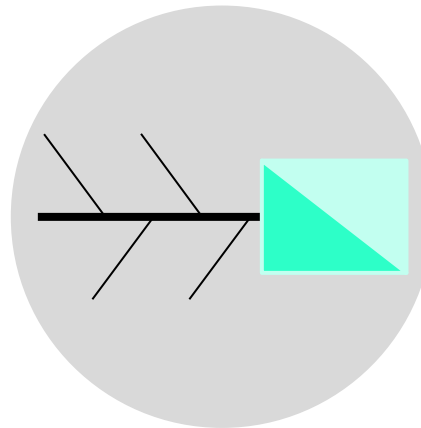


Continuous Improvement Toolkit

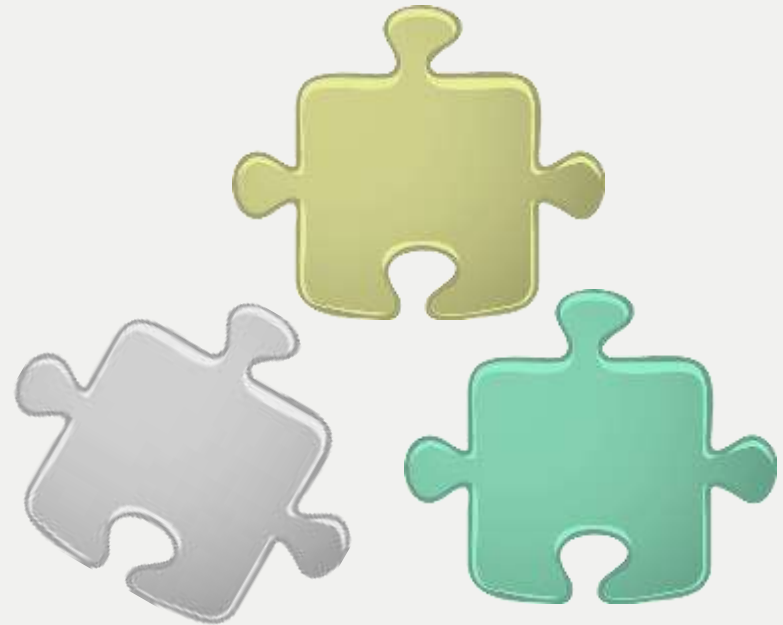
FISHBONE DIAGRAM



FISHBONE DIAGRAM

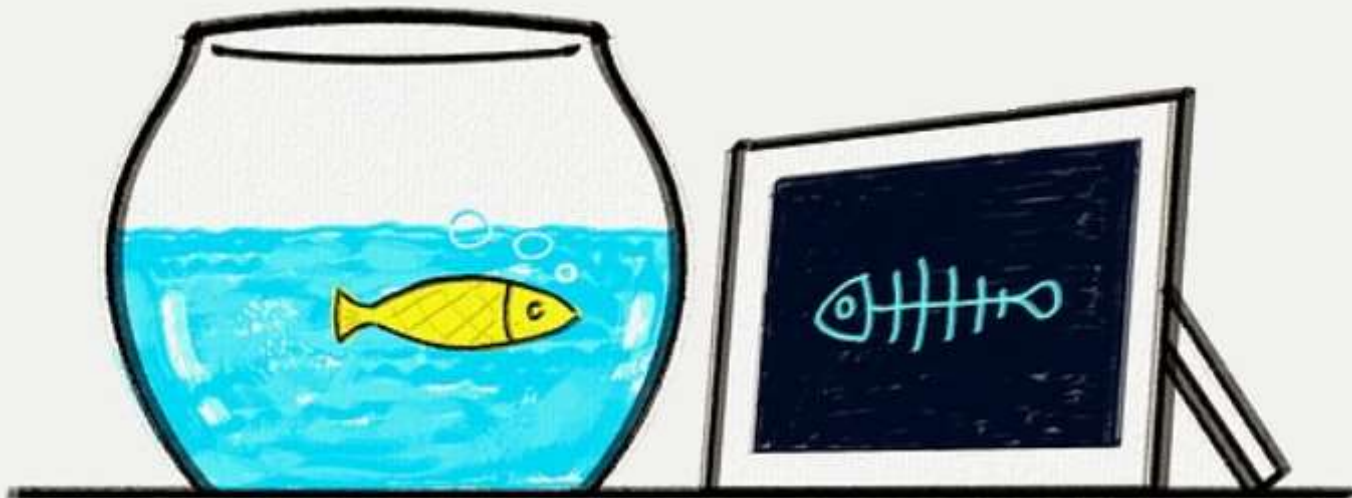
A fishbone diagram provides a **structured way** to identify and organize the potential causes of a problem (or effect).

It allows to establish and present the **cause-and-effect** relationship in an easy and understandable format.



FISHBONE DIAGRAM

It is called this way because of its visual representation that looks like the **skeleton of a fish**.



FISHBONE DIAGRAM

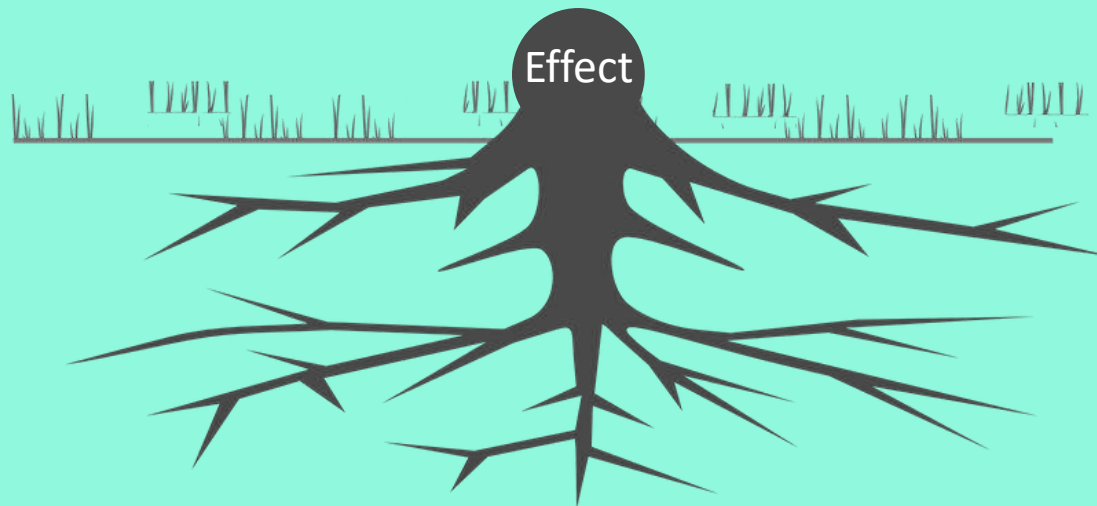
Used to identify the sources of **variation** within a process which causes a problem to occur.

This brings attention to the **primary factors** affecting the quality of a product or service.



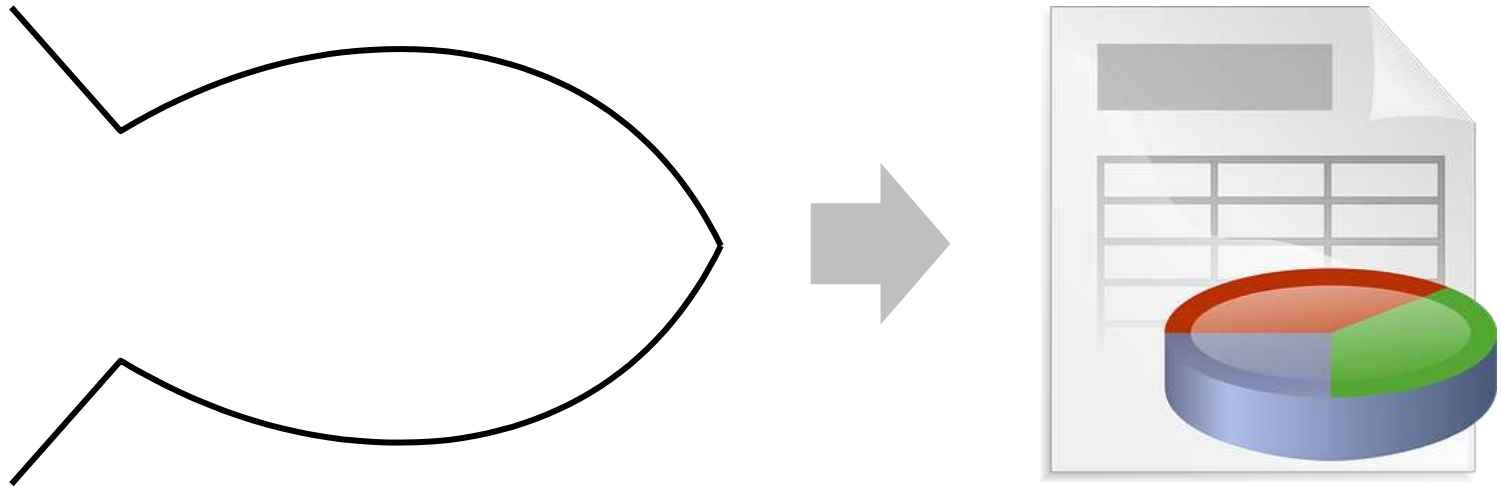
FISHBONE DIAGRAM

- ▶ Helps to identify the **root causes** of an effect in order to identify a solution that can be effective.
- ▶ Often used in Lean Six Sigma and other quality improvement approaches to narrow down the area of analysis.



FISHBONE DIAGRAM

The outcome of the fishbone analysis will provide useful information to **later** problem-solving tools.



FISHBONE DIAGRAM

Often used during **brainstorming** sessions to identify the causes of an undesirable effect of a problem.

By going through the steps of drawing the diagram with your team, everyone gains insight into the cause-and-effect, which makes the solution easier to find later.



FISHBONE DIAGRAM

BENEFITS

Provides a clarity about the causes of an effect and how to avoid it in future.

A teamwork exercise that helps to capture and organize people's knowledge of a process.

Identifies the potential factors that may cause an effect to prevent future problems (cause prevention).

Can be used in product and process design to plan new processes.

Can be used to identify the causes of risks.

FISHBONE DIAGRAM

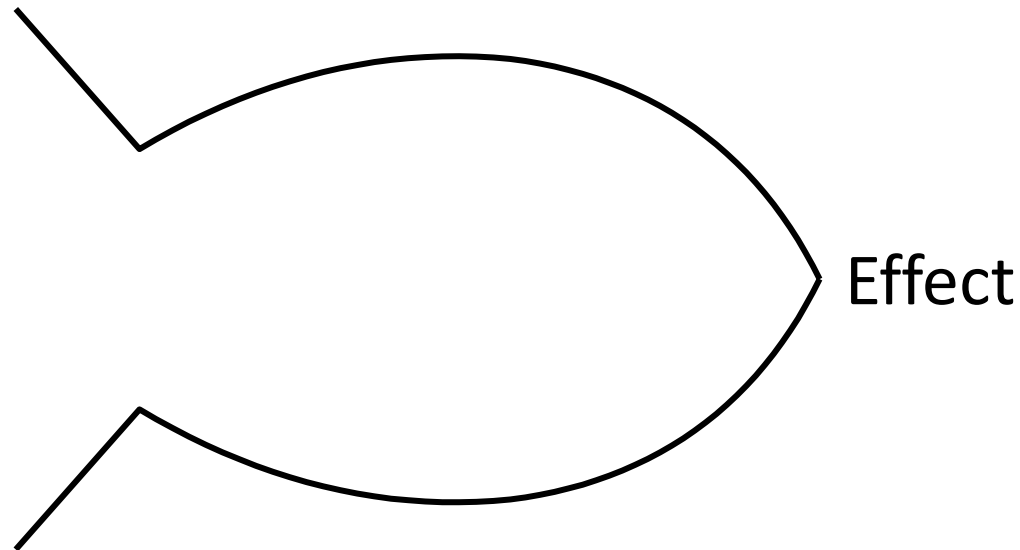
The first step in conducting a fishbone analysis is to clearly define the **effect**.

This could be a quality issue, a technical issue, or simply not meeting a performance target.



FISHBONE DIAGRAM

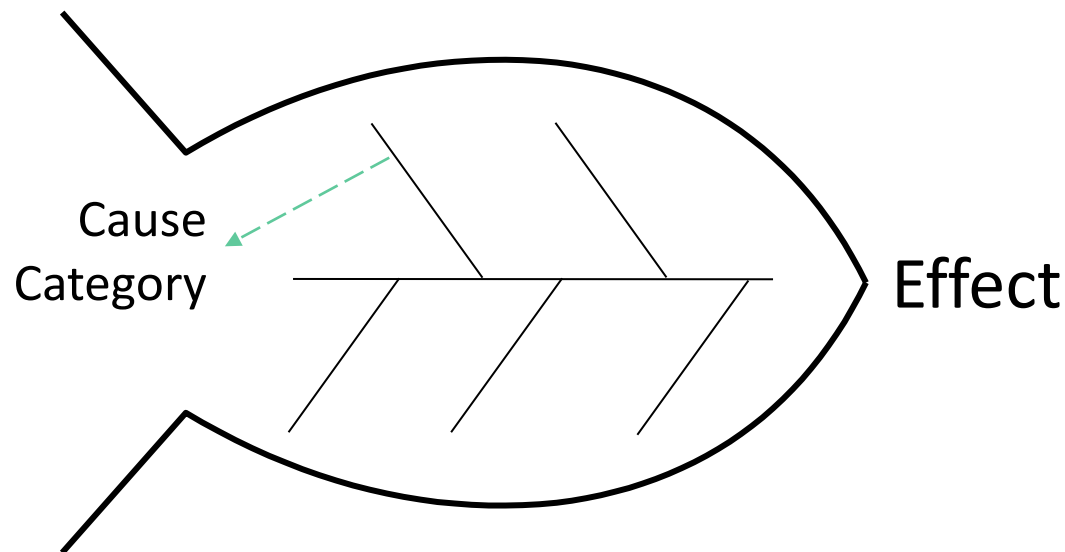
The effect will become the **head** of the fishbone.



- ▶ Should be brief.
- ▶ Use numbers where possible.

FISHBONE DIAGRAM

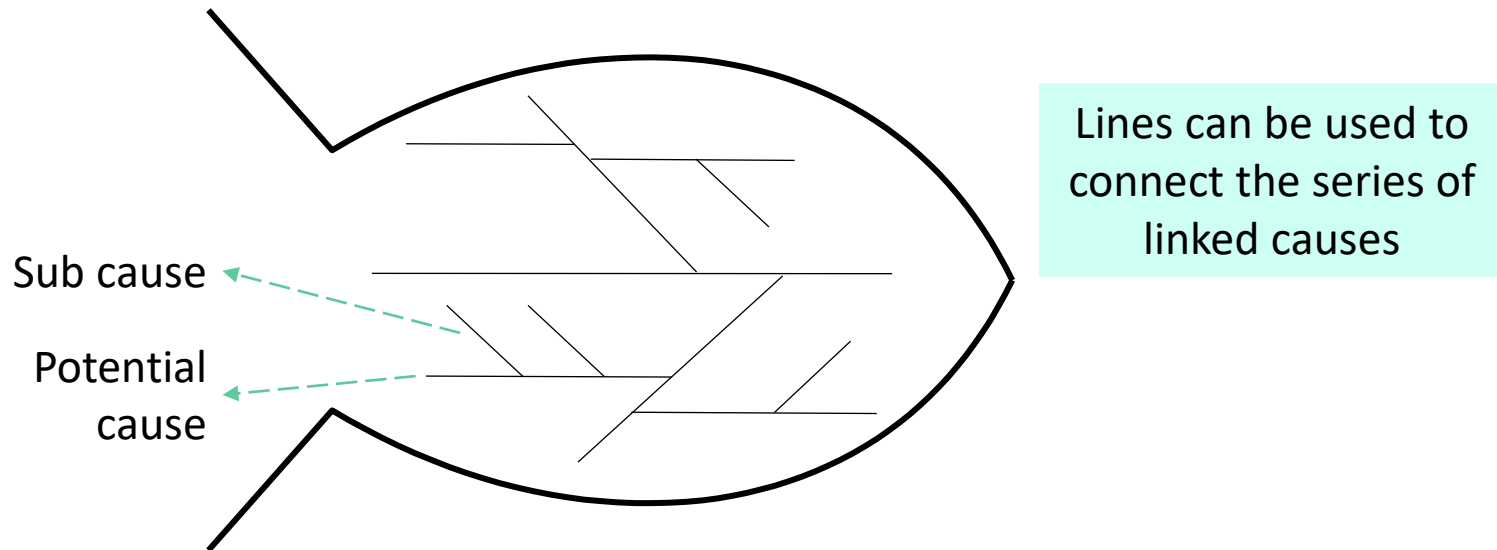
The causes will be placed in the **branches** of the chart.



Each cause needs to be put into a **category** for easier sharing and reference

FISHBONE DIAGRAM

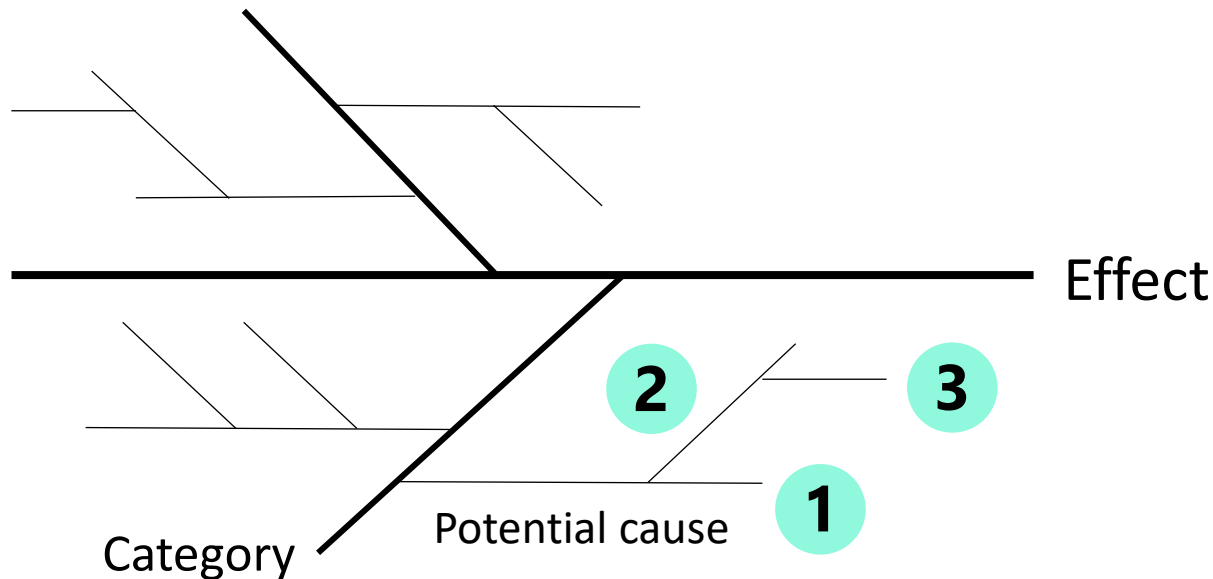
A fishbone diagram allows to identify the **hierarchy of causes** including the possible root causes.



Root causes are normally those at the ends of the chains of causes that do not have any sub causes

FISHBONE DIAGRAM

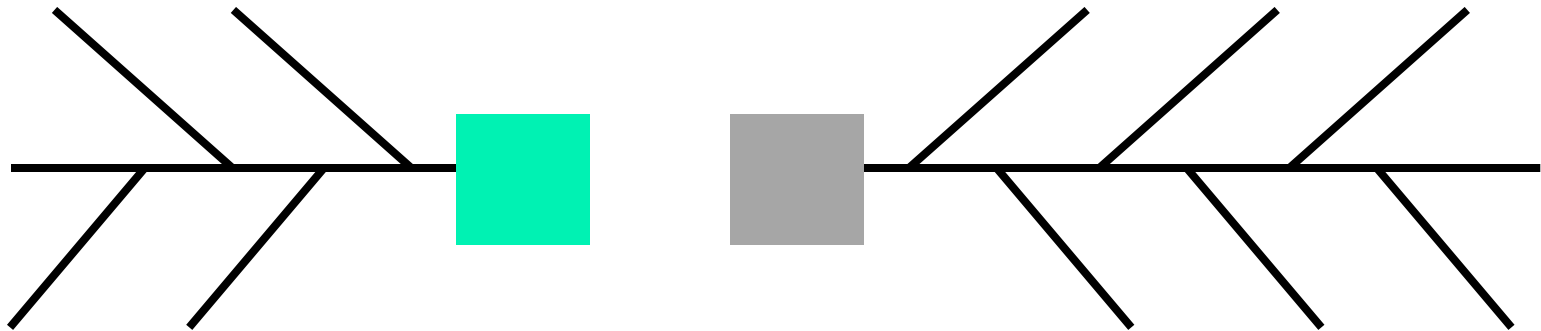
Combining the fishbone with the **5 whys** gives the analysis an extra dimension



5 whys can be used to dig deeper and go beyond symptoms

FISHBONE DIAGRAM

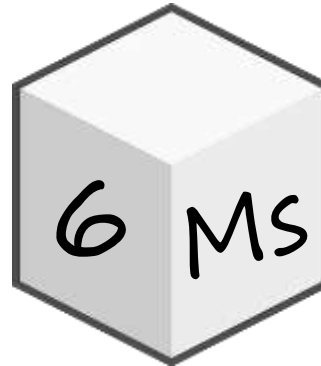
Potential causes in a fishbone diagram are normally **grouped** into categories for easier sharing and reference.



These categories are used to label the different branches on the fishbone diagram

FISHBONE DIAGRAM

There are **different approaches** of constructing a fishbone diagram indicated by the branch labels.



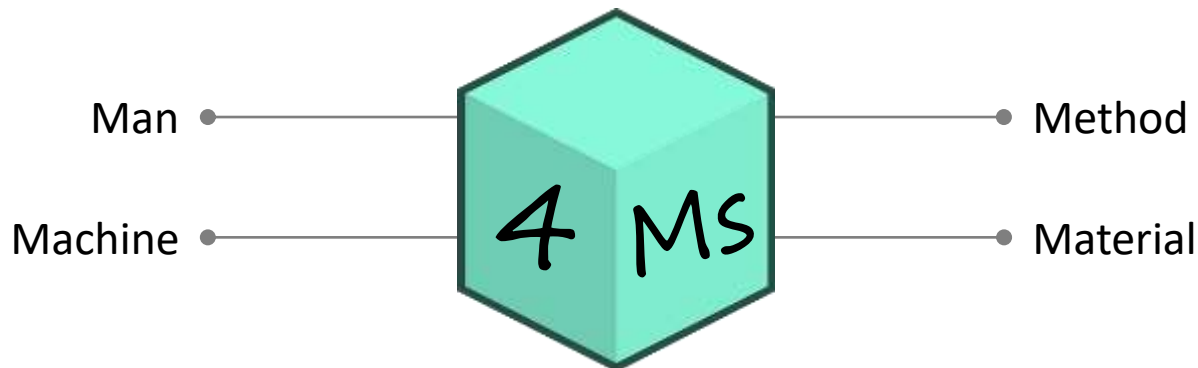
There is no right or wrong way to do that!

FISHBONE DIAGRAM

4 Ms

One of the most basic forms to group the potential causes of a problem or effect.

These categories typically include **Man**, **Method**, **Machine** and **Material**.

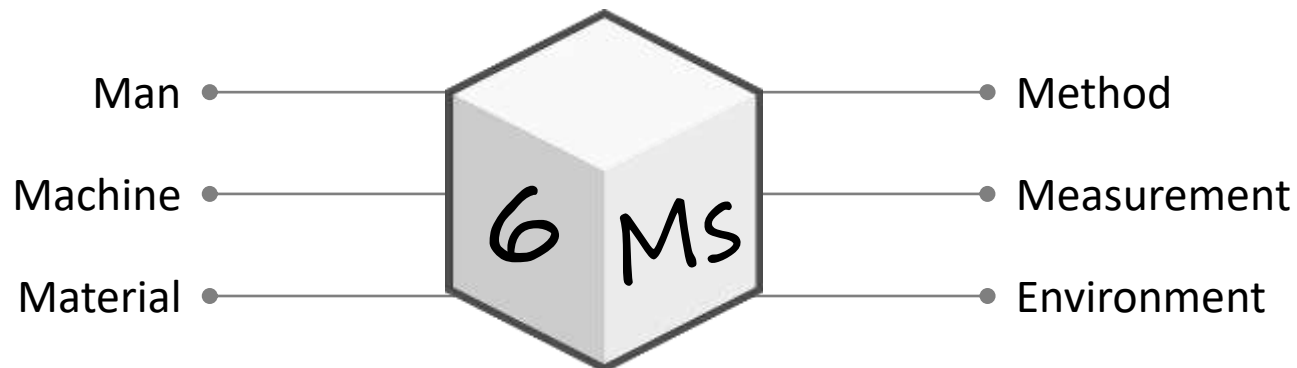


FISHBONE DIAGRAM

6 Ms

The most common way to categorize potential causes of a problem or effect.

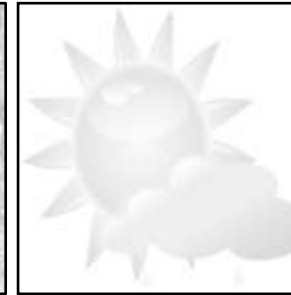
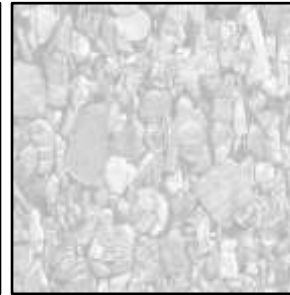
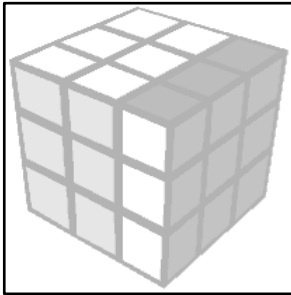
Commonly used in manufacturing and production environments.



FISHBONE DIAGRAM

6 Ms

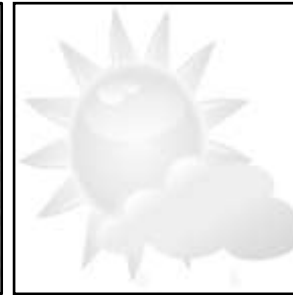
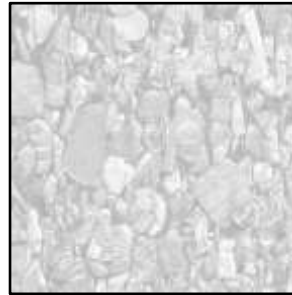
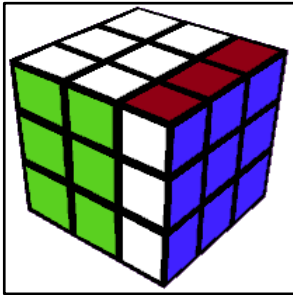
Man – Anyone involved with the process and contributes to the effect Including governance and support functions.



FISHBONE DIAGRAM

6 Ms

Method – How the process is performed and the specific requirements for doing it.



Rules and
policies

Procedures

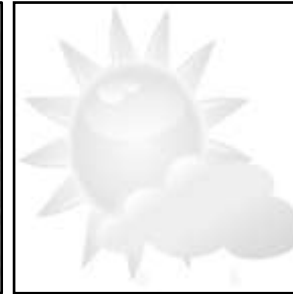
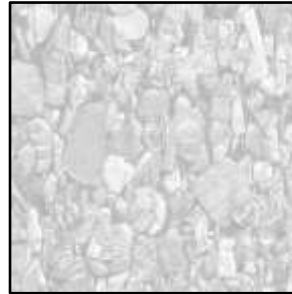
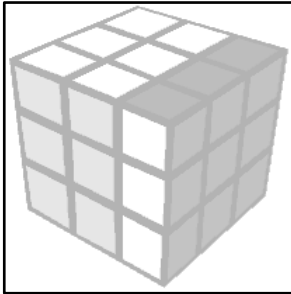
Work
instructions

Common
practices

FISHBONE DIAGRAM

6 Ms

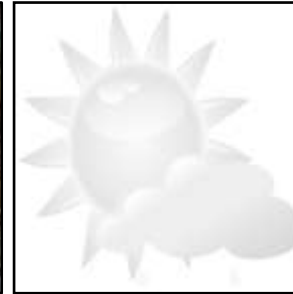
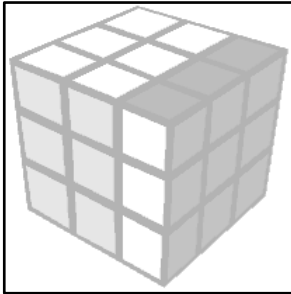
Machine – The machinery, equipment and tools required to perform the process.



FISHBONE DIAGRAM

6 Ms

Material – All the materials needed to perform a process.



Raw materials

Parts

Packaging

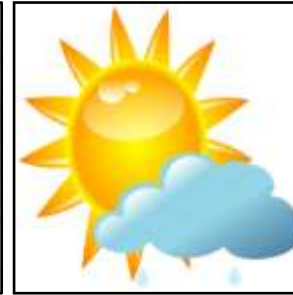
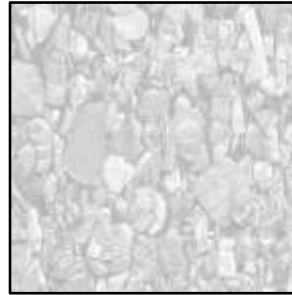
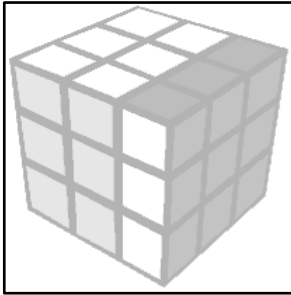
Information

Paperwork

FISHBONE DIAGRAM

6 Ms

Environment – The conditions in which the process operates.



Location

Time

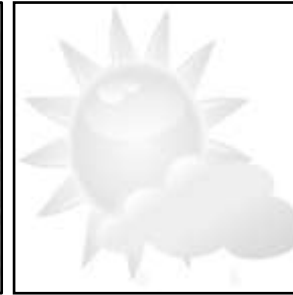
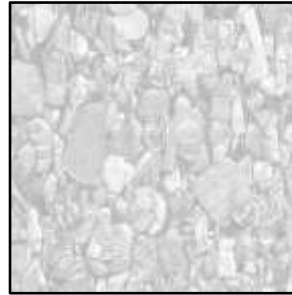
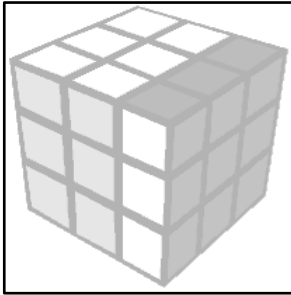
Temperature

Culture

FISHBONE DIAGRAM

6 Ms

Measurement – The data and metrics that are used to evaluate the performance of the process.



FISHBONE DIAGRAM

Different names may be used for the same category depending on the situation and on the user's choice.

Man – **Men** – **Manpower** – People – Labor

Machine – **Machinery** – Equipment – Tools – Systems

Measurement – **Metrics** – Inspection

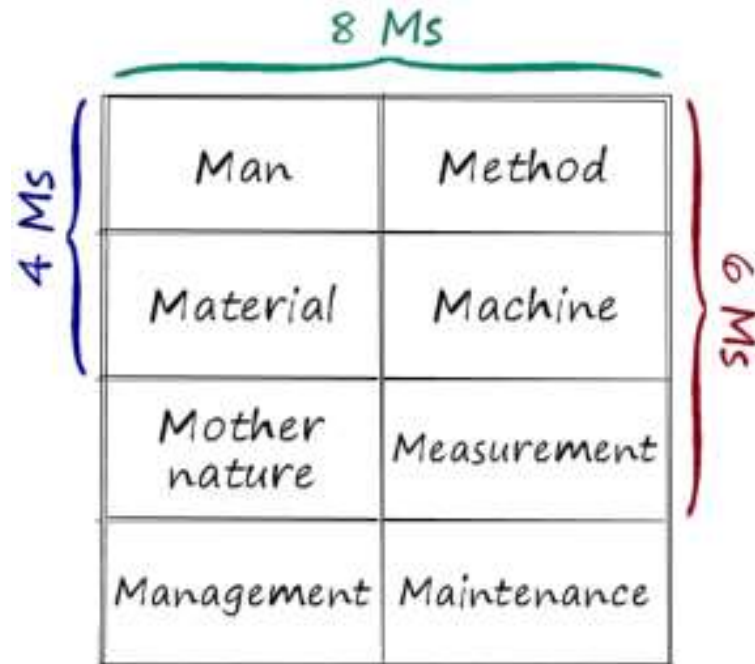
Method – Process – Procedure

Environment – **Mother Nature** – **Milieu**

FISHBONE DIAGRAM

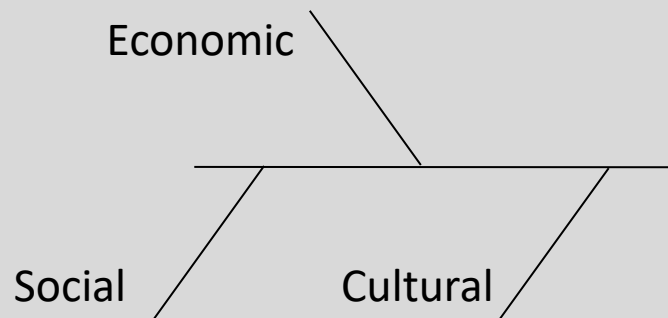
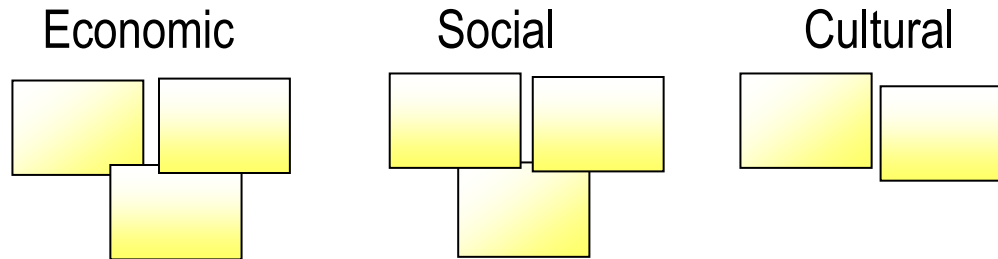
8 Ms

Adds Management and Maintenance to the 6 M categories.



FISHBONE DIAGRAM

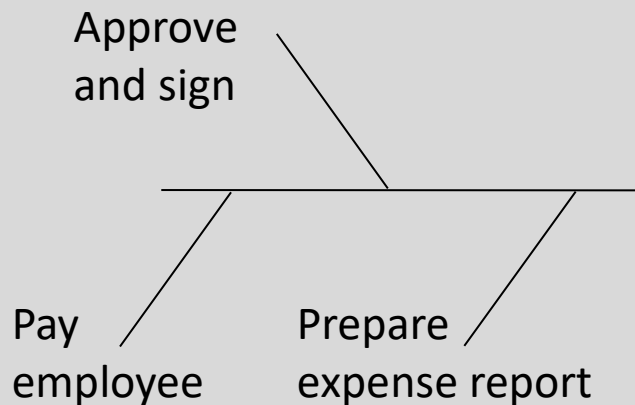
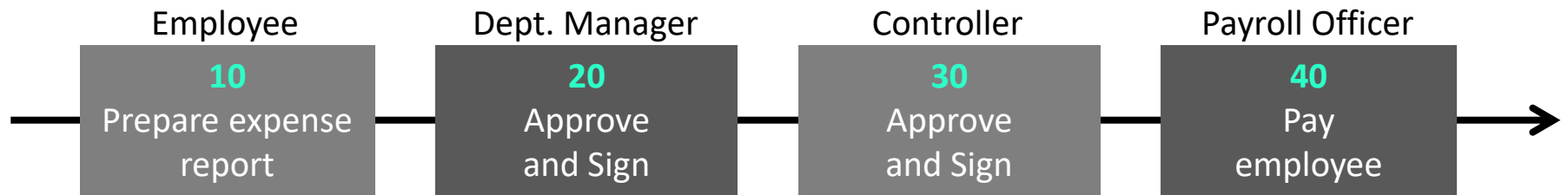
When you are working on an **affinity diagram**, you can use the titles of the affinity groups as the basis for categorization.



The items within each affinity group can be the potential causes

FISHBONE DIAGRAM

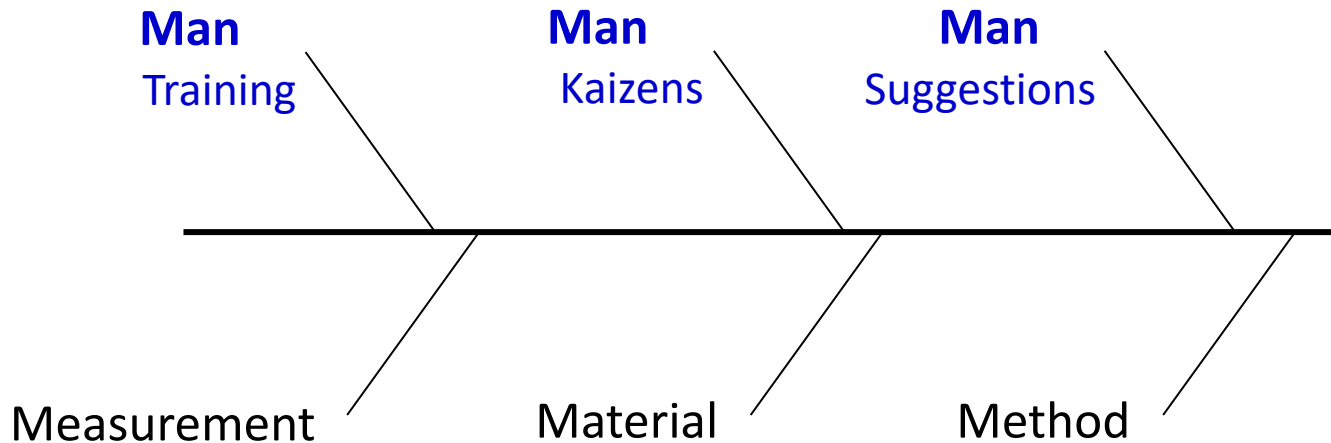
When the effect results from a documented or **mapped process**, the process steps can be used as the basis for categorization.



The process input variables (design factors) can be the potential causes

FISHBONE DIAGRAM

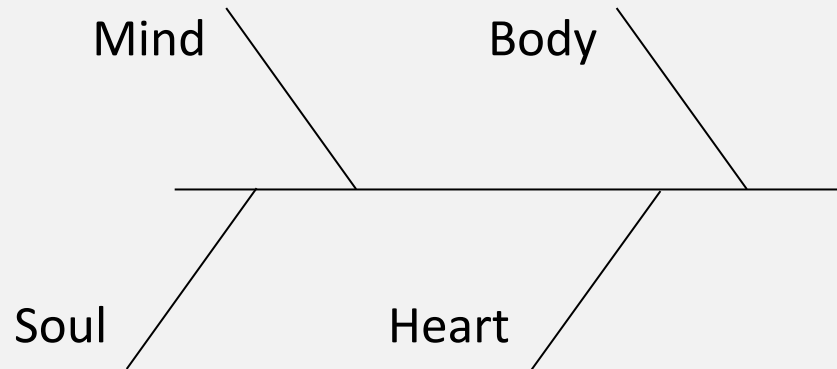
You may also create **subcategories** of a main category and include it in new branches.



Remember to avoid writing real names of persons under the “Man” category

FISHBONE DIAGRAM

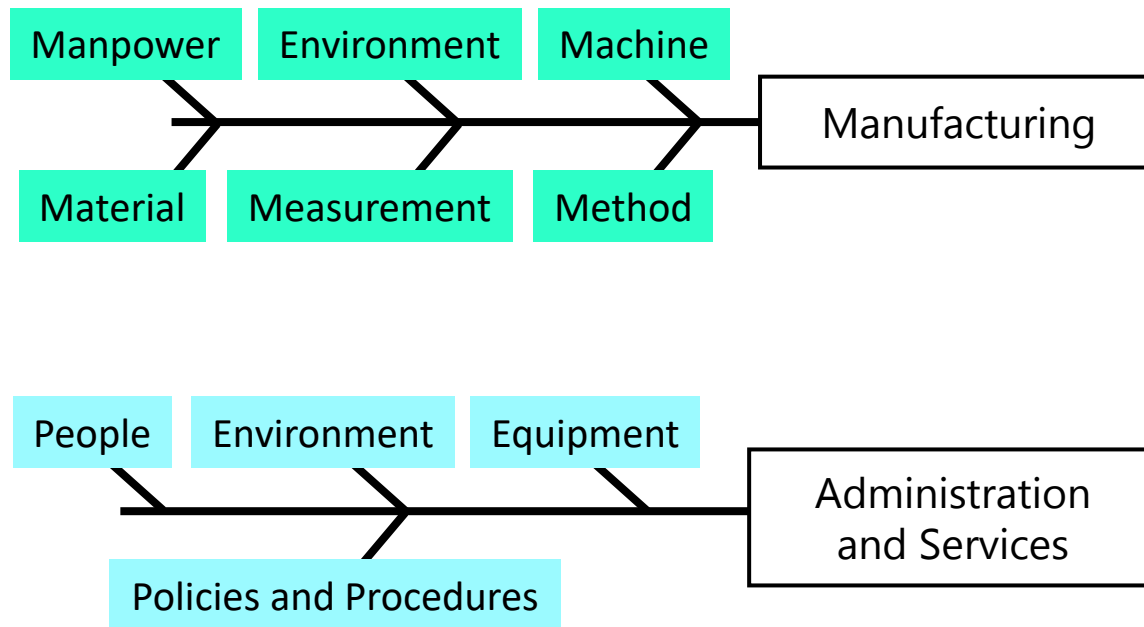
You may even rename or create **your own branches** that best suit your project.



Fishbone analysis can also be used in our **personal** lives to create ideas about the certain personal issues and how to avoid them

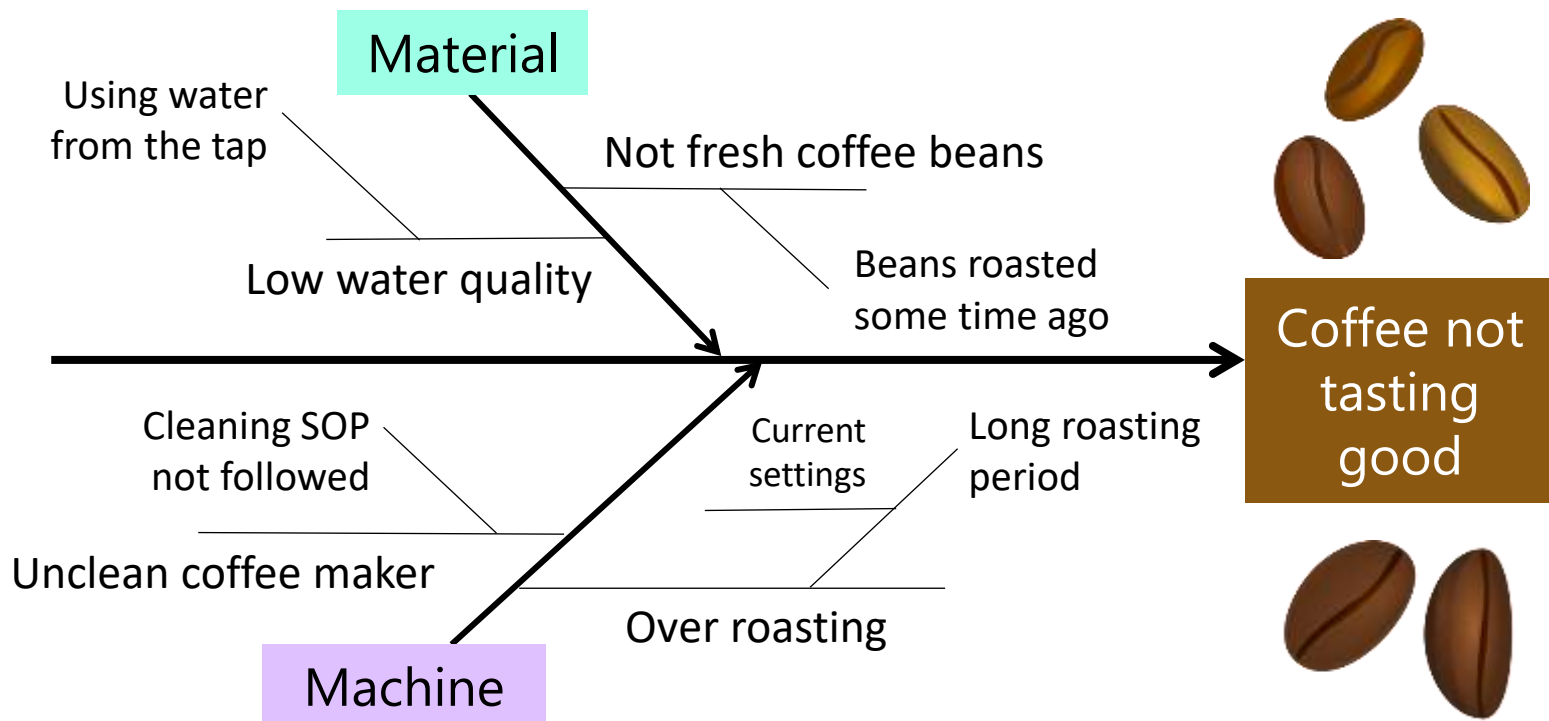
FISHBONE DIAGRAM

Typical Categories for Manufacturing and Non-manufacturing Processes



FISHBONE DIAGRAM

Now that we have identified the categories, it time to add to the diagram the **possible causes** of the effect.

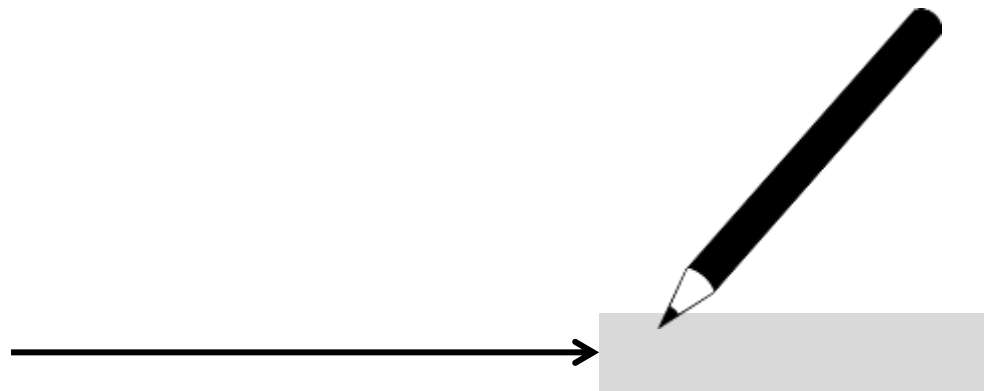


FISHBONE DIAGRAM

How to Conduct a Fishbone Analysis

With your team, clearly define the **effect** that you want to work on

Write the effect statement in a box at the center right of a large piece of paper (or on a wall) and draw a long horizontal line pointing to the box

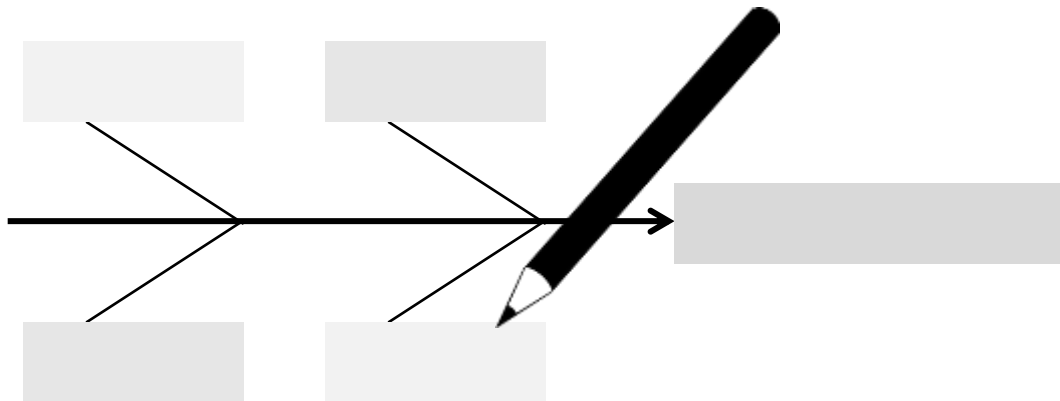


FISHBONE DIAGRAM

How to Conduct a Fishbone Analysis

Identify the **cause categories** using the 6 Ms or any other approach

Write them in boxes parallel to the horizontal line

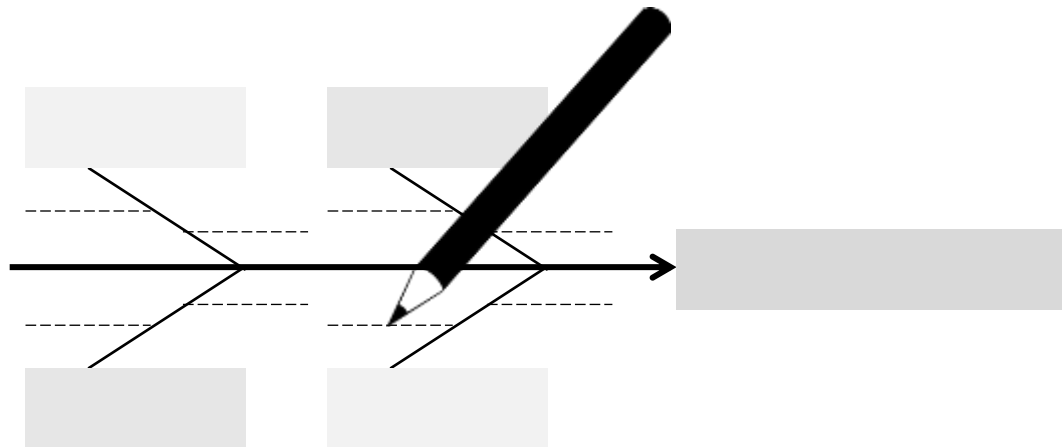


FISHBONE DIAGRAM

How to Conduct a Fishbone Analysis

Use brainstorming to **log all possible causes** under the appropriate categories

Start with the main causes and then the secondary causes and so on
Use 5 whys to get to the root causes

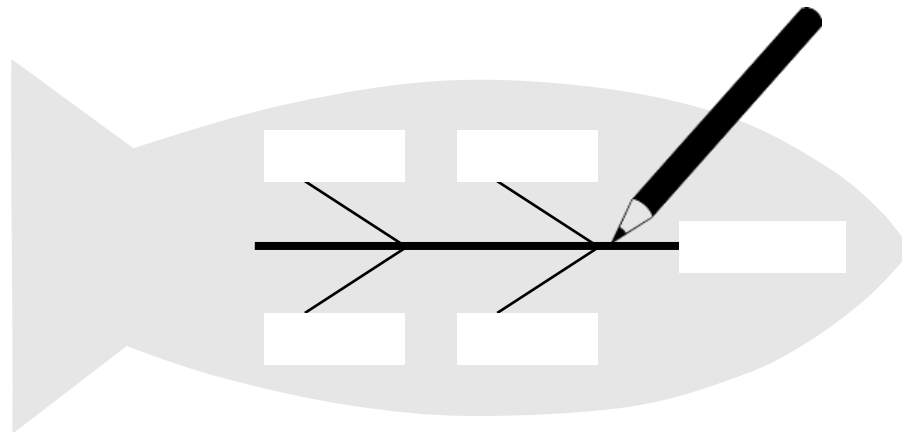


FISHBONE DIAGRAM

How to Conduct a Fishbone Analysis

Take time to ensure the appropriateness of the recorded information

Update the chart as new potential causes become apparent

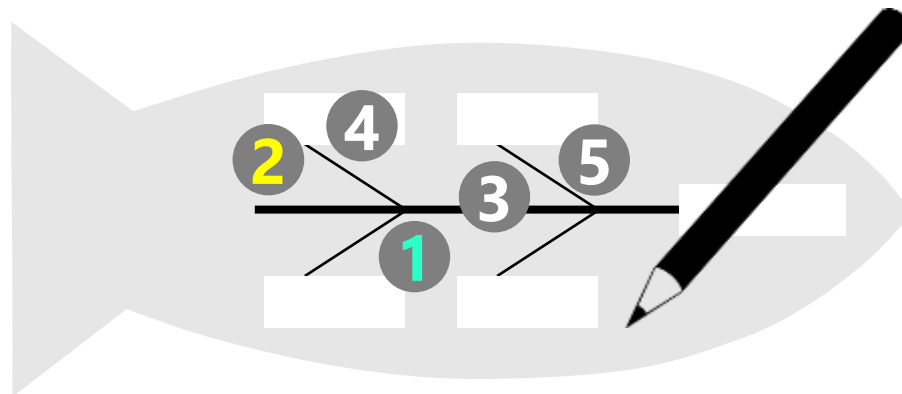


FISHBONE DIAGRAM

How to Conduct a Fishbone Analysis

Highlight or assign numbers near to the key causes to show their relative importance

Draw links between causes that are related



FISHBONE DIAGRAM

How to Conduct a Fishbone Analysis

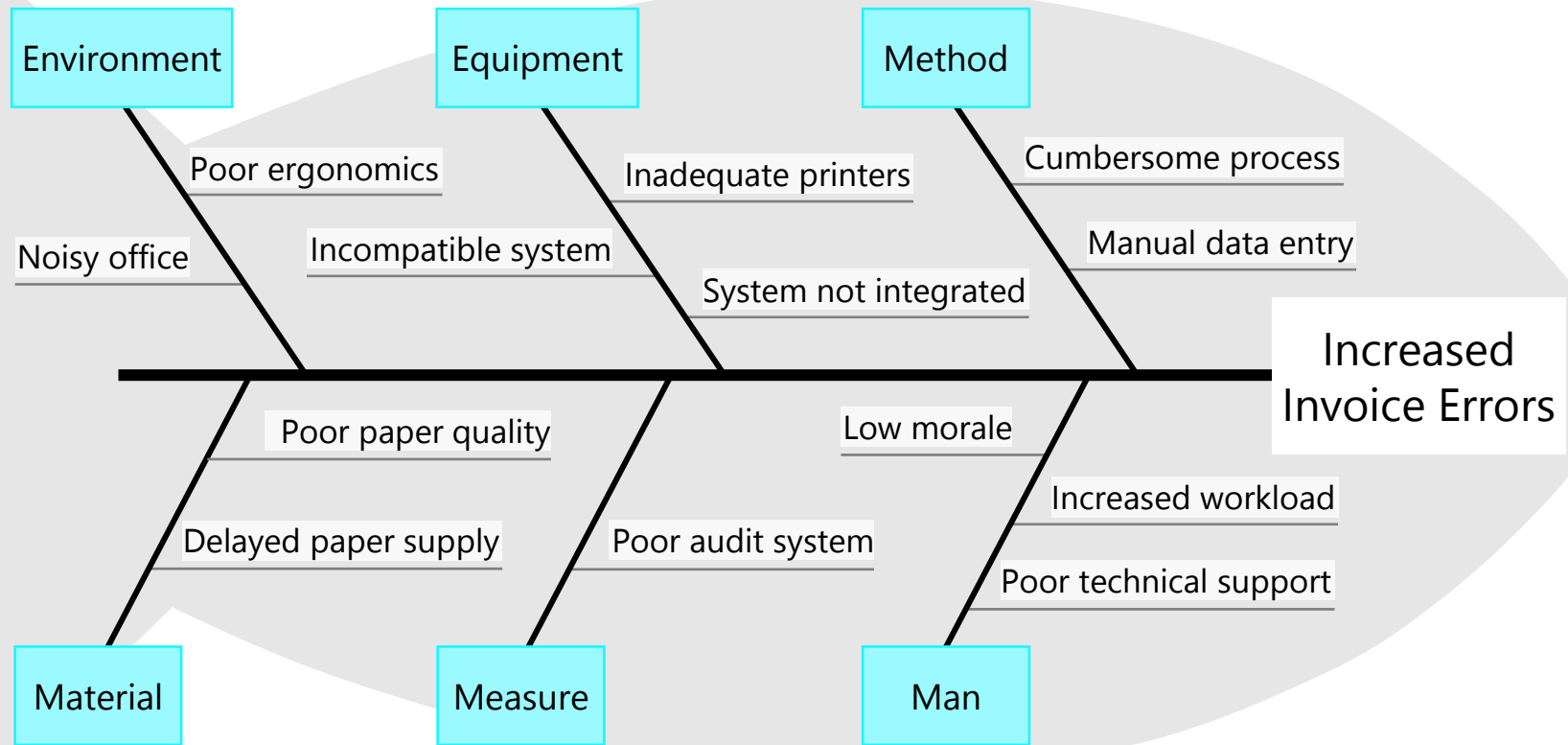
If necessary, **collect data** to confirm key causes are real

Plan and implement actions to address the key causes



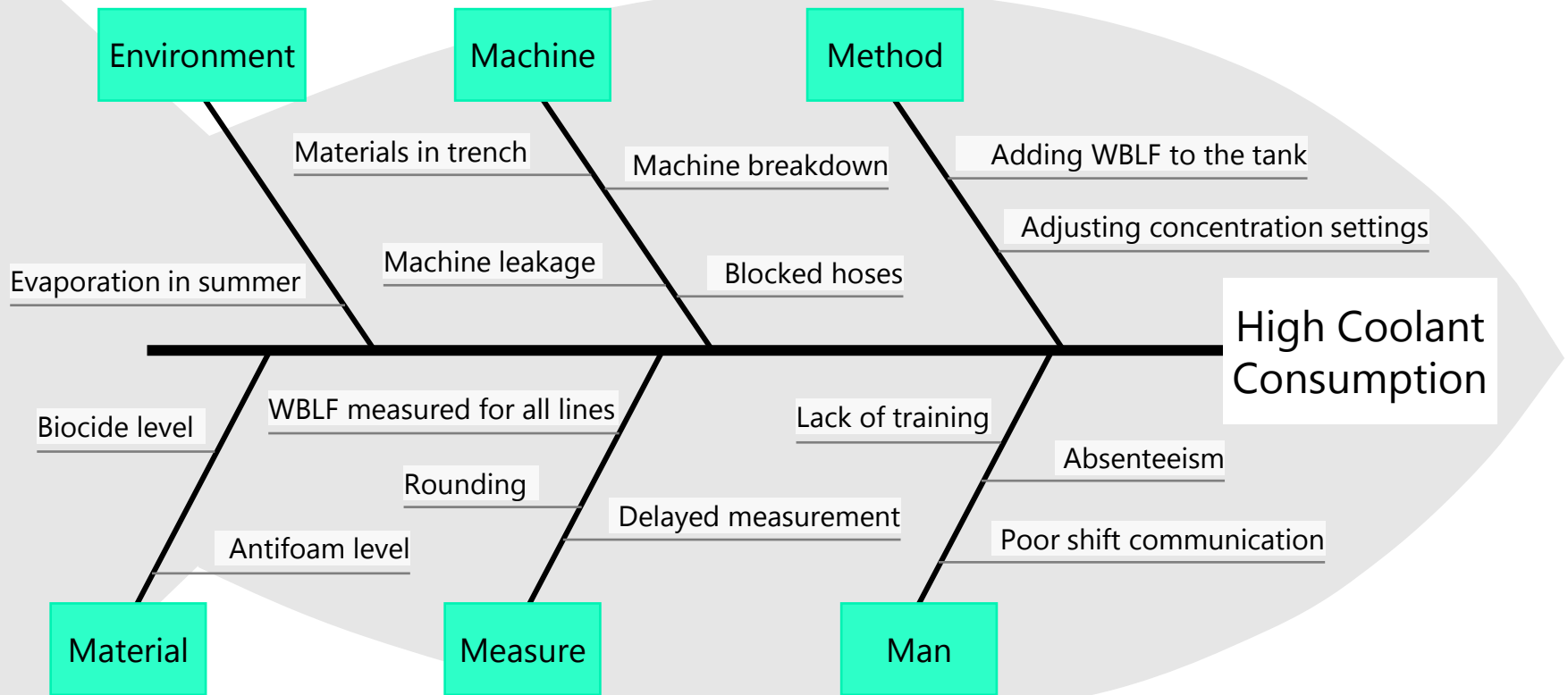
FISHBONE DIAGRAM

Example – Increased Invoice Errors



FISHBONE DIAGRAM

Example – Increased Coolant Consumption



FISHBONE DIAGRAM

Further Information

Be aware of adding causes which are actually **solutions**.

The main idea behind the fishbone analysis is to brainstorm all possible causes that may contribute to a problem, and not brainstorm solutions.



FISHBONE DIAGRAM

Further Information

A **cause-and-effect matrix** can be used to prioritize the causes of the problem.

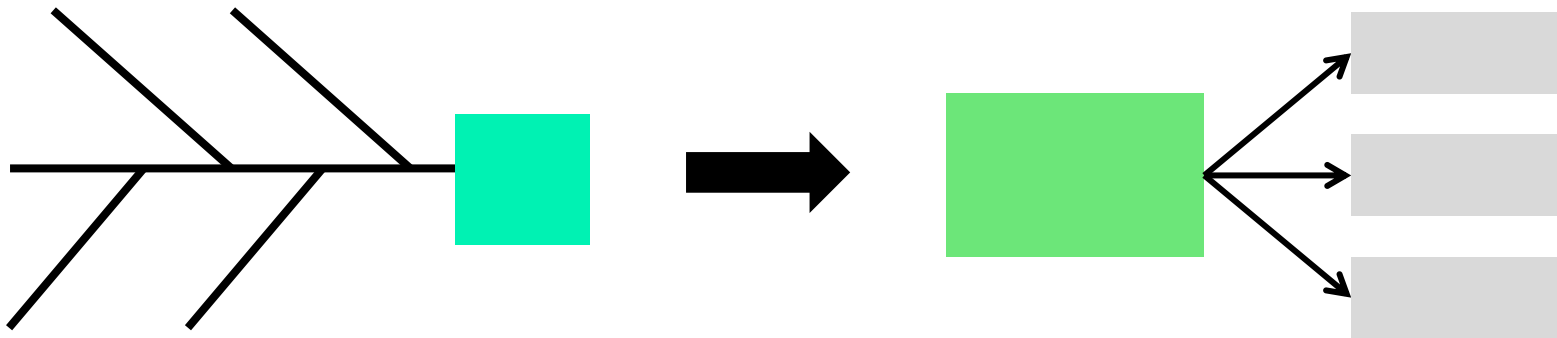
Prioritizing and selecting the key causes will minimize the need for more statistical analysis of inputs that are unlikely to have an impact on the output.

		Importance to Customer (1-10)			
		1	1	1	
		Output Variables (Ys) →			
		Taste	Volume	Temperature	
Process Step	Input Variables (Xs) ↓				
	The boil kettle		3	3	
	Adding water	1	3	9	
	Adding tea	9			
	Adding sugar	3			
	Adding milk	9	1	1	
	Stirring	3			
		Weighted Score (Y)			
		25	7	13	
		Rank			
		1	3	2	

FISHBONE DIAGRAM

Further Information

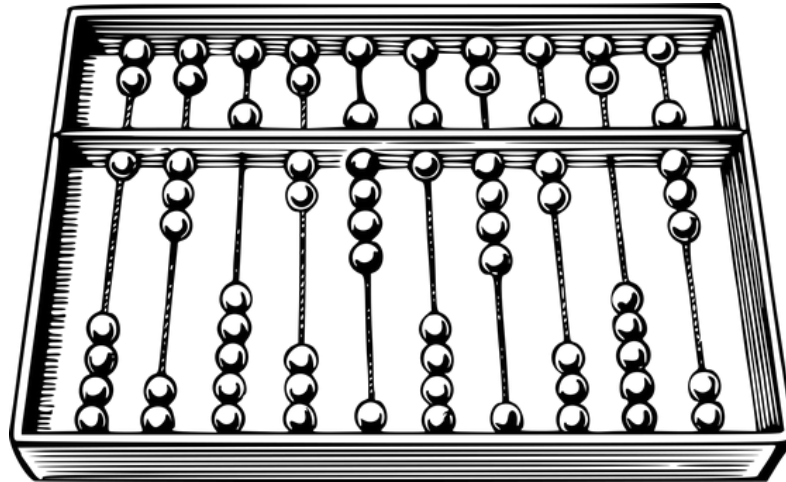
Another way of highlighting the structure of the possible causes is to use the **tree diagram**.



FISHBONE DIAGRAM

Further Information

The measure of success for a fishbone diagram is not quality of ideas but **quantity** of ideas.



FISHBONE DIAGRAM

Further Information

A fishbone diagram can also be used to **structure the thoughts** of a team.

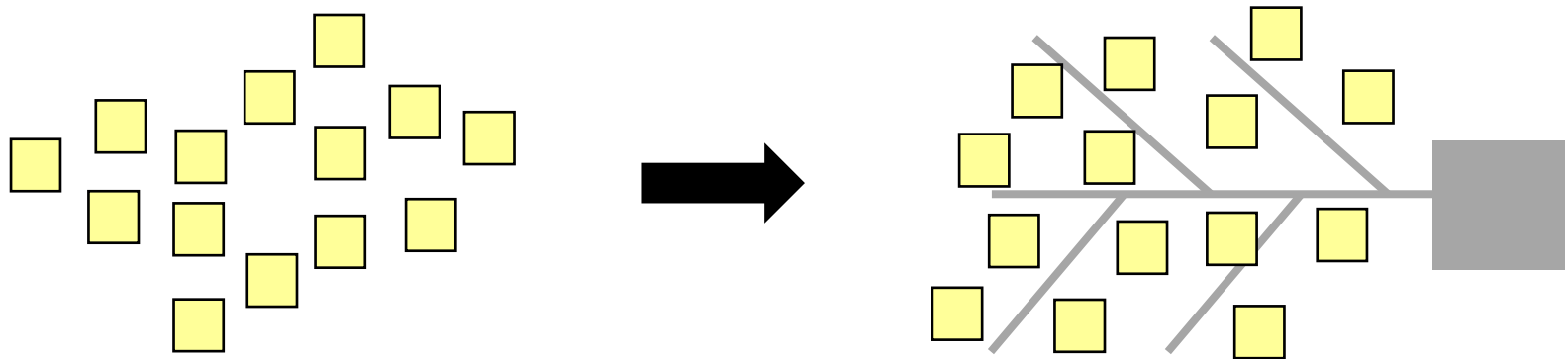
Sometimes it is useful to change the effect statement into the **ideal situation** and ask the team to brainstorm what produces this ideal situation.



FISHBONE DIAGRAM

Further Information

Sometimes it is useful to brainstorm out the ideas first then organize them by category later.

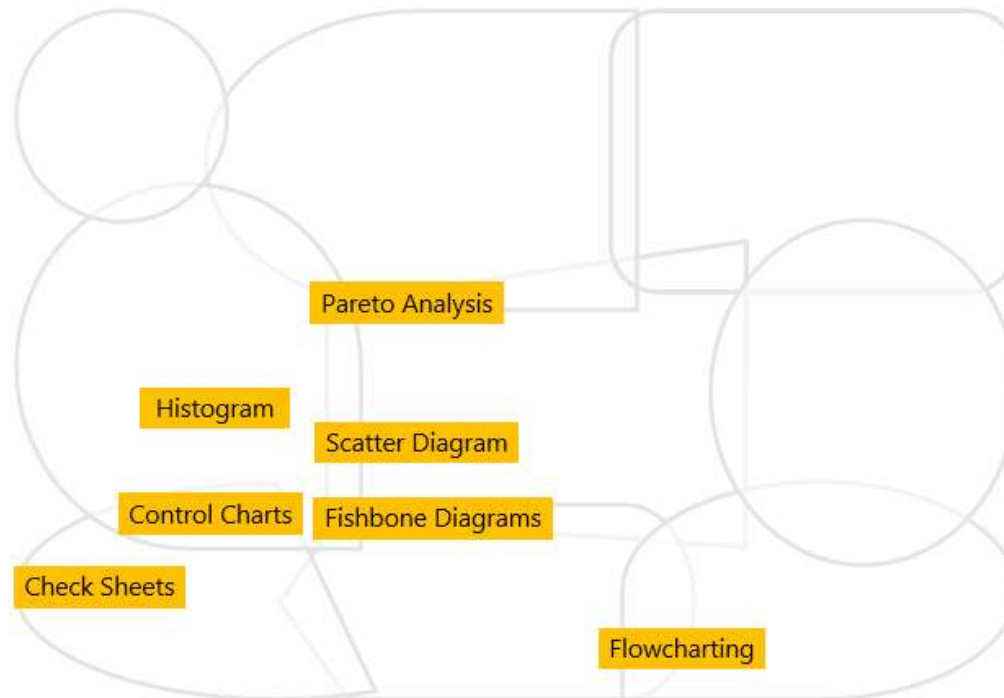


People sometimes tend to focus more on the categories than the content and this slows down and restricts their thinking

FISHBONE DIAGRAM

Further Information

One of the seven basic tools of quality.



FISHBONE DIAGRAM

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