

Fishbone Diagram (a.k.a. Cause & Effect Diagram or Ishikawa Diagram)

Purpose/Description:

A fishbone is a diagram that analyzes the relationship between a problem and its causes. The tool combines aspects of brainstorming with systematic analysis to solve an issue. The head of the "fish" is the problem statement, the body captures the cause and effect relationships between the problem and its root causes.

Steps/Method:

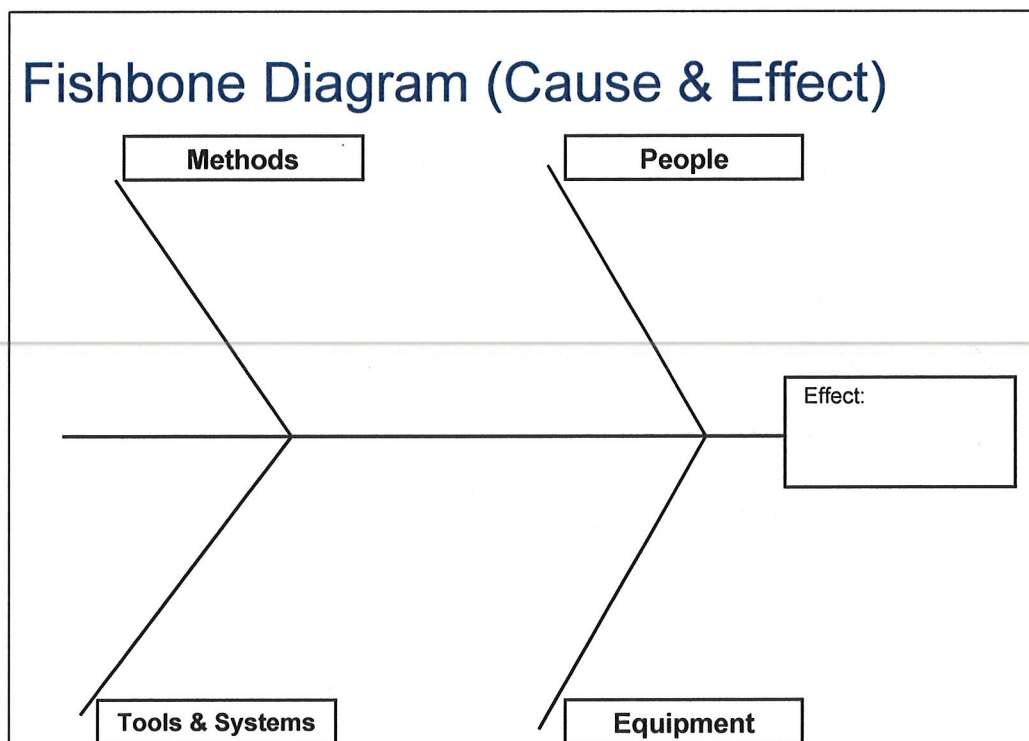
1. Clearly define and describe the problem being assessed and conduct a brainstorming session. Write the problem statement on the white board or flip chart.
2. Write the problem in a box on the right side of a board or flip chart and draw a horizontal line from the box left across the paper. Add several large lines drawn on a slant up to the left and down to the left. These become bones or branches of the diagram.
3. Solicit input about the major factors/categories of causes that contribute to the effect. Write these at the ends of the major branches.
 - a. The classic cause and effect diagram uses the following six buckets: People, Machines, Materials, Methods/Processes, Measurements, and Environment. However, there can be any grouping other than the six, depending on the application.
 - b. In a transactional environment, common buckets are: Procedures, People, Policies, Equipment/Systems, and Environment.
 - c. Choose the major categories that work best for the problem you are solving. Write the possible causes of the problem along the appropriate branches of the fishbone.
4. For each major cause, determine sub causes. Write the sub-causes on horizontal lines from the major cause line. (This can be done first in a brainstorming session and then reviewed to group the sub-causes under the correct headings.)
5. After assigning all causes to the appropriate branches, evaluate the different groups of causes, one at a time.
6. Determine which causes are most critical and would have the biggest impact on reducing the effect if they were solved. Declare possible root causes.
7. Validate assumptions with data whenever possible.
8. If the approach is used to identify a root cause, institute a change to the process, based on the finding. Validate that this change fixes the problem without causing others.

Application:

The main purpose of a fishbone is to understand what causes a problem. You can use it to identify and group problem causes, systematically evaluate them, and determine which are most likely to be root causes. Three uses include: Analyze the problem: identify and verify the root causes, Select and plan the solution: identify critical success factors On-going monitoring and control: the diagram can be used as a starting point on what to measure and trend.

Tips/Traps:

- Make sure ideas are voiced without team discussion. During discussion, encourage team members to “piggy back” on each other’s ideas.
- Exercise caution to ensure that no one’s ideas are overshadowed, and that the discussion isn’t taken over by a few team members.
- The diagram should reflect a chain of logic leading from sub causes to the major causes to the effect they produce.
- The few large branches that feed into the spine represent the main categories of potential causes of the problem. The items on the larger branches are thought to cause the problem in the head.
- The smaller branches represent deeper causes of the larger branches to which they are attached.
- One of the biggest challenges in creating a cause-and-effect diagram is to have the bones or branches show cause-and-effect relationships. One way to overcome this is to use Five Why’s (see Five Why’s tool).
- It often helps to verify which potential causes are actual causes, so that the team can focus energy on the critical factors causing the problem.
- If a potential cause seems to have too many complex sub causes, it may be appropriate to break it off into a separate diagram.
- Fishbone diagrams only identify possible causes. Even when everyone agrees with the possible causes, these assumptions must be backed up by data. Only data can confirm actual causes.



Cause & Effect Diagram Example

The following example illustrates a partially completed fishbone diagram. The clear, precise problem statement appears on the right. The four cause categories are shown in blue. Some typical responses are also shown, and one is circled showing that the group identified this as a "Root Cause."

