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Root Cause Analysis

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## ***Improving ROI of Six Sigma With Root Cause Analysis***

### **Evidence-based root cause analysis is the cornerstone of any truly successful continuous improvement initiative.**

Do you hear Six Sigma professionals express frustration that the organization does not support their efforts?

Are there department heads in your life who have complained that their Six Sigma professionals are not delivering the needed results? And that each project is too time-consuming?

Have you heard stories about CFOs who insist that the sizable investment in Six Sigma training and program initiation has not—and never will—pay off? After all, it costs around \$20,000 just to train one Black Belt.

If you can answer “yes” to one or more of the above questions, you are not alone. Many Six Sigma professionals will tell you that sweeping program improvements are needed for Six Sigma’s validity to be verified.

Many Six Sigma professionals feel frustrated that managers are focused only on short-term results to please shareholders. They feel that if managers would just allow more time, the desired results would be delivered. In reality, managers will not change their position because the pressures they face from executives, shareholders, and analysts will not go away. Six Sigma professionals must give management what they are looking for by producing results more quickly and effectively.

Put plainly, the primary objective of Six Sigma is to improve processes by increasing process knowledge with an end-goal of providing predictive control. Yet very few organizations achieve this. Six Sigma is a valid and valuable methodology that—when implemented with an enlightened approach—fosters a much clearer understanding of processes and the appropriate path forward to improve efficiency and the promised results.

### **Improving cost- and time-effectiveness**

Despite a common misconception, Six Sigma is not a completely inflexible method that must be used in its entirety, nor must it be used exclusively. Each organization should choose which tools work well for its needs, and which tools do not have value and should be eliminated or replaced with something more effective.

Many companies with active and successful Six Sigma programs acknowledge that they still are challenged with problem recurrence and unnecessary costs. One of the most effective ways to address this is by integrating an effective, evidence-based root cause analysis (RCA) methodology.

Six Sigma professionals are taught to use fishbone diagrams, fault tree analysis (FTA), and failure mode and effects analysis (FMEA) to determine root causes. These methods can get very lengthy, tedious, and speculative.

As an alternative, companies that use evidence-based RCA find that they effectively identify the “vital few” root causes and solutions, and then are able to save significant time and money by spending less time validating “Xs,” and reducing the need for design of experiments.

For companies that are about to initiate a Six Sigma program, it is logical to initiate an evidence-based RCA program first. Evidence-based RCA will increase process knowledge and make the Six Sigma program immediately more effective. Logically, you have a better chance of fixing things that you understand.

Following are some guiding principles and best practices to improve the Six Sigma process and results by improving logical problem-solving capabilities.

- An undesired event can only occur as a result of condition-based causes and at least one action-based cause occurring together. For instance, for a fire to start, there are numerous conditions that must be present—such as oxygen, flammable material, and an ignition source. But there also must be some kind of action that initiates the fire, like someone striking a match. If any of those four elements is removed, a fire will not start. There is no single cause of any event; events are the result of multiple causes coming together.

Methods like the fishbone diagram, FTA, and FMEA do not require evidence or identification of both condition-based and action-based causes, so they do not thoroughly and accurately identify the real, multiple-cause nature of problems.

- Some methods encourage identification of problem causes through brainstorming. This tends to generate a list of issues that are important based on personal agendas, but may not really have contributed to the problem at hand. People involved in the process then get frustrated when solutions are not successful, or feel disenfranchised when their opinions are not heeded.

- Because Six Sigma calls for a “scientific” method for problem solving, an evidence-based RCA methodology can be integrated into the analyze phase. And because fishbone, FTA and FMEA are based on opinion and consensus, an evidence-based RCA can be used in their place. To identify and validate causes that truly play a role in any given problem, a proven evidence-based RCA methodology can be very effective.

The evidence-based root cause analysis process has four steps, which include:

1. Define the problem.
2. Identify the causes of the problem (cause and effect chart) and supporting each cause with evidence.
3. Identify solutions.
4. Implement and monitor effectiveness of the best solutions.

An effective solution must meet the following conditions:

- It must prevent a recurrence of the problem.
- It must be within your control to implement.
- It cannot create another problem in the process.
- It must be in alignment with the goals of the business.

- The more you know about your processes, the better you will be at identifying which projects to pursue, which causes really played a role in any given problem, and which solutions have the most potential.

With the inclusion of an evidence-based RCA program, select organizations are reaping significant return on investment (ROI) and other rewards from their Six Sigma programs. The real-life experience below illustrates this.

I worked with a Ph.D. statistician in the early-1990s. Although we did not refer to our work as Six Sigma, we used many of the techniques that are popular today and made many improvements—or so we thought.

We worked on issues that caused problems within operations. We made great improvements, but we suffered from recurring problems and our improvements were difficult to sustain. These problems made it difficult to realize the benefits outside of manufacturing. We had a poor understanding of our processes.

We noticed marginal improvement as we gained experience, but it was still not enough. We did not understand our processes and it was apparent that this was the source of our failures. We were operating by conjecture and consensus.

The company adopted the Apollo RCA methodology in the mid-1990s. This method uses an evidence-based cause and effect approach to identify root causes, but nearly all of the investigations were related to safety. Apollo became known as a “safety tool” and was not used much in other areas.

In the following years, I transferred to other locations within the company. I continued to use Six Sigma and lean, and we continued to make stunning improvements within operations. But the fishbone diagram, FTA, and FMEA remained troublesome. It was very difficult to get people to participate because they were time-consuming and the assumptions were frequently wrong.

Management began to question the capabilities of our subject-matter experts.

We implemented lean to further support our continuous improvement effort, but because it is a methodology designed to eliminate waste, it didn't help identify causes or targets.

In retrospect, no matter our experience or education, it was highly improbable that we could have accurately and consistently diagnosed a problem and identified corrective actions based upon our expertise alone. It is an unrealistic expectation that did not work for us then and it does not work for most people now.

I began working for a different company and received formal Six Sigma training. My new job placed me in direct contact with the business managers and I began to learn the business-critical issues. As a result, the project that I chose for my Black Belt certification was highly relevant to the needs of the business.

I also decided to use the Apollo method in my project to more accurately identify root causes and focus my Six Sigma work.

The initial RCAs were very challenging because we could not provide evidence for many of our causes. We were limited by our lack of process knowledge, but this time we were aware that we did not understand. It was not uncommon for us to suspend an RCA to conduct experiments to find the needed evidence. Whether our causes were right or wrong, the RCA method was validating—or invalidating—the causes and providing tangible evidence on which to focus our Six Sigma effort. The Six Sigma certification project returned two to three times the value estimated in the design phase, and subsequent projects were beginning to consistently affect the bottom line. We were learning.

## **Effective RCA program setup**

I was transferred to a plant manager position and my path forward was clear. The first order of business was to create a documented manufacturing strategy that detailed how we would run our operation. Within that strategy was a formal RCA program that clearly specified when an RCA investigation was required. The specifications were high at first—since our manpower resources were limited—but became much tighter as we made improvements and gained process knowledge and experience.

Every employee received Apollo RCA training. Most were trained as participants, others as facilitators and super users. We conducted nearly 100 investigations per year, tracking the number of recurrences and their value compared to the previous failure. We required all the solutions to be in place and effective for at least six months.

## Impressive results and ROI

The return on investment during the first year was 400 percent and we were learning more about our processes with each RCA.

We followed by providing an overview of Six Sigma to all employees, and training two employees as Black Belts. But, we used RCA in place of the fishbone diagram, FTA, and FMEA. It took much less time to identify and implement projects, which encouraged more involvement and more enthusiasm for the effort.

## Ongoing RCA program development

We continued our effort by providing lean training to all employees. The continuous improvement program was providing consistent and sustainable results. For two consecutive years, plant records were established for throughput, yield, safety, on-time delivery, and reduction in the cost of poor quality. Manpower was reduced by 10 percent through attrition. It simply took less work to produce the products.

The organization is still learning and improving.

## Conclusion

An evidence-based RCA program is the cornerstone of any truly successful continuous improvement initiative. You must understand your processes to create meaningful and sustainable change. RCA also is an excellent approach to reduce the project workload, while providing more meaningful process information. Six Sigma professionals feel more fulfilled as they achieve impressive results quickly and managers are more able to realize the benefits.

## About The Author

*Tracy Willis has nearly 20 years of experience in business process improvement and incident investigations within Rohm and Haas Co. and Solvay. Willis is a certified lean Six Sigma Master Black Belt and a Shingo examiner, and has championed five Six Sigma Black Belts. As owner of Precision Processes, Willis provides specialized consulting in process analysis and improvement. He also is a certified [Apollo RCA](#) instructor and investigator.*