

AQS 200

ROOT CAUSE INVESTIGATION

This material is based upon work supported
by the National Science Foundation under
Grant No. 1304474



Developed as part of NSF AQS Grant #1304474

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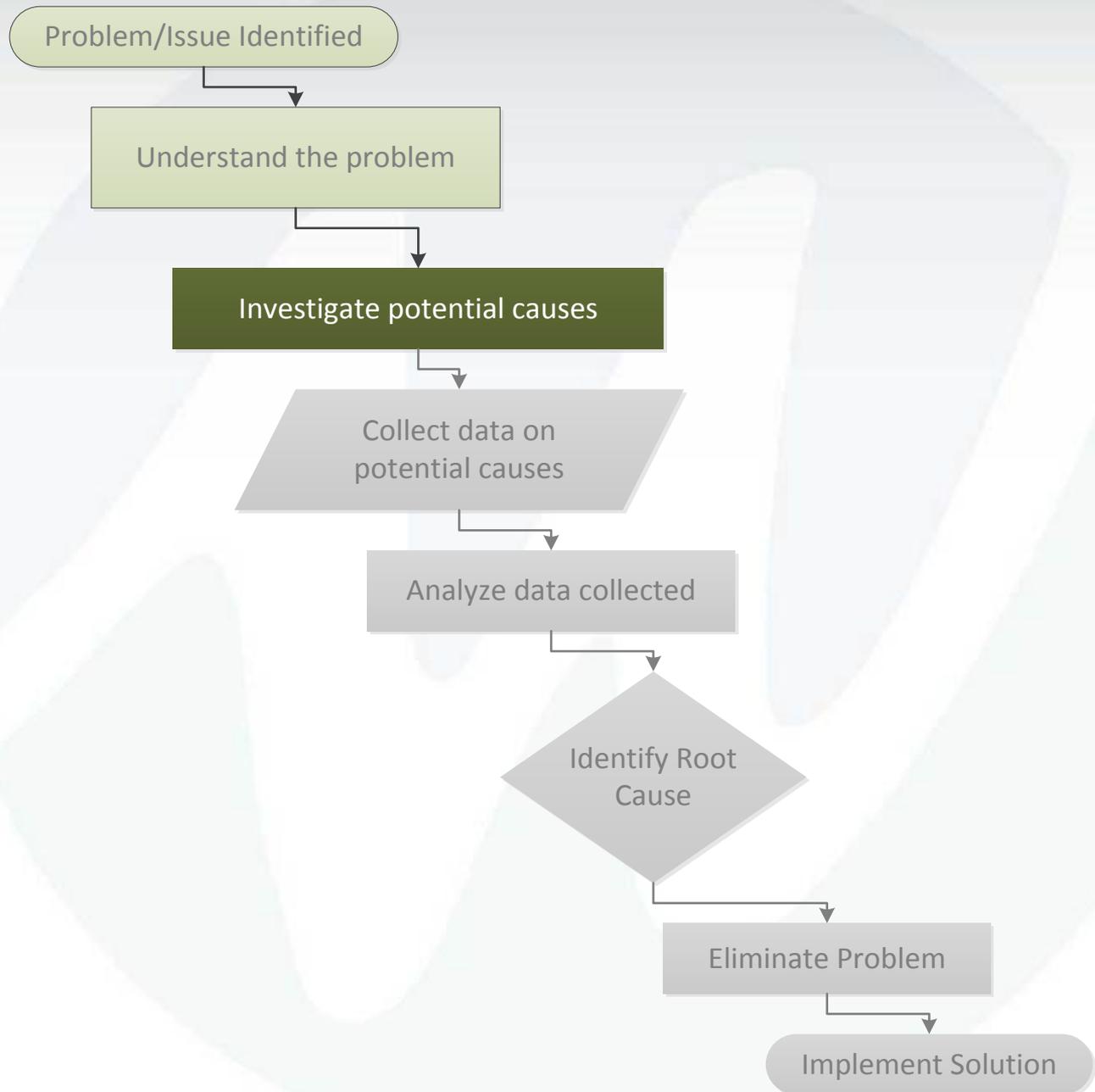
Lecture 6

Tools for

Problem Cause Investigation

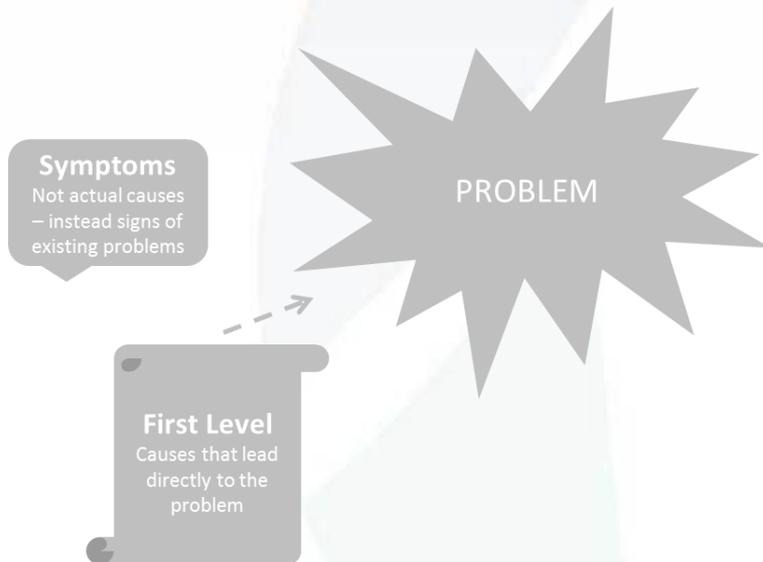
- Brainstorming
- Brain-writing
- Nominal Group Technique
- Is-is Not Matrix
- Paired Comparisons





CAUSE INVESTIGATION

- Root Cause – The fundamental (true) reason a product or process nonconformance occurred.



Define the issue

Understand scope of investigation

Idea generation to determine potential causes of a problem

Reach agreement in cases of dispute or differing views

Tools for Problem Cause Investigation

- Brainstorming
- Brain-writing
- Nominal Group Technique
- Is-Is Not Matrix
- Paired Comparisons

Idea generation
techniques

Idea Generation
AND
Evaluation/Priority
Techniques

Tools for Problem Cause Investigation

- **Brainstorming**
- Brain-writing
- Nominal Group Technique
- Is-is Not Matrix
- Paired Comparisons

Brainstorming

- Generate a list of problem areas that can be improved
- Identify possible consequences stemming from the problem being analyzed
- Develop list of possible causes of the problem
- Encourage thinking about ways to eliminate the causes

Brainstorming

- Two types
 - **Structured**
 - Aka “round-robin”
 - Each participant in turn launches one idea
 - **Unstructured**
 - Aka “free-wheeling”
 - Spontaneous calling out of ideas

Brainstorming – How To

1. Write clearly defined topic on top of whiteboard or flip chart.
2. Participants provide ideas (structured/unstructured)
3. Facilitator writes down all ideas using the same wording as the original proposition
4. NO discussion of ideas (evaluate/criticize)
5. Continue until no more ideas, or ideas are repeated
6. Evaluate ideas (group, prioritize)

EXERCISE

Tools for Problem Cause Investigation

- Brainstorming
- **Brain-writing**
- Nominal Group Technique
- Is-is Not Matrix
- Paired Comparisons

Brain-writing

- Similar to Brainstorming - but written
 - Advantages include more descriptive detail, everyone participates, anonymity (if needed)
- Two types
 - Card method
 - Gallery method

Brain-writing

- Two types
 - **Card method**
 - ideas are written on small cards
 - *Optional - circulated among the participants, who added related ideas or expand on the existing ones*
 - **Gallery method**
 - Topics written on flip charts / stations
 - Team members circulate through adding ideas

Brain-writing How To

1. Establish clearly defined target topic
 - Depending on method, provide index cards or stations
2. Participants write down their ideas
 - precise explanations encouraged
 - time limit per station may be applicable
3. Allow participants to add to others' ideas
 - benefits of combining ideas / further development
4. Evaluate ideas (group, prioritize)

EXERCISE

Tools for Problem Cause Investigation

- Brainstorming
- Brain-writing
- **Nominal Group Technique**
- Is-is Not Matrix
- Paired Comparisons

Nominal Group Technique (NGT)

- An alternate form of brainstorming
 - facilitates participants having the same vote when selecting solutions
 - Allows time for thinkers to come up with solutions
 - Provides those who remain quiet a voice
 - Can diffuse hot button issues
 - Ideas generated similar to brain-writing, but voting/ranking also conducted individually rather than in a group

Nominal Group Technique – How To

1. Defined problem statement is provided. Each person generates ideas and writes them on idea cards
 - one idea on each card
2. Facilitator assigns each idea a letter (from A onward) and registers it on a flip chart.
 - Participants briefly discuss the ideas for clarification and elimination of similar ideas.
3. Voting (ranking) card/sheet provided and each participant selects 5 most important
 - Assigned value of 5 = most important
 - Assigned value of 1 = least important

Nominal Group Technique – How To

1. Individual Ideas
2. Each idea assigned an identifier
3. Individual ranking, 5 most important
4. Facilitator collects cards and totals points for all ideas
5. Idea(s) with highest total score is Group prioritized decision – becomes logical start point

Example - Handout

EXERCISE

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Idea generation
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Idea Generation
AND
Evaluation/Priority
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Tools for Problem Cause Investigation

- Brainstorming
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- **Is-Is Not Matrix**
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Is-is Not Matrix

- Facilitates separation of the essential from the trivial
 - clarify what the problem *is* or *is not*
- Can provide clarity as to starting point

Is-is Not Matrix – How To

1. Create table of six rows and four columns
 - Column headers: Problem, Is, Is-Not, Distinction

Is-is Not Matrix

Problem	IS	Is NOT	Distinctions

Is-is Not Matrix – How To

1. Create table of six rows and four columns
 - Column headers: Problem, Is, Is-Not, Distinction
2. State problem being analyzed in upper right corner

Is-is Not Matrix

Problem State Issue Here	IS	Is NOT	Distinctions

Is-is Not Matrix – How To

1. Create table of six rows and four columns
 - Column headers: Problem, Is, Is-Not, Distinction
2. State problem being analyzed in upper right corner
3. In “Problem Column” list the following, these become row headers
 - What is affected
 - When it happened
 - Where it happened
 - Extent (frequency)
 - Who

Is-is Not Matrix

Problem <i>(State Issue Here)</i>	IS	Is NOT	Distinctions
What occurred What objects affected			
Where occurred			
When it occurred			
Extent of Problem(s)			
Who was involved			

Is-is Not Matrix – How To

1. Create table of six rows and four columns
 - Column headers: Problem, Is, Is-Not, Distinction
2. State problem being analyzed in upper right corner
3. In “Problem Column” create row headers
 - What, where, when extent, who
4. Fill rows with data
 - First answer “Is” - record known facts
 - Then answer “Is-not” - using known facts
 - Compare “Is” vs “Is-not”
 - Anything stand out
 - Differences /Commonalities

Is-is Not Matrix

Problem <i>(State Issue Here)</i>	IS	Is NOT	Distinctions
What occurred What objects affected	<i>What is..</i>	<i>What is not..</i>	<i>Is there a pattern, describe</i>
Where occurred			
When it occurred			
Extent of Problem(s)			
Who was involved			

Is-is Not Matrix – How To

1. Create table of six rows and four columns
 - Column headers: Problem, Is, Is-Not, Distinction
2. State problem being analyzed in upper right corner
3. In “Problem Column” create row headers
 1. What, where, when extent, who
4. Begin filling rows
 - First answer “Is” - record **known facts**
 - Then answer “Is-not” - using **known facts**
 - **Compare Is vs Is-not for what stands out, conclusions, etc.**

Is-is Not Matrix

Problem (<i>State Issue Here</i>)	IS	Is NOT	Distinctions
What occurred What objects affected	<i>What is..</i>	<i>What is not..</i>	<i>Is there a pattern, describe</i>
Where occurred			
When it occurred			
Extent of Problem(s)			
Who was involved			

Is-is Not Matrix – How To

1. Create table of six rows and four columns
 - Column headers: Problem, Is, Is-Not, Distinction
2. State problem being analyzed in upper right corner
3. Complete “Problem Column” (what, where, when extent, who)
4. Fill rows (what did occur, what did not occur, similarity/differences)
5. Within each row/column analyze how it could be cause of the problem
6. For potential causes test by verifying if they explain all items in “is”/”is-not” columns
 - Those that are explained are likely real causes

Example

Problem	IS	IS NOT	Distinction
Taper length incorrect			
What happened			
Where it happened			
When it happened			
Extent (frequency)			
Who did the inspections			

EXAMPLE

Problem <i>Taper length incorrect</i>	IS	IS NOT	Distinction
What happened	<i>Reported as short</i>	<i>Found in retains</i>	<i>OOS at customer</i>
Where it happened	<i>Reported by customer</i>	<i>final inspection data for product lot</i>	<i>OOS at customer</i>
When it happened	<i>Most recent product lot</i>	<i>10 lots shipped in past 8 months</i>	<i>No pattern in complaints</i>
Extent (frequency)	<i>Reported as every piece inspected</i>	<i>16 months - No NCRs !st complaint in 24 months</i>	<i>No internal pattern</i>
Who did the inspections	<i>Unknown inspector</i>	<i>multiple inspectors</i>	<i>New inspector at Customer?</i>

This was determined to be an inspection issue at the Customer.

EXERCISE

Tools for Problem Cause Investigation

- Brainstorming
- Brain-writing
- Nominal Group Technique
- Is-is Not Matrix
- **Paired Comparisons**

Paired Comparison

- Tool for prioritizing and decision making related to ideas generated
 - *One-to-one decisions are easier to make than selecting among a large number of possible solutions.*

Paired Comparison – How To

1. Once ideas have been generated, clearly identify the alternatives to be compared.
 - Typically not more than 8 total
 - Assign each idea a code (e.g. number or letter)
2. Create a matrix
 - Rows will be individual ideas
 - Columns will be comparison pairs

EXAMPLE

Following a brainstorming session, 4 potential causes of the problem were identified.

A = cause 1, B = cause 2, C = cause 3, D = cause 4

	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D	Total
A							
B							
C							
D							

Paired Comparison – How To

1. Once ideas have been generated, clearly identify the alternatives to be compared.
2. Create a matrix
3. Column by column each participant votes for one of the alternatives
 - Votes are logged in the matrix

EXAMPLE

*Vote column by column, comparing only the two alternatives listed in the **column** heading*

	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D	Total
A	4	3	5				
B	4						
C		5					
D			3				

Paired Comparison – How To

1. Once ideas have been generated, clearly identify the alternatives to be compared.
2. Create a matrix
3. Column by column each participant votes for one of the alternatives
4. **When voting complete**
 - Total of each column should equal number of team members
 - Total of each row will provide scoring for the alternatives

EXAMPLE

Column totals should equal total number of team members

Row Totals will be used for prioritization

	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D	Total
A	4	3	5				12
B	4			4	2		10
C		5		4		6	15
D			3		6	2	11
	8	8	8	8	8	8	

Paired Comparison – How To

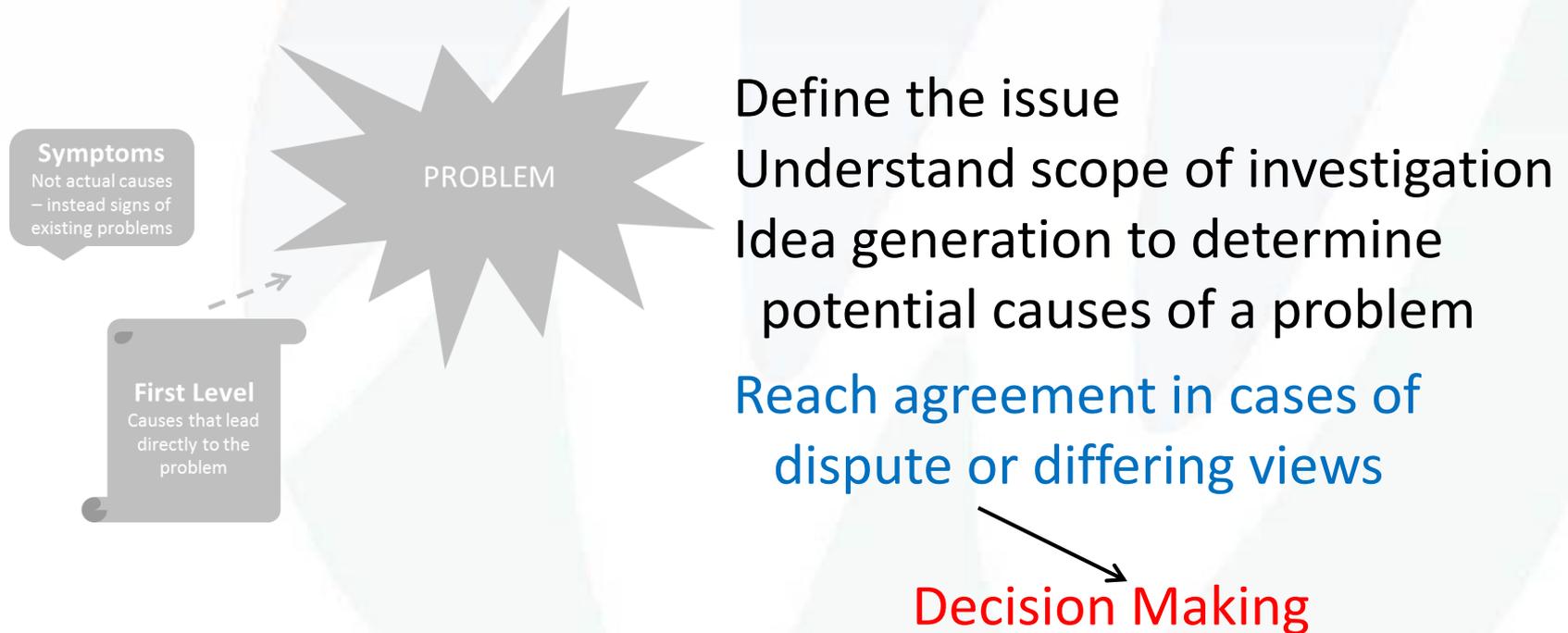
1. Once ideas have been generated, clearly identify the alternatives to be compared.
2. Create a matrix
3. Column by column each participant votes for one of the alternatives
4. When voting complete
 - Row totals will provide scoring for alternatives
5. The highest scoring alternatives should be worked on first

Example hand-out

EXERCISE

CAUSE INVESTIGATION

- Root Cause – The fundamental (true) reason a product or process nonconformance occurred.



Decision Making

- Total Agreement (unanimous)
- Majority (democracy)
- Consensus

Decision Making

- Total Agreement (unanimous)
- Majority (democracy)
- **CONSENSUS** (general agreement)

**Not everyone has to agree with decision,
*but can they live with it?***

- When looking at causes and driving toward solutions, once consensus has been reached, this should not need to be revisited.
 - *Exception - new data that changes original conclusions*

Problem Cause Investigation Summary

- Brainstorming, Brain-writing, Nominal Group Technique
 - Involve generation of ideas ranging from unstructured to highly structured
- Is-is Not Matrix
 - Structured analysis of causes to establish boundaries and focus on those that are relevant
- Paired Comparisons

