



## Four Ways to Measure the Effectiveness of Your Root Cause Analysis Process

Root Cause Analysis is all about improving your bottom line in safety, environmental compliance and profitability. This paper explores measuring the effectiveness of Root Cause Analysis as a business process intended to produce business results. Examples of the primary KPIs will help you keep your finger firmly on the pulse of your RCA process.

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## Overview

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People often define the sole measure of success for Root Cause Analysis (RCA) as being able to “kill” the problem forever. But does that mean dead at any cost? How big are the problems we are solving? Are we trapping mice (forever chasing irritating little problems) or hunting big game (only responding to major events)? Forever is a long time. Is one re-occurrence per 100 years good enough? And is the true objective the analysis, or the actions that follow?

It is important to distinguish between performing an individual RCA (using a tool) and the business process of systematically performing RCAs that supports any effective loss elimination, failure elimination, or continuous improvement program. Excellent training is available for any of the more than 100 documented RCA tools in use. This discussion is limited to measuring the effectiveness of RCA as a business process intended to produce business results. We do RCA because of the desire for good business results which include protecting people, the environment and our profits.

Please keep in mind that an RCA can be performed both reactively and proactively. We are all familiar with the reactive mode of performing a Root Cause of FAILURE Analysis (RCFA). But do you know that RCA adds most value when it is used proactively? One such proactive example is when developing proactive solutions to address potential failure modes identified by risk analysis tools such as Opportunity Analysis (OA) or Failure Mode and Effects Analysis (FMEA). Even when performed in reaction to a failure, if your RCA process is effective, the findings of an RCA can be applied proactively to similar assets, products, and situations, thus preventing failures from occurring elsewhere.

If you are near the top of your class in business, most of your RCA should be focused on eliminating chronic, money-stealing, minor events (the financial equivalent of safety “near misses”) as well as addressing adverse trends in any performance, instead of being reactive and doing RCA only when large or disastrous events occur. Very often, having to perform an RCA on a major disaster is merely painful validation that the system was not truly under control to start with. RCA on disastrous events should be very rare.

In the business process of RCA, program effectiveness is measured using several metrics, also known as Key Performance Indicators (KPIs). The most useful metrics are leading indicators of correct behaviors. Lagging indicators or metrics are part of the feedback loop for the overall process and behaviors system. They are also known as “the bottom line.” What follows are examples of the primary KPIs that, if used properly, will keep your finger firmly on the pulse of your RCA process by answering these vital questions:

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### 1. Is every event that meets or exceeds the published RCFA trigger criteria receiving an RCFA, and is the RCA being initiated within the specified time frame?

First you must understand what an RCA trigger is and why it's important. It often takes a lot of failure analysis and other expensive forensics to fully understand the nature of the failure. Add to that the cost of the RCA team human resources and the cost to implement corrective action, and an RCA can be very expensive! Trigger criteria are used to ensure consistent application of RCFA so that we focus on solving the most important problems first, and to ensure that the resources expended are appropriate to the potential return. This maximizes the return on the resources expended. Without triggers, initiating an RCFA becomes an erratic and often emotionally driven event, jumping from partially solved problem to partially solved problem, often with inadequate results and poor return on investment.



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Trigger criteria are a scale of business consequences including the previously mentioned important business outcomes such as safety, environmental impact, and profits, and takes into consideration the frequency with which these consequences can be expected to occur. In short, they are a means of classifying ongoing business risk. Well-constructed trigger criteria accommodate not only singular big events, such as a major accident, but also chronic events such as repeated first aid injuries. And they will take into account not only those events that have happened, but those that can realistically be expected to happen if no action is taken, such as the output of an FMEA, or multiple, similar safety near-misses. The triggers, usually in tabular form, relate the overall risk reduction potential (benefits) to the amount of resources that the business is willing to spend to reduce the risk (RCA cost). It is a simple tool for classifying the business case and determining if sufficient Return on Investment (ROI) exists to justify performing an RCA, and what level of RCA resources are justifiable to invest.

Some words of caution: Many organizations have developed elaborate multi-tiered trigger systems that select the type of RCA analysis tool to use based on the loss incurred. By specifying the type of RCA tool to be used, what they are really implying is the allowable resource cost of the entire analysis. Just as when selecting the tools to fix a machine, different RCA tools should be selected for different types of problems. This slightly off-target type-based trigger approach is like saying a big hammer is more effective than a little hammer, when in fact a wrench is needed for the job. To get the best results, the tool should be chosen for its effectiveness. The allowable resources to expend to perform the RCA should be determined by the trigger. If the only effective tool to solve the problem costs more to implement properly than the benefits of the resulting solution can support, then pause to consider whether you should be working on this problem at all at this time. Using the wrong RCA tool well or the right tool improperly, or simply wasting major resources on small problems, all lead to sub optimal results.

Concerning the issue of RCA timing, the time required post incident to complete an RCA is often specified as another, inappropriate metric. I do not agree with the common usage rule that every RCA must be completed within some specified time frame, such as one or two weeks, after the incident. The RCFA process should always be started within the specified timeframe (generally hours or days) after an incident occurs, before memories fail and evidence escapes. It should always be completed within the agreed-upon time. Sometimes factors such as external failure analysis services, or tests, will drive the completion timing; thus a single fixed value for all completion is not always appropriate. An RCFA is worthless if it addresses the wrong failure. The key behavior here is starting the RCA promptly and consistently.

## **The critical KPI to measure here is start interval compliance:**

This is the number of RCAs started within the required specified interval after the trigger is pulled, as a percentage of the total number of events that pull the RCA trigger.

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## **2. Are 100% of all approved corrective actions specified in an RCFA being completed on or before the published date?**

Notice that completing the RCA analysis within the time frame is not the most critical measure. That is because the only thing really important to the business is the implemented results of the RCA. An elegant analysis and perfectly worded corrective actions, flawlessly reported is not a business result, just a step in the process. The only things that will produce results are completed corrective actions. The RCA closes only after all approved corrective actions are closed.

There are several good reasons for measuring corrective action compliance:

- a. The RCFA is worthless if the corrective actions are not promptly completed (not to mention the hideous liability trail that an RCA with uncompleted corrective action leaves behind.)



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- b. When everyone understands that the corrective actions will be completed on time or serious consequences will follow, they tend to focus on the critical few corrective actions instead of loading the report with frivolous items or solving everything but the real problem. This is humorously known as “shot-gunning” or “trying to solve world hunger” when the problem was running out of bread at lunch time.
- c. If an organization is unable to complete the necessary corrective actions, the entire RCA effort is wasted. And they obviously have not allocated the resources and priorities to complete what they have started. This rapidly becomes an untenable situation with a large and rising backlog of uncompleted corrective actions. Morale will suffer. If this happens, then there is a hard choice that must be made: you must either raise the trigger level (reduce the inflow), or add more resources and priority (add more pumps.) It is imperative to decide and act or your RCA program will collapse in a flood of incomplete finishes and reoccurring problems.

**This critical KPI to measure, On-time Corrective Completion, one of the most critical to have, and most difficult one to manage, is:** The number of approved RCA corrective actions completed on or before their specified dates, divided by the number of corrective actions having due dates within the measurement time frame. This should always be near 100%.

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### 3. Have all the criteria that were specified to measure success of the corrective actions been measurably met?

Every RCFA must have specified measurable means of assuring that the corrective actions are effective, otherwise there is no means of verification. Closing an unverified RCFA is engaging in wishful speculation. What behaviors, actions, inactions, or conditions need to be changed to prevent recurrence? How do we measure the success of the RCA? We all know the caution about what happens when people make assumptions. Assuming that the RCA correction actions were successful is a common and sometimes literally fatal mistake. The ground is littered with failed RCA programs and damaged or wrecked careers from assuming that the problem was fixed and stayed fixed.

Metrics such as the mean time between failure (MTBF), easily available from a good Failure Reporting and Corrective Action System (FRACAS), work well as a source of confirmation. Measured losses should take into account spare part costs, lost productivity costs, scrap and material losses, lost opportunity cost, and manpower costs. For singular events such as minor accidents, near-misses and other known precursors of more serious events, the rates can be measured. Or you may have to convert the results into commonly agreed-upon meaningful statistics such as OSHA injury rate. By far the simplest and most reliably effective approach is to measure the actual costs where they can be obtained.

Also, when measuring, always be on the lookout for unintended negative consequences of your “fix”. Did we fix one problem to create a different one or move the same problem to some other location? It happens far more often that people care to admit.

It is critical that you measure success for as long as it takes to ensure that the “fix” works and keeps on working. Do not just declare victory and go home when the corrective actions have been implemented and the first good data comes in. You must track for a sufficient period to ensure sustainability of the results. This is especially true when the corrective actions are changes in human behavior, such as SOP changes or training. People are not easily changed, nor do they stay changed without serious effort. A best practice is to specify and approve the audit period simultaneously with the corrective actions.

**The critical KPI to measure, Success Rate, is:**

For each RCA, the actual percentage of each stated improvement goal that was reached, measured over the specified audit period.



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## 4. What is the net return on investment of the RCFA / Loss Elimination Program? How much did you save (the avoided cost of the ongoing incidents) versus the total cost to perform the RCFA plus the cost of the corrective actions?

We measure RCFA effects in money because it is a fairly universal language, and business is in business to make money. In the rare case of a non-profit organization, there is still a need to use resources wisely or measurably protect the public welfare. Even in the area of safety, where there is no price you can place on human life or suffering, there are generally accepted and agreed-upon costs to be avoided for lost human life and suffering. Most Loss Management departments or insurers can give you some very straightforward dollar numbers to use to put a cost on avoided death, injury, and other disastrous events. The U.S. Department of Labor also has some useful data. It is not being callous; using cost as a mean of measuring injury risk is an integral part of risk management in business and government. It is also an effective means to ensure that you are maximizing the use of your resources to minimize the risk to your business, your employees, and the public at large.

It's unfortunate that almost any business activity except for accounting and actual production of product or service has to continuously re-justify itself, as if anything but these few exceptions were some obvious and inherent waste of company funds. Sometimes this problem may be simply due to management ignorance of what really contributes to the value stream. As an RCA practitioner, this problem becomes your challenge. Remember, management controls the money and other resources necessary to do RCA. The RCA program you put in place must eventually show a documented positive cash flow and good ROI, or it will eventually face extinction. Money just happens to be a very universal way to prioritize the use of your resources. Do not start on an RCA if the ultimate impact of the trigger event or trend is not known.

**The final (lagging) KPI, but the one most critical to sustaining your RCA program, is simple Return on Investment (ROI):** It is the cost of the ongoing incidents eliminated / (Cost of the RCFA + Cost of corrective actions.)

Ultimately RCA is all about improving your bottom line in safety, environmental compliance, and profitability.

