ROOT CAUSE ANALYSIS:

# 4 SIMPLE STEPS TO A 5-STAR CAUSE AND EFFECT CHART

ARMS RELIABILITY

# INTRODUCTION

**Root Cause Analysis (RCA) is a powerful tool to investigate issues that have affected the performance of people or systems within your organisation. Done well, an RCA enables you to identify and resolve problems that cost money or cause harm.**

In my role of teaching, facilitating and reviewing RCA investigations I often find there is room for improvement. Some common mistakes I see are where investigations don't dive deep enough, or aren't clear enough in what the problem was and why the recommendations will solve it. Often the language used in corporations assume an understanding by the reader that is open to interpretation, and can lead to ineffective solutions.

This eBook describes four simple steps for the creation of cause and effect charts that will support effective problem solving: The benefits that can be realised are:

- Reduced costs
- Time savings
- Prevention of problems from recurring
- Reduced environmental impacts
- A safer workplace
- Improved reliability
- Reinforced quality control
- Continuous improvement

# A 5-STAR CAUSE AND EFFECT CHART

Follow these simple steps to create 5-star cause and effect charts for your organisation.

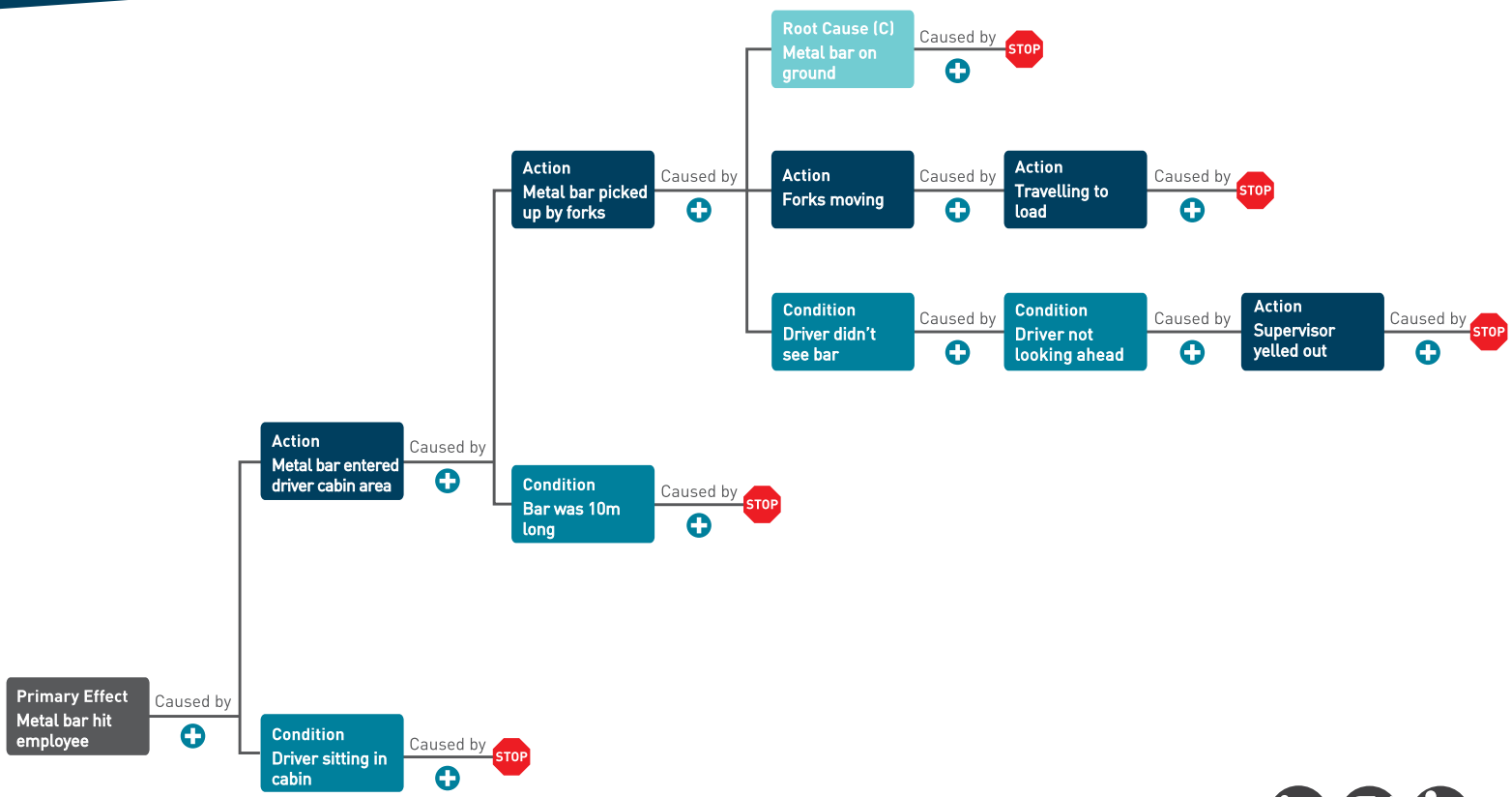
**Step 1:** Use clear language

**Step 2:** Challenge the logic of causal relationships

**Step 3:** Support causes with acceptable evidence

**Step 4:** Quantify your causes

In the next pages, you will learn how easy it is to implement these steps.

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# 1

# USE CLEAR LANGUAGE

*Words are critical in cause and effect charts. The language you use must communicate the causes clearly – leaving no room for misinterpretation.*

Too often, the words used in cause and effect charts are ambiguous, generic or too brief. They force people to 'read between the lines'; they lack pin-point clarity.

**Use these guidelines to improve the words used in the descriptions of causes in your cause and effect charts so that your RCA remains on track.**

# 1. AVOID SINGLE-WORD DESCRIPTIONS

Descriptions need more than just a noun. For example, if a maintainer is asked why a thrust bearing failed, he could have simply answered 'lubrication'. This is ambiguous, and most readers would infer that he meant 'lack of lubrication'. What if it was actually too much lubrication?

Single-word descriptors are not enough, as they make the assumption that the reader will interpret your information correctly. The art of the facilitator is to tell the story, not ask people to guess it.

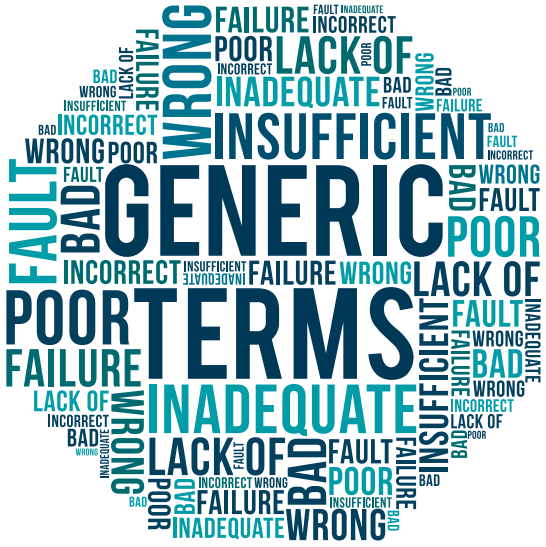
By adding a descriptor, you are eliminating the guesswork. And, by eliminating guesswork, you add value by enabling any reader of your chart to understand exactly what the causes are.

Now, the facilitator can ask more specific questions – which should then also elicit more specific information.

That said, remember to try and limit your description to a maximum of four words. It needs to be short, sharp and to the point.

# 2. AVOID GENERIC WORDS

If you use generic words to describe causes (e.g. poor maintenance), then your chart can be interpreted in different ways by different people. This is not what you want. Generic terms (e.g. insufficient, inadequate, lack of, poor, fault, failure, wrong, bad, incorrect) rely on the reader to make sense of what has happened by reading between the lines.




The use of generic language in the description of causes is an endemic issue across many companies. For many, it is because of a presumption that readers should know what these generic descriptors mean. This should never be presumed – as poor decisions can result.

Instead of using generic words, use words that are very targeted and specific – leaving no room for misinterpretation.

For example, how often is the description 'poor maintenance' used to explain why mobile equipment is unavailable?

**What does this actually mean?**

- Does it mean that the maintenance wasn't done?
- Does it mean that the maintenance wasn't done on time?
- Does it mean that the maintenance wasn't done according to the OEM recommendations?
- Does it mean that the maintenance wasn't done frequently enough?

All are possible interpretations of 'poor maintenance'. It might be something we haven't even thought of yet; or it might be a combination of answers.

Using 'poor' as an adjective to describe a cause allows all possible interpretations to be correct – yet that is not what it was intended to do.

Likewise, consider the word 'failure'. It is often used to describe a 'mechanical failure'. But what does this tell you? Only that something mechanically is wrong.

The challenge is to get around the common use of generic words. On the first pass, you can accept the generic reply (e.g. 'poor' or 'failure'). On the second pass, challenge it by asking what was poor about it, or why did it fail. This should prompt a far more specific reply, which you can use to write over the original, generic description.

# 3. AVOID CONJUNCTIONS

A conjunction is a combining word that is used to join two or more pieces of information together (e.g. and, or, with, when, on, in, caused by, due to).

When used in a causal description, a conjunction is an indicator that there are two or more causes within that description. This makes the logic of the connection tenuous. Some cause will refer to one aspect of the description whilst other causes refer to the other. However, not all of the causes belong to both.

Conjunctions have no place in causal descriptions. Instead, break the description down into the two unique causes and list them separately.

For example, 'oil escaped when valve failed' should be broken down into 'oil escaped' and 'valve failed'.

By separating the causes, the next set of questions also become far more specific and easier to understand. Importantly, they will elicit more specific information.

# 2

# CHALLENGE THE LOGIC OF CAUSAL RELATIONSHIPS

*Always challenge the logic of causal relationships in a cause and effect chart. You should rigorously question the place of every cause in the chart – to ensure that connections make sense on their own and as part of the whole.*

An effect has multiple causes, each of which plays its part in combining to create the effect. There are a number of tests you can do to make sure that all the causes you have listed play their part – and also to see if there are any that you have omitted.

**Remove a cause from the connection**

A quick challenge is to simply remove a cause from the connection and see if the effect still occurs. If it does, then you know that the removed cause is not part of that connection.

If it doesn't, then you know that the removed cause is an essential part of the connection.

For example, if a fire occurs, there are a number of causes that must be present. There must be: fuel available, oxygen, an ignition source (e.g. match) and an event to combine all of these things together (e.g. someone strikes the match). All of these causes must be present. If you remove the 'oxygen' cause, will there be a fire? No. Therefore you know that 'oxygen' must be a part of that connection. Ask the same of each cause, and you will soon see that all must be present for the fire to occur.

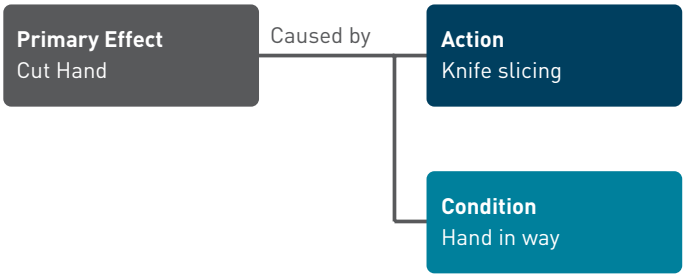
**Use the 'every time' challenge**

Question the validity of a causal relationship by using the 'every time' challenge. This helps to test the 'absolute' logic of each connection.

## CHALLENGE THE LOGIC OF CAUSAL RELATIONSHIPS

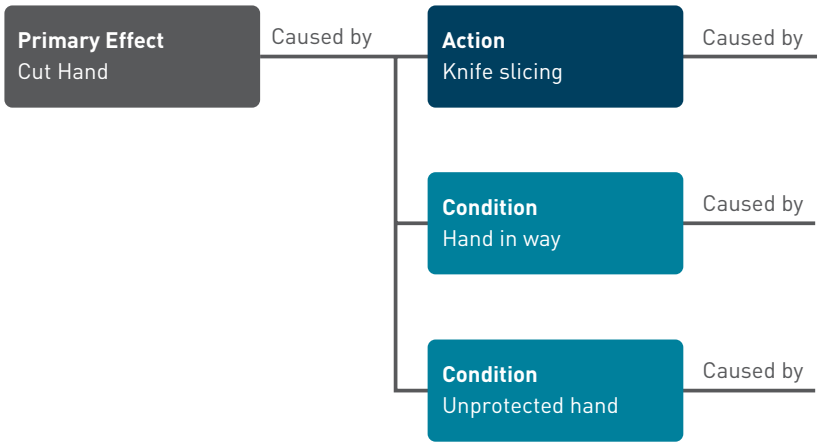
If you state that A is caused by B and C, then conversely B and C must therefore cause A. Ask yourself whether every time you have B and C, A occurs. If the answer is 'no', then something must be missing from the connection.

For example, say the effect is a 'cut hand'. Your initial causes are 'knife was slicing' and 'hand in way'. So we have the following:



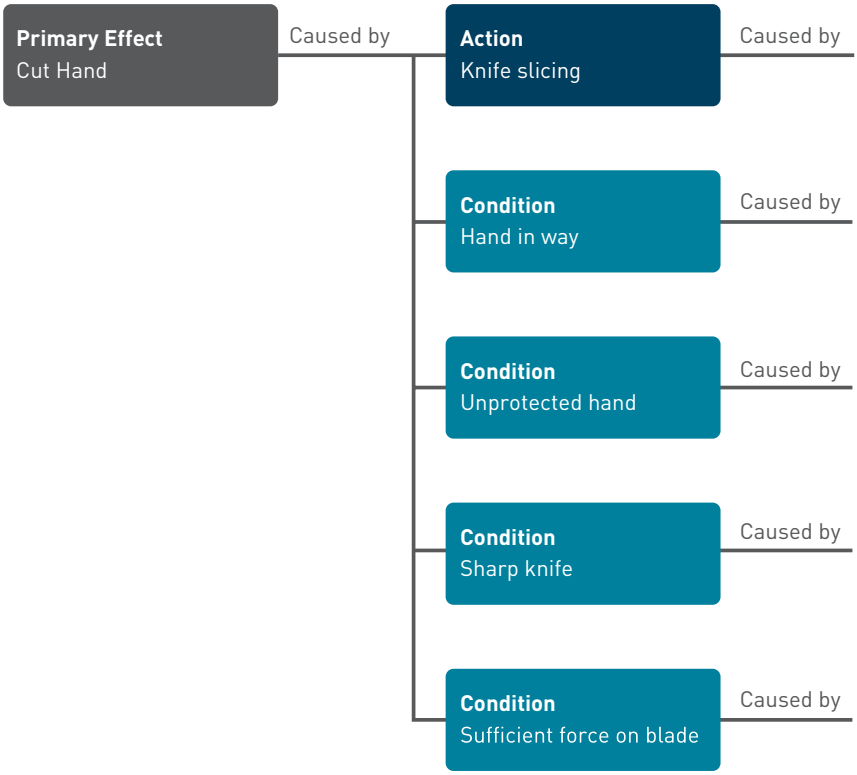

You can challenge this by working from right to left. Ask yourself, 'Will you cut your hand every time the knife is slicing and your hand is in the way?'. The answer is 'no' – and it tells you something is missing.

Now, you can actively search for the reason why the answer is 'no'. It may be that the hand is unprotected. So add this to your list and repeat the 'every time' question.




Again, the answer should be 'no'. Add two more causes: the knife is sharp and there is enough force on the blade. Now, when you ask, 'Will you cut your hand every time the knife is slicing, your hand is in the way, your hand is unprotected, the knife is sharp and there is sufficient force on the blade?', the answer is 'yes'.

If there are no other exceptions that can be found when using the 'every time' challenge, then you know that this causal connection is complete. All of the causes that contribute to the effect are accounted for.




## Use descriptions as triggers

Another method you can use to challenge the logic of a chart is to look at the descriptions, and use them to trigger connections. The description of the effect needs to be referenced in the connection of causes.

Using the example above, when looking for causes of a 'cut hand', with the 'hand' as the subject of the description, there must be a reference to a hand in this line of causes (e.g. the hand must exist).

Conditional causes state that something exists, that it is there. For example, for a cause of a 'leaking seal', there must be a seal. The seal must exist. The clue to understanding what needs to be included in the connection of causes for the effect on the left lies in the description of that effect.

Here's an example, using the effect of 'broken arm'.


If we say that a 'broken arm' is caused by 'fall from truck' and 'fell from height', does this make sense? The question here should be 'How is the arm broken'? We may conclude that this makes sense. Yet it relies on your assumptions to join the dots. What's missing in this connection is any reference to the arm.

Why is the arm broken? Something must have happened to the arm. What was it?

If we apply this trigger way of thinking, then if there is a 'broken arm' there must be an arm, or a reference to the arm in the connection of causes for this effect. The arm must not only exist but something must have happened to the arm for the arm to be broken.

The description of the effect that has occurred generates an understanding of what should be in the next connection.

So, why does this person have a 'broken arm'? Because the 'arm struck ground', 'ground was hard' and it was 'forceful contact'. You need 'arm' in one of these descriptors as it was the subject of the event.

Now, if we look at the description 'arm struck ground', there are two elements here: 'arm' and 'ground'. In the next connection, you should see both of these in some form e.g. 'person falling to ground' and 'arm stopped fall'.

All your clues as to what needs to be in the next line of causes lies within the description of the effect that has occurred.

# 3

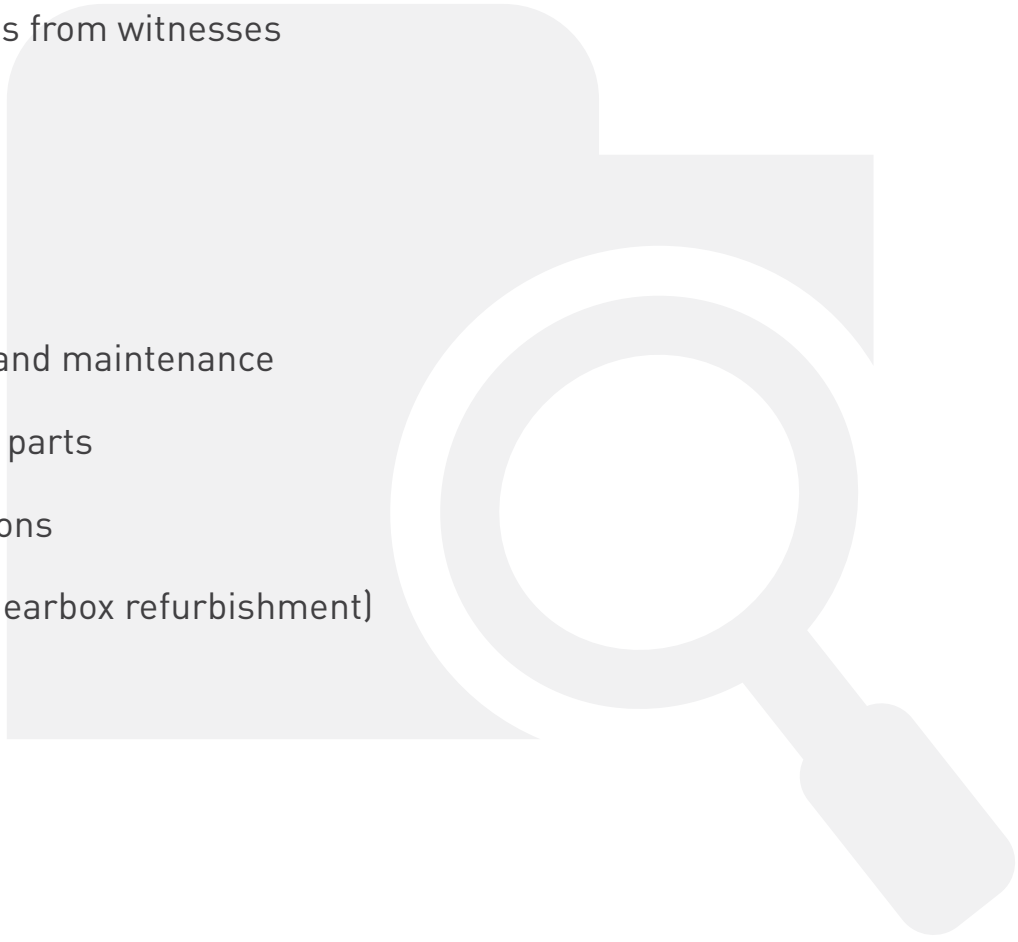
# SUPPORT CAUSES WITH ACCEPTABLE EVIDENCE

# *Evidence is a fundamental aspect of a cause and effect chart. Every cause within the chart requires validation through evidence to give it credibility in the eyes of others.*

Often evidence for causes is simply stated as 'fact' without any supporting evidence. For example, 'wrong oil used' and the evidence for this is simply stated as 'fact'.

Rather, you need hard, tangible evidence for causes that can easily be produced on demand. It may take the form of:

- Recorded statements from witnesses
- Photographs
- Documentation
- Electronic data
- Records of training and maintenance
- The broken or failed parts
- OEM recommendations
- Pull down reports (gearbox refurbishment)



Take the time to gather your evidence and record it diligently. It will make your cause and effect chart more credible as it validates the causes that exist in the chart.

Note that a chart without evidence can be construed as guess work. A chart with less than credible evidence faces strong scrutiny and is questioned. A chart with strong credible evidence is accepted.

# 4

# QUANTIFY YOUR CAUSES

*To avoid the trap of using generic causal descriptions, you should quantify anything and everything that is quantifiable. This eliminates guesswork and helps to validate the chart.*

Here are some of the elements that can be quantified in your cause and effect chart:

- Time – be specific with how long something took (or, conversely, how delayed a process was), using seconds, minutes, hours, days, weeks, months or years
- Loss – quantify your losses by looking at what was lost (e.g. 5 days of lost production) and why it was lost (e.g. the conveyor was down)
- Measurements – weight, volume, capacity etc. should be quantified, so instead of just stating a cause as 'too heavy', give it a weight (e.g. 1.5 tonne) so the weight has perspective for that chart

When you quantify whatever is quantifiable, you create better understanding, you will ask better questions and these questions will elicit better information.

# CONCLUSION

**In this eBook, we looked at 4 simple steps that you can implement when creating a cause and effect chart.**

By adhering to these steps, and employing all the other invaluable strategies of the Apollo RCA methodology, you will get to the bottom of issues much faster – and in a more accurate way.

Perhaps the first step is acknowledging that there is always room for improvement in any analysis or investigation! It is a questioning attitude that will help you realise better results each and every time you conduct an RCA.

Challenge your charts and be consistent in this challenge. You will start to identify opportunities for chart improvements, you will construct them more quickly, and they will become more and more comprehensive.

And remember, if you are going to create a chart, then create a really good one. It is a positive reflection of your efforts and of how well you understand the problem. To help you create a good one, share it with others, listen to what questions they ask. Learning from others is one of the fastest most efficient ways to improve.

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Since 1996, ARMS Reliability has trained over 20,000 people in root cause analysis. ARMS Reliability provides RCA Training, software, and services throughout the world and today, it is used successfully by thousands of people from a wide variety of industries such as aerospace, petro-chemical, utilities, manufacturing, telecommunications and healthcare.

# Apollo Root Cause Analysis™ Method

The Apollo Root Cause Analysis™ Method is an intuitive principle-based root cause analysis process that:

- Easily embraces all perspectives
- Eliminates the usual frustration and arguments
- Creates a common reality of your problem
- Ensures buy-in from all stakeholders
- Integrates a user friendly software application to create evidence - based cause & effect charts

For more information on how ARMS Reliability can help, please contact us at the office location nearest you (details below).

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