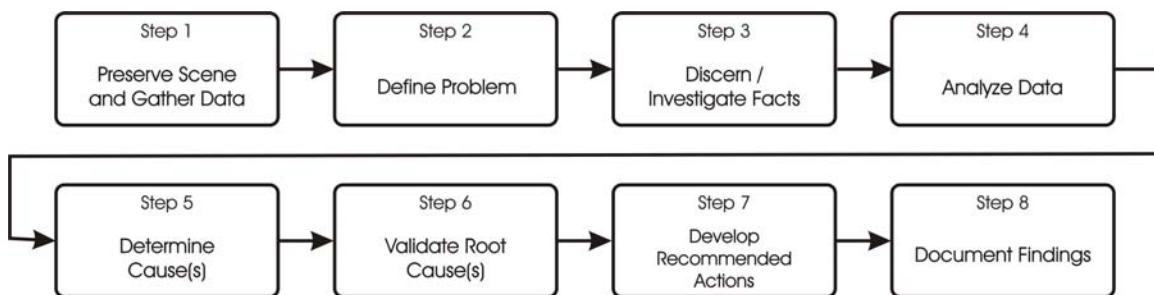


Event Investigation Guidelines

Following are some guidelines for you to consider should you have a significant event to investigate. Be sure to check out the Tools part of this section, where you will find a collection of the best investigation tools available anywhere.

Process Overview

There are eight basic steps to conducting a Root Cause Analysis (RCA) investigation. These steps are identified in the following diagram:



Step One: Preserve Scene and Gather Data

When you have had an event occur, it is important that you initiate the investigation as soon as possible to avoid such things as loss or misplacement of physical and/or documentary information. In addition, first hand reports of event participants and witnesses tend to alter with time due to stress, rationalization, “comparing notes”, and poor or inaccurate memory. When mobilizing an investigation team, your team members must not only have adequate expertise and adequate availability of time to conduct the investigation, but also must be able to come together quickly to initiate the effort.

When practical and appropriate, scene preservation should commence as soon after the event occurs as possible. While these will vary with the nature of the event, some items for you to consider include:

- Delay cleanup to allow for recording of the event scene
- Begin to capture information immediately to prevent loss or elimination through cleanup efforts
- Photograph or videotape the scene

- Record as-found locations of significant accident-related materials
- Record names (and badge numbers as appropriate) of individuals who were involved in or witnessed the event
- Collect individual recollections of the event and of the activities in which the individuals were participating at the time. Consider collecting written statements in this initial stage
- Interview individuals as soon as possible, preferably before they leave work for the day
- Take pre-teardown photos that demonstrate scale and orientation of key elements at the scene

Step Two: Define Problem

While critically important, this step is oftentimes not given an appropriate amount of attention in the investigation process. After all, you know what occurred (the event itself), so the ‘problem’ is obvious, right? Not necessarily.

It’s quite easy, particularly when emotions are still flaring, to jump to conclusions. At this early stage, you may have a perception of what the problem is; however, the actual problem may be something quite different.

For example, let’s say you climb into the driver’s seat of your car, insert the ignition key, turn it clockwise, and...nothing happens. What might logically be the problem? The battery is dead. You might therefore consider your ‘problem’ to be: “Car won’t start due to dead battery.”

The problem is that jumping to such a conclusion (“the battery is dead”) could easily lead you down the wrong path. For example, the actual problem (based upon what is known thus far) might be a bad ignition module, or maybe the key connection has ceased to make contact, or maybe the interlock requiring the transmission to be in Park has failed. Get the point?

An excellent well-thought-out problem statement forms the foundation (and determines the scope) of a good investigation. It helps you and your team to maintain focus.

Here are some pointers for developing a quality problem statement:

- Discuss the event with cognizant personnel to clarify the perceptions surrounding the problem, as well as the resulting consequences. This is a ‘sifting through the chaff’ process. Remember- perceptions of the problem may not reflect the actual problem, but rather, symptoms of the problem.
- Identify only WHAT went wrong (not WHY). For instance, in the “car won’t start due to dead battery” example, the “due to dead battery” portion of the statement is jumping to a conclusion regarding the “why”, and should not be part of the problem statement.
- It may be appropriate to include key condition(s) surrounding the problem. In our example above, adding, “When turning ignition key to the START position,” in the problem statement clearly defines the condition at the time of the event. This will not apply in all cases, but should be considered during the development process.

- When an event involves multiple deviations, identify the problem that is specific to one issue, yet coincides with all deviations.
- Identify the adverse effects or consequences of the stated problem and the associated severity.
- Ensure the problem statement contains only one problem.
- Ensure that the problem statement is not confused with the consequences. For example, if you were late to work because your car wouldn't start, "being late to work" is a consequence of the problem and should not be included in the statement.
- Ensure that the problem statement is not confused with corrective or intermediate actions taken. For example, "causing me to have to walk to work" would be an action taken statement and should not be included in the problem statement.

So with all of this information in mind, what would be a quality problem statement for our example of the car not starting?

→ "When turning ignition key to the START position, the car did not start."

Hopefully you can see how such a statement will aid the investigation. It makes the problem very clear, and will keep your investigation team focused on the problem (vice being led to any potential cause or mere symptom).

Step Three: Discern / Investigate Facts

This is where you will gather information for analysis in Step Four. We have created tools to help you through this phase of the process. We have provided links to .pdf versions of associated tools where appropriate. Please feel free to use them in your investigations. We also provide customizable interactive simple-to-use tools that will speed up your data gathering and sifting process. For more information on these tools, [click here](#).

Following are our recommended data gathering and sifting steps to provide you with the best opportunity to discern fact from non-fact, and to collate information for Step Four Analysis.

1. Conduct a review of pertinent data and documentation. Use the [Data / Document Review Checksheet](#) as an aid to ensure that all appropriate information is gathered / reviewed.
2. Conduct initial interviews of involved / appropriate personnel. Consult the [Guide to Effective Interviewing](#) for insights on how to maximize the quality of information gleaned during the interview process. Individuals to consider for interviews include:
 - a. Personnel present during the event, either at the event location or in another location that was either involved in or witnessed indications / consequences of the event.
 - b. Personnel who directly responded to the event or event consequences.
 - c. Additional personnel who might have been directly involved in pre-event activities that could have affected the event.
3. When human error is involved or suspected, conduct a Human Error Review in accordance with the [Human Error Review Guideline](#).

The Human Error Diagnostic Form provided within the [Human Error Review Guideline](#) provides interface for direct data input into the [Performance Enhancement Matrix \(PEM\)](#). The [PEM](#) is a corrective action database that allows you to quickly and easily input information. Moreover, the [PEM](#) allows you to easily identify trends and uncover hidden weaknesses that are causing mistakes. For more information, [click here](#).

4. If you have access to information on previous events (either internal to your organization or within your industry), conduct a Previous Occurrence

Evaluation using the [Previous Occurrence Evaluation Guideline](#). Doing such a review can provide substantial insight regarding the causes of previous events, as well as to identify when previous actions taken were not effective.

By entering data in the [Performance Enhancement Matrix \(PEM\)](#), you will be able to easily identify any previous occurrences of similar events.

5. Conduct an overview evaluation of data and interview information accumulated to determine if additional data gathering or interviews are necessary. Claims by interviewees should be validated using multiple sources of information.

Step Four: Analyze Data

This step is where the rubber begins to meet the road. All of the data that you have accumulated and sorted is now analyzed using various tools and techniques to arrive at conclusions regarding the root and contributing causes. The more experience you gain at using the tools we have provided, the more efficient you will become at determining causes. In our experience, we've seen that while "science" certainly plays a role, there is an equal (if not greater) art involved in cause determination.

This step can be quite intimidating to the inexperienced investigator. We have provided you with a large number of tools, each including step-by-step guidelines to help you through the process. While we have provided some suggestions for use, it is up to you to pick and choose those tools which you feel are most appropriate and/or desirable.

Please be reminded that, should you need assistance in your investigation, we have experts standing by to help. We will provide assistance that spans the spectrum from conduct of a peer review of your finished report, to providing a member or two to augment your in-house team, to providing an entire team and event investigation project management. If you need assistance, call us at **877-832-9492**, [click here](#) to access our **LIVE HELP**, or email us at EventHelp@PracticingPerfectionInstitute.com. We're here to help!

Following is a listing and brief description of the tools we have provided for your use. The tools identified are available for your use in .pdf format, which you can print and use as often as you like. Again, if you are interested in customizable / interactive tools, [click here](#) for more info.

Timeline

In our opinion, the Timeline is a good place for you to begin most investigations. It provides a chronological sequence of events in a logical and sensible format.

By constructing and using a Timeline, you are provided with a clear reminder of conditions and factors to consider during analysis and cause determination. It can also assist in formulating interview questions.

As part of the investigation report, the Timeline provides an understanding of the sequence of events that might otherwise be difficult to extract from the investigation report.

Event and Causal Factor Charting

One of the key lessons learned over the course of event investigation history is that significant events are rarely the result of a single act or component failure. Typically, a “daisy-chain” of errors, failures, and weaknesses are found to have “lined up” to allow the event to happen.

Event and Causal Factor Charting is a tool that will help you understand the sequence of conditions/occurrences and associated causes involved with the event under investigation. This tool is very valuable for evaluating complex events.

Change Analysis

When an event involves an activity or process that has been previously completed successfully, Change Analysis can provide valuable insight. It can help answer the question, “What was different this time (when the event occurred) from previous performances of the activity / process where no undesirable consequences occurred?”

Change analysis identifies specific causal factors, and can lead to the identification of additional causal factors.

Barrier Analysis

In most any activity, “barriers” are installed to keep us on the other side of the table from doing something unsafe or making a mistake. Barriers are both administrative and physical in nature.

Administrative barriers are used to ensure consistent human performance. Examples include procedure steps, training, and the use of [Error Elimination Tools](#).

Physical barriers are used to protect people and equipment, and can include such things as a railing around a mezzanine or catwalk, and interlocks (such as the interlock in your car that requires your automatic transmission to be in Park before the ignition key can be turned to Start).

A Barrier Analysis identifies the administrative and physical controls involved with the event under investigation, and assesses each for effectiveness. By conducting a barrier analysis, you will be able to determine which barriers failed, and which barriers were either weak or nonexistent.

Barrier Analysis is typically used in conjunction with Event and Causal Factor Charting. By superimposing the Barrier Analysis upon the Event and Causal Factor Chart, you can identify where the various barriers applied within the sequence of events.

Task Analysis

Task analysis can be used for events where human error appears to have been involved. It guides you through a review of work documents, log sheets, procedures, technical manuals and other associated documents in order to determine task specifics and how they are to be performed.

Basically, the Task Analysis allows you to compare how tasks should have been performed, compared to how they were performed during the event.

There are two basic types of Task Analysis:

- A Pencil and Paper Task Analysis is used to identify what actions are expected to be performed.
- A Walkthrough Task Analysis is used to observe how the task is normally performed (without adverse consequence).

Fault Tree Analysis

Fault Tree Analysis helps to establish all possible causes for an event. The basic premise is that once all possible causes are listed, a knowledgeable individual (or team of individuals) can consider each possible cause, eliminate non-causes through deduction or evaluation, and (eventually) arrive at the root and contributing causes.

Using Fault Tree Analysis, you will be able to unleash the free-thinking creativity of your right brain, and mesh it with your logical left brain.

Behavioral Analysis and the How-to-Why Matrix

When human error is involved, this tool helps you identify the mechanisms that influenced the behaviors of the individual(s) involved. By considering the internal factors affecting the individual's ability to order/direct, sense, interpret, or act, you can arrive at an explanation of "how" the occurrence happened.

Once the “how” is determined, the tool can then be used to cross-reference various causal factors that led to the inappropriate act. By so doing, you can draw conclusions about “why” the individual acted in the manner involved with the event

Evaluation for Organizational & Programmatic Issues

From the precepts of Practicing Perfection™, we know that 84 to 94 percent of all human errors can be directly attributed to process, programmatic, or organizational issues. This tool provides you with a method to identify what organizational and/or programmatic issues contributed to the event under investigation.

This tool also helps to provide you with a “sanity check” relative to the scope and breadth of your investigation.

Step Five: Determine Cause(s)

By now (depending upon the nature of the event and your investigation), you've preserved, gathered, sorted, and analyzed a ton of information. By using the various tools we've provided, you have also identified at least one cause (and likely more).

What's left now is to specifically differentiate between the root and contributing causes. From time to time, you will find that there is more than one root cause. For most events, however, you will be able to determine a single root cause and one or more contributing causes.

A **root cause** is the most basic cause of a failure or occurrence that, if corrected or eliminated, will preclude repetition of the event. In other words, with the root cause corrected/fixed/eliminated, the event could not possibly happen again.

A **contributing cause** is a cause in addition to the root cause that might have increased the severity of the event or added additional problems / consequences. The test to determine whether a cause is a contributing cause (vice a root cause) is that while the cause might have provided an opportunity to prevent the event from occurring, it does not provide a credible barrier (in other words, the event could have occurred whether or not the cause was present).

Here's an example to help make this a bit more clear:

Let's pick a very simple event- someone (Fred) slips and falls on a patch of ice as he is leaving the building. During the investigation, the potential causes identified are (1) ice accumulated in the walkway outside the door, and (2) as he stepped out of the building, Fred turned to talk to Sheila, who had called out to him from the parking lot.

Clearly, had Fred not turned to talk to Sheila, he might have been paying more attention and not have slipped on the ice. Is this then a root cause? Clearly not. It is a contributing cause. Why? Because even if Sheila had not been present, Fred still could have slipped on the ice. In other words, while this might have provided an opportunity to prevent the event (Fred not turning to talk with Sheila), its absence does not provide a credible barrier [to slipping on ice].

Note: In some cases, it is not possible to determine a root cause. In such cases, the root cause is termed, "indeterminate". When you arrive at a conclusion of "indeterminate", you will want to include the following in your documentation:

- Explain the basis for not determining the root cause
- Describe what unavailable information is required to determine the root cause

- Identify what possible additional actions might be needed to determine the root cause
- Identify the potential cause(s)
- Provide documentation to support the stated potential cause(s)

Step Six: Validate Root Cause(s)

The purpose of this step is to ensure that the identified root cause(s) is/are actually the root cause. This is achieved by passing each identified root cause through a check of three criteria. For explanation, we will return to our example of Fred slipping on the ice, where we have identified “ice accumulation in the walkway” as our root cause. Now let’s test it:

Criteria #1: The event/problem would not have occurred had the root cause not been present.

Based upon our knowledge of the event, we can say with fair certainty that if ice had not been present in the walkway, Fred would not have slipped.

Criteria #2: Correction or elimination of the cause(s) will ensure that the problem will not recur due to the same causal factors.

If the ice is removed from the walkway and/or not allowed to accumulate, slippage due to ice in this walkway will not occur.

Criteria #3: Correction or elimination of the cause(s) will preclude repetition of the specific problem or of similar problems.

Measures to remove / prevent accumulation of ice in this walkway will also prevent slippage due to ice in other walkways when employed in those locations.

All three criteria satisfied, we know with a high level of certainty that “ice accumulation in the walkway” is indeed the root cause of Fred slipping. We now have a validated root cause.

Step Seven: Develop Recommended Corrective Actions

This is where the value is achieved in having completed a quality investigation. Having accurately identified the root and contributing causes for an event, you can now formulate corrective actions that will prevent such things from ever happening again.

Where multiple corrective actions are recommended, each must be considered relative to its overall impact and how it will affect / be affected by the other recommended actions. When put together and properly coordinated, your corrective actions form your Corrective Action Plan.

One note of caution here: It is not uncommon for investigators to get very global in their recommendations, and attempt to 'solve world hunger'. While noble in gesture, and while the generic implications of any event should be considered, recommended corrective actions must be crafted to specifically target the causes of an event. Also, much to the disdain of many an investigator, cost versus benefit must be considered.

Here are some guidelines to use when developing your Corrective Action Plan:

1. Identify the immediate (remedial) corrective actions taken
2. Identify interim actions needed to prevent the event from occurring again while the longer term corrective actions are being implemented.
3. Ensure that each root and contributing cause is properly addressed by a corrective action.
4. If any generic implications were uncovered during the event, provide associated corrective actions.

Step Eight: Document Findings

The results of the investigation should be documented in a report for dissemination and archival purposes. For a sample report format, [click here](#).