

Although root cause analysis involves the use of many technical tools, the people associated with the process are the keys to success.

# The Human Side of Root Cause Analysis

Duke Okes

Organizations have limited resources and must effectively allocate them to value-added activities. Unfortunately, problems often occur and some of these resources are diverted to resolving them.

In the quality arena, the corrective action process is one of the buckets into which such problems fall. Whether the problem is an external customer complaint, internal detection of a product/service problem, an audit finding, or some other issue, someone must determine the cause of the problem before applying corrective action to prevent recurrence.

Even if an organization had no problems there is a need for ongoing improvement. This often involves identifying bottlenecks or other major factors that impact process performance, which also calls for system analysis.

## Why It's a Human Issue

The reality is that even when corrective action is taken or a process is improved, the same problem often recurs. This causes frustration that organizations should view as a signal that the root cause analysis (RCA) process may lack sufficient depth.

RCA is an analytical process and calls for rigorous thinking about interrelated cause-and-effect relationships within the system that has failed. While computers

can support the process (e.g., through documenting and tracking corrective action requests, facilitating development of process flowcharts, analysis of process data, etc.), RCA is primarily a cognitive process.

This article presents some of the issues associated with RCA and how to overcome them. The issues are organized into groups (e.g., individual knowledge and emotions, organizational issues) to provide some coherence, but there are obviously significant overlaps between them.

## Lack of Knowledge and Guidance

For someone to effectively carry out an investigation, he/she must know what needs to be found as well as a proper sequence to follow to find it.

## Is It a Creative or Analytical Problem?

Often when we face a problem, we focus only on the presenting problem and not the underlying cause. For example, if a copy machine stops working, we simply may decide to find another way to get copies of the report ready for the upcoming meeting. We may decide to print multiple copies off the printer, e-mail it to attendees and ask them to print it, or go to an outside copy service.

None of these deals with the underlying problem—a defective copier. Getting the copy machine working again calls for understanding how the machine works and finding out which of many causes may have stopped it from working correctly. So dealing with the lack of a copy machine is a creative problem-solving situation, and getting the copier fixed is an analytical one. Many people don't know this difference.

*Solution.* Make sure appropriate personnel understand the difference between creative and analytical problem solving. Ask them which they'd prefer if they went to their dentist with a toothache—randomly pulling teeth until the right one is removed or using an X-ray or other diagnostic technique that detects the actual cause?

### What Is a Root Cause?

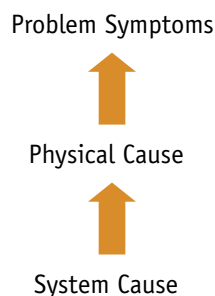
There are actually two levels for problem causes. The first is the physical cause (also called proximal or direct cause). This is the specific physical item that, if it were replaced, would allow the process to work correctly. For example, if the copy machine failed to work because a worn roller was slipping, replacing the roller would allow the machine to again work correctly.

A system cause (also called distal or latent cause) actually may be the underlying problem (see Figure 1), which caused or allowed the physical cause to occur. If, for example, the rollers on the copy machine are not replaced at the recommended preventive maintenance interval, the problem will recur when the new roller gets past its useful life.

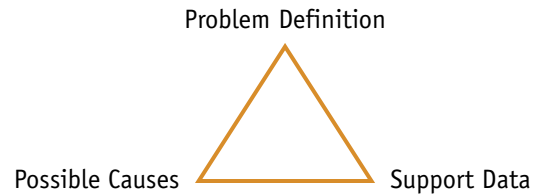
The tendency in organizations is to stop once the physical cause is found and corrected, and in many cases this may be appropriate; however, if a problem occurs at a high frequency, costs a lot when it does occur, and/or has a high risk of injuring people or causing a significant loss of business, then the organization should consider taking the investigation to the system level.

*Solution.* Describe the two levels of causes in the corrective action procedure and ensure that for each problem a decision is made whether to stop at physical cause or to also go after the system cause.

**Figure 1: Levels of Causes**



**Figure 2: Components of RCA**



### How Can You Find the Root Cause?

RCA is a generic skill (as is process thinking) that can be applied to nearly any problem situation, but it is typically not taught in schools. RCA experts are often people who have spent many years troubleshooting a wide range of problems. Very few organizations provide training in RCA, and if you look at a typical corrective action procedure, you won't gain much insight.

RCA has three major components as shown in Figure 2 and described below:

- Creating a clear, concise, and complete problem definition that includes what the problem is, where and when it occurs, and how much of a problem exists (its magnitude).
- Identifying the most likely causes, initiated by a review of the associated process, which provides an analytical framework and helps the investigator to avoid tunnel vision.
- Collecting and analyzing data that points to or eliminates each of the identified causes.

*Solution.* Provide some guidance in the corrective action procedure on steps and tools for finding a root cause. Also, include RCA as a core competency in the organization's process quality management curriculum.

### Do Emotional Factors Affect Root Cause Analysis?

Humans are emotional creatures, which makes them more interesting and very problematic. Individuals and groups both demonstrate emotional patterns that can support or detract from their ability to solve problems.

### Cognitive Biases

As the Dalai Lama said, "A biased mind, which never sees the complete picture, cannot grasp the reality." Humans exhibit several cognitive biases, which affect their aptitude to conduct effective RCA.

One category of cognitive biases might be called cognitive laziness. Decision-making expert Herbert Simon defined this as "satisficing," which means rather than seeking an optimum result, doing just

enough to get to a result that is sufficient. Some examples of cognitive laziness in RCA include the following:

- *Recency bias.* If a problem occurs again which had occurred sometime recently, we often assume it's likely the same cause is present as occurred the last time, and we do not perform a full investigation. For any problem, however, there are usually multiple causes, and there is often no rationale for thinking that the same cause has occurred.
- *Availability bias.* When a problem occurs that calls for collecting data (and most will although the data may take many forms), we go after the data that is easy to get, rather than what would be more accurate or conclusive.

Another category of cognitive biases reflects overconfidence. Some examples include:

- *Anchoring bias.* Latching onto the first piece of data and focusing on what it indicates while ignoring other evidence that might conflict.
- *Confirmation bias.* Looking only for evidence that supports our theory of what the cause is, rather than also searching for an alternative that might disprove our theory.

*Solution.* Take the time necessary to do a good investigation, especially if it's a repetitive problem (e.g., "We thought we fixed that last time!"). Ask the question, "What would prove us wrong?"

### **What About Our Fears?**

In many organizations the first question asked when a problem is found is, "Who did it?" There is an assumption that the problem is due to a person, rather than considering that people may be working in a system that is not well designed or managed. In such an environment, it is natural for people to fear getting fired or otherwise punished, which means there is hesitation to look for the root cause.

In addition, at least in the United States, some people see problems as a lottery—they want to see how much they can make someone else pay for the problem they encountered. They believe humans shouldn't make mistakes or that any problem is caused by the human who made the mistake, rather than the system. Fear of lawsuits also impedes RCA investigations.

*Solution.* Change the culture. If you want to fix problems, you need to know what the cause is—even if it is a human one. Treat RCA as a learning process, and in the case of a lawsuit, ask yourself this

question, "Would you rather show up in court with information indicating the organization did a lousy job on RCA, or with evidence indicating you not only found the cause, but also took action to resolve it?"

### **Can Organizational Issues Undermine Our Efforts?**

Sometimes people don't have time to do a good investigation simply because they're overwhelmed by the number of corrective actions that have been initiated. There is a limit to the number any organization can handle effectively at one time, and asking for more than that simply reduces the attention each will receive.

*Solution.* Have two categories for problems: first, those that definitely need a corrective action, and second, those that will simply be tracked to see if there is a trend that is serious enough to move the issue into the first category.

A barrier in some organizations is who takes ownership of the corrective action. It should go to the individual who oversees the process that failed, but instead it often is assigned to quality assurance personnel. This means the process manager has no direct involvement in the investigation and has a solution imposed on him/her by someone who is not responsible for day-to-day management of the process. How would you like someone coming into your sandbox and telling you how to play with your toys?

*Solution.* Assign responsibility for RCA to the process owner. Have quality assurance or other RCA experts act as facilitators/analysts. Make sure the RCA analysts also have knowledge of personal styles and effective ways to coach/intervene.

### **In Conclusion**

RCA is about finding the causes that need to be addressed by solutions. Obviously there are issues during the solution phase that can affect how well the problem-solving process works, too. Examples include using the same solutions over and over (e.g., add another check stop or retrain people), a lack of orientation and preparation of process personnel for change, and sustaining the change once implemented.

Poor RCA, however, makes it unlikely the right solutions will be identified and implemented. I have observed many completed corrective actions that lacked thorough RCA investigations. This article identified some reasons for those breakdowns and proposed solutions. While organizational systems

*(Continued on p. 29)*

## Social Responsibility: Did You Know?

Paper goods, including envelopes, make up a significant portion of household waste. Many paper products can be recycled, but you may need to prep them a bit before you put them out for pick up. First, check your local recycling authority's brochure, hotline, or Web site to determine if envelopes are accepted. In some cases, contracted paper mills cannot recycle envelopes because of the glue used on the flaps. Envelopes with plastic windows usually can be screened out in the recycling process, but you can separate the window envelopes to be safe and place them with regular trash. Padded envelopes should not be mixed with items for recycling because their plastic is attached to the paper. By the way, many envelopes actually can be reused by applying new address labels, removing the post-marked stamps, and applying a bit of new glue to the flap. See [www.recycling.co.uk/envelopes](http://www.recycling.co.uk/envelopes) for more information.

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create many problems, only individuals can take the initiative to change things for the better—in this case by improving the human factors involved in root cause analysis.

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### More Online

Our Web site, [www.asq.org/pub/jqp](http://www.asq.org/pub/jqp), contains a list of links to other references that can help you improve your root cause analysis skills.



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## Techniques for Root Cause Analysis

These articles and presentations are available from ASQ's Body of Knowledge and can be accessed using the indicated links.

### "Digging for the Root Cause"

Gary G. Jing, *Six Sigma Forum*, May 2008, pp. 19-24, [www.asq.org/six-sigma/2008/05/continuous-improvement/digging-for-the-root-cause.pdf](http://www.asq.org/six-sigma/2008/05/continuous-improvement/digging-for-the-root-cause.pdf).

**Excerpt:** "The expression 'root cause' is somewhat misleading. Many people, including Six Sigma practitioners, use it without realizing its larger context. Asked what root cause means to them, some typical responses are: It's what's really happening; it's the one thing that causes everything else; or it's the switch that turns the light on. That is to say, they subscribe to the notion that there is one absolute thing that is the originator of the considered effects. This absolute origination is what people usually identify as the root cause. Books on quality or Six Sigma don't always give clear descriptions of the concept of root cause. Similar scenarios occur in Six Sigma training programs. As a result, many practitioners might not even know when they discover the root causes. This is a major shortcoming of Six Sigma programs and should be corrected."

### "Root Cause Analysis for Beginners"

James J. Rooney and Lee N. Vanden Heuvel, *Quality Progress*, July 2004, pp. 45-53, [www.asq.org/pub/qualityprogress/past/0704/qp0704rooney.pdf](http://www.asq.org/pub/qualityprogress/past/0704/qp0704rooney.pdf).

**Abstract:** Root cause analysis (RCA) is a tool to help identify what, how, and why an event occurred so that steps can be taken to prevent future occurrences. Additionally, RCA may be used to target opportunities for system-wide improvement. Root causes are specific underlying causes that can be reasonably identified, are within management's control to remedy, and which generate effective recommendations to prevent recurrences. The RCA process involves data collecting, causal factor charting, root cause identification, and recommendation generation and implementation.

### "Root Cause Analysis: A Framework for Tool Selection"

A. Mark Doggett, *Quality Management Journal*, October 2005, pp. 34-45, [www.asq.org/pub/qmj/past/vol12\\_issue4/qmjv12i4doggett.pdf](http://www.asq.org/pub/qmj/past/vol12_issue4/qmjv12i4doggett.pdf).

**Abstract:** A framework is provided for analyzing the performance of three root cause analysis tools: the cause-and-effect diagram, the interrelationship diagram, and the current reality tree. The literature discusses the ability of these tools to find root causes with varying degrees of accuracy, but it does not address selection of the appropriate tool based on objective performance criteria. While each tool has advantages and disadvantages, the framework provides knowledge of root cause analysis performance characteristics so that decision makers can better understand the underlying assumptions of a recommended solution.

### "Back to Basics: To Find the Root Cause, That's Why"

Dave Nelson, *Quality Progress*, September 2003, pp. 104, [www.asq.org/data/subscriptions/qp/2003/0903/qp0903backtobasics.pdf](http://www.asq.org/data/subscriptions/qp/2003/0903/qp0903backtobasics.pdf).

**Abstract:** Quality professionals often use tree diagrams to solve problems or implement solutions. Another tool, the "why-why" diagram, uses a similar approach to determine the root cause of a problem. A "why-why" diagram says, "Slow down. Before we find a solution, let's first find the root cause."

### "On the Trail to a Solution... Part 4: Getting to the Bottom of Things"

James J. Rooney and Deborah Hopen, *The Journal for Quality and Participation*, Summer 2005, pp. 15-21, [www.asq.org/data/subscriptions/jqp\\_sub/2005/summer/jqp0705onthetrail.pdf](http://www.asq.org/data/subscriptions/jqp_sub/2005/summer/jqp0705onthetrail.pdf).

**Excerpt:** This series focuses on identifying human psychological factors that generate resistance to a structured, "facts-and-data-based" approach to problem solving and presenting suggestions on how to tap into the participants' natural creativity and intuition—without jeopardizing reliability.