

Building Science Institute, Ltd. Co. Process 009-2021 Root Cause Analysis

This process applies to Verification Organizations and the Building Science Institute, Ltd. Co. True North Quality Management Services.

Related policies:

- Building Science Institute, Ltd. Co. Policy 08-2022 Terminology

Reference Documents

BSI Process 003 Conformance Assessment Program Management

BSI Process 005 Perform Quality Control Conformity Assessments for Verification Organizations

BSI Process 007 Conformity Assessment Follow-Up & Closure

BSI Process 008 Sampling

Purpose

The purposes of the root cause analysis are:

1. Identify the cause(s) of the problem
2. Eliminate the cause(s)
3. Find ways to prevent recurrence of the problem

Treating the symptoms of the problems do not fix the cause of the problems.

The first level cause is always a temporary fix. Higher level causes are always a temporary fix.

Only eliminating the root causes fixes the problem.

If needed for sampling failures, the verification organization should create a root cause analysis team that consists of:

- the verification activities manager with decision-making authority
- the tradespeople involved in the failed process
- the homebuilder superintendent or manager with decision-making authority
- the internal quality function representative from the verification organization OR True North Quality Management Services as needed

Step 1: Define the problem

The success factors for this step include:

- be specific and objective
- call things as they are
- discuss sensitive issues
- NO speculation about causes
- relevant team composition
- a schedule that allows sufficient debate
- NO blame or fault-speculation

The purposes of this step are to:

- provide an unambiguous start point for the root cause analysis with a well-defined problem
- organize the root cause analysis team
- create a realistic root cause analysis project plan

The outputs of this step are a problem definition, an organized root cause analysis team, and a project plan.

To launch the root cause analysis project, the team should have a mandate to solve the problem and be organized.

Team members should have the available time; relevant knowledge; motivation to solve the problem; the ability to cooperate, listen, and communicate; and credibility and respect.

The verification activities manager should list all tasks & activities that should be completed.

The root cause analysis team should:

- for each task or activity, define the latest finish date and earliest start date, the duration, and dependence on other activities or tasks
- place tasks on a Gantt chart with a timeline that reflects overall duration
- schedule activities with bars drawn that correspond to activity duration
- use diamonds to depict milestones

The failure event should be described in detail. These questions should be answered:

- What is the event?
- When did it happen?
- Where did it happen?
- Who was involved?
- Has it happened before? If so, how often?
- What were the consequences?

To answer those questions, the root cause analysis team should get information through interviews and surveys.

To conduct a successful interview of participants, the root cause analysis team should:

- prepare an interview guide
- test interview questions to eliminate ambiguity
- make appointments with interviewees (participants in the event)
- ensure the interviewer and interviewee have privacy and are not disturbed during the interview

The interviewer should:

- ask questions and make sure they are understood
- record the answers digitally or in writing
- confirm that responses were understood correctly by the interviewee

To conduct a successful survey, the root cause analysis team should:

- define the objective of the survey and what information is required to achieve the objective
- decide the survey delivery format
- develop the questionnaire and test it
- identify the sample of participants to be surveyed
- send the survey
- collect the results
- analyze the results

During this step, the root cause analysis team should eliminate bias and keep suspected causes out of the problem definition statement.

Step 2: Find Causes

The success factors for this step include:

- access to sufficient amounts of background data and evidence about the problem
- generation of a broad set of potential causes
- allow free and creative thinking
- do NOT screen or sort suggestions

The purpose of this step is to generate as extensive a list of potential causes as possible that could have led or contributed to the occurrence of the problem.

To discover potential causes, the root cause analysis team should:

- map the sequence of activities within which the problem took place through a flow chart
- produce a high-level map of the context of the problem and the process it occurred in
 - stakeholders
 - environmental factors
 - contextual factors
- brainstorm possible causes
 - record ideas
 - open the floor to the root cause analysis team to launch ideas
 - encourage everyone to participate
 - write down every idea launched in the same words as the original proposal
 - do NOT discuss, criticize, or evaluate ideas during the brainstorm session

- allow the flow of ideas to stagnate at least once; it will usually pick up again
- use an Ishikawa Diagram and place the problem definition statement at the right end of a large arrow
 - identify the main branches of management, manpower, methods, machines, materials, measurements, and environment
 - use the 5 Why's to proceed through one main branch at a time to brainstorm all possible causes
 - use brief descriptions of the potential causes
 - put causes that are in more than one main branch on all relevant branches
- close the brainstorm process when few new ideas emerge
- sort the ideas into groups of decreasing relevance

Step 3: Find the Root Cause

The success factors for this step include:

- a focus on analysis instead of creativity (Step 2)
- do NOT declare success too soon; often root cause analysis teams stop short of the actual root cause
- drill down past individual blame and analyze the conditions that allowed the problem to occur; find the root cause in the system that creates conditions ripe for human error

The purposes of this step include:

- to shift thinking from creative to analytical
- maintain focus on actual root causes
- to ensure open communication on the root cause analysis team so causes and connections are discussed and called what they are

The root cause analysis team should:

- categorize the possible causes in logical subsets such as management, manpower, methods and processes, machines, materials, measurements, environment, information, and external factors beyond the participants control
 - group possible causes that seem to be similar, overlapping, or in other ways related
- construct a Cause-and-Event Tree
- analyze the possible causes to find the root cause(s) through quality tools such as the 5 Whys, Fault Tree Analysis, Pareto Analysis, Scatter Chart, Histogram, or Problem Concentration Diagram
- collate the findings from the results of different types of analysis and update the Cause-and-Event Tree to capture visually all the knowledge gained about the problem

Step 4: Find Solutions

The success factors for this step include:

- keep up the momentum
- involve people with ideas about solutions since the root cause analysis team may not have sufficient expertise
- involve people who are impacted by the solution since they have to buy-in to the solution for it to be successfully executed
- create ownership of the changes

The purpose of this step is to design workable solutions that eliminate the root causes.

The root cause analysis team should:

- develop flowcharts for the processes that include or are closely related to the root cause(s)
- develop a stakeholder map to place the root cause(s) in the context of the bigger picture
- use interviews to understand the relationships between processes, stakeholders, and the root cause(s)
- conduct surveys to get more information about the root cause(s)

The root cause analysis team uses these results to brainstorm and benchmark solutions.

Solutions may be a new process or routine, software, hardware, gadgets, competencies, Quality System, tools for fool-proofing, or increased accountability.

Next, the root cause analysis team should specify or describe the solutions. Loose ends should be clarified, stakeholders informed, and the solution(s) documented for future processes and continuous improvement.

Step 5: Take Action

The success factors for this step include:

- involve stakeholders, gatekeepers, and those affected by the changes and help them recognize that people must adopt new practices and investments may be required
- have patience to accept that extensive change does not happen overnight

The purpose of this step is to execute the solution(s) that eliminate the root cause(s) and ensures the problem does not re-occur.

The root cause analysis team should analyze the execution setting. The effectiveness of the implemented change is equal to the quality of the change approach multiplied by the acceptance of change by those involved ($E = Q \times A$). Both the quality of the change approach and the acceptance of the change must have high values for the change to be effective.

The root cause analysis team could create a 2x2 Impact Effort Matrix and perform a Force Field Analysis to help analyze the execution setting.

The root cause analysis team should be responsible for the execution of the solution(s) through a dedicated execution team that is developed from root cause analysis team members and line managers from the impacted unit. The impacted unit executes the change led by the line managers.

The execution team should create an execution plan that includes:

- execution tasks and activities with accountabilities and deadlines
- resources to participate in and aid execution
- cost estimate or budget
- training needs
- the desired outcome of the solution(s) when executed
- write a project proposal with a Return On Investment (ROI)
- management approval

The root cause analysis team should inform affected parties of the proposed solution execution and create buy-in with those who need to change work practices.

Resistance to the proposed changes may include:

- disagreement about the existence of a problem
- belief that the problem is outside anyone's control
- disagreement about whether the proposed solution(s) can solve the problem
- disagreement about possible negative effects of the solution(s)

Resistance to change can create barriers to execution and create doubt about the cooperation of others.

To overcome the resistance to change, the execution team should:

- discuss the necessary change(s) as the smart thing to do
- deploy change agents with influence in circles with expected resistance to change
- include potential change agents in the execution team

The execution team should execute the plan and follow up on progress. In cases of deviation from the plan or delays, the execution team should identify the reasons for deviation or delay and take action to remedy those reasons.

The execution team should become a positive force to drive the change(s) required to execute the solution.

Step 6: Measure & Assess

The success factors in this step include:

- assess the solution(s) with objective and unbiased perspectives
- do NOT hurry the close of the project as something important may be missed

The purpose of this step is to make sure the executed solution(s) eliminated the problem that triggered the root cause analysis process.

The root cause analysis team should conduct a pilot study that includes dry runs that test the new solution(s) without customer impact, run the new solution(s) under close monitoring to detect problems

and effects, and modify the new solution(s) as problems are found. It is important to loop back to the previous root cause analysis steps as needed.

The root cause analysis team should take measurements to determine whether the solution(s) work under different conditions and measure the change in problem volume before and after the root cause analysis was initiated.

Balanced measurements should be taken to summarize the effects of the root cause analysis execution.

To assess the effects of execution, these questions should be answered:

1. Has the solution(s) been successfully executed?
2. Has the solution(s) eliminated the root cause(s) and will this prevent the problem from re-occurring?

The root cause analysis team should establish safeguards against the re-occurrence of the problem through documentation and measurement that reinforces the benefits of the change, manuals, and discussion with the larger audience of root cause analysis team members and stakeholders to discuss how things work, whether further changes are required, etc.

The root cause analysis team should report on their work to the person or unit that issued the mandate for the root cause analysis, the line management of the units or processes involved in the work and solution(s), regulatory bodies, external stakeholders who expect to receive an update about the problem and solution(s), and similar units that might wish to apply what was learned.

The root cause analysis team should issue a final report in the following format:

1. Introduction: describes the mandate, team, and timeframe
2. Problem description: short description of the problem and the consequences
3. Analyses description: brief description of the analyses performed, including the steps taken
4. Root cause identification: description of the root cause(s) discovered and the solution(s) designed to eliminate it
5. Execution description: description of the execution that includes any challenges, approaches take to solve them, and how long it took
6. Effect description: description of the effects of execution, including whether the root cause was removed
7. Lessons learned: description of positive and negative lessons learned for future root cause analysis teams

Approved by the Building Science Institute, Ltd. Co. Quality Council on December 21, 2021

Approve: Brian Christensen, Amber Wood, Kevin Burk

Reject: None

Not Voting: Mat Gates, Brett Dillon (Chair)

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