Root Cause & Corrective Action (RCCA) Overview

KEYSIGHT TECHNOLOGIES

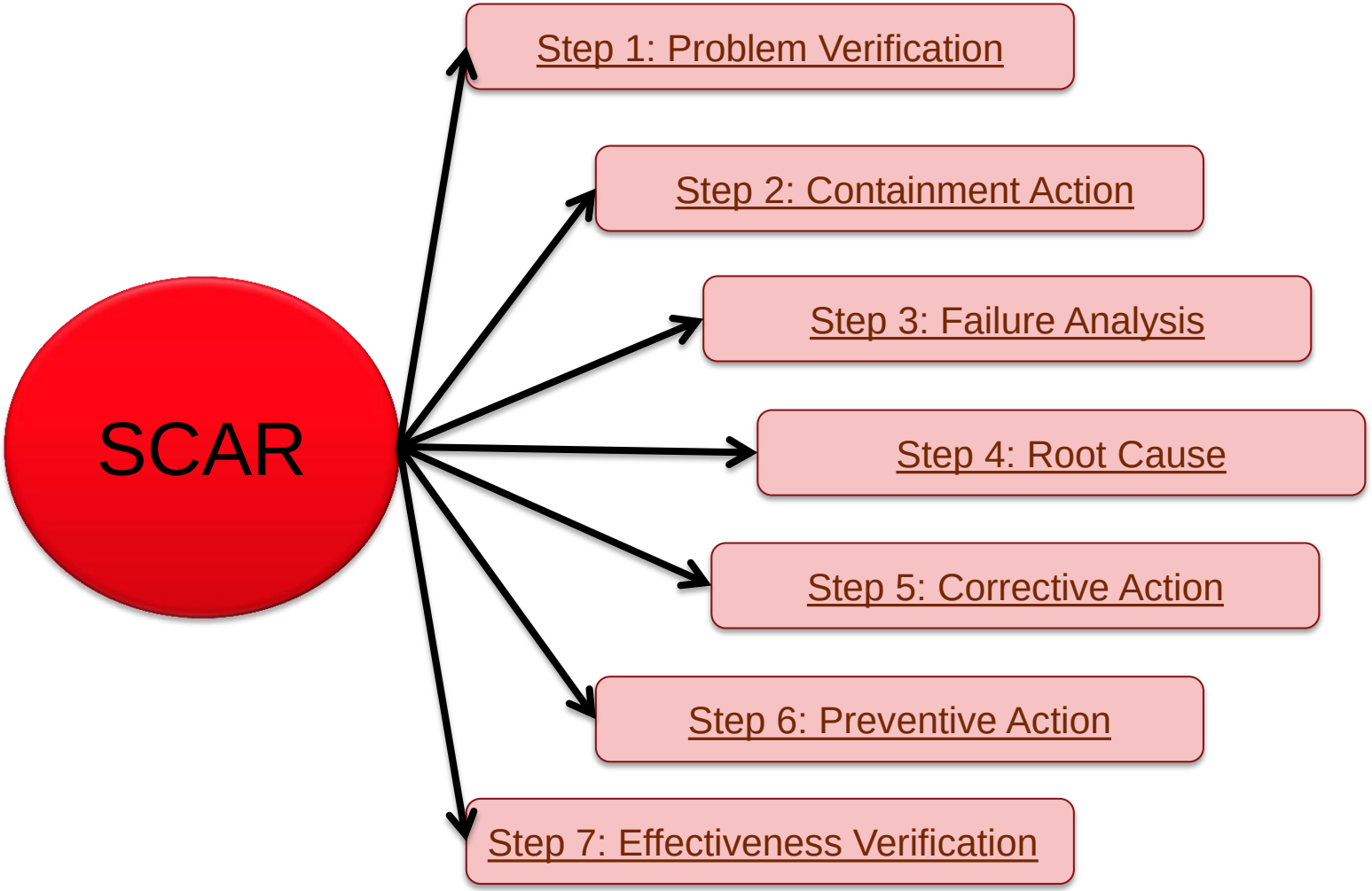
Objective

- To provide guidance to carry out proper **Root Cause Analysis** (RCA) with suitable **quality tools**
- To ensure responded SCAR able to meet Keysight expectation

Introduction

Supplier Corrective Action Request (SCAR) is a **systematic approach** to request investigation of a problem that already happened and **request root cause analysis** and resolution from supplier **to prevent recurrence.**

SCAR Key Elements



Step 1: Problem Verification

Problem verification is the **first step** of problem investigation. There are 3 main activities:

a) Verify the problem

b) Collect information

c) Describe the problem

To describe the problem specifically, **(5W2H)** terms (who, what, where, when, why, how, and how many) would help. Example please refer to next slide.

Step 1: Problem Verification

Example:

What? | What happen? | Where? | When? | How much?

Probe **(Part No.)** is found out of specification at Keysight on **date X**. **Total quantity** X pcs

What type of problem?

The output current is X when the frequency is X KHz. (specification is ±X)

What? | How often?

The defective part **date code** is X. This is the first case reported from customer.

5W2H	Questions to ask	Answer should be provided
Who	Who first observed? Who is affected?	- Location of defect found
What	What type of problem? What has the problem? What is happening?	- Failure reported - Part No./ Model - Detail description of failure
Why	Why it is a problem?	- Detail description on the failure and **verification done** - **Date code** of defective part
Where	Where was the problem observed/ occur?	
When	When the problem first noticed?	
How much/many	How much/ many involved?	- Quantity affected
How often	What is the trend? Has the problem occurred previously?	- **Failure history**

Step 2: Containment Action

Containment action is to **limit a problem extent** while continue normal operation until the root cause is defined and permanent corrective action is implemented

The containment area should cover:

- Production
- Finished goods
- Customer (Keysight)
- Incoming material
- Warehouse Storage

Notes: Affected date code/ serial number should be clearly identified and stated.

Step 2: Containment Action

Activities:

- Stoppage of production or shipment
- Segregation goods on pass or fail
- Additional visual control
- Informing customer about the problem
- Informing operators about the problem
- Check on similar product or processes if there is similar risk

Example:

100% screening is done for below area:

Supplier's production (xx pcs), warehouse inventory (xx pcs)

Keysight inventory including production (xx pcs), warehouse (xx pcs),

Results: xx pcs out of total xx pcs is found with similar reject. The **reject rate** is xx%.

Confirmed the **affected date code** is x. **Rejected part** is sent back for further FA.

Step 3: Failure Analysis

Failure analysis (FA) is the process of **collecting and analyzing data** to determine the cause of a failure.

Failure Analysis can be carry out by various methods including visual inspection, electrical testing and physical testing.

Step 3: Failure Analysis

Examples:

Visual Inspection

- Bare eye inspection
- Optical microscope
- X-ray microscope

Physical Testing

- Drop test
- Bending test
- Pull test

Electrical Testing

- Voltage measurement data
- Resistance measurement

Step 4: Root Cause

Root cause identification is the **most important step**. The problem will be solved only if the corrective action implemented is addressing the real root cause accurately.

Root Cause Analysis (RCA) is **a systematic approach** to identify the actual root causes of a problem. Below are the tools frequently used in RCA.

- **5 Whys Analysis**
- **Fishbone Diagram (Cause and Effect Diagram)**

Notes:

The RCA should identify root cause for both

- Occurrence (Why it occur?)
- Detection (Why it can't be detect?)

Step 4: Root Cause

5 Whys Analysis Tools

This is a continuous **question-asking technique** used to explore the cause-and-effect relationships underlying a particular problem.

<u>General Flow</u>

i. Define the problem.

ii. Ask Why the problem happen and write down the answer

iii. Validate the answer is it the real root cause

iv. If no, Repeat step 3 until problem's root cause is identified.

Step 4: Root Cause

Example of 5 Whys Analysis Tools

Why 1: Why wrong part shipped to customer?

		Addressing the true root cause ?
Answer: Wrong part was pull from the inventory	Retrain the stock picker- **almost no benefit.** The real cause is come from mislabel from supplier	
Why 2 Answer: The part was mislabeled	Perform inspection on inventory- **minimum benefit** Apply to on hand inventory only	
Why 3 Answer: Our supplier mislabeled the part before ship to the warehouse	Contain the problem by sorting out the mislabel part -**very limited long term benefit**	
Why 4 Answer: Operator at supplier site took the other label and placed at the product	Conduct training for operator – **limited long term benefit**	
Why 5 Answer: Many labels with different order was printed at the same location everyday so it is easy to cause mislabeled	Mistake proof printing label process or application – **highly effective**	

Step 4: Root Cause

Fishbone Diagram (Cause and Effect Diagram)

A fishbone diagram is a **visualization tool** for categorizing the potential causes of a problem in order to identify its root causes.

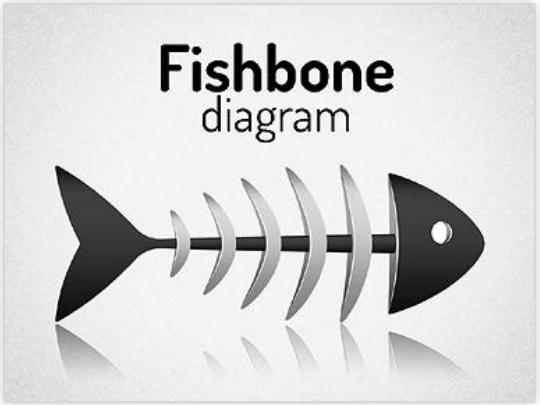
General Flow:

i. Define the problem

ii. Identify the key causes

iii. Brainstorm the causes

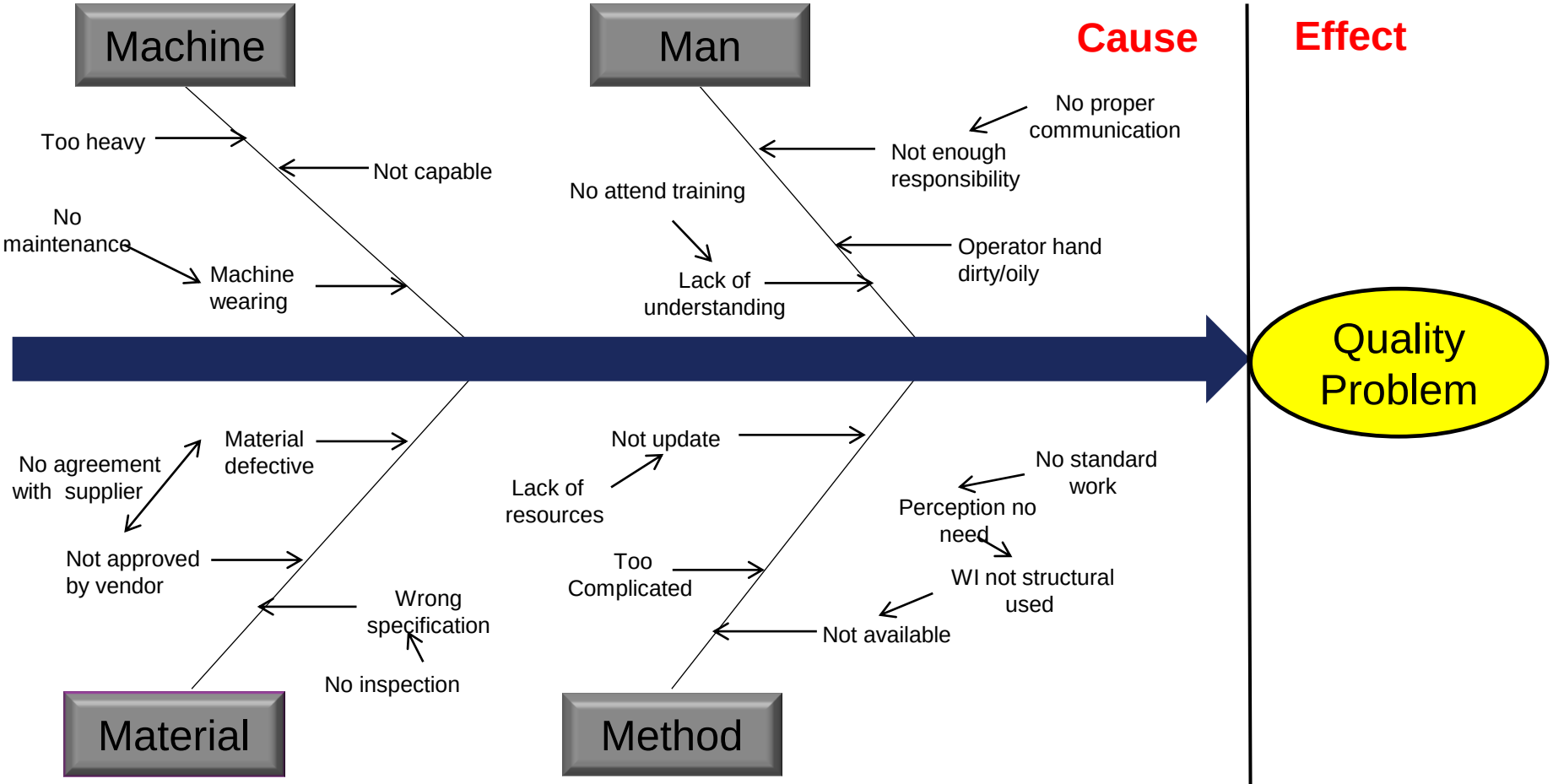
iv. Validate the identified root cause causes.



Step 4: Root Cause

Example of Fishbone Diagram (Cause and Effect Diagram)

1. Identify potential root cause



Step 4: Root Cause

Example of Fishbone Diagram (Cause and Effect Diagram)

2. Validate identified root cause

Category	Root cause	Validation / investigations	Findings	True / false
Man	Hand dirty /oily	Operator's hand are dirty.	Parts found with finger print mark on surface during process	TRUE

Step 5: Corrective Action

Corrective action (CA) is to **remove the root cause** and prevent a problem from ever happening again.

The corrective action should **correspond to the root cause identified** earlier in order to eliminate the real root cause and prevent recurrence of the problem.

Method such as brainstorming is recommended as it can help to select appropriate corrective action for identified root cause.

Step 5: Corrective Action

Examples:

For root cause of “Why problem occur?”

- Introduce additional process control
- Introduce new process

For root cause of “Why not detected?”

- Introduce new testing gate
- Enhance previous testing coverage

Step 6: Preventive Action

Preventive Action are **proactive** and focused on a **potential problem** in the future.

Corrective actions is only a temporary solution that keeps the system running, but a permanent solution is needed to avoid similar problems from occurring into the system again.

Step 6: Preventive Action

Examples:

- Changing the process parameter
- Changing procedure
- Changing documentation or specification
- Changing of process or tools
- Modified or make proper jig

Step 7: Effectiveness Verification

After the corrective and preventive actions are implemented, the effectiveness should be validate.

The **key to verification is evidence**. This evidence usually takes the form of data, records or first-hand observations.

It is recommended the verification made by **monitoring the quality of next deliveries.**

Step 7: Effectiveness Verification

Examples:

- Product acceptance rate
- Test or control results showing improvement
- Engineering measurement (Dimension and appearance) according to specification and tolerance
- Suppliers deliver goods of better quality

Summary

In conclusion, proper RCA should be conducted in a **systematic approach** in order to obtain the real root cause. Besides, **effective** containment, corrective and preventive actions **correspond to identified root cause** should be provided. Below shows the difference between containment, corrective and preventive actions.

Containment Action

A “first aid” that limit a problem’s extent and establish normal operations until the root cause is defined and permanent corrective actions is implemented

Corrective Action

Actions to remove the root cause and prevent a problem from ever happening again. The actions are directed to an event that happened in the past.

Preventive Action

Preventive Action are proactive and oriented towards a potential problem in the future. They improve a process or a product to remove causes for a potential problem and prevent it and related problems from ever happening.

Appendix:

SCAR
Response Guideline and Expectation

SCAR Template

Actionee		Dept/PL	
Date Assign		Date Close (Expected)	
Days Remaining		Date Close (Actual)	
Root Cause Category			

Overall Summary

View Details	☐ Yes	Files

S1 - Problem Verification							
Status							
S2 - Containment Action			Containment Result			Implementation Date	Responsible Person
Screening Area	☐	Production	☐	FGI	☐	Remaining units with customers	
	☐	N/A			☐	Units in Field (with other customers)	

S3 - Failure Analysis (Visual / Electrical / Physical)	Results	
S4 - Root Cause		
S5 - Corrective Actions	Implementation Date	Responsible Person
S6 - Permanent Corrective Actions	Implementation Date	Responsible Person
S7 - Verify Effectiveness of Corrective Actions	Implementation Date (Start of Monitoring Date)	Responsible Person

View Related CAR

SCAR Response Guideline

Process Step	Criteria
Root Cause Option	✓ Select root cause **Supplier – (category)** ✓ Category including: Material, Process, Assembly, Testing & documentation
S0: Overall Summary	✓ Summarize the problem verification, failure analysis, identified root cause and corrective action in less than 1000 character.
S1: Problem Verification	✓ Provide clear and precise problem statement ✓ Method and condition to duplicate and verify the problem reported. (Refer slide 6)
Status	✓ Valid – If is supplier induced failure ✓ Invalid –If is Electrical over stress (EOS), No trouble found (NTF), customer application and etc.
S2: Containment Action	✓ Select proper screening area. If no containment action please provide justification. ✓ Screening area including: Production, finished good inventory (FGI), remaining units with customer(Keysight) and Unit in field (Other customer). Refer Slide 8 ✓ Information needed: a) Method: Type of screening done in respective area selected above b) Results: Reject quantity and rate c) Responsible person name d) Date of the action taken

SCAR Response Guideline

Process Step	Criteria
S3: Failure Analysis	✓ Briefly summaries the failure analysis (FA) conducted and the results (Including visual inspection, Electrical testing and physical testing) ✓ Attach FA report as evidence if available
S4: Root Cause	✓ Encourage to perform RCA using proper tool such as 5 Whys analysis and fishbone diagram but not limited to these analysis tools. ✓ RCA should emphasize on both area: a) why problem happen (root cause of problem happen) b) why escapee (root cause of problem is not detected) ✓ Summaries the RCA results and categories the real root cause in 4M's format (Man, Methods, Machines, Materials) ✓ Attach RCA report as evidence.

SCAR Response Guideline

Process Step	Criteria
S5: Corrective Action (CA)	✓ List down the corrective action which is correspond to the root cause identified in S4 ✓ Provide responsible person and implementation date for each corrective action ✓ **Operator re-training/briefing is refrained from being recorded as a corrective action** ✓ Containment action should **NOT** classified as corrective action. (Please refer slide 9)
S6: Permanent Corrective Action	✓ Permanent Corrective Action (PA) should **NOT** same as corrective action. ✓ Please refer slide 18 & 20 to differentiate between CA and PA. ✓ List down the permanent corrective action (preventive) which is correspond to the root cause identified in S4 ✓ Provide responsible person and implementation date for each permanent corrective action

SCAR Response Guideline

Process Step	Criteria
S7: Verify Effectiveness of Corrective Action	✓ Information should be provided in S7 : ✓ Type 2 a) Monitoring plan (E.g. type of testing and monitoring area) b) Duration of monitoring (At least 3 months) c) Monitoring start date of the action taken d) Responsible person name ✓ Type 4 a) Monitoring results (Any recurrence?) b) Evidence/ Monitoring data (E.g. Test results, Serial Number/ Lot/Batch No. without similar reject) c) Responsible person name

Thank you!