

Fishbone (Ishikawa) Diagram

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Also Called: Cause-and-Effect Diagram, Ishikawa Diagram

Variations: cause enumeration diagram, process fishbone, time-delay fishbone, CEDAC (cause-and-effect diagram with the addition of cards), desired-result fishbone, reverse fishbone diagram

The fishbone diagram identifies many possible causes for an effect or problem. It can be used to structure a brainstorming session. It immediately sorts ideas into useful categories.

When to Use a Fishbone Diagram

- When identifying possible causes for a problem.
- Especially when a team's thinking tends to fall into ruts.

Fishbone Diagram Procedure

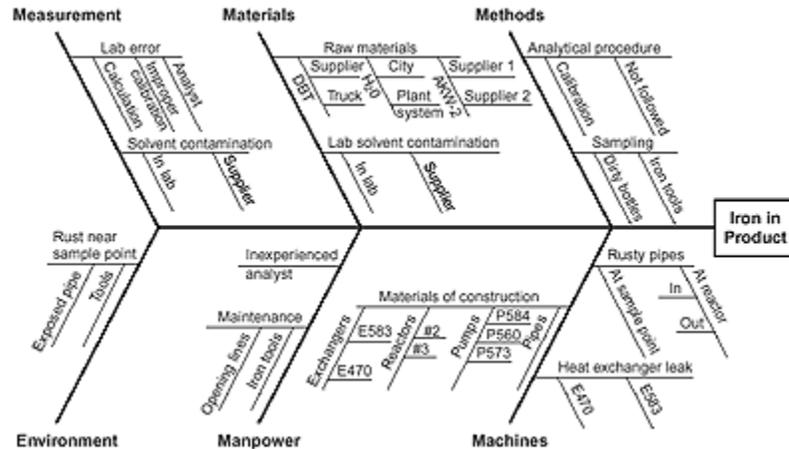
Materials needed: flipchart or whiteboard, marking pens.

1. Agree on a problem statement (effect). Write it at the center right of the flipchart or whiteboard. Draw a box around it and draw a horizontal arrow running to it.
2. Brainstorm the major categories of causes of the problem. If this is difficult use generic headings:
 - Methods
 - Machines (equipment)
 - People (manpower)
 - Materials
 - Measurement
 - Environment
3. Write the categories of causes as branches from the main arrow.
4. Brainstorm all the possible causes of the problem. Ask: "Why does this happen?" As each idea is given, the facilitator writes it as a branch from the appropriate category. Causes can be written in several places if they relate to several categories.
5. Again ask "why does this happen?" about each cause. Write sub-causes branching off the causes. Continue to ask "Why?" and generate deeper levels of causes. Layers of branches indicate causal relationships.

- When the group runs out of ideas, focus attention to places on the chart where ideas are few.

Fishbone Diagram Example

This fishbone diagram was drawn by a manufacturing team to try to understand the source of periodic iron contamination. The team used the six generic headings to prompt ideas. Layers of branches show thorough thinking about the causes of the problem.



Fishbone Diagram Example

For example, under the heading “Machines,” the idea “materials of construction” shows four kinds of equipment and then several specific machine numbers.

Note that some ideas appear in two different places. “Calibration” shows up under “Methods” as a factor in the analytical procedure, and also under “Measurement” as a cause of lab error. “Iron tools” can be considered a “Methods” problem when taking samples or a “Manpower” problem with maintenance personnel.

Excerpted from Nancy R. Tague’s *The Quality Toolbox*, Second Edition, ASQ Quality Press, 2005, pages 247–249.

Create a Fishbone Diagram

Analyze process dispersion with this simple, visual tool. The resulting diagram illustrates the main causes and subcauses leading to an effect (symptom). [Start using the Fishbone tool](#)(Excel, 39 KB).

The Cause and Effect (a.k.a. Fishbone) Diagram

When utilizing a team approach to problem solving, there are often many opinions as to the problem's root cause. One way to capture these different ideas and stimulate the team's brainstorming on root causes is the cause and effect diagram, commonly called a fishbone. The fishbone will help to visually display the many potential causes for a specific problem or effect. It is particularly useful in a group setting and for situations in which little quantitative data is available for analysis.

The fishbone has an ancillary benefit as well. Because people by nature often like to get right to determining what to do about a problem, this can help bring out a more thorough exploration of the issues behind the problem – which will lead to a more robust solution.

To construct a fishbone, start with stating the problem in the form of a question, such as "Why is the help desk's abandon rate so high?" Framing it as a "why" question will help in brainstorming, as each root cause idea should answer the question. The team should agree on the statement of the problem and then place this question in a box at the "head" of the fishbone.

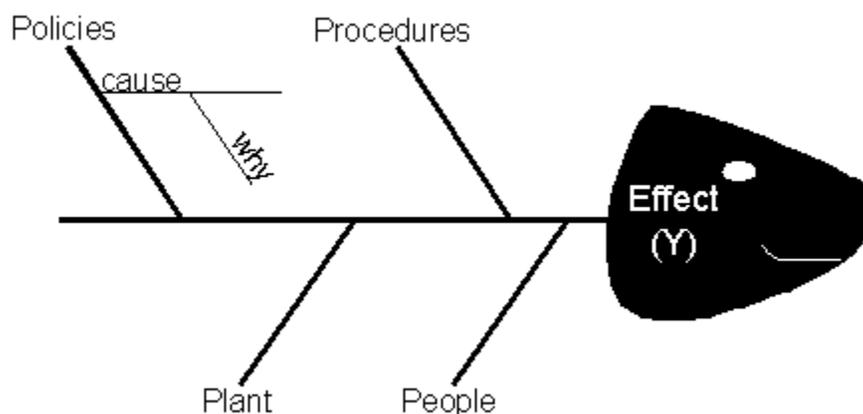
The rest of the fishbone then consists of one line drawn across the page, attached to the problem statement, and several lines, or "bones," coming out vertically from the main line. These branches are labeled with different categories. The categories you use are up to you to decide. There are a few standard choices:

Table 1: Fishbone Suggested Categories

Service Industries <i>(The 4 Ps)</i>	Manufacturing Industries <i>(The 6 Ms)</i>	Process Steps <i>(for example)</i>
Policies	Machines	Determine Customers
Procedures	Methods	Advertise Product
People	Materials	Incent Purchase
Plant/Technology	Measurements	Sell Product
	Mother Nature (Environment)	Ship Product
	Manpower (People)	Provide Upgrade

You should feel free to modify the categories for your project and subject matter.

Once you have the branches labeled, begin brainstorming possible causes and attach them to the appropriate branches. For each cause identified, continue to ask "why does that happen?" and attach that information as another bone of the category branch. This will help get you to the true drivers of a problem.



Once you have the fishbone completed, you are well on your way to understanding the root causes of your problem. It would be advisable to have your team prioritize in some manner the key causes identified on the fishbone. If necessary, you may also want to validate these prioritized few causes with a larger audience.

The following fishbone templates are for immediate download and use. There are two versions: Microsoft Word and Excel.



[Fishbone Template, Microsoft Word \(.DOC\)](#)



[Fishbone Template, Microsoft Excel \(.XLS\)](#)

Viewing Tip: Usually, you can click on the icon link above to view the document in a new window – it may open within your browser using the application (in this case either Word or Excel). If you are having difficulty, try right clicking the link and selecting “Save Target As...” or “Save As...” to save it to your computer harddrive.

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