

[Home](#) > [Resource Pages](#) >👋 Hi! Please [Sign in](#) | [Register](#).**Minitab** 

Ready to leverage Minitab Statistical Software insights, but not sure where to begin?

Start with our free e-learning guide, **Minitab Quick Start!**

[Access Now](#)

THE FUNDAMENTALS OF CAUSE-AND-EFFECT (AKA FISHBONE) DIAGRAMS

By  **iSixSigma-Editorial**

 **5 COMMENTS**

A popular means for identifying the causes of a particular problem, or effect, is the aptly named cause-and-effect diagram. As the completed graphic resembles the bones of a fish, it is also commonly referred to as a “fishbone” diagram (Figure 1).

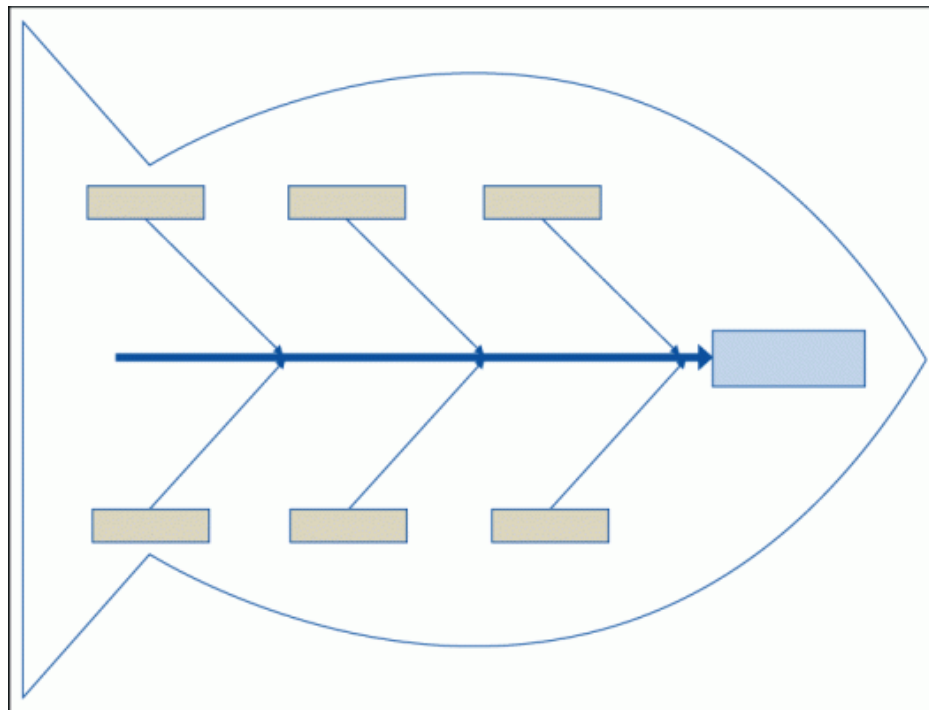
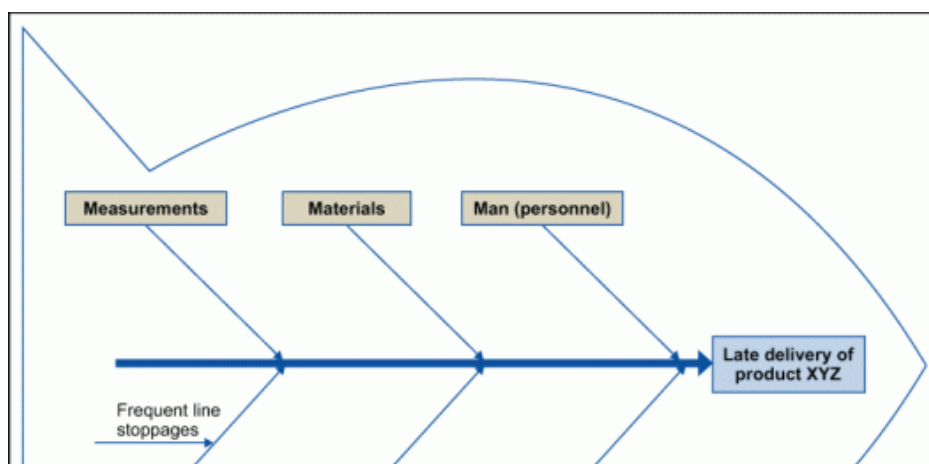


Figure 1: A Fishbone Diagram

The head of the “fish” is the problem statement, such as “late delivery of product XYZ” (Figure 2). From the head is drawn a straight horizontal line, and all of the “bones” coming off that line represent categories of possible causes. For example, many practitioners use the 6Ms as the categories for the bones:

1. Man (personnel)
2. Machine
3. Methods
4. Materials
5. Measurements
6. Mother Nature (environment)



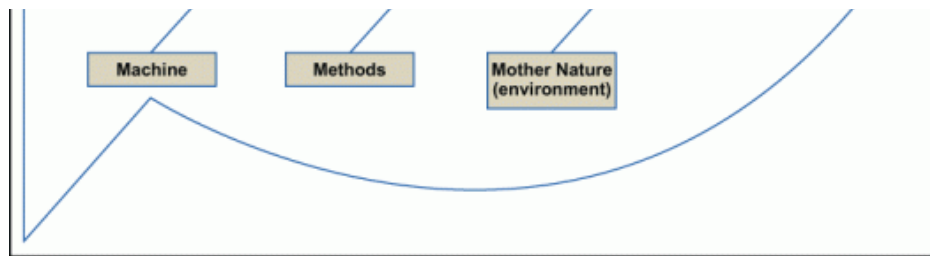


Figure 2: Filling in the Bones

However, what set of categories is used for a given analysis can be modified to fit the situation.

Team members – which should include subject matter experts and those who work within the processes related to the problem – then brainstorm the causes of the defined problem. For example, a possible cause of *late deliveries of product XYZ* within the *Machine* category could be “frequent line stoppages.”

Another approach is to start by brainstorming the possible causes of the problem, and then determining appropriate categories based on what causes were identified. Sticky notes are particularly useful for this method – write one cause per sticky note and they are easily moved for grouping.

A team is likely to find that once they have identified possible causes, they need to delve a little further to find a true root cause. For instance, as shown in Figure 3, each cause coming off the main category “bone” could have one or more lines with sub-causes coming off of it. Application of the 5 Whys at this point can help drive the team to the root cause. Why are there frequent line stoppages? Because the material jams. Why does the material jam? Because it is out of spec. Why is it out of spec? Etc.

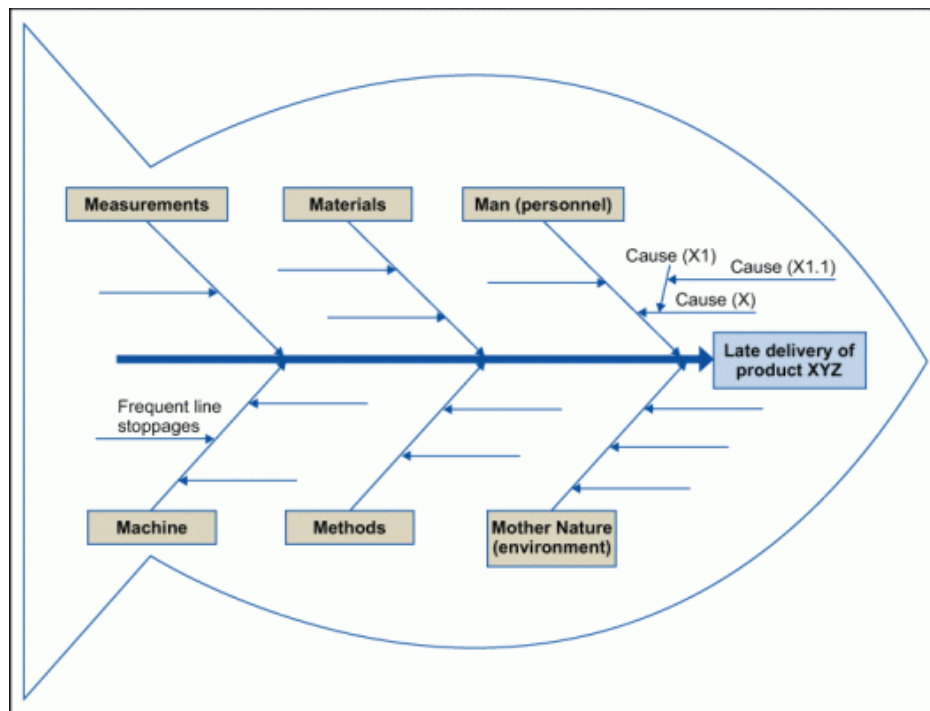


Figure 3: Determining the Causes

Teams that start brainstorming within defined categories may find that as they dig further into a cause, the sub- or root cause might better fit into a different category (e.g., out-of-spec material that causes jams more appropriately fits in the Material category, rather than Machine). Not to worry. The categories are generally used to help spur ideas and should not constrain a team with unnecessary boundaries.

Handpicked Content: [Communication and Business Case Key to Revising Process](#)

While the cause-and-effect diagram has the benefit of being a visual tool that utilizes the input of many team members, its drawback is that it is based on perception and does not constitute a quantitative analysis. For that reason, it is best suited for projects in which hard data is unavailable, or as preliminary work to identify potential causes worthy of data collection and further analysis.

After the diagramming is complete, the improvement team can tackle the root causes – either by immediately addressing the identified cause, or by using the information as input for additional analysis as needed.

Figure 4: Example of Completed Fishbone Diagram – graphic excerpted from “Case Study: Applying Six Sigma to Cricket” at <https://www.isixsigma.com/implementation/sports/case-study-applying-six-sigma-to-cricket/> (Click to enlarge)

To learn more about cause-and-effect analysis and related topics, refer to the following articles, discussions and blogs on iSixSigma.com:

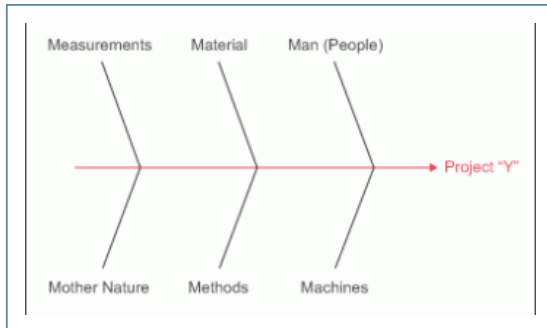
- [Categories of Legitimate Reservation Focuses Fishbone](#)
- [Coffee Variation and Six Sigma Espresso Pours](#)
- [Decision-Making with Cause-and-Effect Analysis and DOE](#)
- [How to Approach Fishbone Brainstorming](#)
- [The Cause and Effect \(aka Fishbone\) Diagram](#) (with free template)

Additional resources are available for purchase on the iSixSigma Marketplace:

- [Cause and Effects Diagrams Training Slides](#)
- [Process Discovery – Fishbone Reference Guide](#)

For more cause-and-effect articles, [click here](#).

You Might Also Like



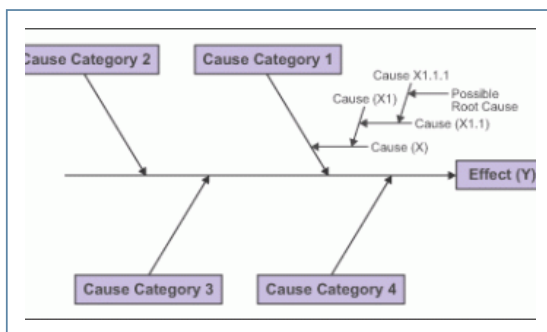
The Cause and Effect (a.k.a. Fishbone) Diagram

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

In "Cause & Effect"

Combining SIPOC with the Cause-and-Effect Diagram

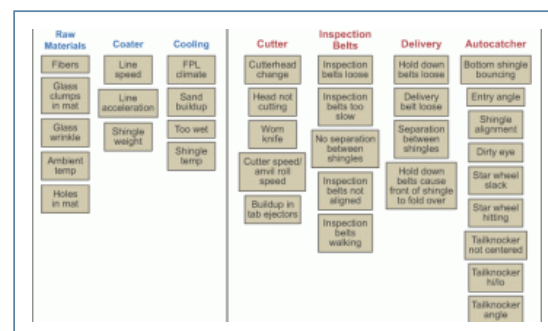
In "Cause & Effect"



Categories of Legitimate Reservation Focuses Fishbone

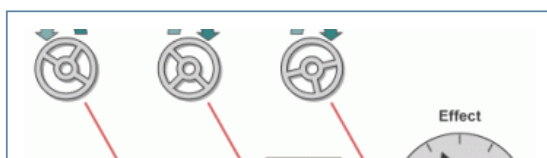
In "Cause & Effect"

	fully utilize the application	no update the application	making sales calls	the benefits of updating it	resistance to update it	no sales	Others	KPI
You don't know how to fully utilize the application		W ↑		S ↑	W ↑	11	0	11
You don't think it is important to update the application	W ←		S ←	S ↑	M ←	9	15	24
You're busy making sales calls		S ↑		S ↑	M ↑	25	0	23
You don't identify with the benefits of updating it	S ←	S ←	S ←		S ←	0	35	35
There is no resource or incentive to update it	W ←	M ↑	M ←	S ↑		14	6	20
	S = S (Strong relationship)	M = S (Medium relationship)						



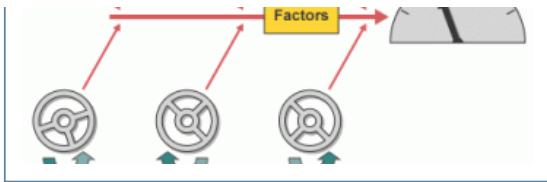
Thinking Two Moves Ahead with Analytical Tools

In "Brainstorming"



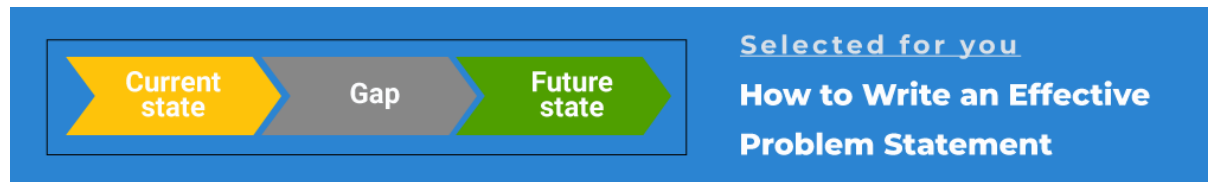
An Affinity for Scope

In "Affinity Diagram/KJ Analysis"



Teamwork and Creativity Help to Identify Root Causes

In "Brainstorming"



Share With Your Network



iSixSigma-Editorial

[View Profile](#) | [View all posts by iSixSigma-Editorial](#)

Comments



caseyem

It's not always possible to get to the "true" root cause. For example, a hole in a wall may be due to a leaky pipe. A leaky pipe maybe due to the material used. The material's fragility is due to physical properties. It's physical properties are due to? When have you reached the "true" root cause?

But often we just want to mitigate the effect, so we don't need to get to root causes.

I've never seen anyone teach/explain when to stop digging deeper, i.e., when to stop asking why. The advice I give is when by the answer you know what action to take to mitigate the effect. Thus. a less knowledgeable and capable person will ask more

whys than a more knowledgeable and capable one.

A third issue is that once a list of potential causes is generated, little is said about how to reduce the list without subjectivity. I was happy to see you state: "its drawback is that it is based on perception and does not constitute a quantitative analysis. For that reason, it is best suited for projects in which hard data is unavailable, or as preliminary work to identify potential causes worthy of data collection and further analysis."

Fourthly, it's easy to give examples of the Five Whys. But I have never seen anyone explain how to get the answers, giving the impression that we always know the answers. If we know, then why not just solve the problem?

Finally, because brainstorming's purpose is quantity over quality, I prefer using another set of categories that keeps the list to what is relevant: process steps. Rather using the 6 Ms or its variants, I list the process steps. Of course, once I decide to use process steps, then I no longer need to use a fish bone. An example of a template for process steps is the FMEA or variations of it. Using the FMEA, I then replace Potential Failure Mode with Actual Defect.

- Log in to Reply

Terence Winslow

Powerful Presentation Diagrams!!! Laser precision for "GETTING IT DONE" Teams & Personal Development Masters...

- Log in to Reply

Pranay Kumar

Good article. Fishbone is an imperative graphical representation of the root causes identified. However it is THE most challenging exercise in any consulting/improvement assignment.

C&E is the defining moment to the improvement journey,

- Log in to Reply

Reply

Fish bone is powerful tool to understand the root cause and at the same time, challenging task. Further, we can leverage this diagram to validate the real cause of the problem.

- Log in to Reply

Olive

Very good thank you

- Log in to Reply

 SUBSCRIBE

Leave a Reply

You must be logged in to post a comment.



[report this ad](#)

5S & LEAN E-BOOKS



FREE

DOWNLOAD NOW >

SIGMAXL V9

INCLUDES ALL THE TOOLS AND TEMPLATES NEEDED
FOR LEAN SIX SIGMA AND PROCESS IMPROVEMENT

**NEW IN V9 – TIME SERIES
FORECASTING AND ADVANCED SPC!**

SigmaXL Inc. brings you these
tools as user friendly Excel add-ins.

DOWNLOAD A 30 DAY FREE TRIAL
at www.SIGMAXL.com

ACHIEVE
**OPERATIONAL
EXCELLENCE**
IN YOUR CAREER
100% ONLINE
LEAN SIX SIGMA
CERTIFICATION

**P PURDUE
UNIVERSITY.**

LEARN MORE

Recent Discussions

No Support for Six Sigma Initiatives in Organization >

by  suri19591

11 hours, 43 minutes ago

New to Six Sigma >

by  Pratik Pawar

12 hours, 1 minute ago

Hi Everyone. I am Carlos from Spain >

by  Carlos Gomez Portela

1 day, 16 hours ago

What Is the Difference Between Discrete and Continuous Variables? >

by  kathilee

2 days, 13 hours ago

Top Rated Resources

How to Write an Effective Problem Statement	>
High-performance Teams: Understanding Team Cohesiveness	>
Preparing to Measure Process Work with a Time Study	>
The Importance of Implementing Effective Metrics	>
Heijunka: The Art of Leveling Production	>
The Implementation Plan – Getting Beyond the Quick Fix	>
Calculating ROI to Realize Project Value	>
Lean Six Sigma and the Art of Integration	>
Most Practical DOE Explained (with Template)	>
Set SMART Goals to Better Manage Time	>



100% Online

Featured Jobs

Sr. Quality Improvement Specialist >

Cincinnati Children's Hospital

Cincinnati, OH, USA

Process Improvement Engineer >

Henkel

Bowling Green, KY, USA

Director, Continuous Improvement & Lean >

Xometry Inc

Rockville, MD, USA

What's Your Sigma?

Process Sigma Calculator

Enter your process opportunities and defects.

Opportunities*

100

Defects*

1

Calculate

Recent Articles

Ensuring Successful New Products and Services with QFD >

Maximize the Effectiveness of Teams >

Using Lean Six Sigma Measurement Tools in Maintenance >

Overcoming Capacity Constraints with Optimization Modeling >

The Importance of Vision Casting >



[report this ad](#)

ISIXSIGMA

We help businesses of all sizes operate more efficiently and delight customers by delivering defect-free products and services.

iSixSigma is your go-to Lean and Six Sigma resource for essential information and how-to knowledge. We are honored to serve the largest community of process improvement professionals in the world.

[Learn More About iSixSigma](#)

Inside iSixSigma

- [iSixSigma Disclosures](#) >
- [Submit an Article or Blog for Publishing](#) >
- [Advertising on iSixSigma](#) >
- [Article or Content Licensing](#) >
- [Contact iSixSigma](#) >
- [★ Get Six Sigma Certified](#) >



Instant Insider Report PDF Download!

Join **59000+** other smart change agents and insiders on our weekly newsletter, read by corporate change leaders of:



[Yes & Send Me My Free Report! →](#)

© Copyright iSixSigma 2000-2021. Terms. Privacy. Reproduction or use of content without the express written consent of iSixSigma is prohibited. [More »](#)

