



Root Cause Analysis

Closing Skill Gaps Initiative



Topics

- Objectives
- Root Cause Analysis Overview
- Brainstorming
- Root Cause Identification
 - Why Reality Charting
 - Ishikawa Diagramming
- Prioritization
 - Multivoting
 - Importance-Difficulty Matrix
- Next Steps



Objectives

- Learn and apply in a case study the concepts and techniques of
 - Why Reality Charting
 - Ishikawa Diagramming
 - Multivoting
 - Importance-Difficulty Matrix
- Be prepared to
 - Select a root cause analysis (RCA) process by May 13, 2015
 - Complete the RCA for your selected mission-critical occupations (MCOs) by July 15, 2016

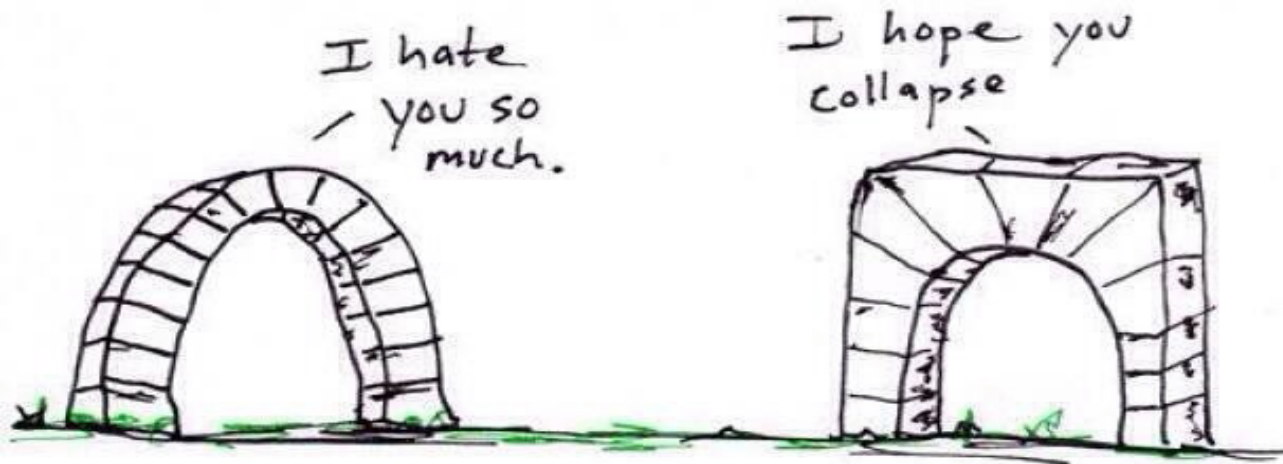




The Most Interesting Dog in the World



Arch Enemies

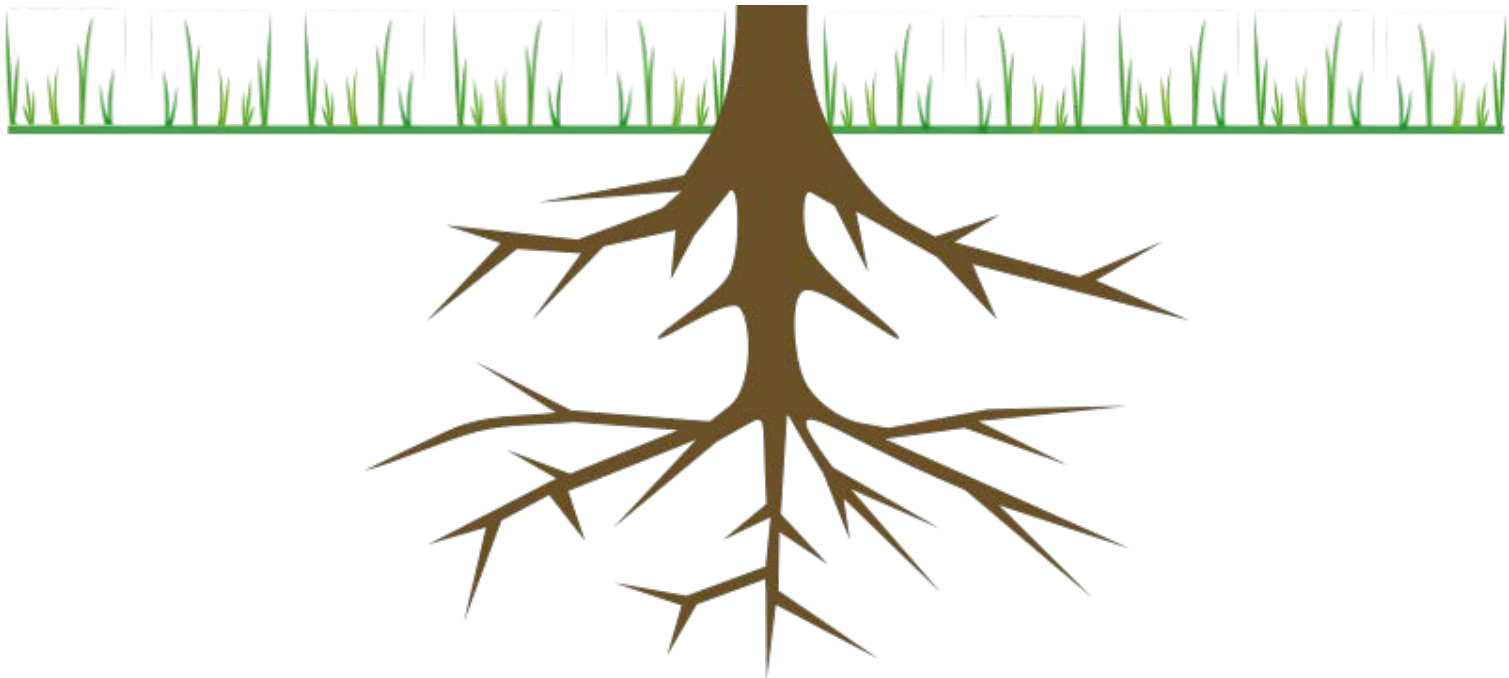


Arch Enemies

Jason Bergsieker



Root Cause Analysis Overview





Fresh Look at RCA

- Although an RCA process was introduced during the previous Closing Skills Gaps cycle, in hindsight, it was not comprehensive enough and was not conducted consistently
- Therefore, we are taking a fresh look as well as an integrated and comprehensive approach to RCA
- A new RCA should be conducted even if there may have been a previously conducted analysis, because
 - Circumstances, people, and skill needs may have changed
 - It may not have looked into all areas for which an MCO was selected for this current effort





Purpose

- The purpose of any root cause analysis is to find effective solutions to problems such that they do not reoccur
- RCA “is a process of analysis to define the problem, understand the causal mechanism underlying transition from desirable to undesirable condition, and to identify the root cause of the problem in order to keep the problem from recurring by using a structured procedure”

Okes, D., *Improve your root cause analysis*. Manufacturing Engineering, 2005.



An Investigative Approach

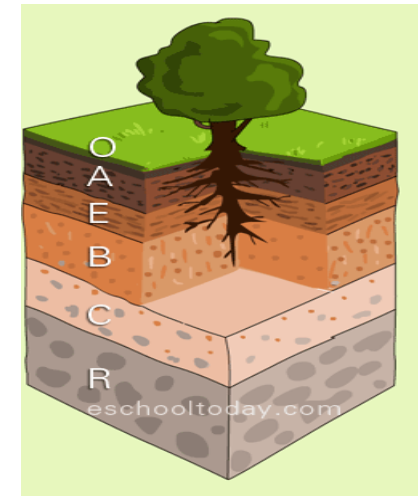


- RCA is to be an investigative, data-driven approach to determine the foundation of problems and consequently inform where solutions might be found
- An investigative, data driven approach will include:
 - Sources (quantitative and qualitative data)
 - Intermediate findings (answers that lead to additional questions)
 - Findings (conclusions)
- Research is the essential element, **not** intuition or “gut-feeling”



Digging Deep

- **We really have to dig deep to find most roots**
- They usually are not the most immediate, obvious, or proximate causes
- **Often, they are three, four, or five layers down into the system**
- This will require time, carefully selected RCA members, thoughtful input, and executive commitment and support





RCA Process Criteria

An effective RCA process should meet the following four criteria:

1. Clearly defines the problem(s)
2. Clearly establishes causal relationships between the root cause(s) and the defined problem
3. Clearly delineates the known dynamics among those causal relationships on how they combined to cause the problem
4. Clearly presents the evidence used to support the existence of identified causes

Note: If a FAST chooses to use an already established process for the RCA that is different from the techniques discussed today, it must meet these criteria.



Cautions

- There may be several root causes for an event or a problem, thus requiring **persistence** in sustaining the effort to locate them
- In cases of human error, **people are rarely the true root cause.** Seek the system, policy, or process that allowed the error to occur.
- RCA is **not designed to establish blame** for a non-conformity, but to correct the underlying cause and prevent re-occurrence



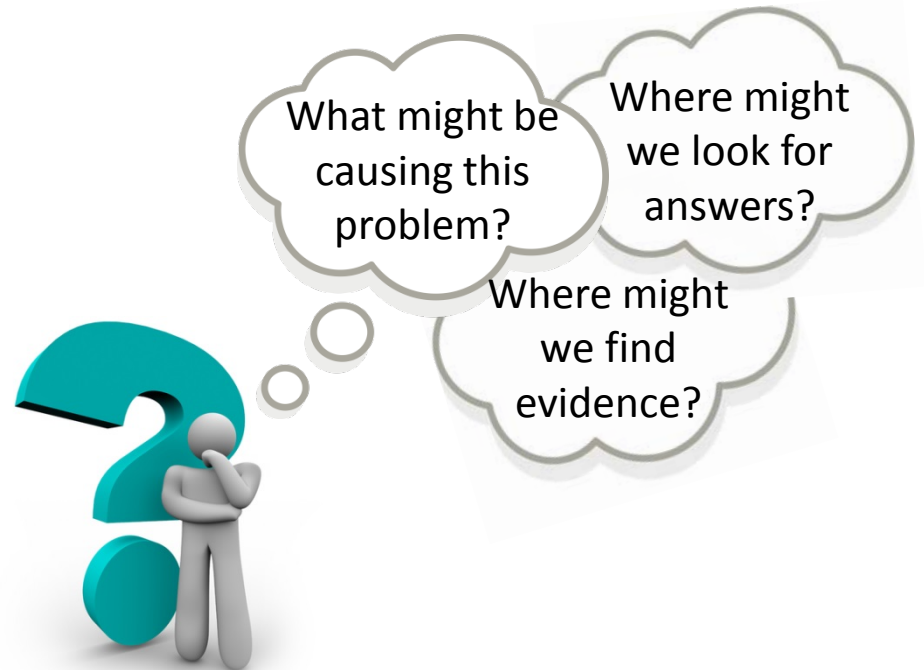


Brainstorming



Why Brainstorming?

- Brainstorming and group idea generation will likely be needed several times in the RCA process
- RCA is an iterative process from question to answer to question...
- When beginning to address a given question, you will likely start with brainstorming





Guidelines

To get the most out of your brainstorming:

- **Defer judgment –**
There are **no bad ideas** at this point; there will be plenty of time to judge ideas later
- **Encourage wild ideas –**
It's the wild ideas that often create real innovation
 - It is always easy to bring ideas down to earth later
- **Build on the ideas of others –**
Think in terms of “**and**” instead of “but”
 - If you dislike an idea, challenge yourself to build on it and make it better
- **Stick to one conversation at a time –** Allow ideas to be heard and built upon





Guidelines (cont'd)

You should also:

- **Stay focused –**
You will get better output if everyone is disciplined
- **Be visual –**
Try to engage the logical and the creative sides of the brain
 - A quick sketch can help make your idea more understandable to someone else
- **Go for quantity –**
Remember there is no need to make a lengthy case for your idea since no one is judging
 - Ideas should flow quickly



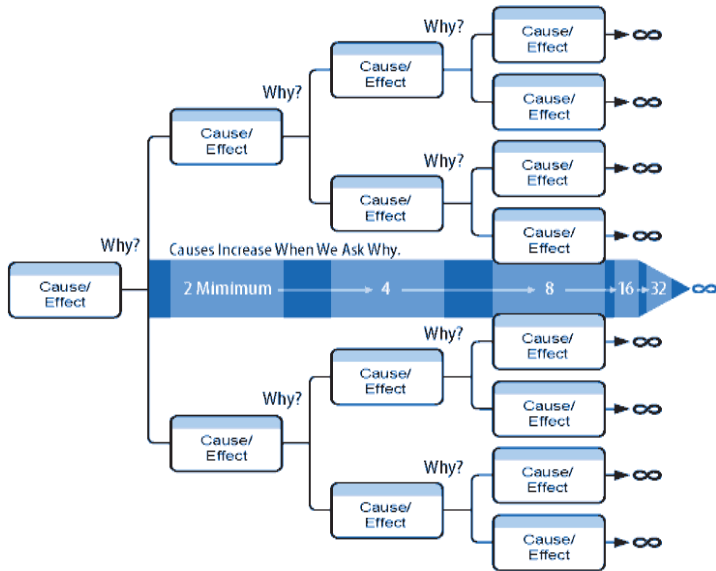
Root Cause Identification



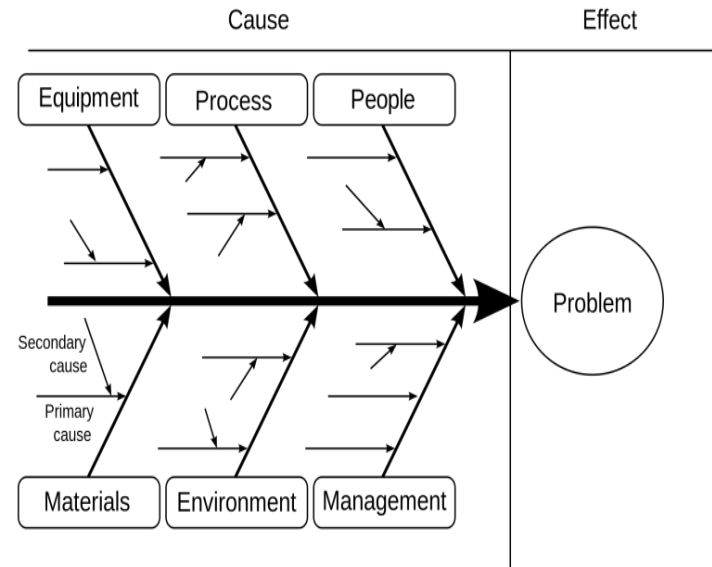
Today's Processes

- We will engage in two root cause identification processes

Why Reality Charting



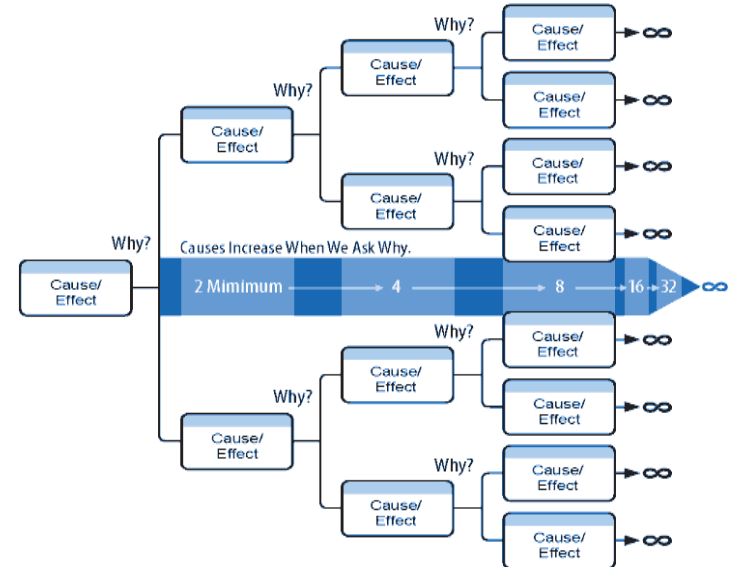
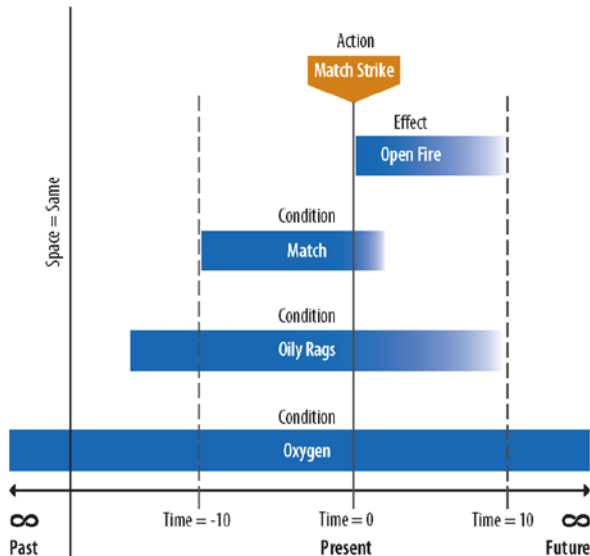
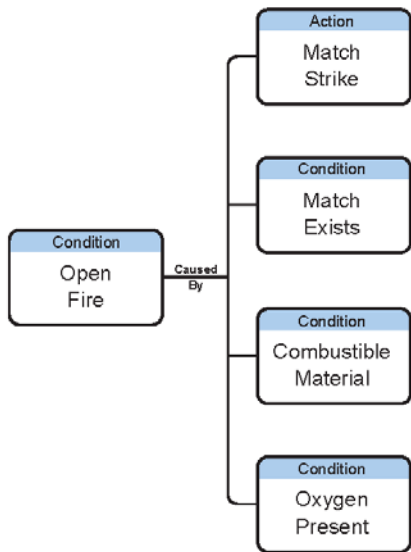
Ishikawa Fishbone Diagramming



- Both processes are pre-approved by OPM in meeting the criteria for an effective RCA process (slide 30)



Why Reality Charting



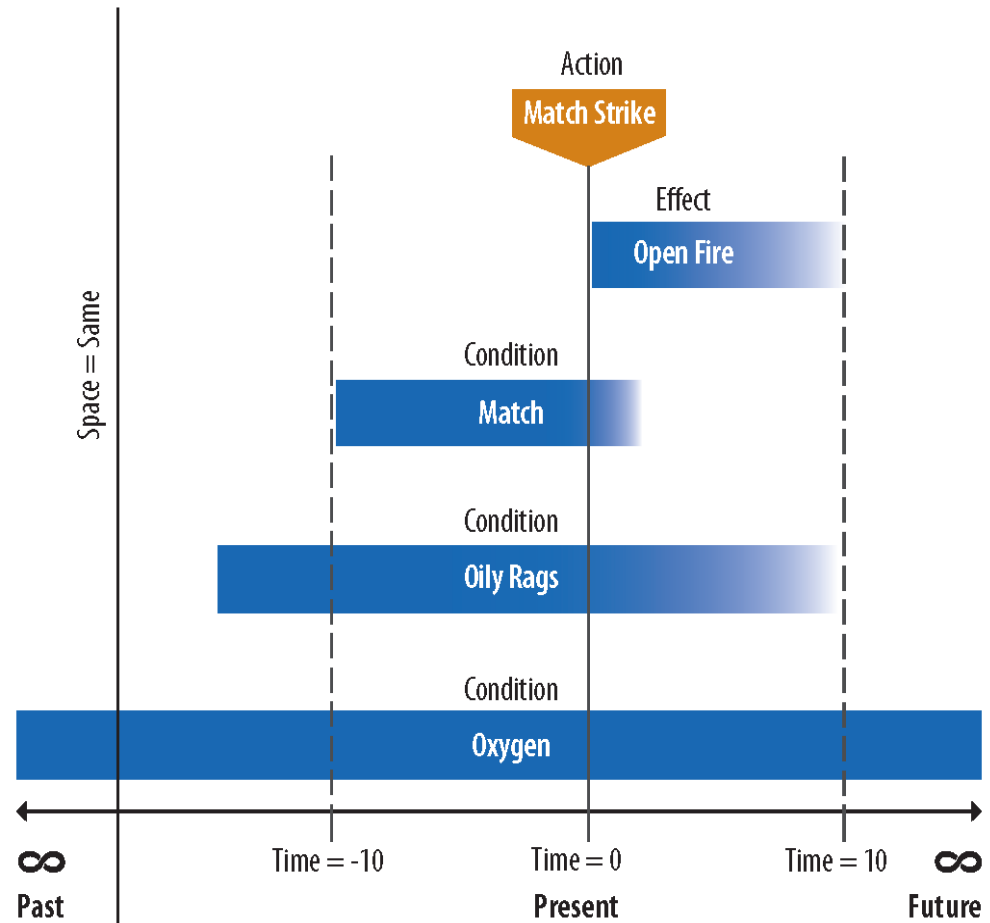
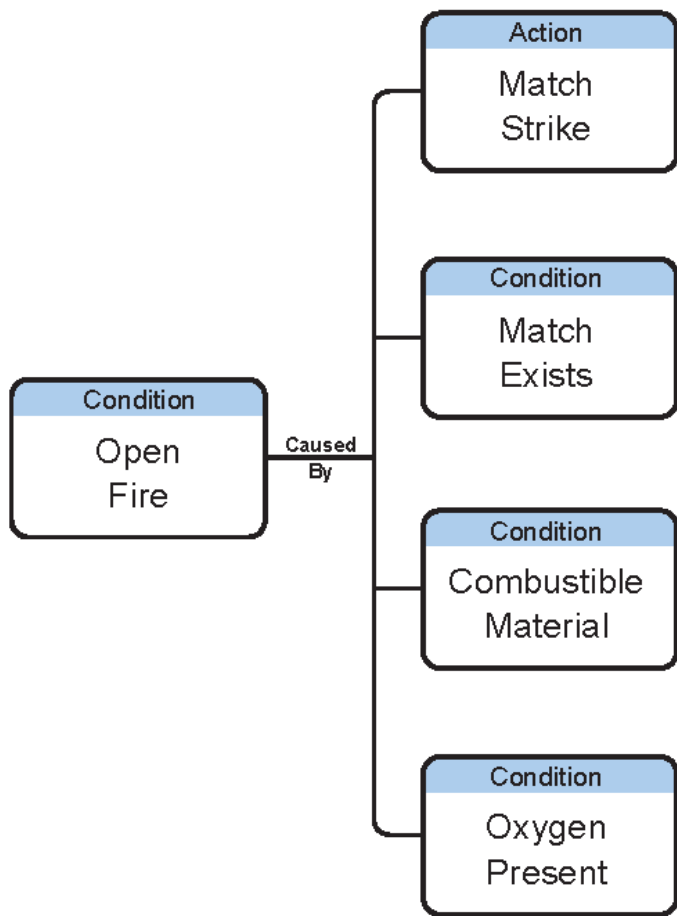


Apollo RCA Principles

1. Cause and effect are the same thing
2. Each effect has at least two causes in the form of actions and conditions
3. Causes and effects are part of an infinite continuum of causes
4. An effect exists only if its cause exists in the same space and time frame

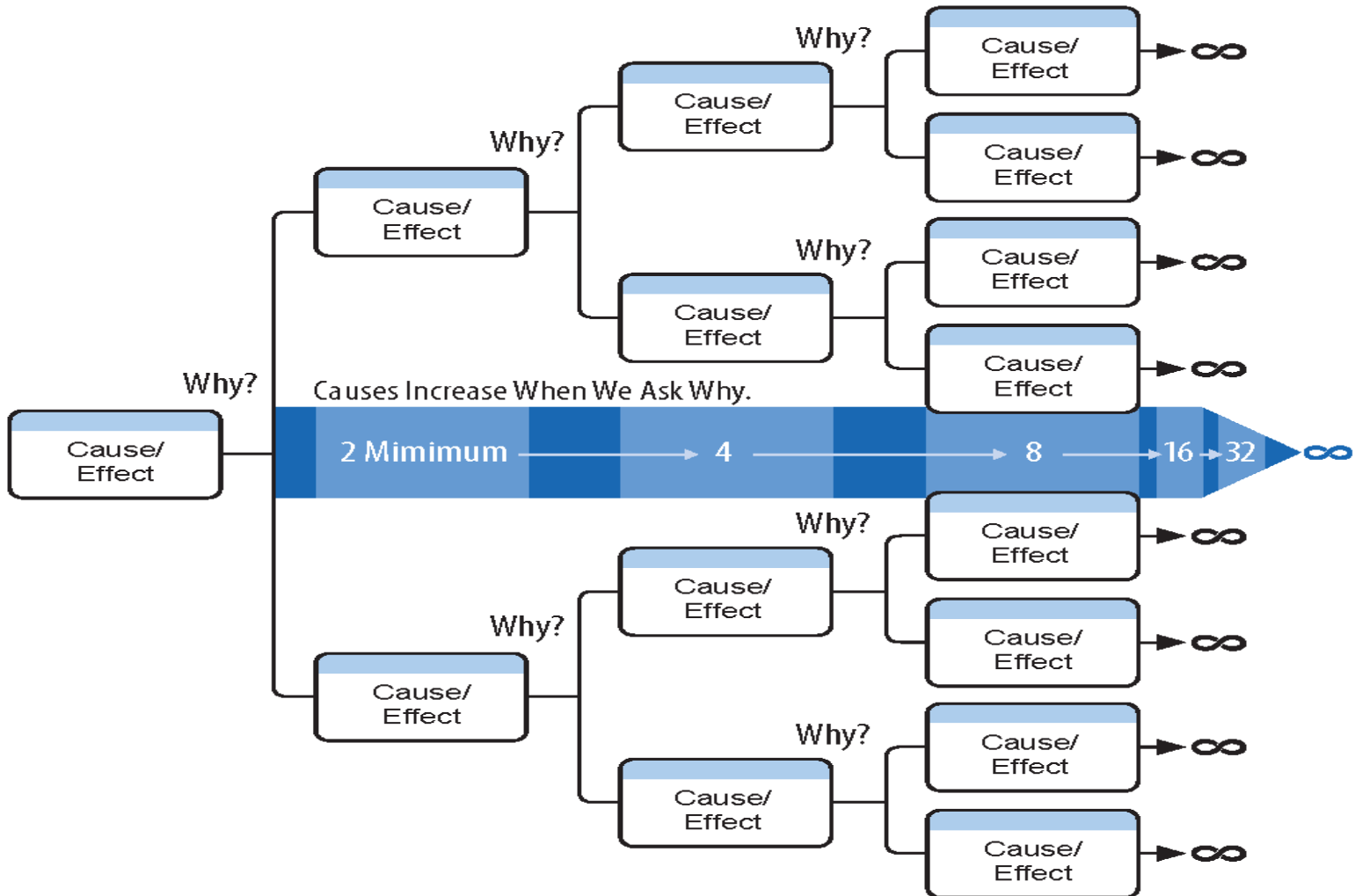


Example: Open Fire





“Why’s” in Reality Charting





5 Steps to Problem Solving

Step 1:

Define the problem

- What is the problem?
- When did it happen?
- Where did it happen?
- What is the significance of the problem?



5 Steps to Problem Solving

Step 2:

Determine the Causal Relationships

- For each primary effect, ask why
- Look for causes in actions and conditions
- Connect all causes with “Caused By” statements
- End each cause path with a question mark or a reason for stopping



5 Steps to Problem Solving

Step 3:

Clearly establish causal relationships between the root cause(s) and the defined problem

- You begin creating the graphical representation
- As you collect causes and effects, begin sequencing them
- Though software is available, you can use a low-tech method:
 - a. Write each action or condition on a Post-It Note.
 - b. Place the Post-It Notes on a whiteboard.
 - c. Sequence the Post-It Notes from cause to effect. When you are sure that the cause and effect are linked, connect the Post-It Notes with a caused-by line drawn on the whiteboard.



5 Steps to Problem Solving

Step 4:

Clearly present the evidence used to support the existence of identified causes

- Using our low-tech method:
 - d. Create a second Post-It Note for each Post-It Note in your diagram.
 - e. On these second Post-It Notes, record the evidence for the action or condition. Write “observation,” “document,” or any appropriate evidence type. If you don’t know what evidence supports the action or condition, make sure to note that for further research.



5 Steps to Problem Solving

Step 5:

Determine if the Causes are Sufficient and Necessary

Sagan's Baloney Detection Kit

1. Seek independent facts
2. Welcome open debate on all points of view
3. Always challenge authority
4. Consider more than one hypothesis
5. Don't defend a position because it is yours
6. Try to quantify what you know
7. Every link must work in a chain of causes
8. Use Occam's razor to decide between hypothesis
9. Try to prove the hypothesis wrong
10. Use carefully designed experiments to test all hypothesis

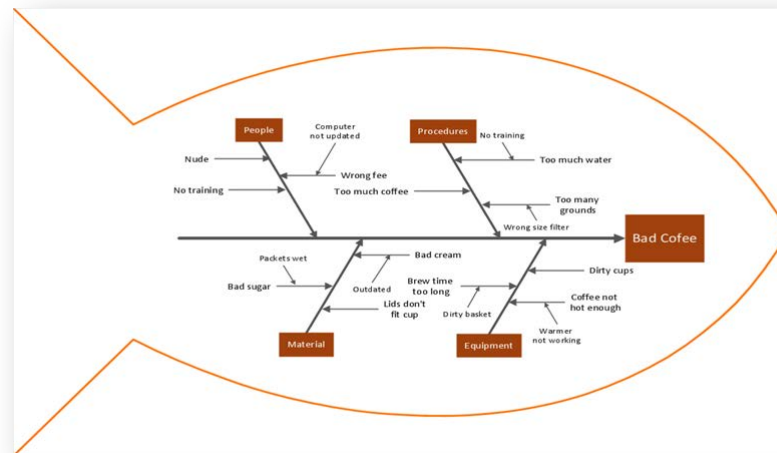


Why Reality in Practice

- Please take about 5 minutes to read the case study handout
- Within your groups, take about 20 minutes to:
 - Define the problem (slide 42)
 - Establish and define the causal relationships in a graphical representation (slides 41, 43, 44)
 - Present the evidence to support the identified causes (slide 45)
- Groups will report out their results

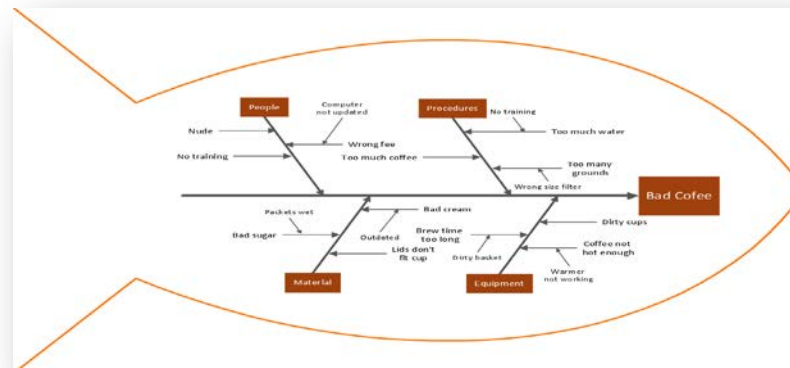
Ishikawa Diagramming

The Fishbone Analysis Process



What is an Ishikawa Diagram?

- Dr. Kaoru Ishikawa, noted for his quality management innovations, invented the fishbone diagram in 1968
- Also referred to as the herringbone diagram, Fishikawa, and a cause-and-effect diagram
- Technique that provides a systematic way of understanding effects (problems) and the root causes that created them





Primary Benefit



When used correctly, the Ishikawa diagramming and analysis technique is an excellent tool in assisting teams in categorizing, without biases, the potential causes of problems or issues via a systematic approach that also helps identify the root cause(s) of a effect, issue, or problem.



Components of the Fishbone Diagram

Rectangles at the end show the main **category** causes of the problem. Diagonal arrows point to the spine.

Category

Reasons are secondary causes that further explain the primary causes

Reason

Cause

The **spine** is the large arrow going horizontally from left to right and points to the effect

The **problem (or effect)** you are investigating is placed on the right side of the diagram

Problem

Primary **causes** are listed on arrows that connect to the categories

Cause (+)

Cause (-)

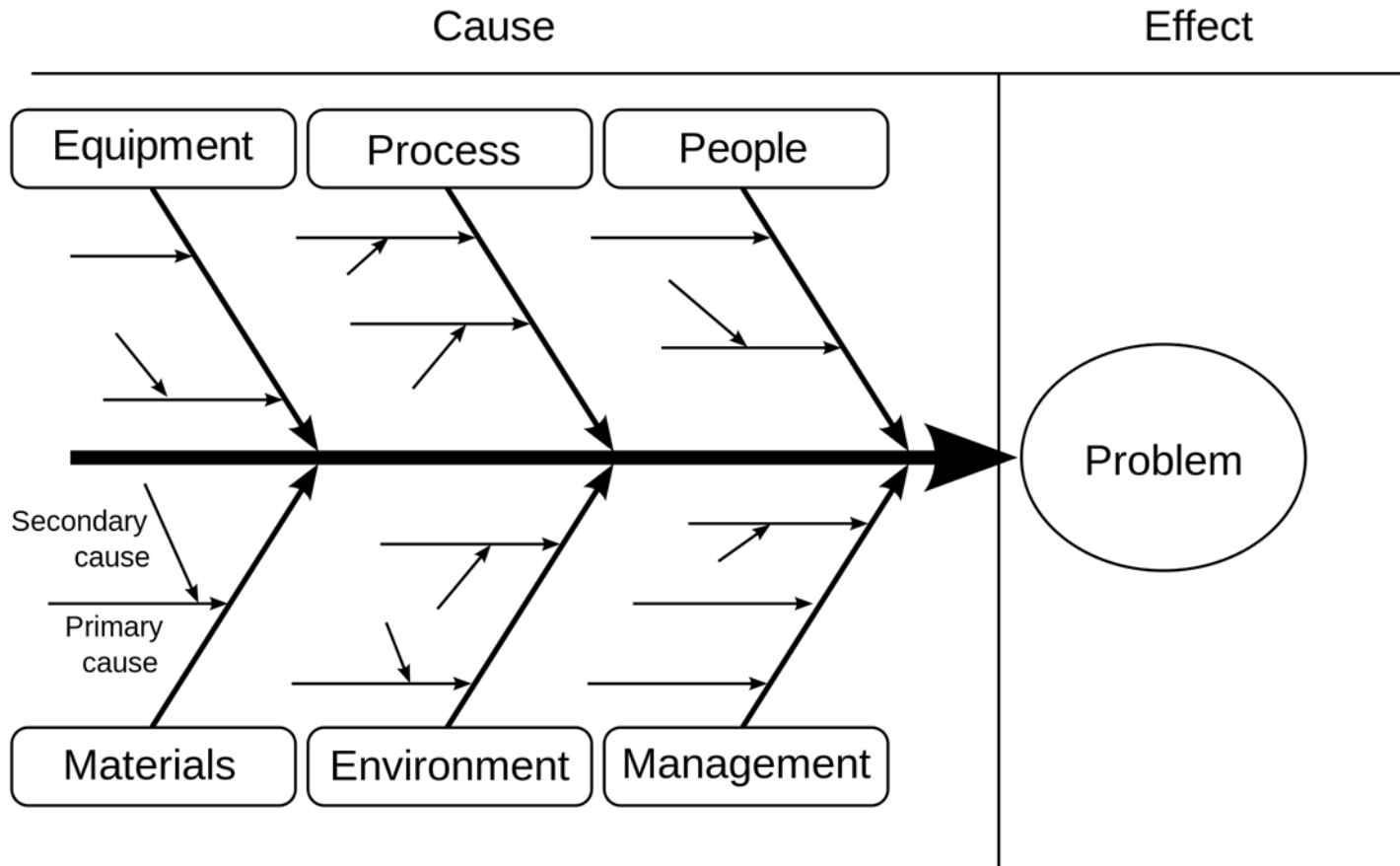
Arrows going from left to right indicate causes that *increase(+)* the main problem

Arrows going from right to left indicate causes that *diminish* the problem

Category



Typical Diagram

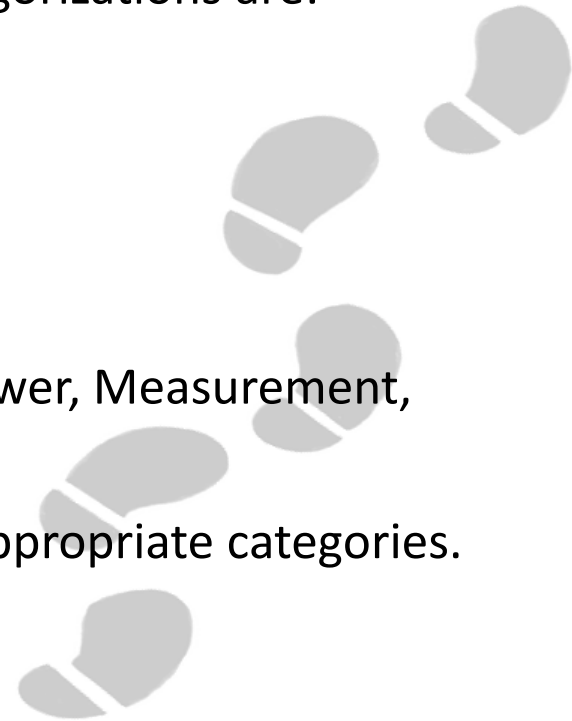




Steps to Creating a Fishbone Diagram

Using a flip chart, Microsoft Word or Visio, etc.

1. Draw a fishbone head and spine.
2. List the problem/effect to be studied in the head of the fish.
3. Add and label the bone categories. Common categorizations are:
 - {Service Process}
 - 4 P's (People, Place, Procedure, Policies)
 - 4 S's (Surroundings, Suppliers, Systems, Skills)
 - {Non- Service Process}
 - 6 M's (Methods, Machines, Materials, Manpower, Measurement, Management)
4. Add and label the causes and reasons under the appropriate categories.





Your Turn

- Use the same information from our case study
- Reference slides 51 and 53
- Within your groups, take about 20 minutes to:
 - Draw a fishbone diagram
 - Label the “head” with the problem/effect
 - Choose and add categories
 - Add the causes (primary) and reasons (secondary) under the appropriate categories
- Groups will report out their results



Root Cause Prioritization

Today's Methods

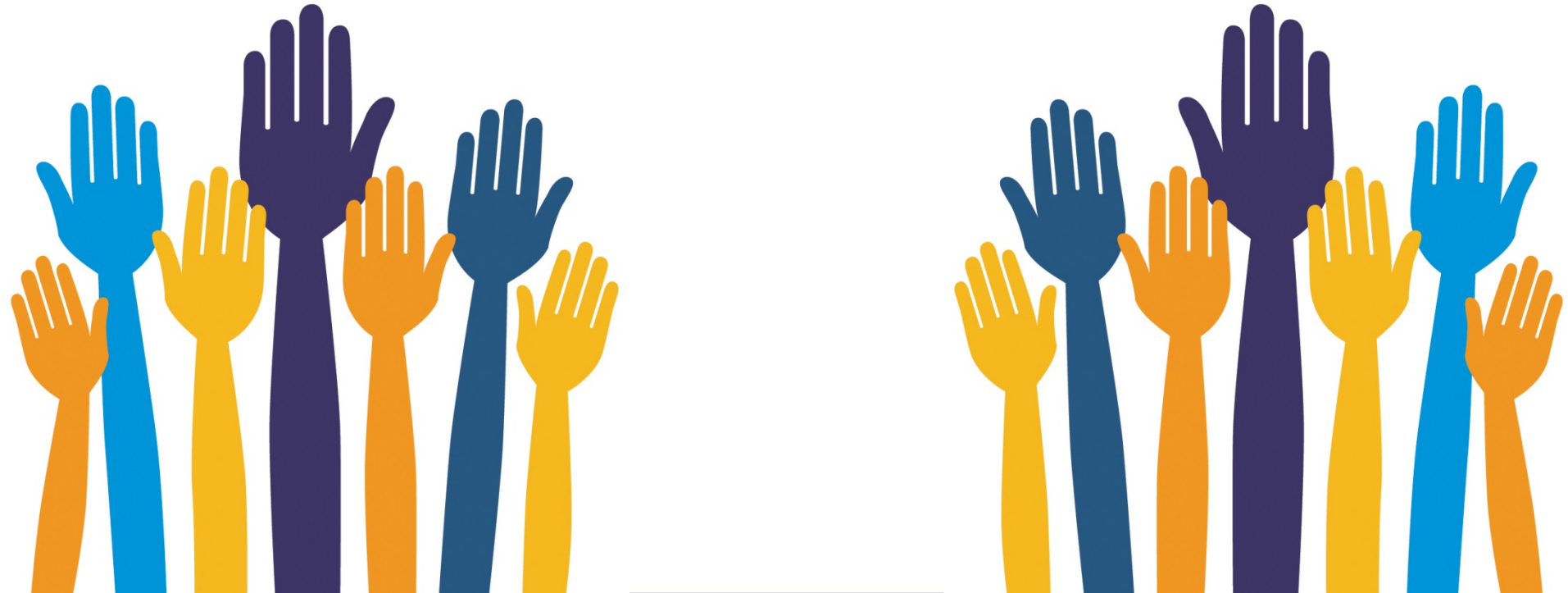
- Prioritization will be needed when you won't be able to address every identified root cause
- The two processes we will engage in today are
 - Multivoting
 - Importance-Difficulty Matrix
- They rely on and systematically organize the opinion and judgment of the FAST subject-matter experts

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Multivoting





About Multivoting

- Used by groups to **reduce a list** from a large number to a more manageable number of items through a **series of votes**
- Aims to garner **consensus** around a feasible list of priorities (not used for consensus around a single option)
- Applied in **many variations** and is also referred to as N/3 voting, nominal prioritization, dot voting, and more





Benefits

Serves as an **efficient** process to quickly move on to next steps, when facing time constraints

Provides a **clear understanding** on how the team will reduce the list to a manageable number



Reduces pressure and lets everyone **participate equally**, whether highly or minimally vocal

Allows an item that is **favored by all**, but not the top choice of any, to rise to the top (asq.org)



How it Works

1. Assign a number or letter to each unique item on your list and have your ordered list visible for reference
2. Determine how many votes each person will cast (typically $\frac{1}{3}$ of the available items)
3. Cast your votes and tally the results
4. Remove items from your list that have few to no votes
5. Repeat steps 2 – 4 on the reduced list until there is a manageable list of items



Voting Procedures

Voting Options

Anonymity
is not
desired

Show of hands—members raise their hands to cast a vote, which are counted and noted as you proceed through each option

Tally marks—members place a tally mark next to each of their selections on one central sheet

Stickers—members place stickers or other adhesive items (such as dots) next to each of their selections on one central sheet

Anonymity
is desired

Ballots—members write their selections on a piece of paper, post-it, or 3x5 card, which are then collected, shuffled, and tallied

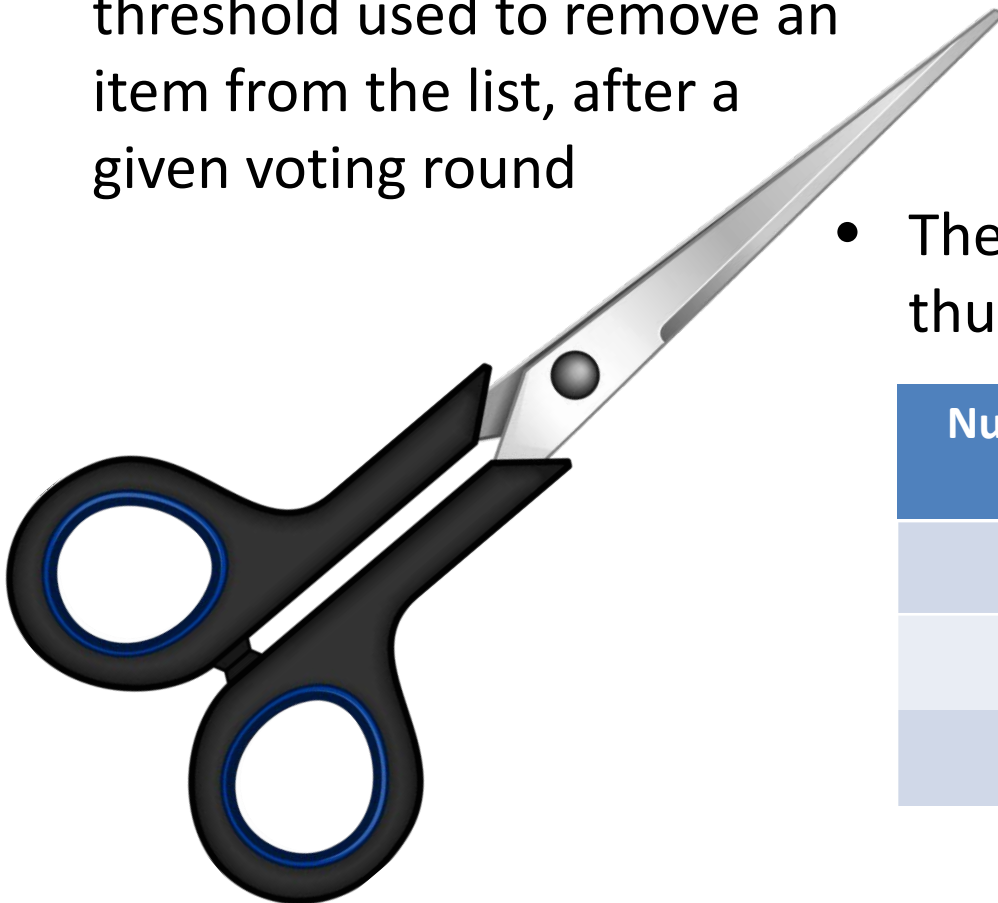


All votes must be cast, with each person casting only one vote per item



Trimming the List

- Teams will determine the threshold used to remove an item from the list, after a given voting round



- The following is a suggested rule of thumb (balancedscorecard.org):

Number of Team Members	Eliminate Items with:
≤ 5	0 – 2 Votes
6 - 15	0 – 3 Votes
> 15	0 – 4 Votes

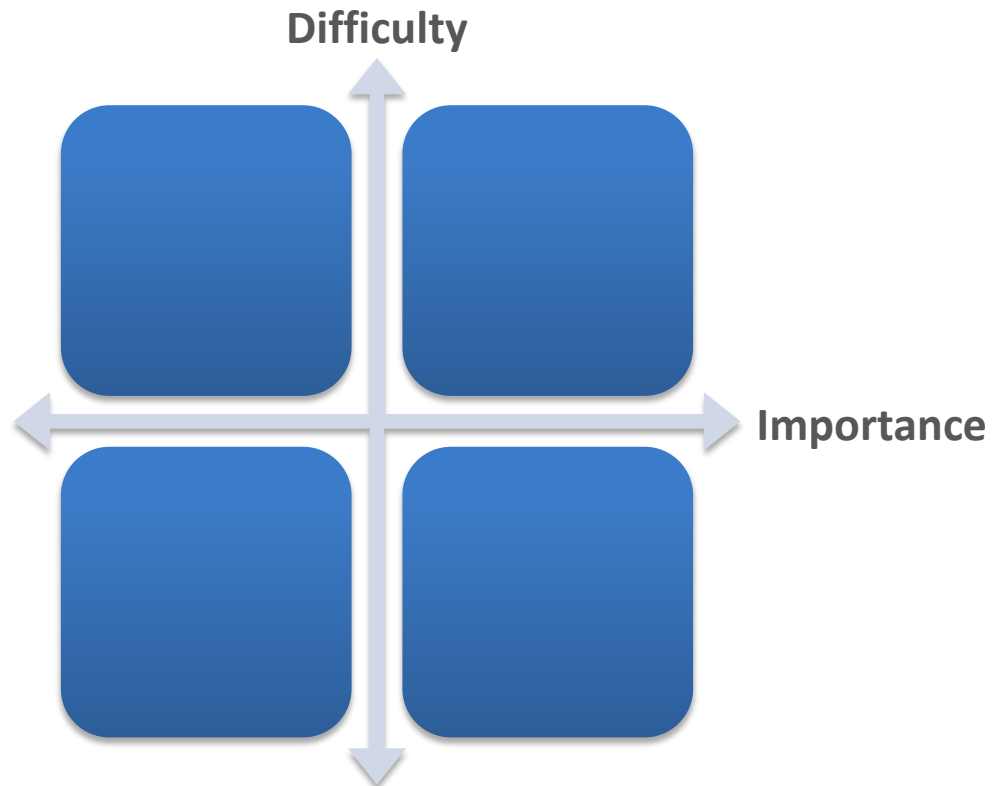


Let's Multivote!

- Using the collective unique root causes identified, we will facilitate one multivoting exercise for the room
- In each round, every person will vote for $\frac{1}{3}$ of the options
 - Round 1: _____ options \div 3 = _____ votes per person
 - Round 2: _____ options \div 3 = _____ votes per person
 - Round 3: _____ options \div 3 = _____ votes per person
- We will conduct our voting using a show of hands
 - Raise your hand when an item you wish to cast your vote for is read aloud
 - Keep your hand raised until you're certain it has been counted
- Please ensure you cast all of your allocated votes in each round



Importance-Difficulty Matrix





The Matrix

- A **quad chart** to plot options according to their relative importance (x-axis) and difficulty (y-axis)
- Approaches decision-making based on **relative return-on-investment** by balancing the two competing forces
- Facilitates **deliberation** to resolve differences in opinion

Importance

The impact an item has on your problem statement and the extent to which addressing it could better the situation

vs.

Difficulty

The amount of effort, resources, and time potentially needed to address an item, including overcoming anticipated barriers



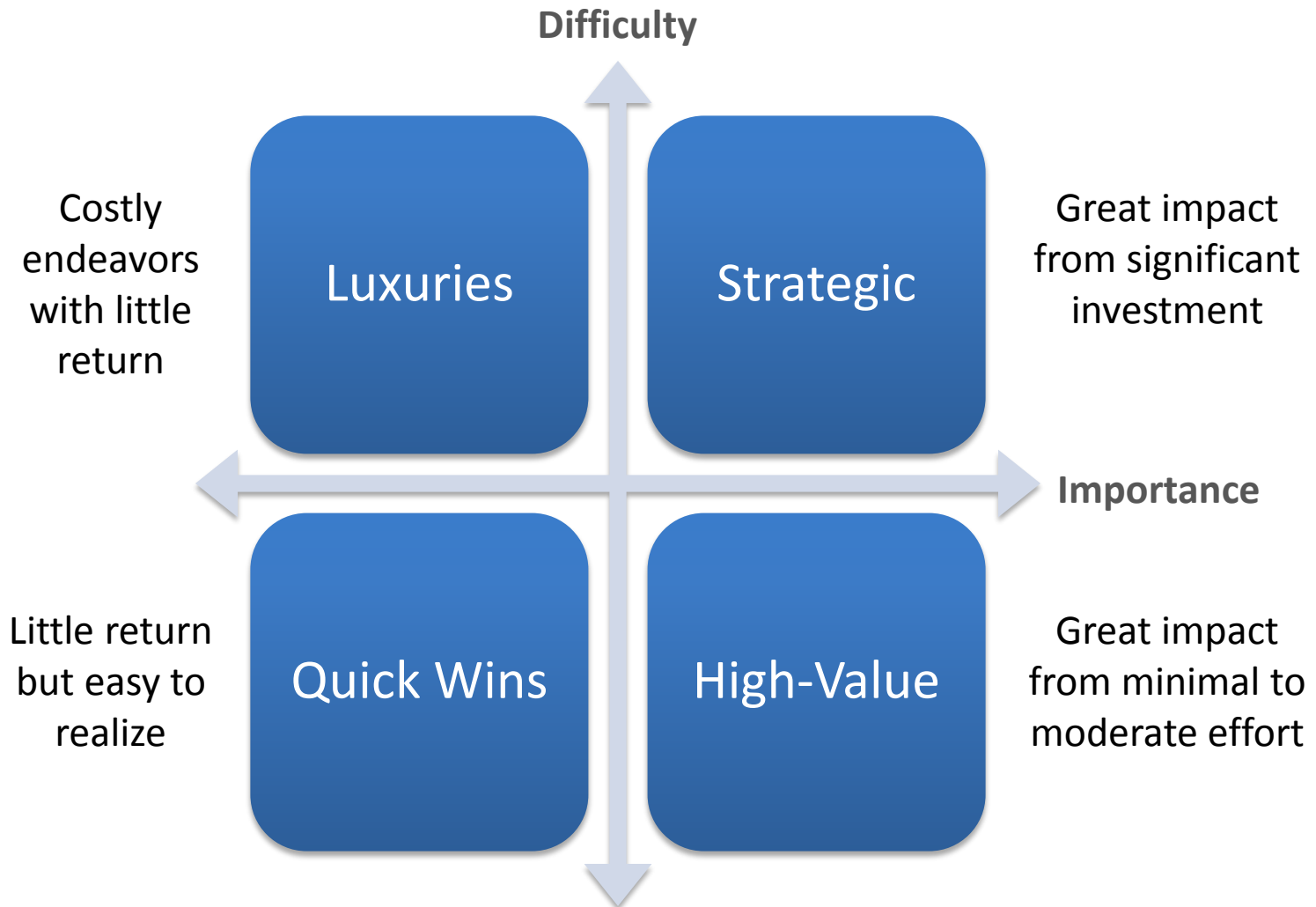
How to Plot Items

1. On a large sheet of paper, draw your quad chart and label the horizontal line “Importance” and the vertical line “Difficulty”
2. Write each unique item on individual post-its
3. Rank the items from least (left) to most (right) important
 - a. Place any one post-it on the middle of the Importance axis
 - b. Select a second post-it and decide as group if it is more or less important than the first. If more, place it to the right. If less, place it to the left.
 - c. Continue to determine as a group if each remaining post-it is more or less important than the others and place them in the appropriate spot.

Note: No two items can be ranked the same (e.g., tie) on importance
4. Keeping your post-its in their Importance rankings, move them up (high) or down (low) based on their relative difficulty



Interpreting Results





Matrix Exercise

- Use the same list of root causes from our multivoting exercise
- Reference slides 48 and 49
- Within your groups, take about 10 minutes to:
 - Draw your quad charts
 - Write the root causes on post-its
 - Plot the post-its on the Importance axis, in a forced ranking
 - Move the post-its vertically (only!) on the Difficulty axis
 - Select the root causes you recommend for action planning
- Groups will report out their results on what they recommend and why



RECOMMENDED



Next Steps



RCA Deliverables

Regarding RCA, all FASTs are required to:

Select an RCA process
and notify OPM by
May 13, 2016

Conduct an RCA and
submit the results to
OPM by July 15, 2016

Email all submission to: closingskillsgaps@opm.gov



Selecting Your RCA Process

- FASTs may select
 - a) The RCA techniques presented in the OPM-hosted training
 - b) Other established processes an organization already has in place
 - c) A combination of both
- Selections must include
 - A root cause **identification** technique (how you'll investigate the problem)
 - A **prioritization** technique (how you'll select causes for action planning)
- Root cause identification techniques must meet the four criteria for an effective RCA process (slide 30)
- FASTs will notify OPM of their selections through the RCA Process Certification Form due **May 13, 2016**



Conducting Your RCA

- FASTs must use the techniques submitted to and vetted by OPM, according to their final RCA Certification Forms
- A separate RCA will be conducted for each MCO, as the issues they face should differ
- **Why at Risk = Problem Statement**
Factors from the Multi-Factor Model (and/or any supplemental factors) whose risk levels were used to select an MCO will be used as the starting points/problem statements for the RCA



Submitting Your Results

- There is no specified template for submitting RCA results
- However, the following elements must be included in the FAST submissions due **July 15, 2016**:
 - ✓ List of all root causes identified
 - ✓ List of the root causes selected for action planning and why they were selected (e.g., prioritization results)
 - ✓ Graphical representation of the causal linkages from the root causes to the problem statement
 - ✓ Evidence supporting the identification of the root causes



