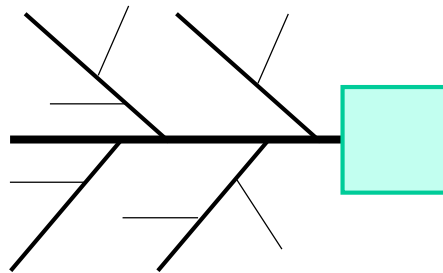
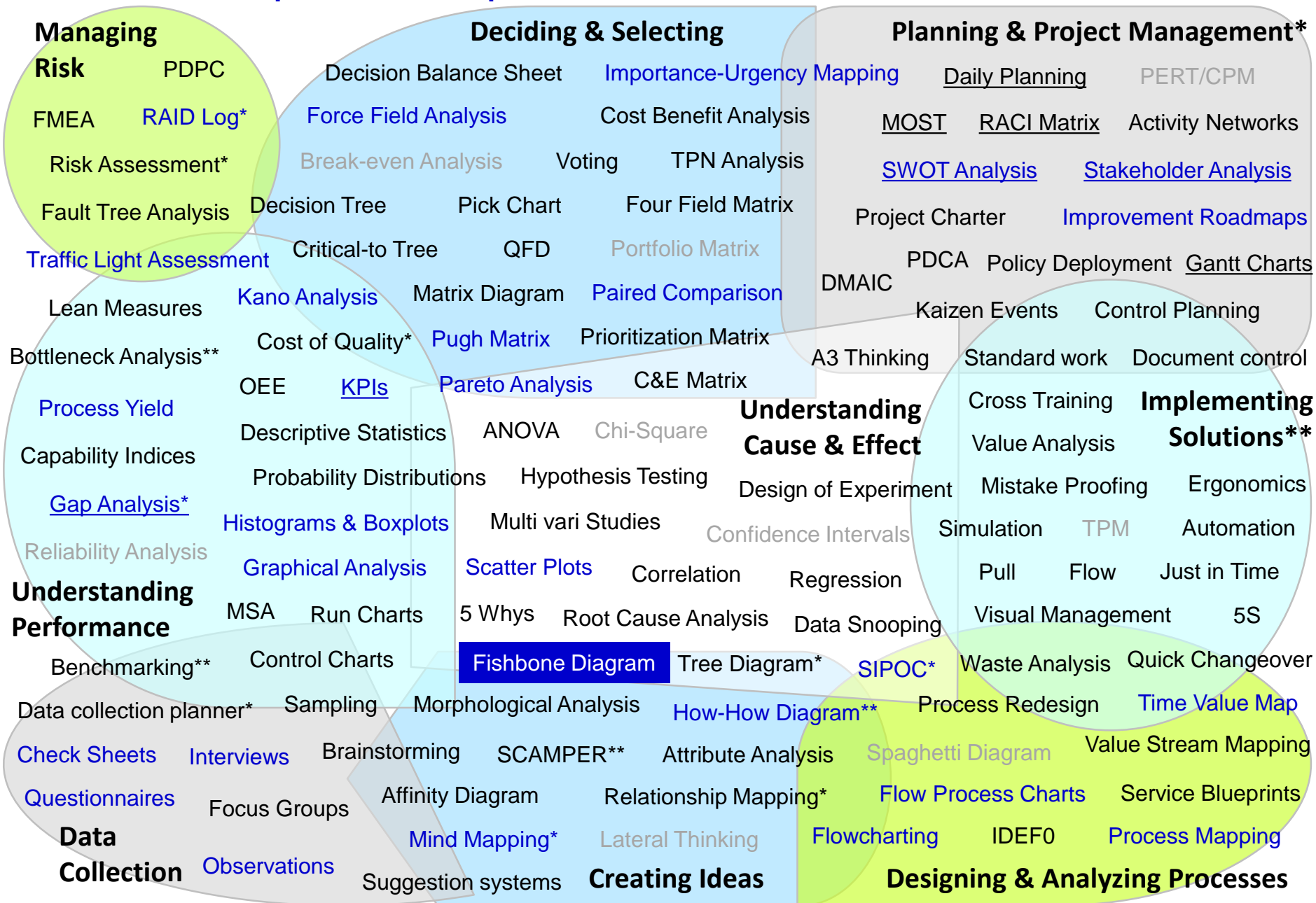


Continuous Improvement Toolkit

Fishbone Diagram

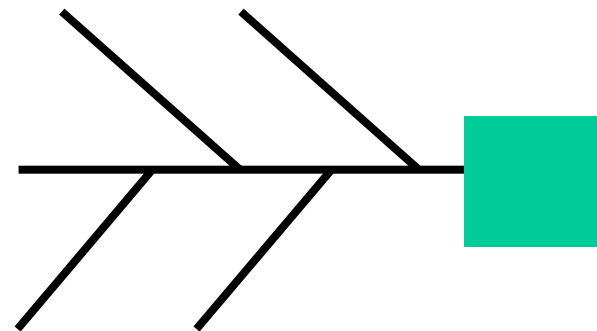


The Continuous Improvement Map



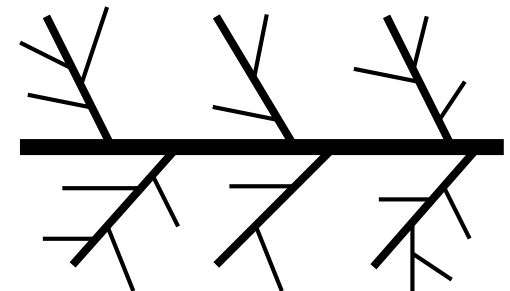
- Fishbone Diagram

- ❑ 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**.



- Fishbone Diagram

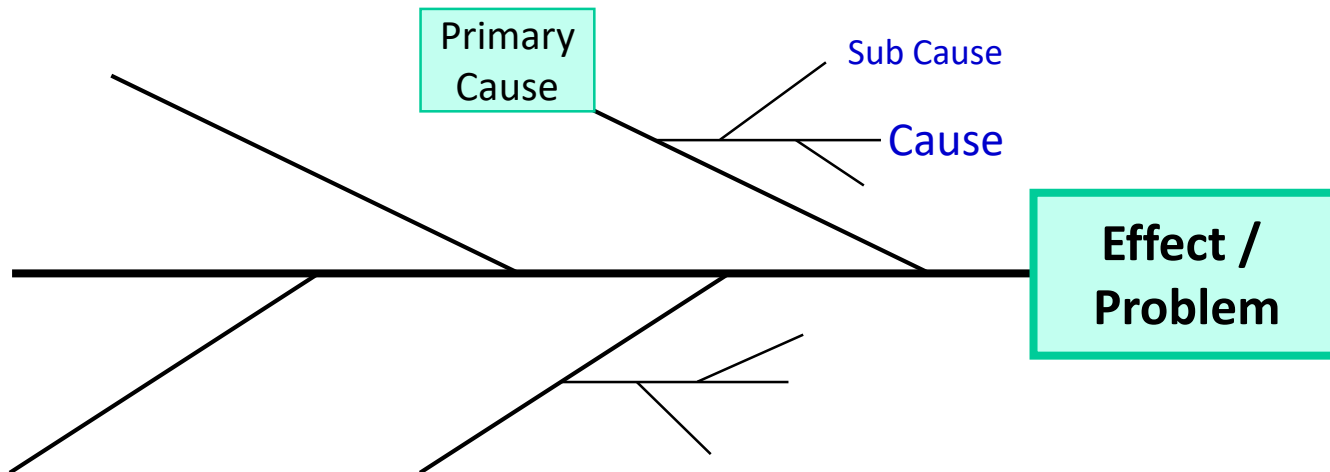
- ❑ Identifies the causes of an undesirable effect of a problem.
- ❑ It is also possible to identify the hierarchy of causes including the possible root causes.
- ❑ Brings attention to the primary factors affecting the quality of a product or service.
- ❑ These factors need to be optimized in order to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



- Fishbone Diagram

Root Causes are Normally:

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



- Fishbone Diagram

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



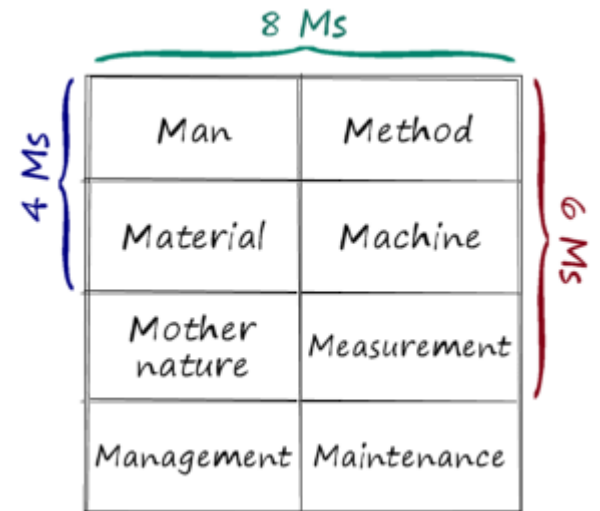
- Fishbone Diagram

- ❑ 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.



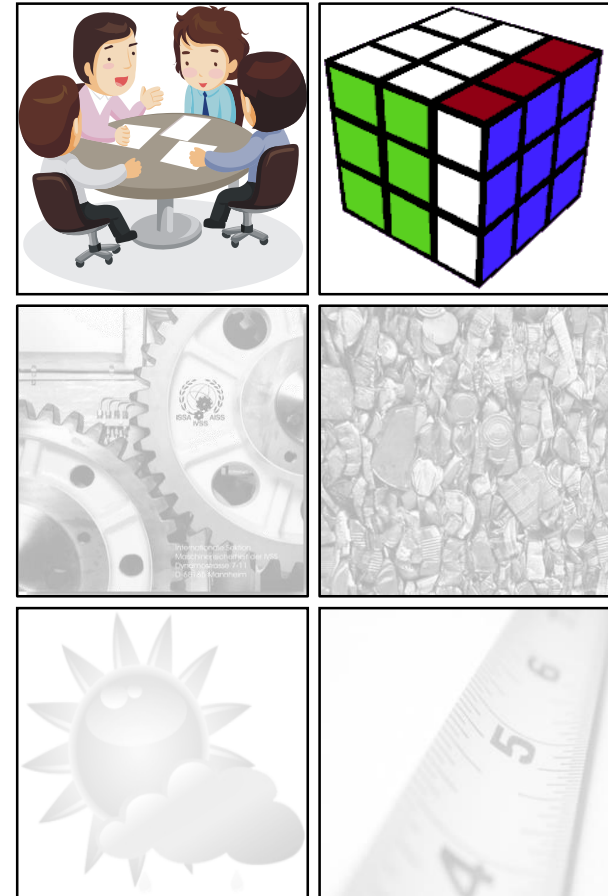
- Fishbone Diagram

- ❑ 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**.



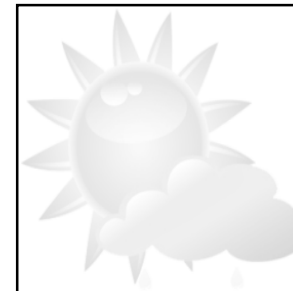
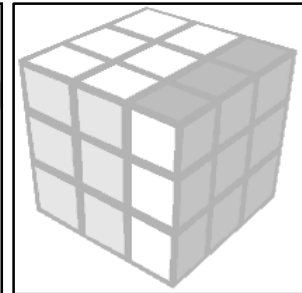
- Fishbone Diagram

- ❑ **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.



- Fishbone Diagram

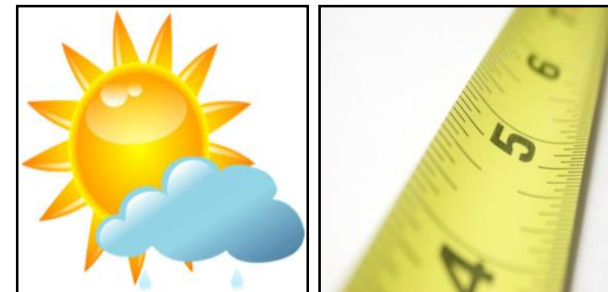
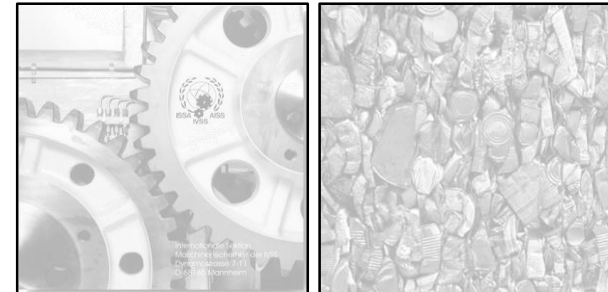
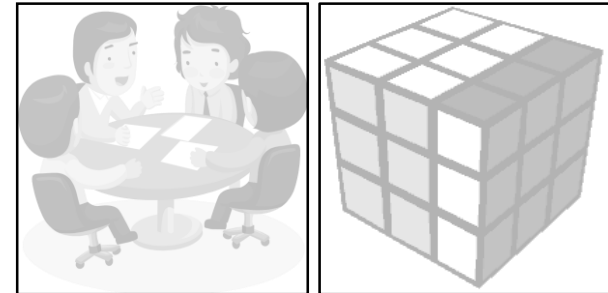
- ❑ **Machines** – including the equipment and tools required to do the process.
- ❑ **Materials** – The material needed to produce the product or provide the service, including:
 - Raw materials.
 - Parts.
 - Papers.
 - Packing.
 - Consumables.



- Fishbone Diagram

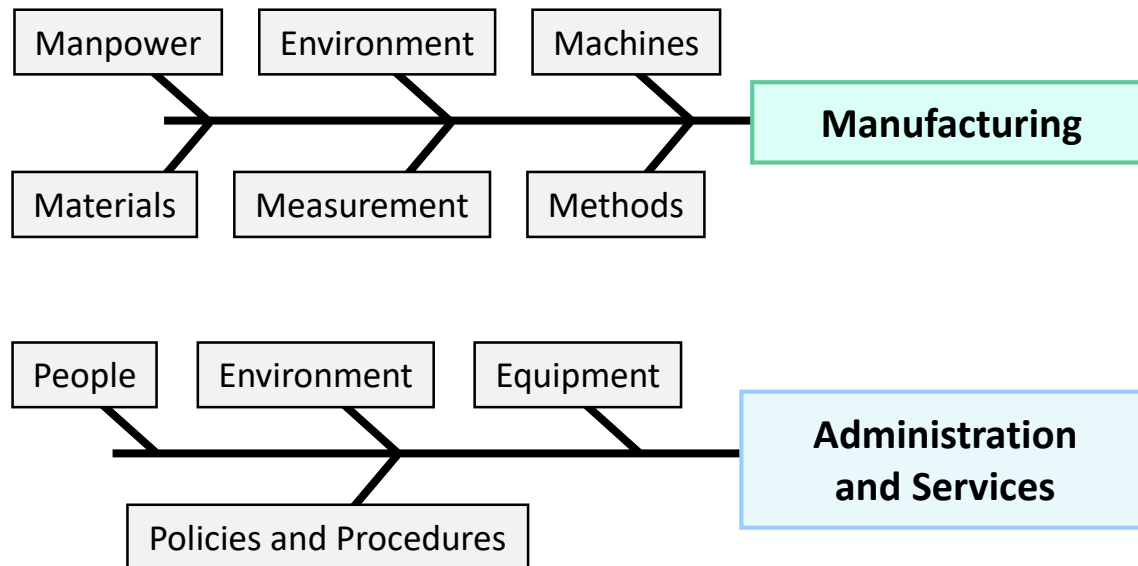
- ❑ **Environment** (or Mother Nature) – the conditions in which the process operates such as:
 - Location.
 - Time.
 - Temperature.
 - Culture.

- ❑ **Measurements** – including the data that are used to evaluate the performance of the process.



- Fishbone Diagram

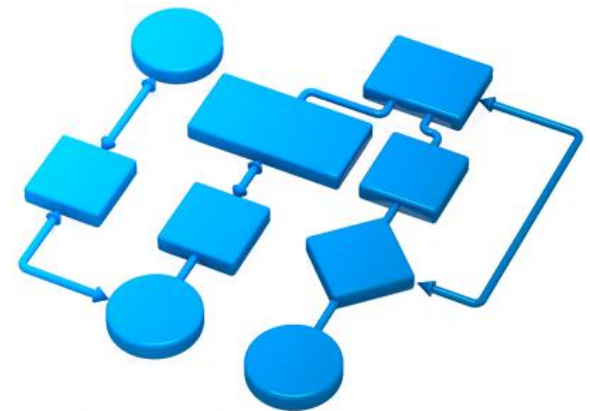
- Typical Fishbone Diagrams for Manufacturing and Non-manufacturing Processes:



- Fishbone Diagram

How to Construct a Fishbone Diagram:

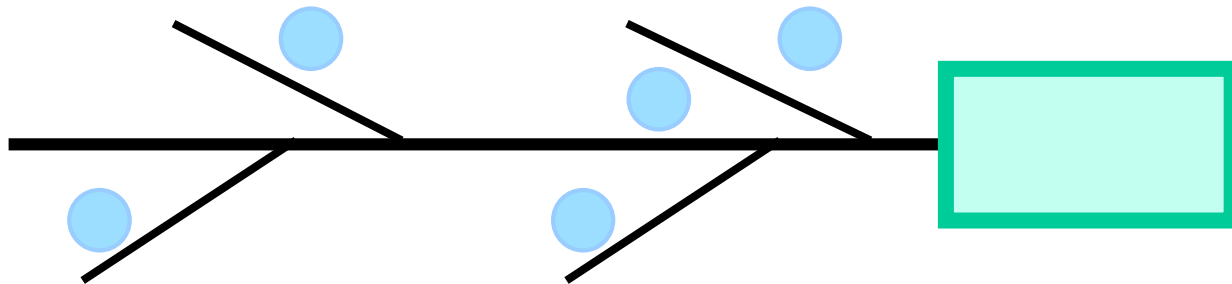
- ❑ Clearly define the effect of the problem.
- ❑ Write it down at the center right of a large piece of paper.
- ❑ Determine the major categories of causes.
- ❑ Write them on the branches of the diagram.
- ❑ Use brainstorming to log all possible causes under the appropriate branches.
- ❑ Use **5 Whys**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



- Fishbone 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.



- Fishbone Diagram

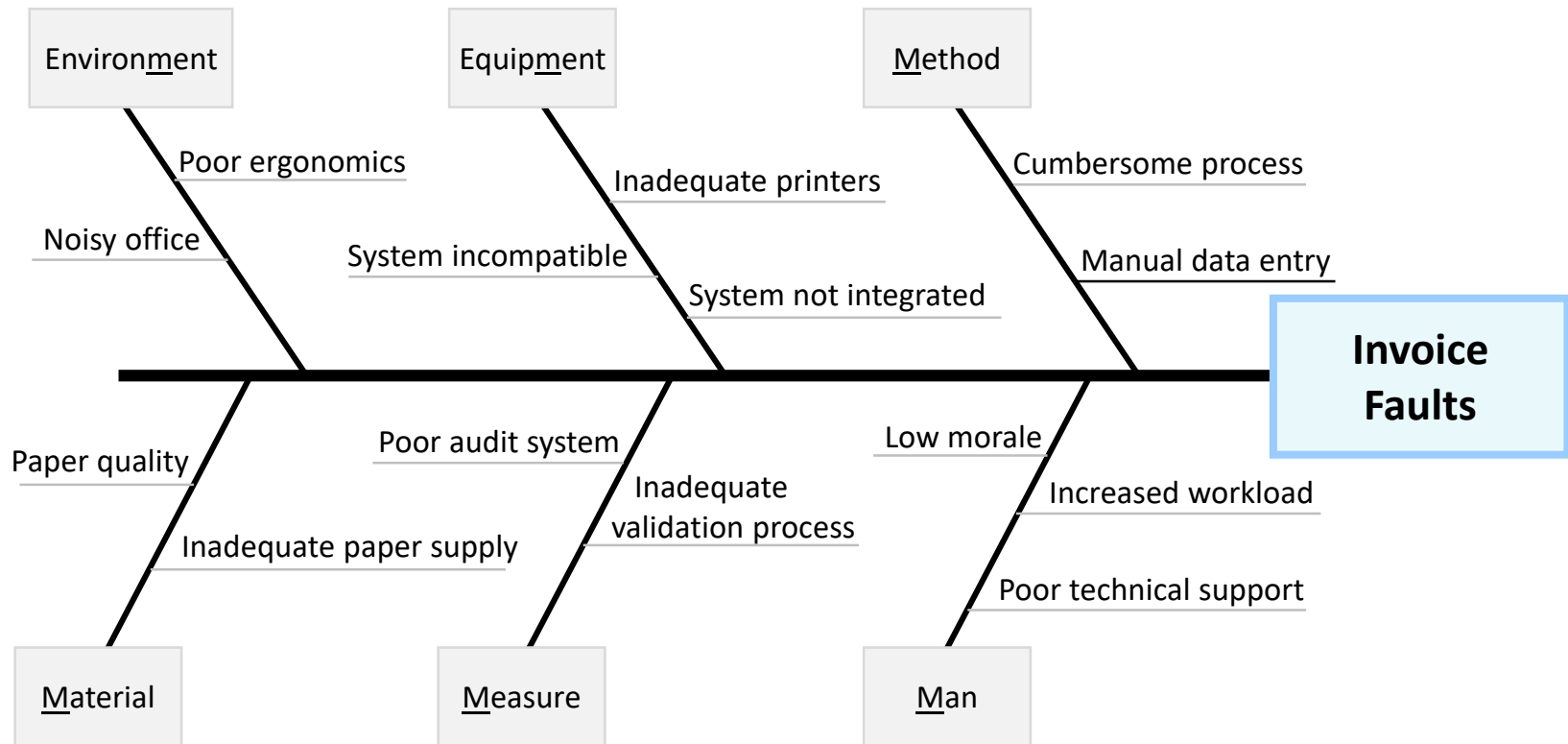
Ways of Finding More Causes:

- ❑ 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.



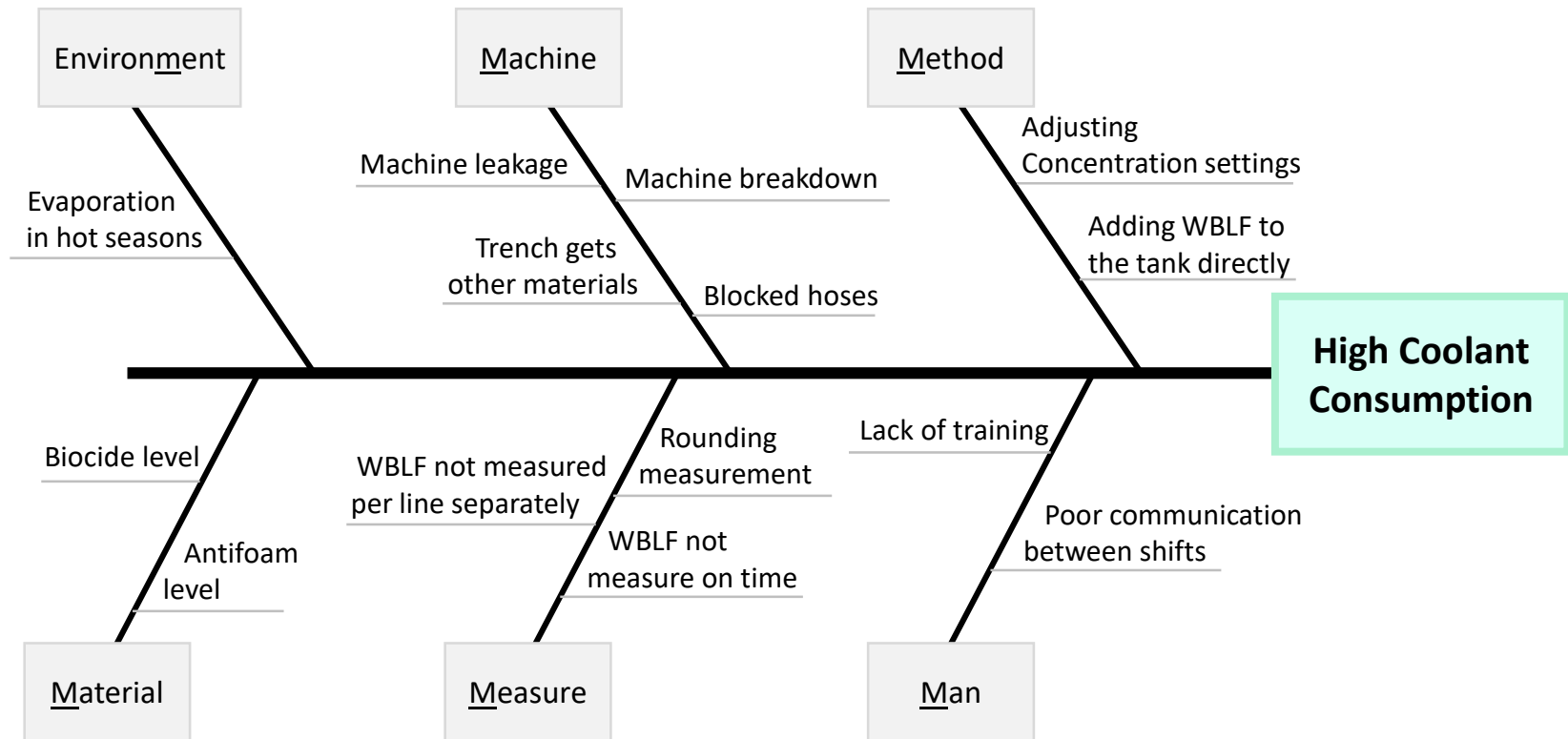
- Fishbone Diagram

Example – The Increased Invoice Errors for a Company:



- Fishbone Diagram

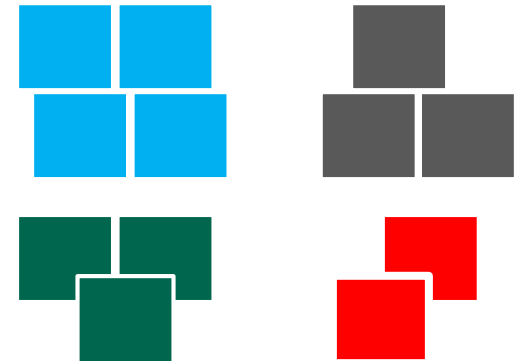
Example – The Increased Coolant Consumption in a Factory:



- Fishbone Diagram

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.



- Fishbone Diagram

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.

- Fishbone Diagram

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 minimize the need for more statistical evaluation of inputs that are unlikely to have an impact on the output.

	Y1	Y2	Y3	Y4
X1		○		○
X2	○			
X3	○	○		
X4			○	○

- Fishbone Diagram

Further Information:

Example – Making Tea Cause and Effect Matrix:

Cause / Effect	Taste	Volume	Temperature	
The boil kettle		○	○	6
Adding water	△	○	⊙	13
Adding tea	⊙			9
Adding sugar	○			3
Adding milk	⊙	△	△	11
Stirring	○			3
	25	7	13	

Symbol	⊙	○	△
Value	9	3	1
Relationship	Strong	Medium	Weak