Fishbone Diagram

What is a Fishbone Diagram?

The fishbone diagram or Ishikawa diagram (named after Dr. Kaoru Ishikawa) is a diagram that resembles a fishbone, or rather a fish skeleton that is viewed from the side. The main purpose of the fishbone diagram is to show what will cause a specific event. What will be caused relates to both primary and secondary causes for a specific event, so the diagram can help all eventualities be considered.

History of The Fishbone Diagram

The first fishbone diagrams were used by the Japanese quality 'guru' in the 1960's. Soon it was established as one of the most fundamental tools to be used in quality management and it is as widely used today as it used to be in the 1960's.

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How an Ishikawa Diagram Works

The diagram works by an event being placed on the ‘backbone’ of the fish and then lines from there, show the primary causes and secondary causes.

So to analyse a basic problem such as ‘no electricity’ the problem would be highlighted on the backbone and all primary and secondary causes will be identified.

No electricity could be caused by not paying the bill, by the utility company being inefficient, by building works that are being undertaken etc.

Once completed it provides a pictorial assessment of our problem and potential route causes.

Fishbone diagrams as brainstorming tools

The fishbone diagram forces you to think along logical lines, in other words, to take an issue and think about it until you have thought about every single result that could happen.

The process of thinking about something to the ‘nth’ degree can be helpful because it sorts out the relationship between cause and effect and helps all those involved understand that each action or event has a consequence i.e you look at the causes and they drive a certain event to happen. Fishbone diagrams are great when coupled with 5 why analysis.

Purpose of a Fishbone Diagram

The purpose of the Fishbone Diagram is to help teams categorize the many potential causes of problems or issues in an orderly way. It also helps in determining root causes. Essentially, this analysis breaks the “whole” into “parts.” Fishbone Diagrams are helpful in clearly breaking down the relationship between a topic and all of the possible factors that are related to it. When used as a Cause-and-Effect Diagram, a Fishbone Diagram can represent the amount of influence of each cause

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Five Types of Fishbone Diagrams

I recently came across a good post about fishbone diagrams on Christian Paulsen's Lean Leadership blog.

Fishbones (also called cause-and-effect, C&E or Ishikawa diagrams) help you brainstorm potential causes of a problem--and see relationships among potential causes.

Brainstorming frequently gets a bad rap. Some people have had bad experiences with brainstorming sessions that were too loose, and consequently didn't result in any useful information or ideas. But when its done in a structured way it's a very useful tool, and can reveal potential causes that wouldn't be immediately obvious.

These diagrams give you a great way to brainstorm within a well-defined structure. You place a central problem, or effect, on the far right of the diagram, then branch "affinities" or types of causes from the spine of the central effect. The specific causes then branch from the affinities.

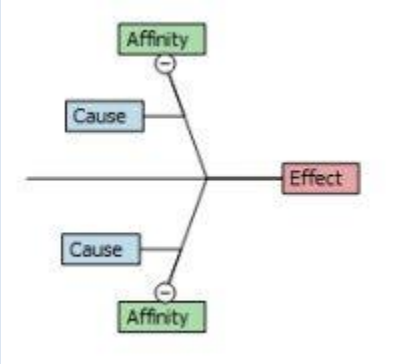
Paulsen points to the effectiveness of this tool for root cause analysis, or as a way to explore several potential causes of problems, focusing on one particular type of diagram.

It's worth mentioning that Lean Six Sigma tools frequently come in different "flavors,", some of which may be better suited to your particular project or challenge. For instance, some Ishikawa diagrams are better for manufacturing than for other types of businesses.

I'm aware of at least five different types, each suited to a different challenge or approach.

Simple Fishbone

In its basic form, the cause-and-effect diagram has no predetermined affinities, or categories of causes, so you can determine affinities that may be unique to your organization. For example, a public relations firm may have affinities that wouldn't be found in a manufacturing operation, and vice versa.



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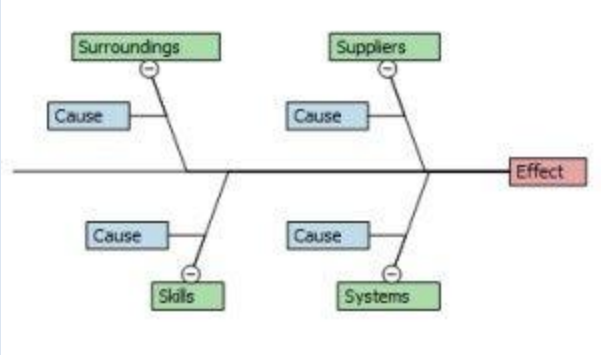
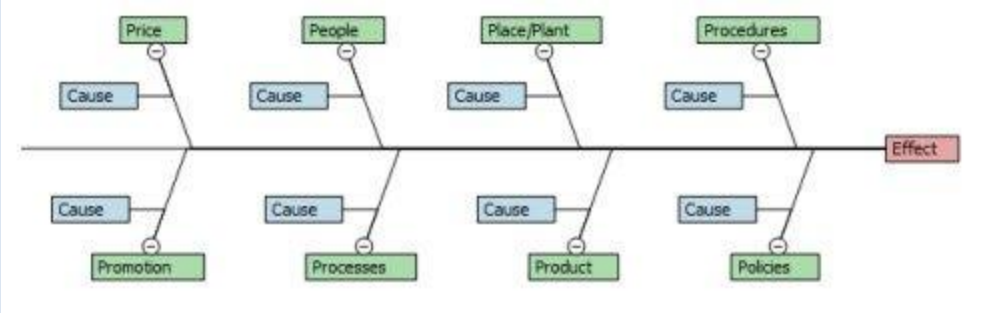
4S Fishbone

This type of C&E diagram is commonly used in the service industry. It organizes information about potential causes into four common categories: Suppliers, Systems, Surroundings, and Skills.



8P Fishbone

This type uses 8 categories: Procedures, Policies, Place, Product, People, Processes, Price, and Promotion. This variation is also commonly used in the service industry, but can certainly be applied in nearly any type of business.



Man Machines Materials Fishbone

This variation, commonly used in manufacturing, allows you to organize potential causes of a problem into these categories: Man, Materials, Machine, Methods, Measurements, and Environment. In some cases, two additional categories are included: Management/Money and Maintenance.

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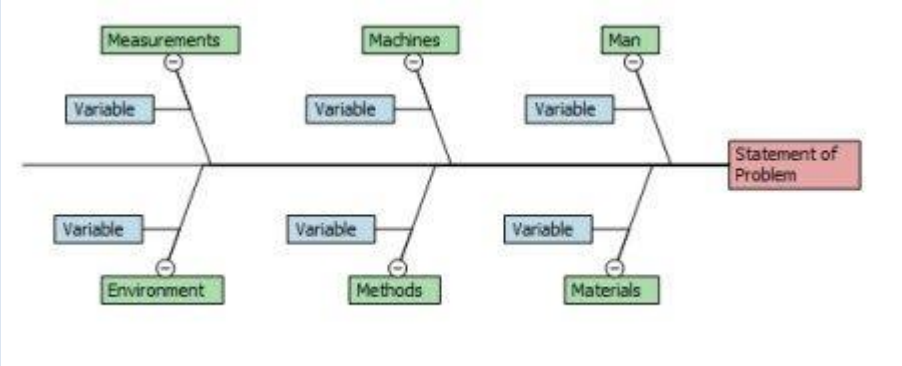
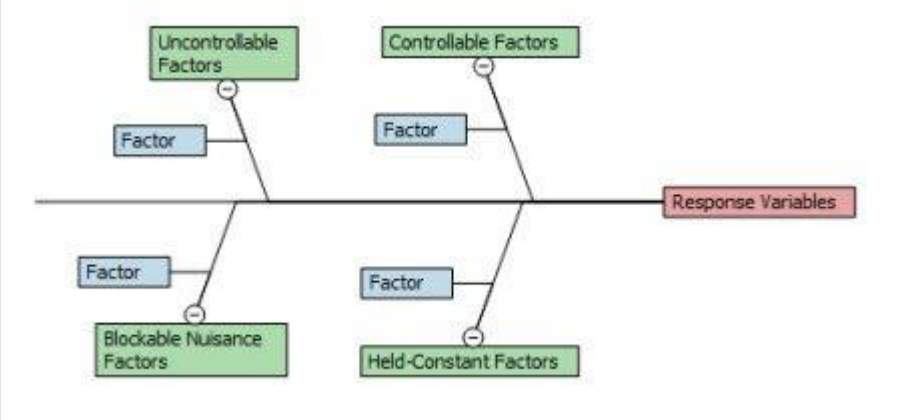


These four Fishbone templates are built into Minitab's Companion software for executing and reporting on quality improvement, along with dozens of other Lean Six Sigma forms and tools. You can use other tools, of course, or just draw out your fishbone diagram on paper. But a cool thing about doing a fishbone diagram in Companion is that the factors you enter during your brainstorming session can be drag-and-dropped and/or autofilled into other tools, reducing the need to re-enter data.

Design of Experiments Fishbone

A last type of Fishbone diagram allows structured brainstorming about potential factors for a response variable to help you design an experiment. You can use this diagram to organize information about potential factors of response variables into Controllable, Uncontrollable, Held-Constant, and Blockable Nuisance categories.

This type of Fishbone that isn't pre-built in to Companion, but it's it's incredibly easy to create a new tool template yourself.



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How to Create a Fishbone Diagram

Creating a Fishbone Diagram involves four main steps. Within those steps, “bones” are used to indicate the impact of the causes (the weight of the impact is measured in the size of the bones that are drawn). For instance, the larger bones closer to the head of the fish represent a big impact, while small bones further away from the head have a smaller impact. The four steps include:

Determine the Head of the Fish

- The head of the fish should be the topic you are analyzing. When creating a Cause-and-Effect Diagram, the head will be the effect.

Determine Related Factors to the Head

- Factors are causes related to the topic or the effect. One option is to list the causes by which have the biggest influence on the head.

Determine the Possibility of Grouping Factors/Causes into Categories

- It might be possible to group factors into categories such as materials, people, environment or types. Categories should be determined by the topic or effect being analyzed.

Draw the Diagram

1. On the right side, write the topic and draw a backbone arrow from left to right.
2. Draw vertical arrows connecting the categories to the main backbone arrow. When creating a Cause-and-Effect diagram, if you listed the causes by those that have the biggest influence on the head, the larger bones that are closest to the head of the fish have the greatest impact and the smaller bones that are further away indicate causes that have less impact.
3. If you’re grouping factors or causes, draw horizontal branching arrows for each vertical arrow connected to a category. This helps compartmentalize the individual factors related to the category.

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