

Pocket Guide To Root Cause Analysis

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MINI GUIDE TO ROOT CAUSE ANALYSIS

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Contents:

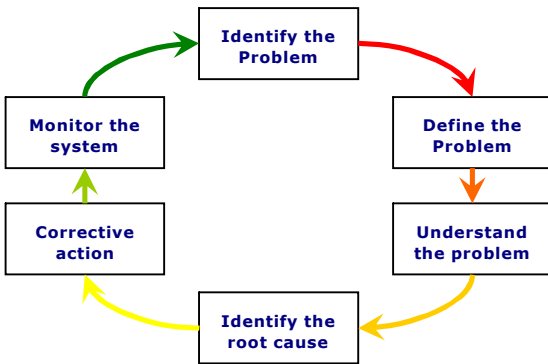
| | | |
|----|---|----|
| 1) | Introduction | 3 |
| 2) | Why complete Root Cause Analysis? | 4 |
| 3) | QM&T approach to RCA. | 5 |
| 4) | Practical guide to carrying out an RCA..... | 6 |
| 5) | RCA Tools & Techniques. | 7 |
| 6) | Look up table for completing an RCA..... | 13 |
| 7) | Examples RCA's..... | 14 |
| 8) | Hints and Tips | 14 |
| 9) | 12 Pitfalls of RCA..... | 14 |

1) Introduction

Root Cause Analysis (RCA) is a method that is used to address a problem or non-conformance, in order to get to the "root cause" of the problem. It is used so we can correct or eliminate the cause, and prevent the problem from recurring.

It is not "rocket science" – anyone can do it. You probably do it on a day to day basis without thinking about it.

RCA is simply the application of a series of well known, common sense techniques which can produce a systematic, quantified and documented approach to the identification, understanding and resolution of underlying causes. Below are a number of definitions which encapsulates the main points of this technique:



"An objective, thorough and disciplined methodology employed to determine the most probable underlying causes of problems, complaints and undesired events within an organization, with the aim of formulating and agreeing corrective actions to at least mitigate, if not eliminate, those causes and so produce significant long term performance improvement." - *Vorley & Tickle, QM&T, 2002*

"A powerful tool used to identify, record and visually represent the possible causes of a problem" Instead of problems and their effects appearing vast and insoluble, root cause analysis breaks down the problem into smaller, more easily handled chunks represented by a 'fishbone' diagram". - *Paul Wilson RCA (ASQC)*

"The investigation and reporting the causes of occurrences to enable the identification of corrective actions adequate to prevent recurrence and thereby protect the health and safety of the public, the workers, and the environment." - *RCA Guidance document DOE Guidelines, Feb 92*

2) Why complete Root Cause Analysis?

Organizations often respond to problems with short-term solutions. However, constantly relying on quick fixes requires staff to repeat the same tasks over and over again, all while maintaining the status quo. Focusing on short-term solutions is not a recipe for increased profitability and organizational growth.

When people spend a lot of time putting out fires in the workplace, there is an illusion of industry; lots of busy people completing lots of tasks. Working harder and faster, we allow the environment's energy and rhythm to seduce us into believing we're doing our best to increase productivity and efficiency. But the law of diminishing returns applies here. However, you can improve efficiency by taking time to think through problems from first principles, and then tackling the causes rather than the effects.

To improve efficiency and profitability, we need to look beneath the surface to the root of a problem or issue. By observing the effect (which is really just the symptom) of a problem and deducing what has caused it to occur, you can create a preventative solution that should put an end to the problem. In order to understand the source of a problem, you will need to undertake a *root cause analysis*.

RCA gives the confidence that the problem can be solved by taking a structured approach - making sure that the problem never happens again.

- **By the way, RCA is not a chore – it can be fun!**
- **By eliminating the root cause, you can save time and money**

3) QM&T approach to RCA.

The first step in any RCA is to identify the problem. QM&T monitor many aspects of the organisation, and can spot potential problem areas. This process is known as Pareto Analysis, which we will cover later. However, potential RCA's can be derived from many areas, ranging from Customer Complaints, Escalations, and Incidents through to recurring EARS/QA's, Customer Surveys and Credit Notes.

The Corrective Action Request (CAR) system can be used to document the immediate and longer term corrective action. There is no one person identified to chase and progress these CAR. This pocket guide is not intended to be a guide to the CAR system, but to provide a 'Road Map' or approach that can be adopted in tackling a specific RCA project. The table below may help in determining the RCA projects importance.

RCA Significance

| Likelihood of Occurrence | Consequences or Severity of Incident | | | |
|--------------------------|--------------------------------------|----------------|---------------|---------------|
| | Critical | High | Medium | Low |
| Almost certain | Very high risk | Very high risk | High Risk | Low Risk |
| Likely | Very high risk | High Risk | Moderate Risk | Low Risk |
| Occasional | High Risk | Moderate Risk | Moderate Risk | Low Risk |
| Unlikely | Moderate Risk | Low Risk | Low Risk | Very Low Risk |
| Rare | Moderate Risk | Low Risk | Very Low Risk | Very Low Risk |

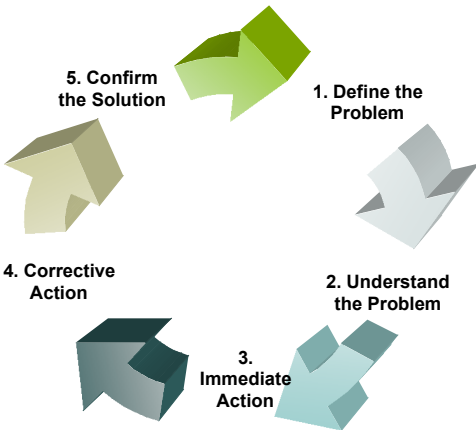
Consequences (of incident): Critical: Health & Safety issue, High: Customer's Business Process (CBP) unavailable, Medium: Customer's Business Process (CBP) degraded, Low: Non urgent

Likelihood (of occurrence): Almost certain, Likely, Possible, Unlikely, Rare

Priority: Very High Risk, High Risk, Moderate Risk, Low Risk, Very Low Risk

4) Practical guide to carrying out an RCA.

To assist with the process, QM&T have devised a Worksheet which can be found at on the website, along with many if the tools that can be used to complete a RCA project. Once the problem has been discovered there are 5 basic steps to completing an RCA.



- I. **Define the Problem:** Try and use **SMART** principles, i.e. **S**pecific; **M**easurable, **A**ctions oriented; **R**ealistic; **T**ime constrained. Unless the problem is defined accurately, the RCA whole process maybe prone to failure. This phase will usually also define how the RCA will be run as a Project.
- II. **Understand the Problem:** Check the information, obtaining real data regarding the problem, gaining a clear understanding of the issues. This is when the various tools and techniques, such as Cause and Effect, brainstorming, etc, can be used.
- III. **Immediate Action:** Implement temporary counter-measures at the place of the problem. 'The further away from the problem source the solution is determined, the less likely that the solution will be effective'.
- IV. **Corrective Action:** Determine and prioritise the most probable underlying causes of the problem, as the temporary counter-measure may not resolve the root cause. Taking corrective actions to at least mitigate or preferably eliminate the causes.
- V. **Confirm the Solution:**. After the measures have been determined and implemented the success of the adopted approach needs to be established. Having confirmed the success of the suggested solution then rules or control methods need to be established that will avoid the problem ever happening again. **This is probably the most important phase in the RCA, but the one most often missed.**

5) RCA Tools & Techniques.

5 Why's (or Gemba Gembutsu)

5 Why's can sometimes be referred to as Gemba Gembutsu (which literally means Place and Information in Japanese, from who's car industry much of today's RCA methods are taken). 5 Why's typically refers to the practice of asking, five times, why the failure has occurred in order to get to the root cause/causes of the problem. No special technique is required or form is required, but the results should be captured in the Worksheet (see an example of 5 Why's in Sect.6). 5 Why's are best used when tackling a simple RCA.

Pareto Analysis

Pareto analysis is an easy to use technique that helps you to choose the most effective changes to make.

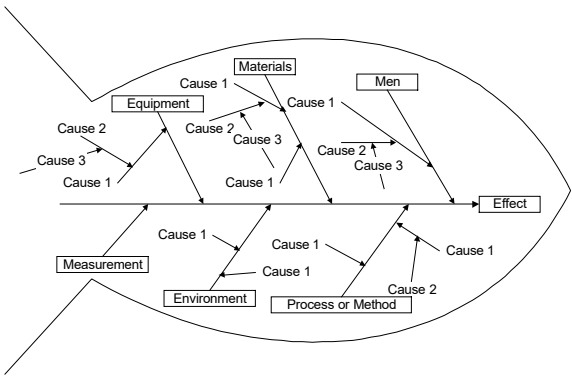
It uses the Pareto principle, i.e. the idea that by doing 20% of the work you can generate 80% of the advantage of doing the entire job. Pareto analysis is a formal technique for finding the changes that will give the biggest benefits. It is useful where many possible courses of action are competing for your attention.

For example, you might want to establish why customers no longer deal with us as a supplier.



Cause & Effect diagrams

Also known as Fishbone diagrams (for their appearance) and Ishikawa diagrams (names after their developer Kaoru Ishikawa), this useful technique is used for more complex RCAs. This type of diagram identifies ALL the potential processes and factors that could contribute to a problem. A basic diagram is shown below. A basic Cause and Effect template can be found in Microsoft Visio, or just use PowerPoint.



Once you have captured all the desired information, try and prioritise those areas that you have a control over, and concentrate on finding resolutions for these.

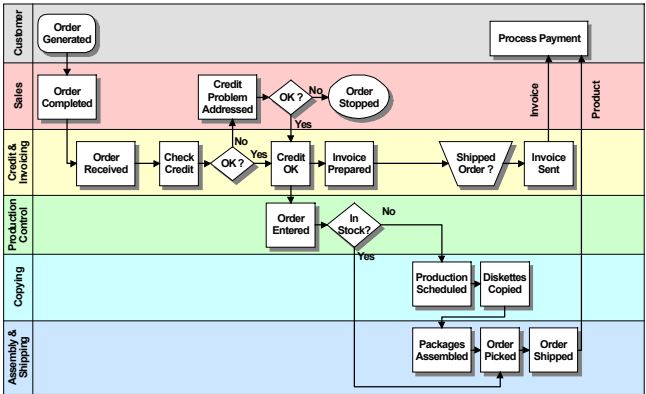
Brainstorming/Interviewing

Most people are familiar with Brainstorming and Interviewing techniques. However, here are a few reminders:

- Collect as many ideas as possible from all participants with no criticisms or judgments made while ideas are being generated.
- All ideas are welcome no matter how silly or far out they seem. Be creative. The more ideas the better because at this point you don't know what might work.
- No secondary discussions should take place during the brainstorming activity. Talking about the ideas will take place after brainstorming is complete.
- Do not criticize or judge. Don't even groan, frown, or laugh. All ideas are equally valid at this point.
- Do build on others' ideas.
- Do write all ideas on a flipchart or board so the whole group can easily see them. Use **Cause and Effect Diagrams** and **Fault Trees** to help capture the information.
- Set a time limit for the brainstorming. 30 minutes is often enough.

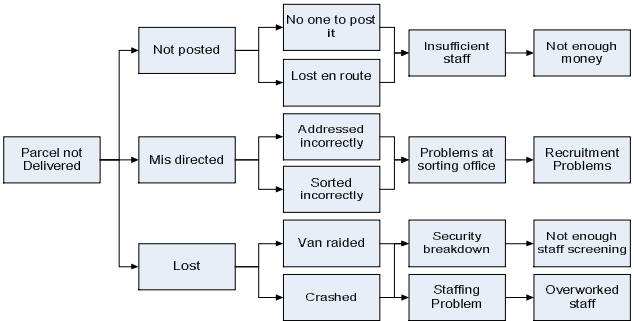
Process Analysis, Mapping and flowcharts

Most processes we follow today are mapped out by a flowchart. Flowcharts organize information about a process in a graphical manner thus making it clear what is impacted. Whether your problem has a documented process or not, this can be a really useful tool to understand what is going on. You don't have to be an expert to in flowcharting either. Although there are good templates in Microsoft PowerPoint and Visio, you can just as easily use a wipe board or pen and paper.



Fault Tree

This is a graphical technique that provides a systematic description of the combinations of possible occurrences in a system, which can result in an undesirable outcome. This method can combine system and human failures. A good example is shown below.



Fault trees can either be presented left to right or top to bottom. There are many specialist software products that allow Fault Tree analysis, but both Microsoft PowerPoint and Visio can be used to complete these diagrams.

Check Sheets

Check Sheets (or Tally Charts) are simply used to gather and record data. The data is usually numerical, but can also be used for other purposes, e.g. listing audit questions to be asked and recording the responses. You may use a Check Sheet on a day-to-day basis to check for software defects or the numbers and types of Customer incidents.

Example 1 – Study of projects completed late

| # | Checked | Project Number | | | | | Number correct | % Failure |
|---|---------------------------------|----------------|---|---|---|---|----------------|-----------|
| | | 1 | 2 | 3 | 4 | 5 | | |
| 1 | Correct File Structure/Contents | ✗ | ✗ | ✗ | ✗ | ✗ | 0 | 100 |
| 2 | Specification correct | ✓ | ✗ | ✗ | ✗ | ✗ | 1 | 80 |
| 3 | Cost estimate available | ✓ | ✓ | ✓ | ✗ | ✗ | 3 | 40 |
| 4 | Customer Order available | ✓ | ✓ | ✓ | ✗ | ✗ | 3 | 40 |
| 5 | Order Acknowledged | ✓ | ✓ | ✓ | ✗ | ✗ | 3 | 40 |
| 6 | Contract reviewed | ✓ | ✗ | ✓ | ✗ | ✗ | 2 | 60 |
| | Total correct | 5 | 3 | 4 | 0 | 0 | | |

Example 2 – Study of customers reasons for leaving

| Customer Relationship | Number per month | | | | | Week Total |
|-----------------------|------------------|-----------|-------------------|-------------------|--------------------------------|------------|
| | M | J | J | A | S | |
| No reason | 11 | 1111 | 1111 | 1 | 111 | 17 |
| Other suppliers | 11 | 1111 | 1 | 1111 1 | 11 | 15 |
| Competitive Reasons | 1 | 1 | 1 | 1111 | 11 | 10 |
| Attitude of staff | 1111 | 1 | 1111 1 | 0 | 1111 1111 111 | 24 |
| Total | 9 | 10 | 15 | 12 | 20 | 66 |

Sampling

Used to collect data for the above check sheets

Control Charts

The control chart is a graph used to study how a process changes over time. Data is plotted in time order. A control chart has a central line for the average, an upper line for the upper control limit and a lower line for the lower control limit. These lines are determined from historical data. By comparing current data to these lines, you can draw conclusions about whether the process variation is consistent (in control) or is unpredictable (out of control, affected by special causes of variation).

We quite often use Control Charts to look at where areas of the Business are falling outside defined limits. For example, when the number of reported incidents exceeds a certain figure.


Example of Help Desk Calls



Quality Planning

Every stage of a process or project is a possible source of poor quality. The objective of a Quality Plan is to anticipate possible sources of poor quality and to arrange for means of identifying such failure and preventing them from occurring. Where a Quality Manual is company specific a Quality Plan is project or process specific.

6) Look up table for completing an RCA

| <p>Section (See "Quality Management - Tools & Techniques")</p>  | <p>1. Define the Problem <i>(Identify Improvement Area)</i></p> | <p>2. Understand the Problem <i>(Evaluate Improvement Area)</i></p> | <p>2. Understand the Problem <i>(Collect Data)</i></p> | <p>2. Understand the Problem <i>(Data Analysis)</i></p> | <p>3. Immediate Action <i>(Develop Action Plan)</i></p> | <p>4. Corrective Action <i>(Implement Action Plan)</i></p> | <p>5. Confirm the Solution <i>(Monitor Action Plan)</i></p> |
|---|--|--|---|--|--|---|--|
| Activity Sampling | | • | • | • | | | |
| Brain Storming (NGT) | • | • | | | • | | |
| Cause and Effect Dgrms | | • | | | • | • | |
| Check Sheets | | | • | | | • | |
| Gemba Gembutsu - 5whys | | • | • | | | | |
| Histograms | | | | • | | | |
| Pareto Analysis | • | | | • | | | • |
| Performance Measurem't | • | • | | | | • | • |
| Process Mapping | • | • | • | | | | |
| Quality Planning | | | | | • | | • |
| Risk Assessment (FMEA) | • | • | | | • | | |
| Root Cause Analysis | • | • | • | • | • | • | • |
| Sampling | | | • | | | | |
| Scatter Diagrams | | | | • | | | |
| Six Sigma | • | • | • | • | • | • | • |
| SMART | • | | | | | | |
| Statistical Quality Control | • | • | • | • | | | • |

7) Examples RCA's

Examples of RCA projects will be shown on the RCA course.

8) Hints and Tips

- It is important to select the right team for carrying out an RCA; members should have knowledge of the process and be able to help explore the why, what and how
- Don't jump in with solutions: the problem and solution may not be obvious
- Make sure you are aware of the causal relationships
- Suggest improvements that you can implement and that are owned and signed up to by your team
- Having a facilitator with experience in the process will make things easier; this includes someone who knows about process, tools and facilitation
- Practising the techniques of RCA will ensure that you maintain the skills
- Only take responsibility for actions over which you have control: you should not agree an action plan for something you can't implement

9) 12 Pitfalls of RCA

- i. Not understanding the problem and therefore not defining it correctly
- ii. Not asking for help
- iii. Not considering all possible failure modes/causes
- iv. Not identifying all root causes
- v. Not understanding how the system should operate
- vi. Runaway tests and analysis
- vii. Adopting a 'remove & replace' mentality
- viii. Silver Bullet Theory
- ix. Returning the part/product without analysis
- x. Failing to follow-through
- xi. Jumping to conclusions (satisficing)
- xii. Tearing a system apart without a plan

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