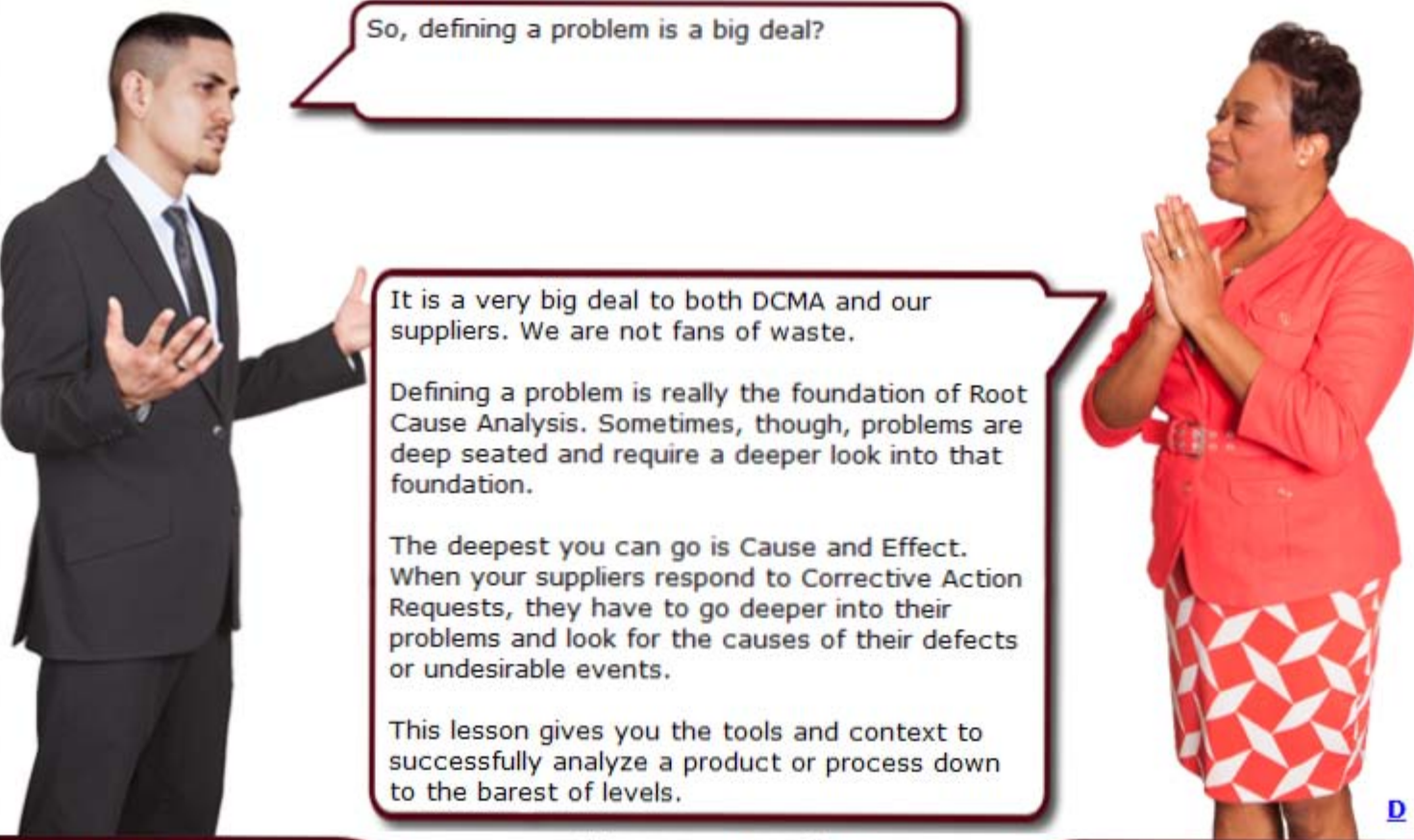


Lesson Introduction

[View CR](#) [Submit CR](#)



So, defining a problem is a big deal?

It is a very big deal to both DCMA and our suppliers. We are not fans of waste.

Defining a problem is really the foundation of Root Cause Analysis. Sometimes, though, problems are deep seated and require a deeper look into that foundation.

The deepest you can go is Cause and Effect. When your suppliers respond to Corrective Action Requests, they have to go deeper into their problems and look for the causes of their defects or undesirable events.

This lesson gives you the tools and context to successfully analyze a product or process down to the barest of levels.

**Long Description**

The mentor is having a conversation with the first DCMA specialist. The DCMA specialist says skeptically to the mentor, "So, defining a problem is a big deal"? The mentor replies, "It is a very big deal to both DCMA and our suppliers. We are not fans of waste. Defining a problem is really the foundation of Root Cause Analysis. Sometimes, though, problems are deep seated and require a deeper look into that foundation. The deepest you can go is Cause and Effect. When your suppliers respond to Corrective Action Requests, they have to go deeper into their problems and look for the causes of their defects or undesirable events. This lesson gives you the tools and context to successfully analyze a product or process down to the barest of levels."

## Lesson Objectives

[View CR](#) [Submit CR](#)

Terminal Learning Objective - Given a simple problem scenario and a problem solving tool, complete cause and effect charts.

This lesson has six objectives. Upon completion, you should be able to:

- Recognize the four characteristics of the cause and effect principle.
- Identify the 5 Whys Principle.
- Identify the characteristics of the Ishikawa (fishbone) and tree diagrams.
- Recognize the categories used for generating an Ishikawa diagram.
- Illustrate an Ishikawa (fishbone) diagram that shows the cause effect relationship between events and outcomes.
- Illustrate a tree diagram that shows the cause effect relationship between events and outcomes.

First, you will learn the four characteristics of the cause and effect principle.



## Cause and Effect Illustration

[View CR](#) [Submit CR](#)

This simple illustration will help you understand a few definitions used in the Cause and Effect Principle.

The top graphic illustrates a wet surface.

The middle graphic illustrates a fall.

The bottom graphic illustrates an injury.

You have probably already made up your mind as to what the cause and effect are in this illustration:

"The wet surface (cause) made the man fall (effect) and land in the hospital."

Let's look at the illustration a different way – through the characteristics of the Cause and Effect Principle.



**Long Description**

Three signs are stacked vertically. The first sign illustrates a wet surface. The second sign illustrates a person falling on top of the wet surface. The third sign illustrates the person lying in a hospital bed, foot raised in a cast.

## Cause and Effect Characteristics

[View CR](#) [Submit CR](#)

The Cause and Effect Principle has four characteristics:

1. Causes and effects are the same thing.
2. Causes and effects are part of an infinite continuum of causes.
3. Each effect has at least two causes in the form of actions and conditions.
4. An effect exists only if its causes exist at the same point in time and space.



[D](#)

**Long Description**

Three signs are stacked vertically. The first sign illustrates a wet surface. The second sign illustrates a person falling on top of the wet surface. The third sign illustrates the person lying in a hospital bed, foot raised in a cast.



## Cause and Effect Characteristics, Cont.

[View CR](#) [Submit CR](#)

Click on each of the four characteristics below to learn more about the Cause and Effect Principle.

**Characteristic #1**

**Characteristic #2**

**Characteristic #3**

**Characteristic #4**

### Cause and Effect are the Same

Knowing that cause and effect are the same thing only viewed from a different perspective in time helps us understand one reason why people can look at the same situation and see different problems. They are actually perceiving different time segments of the same event.

For example, in the graphic, the primary effect is the "Injury" and the first cause is a "Fall". If we ask why "Fall", this cause has to be seen as an effect. That is, we cannot ask why of a cause, only of an effect, so "Fall" changes from a cause to an effect.



[D](#)



## **Popup Content**

### **Characteristic 1**

#### **Cause and Effect are the Same**

Knowing that cause and effect are the same thing only viewed from a different perspective in time helps us understand one reason why people can look at the same situation and see different problems. They are actually perceiving different time segments of the same event.

For example, in the graphic, the primary effect is the "Injury" and the first cause is a "Fall". If we ask why "Fall", this cause has to be seen as an effect. That is, we cannot ask why of a cause, only of an effect, so "Fall" changes from a cause to an effect.

#### **Long Description**

A graphic similar to the previous page is depicted here. Again, the graphic is made up of three images. The first image, labeled "Cause", illustrates a wet surface. The second graphic, labeled "Cause Effect", illustrates a person falling on top of the wet surface. The third graphic, labeled "Effect", illustrates the person lying in a hospital bed, foot raised in a cast.

### **Characteristic 2**

#### **Infinite Continuum**

Knowing that causes and effects are part of an infinite continuum of causes helps you understand that no matter where you start problem analysis, you are always in the middle of a chain of causes.

There is no right place to start. Your suppliers can start the problem solving process anywhere and still end up with a complete picture. Using the graphic, one supplier may be focused on the injury while another is focused on the leaky valve. Instead of arguing over what the problem is, your suppliers should know that all causes are connected somehow in time, and they just need to figure out what those connections are.

### **Long Description**

This graphic is a series of five images illustrating the events that culminate in a person with a broken leg. The last graphic in the series is an image of person lying in a hospital bed with a broken leg. This is the final effect. An arrow points back to the previous graphic, which depicts the person slipping and falling over a wet surface. This is the cause of the broken leg effect. An arrow points back to the previous graphic, which depicts a wet surface. This is the cause of the fall effect. An arrow points back to the previous graphic which depicts a faucet dripping on the ground. This is the cause of the wet surface effect. An arrow points back to the first graphic in the series, which depicts the faucet alongside a wrench that has been crossed out to indicate the faucet was not maintained. This is the cause of the leaking faucet effect.

### **Characteristic 3**

#### **Each Effect has Two Causes**

The most profound characteristic of the Cause and Effect Principle is that each effect has at least two causes in the form of actions and conditions.

Every time a supplier asks, "why?", they should find at least two causes. And because of the infinite continuum, for each of these causes we should find at least two more causes resulting in four causes, and from each of these four causes we should find two causes resulting in at least 8, and on to 16, 32, etc.

### **Long Description**

This graphic illustrates the effect of the person lying in a hospital bed with a broken leg. This graphic branches into two causes: a graphic of a wet surface is labeled "Conditional Cause", and a graphic of a person slipping and falling is labeled "Action Cause". Each of these causes themselves each branch into a Conditional Cause and an Action Cause. The wet surface Conditional Cause is the faucet not being maintained. The wet surface Action Cause is the dripping faucet. The person tripping and falling Conditional Cause is a water droplet. The person tripping and falling Action Cause is the puddle that is created on the ground.

## **Characteristic 4**

### **Effects Exist at the Same Point in Time and Space**

Note how an effect exists only if its causes exist at the same point in time and space. The injury exists because conditional causes came together with an action cause at a particular point in time and space. In the graphic, two conditional causes: the wet floor and the poorly maintained valve, AND one action cause, a person walking, occurred at the same point.

If these three causes did not exist at the same time and space, the injury would not exist.

### **Long Description**

A timeline is depicted that shows a poorly-maintained faucet valve dripping to create a wet surface on the floor. A person walking is depicted at the same time and in the same place/space as the wet surface. The next image in the timeline is the injury of the person with the broken leg.

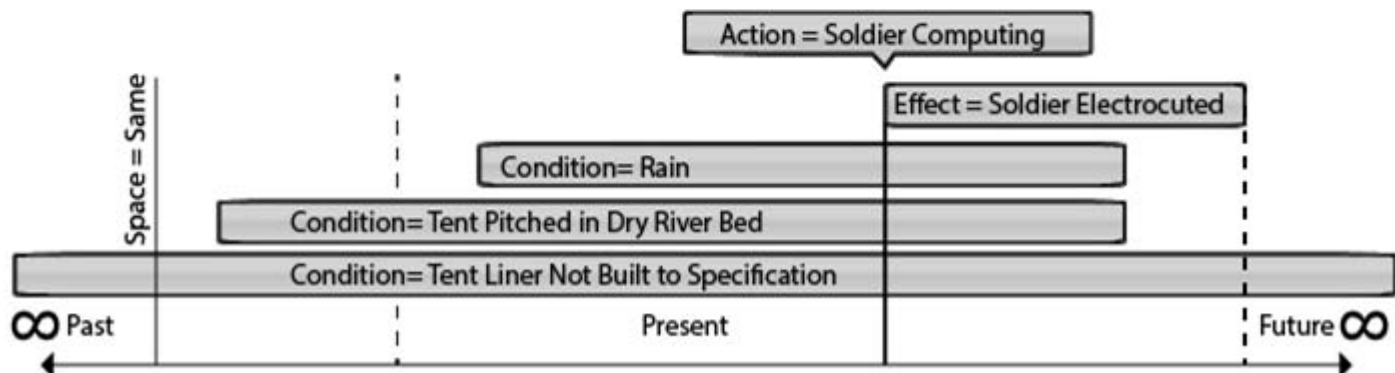
## Cause and Effect Example

[View CR](#) [Submit CR](#)

These four characteristics of the Cause and Effect Principle allow you to look at your suppliers and their problems from a new and basic perspective:

1. Causes and effects are the same thing.
2. Causes and effects are part of an infinite continuum of causes.
3. Each effect has at least two causes in the form of actions and conditions.
4. An effect exists only if its causes exist at the same point in time and space.

Use the diagram below to understand the cause and effect relationship for the events that lead up to the electrocution of a soldier operating inside one of your supplier's tents.



**Long Description**

A timeline depicts three conditions occurring in the same time and space. The conditions are Rain, a Tent Pitched in a Dry River Bed, and the Tent Liner Not Built to Specification. The next event in the timeline is the effect of a soldier being electrocuted.

## Cause and Effect Knowledge Review

[View CR](#) [Submit CR](#)

Which of the following statements are characteristics of the Cause and Effect Principle?

(Select all that apply)

- ☐ Causes and effects exist in opposite points and times in space.
- ☒ Causes and effects are part of an infinite continuum.
- ☐ Causes and effects are scheduled in an indefinite continuum.
- ☒ Causes and effects are the same thing.
- ☒ Each effect has at least two causes.
- ☐ Each cause has more than two effects.
- ☒ Effects and their causes exist in the same point and time in space.
- ☐ Effects are independent of their causes.

[Check Answer](#)



The four characteristics are that **causes and effects are the same thing and part of an infinite continuum. Each effect has at least two causes, and they exist in the same point and time in space.**



## Cause and Effect Summary

[View CR](#) [Submit CR](#)



Do suppliers and vendors know about the Cause and Effect Principle?



Some vendors are better than others at determining the cause and effect relationship when they are correcting an action.

At DCMA, you may be in a position to review a Corrective Action Plan that may or may not distill things down to cause and effect.

Many suppliers and vendors submit what are called Reality Charts in their plans.

[Click here to see a Reality Chart created for an automobile accident.](#)

In the next topic, we'll lay the groundwork for other diagrams by explaining the "Five Whys".

D

### **Long Description**

The mentor, Linda, is now having a conversation with a different DCMA Specialist. The DCMA Specialist asks the mentor, "Do suppliers and vendors know about the Cause and Effect Principle?" The mentor answers, "Some vendors are better than others at determining the cause and effect relationship when they are correcting an action. At DCMA, you may be in a position to review a Corrective Action Plan that may or may not distill things down to cause and effect. Many suppliers and vendors submit what are called Reality Charts in their plans."

[Click here to see a Reality Chart created for an automobile accident.](#)

The mentor continues by saying, "In the next topic, we'll lay the groundwork for other diagrams by explaining the "Five Whys"."

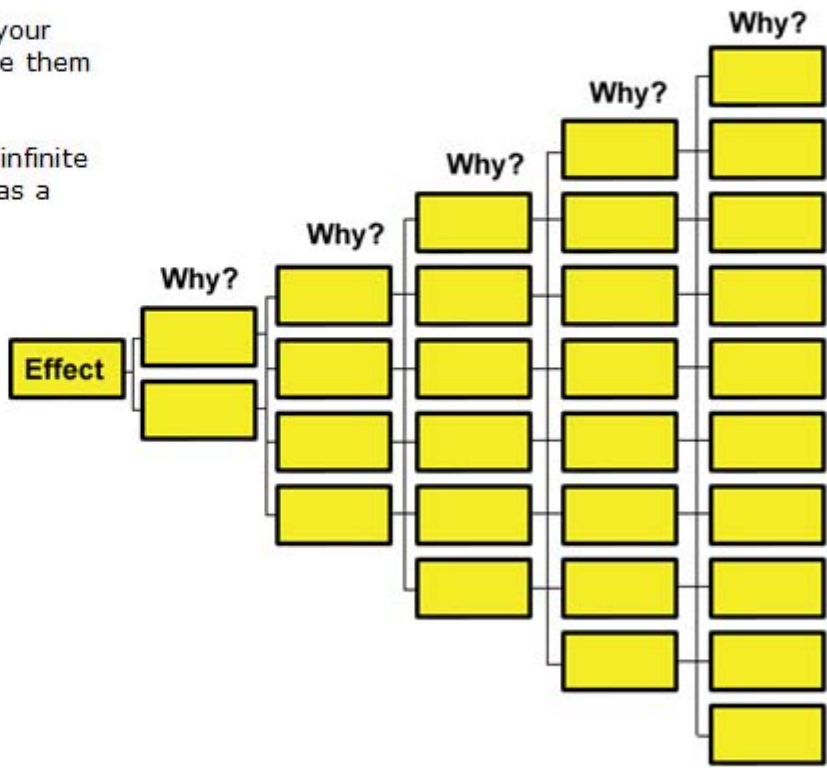
Five Whys Introduction

[View CR](#) [Submit CR](#)

Another principle used in Root Cause Analysis to explore cause and effect is called the Five Whys.

When trying to identify or define a problem, your suppliers can use this simple principle to guide them through their analysis.

The Five Whys are illustrated here using the infinite continuum of the Cause and Effect Principle as a backdrop.



**Long Description**

A Five Whys diagram that consists of six columns. The first column has a single rectangle labeled "Effect." This rectangle then branches out into two more rectangles in the second column. These rectangles in turn both branch out into two more rectangles, and so on. The sixth and final column has a total of ten rectangles. The last five columns have the word "Why?" written above them.

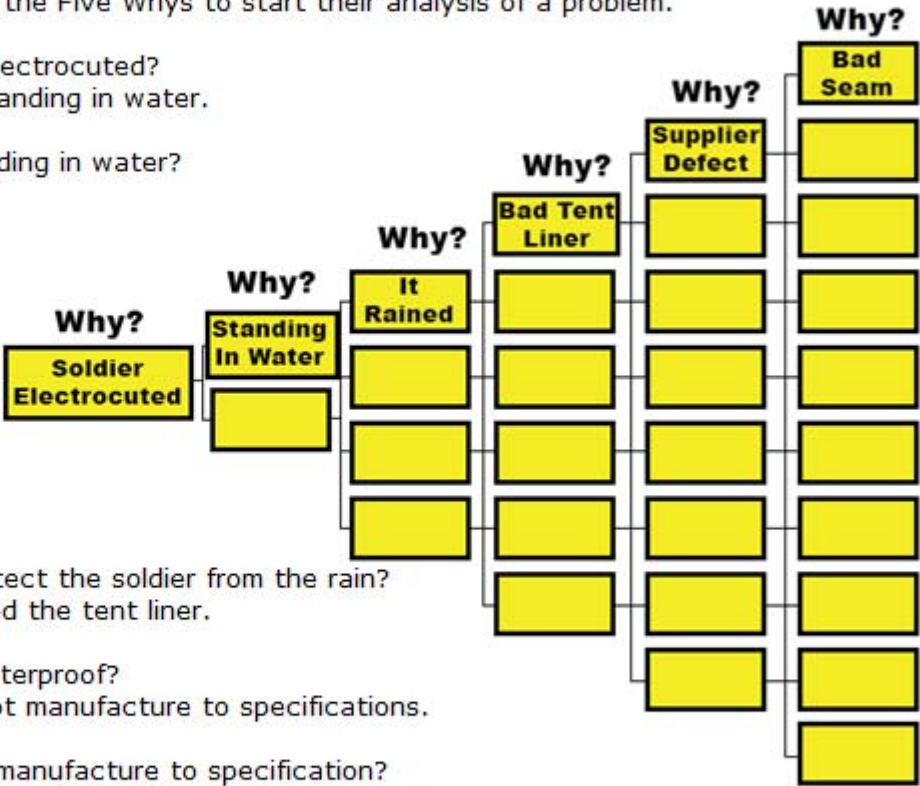
Five Whys Example

[View CR](#) [Submit CR](#)

Here is an example of a supplier using the Five Whys to start their analysis of a problem.

Question 1: Why did the soldier get electrocuted?  
Answer 1: Because the soldier was standing in water.

Question 2: Why was the soldier standing in water?  
Answer 2: Because it rained.



Question 3: Why did the tent not protect the soldier from the rain?  
Answer 3: Because the rain penetrated the tent liner.

Question 4: Why was the liner not waterproof?  
Answer 4: Because the supplier did not manufacture to specifications.

Question 5: Why did the supplier not manufacture to specification?  
Answer 5: Because their machines did not calibrate the machine that sews the seam.

Note that the "5 Whys" approach is not limited to 5 whys. It can take a few more "whys" before revealing the root cause.

[D](#)

### **Long Description**

The Five Whys diagram from the previous page is depicted, except now, the first path is populated. The root node is labeled "Soldier Electrocuted". The first "Why?" that branches from "Soldier Electrocuted" is labeled "Standing in Water". The first "Why?" that branches from "Standing in Water" is labeled "It Rained". The first "Why?" that branches from "It Rained" is labeled "Bad Tent Liner". The first "Why?" that branches from "Bad Tent Liner" is labeled "Supplier Defect". The first "Why?" that branches from "Supplier Defect" is labeled "Bad Seam". All other nodes are empty.



## Five Whys Knowledge Review

[View CR](#) [Submit CR](#)

Which question is most likely to be asked by a DCMA supplier when using the Five Whys Principle to help define a problem with a defective glass bezel on a compass?

- ☐ Why did the Major choose North instead of South?
- ☐ Why did the map not identify a fork in the road?
- ☐ Why did glass reflect the sun into the Major's eyes?
- ☒ Why did the compass body fill with water?

Check Answer

Each of these questions could be part of a Five Why analysis, but the most likely question is: **Why did the compass body fill with water?**



## Five Whys Summary

[View CR](#) [Submit CR](#)



Is there ever a time when a supplier might use more than just five Whys?



Of course! Suppliers and vendors may use as many Whys as necessary to get to the root cause of their problem. At DCMA, you may never see the supplier's application of the Five Whys Principle, but you can certainly look at their diagrams to see if they asked enough Whys.

[Click here to see the Reality Chart from the last topic \(automobile accident\) with all of the Whys highlighted.](#)

In the next topic, we'll look at the characteristics of the Ishikawa Fishbone and Tree diagrams. These are built as a result from a good Five Whys session.

[D](#)

### **Long Description**

The mentor and the DCMA Specialist continue their conversation. The DCMA Specialist asks the mentor, "Is there ever a time when a supplier might use more than just five Whys?" The mentor answers, "Of course! Suppliers and vendors may use as many Whys as necessary to get to their problem. At DCMA, you may never see the supplier's application of the Five Whys Principle, but you can certainly look at their diagrams to see if they asked enough Whys."

[Click here](#) to see the Reality Chart from the last topic (automobile accident) with all of the Whys highlighted.

The mentor continues by saying, "In the next topic, we'll look at the characteristics of the Ishikawa Fishbone and Tree diagrams. These are built as a result from a good Five Whys session

## Cause and Effect Diagrams

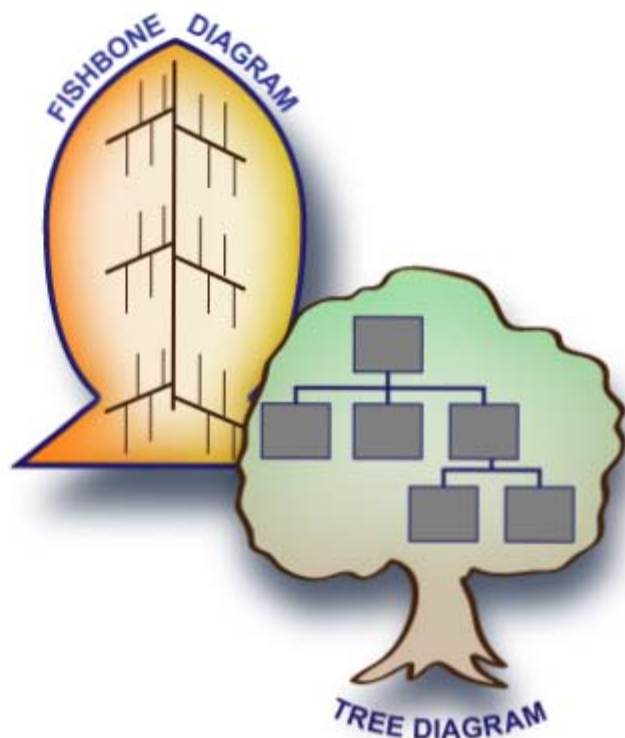
[View CR](#) [Submit CR](#)

The two most common tools used during cause and effect analysis are:

1. Ishikawa (fishbone) diagram
2. Tree diagram

Both of these diagrams serve the same purpose – they provide graphic displays for problem solvers to generate and sort their cause and effect ideas or hypotheses.

They take their names from the shapes they make when drawn.



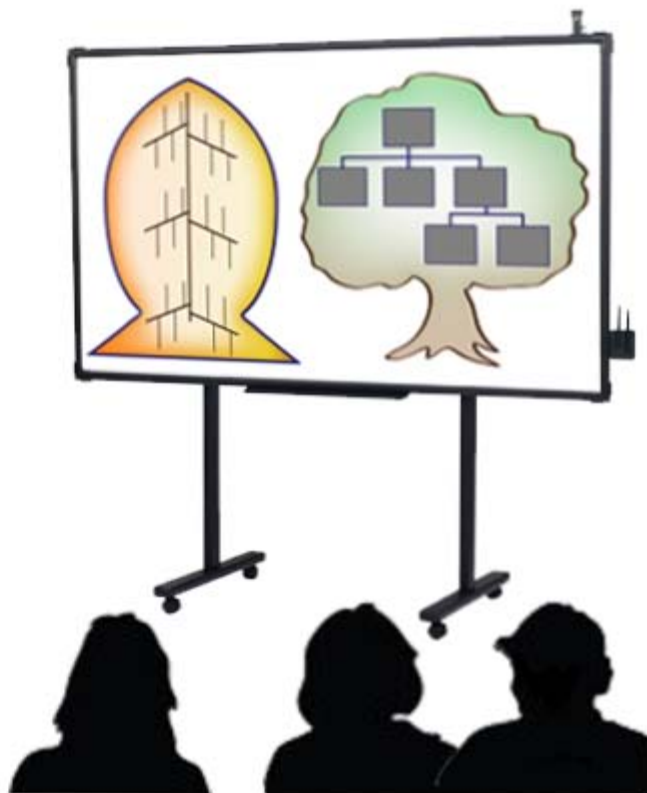
## Cause and Effect Diagrams - Common Characteristics

[View CR](#) [Submit CR](#)

The common characteristics between the Fishbone and Tree diagrams are that they both:

- Organize large amounts of information
- Show links between events
- Point to potential or actual causes

Both are used by teams to brainstorm, and to gather and sort ideas during cause and effect analysis. A supplier may organize several members of its management team and its manufacturing team around the same table to complete one of these diagrams.



**Long Description**

The silhouette of a team faces a projector screen. On the screen are two diagrams. On the left is a fish diagram. On the right is a tree diagram.



## Cause and Effect Diagrams - Purpose

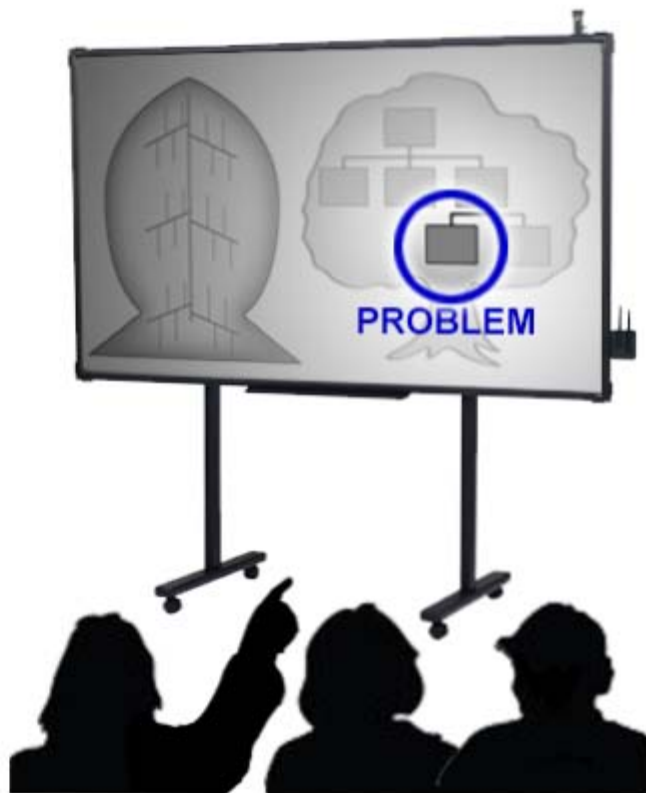
[View CR](#) [Submit CR](#)

Because everyone's ideas can find a place on these diagrams, a cause-and-effect analysis helps to generate consensus about causes.

It can help to focus attention on the process in which a problem is occurring and to allow for constructive use of facts gained from reported events.

However, it is important to remember that a cause-and-effect diagram (whether it is a Fishbone or Tree Diagram) is a structured way of expressing hypotheses about the causes of a problem or about why something is not happening as desired.

It cannot replace empirical testing of these hypotheses: it does not tell which is the root cause.



**Long Description**

One of the audience members points at the projector screen. On the screen is a circle over the tree diagram. The circle is labeled "PROBLEM".

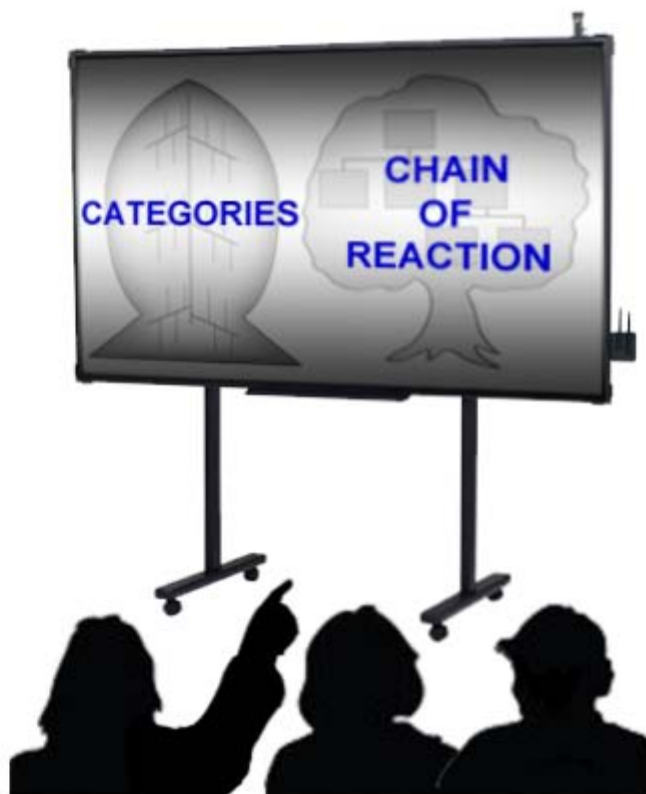
## Cause and Effect Diagrams - When to Use

[View CR](#) [Submit CR](#)

With two diagrams in use to brainstorm, gather, and sort ideas, it is important to know when to use one over the other.

When deciding which diagram to use, your suppliers will look at the potential causes of their problem and use the following conditional statements to pick a diagram:

- If causes can be categorized, then use the Fishbone diagram.
- If causes are seen as a chain of events, then use the Tree diagram.



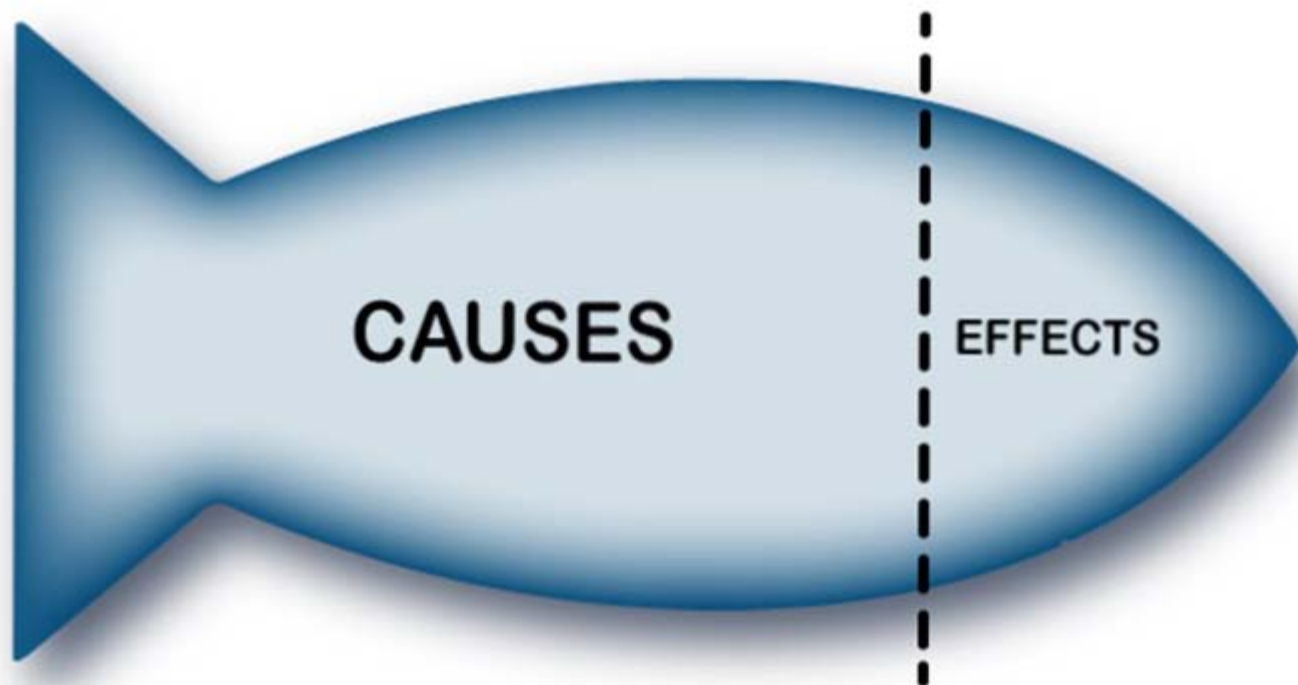
**Long Description**

One of the audience members points at the projector screen. The fish diagram on the left of the screen is labeled "CATEGORIES". The tree diagram on the right of the screen is labeled "CHAIN OF REACTION".

### Ishikawa Fishbone Diagram Characteristics

[View CR](#) [Submit CR](#)

The characteristics of the Ishikawa diagram begin with the team separating the causes from the effects on a horizontal diagram. A dotted line is used to separate them on the graphic. Note that the fish can face left or right and it is advisable to leave more room for the causes (bones) than for the effects (head).



**Long Description**

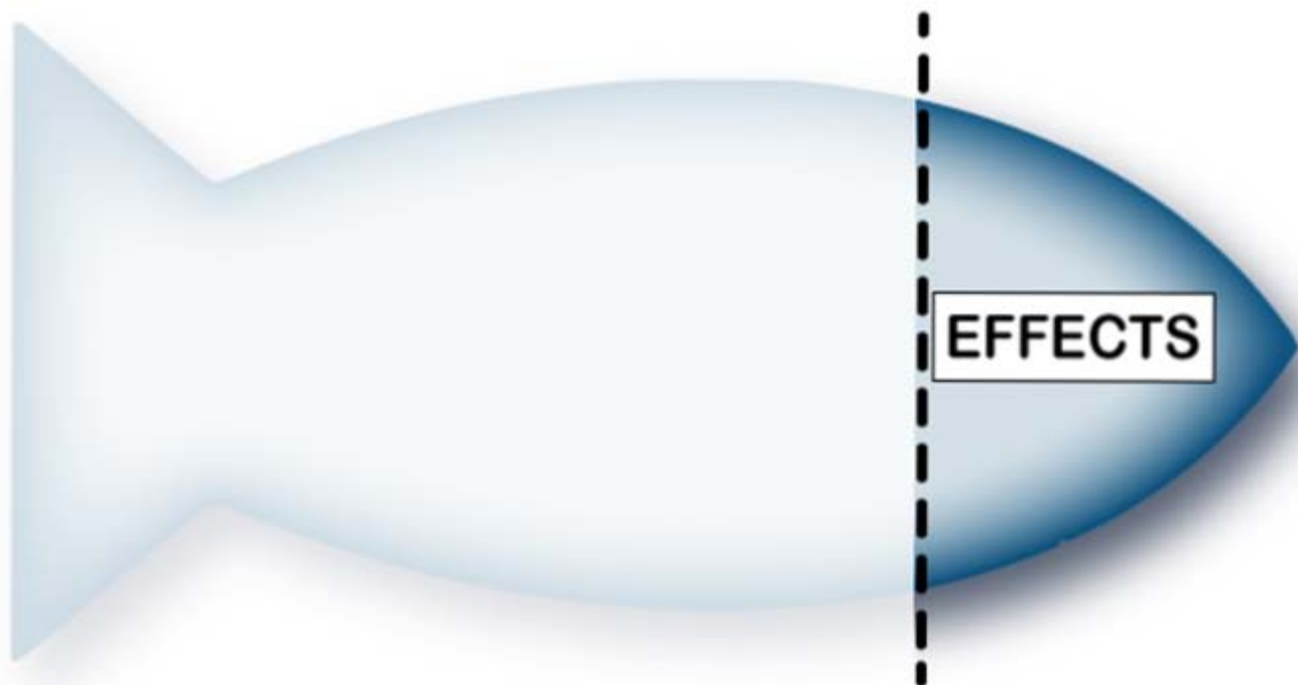
A blue fish diagram. The left side of the diagram is labeled "CAUSES." The right side of the diagram is labeled "EFFECTS". A dashed line separates the two sides of the diagram. The "Causes" portion is bigger than the "EFFECTS" portion.



**Ishikawa Fishbone Diagram Characteristics - Effect**[View CR](#) [Submit CR](#)

A supplier performing a cause and effect analysis using an Ishikawa diagram will start with the effect. It is at this point in Root Cause Analysis that they have defined their problem and are looking for causes and effects. Their problem appears as an effect.

Your suppliers and vendors may label their effect as the Problem Statement.

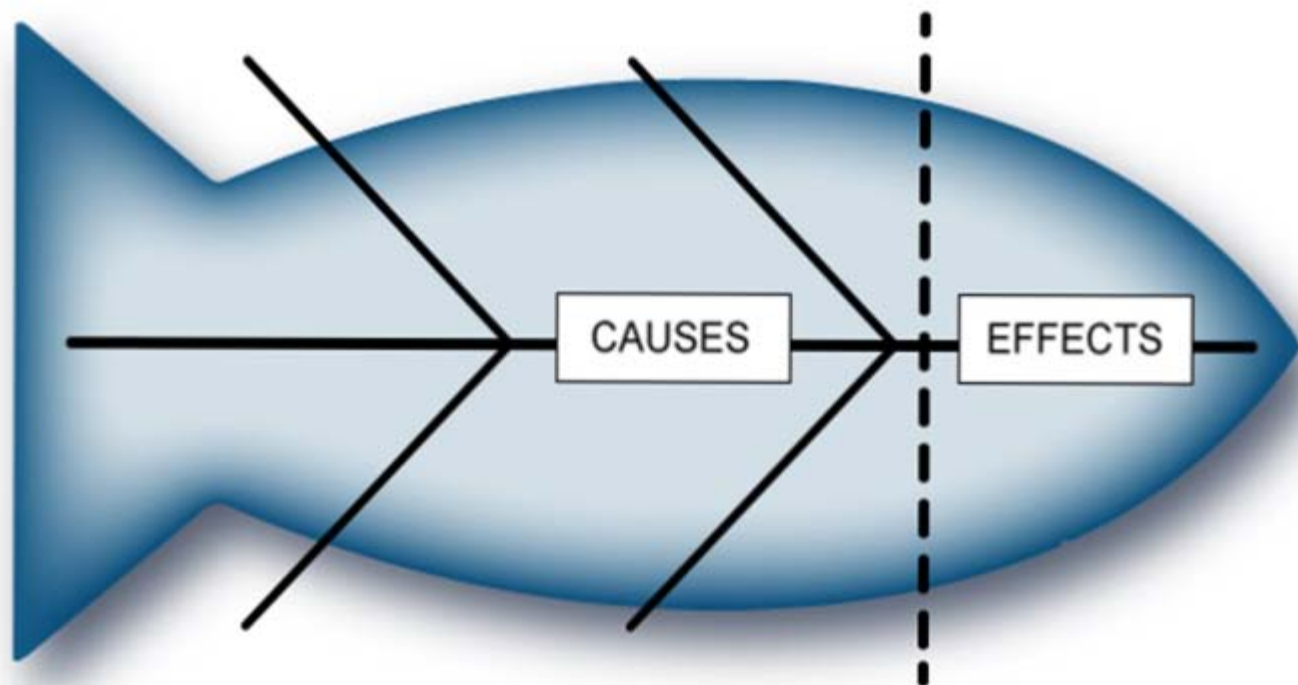


**Long Description**

A blue fish diagram. The left side of the diagram is faded out. The right side of the diagram is a labeled "EFFECTS".

**Ishikawa Fishbone Diagram Characteristics - Causes**[View CR](#) [Submit CR](#)

Your supplier looks at their problems and draws their first set of bones on the fish. On our diagram, there is one backbone that leads to the effect and four fish bones that represent categories of potential causes.



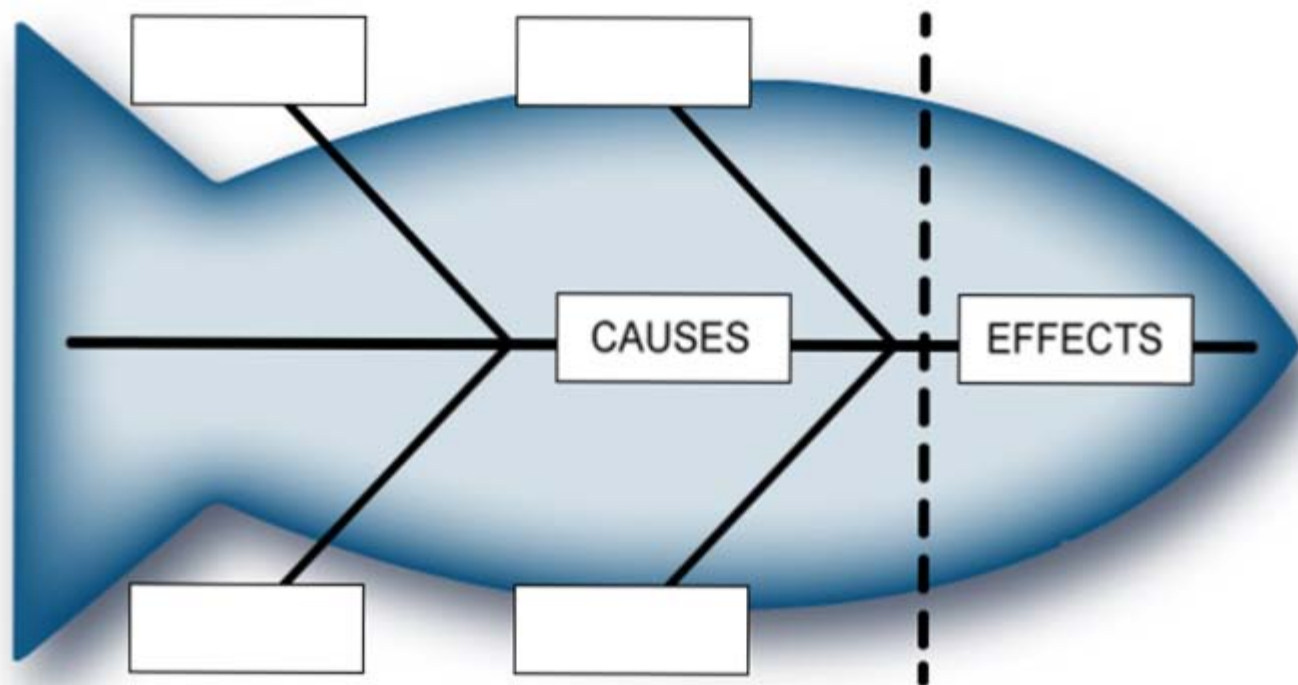
**Long Description**

A blue fish diagram. Bones are drawn in the middle of the fish. The left side of the diagram is labeled "CAUSES". The right side is labeled "EFFECTS".

### Ishikawa Fishbone Diagram - Categorizing Causes

[View CR](#) [Submit CR](#)

Your suppliers look to categorize their causes into as many fish bones as necessary. Categories are depicted as blank boxes at the end of the fish bones. No two diagrams may look alike as the number of categories can range from one to one-hundred. Most use between three and six.



**Long Description**

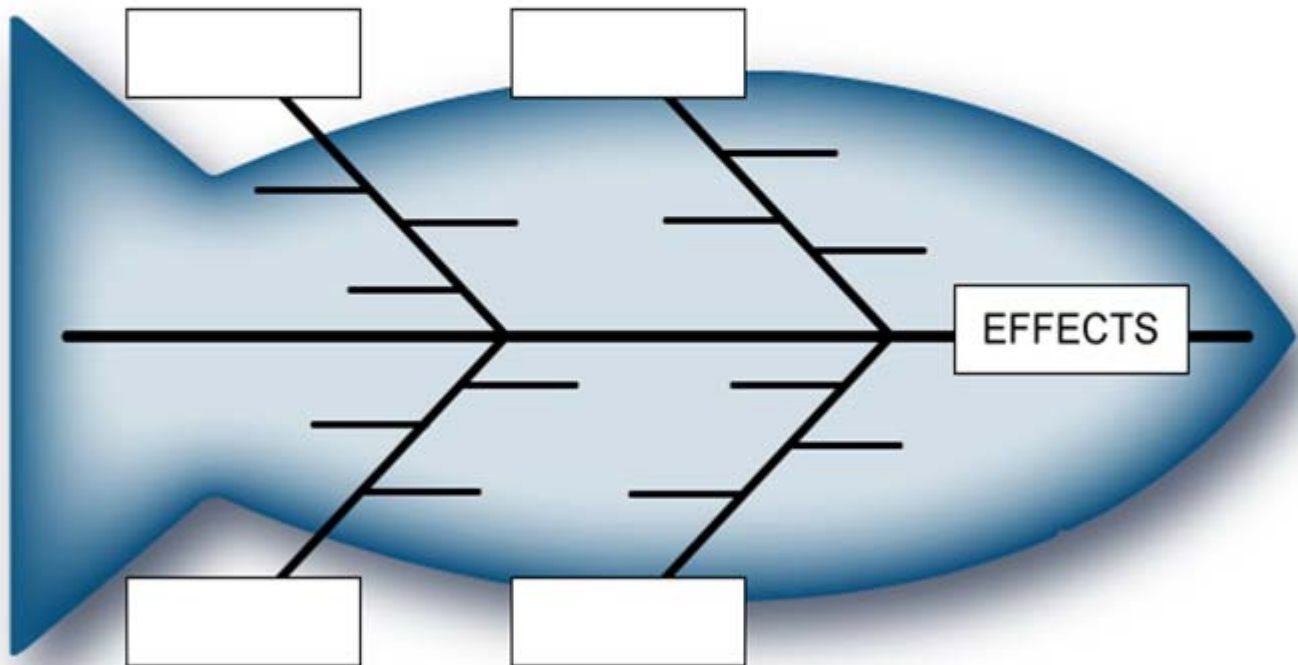
A blue fish diagram. Bones are drawn in the middle of the fish. Each bone has a white blank box on the end. The left side of the diagram is labeled "CAUSES". The right side is labeled "EFFECTS".

### Ishikawa Fishbone Diagram Example

[View CR](#) [Submit CR](#)

Once your supplier has established the categories, they brainstorm causes from their problem solvers and sort them into their categories. These causes are listed on the small veins that point to a fish bone.

[Click here to see a real world Ishikawa \(fishbone\) diagram used to perform cause and effect analysis for a lack of responsiveness to customers.](#)



[D](#)



**Long Description**

A blue fish diagram. Bones are drawn in the middle of the fish. Each bone has a white blank box on the end, and multiple, smaller bones projecting out of the middle. The right side is labeled "Effects".

## Tree Diagram Characteristics

[View CR](#) [Submit CR](#)

The characteristics of the Tree diagram begin with the team separating the causes from the effects on a vertical diagram. A dotted line is used to separate them on the graphic. Note that the tree can lean on its side and it is advisable to leave more room for the causes (bottom branches) than for the effects (tree top).



[D](#)

**Long Description**

A blue tree diagram. The bottom of the diagram is labeled "Causes." The top of the diagram is labeled "Effects". A dashed line separates the two sides of the diagram. The "Causes" portion is bigger than the "Effects" portion.

## Tree Diagram Characteristics - Effect

[View CR](#) [Submit CR](#)

A supplier performing a cause and effect analysis using a Tree diagram will start with the effect. Like other cause and effect diagrams, their problem appears as an effect.

Your suppliers and vendors may label their effect as the Problem Statement.



[D](#)

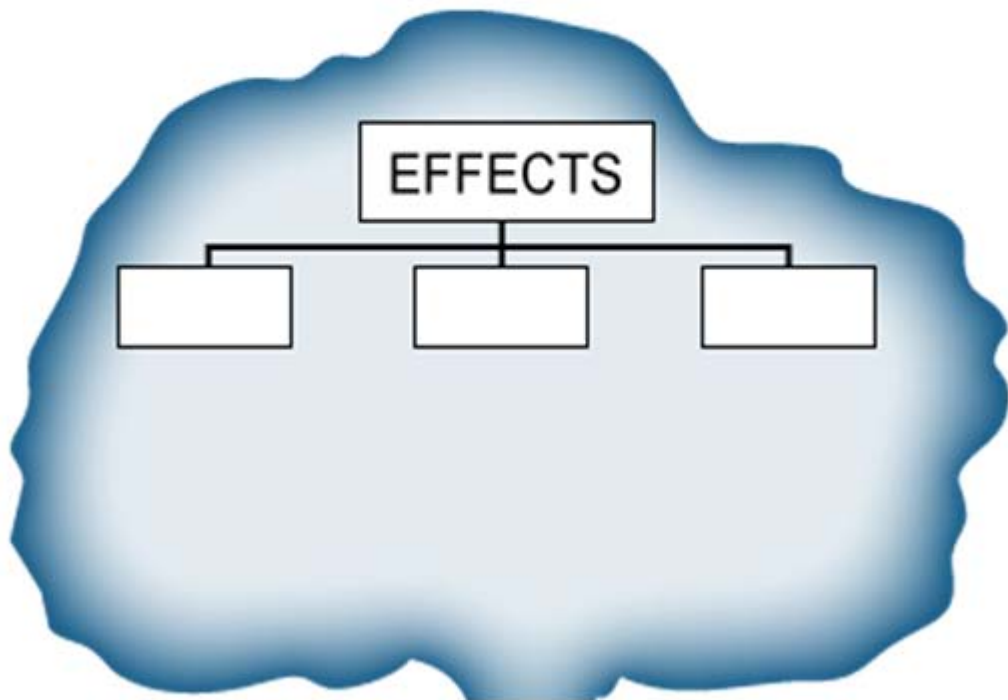
**Long Description**

A tree diagram. A white box at the top of the diagram is labeled "Effects".

### Tree Diagram Characteristics - Causes

[View CR](#) [Submit CR](#)

Your supplier looks at their problems and draws their first set of branches of their tree. On our diagram, there are three causes at this level. Since Tree diagrams are best used to sort a chain of events, then this layer of branches is typically reserved for high level results that lead directly to the effect (or problem statement).



[D](#)

**Long Description**

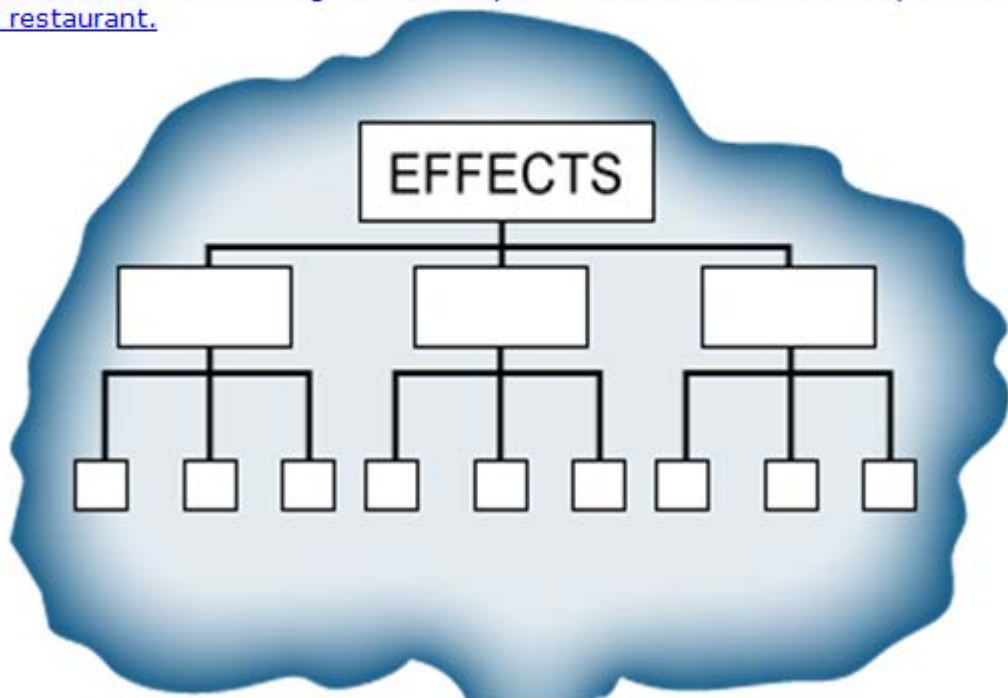
A tree diagram. A white box at the top of the diagram is labeled "Effects". Three more white boxes are below the top box and are connected with lines.

### Tree Diagram Example

[View CR](#) [Submit CR](#)

The next characteristic of the Tree diagram is the detailed boxes that house the causes that lead up to the high level events. The boxes contain text that typically describe a step in a process or chain of events. These are the boxes that most directly point to a potential cause in a series of events that can be traced up to the problem or effect.

[Click here to see a real world Tree diagram used to perform cause and effect analysis for unsatisfied customers in a restaurant.](#)



[D](#)



**Long Description**

A tree diagram. A white box at the top of the diagram is labeled "Effects". This box branches into three other white boxes. These three boxes further branch into three more white boxes each.

### Cause and Effect Diagrams Knowledge Review

Which of the following statements are characteristics of an Ishikawa (fishbone) diagram when performing a cause and effect analysis?  
(Select all that apply)

- ☒ Branches near the bottom are also categories
- ☒ Used when causes can be categorized
- ☐ Used when causes are a chain of events
- ☐ Branches near the bottom are causes

Check Answer

*That is correct.*

Of the four characteristics to select from, only two are correct. The Ishikawa (fishbone) diagram is used **when causes can be categorized and the branches near the bottom are also categories.**



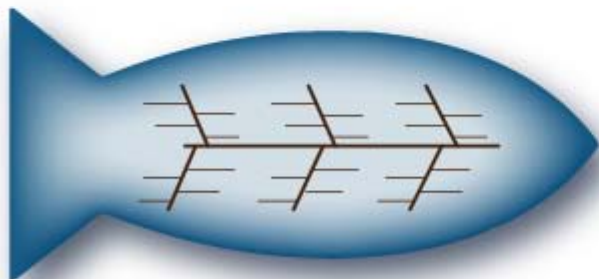
## Cause and Effect Diagrams Summary

[View CR](#) [Submit CR](#)

In summary, the characteristics for each diagram are listed below. It is not likely that your suppliers and vendors will include an Ishikawa or Tree diagram in their Corrective Action Plans, but it is worth noting that some companies use these during Fault Review Boards. You are a better QA Specialist if you are aware of how they are used and if you are aware of their characteristics.

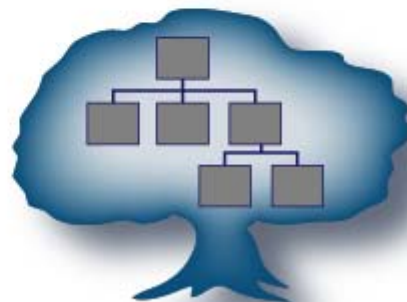
### Characteristics of an Ishikawa Fishbone diagram:

- Used when causes can be categorized
- Head of the fish shape is the effect
- Body of the fish shape is the causes
- Bones off the backbone are categories
- Veins off the bones are causes



### Characteristics of a Tree diagram:

- Used when causes are a chain of events
- Top of the tree shape is the effect
- Body of the tree shape is the causes
- Branches off the effect are high level
- Branches near the bottom are causes



### Cause and Effect Diagrams Summary, Cont.

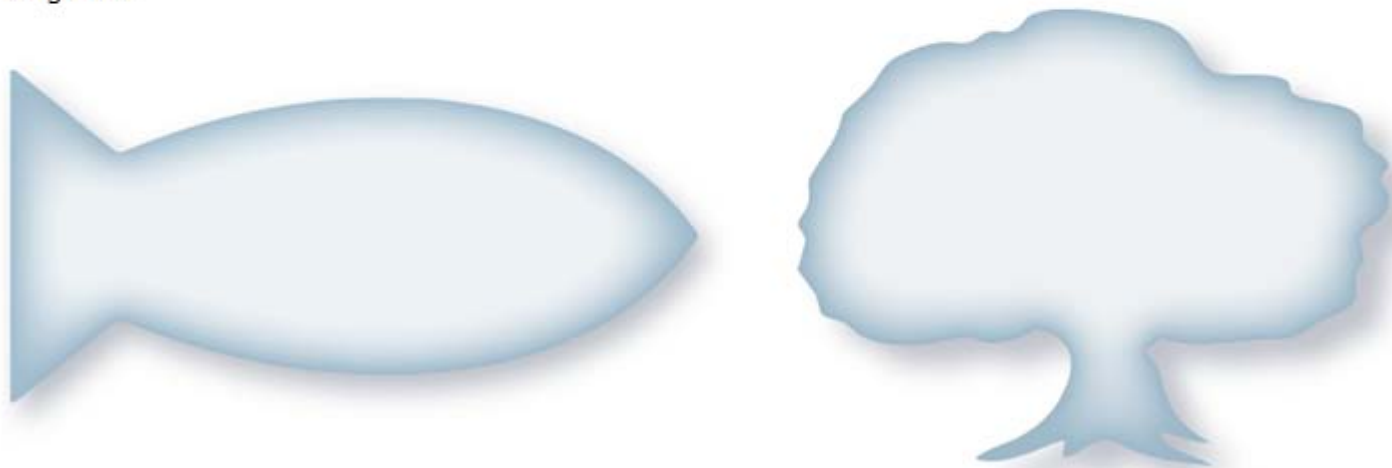
[View CR](#) [Submit CR](#)

The Ishikawa (fishbone) and Tree diagrams are two of many tools used in Root Cause Analysis. They are used specifically by suppliers who wish to analyze the causes that lead to a problem.

Although the characteristics of these diagrams have been identified here, you should understand that the suppliers to the DCMA have their own quality assurance processes and may prefer one characteristic over another or abandon some or all of the illustrations described here.

Since many suppliers use the same quality assurance resources, you will find common threads among their analysis, but you should remain aware of the potential for changes to the names of these characteristics.

Next, we will take a look at the categories used by suppliers when they create their Ishikawa (fishbone) diagrams.





## Cause and Effect Analysis Cause Groups

[View CR](#) [Submit CR](#)

The categories used for generating an Ishikawa diagram depend on the nature of the effect or problem. Although not limited to the list below, you may find suppliers to DCMA focusing their cause and effect analysis in one of these three overall cause groups:

- Manufacturing
- Service
- Administration



**Long Description**

A paper labeled "Acme Company Problems" appears at top. Three arrows branch out from under this paper and point at three bins labeled Manufacturing, Service, and Administration.

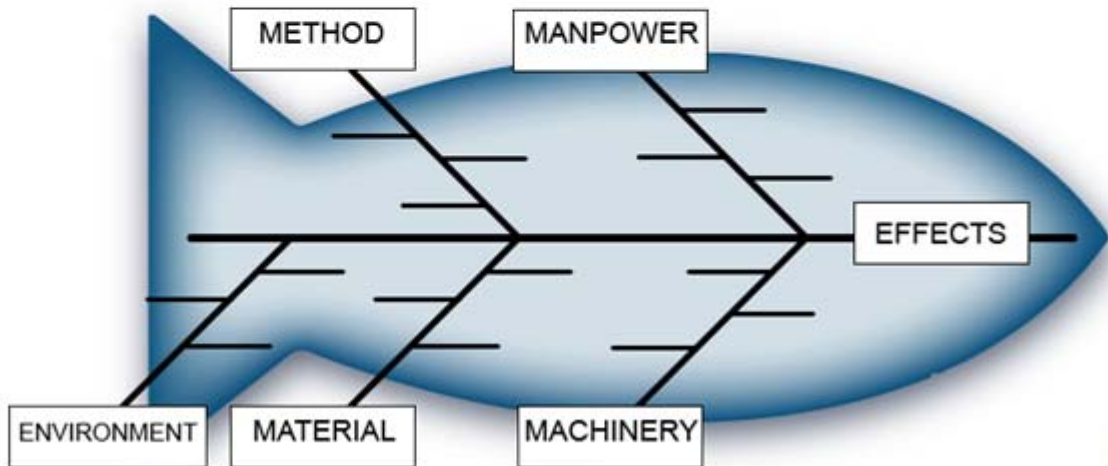
### Categories for Manufactured Components

[View CR](#) [Submit CR](#)

When a supplier is faced with a problem (or effect) with a **manufactured** component, they use the following categories to sort their potential causes:

- Method
- Manpower
- Material
- Machinery (equipment)
- Environment

When the suppliers meet to create their Ishikawa diagram, they will sort the potential causes into one of these five categories.



[D](#)

**Long Description**

An Ishikawa fishbone diagram analyzes a manufacturing problem using five categories: method, manpower, material, machinery, and environment.



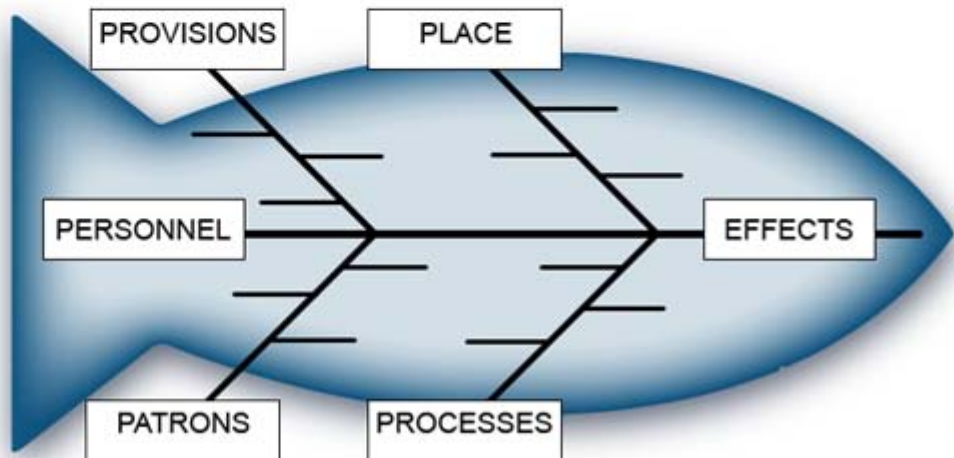
### Categories for Service Components

[View CR](#) [Submit CR](#)

When a supplier is faced with a problem (or effect) in a **service** component, they use the following categories to sort their potential causes:

- Provisions
- Place
- Patrons
- Processes
- Personnel

When the suppliers meets to create their Ishikawa diagram, they will sort the potential causes into one of these five categories.



**Long Description**

An Ishikawa fishbone diagram analyzes a service problem using five categories: provisions, place, patrons, processes, and personnel.

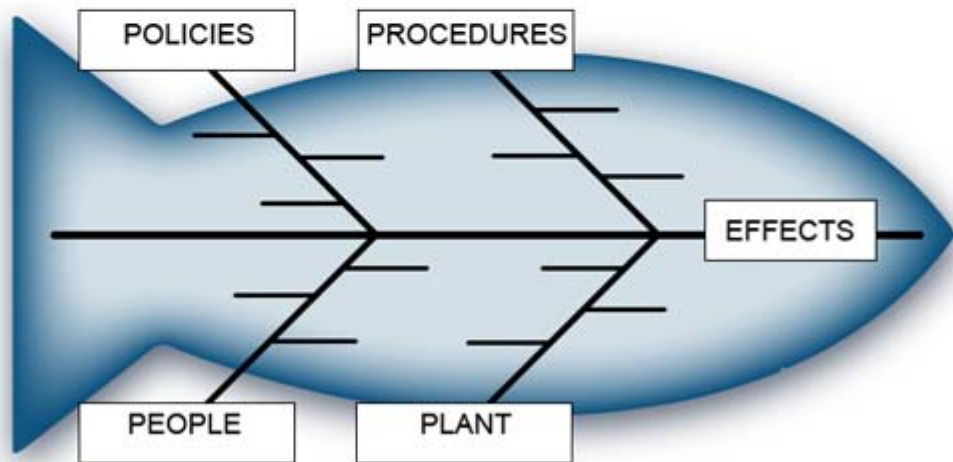
### Categories for Administrative Components

[View CR](#) [Submit CR](#)

When a supplier is faced with a problem (or effect) with an **administrative** component, they use the following categories to sort their potential causes:

- Policies
- Procedures
- People
- Plant

When the suppliers meets to create their Ishikawa diagram, they will sort the potential causes into one of these four categories.



[D](#)

**Long Description**

An Ishikawa fishbone diagram analyzes an administrative problem using four categories: policies, procedures, people, and plant.

Ishikawa Fishbone Diagram Categories Knowledge Review

[View CR](#) [Submit CR](#)

Which of the Ishikawa diagrams will your supplier start with when faced with a problem or effect in a service component?

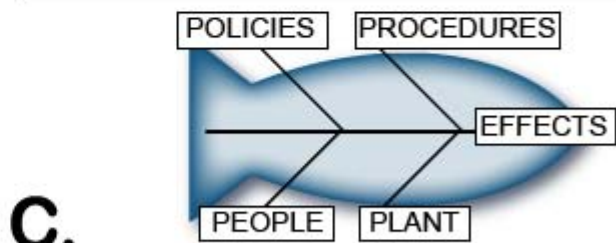
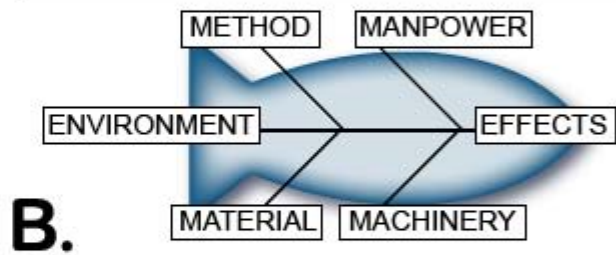
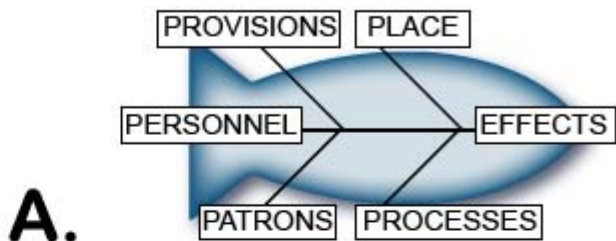
☒ A

☐ B

☐ C

Check Answer

The Ishikawa diagram that has the categories **Provisions, Place, Personnel, Patrons, and Processes** is the correct Ishikawa diagram to use for a problem or effect that is related to a service component.



[D](#)

**Long Description**

Three fish diagrams are lined up vertically. The top diagram is labeled A, and has five categories: provision, place, patrons, processes, and personnel. The middle diagram is labeled B, and has five categories: method, manpower, material, machinery, and environment. The last diagram is labeled C, and has four categories: policies, procedures, people, and plant.

## Ishikawa Fishbone Diagram Summary

[View CR](#) [Submit CR](#)



I really like how DCMA and our suppliers use fish bones and trees as metaphors for their diagrams.



Yes. But the Ishikawa Fishbone diagram and the Tree diagram are prevalent across the entire Quality Assurance industry. They are not unique to DCMA and our suppliers. Once a team starts brainstorming, the metaphor gets lost in the actual process.

Next, you will watch a supplier create and illustrate an Ishikawa (fishbone) diagram from a defined problem inside a scenario.

### **Long Description**

The mentor and the DCMA Specialist continue their conversation. The DCMA Specialist comments, "I really like how DCMA and our suppliers use fish bones and trees as metaphors for their diagrams." The mentor responds, "Yes. But the Ishikawa Fishbone diagram and the Tree diagram are prevalent across the entire Quality Assurance industry. They are not unique to DCMA and our suppliers. Once a team starts brainstorming, the metaphor gets lost in the actual process. Next, you will watch a supplier create and illustrate an Ishikawa (fishbone) diagram from a defined problem inside a scenario."

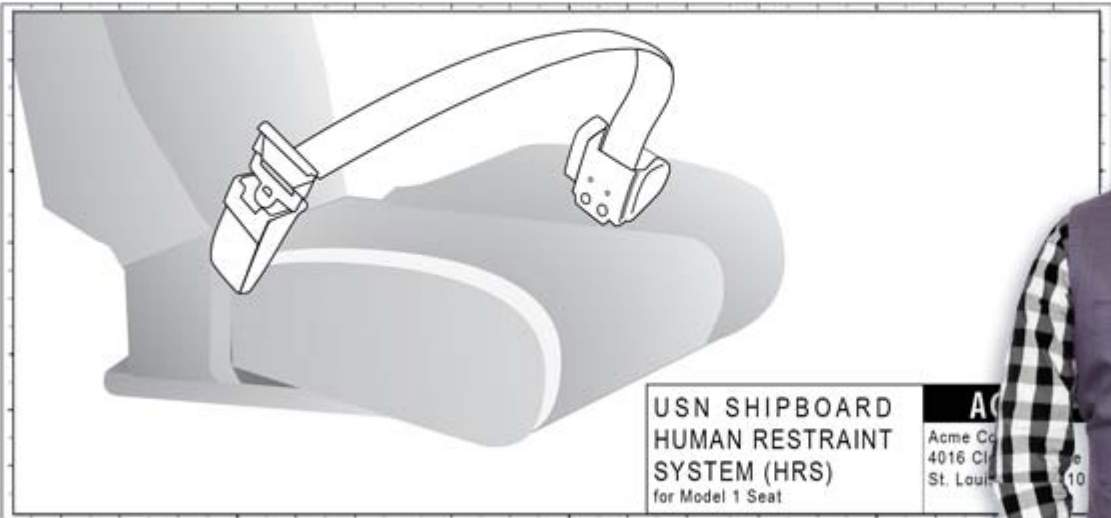


Ishikawa Fishbone Diagram Scenario Introduction

[View CR](#) [Submit CR](#)

It looks like we have a new problem with our restraints for the U.S. Navy seats. The buckles are not connecting properly.

Acme Company is convening a Failure Review Board to determine root and contributing causes for this new nonconformance. I've invited DCMA to attend. I've assembled the necessary Acme employees in a conference room for a Cause and Effect Analysis session.



## Ishikawa Fishbone Diagram Scenario

[View CR](#) [Submit CR](#)

Jim is the Delivery Manager at Acme Company. He has assembled the following employees:

- Meg – Team Leader – Directs the restraint manufacturing process
- Pat – Production Line Worker – Works on the assembly line in the manufacturing process
- Deb – Supply Worker – Procures and stocks parts for the manufacturing process
- Kim – Human Resources – Manages contracts and personnel schedules
- Bob – Line Foreman – Supervises the manufacturing of restraints

Meg  
Team  
Leader

Pat  
Line  
Worker

Deb  
Supply

Kim  
Human  
Resources

Bob  
Line  
Foreman

Jim  
Manager

Ishikawa Fishbone Diagram Scenario, Cont.

[View CR](#) [Submit CR](#)

Jim has disclosed to the team that the lot of U.S. Navy seats scheduled for delivery on 23 December were rejected by DCMA during routine surveillance on the loading dock. The QA Representative tested the buckles on a random sample of twenty seats and found ten seat belts that failed to remain buckled when pulled from opposite ends.

**Acme Company**

**Work Order**

**REJECTED**

Unit Price: \$1237.00  
Line Total: \$24,740.00

Meg Team Leader, Pat Line Worker, Deb Supply, Kim Human Resources, Bob Line Foreman, Jim Manager

**Long Description**

The Cause and Effect Analysis team members are all looking at an Acme Company document that has been stamped with the word "REJECTED".

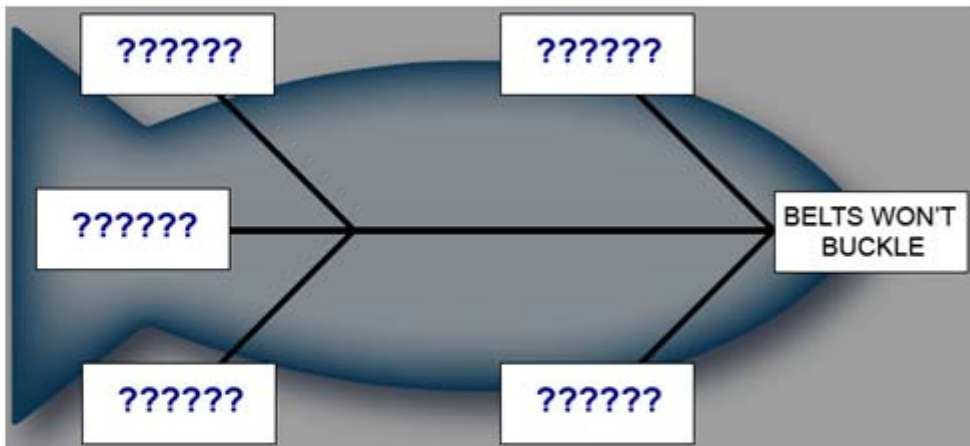
Ishikawa Fishbone Diagram Scenario Knowledge Review 1

[View CR](#) [Submit CR](#)

The team has chosen to perform a cause and effect analysis using an Ishikawa (fishbone) diagram. The team has also identified the problem as "Belts Won't Buckle." This is a manufacturing defect. Click on the correct group of categories that Jim should label on the diagram at the ends of the diagonal fish bones.

☒ Method, Manpower, Material, Machinery, and Environment

☐ Provisions, Place, Patrons, Processes, and Personnel



Check Answer

When specifically analyzing a manufacturing defect, an Ishikawa should have these categories:  
**Method, Manpower, Material, Machinery, and Environment.**

[D](#)

**Long Description**

An Ishikawa Fishbone diagram is shown. The head is labeled "BELTS WON'T BUCKLE". There are four fish bones stemming diagonally from the spine of the fish. There are four boxes containing question marks at the end of each fish bone. There is also final box containing question marks on the left-most "spine" of the fish.



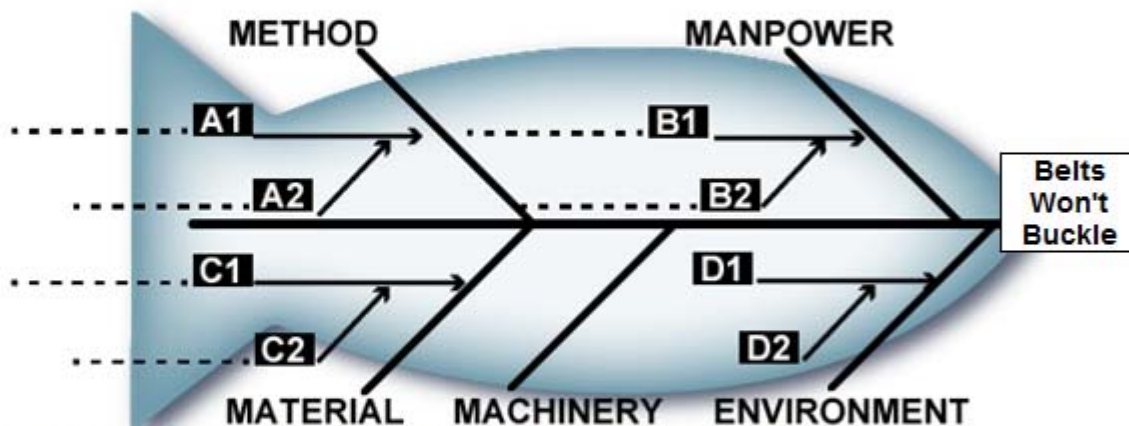
## Ishikawa Fishbone Diagram Scenario Knowledge Review 2

[View CR](#) [Submit CR](#)

Bob tells the team, "The rejected lot of seat belts were manufactured during the holiday break. We used temps to staff the assembly line." Pat adds, "I was scheduled to work but caught the flu. I was out sick for that lot." Under which category should the team enter "Temp Staffing"?

- ☐ Material
- ☐ Method
- ☒ Manpower
- ☐ Environment

Check Answer



Temp Staffing is a personnel issue, so it belongs under the **Manpower** category, next to sub-category **B1**.

### **Long Description**

A blue fishbone diagram. There are five fishbones connecting to the fish spine, indicating five categories. The top left category is Method, which branches into sub-category A1, which branches again into sub-category A2. The top right category is Manpower, which branches into sub-category B1, which branches again into sub-category B2. The bottom left category is Material, which branches into sub-category C1, which branches again into sub-category C2. The bottom middle category is Machinery and lacks sub-categories. The bottom right category is Environment which branches into sub-category D1, which branches again into sub-category D2.



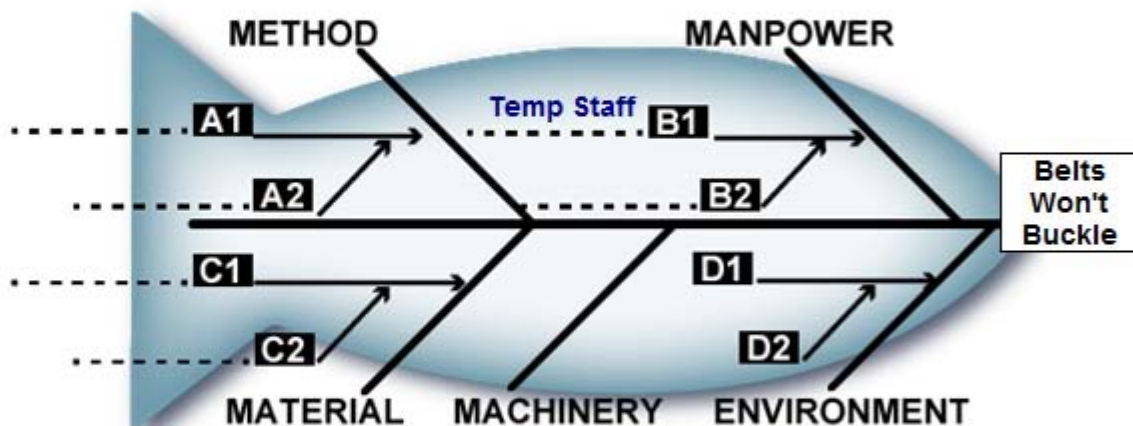
Ishikawa Fishbone Diagram Scenario Knowledge Review 3

[View CR](#) [Submit CR](#)

Kim adds, "We went through two batches of temporary workers. The agency said it was difficult to find staffing during the holidays." Under which lettered fish bone should the team enter "Temp Worker Turnover?"

- ☐ A1
- ☐ A2
- ☒ B2
- ☐ C1
- ☐ C2
- ☐ D1
- ☐ D2

Check Answer



Temp Worker Turnover is related to the Temp Staff sub-category, and therefore belongs under sub-category **B2**, under the **Manpower** category.

[D](#)

### **Long Description**

A blue fishbone diagram. There are five fishbones connecting to the fish spine, indicating five categories. The top left category is Method, which branches into sub-category A1, which branches again into sub-category A2. The top right category is Manpower, which branches into sub-category B1, now labeled "Temp Staff." This branches again into sub-category B2. The bottom left category is Material, which branches into sub-category C1, which branches again into sub-category C2. The bottom middle category is Machinery, but this one has no sub-categories. The bottom middle category is Machinery and lacks sub-categories. The bottom right category is Environment which branches into sub-category D1, which branches again into sub-category D2.

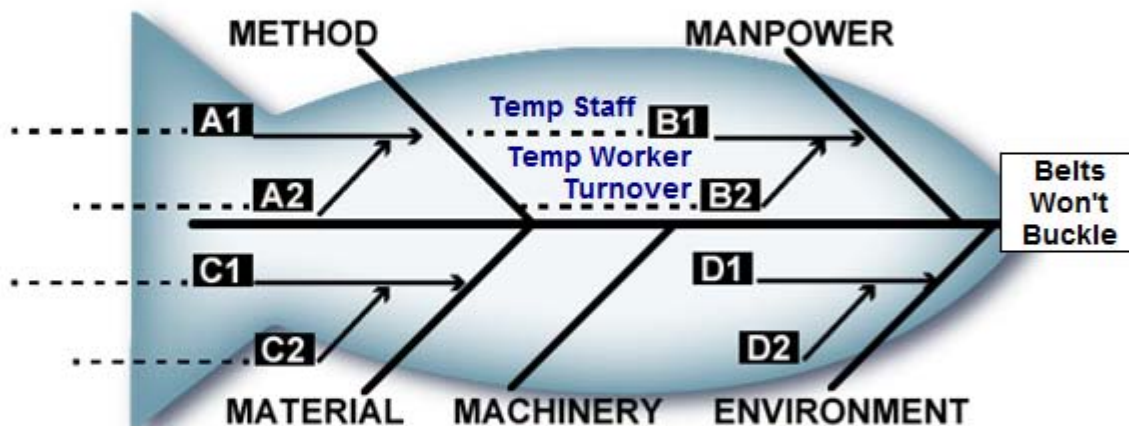
# Ishikawa Fishbone Diagram Scenario Knowledge Review 4

[View CR](#) [Submit CR](#)

Meg says, "I approved a change to the seat belt assembly line for this lot. I gave Bob permission to adapt the line to the inexperience of the temporary workers." Under which lettered fish bone should the team enter "Adapt the Line?"

- ☒ A1
- ☐ A2
- ☐ C1
- ☐ C2
- ☐ D1
- ☐ D2

Check Answer



Adapting the Line requires a change to the process, so it belongs under the **Method** category, next to sub-category **A1**.

[D](#)

### **Long Description**

A blue fishbone diagram. There are five fishbones connecting to the fish spine, indicating five categories. The top left category is Method, which branches into sub-category A1, which branches again into sub-category A2. The top right category is Manpower, which branches into sub-category B1, labeled "Temp Staff," which branches again into sub-category B2, now labeled "Temp Worker Turnover." The bottom left category is Material, which branches into sub-category C1, which branches again into sub-category C2. The bottom middle category is Machinery and lacks sub-categories. The bottom right category is Environment which branches into sub-category D1, which branches again into sub-category D2.

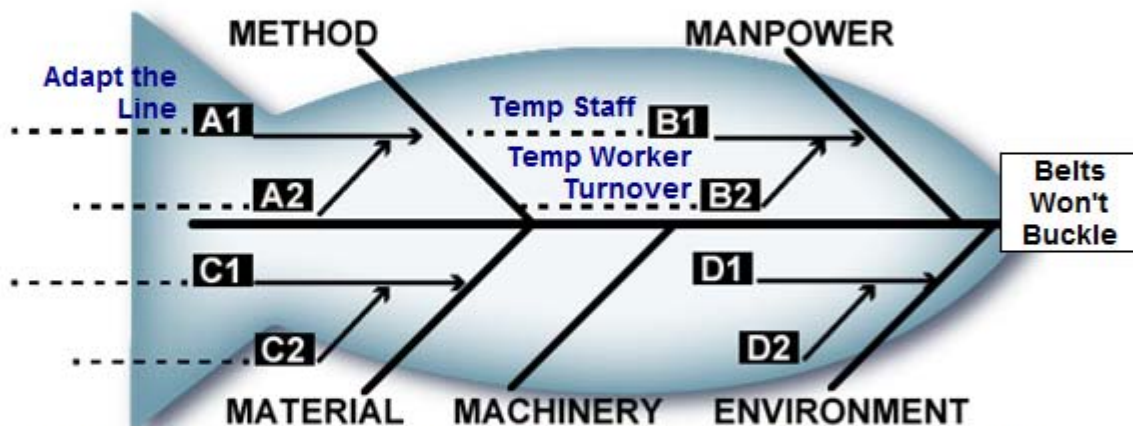
# Ishikawa Fishbone Diagram Scenario Knowledge Review 5

[View CR](#) [Submit CR](#)

Bob adds, "I had to use one worker to cover two stations on the line. She was responsible for inspecting the release switches and measuring belt lengths. Later, I used her at the Quality Control checkpoint." Under which lettered fish bone should the team enter "Temp Worker Multi-Tasking?"

- ☒ A2
- ☐ C1
- ☐ C2
- ☐ D1
- ☐ D2

Check Answer



Temp Worker Multi-Tasking is related to the Adapt the Line sub-category, and therefore belongs under sub-category **A2**, which points to "Adapt the Line", which is under the **Method** category.

[D](#)

### **Long Description**

A blue fishbone diagram. There are five fishbones connecting to the fish spine, indicating five categories. The top left category is Method, which branches into sub-category A1, now labeled "Adapt the Line," and branches again into sub-category A2. The top right category is Manpower, which branches into sub-category B1, labeled "Temp Staff," which branches again into sub-category B2, labeled "Temp Worker Turnover." The bottom left category is Material, which branches into sub-category C1, which branches again into sub-category C2. The bottom middle category is Machinery and lacks sub-categories. The bottom right category is Environment which branches into sub-category D1, which branches again into sub-category D2.



# Ishikawa Fishbone Diagram Scenario Knowledge Review 6

[View CR](#) [Submit CR](#)

Deb says, "I think our supplier for the springs may have shipped us a bad batch leading up to this holiday lot. I did not send them the update to the specs for the new springs until after the holiday break." Under which lettered fish bone should the team enter "Obsolete Specs?"

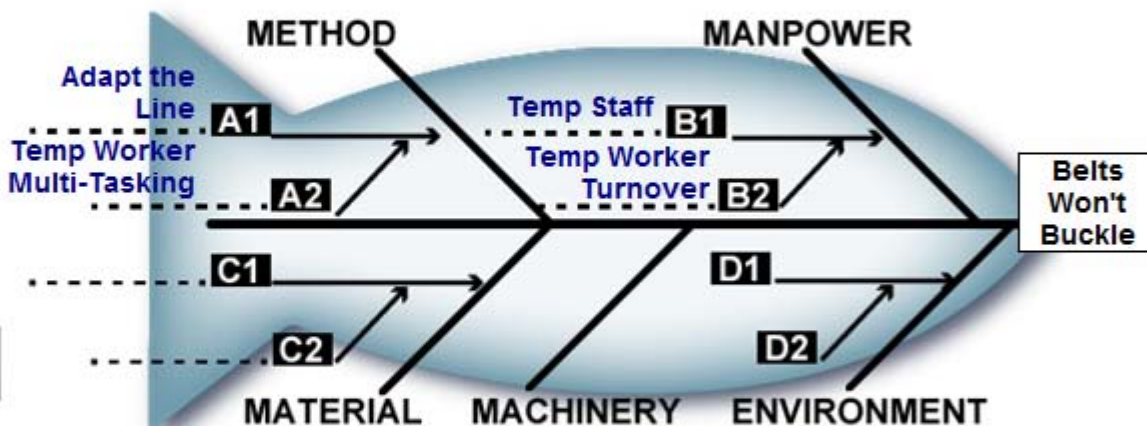
☒ C1

☐ C2

☐ D1

☐ D2

Check Answer



Obsolete Specs belongs under the **Material** category, next to sub-category **C1**.

[D](#)

### **Long Description**

A blue fishbone diagram. There are five fishbones connecting to the fish spine, indicating five categories. The top left category is Method, which branches into sub-category A1, now labeled "Adapt the Line," and branches again into sub-category A2, now labeled "Temp Worker Multi-Tasking." The top right category is Manpower, which branches into sub-category B1, labeled "Temp Staff," which branches again into sub-category B2, labeled "Temp Worker Turnover." The bottom left category is Material, which branches into sub-category C1, which branches again into sub-category C2. The bottom middle category is Machinery and lacks sub-categories. The bottom right category is Environment which branches into sub-category D1, which branches again into sub-category D2.



Ishikawa Fishbone Diagram Scenario Knowledge Review 7

[View CR](#) [Submit CR](#)

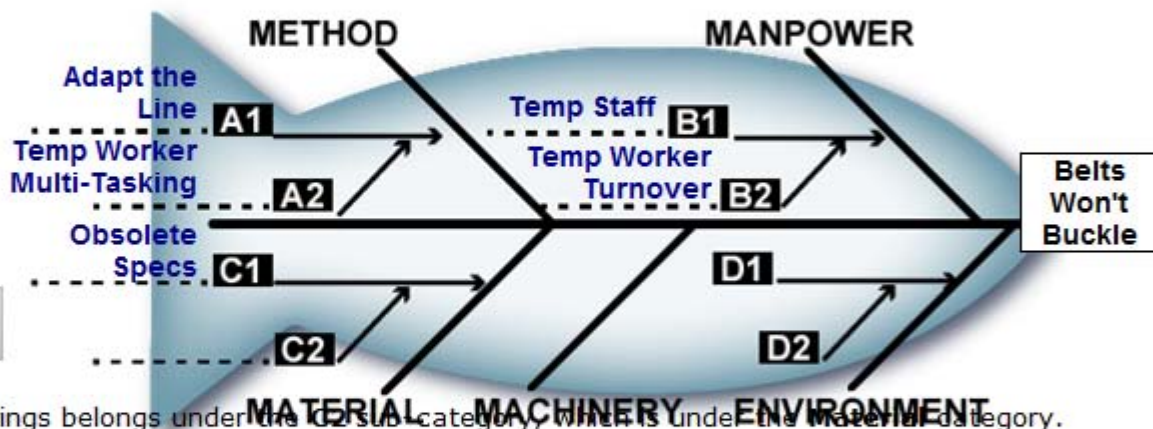
Bob asks, "Were those the springs without enough tension?"  
Deb answers, "Yes, a few of those 'out-of-spec' springs may have made it to the line."  
Under which lettered fish bone should the team enter "Out of Spec Springs?"

☒ C2

☐ D1

☐ D2

Check Answer



Out of Spec Springs belongs under the C2 sub-category, which is under the MATERIAL category.

[D](#)

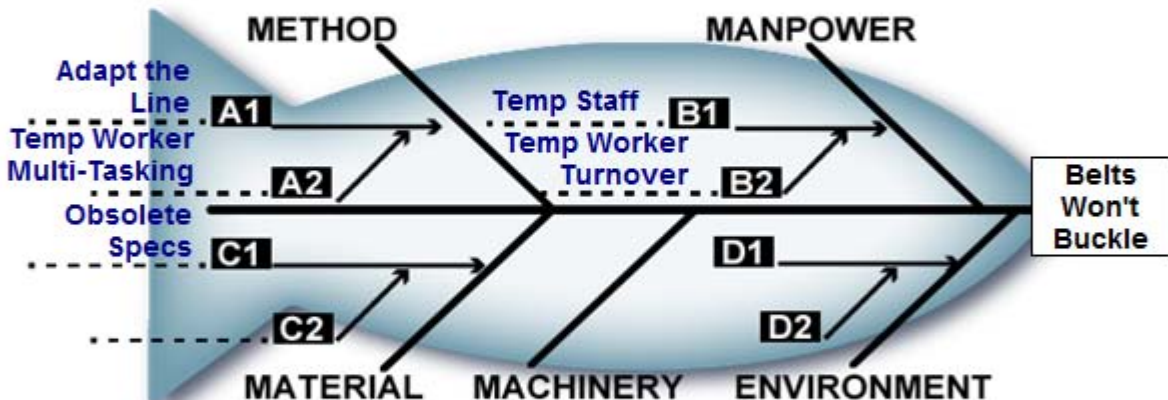
### **Long Description**

A blue fishbone diagram. There are five fishbones connecting to the fish spine, indicating five categories. The top left category is Method, which branches into sub-category A1, labeled "Adapt the Line," and branches again into sub-category A2, labeled "Temp Worker Multi-Tasking." The top right category is Manpower, which branches into sub-category B1, labeled "Temp Staff," which branches again into sub-category B2, labeled "Temp Worker Turnover." The bottom left category is Material, which branches into sub-category C1, now labeled "Obsolete Specs." This branches again into sub-category C2. The bottom middle category is Machinery and lacks sub-categories. The bottom right category is Environment which branches into sub-category D1, which branches again into sub-category D2.

## Ishikawa Fishbone Diagram Scenario Analysis Results

[View CR](#) [Submit CR](#)

The manager, Jim, is visibly upset. He exclaims "Let's stop this analysis now! All of the entries on our diagram so far point to several causes that explain why our lot was rejected. Acme Company failed to address manpower, material, and methodology issues in time to manufacture seat belts to specification. It does not matter that the defects occurred over a holiday. I would like to ask our DCMA representative to leave the room until after lunch. Thank you."



**Long Description**

Silhouettes of the Cause and Effect Analysis Team members, Meg, Pat, Deb, Kim, Bob, and Jim, all sit looking at the fishbone diagram from the previous page.

## Ishikawa Fishbone Diagram Job Aid

[View CR](#) [Submit CR](#)

A Job Aid may have been helpful to Acme Company to use as a quick reference during their Cause and Effect Analysis.

Be sure to compare the Job Aid from this training to the one your manager prescribes in your DCMA office, if one is available.

An Ishikawa (Fishbone) Diagram Job Aid has been included with this training to assist you on the job. Access and print this document. With your DCMA supervisor's approval, use it as a starting point to chart the relationship between an "effect" and all the possible "causes" that influenced it.

[Click here to access the Ishikawa \(Fishbone\) Diagram Job Aid for this training.](#)



**Long Description**

A thumbnail of the Ishikawa (Fishbone) Diagram Job Aid. The image has a magnifying glass superimposed over it that says "CLICK TO OPEN".

## Ishikawa Fishbone Diagram Scenario Knowledge Review 8

[View CR](#) [Submit CR](#)

What was the cause on the Acme Company Ishikawa (fishbone) diagram that led to the outcome labeled Obsolete Specs?

- ☒ Out of Spec Springs
- ☐ Temp Worker Turnover
- ☐ Temp Worker Multi-Tasking

[Check Answer](#)

It was the delivery of the **out of spec springs** that led up to the outcome of the Mishandled Specs.



## Failure Review Board Scenario Summary

[View CR](#) [Submit CR](#)



I can see the cause and effect relationship between the events and outcomes listed on the Fishbone Diagram at the Acme Company Failure Review Board. I think the Manager was upset.



I think the takeaway from the last topic is that your suppliers have their own QA processes when performing Root Cause Analysis.

What you saw was Acme Company realizing they have manufacturing problems during holidays.

Next, you will watch a supplier create and illustrate a Tree diagram from a defined problem inside a scenario.



**Long Description**

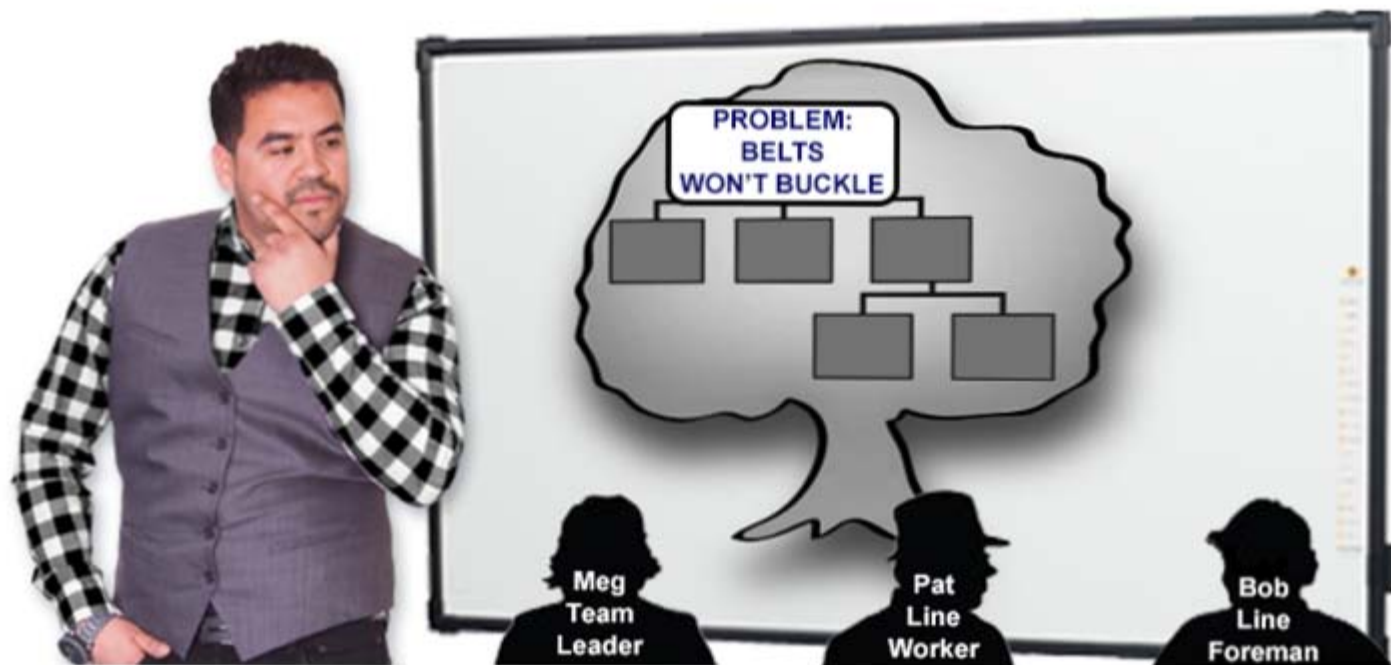
The mentor and the DCMA Specialist continue their conversation. The DCMA Specialist says, "I can see the cause and effect relationship between the events and outcomes listed on the Fishbone Diagram at the Acme Company Failure Review Board. I think the Manager was upset." The mentor responds, "I think the takeaway from the last topic is that your suppliers have their own QA processes when performing Root Cause Analysis. What you saw was Acme Company realizing they have manufacturing problems during holidays. Next, you will watch a supplier create and illustrate a Tree diagram from a defined problem inside a scenario."

## Tree Diagram Scenario Introduction

[View CR](#) [Submit CR](#)

Based on the Fishbone Diagram, we may have a few causes to our problem.

But for now, let's focus on my biggest concern. I want to use a Tree Diagram to determine where in the material chain of events we made our mistakes.



**Long Description**

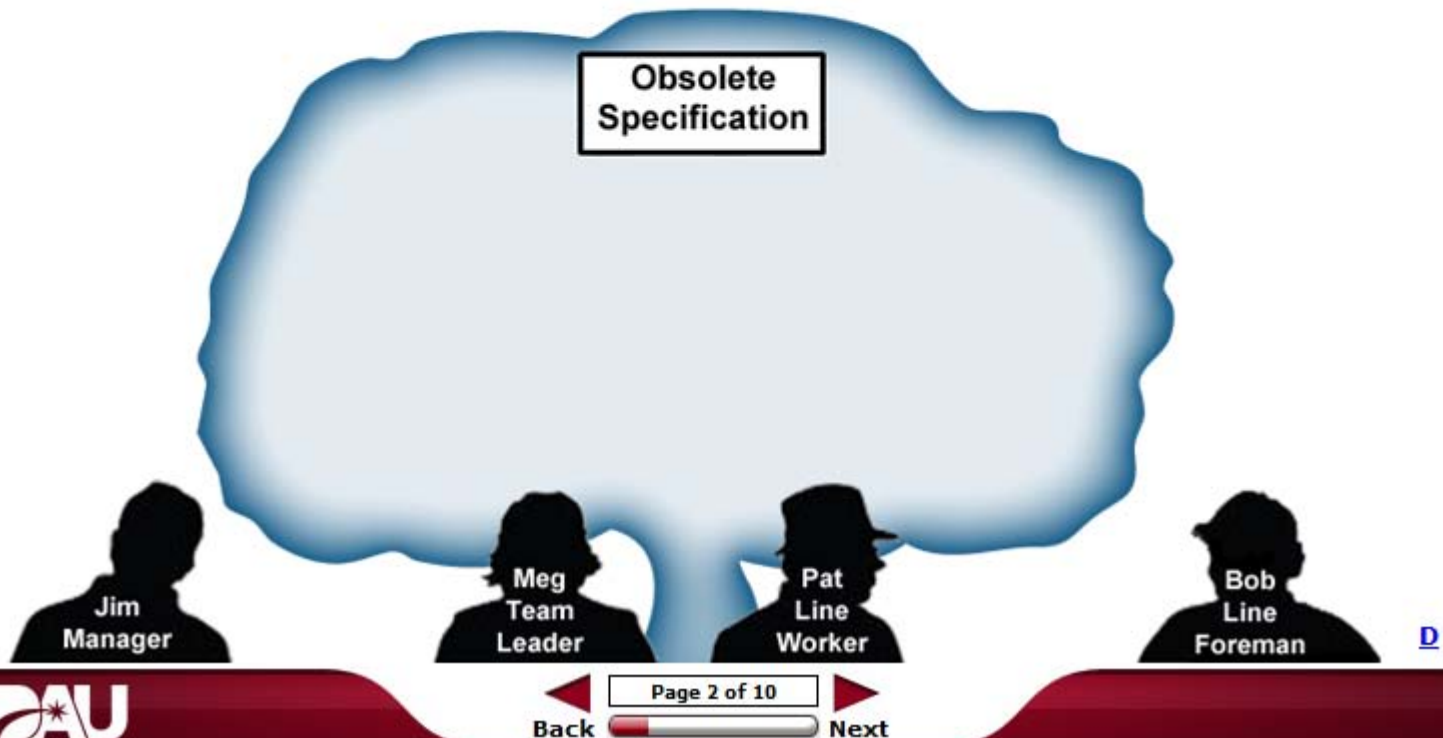
The head of the supplier RCA team stands beside a projector screen. He is addressing three people: Meg, the Team Leader; Pat, the Line Worker; and Bob, the Line Foreman. On the projector screen is an image of a tree diagram with the effect header labeled "PROBLEM: BELTS WON'T BUCKLE".

## Tree Diagram Scenario Participants

[View CR](#) [Submit CR](#)

Jim is the Delivery Manager at Acme Company, and he has assembled the following employees:

- Meg – Team Leader – Directs the restraint manufacturing process
- Pat – Production Line Worker – Works on assembly line in manufacturing process
- Bob – Line Foreman – Supervises the manufacturing of restraints



**Long Description**

Four people sit looking at a large tree diagram. The people are: Jim, the Manager; Meg, the Team Leader; Pat, the Line Worker; and Bob, the Line Foreman. The top of the tree diagram is labeled "Obsolete Specification".

Tree Diagram Scenario Knowledge Review 1

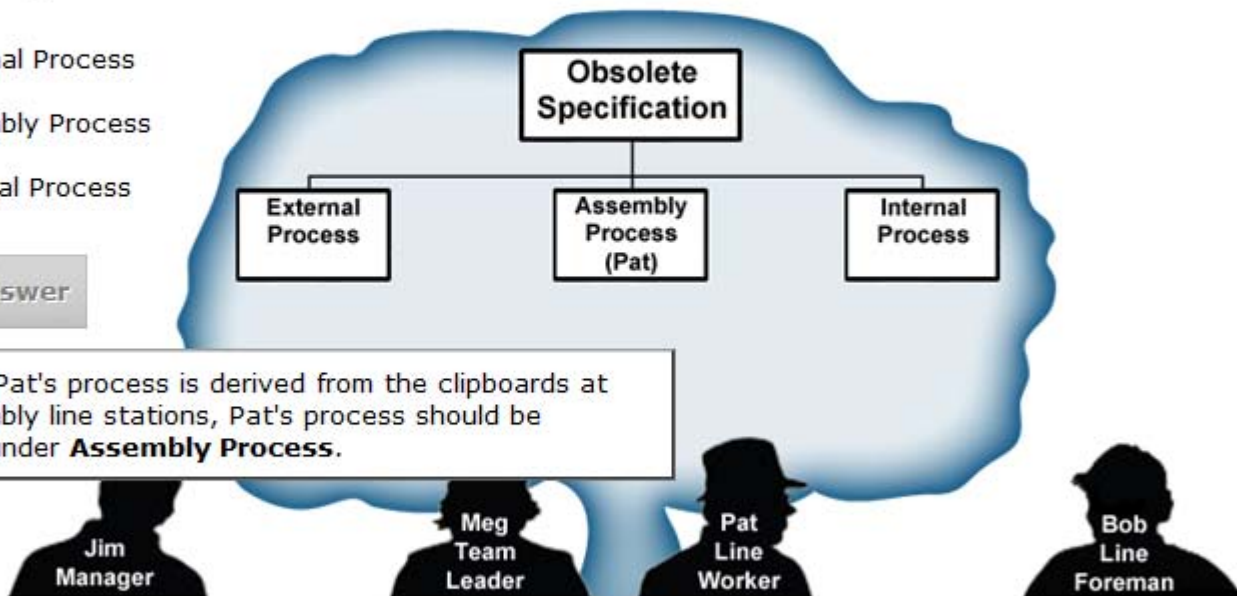
[View CR](#) [Submit CR](#)

Jim asks Pat to describe the steps he takes on the production line to ensure seat belts are built "to spec". Pat follows one step - He checks the clipboard for each station he works on the assembly line. Changes are printed on yellow paper. On which branch of the Tree Diagram should they map Pat's step-by-step process in this diagram?

- ☐ External Process
- ☒ Assembly Process
- ☐ Internal Process

Check Answer

Because Pat's process is derived from the clipboards at his assembly line stations, Pat's process should be mapped under **Assembly Process**.



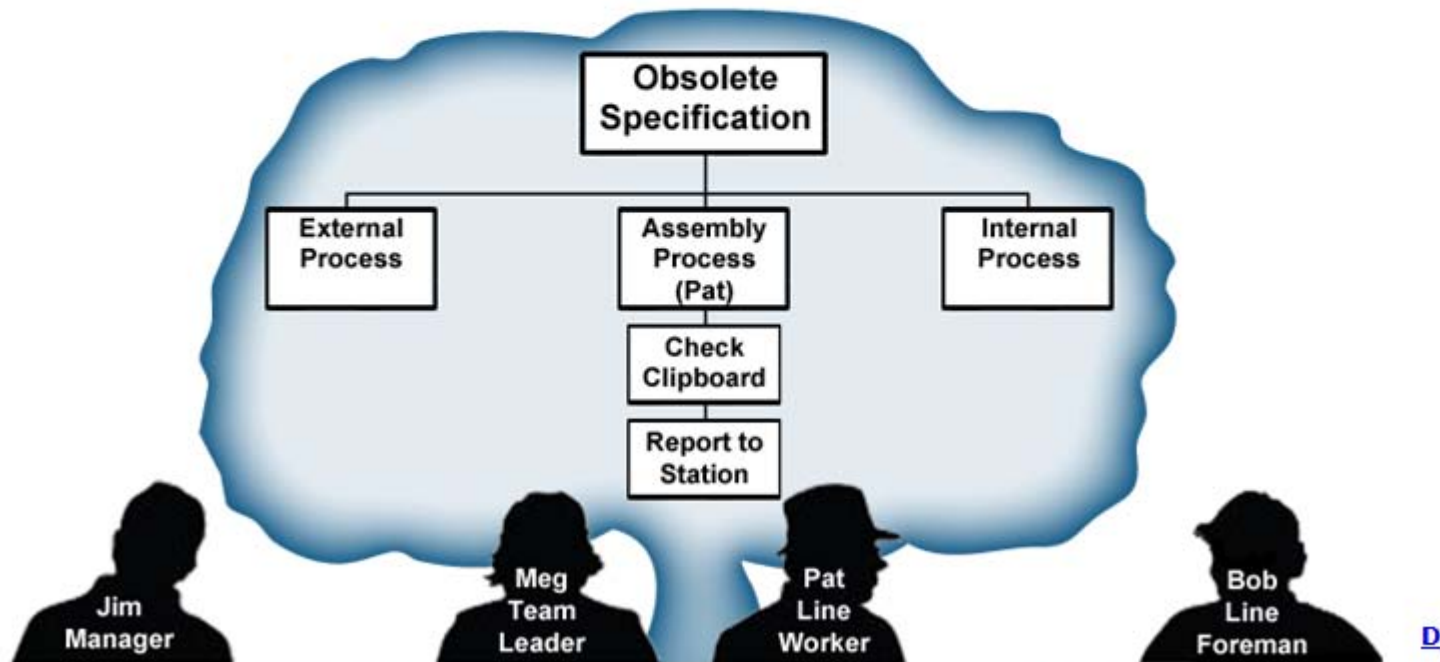
**Long Description**

The tree diagram from the previous page is displayed, except the top tree branch, labeled "Obsolete Specification", now branches into three sub-branches: External Process, Assembly Process, and Internal Process.

Tree Diagram Scenario - Line Foreman Input

[View CR](#) [Submit CR](#)

Jim asks Bob to pick up where Pat left off and explain the steps he takes to get a new yellow specification onto the clipboard. Bob says, "Before my shift starts, I check my email inbox for a change notification from Meg, and then I check the Inbox on my desk for yellow paper. If there is a change in either Inbox, I personally add the printed spec to the clipboard on the line."





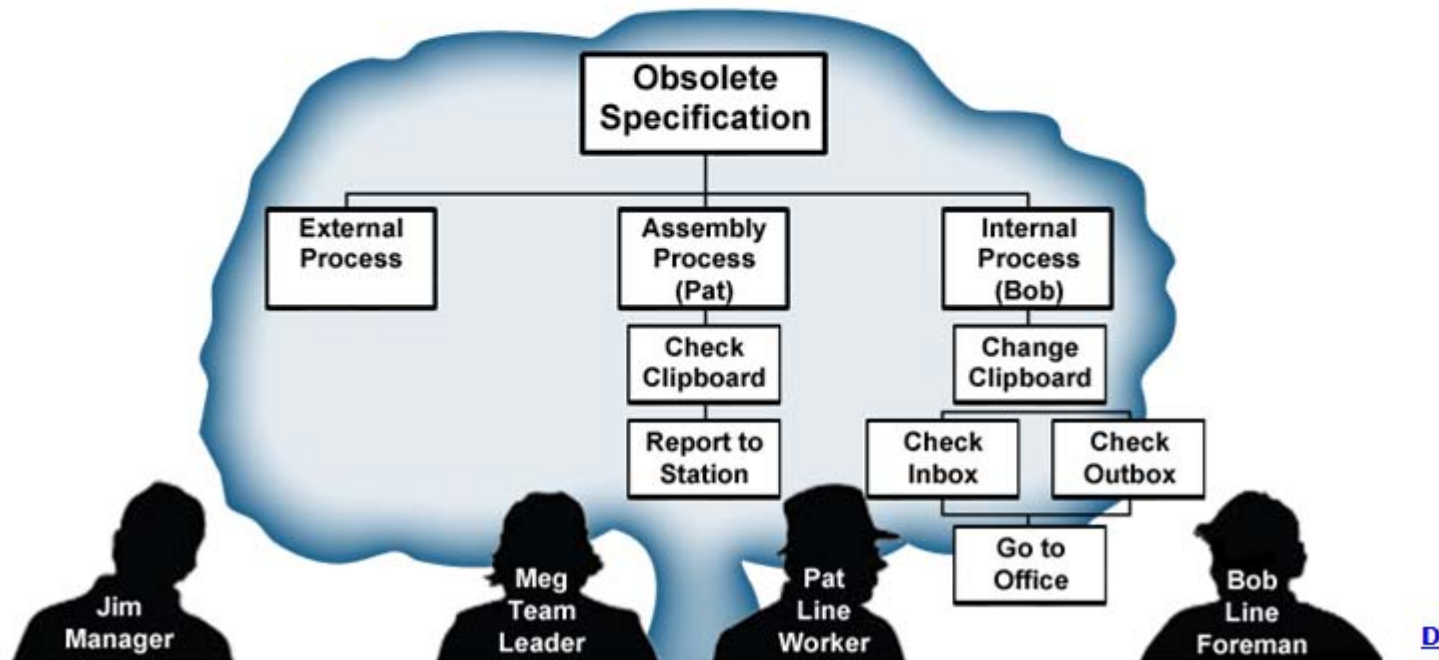
**Long Description**

The tree diagram from the previous page is displayed, except the branch labeled "Assembly Process" is now labeled "Assembly Process (Pat)" and now branches further into a branch labeled "Check Clipboard", which then branches further into a branch labeled "Report to Station".

Tree Diagram Scenario - Team Leader Input

[View CR](#) [Submit CR](#)

Jim asks Meg to pick up where Bob left off and explain the steps she takes to get a specification change into either of Bob's inboxes. Meg says, "I go to my office. I check our customer/supplier eRoom for changes, then my email for changes, and then look for changes on our specification server. If I find a change notification, I either print it on yellow paper or email the document to Bob and the other foremen."

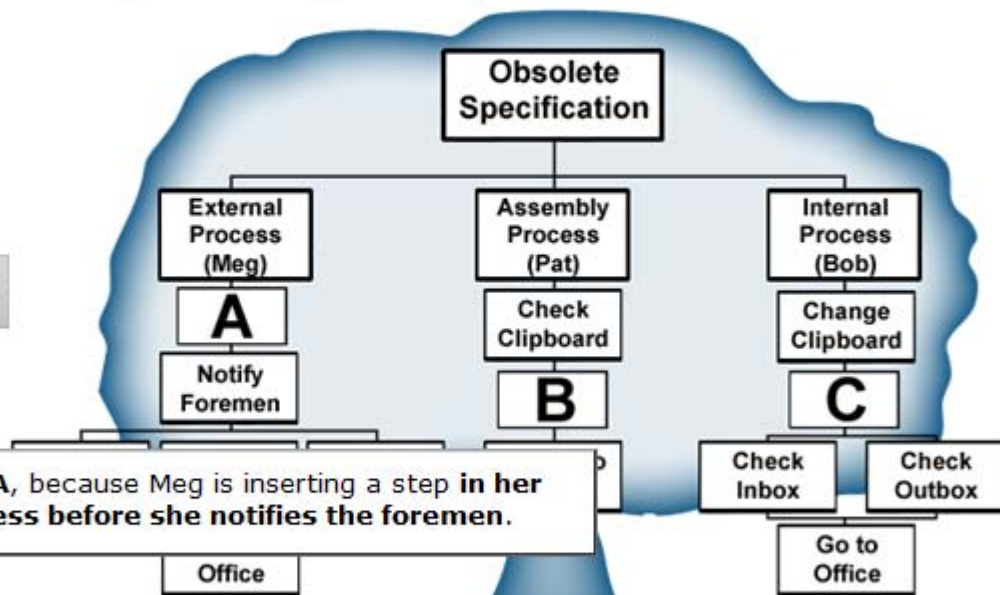


### **Long Description**

The tree diagram from the previous page is displayed, except the branch labeled "Internal Process" is now labeled "Internal Process (Bob)" and now branches further into a branch labeled "Change Clipboard", which then branches further into two branches, both of which are labeled "Check Inbox", and both of which then combine into another branch labeled "Go to Office".

## Tree Diagram Scenario Knowledge Review 2

Jim asks Meg, "Where did we get our 'out-of-spec' springs?" Meg answers that the 'out of spec' springs were from a sub-tier supplier. Meg realizes her mistake and suggests they add a critical step to her workflow for handling change specifications. She says she will add a step that reads, "Notify Subs." Which lettered box below is the best spot to add Meg's new step?

☒ A☐ B☐ C[Check Answer](#)

The answer is **A**, because Meg is inserting a step **in her External Process** before she notifies the foremen.

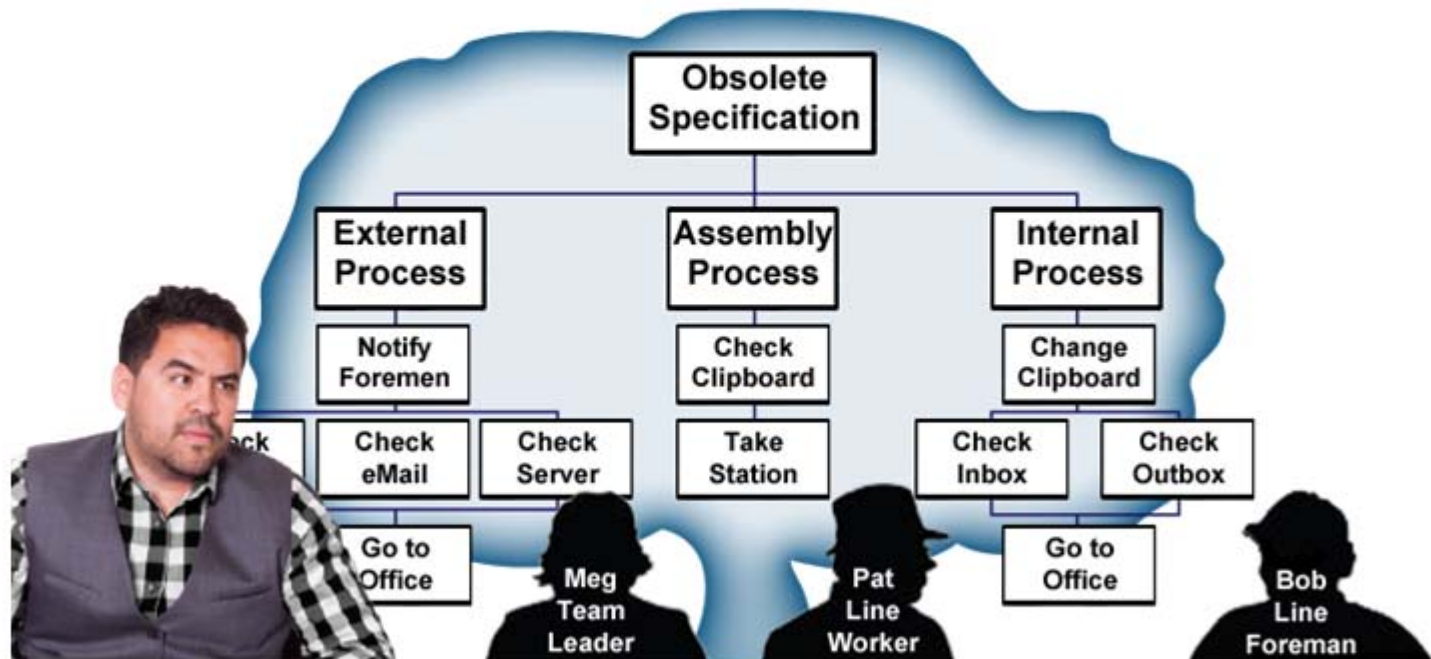
### **Long Description**

The tree diagram from the previous page is displayed. To repeat, the top branch is labeled "Obsolete Specification", which branches into three branches. The first branch is labeled "External Process (Meg)", which branches into a box labeled "A", which then branches into a box labeled "Notify Foremen". The second branch is labeled "Assembly Process (Pat)", which branches into a box labeled "Check Clipboard", which then branches into a box labeled "B", which then branches into a box labeled "Report to Station". The third branch is labeled "Internal Process (Bob)", which branches into a box labeled "Change Clipboard", which branches into a box labeled "C", which branches into two boxes, the first of which is labeled "Check Inbox" and the second of which is labeled "Check Outbox".

## Tree Diagram Scenario Results

[View CR](#) [Submit CR](#)

Based on the Tree Diagram, we have mapped the relationship between the events in Meg's workflow and the outcome of an obsolete specification. Our problem is that Meg missed an important step in her workflow and our sub-tier supplier delivered springs that were not manufactured to the revised specification.



**Long Description**

The head of the supplier RCA team stares angrily at the tree diagram from the previous page.



## Tree Diagram Job Aid

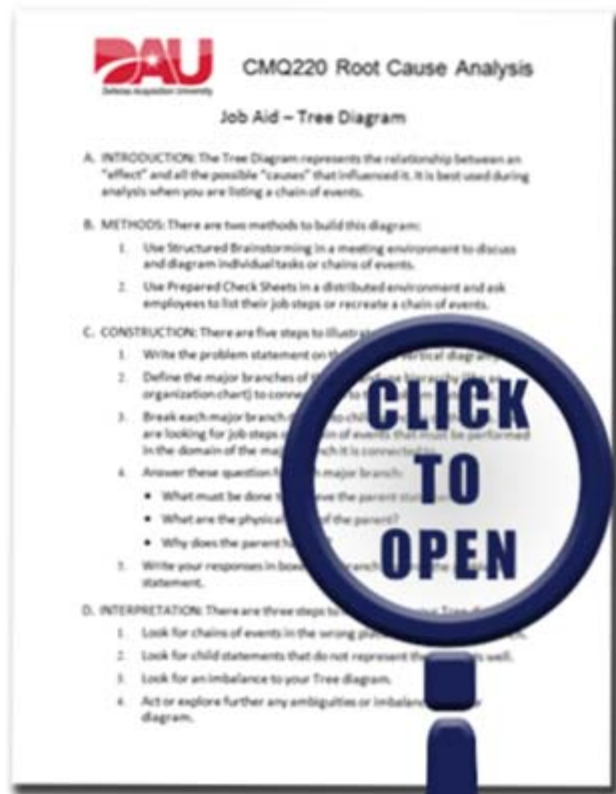
[View CR](#) [Submit CR](#)

A step by step guide may have been helpful to Acme Company to use as a quick reference when illustrating their Tree Diagram. We have provided one here as a Job Aid.

Be sure to compare the Job Aid from this training to the one your manager may prescribe in your DCMA office.

A Tree Diagram Job Aid has been included with this training to assist you on the job. Access and print this document. With your DCMA supervisor's approval, use it as a starting point to list the possible chain of events that lead up to a problem.

[Click here to access the Tree Diagram Job Aid for this training.](#)



**Long Description**

A thumbnail of the Tree Diagram Job Aid. The image has a magnifying glass superimposed over it that says "CLICK TO OPEN".

## Tree Diagram Scenario Knowledge Review 3

[View CR](#) [Submit CR](#)

Which event on the Acme Company Tree diagram led to the outcome and overall problem of Obsolete Specification?

- ☐ Check Inbox – Bob's failure to perform this step
- ☐ Check Clipboard – Pat's failure to perform this step
- ☒ Notify Subs – Meg's failure to perform this step


[Check Answer](#)

It was **Meg's failure to Notify the Subcontractor** that the specification led to the overall problem of mishandled specifications.




## Tree Diagram Scenario Summary

[View CR](#) [Submit CR](#)



I can see the cause and effect relationship between the events and outcomes listed on the Tree Diagram at Acme Company. Meg's oversight caused her to miss a step in the chain of events.



That's a great observation and probably an oversimplified example of illustrating a Tree Diagram.

Our checkpoint is that you understand the fundamentals and can see the relationship between a step in a chain of events and the outcome.

Great Job. It is time to move on to another lesson.

### **Long Description**

The mentor and the DCMA Specialist conclude their conversation. The DCMA Specialist states "I can see the cause and effect relationship between the events and outcomes listed on the Tree Diagram at Acme Company. Meg's oversight caused her to miss a step in the chain of events." The mentor replies, "That's a great observation and probably an oversimplified example of illustrating a Tree Diagram. Our checkpoint is that you understand the fundamentals and can see the relationship between a step in a chain of events and the outcome. Great Job. It is time to move on to another lesson."

## **Lesson Summary**

[View CR](#) [Submit CR](#)

This lesson focused on the concepts of Cause and Effect Analysis.

You now understand that suppliers and vendors to DCMA have several methods for determining the causes of their problems.

Maintain an awareness of these concepts when assessing your supplier Corrective Action Plans. Approach each plan with an understanding of these cause and effect concepts:

- Many suppliers adhere to the Cause and Effect Principle.
- A supplier may use the 5 Whys Principle to find the causes of their problems.
- An Ishikawa (fishbone) Diagram may help your suppliers see the relationship between events and outcomes.
- A Tree Diagram is a valuable tool if your suppliers are looking for causes in a chain of events.

Lesson Completion

[View CR](#) [Submit CR](#)

You have completed the content for this lesson.

To continue, select another lesson from the Table of Contents on the left.

If you have closed or hidden the Table of Contents, click the Show TOC button at the top in the Atlas navigation bar.