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# Root Cause Analysis VS. Shallow Cause Analysis

Understanding the difference, and realizing the impact these processes can have on your maintenance department.

By Robert J. Latino

**W**hen it comes to downtime, the primary focus usually centers not around why the problem occurred, but on how the problem will be fixed in order to get people and equipment back into the production flow. This can lead to a lot of questions pertaining to the right problem-solving approach for you and your business. But perhaps the most important one to ask deals with greater analysis of the “why”, which will lead to decisions based on using Root Cause Analysis or Shallow Cause Analysis.

Root Cause Analysis (RCA) can be defined as establishing a logically complete, evidence-based, tightly-coupled chain of factors from the least acceptable consequences to the deepest significant underlying causes in determining the source(s) of a problem.

Shallow Cause Analysis (SCA) looks to understand the source of a problem through quicker and less expensive means. SCA defines a problem, determines the cause, sets priorities in selecting alternatives for a solution, and then implements that solution.

### Common Tools

The goal here is not to teach you how to use these tools



properly, but to demonstrate how they can lack breadth and depth if they're not imple-

mented correctly. Analytical tools are only as good as their users. So, used properly, any of these tools can produce acceptable results. The problem, however, is that the elements which make these tools most attractive, in terms of their rapid feedback and lower expense, are also their biggest drawbacks, since improper utilization often leads to incomplete and misleading results.

### The 5-Whys

Let's start with the 5 Whys. While there are varying forms of this simplistic approach, the most common understanding is to simply ask the question “Why?” five times in uncovering the root cause.

Now, there's a reason we don't hear about NTSB investigators using the 5-Why approach in the course of their investigations. The reason for this is that the main flaws with this concept, when used under conditions which warrant an RCA approach, are that failure does not always occur in a linear pattern. Multiple factors combine laterally to allow the undesirable outcomes to occur. Also, there is almost never a single root cause, which can make this approach misleading.

Additionally, when people use this tool by themselves,

which is usually the case, they don't rely upon a team or evidence to back up their assertions.

### The Fishbone Diagram

The fishbone diagram is another popular analytical tool. This approach gets its name from its form, which is the shape of a fish. The spine typically represents the sequence of events leading to the undesirable outcome. The fish bones themselves represent categories that should be evaluated as having been contributors to the sequence of events. These categories change from user to user, but the most popular categories tend to be:

#### The 4 Ms

- Methods
- Machines
- Materials
- Manpower

#### The 4 Ps

- Place
- Procedure
- People
- Policies

#### The 4 Ss

- Surroundings
- Suppliers
- Systems
- Skills

The fishbone is often a tool used for structured brainstorming. Team members decide on the categories and

continue to ask what factors within the category caused the event to occur. Once these factors are identified, then they ask why the factors occurred, and so on.

As a brainstorming technique, this tool is less likely to depend on evidence to support a hypothesis, and more likely to let hearsay fly as fact. This process is also not cause-and-effect-based, but category-based. The users must pick the category set they wish to use and throw out ideas within that category. If the correct categories for the event at hand are not selected, key root causes could be missed.

## The PROACT Logic Tree

The PROACT Logic Tree is representative of a tool specifically designed for use within RCA. The logic tree is an expression of cause-and-effect relationships that, queued up in a particular sequence at a particular time, cause an undesirable outcome to occur. These cause-and-effect relationships are validated with hard evidence, as opposed to hearsay. The evidence leads

the analysis, not the loudest expert in the room.

A logic tree starts off with a description of the facts associated with an event. These facts will comprise what is called the Top Box (the Event and the Modes). Modes are the manifestations of the failure and the Event is “the least acceptable consequence” that triggered the need for an RCA. While we may know what the Modes are, we do not know how they were permitted to occur. So we proceed with questioning as to how the Mode could have occurred.

Many have been conditioned to ask the question “why?” during such analysis. However, using this methodology, the question that should be used is “how could?” When looking at the differences between these two questions, we find that when simply asking “why?” we are connoting a singular answer and, to a point, an opinion.

When asking “how could?,” we are seeking all the possibilities (not only the most

likely), as well as evidence to back up what did and did not occur.

This questioning process is reiterative as we follow the

*Modes are the manifestations of the failure and the Event is “the least acceptable consequence” that triggered the need for an RCA.*

cause-and-effect chain backwards. Simply ask the questions, answer them with a hypothesis and use evidence to back it up. This holds true until we uncover the Human Roots, or the points in which a human made a decision-making error.

Human Roots represent errors of omission or commission by the human being. At this point we are exploring the reasoning of why someone made the decision they did.

This is an important point in the analysis because we are seeking to understand why someone thought the decision they made was the correct one at the time. At this point in the analysis we switch the questioning to “why?” because we are exploring a set of answers particular to an individual or group.

These answers are called Latent Root

Causes. The Latent Roots represent the rationale for the decision that was made at that time, which triggered the current consequences. They’re

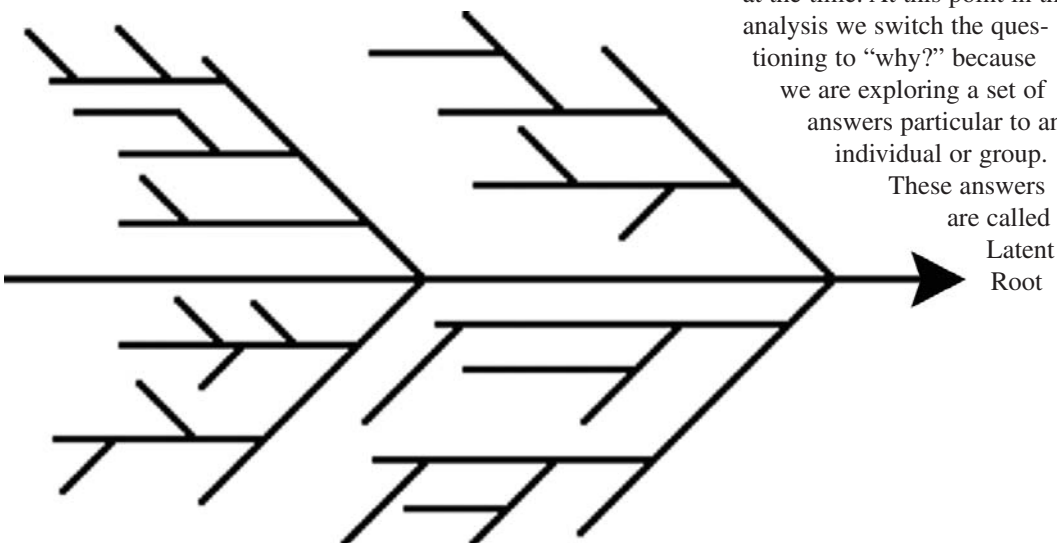
referred to as “latent” because they are always there, lying dormant. They require a human action to be triggered and, when triggered, they start a sequence of Physical Root Causes to occur. This error-chain continues, if unbroken, to the point that it results in an adverse outcome requiring an immediate response.

## Translation

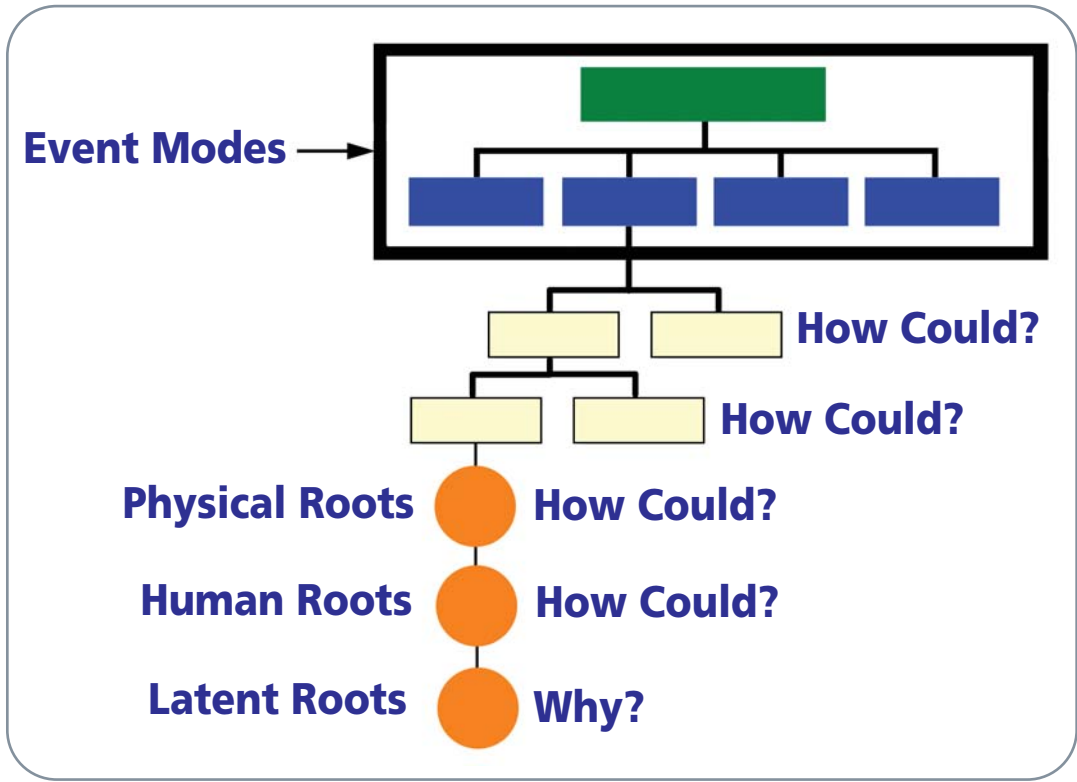
So what does this mean to you when working through your maintenance or operations-based problems?

As can be derived from this description, the logic tree approach is certainly cause-and-effect related, requires evidence to back up what people say, and requires a deeper understanding of the system flaws that contribute to poor decisions.

The failure of a process to achieve its designated objective has to do with the design of the linkages between steps in the process, and how the steps relate to one another. It is the interrelationships that are themselves prone to failure and that propagate the effects of a failure to other parts of the process, often in ways that are unexpected (side effects) or not immediately evident (long-term effects).



## The Fishbone Diagram



# The Logic Tree

The logic tree's strict adherence to graphically representing these tightly coupled relationships makes it more accurate than the other tools described.

In addition to the most commonly used approaches described here, many simply use form-based Root Cause Analysis. This is basically a one-size-fits-all mentality, or "root cause by the numbers." The same questions are asked, regardless of the incident, and opinions are input as acceptable evidence. Checklists are often provided which give people the false sense that the correct answer(s) must be within the listed items.

The problem here is that no "pick-list" RCA process can ever be comprehensive enough to consider all the

possibilities that could exist in each working environment at all times.

However, the innate human

*"An expert is not someone that gives you the answer, it is someone that asks you the right question." That is exactly what true RCA is all about.*

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tendency to follow the path of least resistance makes using pick lists very attractive. As noted author Eli Goldratt says, "An expert is not someone that gives you the answer, it is someone that asks you the right question." That is exactly what true RCA, not "lip service RCA," is all about.

Many people choose to use form-based RCA systems because the regulatory authority seeking compliance provides them free of charge, and even suggests their use. The commonly held belief is that "we are using their forms so we will have a better chance of complying if we use them". This may be true, but does not mean the analysis has been comprehensive enough to ensure the undesirable outcome will not reoccur.

While this is a synopsis of a very broad topic, and is meant to get you thinking about whether the tools you're using are appropriate for Root Cause Analysis. As stated earlier, all RCA tools are more appropriate under certain circumstances than others.

They're also subject to abuse by human beings, as the tool is only as good as the analyst applying it. The key here is to know the technical differences in the tools available, and then determine which ones are the best fit for a given situation.

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