



ASA / AFRA Annual Conference

ASA/AFRA Conference Scottsdale AZ

June 24, 2024

Effective Root Cause Analysis including Human Factors

Presented by Wyndie Meyer ASA Director of
Certification Services and Operational Performance
June

Five Key Elements of Root Cause Analysis

Root cause analysis is an approach for identifying the underlying causes of an incident, so the most effective solutions can be identified and implemented to prevent the issue from reoccurring. It is often misunderstood and mis-used.

- Elements of a successful root cause analysis for effectively using the problem-solving approach
- Thorough and clear Explanation of the problem / issue
- Reveals a “system” of problems
- Identifies Opportunities to reduce risk
- Avoids blame and focuses on prevention – always consider FAA Human Factors

The output of a successful RCA is specific actions that improve work processes.

Root Cause Analysis – Always consider Human Factors

Human Factors – *The Dirty Dozen*



Daily Pressures

- Lack of communication
- Complacency
- Lack of knowledge
- Distractions
- Lack of teamwork
- Fatigue
- Lack of resources
- Pressure
- Lack of assertiveness
- Stress
- Lack of awareness
- Norms

Examples of Root Causes possibly based in Human Factors.

Lack of Communication – The organization has updated a process and failed to communicate the updates.

Complacency – Employees not paying attention or expecting the same results (Norms)

Distraction – Too many Tasks, or use of mobile phones, talking, etc.

Fatigue – Employees are overworked, working long shifts.

Stress - Work environment stressful, toxic, unreasonable deadlines

These may not be THE Root Cause but can greatly contribute.

Most Common Industry NCRs

“Auditing is not about just managing your good days but also how you manage your bad days, what processes go into affect once an issue occurs.”

Top 3 Area for NCRs across the 3 Aerospace Standards 9100/9110/9120

8.5.1 - Control of Production and Service Provision

7.1.5 - Monitoring and Measuring Resources

8.4.1 General – The organization shall ensure that externally provided processes, products, and services conform to requirements.

Steps by Step – Answering NCRs

- 1. Correction:** Enter the correction the organization intends to do related to the nonconformance. This is normally related to an immediate correction.
- 2. Containment:** This field is for any nonconformity that requires a containment action to eliminate and nonconforming deliveries. If the NCR will not cause the organization to delivery nonconforming articles, this field shall have a N/A.
- 3. Locate and Correct Similar Discrepancies:** This section allows the organization to look across to determine if similar discrepancies exists. If no similar discrepancies exist, please enter N/A.
- 4. Root Cause:** Please make certain the organization uses one of the following to determine a proper Root Cause: Five Whys, Fishbone Diagram, Pareto Analysis, Fault Tree Analysis, Failure Mode and Effects Analysis, Statistical Analysis, Brainstorming and Group Discussions, Process Mapping, and Document Review.
- 5. Corrective Action:** Please enter a corrective action that will eliminate the root cause identified by the organization.
- 6. Enter the organization's representative:** Enter name of the organization's representative.
- 7. Projected Completion Date:** Enter when the corrective action will be implanted.

Steps by Step – Answering NCRs

- 8. Completion Date:** Enter the date the corrective action was implemented.
- 9. Follow Up Verification of Corrective Action:** Enter how the organization will follow up on the implemented corrective action to determine the root cause was eliminated.
- 10. Follow Up Company Representative:** Enter name of representative conducting the follow up of the implemented corrective action.
- 11. Date of Verification:** Enter the date verification of the implemented corrective action was performed.

Implementation of Corrective Actions

- Implementing corrective actions effectively involves a structured approach to address root causes and prevent recurrence of problems. The following are some steps to guide you through the process:
 1. **Identify Root Cause:** Use the tools identified within the Root Cause PPT pages.
 2. **Define Corrective Actions:** Based on the identified root causes, develop specific corrective actions that directly address these causes. Ensure that actions are realistic, achievable, and measurable.
 3. **Assign Responsibility:** Clearly assign responsibilities for implementing each corrective action to individuals or teams within your organization. Ensure accountability and ownership.
 4. **Set Deadlines:** Establish realistic timelines for implementing each corrective action. Consider the urgency of the issue and the resources required for implementation.
 5. **Allocate resources:** Provide necessary resources such as budget, manpower, training, tools, and technology to support the implementation of corrective actions effectively.
 6. **Communicate:** Communicate the corrective actions, responsibilities, timelines, and expectations to all relevant stakeholders, including employees, management, customers, and suppliers.
 7. **Monitor Progress:** Regularly monitor the progress of corrective action implementation. Use key performance indicators (KPIs) or metrics to track progress and identify any deviations from the plan.

Implementation of Corrective Actions

8. **Address Barriers:** Identify and address any barriers or obstacles that hinder the successful implementation of corrective actions. This could include resource constraints, lack of expertise, resistance to change, etc.
 9. **Review and Adjust:** Conduct periodic reviews to evaluate the effectiveness of implemented corrective actions. Adjust the approach if needed based on feedback, results, or changes in the business environment.
 10. **Document and Learn:** Document the entire corrective action process, including findings, actions taken, results, and lesson learned. Use this information to improve future problem-solving processes and build organizational knowledge.
- **Note:** By the following these steps, organizations can effectively implement corrective actions, improve processes, prevent recurrence of problems, and drive continues improvement. Regular review and feedback mechanisms are essential to ensure sustained success



How do we identify a Root Cause?

Root Cause Analysis

What is RCA?

Identify Causes: RCA is an activity that focuses on getting to the underlying causes of an identified issue. It is used to “get to the bottom” of the causes so that the causes/actions can be corrected lessening the chances they will not reoccur.

RCA assumes that systems and events are interrelated. An action in one area triggers an action in another, and another, and so on. By tracing back these actions, you can discover where the issue started and how it grew into the problem being faced.

How do we identify the causes?

Sometimes you think you know the root cause. However, you should go through the process to verify that your conclusion is accurate. **HAVE AN OPEN MIND. Trust** your instincts **but verify** your conclusions.

There are **several tools** that are useful in truly identifying root causes.

Common, Effective Root Cause Analysis Tools

- **Most Common –**
 - Five Why
 - Affinity Process - AP
 - Fishbone
 - Failure Mode and Effect Analysis (FMEA)
 - WEED

5 Why Technique – Benefits and Limitations

■ Benefits

- Easy to understand
- Can be used for any type of problem
- Can help get to the root cause of the problem quickly

■ Limitations

- Assumes that each symptom has a single cause but this is not always the case
- Not suitable for complex issues
- Not repeatable

•

Root Cause Analysis – Five Why

5 Whys Analysis

PROBLEM: The conveyor belt on the main production line has stopped

1

Why has the conveyor belt stopped?

The main pulley responsible for rotating the belt is not functioning properly

2

Why is the main pulley not functioning correctly?

Because it's not getting enough power from the motor

3

Why is it not getting enough power from the motor?

Because the motor has stopped working

4

Why has the motor stopped working?

Because the motor windings had burned out

5

Why have the windings burned out?

Because the motor was loaded beyond its power capacity

6

Why was the motor overloaded?

Instructions about the motor's maximum load weight were missing

ROOT CAUSE



Root Cause Analysis – Five Why

5 Whys Analysis Template - J & J Shipping Company

Problem Statement: A wrong item was shipped to the customer



Affinity Process Tool –Benefits and Limitations

- The AP (Affinity Process) tool is one of the Root Cause Analysis (RCA) techniques used to identify and organize potential root causes of problems, typically through collaborative group efforts.

▪ Benefits

- Encourages Participation: Engages all team members in the brainstorming process, fostering a collaborative environment.
- Organizes Thoughts: Helps to organize a large number of ideas into manageable categories.
- Reveals Patterns: Identifies patterns and relationships among ideas that may not be immediately apparent.
- Facilitates Consensus: Promotes consensus and shared understanding among team members regarding potential root causes.

▪ Limitations

- Subjectivity -

Affinity Process Tool –Benefits and Limitations

•Subjectivity:

•The process of grouping ideas and naming categories can be subjective, as it relies on the perspectives and judgments of the team members. Different individuals may interpret and group ideas differently, leading to potential biases.

•Groupthink:

•While the Affinity Process encourages group participation, it can also lead to groupthink, where the desire for consensus may suppress dissenting opinions or innovative ideas. Dominant personalities in the group may unduly influence the categorization and prioritization processes.

•Complex Problems:

•For very complex problems with numerous potential causes, the AP tool might oversimplify the issues by categorizing them into broad groups.

•It might miss nuances and interactions between different categories that are crucial for understanding the root causes.

•Dependence on Facilitation:

•The effectiveness of the AP tool heavily depends on skilled facilitation to guide the process, manage group dynamics, and ensure that all voices are heard.

•Poor facilitation can lead to disorganization, incomplete analysis, or dominance by certain individuals.

AP RCA TOOL Example

Start up Problems

Start up problems

HR

Financial

Team

Experience

Marketing

Small capital

Skill hunting

Lack of consultations

Marketing channels

Lack of investment

Not enough team

Bad education

Competency

Missing skills

Affinity Process – Steps Involved

- **Step 1: Problem Definition** - Clearly define the problem or issue that needs to be analyzed. Ensure that all team members have a shared understanding of the problem.
- **Step 2: Idea Generation** - Team members brainstorm ideas related to the potential causes of the problem. These ideas are typically written on sticky notes or cards, with each note representing a single idea or cause.
- **Step 3: Grouping Ideas** - Once a sufficient number of ideas have been generated, the team collaboratively sorts the sticky notes or cards into groups based on their similarities. This process is often done silently to encourage individual thought and prevent groupthink.
- **Step 4: Naming the Groups** - After the ideas are grouped, each group is given a title that reflects the common theme or category of the ideas within that group. These titles help to summarize and communicate the main categories of potential causes.
- **Step 5: Prioritizing the Groups** - The team discusses the grouped categories and prioritizes them based on their relevance and potential impact on the problem. This step may involve further analysis and discussion to determine which categories are most likely to contain the root cause.

Fishbone Diagram –Benefits and Limitations

▪ Benefits

- Best Type to use for brainstorming method
- This technique is widely used in product design, quality improvement, and defect minimization.
- Instead of pointing out just one reason, this technique gives us a gamut of all the possible reasons that assist not only in identifying the root cause of the current problem and avoiding any future mishappening.

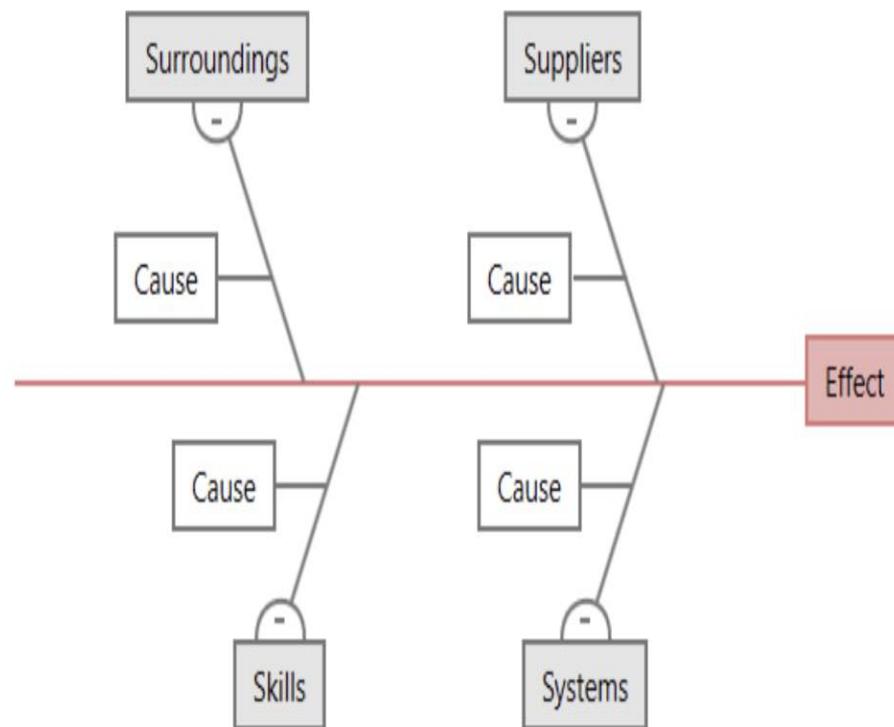
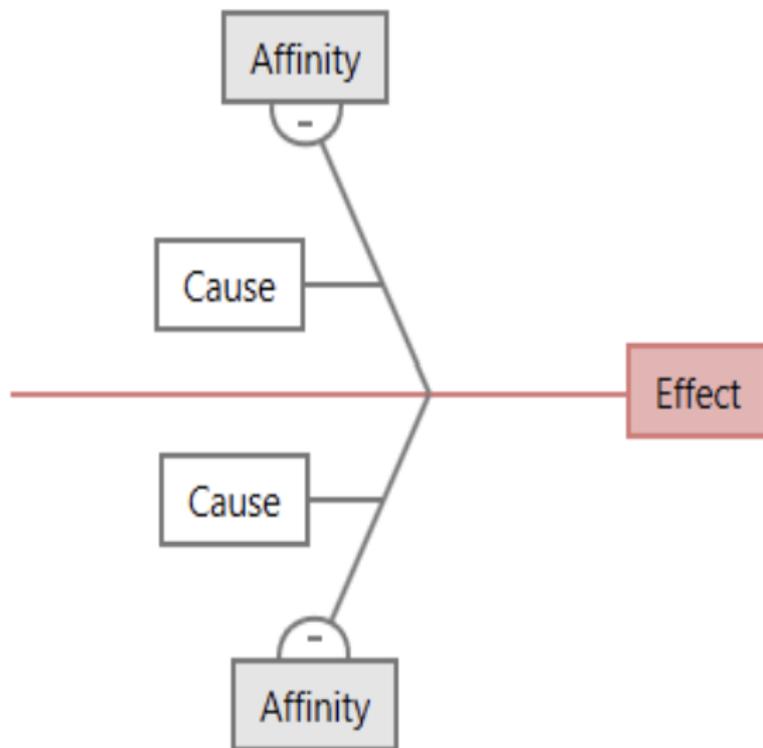
▪ Limitations

- This technique should not be used as a one-time activity. Instead, this activity should be undertaken continuously to be proactive in determining any possible loophole.

4 types of Fishbone Diagrams

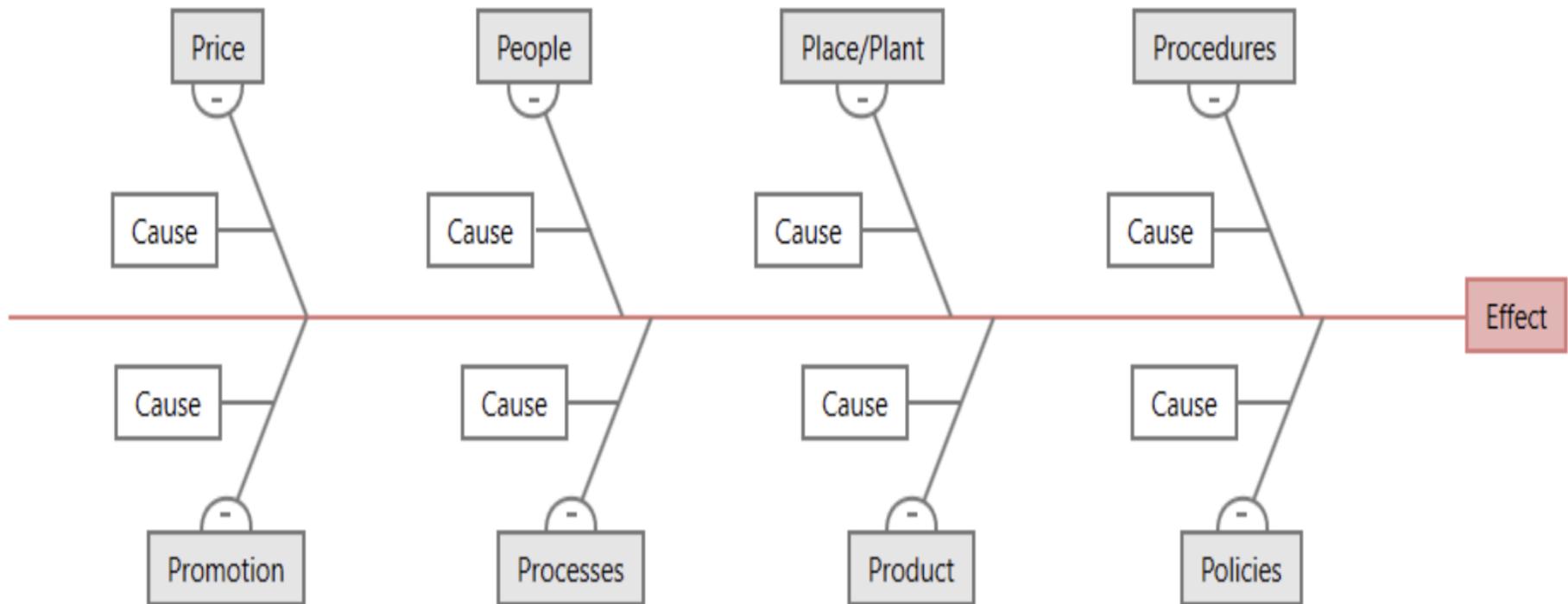
Simple Fishbone - In its most basic form, the fishbone diagram has no predetermined affinities or categories of causes, so you can set and create the affinities that may be unique to your organization or industry.

The 4S Fishbone - This type of fishbone diagram gets its name from the way it organizes information about potential causes into four common categories: Suppliers, Systems, Surroundings and Skills. It is commonly used in the service industry but could be used in nearly any industry.



4 types of Fishbone Diagrams

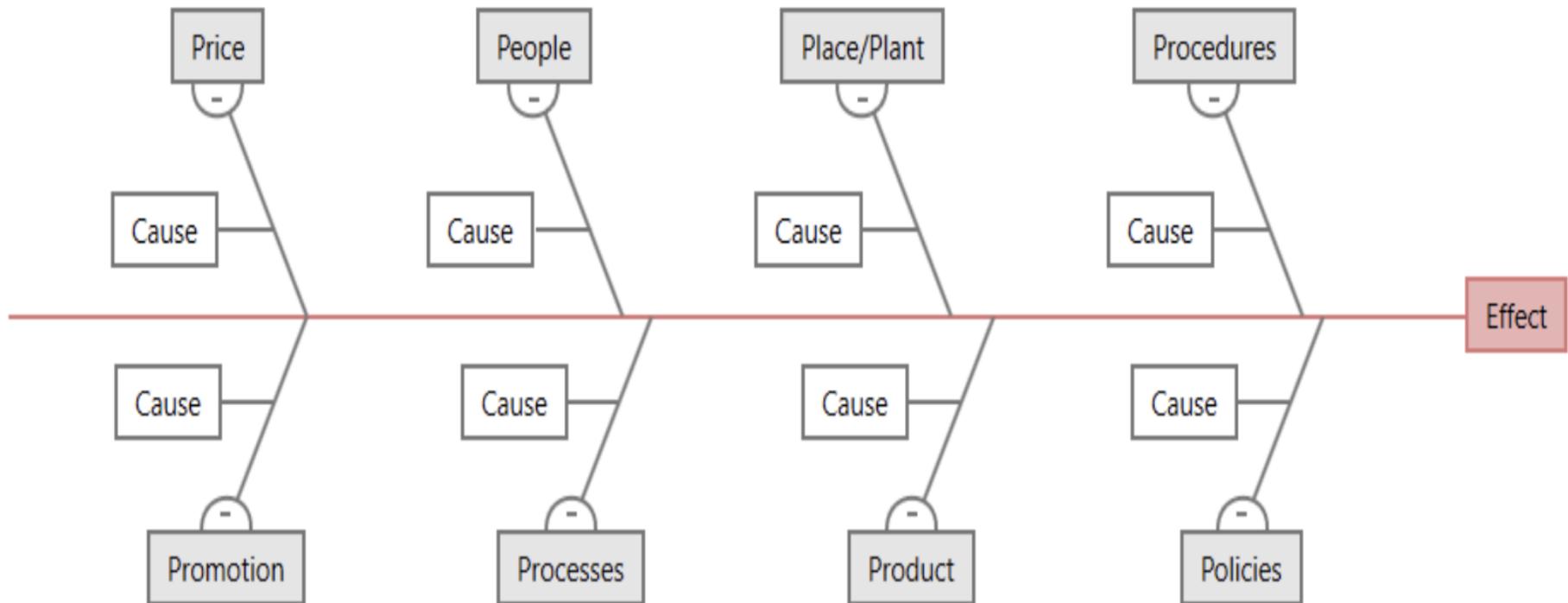
The 8P Fishbone - This type of fishbone is named after the 8 categories that make it up: Procedures, Policies, Place, Product, People, Processes, Price and Promotion. This variation is also commonly used in the service industry, but can be applied in nearly any type of business or industry.



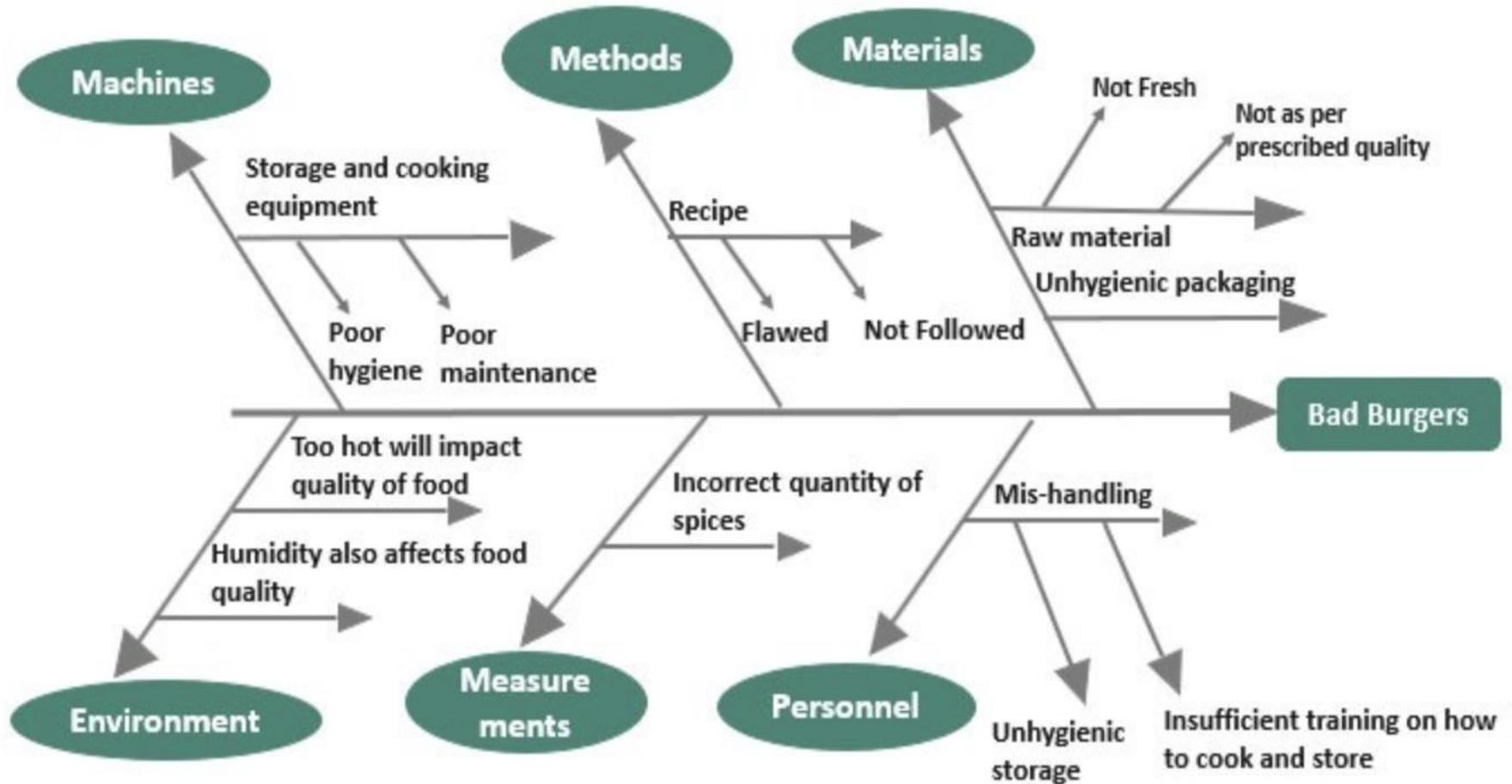
4 types of Fishbone Diagrams

THE MAN MACHINES MATERIALS FISHBONE – MOST COMMON

This fishbone diagram variation is most commonly used in manufacturing and allows you to organize potential causes of a problem into these categories: Man, Materials, Machine, Methods, Measurements and Environment. In some cases, two additional categories are included: Management/Money and Maintenance.



Fishbone Diagram 2



Failure Mode and Effects Analysis (FMEA)– Benefits and Limitations

What is it? FMEA is a procedure for determining where processes, products or designs are most likely to fail and why. It is used to design a process, [review and improve a process](#) and also act as an efficient process control. Its step-by-step approach identifies each failure mode, with the analysis then estimating the effects of failure and devising ways of controlling the process so that failure can be averted

Benefits of FMEA –

Logical and structured way to identify areas of concern while reducing development time and cost.

Proven way to effectively identify how to improve areas where performance might be lagging. FMEA enables early identification of single failure points and system interface problems that can hinder success and impact safety

Limitations of FMEA –

function of the FMEA's basis for prioritizing failure modes according to their risk. This won't *eliminate* the failure modes and may well require other actions outside of the FMEA and the team carrying it out.

Can be too small of a scope so there may not be enough focus on details, missing failure modes

Can also be too large, causing the process to seem daunting and avoided. The solution is to break it down into manageable pieces

Failure Mode and Effects Analysis (FMEA)–Example

Failure Modes & Effects Analysis

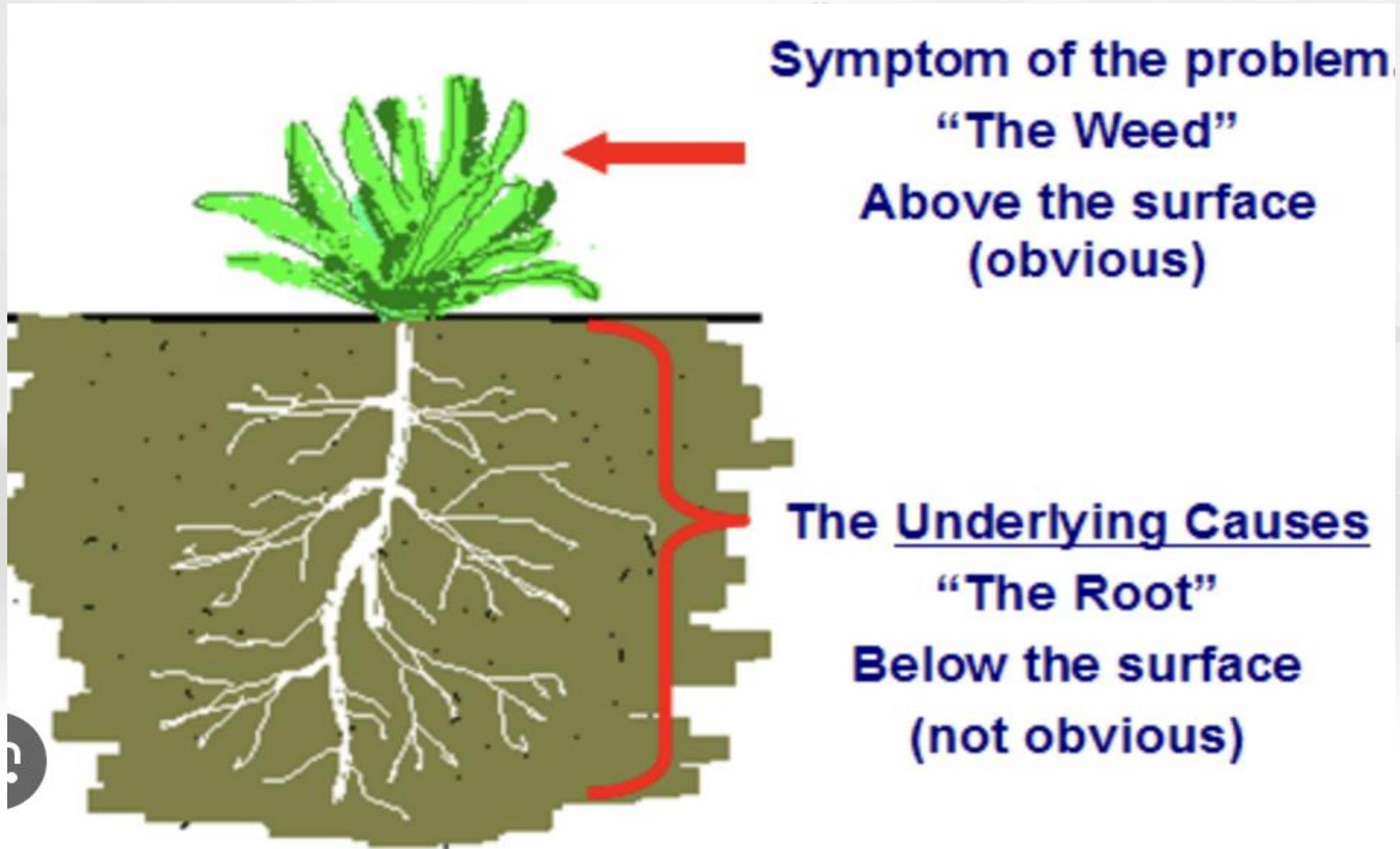
Failure Modes & Effects Analysis (FMEA) is a risk management tool that identifies the influence of potential failures in a process in order to prevent them or create contingency plans.



Failure Mode and Effects Analysis (FMEA)–Example

ID	Item	Function	Potential Failure Mode(s)	Potential Failure Effect(s)	Severity (1-5)	Potential Cause(s)	Occurrence (1-5)	Current Control (Prevention)	Current Controls (Detection)	Detection (1-5)	RPN (S x O x D)
R-1	AC Adapter (PN 80100 rev 1)	Converts 240 VAC to 5 VDC to supply continuous power to gadgets	Housing breaks and detaches	Exposes the internal metal components, posing an electrical shock hazard		Inadequate material selection of housing to withstand environment use conditions (drop/Shock)		Product is designed to comply with IEC 62368-1	Design Analysis		

Root Cause Analysis- WEED METHOD



What is the WEED RCA Method?

In the context of Root Cause Analysis (RCA), the term "WEED" is an acronym used to represent a systematic approach to identifying and addressing problems.

The WEED approach provides a structured framework for conducting RCA, ensuring that each aspect of the problem-solving process is thoroughly addressed.

Here's what each letter in WEED stands for:

W - What Happened?

- Description: Clearly define the problem or incident. This step involves gathering detailed information about what occurred, including the circumstances and impact.
- Objective: Ensure a precise understanding of the issue at hand.

E - Evaluate the Evidence

- Description: Collect and analyze data related to the problem. This includes reviewing documents, conducting interviews, and examining relevant records.
- Objective: Build a factual and comprehensive picture of the situation, eliminating assumptions and ensuring accuracy.

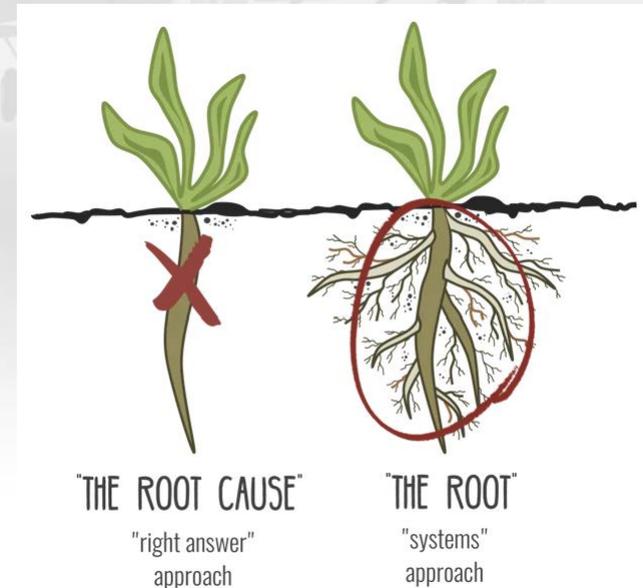
What is the WEED RCA Method?

E - Establish Root Causes

- Description: Use RCA techniques to dig deeper and identify the fundamental causes of the problem. Methods such as the 5 Whys, Fishbone Diagram, or Fault Tree Analysis are typically employed here.
- Objective: Determine the underlying reasons behind the issue, rather than just addressing symptoms.

D - Develop and Implement Corrective Actions

- Description: Formulate and execute a plan to address the root causes identified. This includes designing specific actions to correct the issue and prevent recurrence.
- Objective: Ensure that the problem is resolved and measures are in place to avoid future occurrences.



Core Principles of Root Cause Analysis

- Focus on Correcting and remedying root cause rather than just symptoms
- Don't ignore the importance of treating symptoms for short term relief
- Realize there can be, and often are, multiple root causes
- Focus on HOW and WHY an incident occurs and not WHO was responsible
- Be methodical and find concrete cause-effect evidence to substantiate RC suspicions.
- Provide enough information to identify an effective course of action.
- Consider how a root cause can be prevented in the future.

As the above principles illustrate: when we analyze deep issues and causes, it's important to take a comprehensive and holistic approach. In addition to discovering the root cause, we should strive to provide context and information that will result in a action or a decision.

Good Analysis is actionable analysis

Following Up Verification

Follow-up verification of corrective actions is crucial to ensure that the implemented solutions are effective and sustainable. Here are steps to conduct follow-up verification effectively:

- 1. Define Verification Criteria:** Clearly define the criteria for successful verification. This includes identifying specific measurable outcomes, performance indicators, and standards that indicate the corrective action's effectiveness.
- 2. Establish Verification Schedule:** Determine the frequency and timing of follow-up verification activities. Schedule regular reviews and assessments based on the complexity of the corrective action and the [potential impact of the problem.
- 3. Gather Data:** Collect relevant data and evidence to assess the impact of the corrective action. This may include performance metrics, feedback from stakeholders, incident reports, quality assurance data, and any other relevant information.
- 4. Conduct Assessments:** Use appropriate methods to assess the effectiveness of the corrective action. This could involve quantitative analysis, qualitative assessment, surveys, interviews, audits, or inspections, depending on the nature of the corrective action.
- 5. Compare Results:** Compare the results of the follow-up verification with the initial problem assessment and baseline data. Evaluate whether the implemented corrective action has achieved the desired outcomes and met the predefined criteria for success.
- 6. Documented Findings:** Document the findings of follow-up verification, including any observations, deviations, improvements, or areas for further action. Maintain clear records of verification of activities, results, and conclusions.

Follow-up Verification of Corrective Actions (continuation)

- 7. Communicate Results:** Communicate the results of follow-up verification to relevant stakeholders, including management, employees, customers, suppliers, and regulatory authority. Share insights, lessons learned, and recommendations for continuous improvement.
- 8. Address Issues:** If follow-up verification reveals any gaps, deficiencies, or areas of noncompliance, take corrective actions promptly. Implement additional measures, adjustments, or improvements as needed to address identified issues.
- 9. Update Documentation:** Update documentation, reports, and records related to the corrective action process. Include details of follow-up verification findings, actions taken, and any revisions to the action plan or procedures.
- 10. Monitor Ongoing Performance:** Continuously monitor ongoing performance and feedback to ensure sustained effectiveness of the corrective action. Implement mechanisms for continuous improvement, learning, and adaptation based on feedback and results.

Note: By following these steps, organization's can verify the effectiveness of corrective actions, address any remaining issues, and foster a culture of continuous improvement and problem-solving.



Do You Have Any Questions?

Please contact Wyndie Meyer