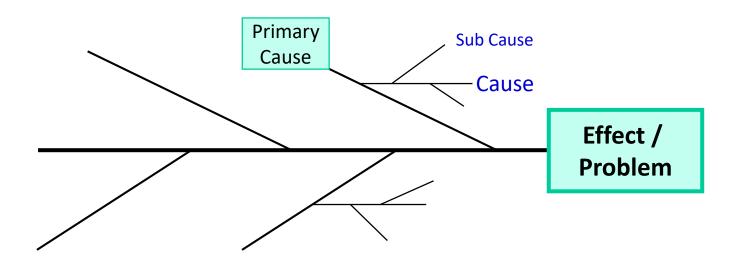


- Identifies the causes of an undesirable effect of a problem.
- □ It is also possible to identify the hierarchy of causes including the possible root causes.
- Brings attention to the primary factors affecting the quality of a product or service.
- These factors need to be optimized in order to reduce the amount of process variation.
- □ The outcome can provide initial information to later problem solving tools.



Root Causes are Normally:

- Those at the ends of chains of causes.
- They do not have any sub-causes.



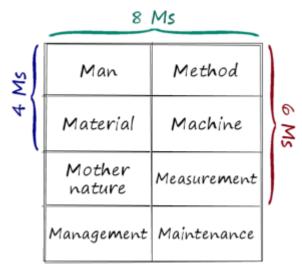
- □ Often used during **brainstorming sessions**.
- □ Everyone gains insight into the cause and effect
- This makes the solution easier to find later on.



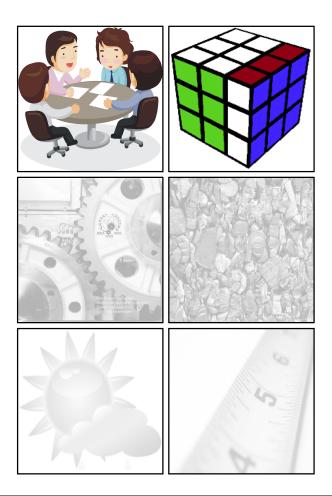
- Helps to create ideas about the possible causes of a problem before it happens.
- An effective cause prevention tool.
- Helps to identify the potential factors causing an effect to prevent future problems.
- Can also be used in product design and to plan new processes.



- Potential causes are sometimes called the process input variables.
- They are normally grouped into categories for easier sharing and reference.
- These are often called the 6 Ms.

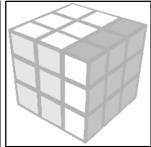


- Man anyone involved with the process and contributes to the effect.
- Methods how the process is performed and the specific requirements for doing it, such as:
 - Policies.
 - Procedures.
 - Rules.
 - Common practices.



- Machines including the equipment and tools required to do the process.
- Materials The material needed to produce the product or provide the service, including:
 - Raw materials.
 - Parts.
 - Papers.
 - Packing.
 - Consumables.





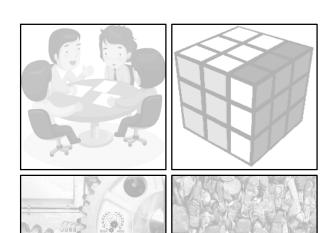








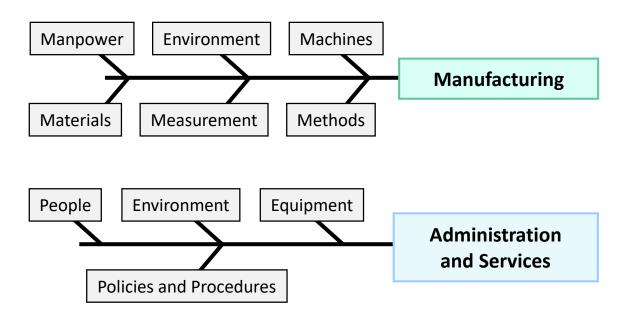
- **Environment** (or Mother Nature) the conditions in which the process operates such as:
 - Location.
 - Time.
 - Temperature.
 - Culture.
- Measurements including the data that are used to evaluate the performance of the process.







Typical Fishbone Diagrams for Manufacturing and Nonmanufacturing Processes:

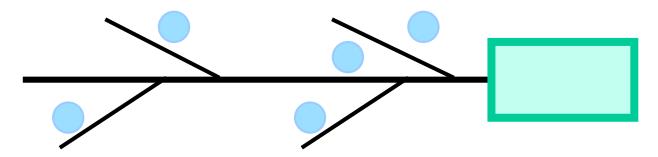


How to Construct a Fishbone Diagram:

- Clearly define the effect of the problem.
- Write it down at the center right of a large piece of paper.
- Determine the major categories of causes.
- Write them on the branches of the diagram.
- Use brainstorming to log all possible causes under the appropriate branches.
- Use 5 Whys to search for root causes then add them to the diagram.

How to Construct a Fishbone Diagram:

- □ Take time to ensure the appropriateness of the recorded information.
- Update the chart as new causes become apparent.
- Mark or assign numbers near to the key causes to show their relative priority.
- Collect data and investigate to verify the key causes are actual.
- □ Plan and implement actions to address the key causes.



Ways of Finding More Causes:

Keep asking questions to encourage everyone to participate.

Involve other people, especially those who have experience in

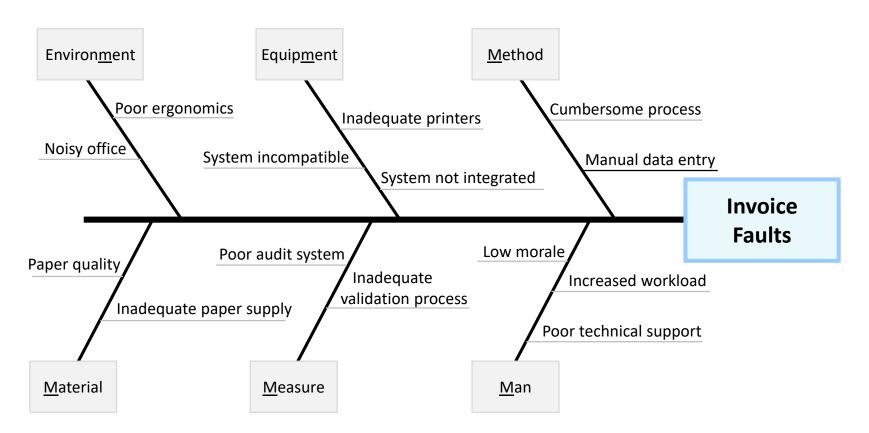
the process.

■ **Leave** the chart on the wall for few days and encourage passers-by to contribute.

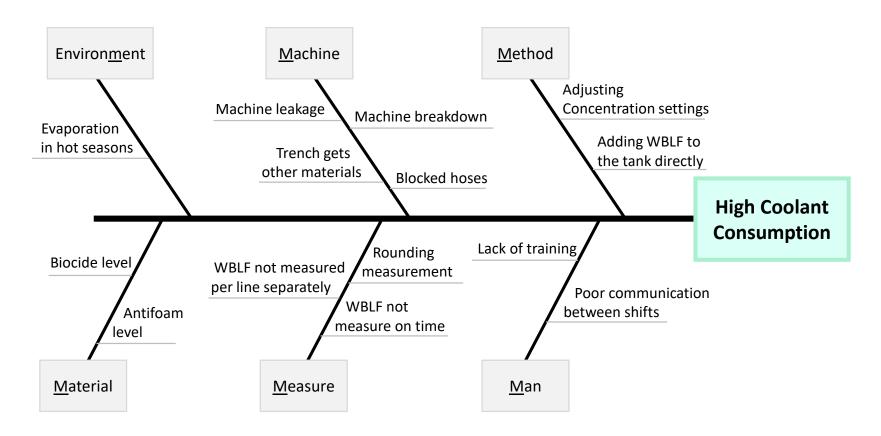
□ Take a **break** or do something to take the team's mind off the current thoughts.



Example – The Increased Invoice Errors for a Company:

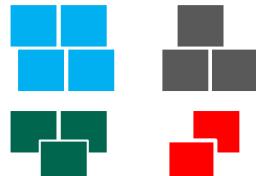


Example – The Increased Coolant Consumption in a Factory:



Further Information:

- Different names may be used for the same category.
 - Procedures could be used instead of Methods.
 - Equipment could be used instead of Machines.
- You may even create your own branches that suit your needs.
- An affinity diagram could be used to create the branches of the diagram from the titles of the affinity sets.
- Don't overload categories.
 - Establish another category if needed.

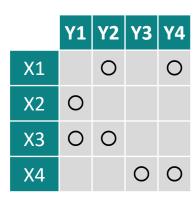


Further Information:

- You could also create sub categories under the main categories.
- □ For example, under **Man** there might be:
 - Poor Communication
 - Absenteeism
 - Lack of Training
 - ...
- You should, however, avoid writing real names of persons.

Further Information:

- Beware of adding causes which are actually solutions.
- A Cause and Effect Matrix could be used to prioritize the causes of the problem.
- Prioritizing and selecting the key causes will minimizes the need for more statistical evaluation of inputs that are unlikely to have an impact on the output.



Further Information:

Example – Making Tea Cause and Effect Matrix:

Cause / Effect	Taste	Volu	me	Temperature	
The boil kettle		С)	0	6
Adding water	Δ	С)	•	13
Adding tea	•				9
Adding sugar	0				3
Adding milk	•	Δ		Δ	11
Stirring	0				3
	25	7		13	
	Symbol	•	0	\triangle	
	Value	9	3	1	
	Relationship	Strong	Mediu	m Weak	