



Root Cause Analysis

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What you need to know about

Root Cause Analysis

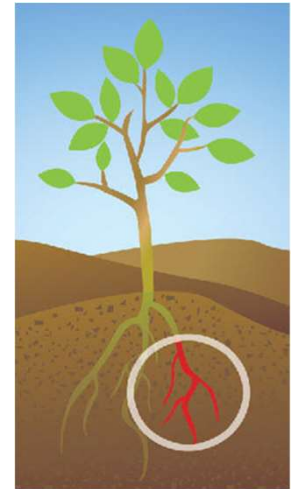
- How many times do you think that you have solved a problem only to have it come back to haunt you again and again? When the same problem reoccurs there is a good chance that you only addressed symptoms and did not get to the root cause of the problem.
- It takes tenacity coupled with the effective use of problem solving tools to get to the root cause of a problem. Root cause analysis involves searching backwards from an undesirable effect (or problem) to its cause(s) and addressing those causes. "Root Cause" implies that there is a single cause for a problem when in fact, there may be multiple causes working together to trigger the undesirable event.
- The objective of Root Cause Analysis is to identify potential causes, determine which cause(s) are root cause(s) and address those root causes to ensure the problem does not recur.
- Unfortunately, the identification and analysis of root causes is rarely easy. Getting to the root cause of problems requires digging deep into the process that the problem "lives in." However, root cause analysis can be made easier by using a formal and standardized problem solving approach.



Why is it so difficult

RCA and corrective action barriers

- These are 10 of the most common organizational or cultural barriers that Root Cause Analysis teams must contend with. Effective Root Cause Analysis requires understanding these barriers and then preventing or overcoming them as they present themselves. (see hand-out for details)
 - The problem is poorly defined.
 - A systematic approach is not used.
 - Investigations are stopped prematurely.
 - Decisions are based on guesses, hunches or assumptions.
 - An inadequate level of detail is used to get to the real root cause.
 - Interim containment fixes are sometimes allowed to become "permanent."
 - The skills, knowledge and experience needed to uncover the root cause are not available.
 - A Lack of organizational will to tackle the “bigger” issues
 - Fear of being blamed
 - “I don’t have the time”



What's it all about

Root Cause Analysis

- Root cause analysis involves searching backwards from an undesirable effect (or problem) to its cause(s) and addressing those causes.
 - The term "Root Cause" implies that there is a single cause for a problem.
 - Actually many problems have multiple causes that interact or work together to trigger the event.
- The root cause analysis task is to:
 - Identify potential causes.
 - Determine which cause or causes are root causes.
 - Address those root causes to ensure the effect (the problem) does not recur.
- Why is root cause analysis so important?
 - If a problem has occurred once, it most likely will occur again (unless something is done to prevent its recurrence.) However, if the root cause is found (and it is addressed,) future occurrences of the same problem CAN BE PREVENTED!
 - Root cause analysis is the key to preventing future problems.
- Can all problems be prevented?
 - Probably not - BUT... most recurring problems can be prevented if the root cause is found and addressed.

Four keys to a successful RCA

Root Cause Analysis

- Use a step-wise approach:
 - Standardize the approach throughout the organization.
- Adopt fact-based decision making:
 - Don't accept opinions, guesses or hunches.
- Test to confirm:
 - If the root cause has been "found," test to confirm you have indeed identified the root cause or causes.
- Implement permanent corrective solutions:
 - Does the solution answer the "root cause question?"
 - (The root cause question: Does this cause explain all that we know about what the problem is, as well as all we know about what the problem is not?)
 - Is the solution practical, feasible and cost-effective?
 - Is the solution robust and sustainable?

The Four Steps

Root Cause Analysis

■ Step 1: Form and Focus the Team

- If the problem has been around for a while, it is probably not easy to find and fix. A team approach pools the experience and expertise of all members to focus on and solve the problem.
- A Problem Statement communicates the scope of the problem, establishes a common understanding of the problem among all team members and focuses the team on the task at hand.

■ Step 2: Find the Root Cause

- It takes detective work to find the root of the problem.
- Think of root cause analysis as "problem-finding;" once the real problem (the root cause) has been found, the solution to the problem is often obvious.
- Follow the trail of evidence; the evidence (data) will point the way from the symptoms to the root cause of the problem.

Root Cause Analysis

■ Step 3: Fix the Root Cause

- Once the root cause or causes have been found, typically one or more potential solutions will become apparent as well.
- The next job is to select the best solution or combination of solutions that will lead to a robust yet cost-effective solution.
- Screen solution candidates by testing the practicality, feasibility, and cost-effectiveness of the solution. If the solution candidate fails those tests, move on to more promising solution candidates.
- When many solution candidates are still in contention, the use of decision-making matrices can help guide the objective decision.
 - Note: Sometimes, the best solution combines aspects from two or more (preliminary) solutions.
- Once the solution is approved for implementation, it is time to create an action plan.
 - Action plans can be simple or complex. A simple action plan merely documents what needs to be done, who will do it, and by when it will be completed.
 - On the other hand, a complex action plan involves more thorough planning and documentation of the implementation process and may include the use of project management tools such as Activity Plans, PERT Charts and Gantt Charts.

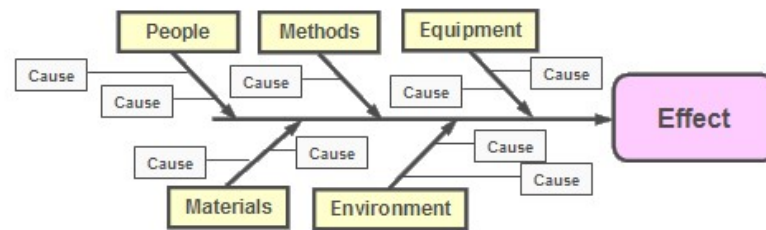
■ Step 4: Finalize Solutions

- Once the solution is in place, validate the solution by checking to make sure the desired outcomes have been realized.
- Update all related documentation.
- Update Quality Systems, Control Plans, related FMEAs and Operating Procedures.
- Adjust audit systems and schedules to ensure the gains are held.
- And share lessons learned to multiply the gains.

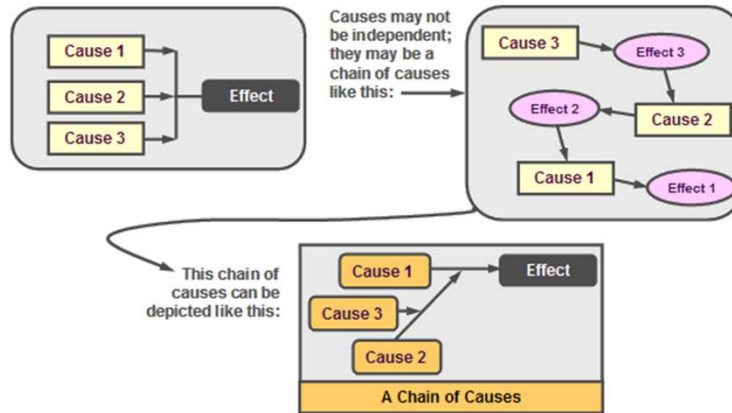
Find the root

Root Cause Analysis

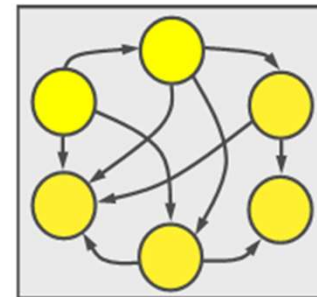
Start by studying symptoms.
Group causes into like categories.



Look for chains of causes.



Are the causes interrelated?



To draw conclusions – data must be collected and analyzed

Root Cause Analysis

- Visual displays of data often provide the most helpful clues.
- Standard data collection tools include:
 - Data collection forms
 - Checklists
 - Tally (or check) sheets
- The following are both data collection and data display tools.
 - Run Charts (Trend Charts)
 - Histograms
 - Scatter Diagrams
 - Concentration Diagrams
 - Workflow Diagrams
- Data display tools and techniques include:
 - Standard charts and graphs
 - Pareto Diagrams
 - Run Charts (Trend Charts)
 - Histograms
 - Scatter Diagrams
 - Concentration Diagrams
 - Workflow Diagrams
 - Cause and Effect Diagrams
- Data analysis tools and techniques include:
 - Control Charts (SPC)
 - Tests of Significance
 - Correlation and Regression Analysis
 - Time Series Analysis
 - Design of Experiments
 - Failure Analyses
 - Simulations

Investigative tools may be needed to “question” the process

Root Cause Analysis

■ Investigative tools include:

- The Five-Whys
- Comparative Analysis (What Is-What Is Not)
- Timeline Analysis
- FMEA (Failure Mode and Effects Analysis)
- Fault Tree Analysis
- Design of Experiments
- TapRoot® – subject to additional training

■ What if the root is still Unknown

- If the root cause is still hidden from view, it is time to retrace the steps taken, starting way back with the Problem Statement.
- Something may be "missing;" ask:
 - Is the task clear?
 - Has the process been properly defined?
 - Does the team have the necessary skills, knowledge and experience to tackle the job?

Parting thoughts on finding the root cause

Root Cause Analysis

- Rarely will all tools and techniques be needed to uncover a root cause. Experience is the best judge to determine the best order to use the various tools and techniques available to search and question processes for the root cause to a specific problem.
- When the root cause is found, always ask the "root cause question":
 - *"Does this cause (or causes) explain all that we know about what the problem is, as well as all we know about what the problem isn't?"*
- If answer is a resounding "YES," the root cause has most likely been found and hearty congratulations are in order.

Fixing the root cause (aka Corrective Action)

Root Cause Analysis

■ Fixing the root cause (aka Corrective Action):

- "Fixing" the root cause is often called a Corrective Action Plan. A good solution will keep the problem from occurring again and is practical, feasible and cost-effective as well as robust and sustainable.
- To address (fix) the root cause, potential root cause solutions are evaluated, a solution (or combination of solutions) is selected, the action plan is developed, and the solution is implemented and verified.

■ Evaluate potential solutions:

- Combine solutions that are similar or are extensions of each other.
- Screen solution candidates for practicality, feasibility and cost-effectiveness; delete those that fail these tests.

Fixing the root cause (aka Corrective Action)

Root Cause Analysis

■ Select the best solution:

- Develop a criteria and an approach to be used to evaluate solution candidates against that criteria.
- Decision Matrices can aid decision-making; many types of matrices are available to help evaluate solution candidates including:
 - Pros & Cons Matrix
 - Force Field Analysis
 - Plus-Minus Attribute Rating
 - Musts and Wants Analysis
 - Nominal Group Technique
 - Voting and Ranking
 - Kano Analysis
 - (Is one technique better than another? That is up to you to decide.)

Fixing the root cause (aka Corrective Action)

Root Cause Analysis

■ Develop and implement the action plan:

- The action plan outlines what steps are needed to implement the solution, who will do them, and when they will be completed.
 - Simple Action Plans have a "who, what, & when" format.
 - Complex Action Plans often use PERT and Gantt Charts as action planning tools.

■ Verify the action plan:

- Verify that the solution works as designed.
- Always check to see if the solution creates new problems by checking with the users, asking specific questions on use, usability and performance. To verify, ask:
 - Does it work?
 - How well does it work?
 - Does it work for all conditions and all participants?
 - Does it create other problems?

■ Adjust the solution quickly if:

- Instructions are unclear, using the solution creates confusion or
- The solution creates other problems

Fixing the root cause (aka Corrective Action)

Root Cause Analysis

■ To finalize the solution, ensure that it is permanent and institutionalized by:

- Validating the solution
- Updating related documentation
- Training the affected groups in the new process and procedures
- Implementing audit schedules
- Sharing lessons learned

■ Validate:

- Verification versus Validation:
 - Verification: Was the solution built right?
 - Validation: Was the right solution built? (Or: Have the desired outcomes or effects been realized?)
- Things to check:
 - Does the outcome meet expectations?
 - Does it work for all possible conditions?
 - Does it create any new problems?
 - Do customers agree with (or at least accept) the solution?
 - Has the solution affected suppliers?

Fixing the root cause (aka Corrective Action)

Root Cause Analysis

- **Updating systems and related procedures and controls is part of finishing the job**
 - Related procedures
 - Quality Systems
 - Control Plans
 - FMEAs

- **If the solution has led to changes in procedures or systems have changed, those using the systems will need training on how to work with the changes.**
 - Most likely, informal training has been conducted as part of the solution implementation and verification. Now is the time to develop a formalized training program around the new system.
 - Who, how and when will users be trained?
 - How will suggestions for potential revisions or enhancements be collected and used?

Fixing the root cause (aka Corrective Action)

Root Cause Analysis

■ **Audit:**

- Early audits are checks on documentation and training
- Auditing helps assure that all users understand the new systems the same way.
- Noncompliance may be a sign that not all users understand the new system or that the instructions are not clear.
- Audits help hold the gains
- Ongoing audits make sure that the solution continues to be both useable and used.

■ **Knowledge transfer:**

- Identify other processes that are similar; the same root cause analysis solutions may apply to them.
- Leverage best practices by considering a Knowledge Base to archive and retrieve best practices.
- Mitigating a root cause creates a best practice; publicize best practices through (internal) forums, newsletters or blogs.