

8D Problem Solving



OSHKOSH™

Learning Outline

- Introduction to 8D
- D1 – Problem Solving Team
- D2 – Problem Description
- D3 – Containment and Short-Term Corrective Actions
- D4 – Root Cause Analysis (Definitions, Fishbone, 5 Why, etc)
- D5 – Long Term Corrective Actions
- D6 – Implementation & Verification of Long-Term Corrective Actions
- D7 – Preventative Actions
- D8 – Congratulate the Team & Conclusion



Introduction

“Failure is simply the opportunity to begin again,
this time more intelligently.”

– **Henry Ford**

There is no method of improvement more effective than good problem solving

A problem is an opportunity for improvement that:

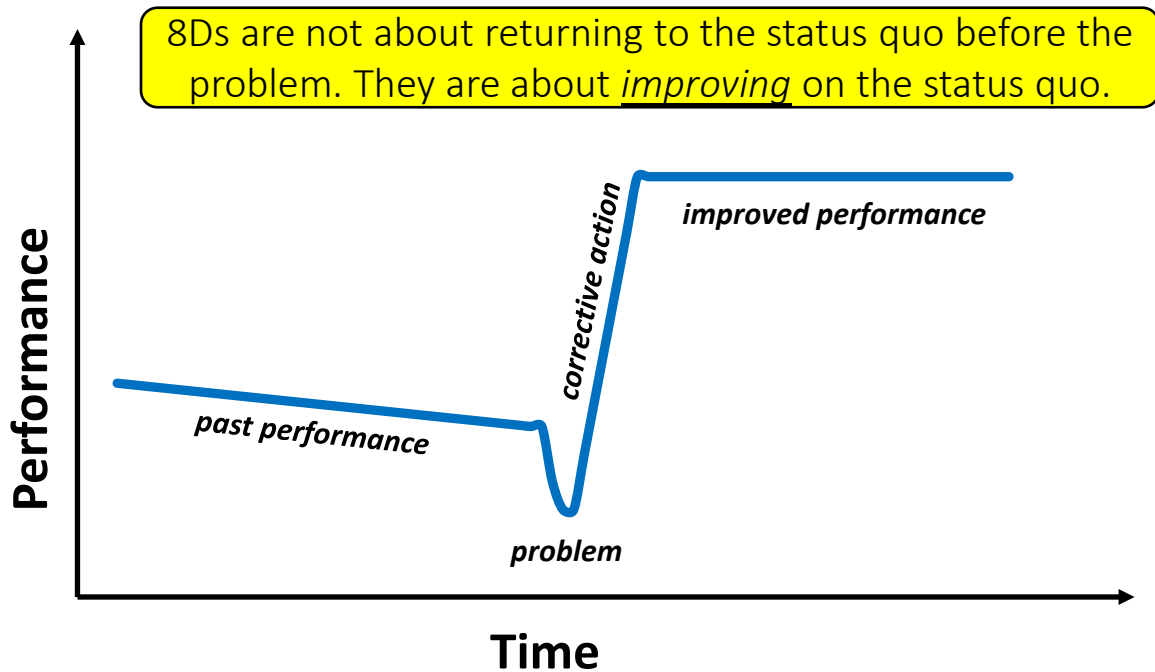
- You have proof is worth addressing
- You can quantify the benefit of addressing
- You can convince others is worth addressing



Introduction

What to expect from your 8Ds:

1. Elimination of the problem
2. Permanent prevention of the problem
3. Prevention of similar problems
4. Overall improvement



Common Misconceptions

8Ds are part of the punishment for failures.

- No! 8Ds and Corrective Actions are great opportunities to improve.

8Ds are Quality's responsibility.

- No! Problem solving only works when the experts are involved.

8Ds are only for quality issues.

- No! Problem solving processes can be applied to any type of problem (cost, quality, delivery).

Problem solving means 8D, 100% of the time.


- No! The 8D is a strong, formal corrective action process, not the only one.

8Ds are only able to prevent recurrence of the same failures.

- No! 8Ds should also address system weaknesses in order to prevent related failures.

8D Form

Two versions of the Oshkosh 8D are available (8D process is the same with both):



OSHKOSH™

Oshkosh Supplier Network

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[Global Supplier Quality Manual](#)
[SDX Defense Addendum](#)

This section contains information and requirements for Defense suppliers such as: Surface preparation, painting and finishing; Part marking, identification and traceability; Casting technology and welding procedures.

Revision Date	Expiring Date	GSQM Page Number
02/22/2017	04/08/2013	OSK T3000
04/05/2019	02/15/2016	OSK T2000
	09/19/2019	OSK I1000
	11/01/2012	OSK T3100
	09/26/2016	OSK T2100

[Training Technicals](#)
[SD Corrective Action](#)
[Production Part Approval Process \(PPAP\)](#)
[Supplier Change Request](#)
[Containment Level 1 and 2](#)
[Supplier Technical Review](#)
[CAP/NTV Final Plan](#)
[QUALITY ASSURANCE](#)
[Measurement Systems Analysis \(MSA\) Instruction Guide](#)
[Procedures](#)

Revision Date	Procedure Number	GSQM Page Number
04/08/2013	OSK-P3000	16 - 17
05/04/2018	OSK-P2000	7 - 14
06/13/2018	OSK-P1000	15
11/01/2013	OSK-P1000	17 - 18
06/27/2015	OSK-P2100	

[SD Corrective Action Select](#)

Revision Date	Form Number	GSQM Page Number
04/02/2018	OSK-I3000	16 - 17
04/08/2019	OSK-P2000	7 - 14

Excel spreadsheet on the OSN

<https://osn.oshkoshcorp.com/gsq-en.htm>

Corrective Action and Prevention...
Welcome to ETQ-R

PRD

✖ SCAR 8D # SCAR 8D-00002108

SCAR 8D # SCAR 8D-00002108

Close
Save
Save & Close
Send

03 NOV

or
D0 - Issue to Supplier
D1, D2, D3 - Containment /
D1, D2, D3 - Review
D4, D5, D6, D7 - Root Cause, ...
D4, D5, D6, D7 - Review Root ...
D8 - Verify Effectiveness
Void
Closed

New Document
...

Comments
Close Work

SCAR 8D
Supplier Response
Access Control
Show All

General Information

Do NOT post IITAR or EAR controlled technical data relating to military vehicles, systems, or parts. The information on this site may be accessible by non-U.S. persons.

External Links

1 link(s)

SCAR 8D Quick Reference Guide	https://supplierquality.oshkoshcorp.com/Reliance_PRD/common/SCAR/Oshkosh...
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Number	Segment	CAPA Type	Failure Mode	<input type="checkbox"/> Sponsored by C...
SCAR 8D-00002108	Oshkosh Leon - Mexico	Process	Quality	

Document Links

Problem Identification

Subject (Part Number/Failure Mode/Short Description)
 NCMR Pn 1001249048. The Coil portion of the cable is deforming once that is extended, the cable is losing the memory coil.
 Initiating Depart...

Reliance SCAR

(issued by Oshkosh Supplier Quality)

8D Pre-Work (D0)

Before kicking off an 8D, you need to understand:

Who is impacted?

- *Customer? Production line? End user? Etc.*

How significant is the impact? Is this an emergency? Does it need to be escalated?

What is the scope of the problem (best guess)?

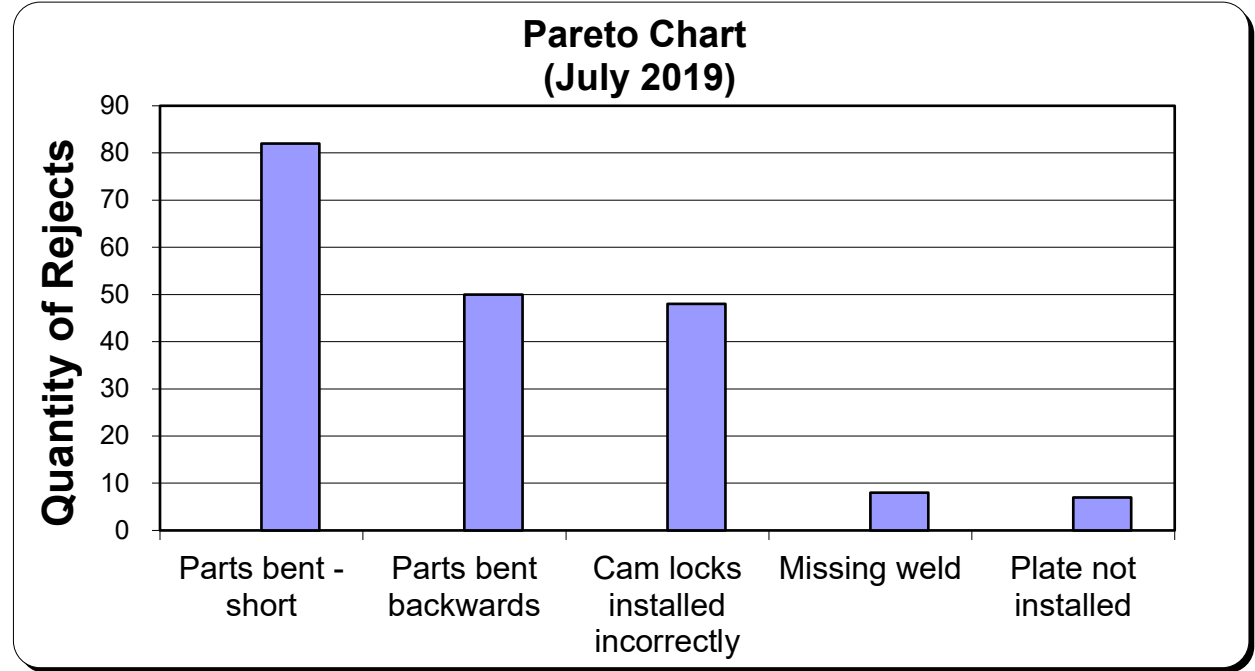
Has this happened before?



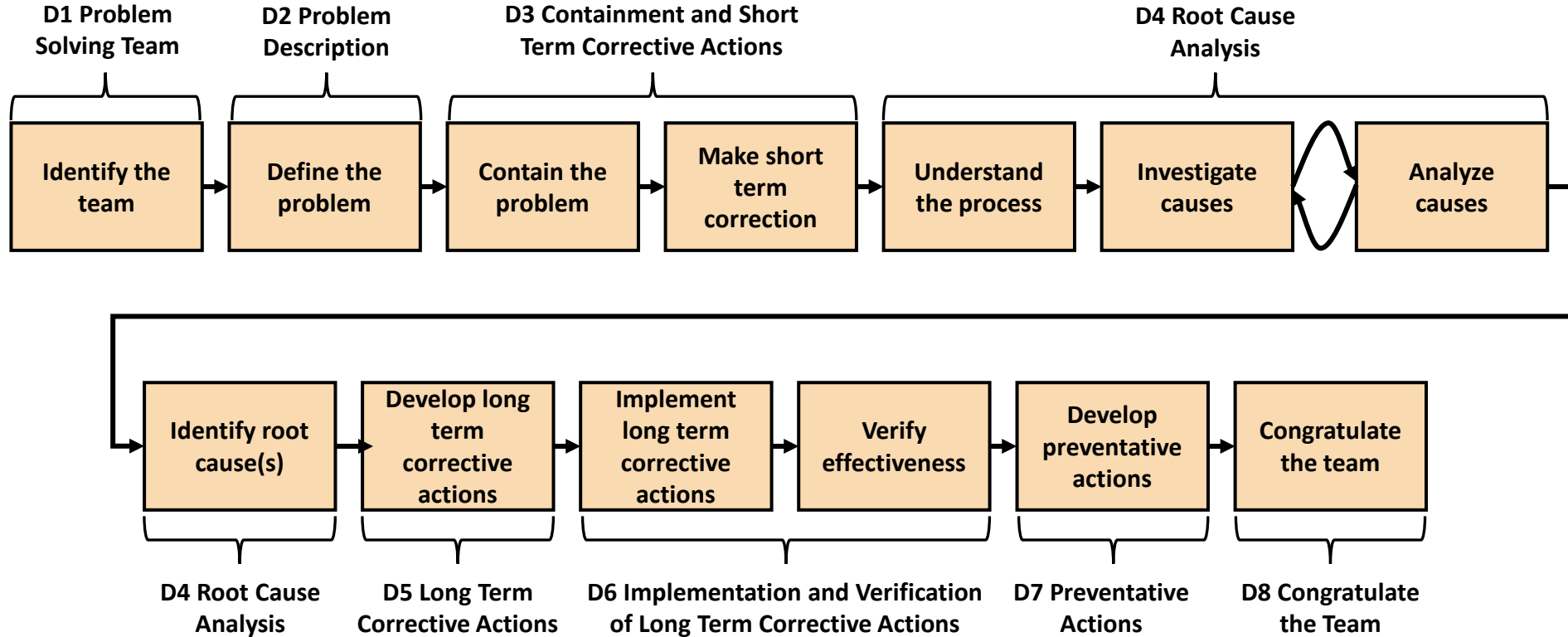
THE HISTORY CHANNEL®
WHERE THE PAST COMES ALIVE™

8D Pre-Work (D0)

Pareto analysis is one very effective method to determine what problem deserves an 8D



Problem Solving Process



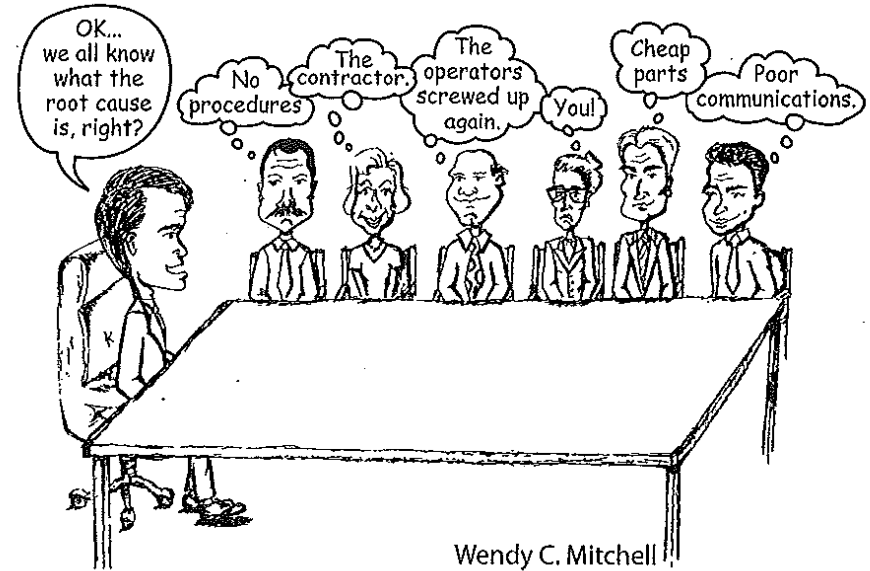
D1 – Problem Solving Team

Identify the Team

Teams are critical to problem solving!

- No individual has the necessary knowledge or objectivity
- Overcoming initial biases is difficult and typically requires a team
- Getting buy-in is difficult as an individual

Rule of thumb: Look for a team of 3 to 5 members.



8D Rule 1: If there's no team, it's not an 8D.

Identify the Team

Team Champion

- Person of authority in the organization
- Does not actively participate in team meetings
- Is responsible for the culture of problem solving

The team champion is responsible for the success of the whole 8D program.



Contributions:

- Sets expectations
- Removes roadblocks (i.e., politics and resources)
- Guarantees positive recognition for the team

“70% of Projects or Initiatives Fail”

McKinsey & Company

Why do you think they fail?

- Adoption of change
 - Lack of sponsor engagement
 - Too many priorities going on at same time
 - History of past failed changes
 - They can't understand it
 - They can't shape or influence
 - It attacks things they hold dear
 - It lacks direction
-
- *And many more reasons...*

D1 – Summary



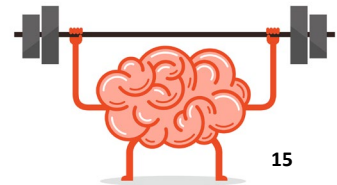
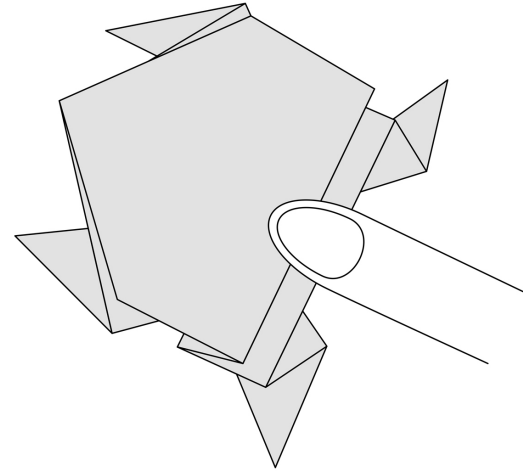
Key Questions – Problem Solving Team:

- | | |
|--|---|
| <i>Does the team champion have the necessary influence?</i> | <i>Does the team have a knowledgeable 8D facilitator?</i> |
| <i>Will the team champion be an active member of the team?</i> | <i>Does the team include the stakeholders?</i> |
| <i>Does the team include the process experts?</i> | <i>Is the team cross-functional?</i> |

Class Exercise – Origami Jumping Frog

Objective: Each person has 10 min to build an Origami Jumping Frog. Frog must jump at least 12”.

- Instructions are provided at origami.me/jumping-frog
- Materials are not provided. You'll need to provide your own.
- The time limit for the build campaign is **10 minutes**
- Frog must jump at least **12”**



Class Exercise – Identify the Team

Objective: Based on the initial problem statement from the customer (instructor), identify the best problem solving team

Roles:

1. Team Champion
2. Team Leader
3. Team Members

Note: Select from the roles to the right (or similar roles), not from your team members.

- | | |
|--|---------------------------------|
| • <i>Production Manager</i> | • <i>Quality Manager</i> |
| • <i>Operator 1</i> | • <i>Planner</i> |
| • <i>Operator 2</i> | • <i>Director of Quality</i> |
| • <i>Operator 3</i> | • <i>Purchasing Manager</i> |
| • <i>Assembler</i> | • <i>Tool Room Manager</i> |
| • <i>QA</i> | • <i>Maintenance Lead</i> |
| • <i>Process Engineer – Operations</i> | • <i>Director of Operations</i> |
| • <i>Process Engineer – Assembly</i> | • <i>Sales Engineer</i> |
| • <i>Quality Engineer</i> | • <i>Company President</i> |

D2 – Problem Description

Define the Problem

“If I had an hour to solve a problem, I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions.”

— **Albert Einstein**

The definition of the problem, rather than its solution, will be the scarce resource in the future.

— **Esther Dyson**

“We fail more often because we solve the wrong problem than because we get the wrong solution to the right problem.”

— **Russell L. Ackoff**

“If you define the problem correctly, you almost have the solution.”

— **Steve Jobs**

“You don't fix the problem until you define it.”

— **John W. Snow**

“A problem well put is half solved.”

— **John Dewey**

“It's so much easier to suggest solutions when you don't know too much about the problem.”

— **Malcolm Forbes**

The problem definition step is the most critical of the whole problem solving process!

Define the Problem

Specific problem statements are required for the root cause process.

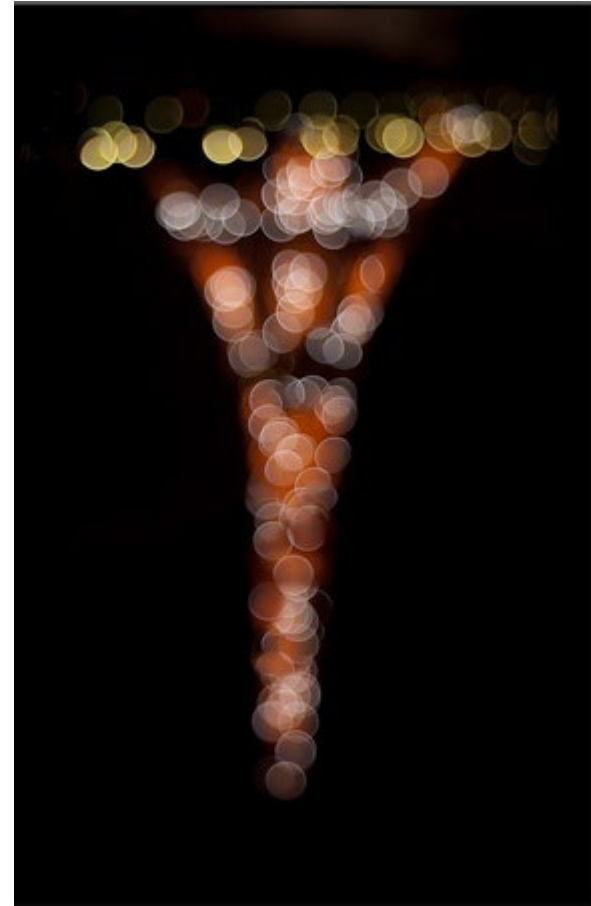
Problem descriptions should provide the answer to: What? Where? When? How Many?

What?

- What is the part/product with the problem?
 - *Typically the part number, but could be the output of any process (on-time delivery rating, part cost, etc.)*
- What is the specific problem?
 - *What is the requirement being violated? What is the actual value? What was the specific performance or test failure?*

Every problem statement should include both:

- “Should Be” – What is the requirement?
- “IS” – What is the actual condition?



Define the Problem

Where?

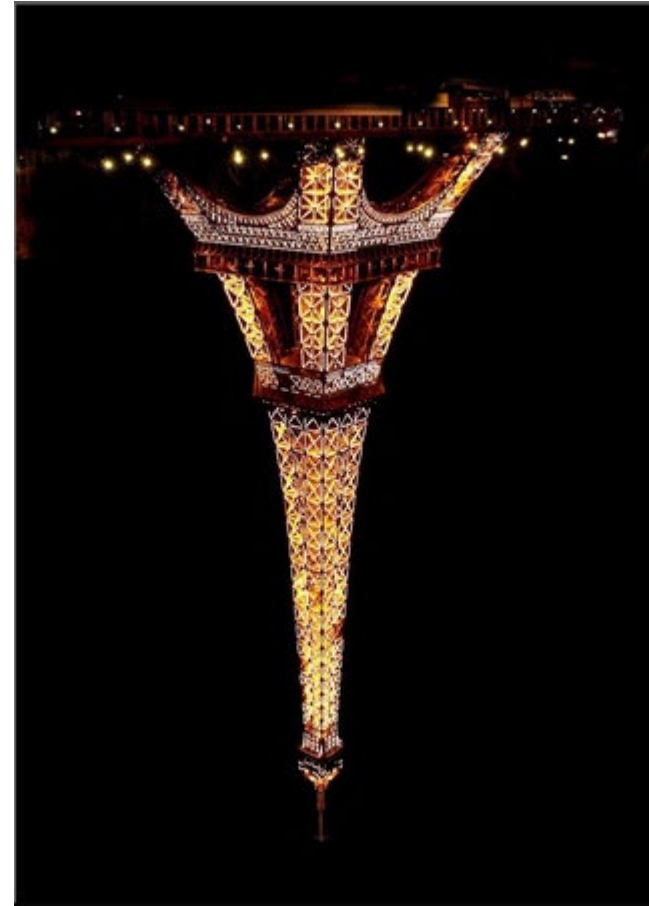
- Where was the problem detected and who detected it?
 - *At Oshkosh receiving inspection? At supplier final inspection? By the shift supervisor? At the quality gate? Etc.*
- Where was the problem not detected?
 - *The problem is only present after paint? Complaints are only received from customers in cold climates? Etc.*

When?

- When did the problem occur? What is the scope of the problem?
 - *Shipment dates, lot numbers, batch numbers, PO numbers, date ranges, Etc.*
- When is the problem not present?
 - *Is the problem only identified during humid months? Does the problem impact all lots or only some? Is the problem on-going or is it new? Etc.*

How many?

- How many parts/products/etc. are affected?
 - *How many parts? What percentage of parts?*



Define the Problem

Example A: 42.75" +/- 0.10 dimension out of specification on 271828 (Weldment Brackets) for 3 repeated shipments (reject dates 5/12, 5/13, 5/27 from supplier Quick Machine Co). Quantity of rejects: 27 out of 27 pieces.

Rejected at Harrison Street assembly line on 5/30 because they did not fit. Two shipments have been received since 5/27 and do not have problem.

Sample of 10 parts measures at 43.10" to 43.15".

<i>What?</i>	<i>Where?</i>
271828 Weldment Bracket Should Be: 42.75" Is: 43.10"-43.15" (Sample)	Harrison Street assembly line
<i>When?</i>	<i>How many?</i>
3 repeated shipments from Quick Machine Co. 5/12, 5/13, 5/27	27 of 27

Define the Problem

Vague problem definitions make the root cause process impossible!

- *Part is bad*
- *Paint looks bad*
- *Part doesn't fit*
- *Missing weld*
- *Doesn't work*



(Problem description submitted by JLG Aftermarket customer)

8D Rule 2: Incomplete problem descriptions lead to bad solutions.

Define the Problem

What is missing from these problem descriptions?

- Supplier XYZ for Oshkosh Defense has an on-time delivery rating of 54.3% percent (multiple part numbers supplied).
 - *From when to when? Is this a long term problem or only for the last month?*
- 38 of 38 pins in stock at IMT (all of the pins that were received in May) are long by .03 to .08.
 - *What part number(s)?*
- Paint is chipped and scuffed on 274A274 brackets from the first production lot, found in supplier's warehouse.
 - *How many brackets are chipped and scuffed? Is this 2 parts or 1000 parts?*
- All 37 of the 274A274 brackets built in July have oil/grease contamination on all surfaces.
 - *Where in the process are the parts? Are they in stock? Have they not been painted yet?*

Define the Problem

Good problem descriptions require good data.

- Get hands on the parts or vehicles with the problems
- Take photos
- Collect any available data – numerical inspection results, test results, performance (miles to failure or time to failure, etc.), historical results
- Document what you find

Always update the problem description based on what is found during containment activities, as well as later in the 8D effort!



Don't forget to make sure that the "problem" you are solving actually is a problem.

Define the Problem

(IS / IS NOT example A)

Instructions:

- Do not make assumptions.
- Define:
 - What the problem IS
 - What the problem could be but IS NOT
- Investigate as needed to provide accurate/proven answers.
- Highlight potentially key items.

	What the problem IS	What else it might be but IS NOT
WHO	Who reported the problem?	Who did not report the problem?
	Harrison Street assembly line	Harrison Street receiving inspection
	Who is affected by the problem?	Who is not affected by the problem that could have been?
	Harrison assembly line	Other Oshkosh plants
WHAT	What is the product ID or reference number?	What ID's or reference # are not affected that could have been? (similar parts or processes)
	P/N 271828 Weldment Brackets	Other weldments from Quick Machine Co.
	What is (describe) the defect?	What is not the defect?
	Do not fit 42.75" dimension measures 43.10"-43.15"	Parts do not appear to be damaged
WHERE	Where does the problem occur?	Where is it not occurring but could?
	Harrison Street assembly line	N/A
	Where was the problem first observed?	Where else might it occur?
	Harrison Street assembly line	N/A
WHEN	When was the problem first reported?	When was the problem <u>not</u> reported?
	First reported 5/30, shipment date 5/12 from supplier	Shipments prior to 5/12 or since 5/27
	When was the problem last reported?	When might it reappear?
	Shipment date 5/27	Any future shipments
WHY	Why is this a problem?	Why is this <u>not</u> a problem?
	Causes line delays and part scrap	Problem has not been reported on 2 shipments since 5/27
	Why should this be fixed now?	Why is the problem urgent?
	Continued line delays and part scrap	Risk of line stoppage if problem occurs again
HOW	How often is the problem observed?	How often is it not observed?
	27 out of 27 parts shipped between 5/12 and 5/27	Any parts shipped prior to 5/12 or since 5/27
	How is the problem measured?	How accurate is the measurement?
	Dimensional inspection of 42.75" using FARO arm	FARO arm accuracy is approximately +/- .003"
OTHER	Can the problem be isolated? Replicated? Is there a trend? Has the problem occurred previously? Problem can be isolated to shipments dated 5/12 to 5/27 but cannot yet be replicated. This problem has not occurred previously.	

Define the Problem

IS / IS NOT Problem Descriptions focus on the differences between what you would expect the problem to be and what the problem actually is.

Benefits:

- Kick-starts the investigation.
- Provides direction for the investigation.
- Ensures the problem is fully described and understood.



***What I expect the
problem to be***

***What the problem
actually is***

D2 – Summary



Key Questions – Problem Description:

What is the part number?

What lot numbers/batch numbers/shipments are affected?

What is the requirement that was violated?

Is the problem a single occurrence or intermittent?

What is the nonconformance?

How many parts are suspect?

Is the nonconformance description specific enough?

What percentage of the parts does that represent?

Where was the nonconformance detected?

Based on the updated problem description, does the team composition need to change?

Class Exercise – Problem Description

Objective: Create a problem description for an 8D

- Investigate and create a full problem description
- Do not make anything up, limit the problem description to what you can prove



Customer Problem Description: “Defective Frog”

D3 – Containment and Short Term Corrective Actions

Contain the Problem

Oshkosh manufactures safety critical vehicles. Effective containment of problems is critical to protective the customer.

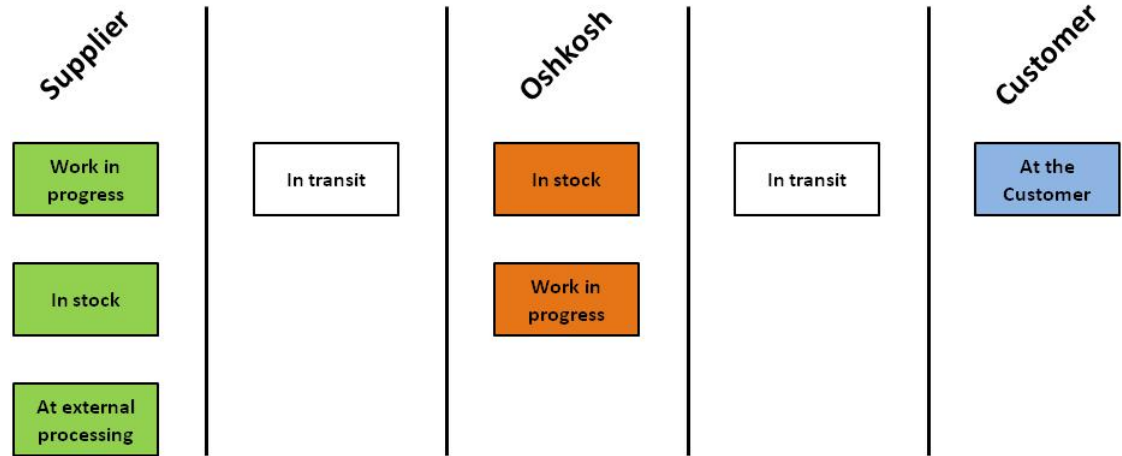


Contain the Problem

Containment means identifying suspect parts/materials and preventing use until the nonconformance has been resolved or a short term corrective action has been put in place.

Containment needs to occur along the whole pipeline of parts/materials/etc.

Containment is focused on **Product**.



Short Term Corrective Actions

Short Term Corrective Actions

We can't always stop and wait for a full investigation, so we need a way to apply a band-aid until the problem is solved.

- Short Term Corrective Actions are temporary band-aids that you use to give you time to investigate properly
- Short Term Corrective Actions are focused on the **Process**.



THIS IS NOT A PERMANENT SOLUTION! DO NOT STOP HERE!

Short Term Corrective Actions

Short term corrective actions are a quick and dirty fix (often actions that would not be acceptable as a **permanent** corrective action)

Effective short term corrective actions are:

1. Contained At The Source And At Points Downstream In The Process
2. Implemented *Immediately* After Containment Is Complete
3. Proven Effective By *Evidence*

Types of short term corrective actions:

- Correct the immediate cause if it is known
 - Replace a worn tool
 - Re-train the operator
 - Repair the fixture
 - Rework parts

Add an inspection or double check:

- 100% inspection after operation
- Review every PO before it is issued
- CL1 or CL2 to protect the customer

Short Term Corrective Actions



Short Term
Corrective Action

It is tempting to stop the 8D after implementing a short term solution, because the symptoms are gone

If you stop here, the problem will come back.

8D Rule 3: Never stop after the short term fix, even if the symptoms go away.

D3 – Summary



Key Questions – Containment and Short Term Corrective Actions:

Containment

- *When did the containment activities occur?*
- *Where were containment activities performed? Was any part of the pipeline missed?*
- *How many suspect/nonconforming parts were found at each area?*
- *What containment activities were performed?*
- *Does the problem description need to be changed based on findings in containment?*

Short Term Corrective Action(s)

- *Is the short term corrective action being implemented immediately?*
- *Is the short term corrective action formally documented?*
- *Is there objective evidence that the short term corrective action effectively insulated the customer from the nonconformance?*

D4 – Root Cause Analysis

Understand the Process

Before beginning the root cause analysis process, you need to understand the current state of the process or processes where the problem occurred is necessary:

Go see!

- Watch the processes in action. Ask questions. Review process set-up, work instructions, documentation, tools, training requirements, etc.

Utilize process experts

- The people performing the processes (operators, etc.) are the experts, so make sure to use them

Utilize process documents

Map the process (using a tool like a flowchart)



Do not try to solve problems on a process you don't understand.

Understand the Process

Flowcharts

Flowcharts help you understand the **current state** of the processes where the problem might have occurred.
Strict flow chart rules and conventions aren't critical.

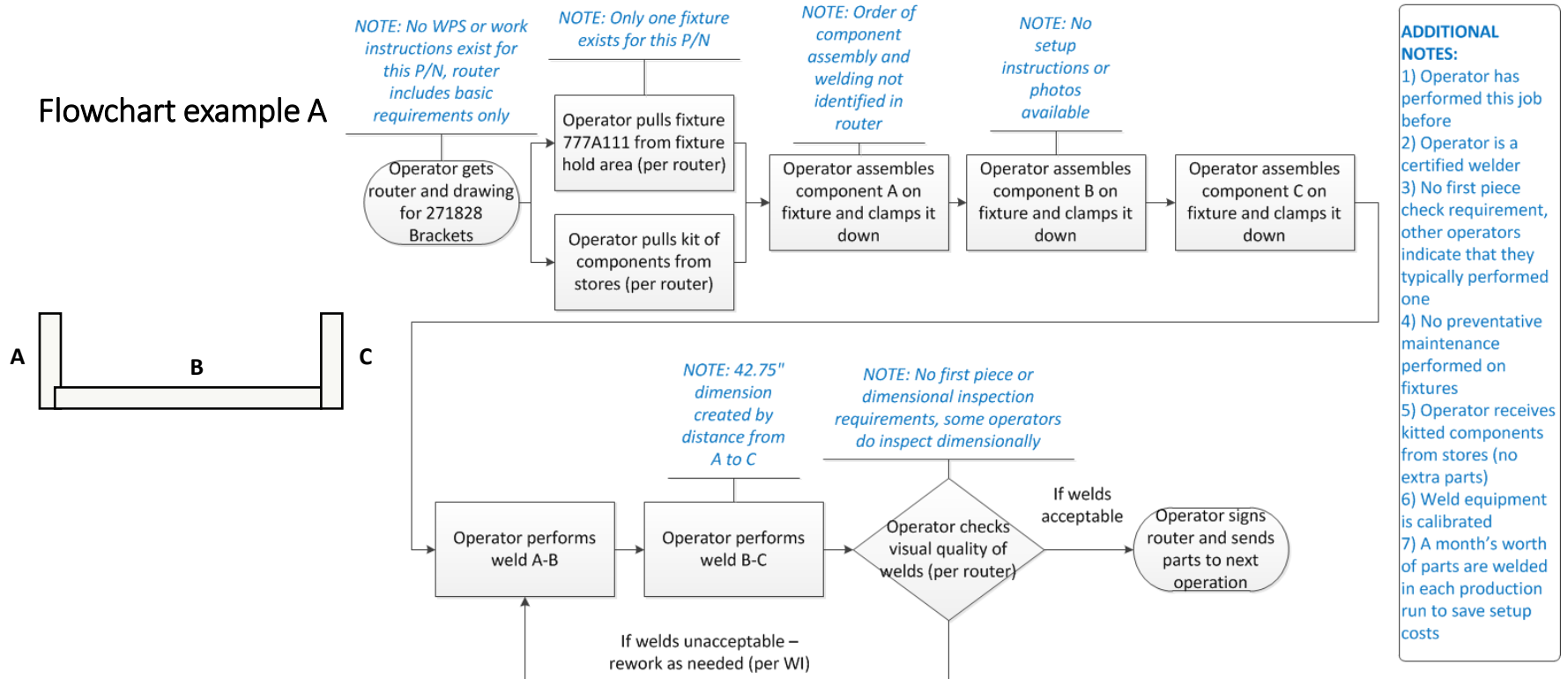
Use a whiteboard or post-it notes to quickly map the process to make sure that it's understood:

- Make sure inputs and outputs are understood (suppliers and customers).
- Identify all activities.
- Note the controls for each activity (e.g., work instructions, tribal knowledge, etc.).
- Make any other notes that are helpful for understanding the process.

You are trying to understand the process, not determine a final root cause. Note everything that could potentially be relevant.

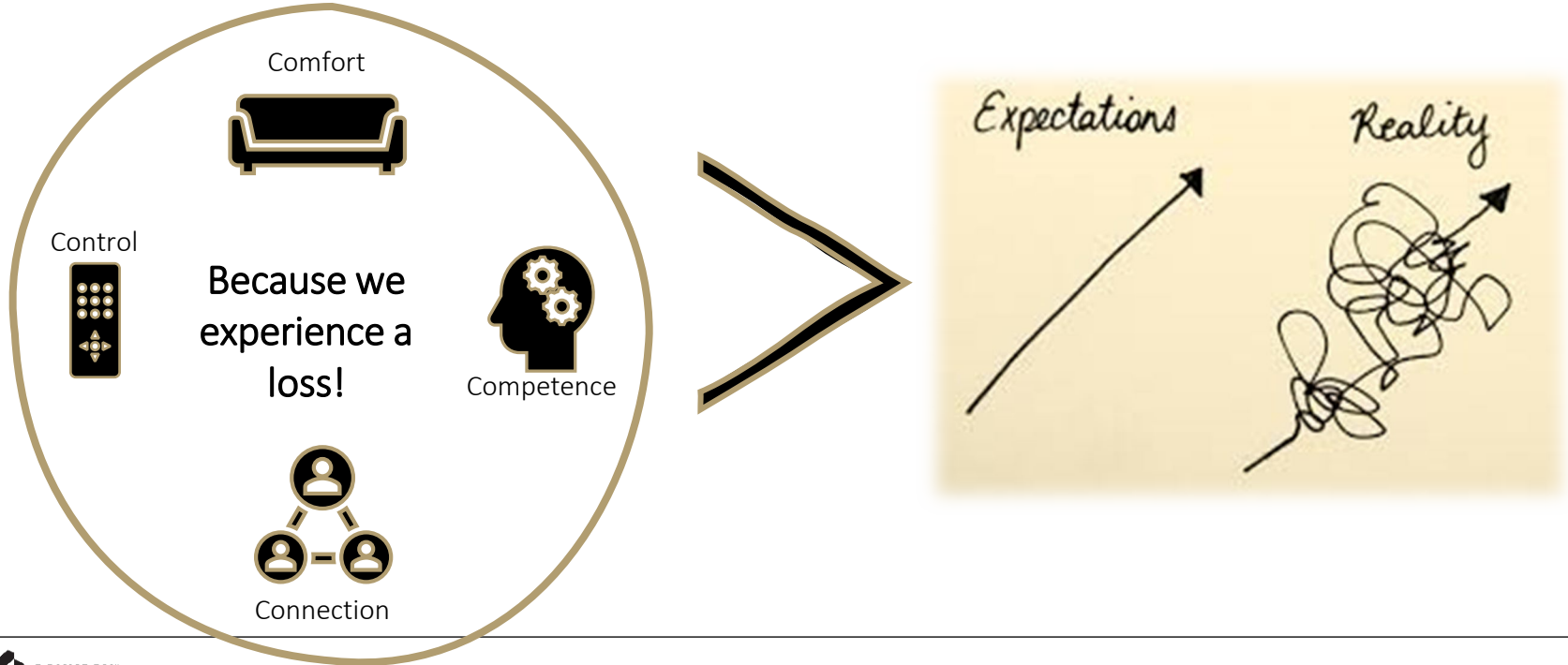
Understand the Process

Flowchart example A



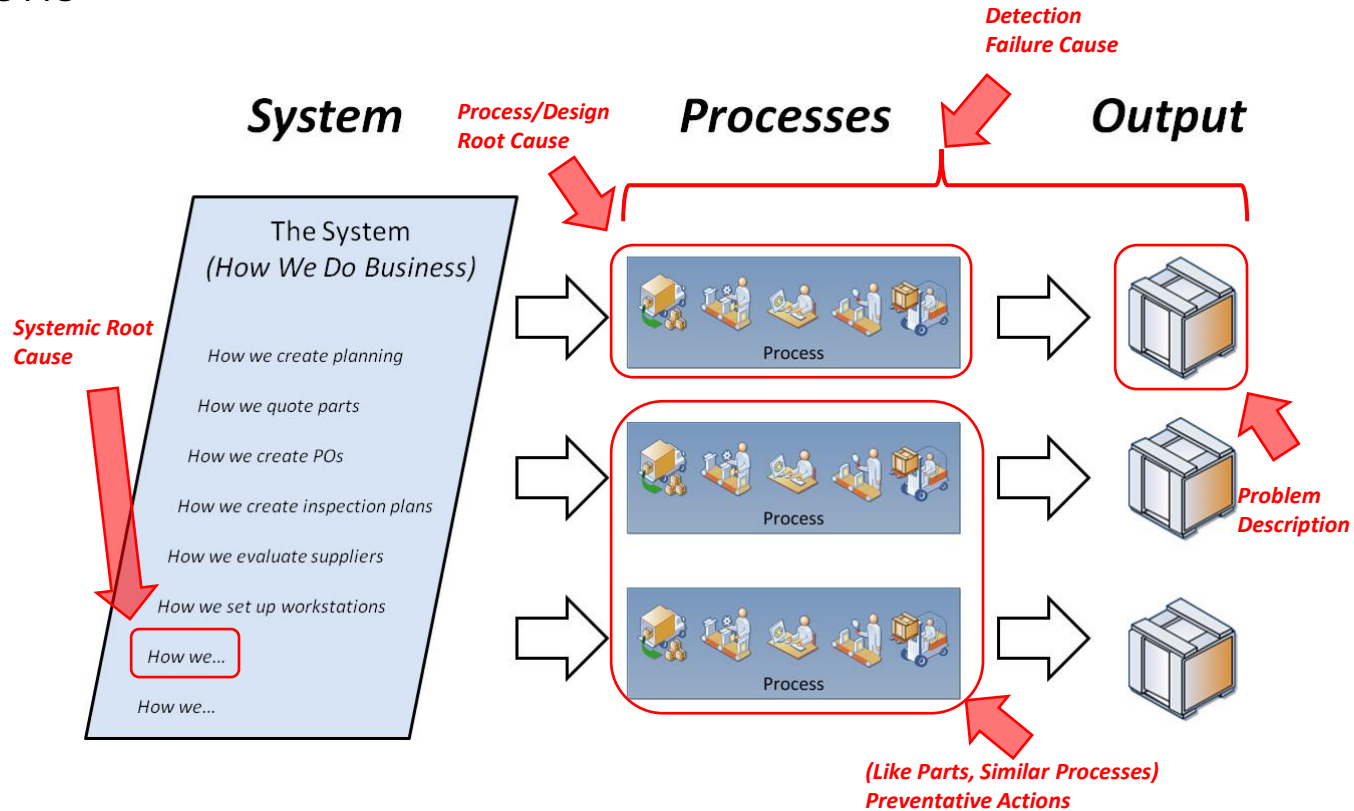
Why do we struggle so much with change?

Identifying what we lose and in what category, and then replacing that loss with a gain, or a find, or something new that helps to fill the void and move us closer to integration and resilience.



D4 – Root Cause Analysis (Definitions)

Definitions



Definitions

Process/Design Root Cause(s) – the direct **process or design** related cause(s) which led to the undesirable condition. *Eliminating this cause(s) will prevent recurrences of the same failure.*

Example: Weld fixture design allows multiple setups of components on weld fixture. Only one of the setups can produce a conforming part.

The Process/Design Root Cause is what is typically meant by “root cause”. Addressing it is the minimum requirement for an 8D.

Systemic Root Cause(s) – the underlying **systemic** cause(s) which created or allowed the direct root cause(s) to occur. *Eliminating this cause(s) will prevent related failures.*

Example: No defined process is in place to control the design of weld fixtures.

Example: New product design process does not include a review of historical DFMEAs for probable failure modes.

Definitions

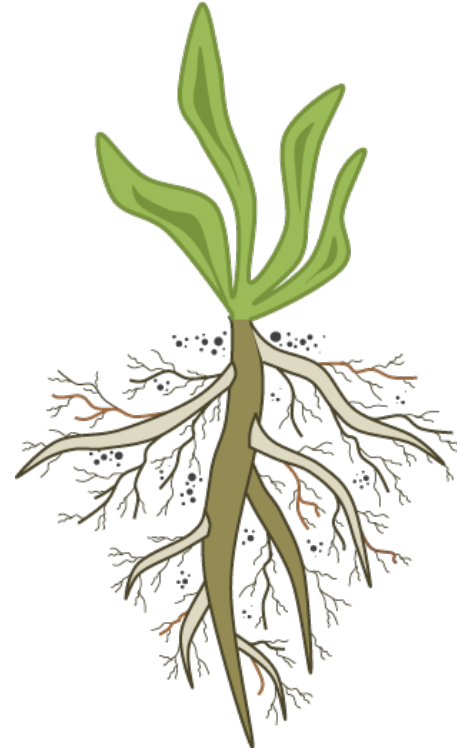
Detection Failure Cause(s) – The reason why the earliest opportunity to catch the undesirable condition did not prevent the defect from progressing to the next step in the process. *It should answer the question: “Why wasn’t it caught?”*

Example: Work instructions do not clearly identify the requirement for 100% inspection of the first piece for each production run.

8D Rule 4: Inspection cannot be the root cause. Inspection catches defects. It doesn’t prevent them.

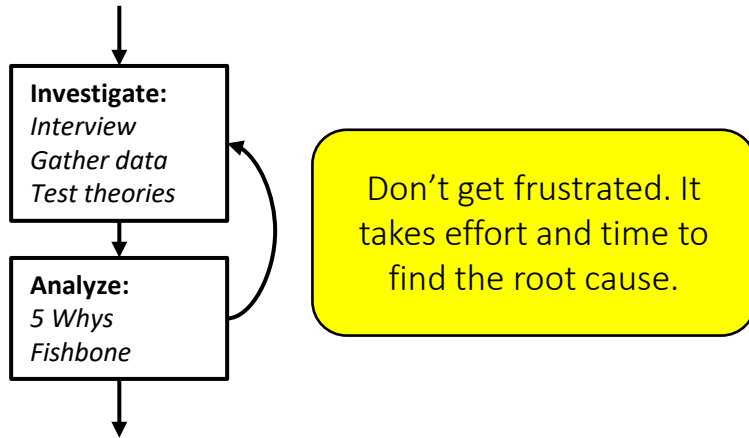
Contributing Cause – Generic term for important causes other than the root causes. *In other words, watch for the phrase that: “It didn’t help that...”*

Example: Work instructions for welding process do not clearly define the required setup to produce conforming parts.

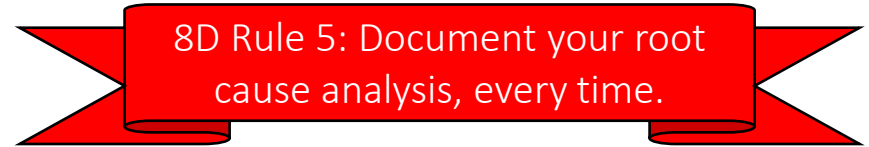


Analyze – Investigate (Root Cause)

The root cause investigation steps repeat themselves. It usually takes several repetitions of investigating and analyzing to start identifying root causes.



The key is to use a method (5 Whys, etc.) and *to write it down!* If the analysis is not documented, then it will be impossible to review.



Note: The Oshkosh supplier 8D procedure requires documentation of the root cause analysis.

Analyze – Investigate (Root Cause)

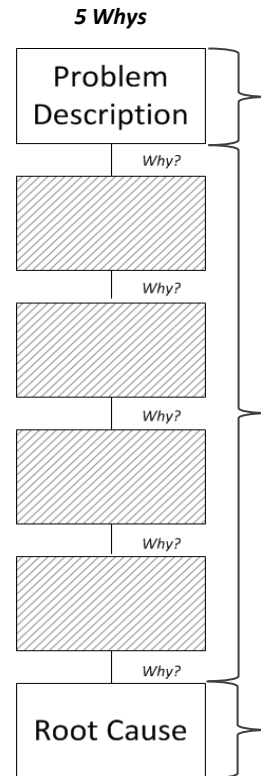
Human Error – Operator Error

Avoid the “Blame Game”. Blaming and training (or disciplining) people is quick and easy, *but it does not lead to long-term improvement.*

Make sure to ask **WHY** they made the mistake. Not just if they made the mistake.

Keep digging! The goal is to find the process/design or systemic root cause that led to the human error.

8D Rule 6: Human error is not an acceptable root cause.





IT'S FINGER POINTING TIME. AND EVERYONE'S INVITED.

Yes. Let's start the blame game. It's easy. Just lift your finger and point it in a direction away from you. Any direction. And go.

Point out the problems with everyone in positions of power around you. Point out the politicians. Their brothers. Their uncles. Their nephews.

Analyze – Investigate (Root Cause)

Human Error Root Cause Analysis (HERCA) Worksheet		
D5 Problem Description		
Investigation Questions	Yes <input type="checkbox"/> No <input type="checkbox"/>	Next Steps
1 Is the process complete?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Investigate the process further in order to identify the Process/Design Root Cause(s)
2 Is the process highly repetitive?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
3 Is the operator being rushed?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4 Are there any ergonomic difficulties?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
5 Are there any visual obstructions that make parts of the job hard to see?	Yes <input type="checkbox"/> No <input type="checkbox"/>	The Corrective Action(s) need to make physical changes to the process
6 Does the operator need to do anything out of the ordinary to complete the process?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
7 Are the tools adequate to complete the process successfully?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
8 Does the operator have all the tools needed to complete the job?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
9 Is the tooling error proofed?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Investigate the tools, tooling and/or equipment to identify the Process/Design Root Cause(s)
10 Is the tooling in good shape?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
11 Is the equipment adequate to complete the process successfully?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
12 Is the equipment in good shape?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
13 Can the equipment settings be changed more than the process allows?	Yes <input type="checkbox"/> No <input type="checkbox"/>	The Corrective Action(s) need to make permanent changes to the tools, tooling, or equipment
14 Are the process steps documented in a clear and easy to understand way?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
15 Are the work instructions (or other process documentation) missing any steps/operations?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
16 Are the work instructions (or other process documentation) up to date?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
17 Do the work instructions (or other process documentation) indicate when to use each tool?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Investigate the process documentation further to identify the Process/Design Root Cause(s)
18 Do the work instructions (or other process documentation) indicate when to use each piece of tooling?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
19 Do the work instructions (or other process documentation) indicate when to use each piece of equipment?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
20 Is the workstation well laid out? (parts and tools easy to reach, adequate space to perform job, etc.)	Yes <input type="checkbox"/> No <input type="checkbox"/>	
21 Is the workstation organized? (everything has a designated place)	Yes <input type="checkbox"/> No <input type="checkbox"/>	Investigate the workstation and/or work environment to identify the Process/Design Root Cause(s)
22 Is lighting in the workstation adequate?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
23 Are there similar but different parts or tools in the workstation?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
24 Is it possible to tell the status of each part in the workstation?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
25 Are there any significant sources of distraction near the workstation?	Yes <input type="checkbox"/> No <input type="checkbox"/>	The Corrective Action(s) need to make permanent changes to the workstation or work environment documentation
26 Has the operator been trained on the job?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
27 Has the operator been trained on the work instructions (or other process documentation) for the job?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
28 Was the training adequate?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
29 Does the job require any special qualifications/training that the operator does not have?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Investigate the competency and training system to identify the Process/Design Root Cause(s)
30 Is the operator qualified to perform the job?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
31 Does the operator know how to verify their work?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
32 Does the operator know what to do if something is out of the ordinary?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
33 Does the operator perform the job regularly?	Yes <input type="checkbox"/> No <input type="checkbox"/>	The Corrective Action(s) need to make permanent changes to the competency and training systems

**Human Error Root Cause Analysis
(HERCA) Worksheet**

Human Error – Operator Error

- Three key steps for finding the root cause of human error:
 - Interview people in a non-confrontational way to find out why they made the mistake. Make it clear that you want to help them succeed, not punish them for failing.
 - Go see! Watch the process that failed as multiple people perform it (person who made the mistake and personnel who didn't).
 - Ask a lot of questions! You can use the questions on the HERCA worksheet as a guide.

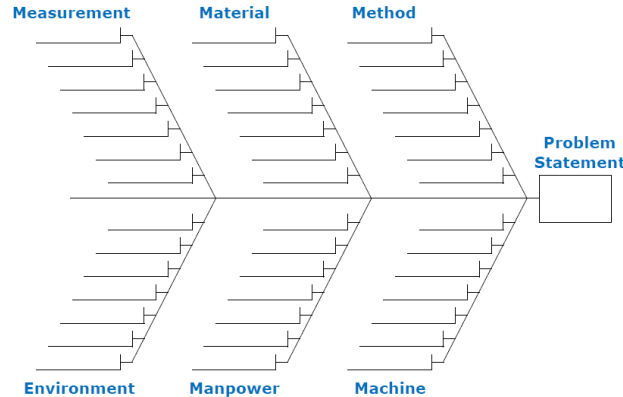
IT'S NOT THE PERSON, IT'S THE PROCESS!

D4 – Root Cause Analysis (Fishbone)

Fishbone Diagrams

Fishbone Diagram

1. Break the diagram into 6 primary categories: Measurement, Materials, Environment, Manpower, Method, and Machine
2. For each category, brainstorm possible/likely causes
3. Analyze the causes, discuss whether causes can or can not be controlled



Can be performed by drawing the diagram on a whiteboard and writing causes onto post-it notes.

Things to know:

- This is a form of structured brainstorming.

- It should be paired with another method to analyze possible causes that have been identified.

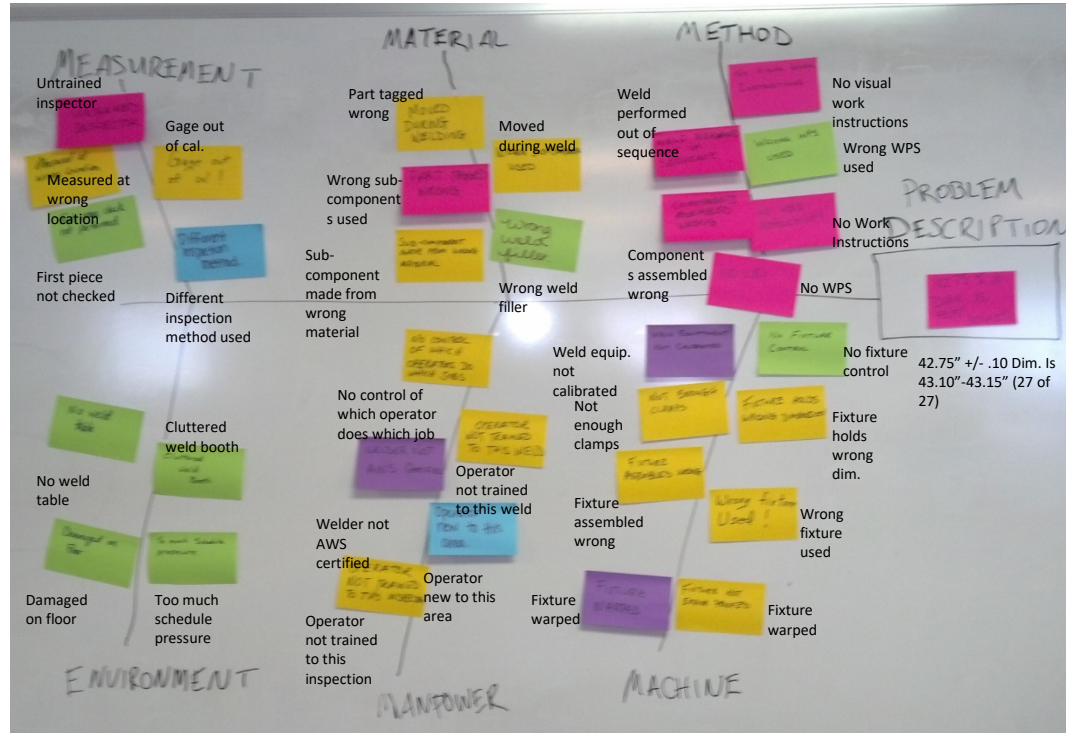
- Do not argue about which category a specific cause belongs in.

When to use:

- Problem where you don't know where to start).

Fishbone Diagrams

Fishbone Diagram – Example A



Fishbone Diagrams

Fishbone Diagram

Fishbone diagrams are only a brainstorming method!

Don't stop once the fishbone diagram is complete.

You need to prove or disprove the possible causes that you identify.

Each cause needs to be analyzed and investigated:

- Identify the most likely causes and investigate/prove
- Cross off causes that have been eliminated from consideration
- Add possible causes that may come up

Update the fishbone as you investigate

Class Exercise – Fishbone Diagram

Objective: Each group should develop a fishbone diagram of likely causes for the problem.

Write the possible causes on post-it notes and place on the fishbone diagram

Categories:

Measurement

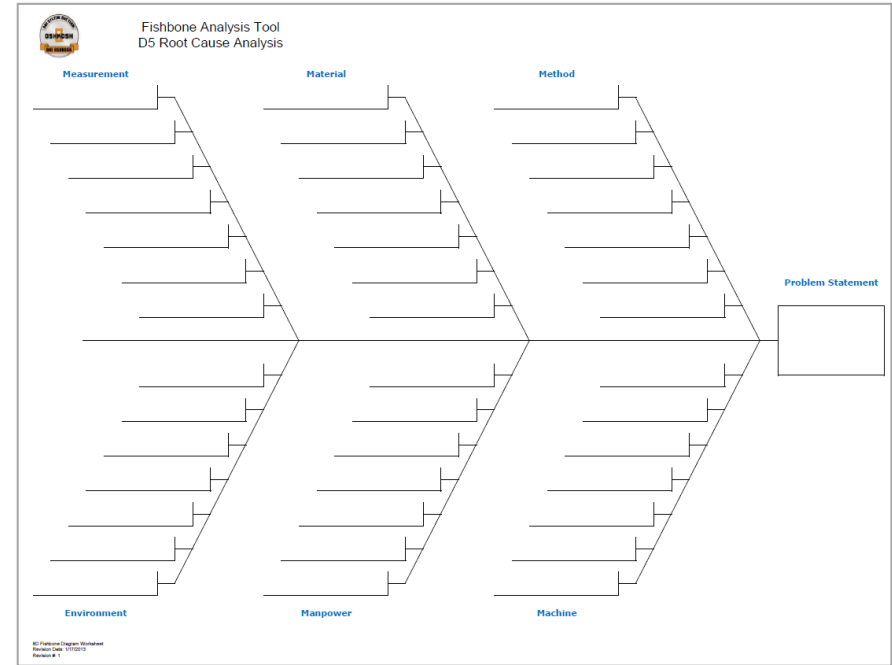
Materials

Method

Environment

Manpower

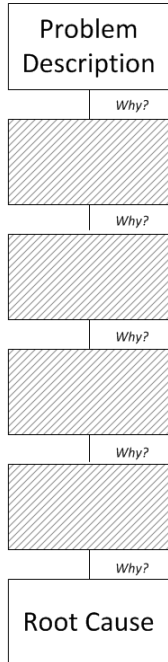
Machine



D4 – Root Cause Analysis (5 Whys)

5 Whys

5 Whys



5 Whys

Start with the problem description and just keep asking “Why?” until you have reached the root cause.

It can take less than, or more than, 5 Whys to reach the root cause

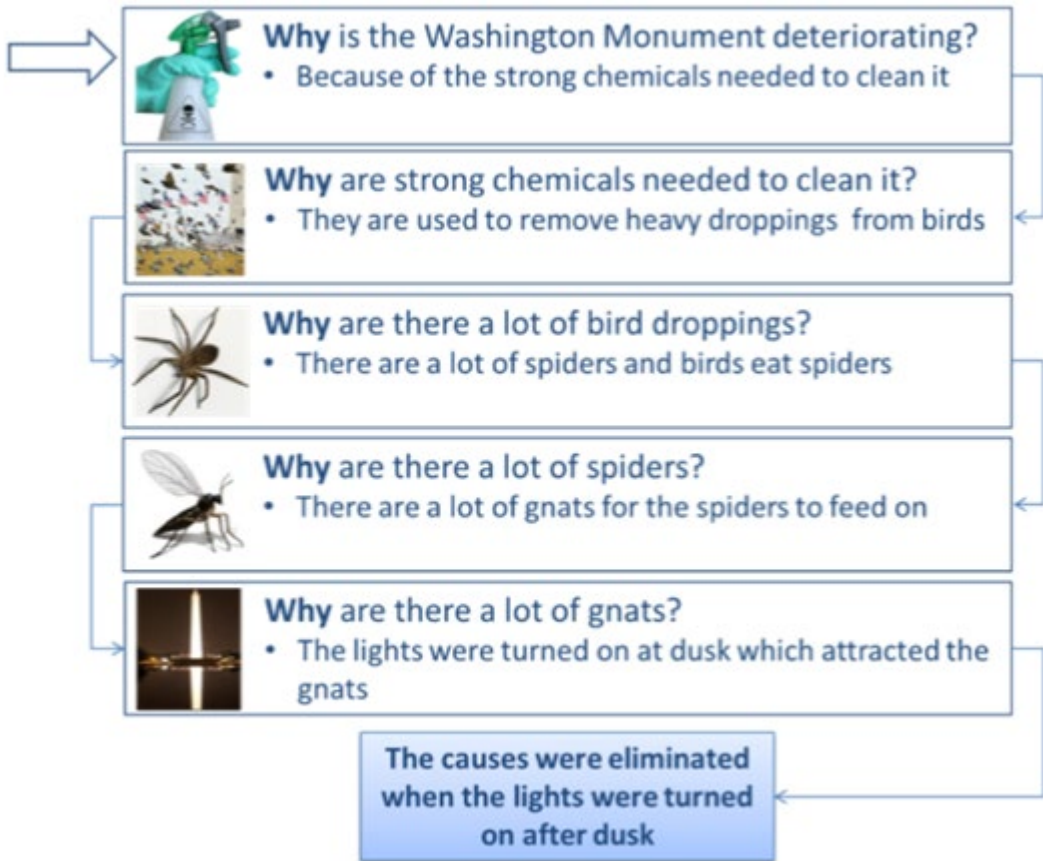
Things to know:

- Excellent "quick and dirty" method for problem solving.
- Focus is critical. The 5 Whys can be derailed easily if questions are not answered carefully and logically.
- Be specific! For each “Why?”, try to provide the most basic answer instead of jumping right to the root cause.

When to use:

- Problem that is likely to have few significant contributing causes.
- Problem that is not highly complex or critical (should be used with other tools for difficult problems).

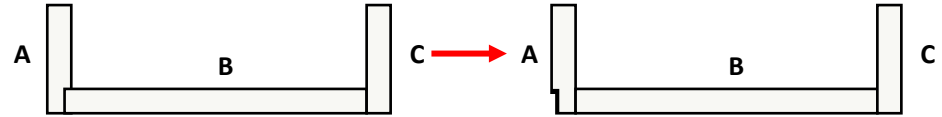
5 Why Example



5 Whys

5 Whys Example A

Problem: 42.75" dimension on bracket measures 43.10-43.15" on 27 of 27 for 3 repeated shipments.



Why does the bracket measure 43.15"? – Components 'A' and 'C' were welded to component 'B' 43.15" apart from each other.

Why were components 'A' and 'C' welded to 'B' too far apart? – The components were held in the fixture too far apart.

Why were the components held in the fixture too far apart? – The components were assembled and clamped into the fixture too far apart.

Why were the components assembled in the fixture too far apart? – The components can be assembled into the fixture in several different orientations.

Why can the components be assembled into the fixture in several different orientations? – The fixture design allows several orientations instead of just one. **Fixture Design Error (Process/Design Root Cause)**

Why was the fixture designed incorrectly? – Further investigation needed to reach systemic root cause...

5 Whys

The “5 Whys Trap”

One of the most common mistakes that is made on the 5 Whys is to answer a “Why?” incorrectly.

Each answer must be backed up by logic and evidence.

If the answer to “Why?” is not apparent, keep investigating. Do not make assumptions!

Two things to prove:

1. The answer to “Why?” is true. For example:

Question: Why didn’t the operator know which specific fixture to use?

Answer: The work instructions do not specify the required fixture number.

Objective Evidence: The team examines the work instructions to prove that the fixture number is not referenced.

2. The answer to “Why?” is the actual cause. For example:

Question: Why wasn’t the hose assembled correctly?

Answer: The operator did not follow the work instructions.

Objective Evidence: The team shows that following the work instructions will prevent the problem from occurring.

5 Whys

Expanded 5 Whys

Same process as the 5 Whys, except that more than one answer can be given for each “Why?”

At each stage, determine which of the answers provided are legitimate and which can be ignored.

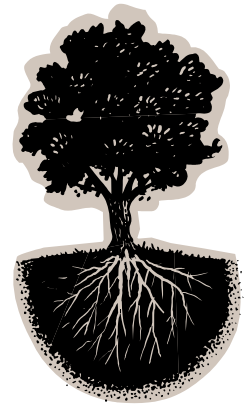
Look for major contributing causes and detection failure causes as well as process/design and systemic root causes.

Things to know:

- Same basic process as the 5 Whys.
- Careful reasoning is needed for marking causes as critical or non-critical.

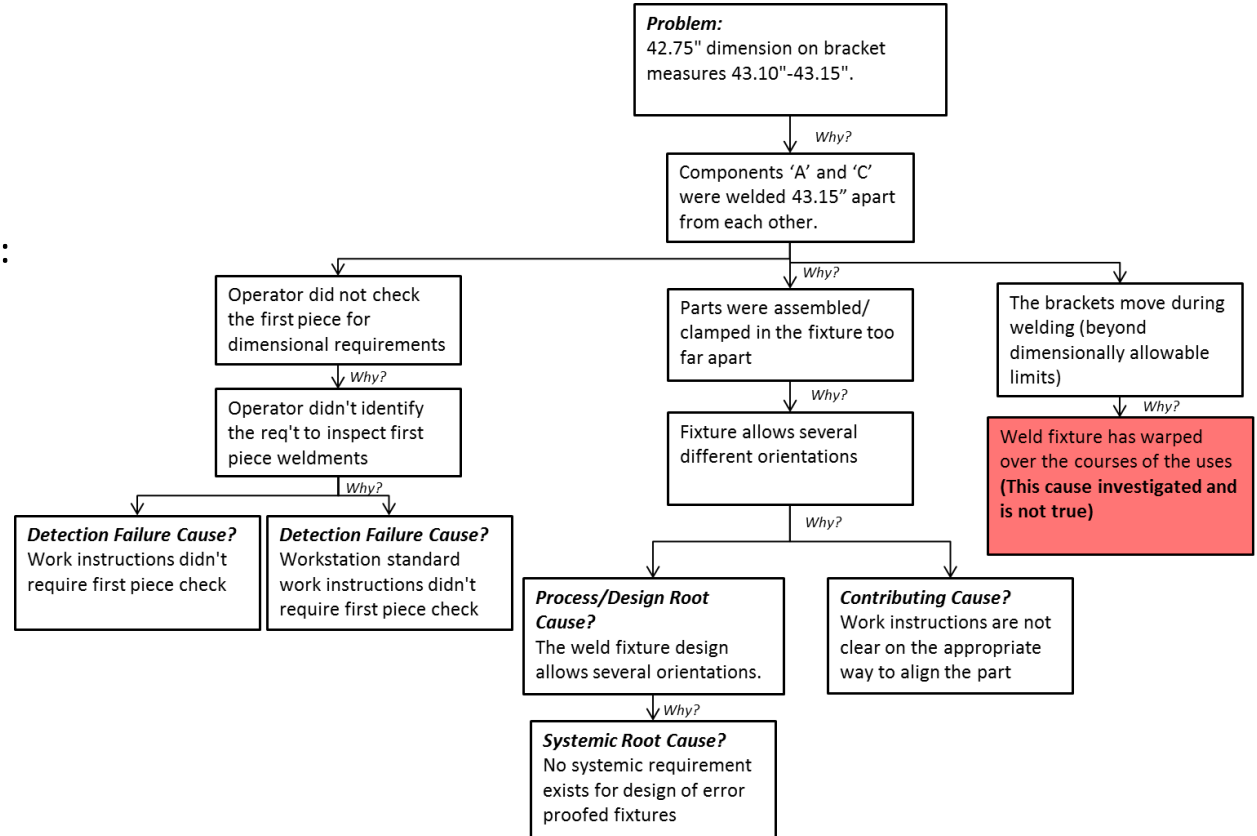
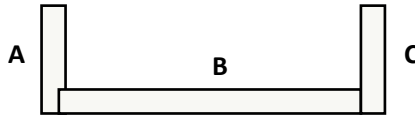
When to use:

- Problem that is not highly complex or critical (should be used with other tools for difficult problems).



5 Whys

Expanded 5 Whys example A:



D4 – Root Cause Analysis (Root Causes)

Root & Contributing Cause(s)

Five questions to ask, to determine if you have found the Process/Design Root Cause (“the Root Cause”):

1. If you fix it, will it prevent the problem from happening again?
2. Is it a *process* or *design* issue?
 - Are you changing anything with the process or the design to fix the root cause? If not, you need to keep digging.
3. Is it blaming a person or organization?
 - *If the root cause is blaming someone, that means you need to keep digging. You need to ask **WHY** the person or organization made that mistake.*
4. Can you fix it?
5. Do you want to fix it?

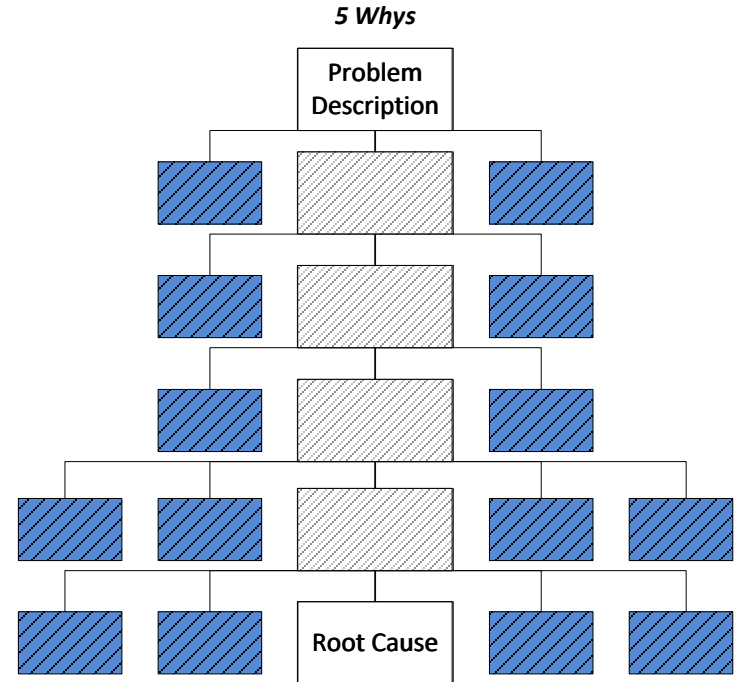


Root & Contributing Cause(s)

Contributing causes:

- Critical causes other than the root cause, which made the undesirable condition more likely to occur

Watch for phrases like: ***“It didn’t help that...”***



Root & Contributing Cause(s)

Examples of weak root causes:

- Operator error
- Inattention
- Failure to follow procedures
- Operator wasn't trained
- I was busy
- Machined wrong
- Inspection failure
- Wrong material selected
- Machining error
- Workmanship
- Supplier error
- Untrained operator
- Job set-up wrong
- Inspection didn't catch it
- No paperwork
- Process not followed
- Wrong part
- Caused by supplier
- Second check not performed
- Management

D4 – Summary



Key Questions – Root Cause Analysis

Is the root cause that was identified a problem with the process or design, not a symptom?

Will eliminating the process/design root cause prevent recurrences of the problem?

Does the root cause blame someone or does it address the process or design?

Is the root cause within the control of the team/organization?

What method (5 Whys, fishbone diagram, etc.) was used to identify the root cause?

Are significant contributing causes and detection failure causes identified for correction?

Was the root cause proven by evidence/logic?

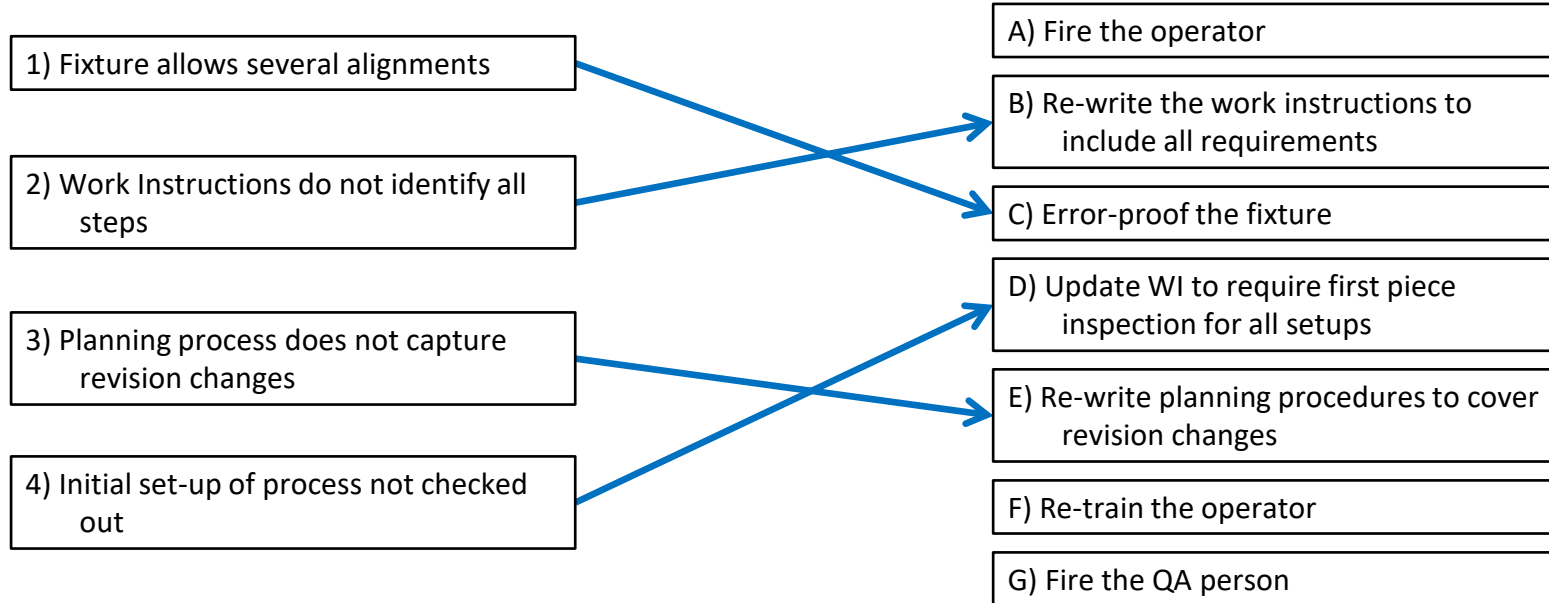
Do the process experts agree with the process/design root cause?

D5 – Long Term Corrective Actions

Correct the Root & Contributing Cause(s)

Match the root cause to the corrective action:

Root Causes:



Corrective Actions:

Correct the Root & Contributing Cause(s)

Long Term Corrective Action principles:

- Always *address the root causes* (mitigate or eliminate)
- Be *specific*
- Be *formally implemented* (not a statement of intent or tribal knowledge)
- Be *verifiable* (i.e., it is possible to audit the corrective action to verify implementation)

There are always resource limitations:

For cost/weight/time reasons, sometimes the root cause cannot be eliminated (e.g., adding inspection instead of changing the process)

There are times when the corrective action can only decrease the likelihood of recurrence (e.g., adding better lighting and work instructions to a manual weld process, rather than changing to a robotic weld process)

Always be honest on your 8Ds. If you cannot fix the root cause, be sure to record that fact. It will help if you deal with the problem if it happens again.

Correct the Root & Contributing Cause(s)

Long Term Corrective Action questions:

What are you going to change?

Fixture

Machine

Procedure

Work Instructions

Policies

Etc.

What change are you going to make?

Who is going to make the change?

When will the change be made?

How will you make sure the change was made correctly?

How will you make sure the change worked?

Correct the Root & Contributing Cause(s)

Example A:

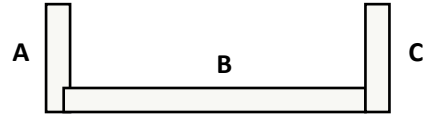
Corrective Action: Manufacturing Engineering will change the fixture to allow only one setup of components in the fixture. Fixture drawing 777A111 will be updated and fixture 777A111-1 will be reworked to meet the new requirements.

Implementation Plan:

W. Smith – Update 777A111, attach updated drawing as evidence – Due July 15

K. Ishikawa – Rework fixture 777A111-1, attach photos of fixture as evidence – Due July 29

G. Taguchi – Update welding PFMEA and Control Plan – Due Aug. 8



Verification Plan: Five different operators will set-up and run a sample part. The sample parts will be dimensionally inspected.

D5 – Summary



Key Questions – Long Term Corrective Actions

Do the long term corrective actions directly address the root causes?

Do the corrective actions eliminate the root causes (prevent defects from occurring) or mitigate the root causes (decrease probability of occurrence or ensure detection)?

Will the corrective actions be formally implemented or are they tribal knowledge or training?

Are the corrective actions specific and auditable?

What is the plan to verify that the corrective actions are effective?

D6 – Implementation and Verification of Long Term Corrective Actions

Implementation

Implementing Corrective Actions

When you implement a Corrective Action, you must make it permanent!

Formally implement the Corrective Action

- Verbal instructions, tribal knowledge, and/or one time training are not long-term fixes

Questions to ask:

- Will this corrective action still work if we hire someone or fire someone?
- Will the corrective action still be in place in a month? In a year?



Implementation

Update core documents including:

- **Work instructions** – update with any changes to the process
- **Process Flow Diagram** – update with any changes to the process
- **PFMEA** – update with new/updated risks based on everything learned during the 8D AND with any changes to the process
- **Control Plan** – update with any changes to the process

PROCESS/INSPECTION FLOWCHART

Product/Project: _____ Date: _____
 Requested By: _____ Requested By Title: _____
 Requested By Department: _____ Requested By Location: _____

Process/Inspection Name: _____

Version: _____

Created By: _____ Date: _____

Reviewed By: _____ Date: _____

Approved By: _____ Date: _____

Flowchart Description: _____

Flowchart Details: _____

PFMEA - PROCESS FAILURE MODE & EFFECTS ANALYSIS

Product/Project: _____ Date: _____
 Requested By: _____ Requested By Title: _____
 Requested By Department: _____ Requested By Location: _____

Process/Inspection Name: _____

Version: _____

Created By: _____ Date: _____

Reviewed By: _____ Date: _____

Approved By: _____ Date: _____

Flowchart Description: _____

Flowchart Details: _____

CONTROL PLAN

Product/Project: _____ Date: _____
 Requested By: _____ Requested By Title: _____
 Requested By Department: _____ Requested By Location: _____

Process/Inspection Name: _____

Version: _____

Created By: _____ Date: _____

Reviewed By: _____ Date: _____

Approved By: _____ Date: _____

Flowchart Description: _____

Flowchart Details: _____

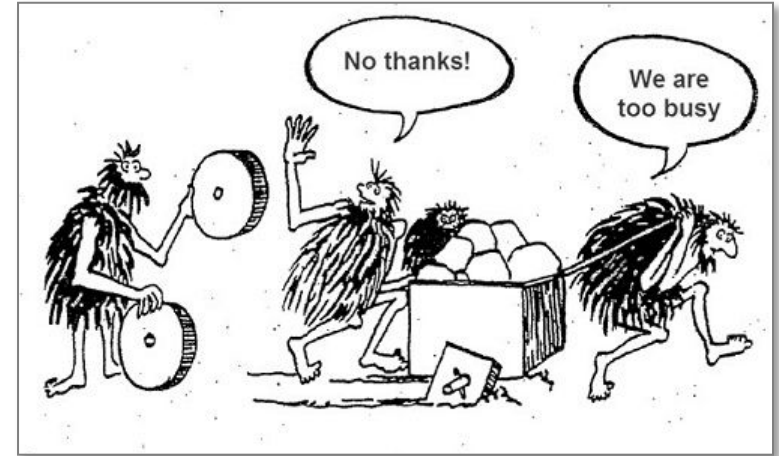
Implementation

Getting buy in

Always get buy in with the process owners (whoever performs the process day-to-day)! Many corrective actions fail because the team never gets buy in.

Involve process experts.

Make sure the process owners know what the problem was and how the corrective action will eliminate it.



8D Rule 7: Without buy in, even the best corrective action in the world will fail.

Implementation

Effective methods for verifying implementation:

Go see! Go witness the updated process. Ask questions, make sure that the updated process is understood by everyone using it.

Use the 8D as an audit guide. Can you find evidence that they completed every action that the 8D said they would?

Photos or other objective evidence. Take pictures of changes to processes or fixtures or other relevant items. Get copies of updated procedures, work instructions, and other documents.

Verify Effectiveness

Effectiveness Verification answers the question: **Did you eliminate the problem?**

The key requirement is *objective evidence* that the corrective actions have prevented recurrences of the problem.

Another way to think of effectiveness verification is: "Can I remove my short term fix, without having the problem re-occur?"

The method and length of the verification should be based on:

- **Problem description (When? How Many?)**
 - Is it a rare problem (low percentage effected)?
 - Would it be present on every batch/lot/job or does it happen sporadically?

- **The strength of the correction action**
 - Is it physically changing the process or design (e.g., creation of a new fixture, error proofing, etc.)?
 - Does it prevent the problem or only make it less likely (e.g., installing lighting, adding a checklist, etc.)?

Fixed vs. Growth Mindset

Be aware of which
mindset you're in and
the **impact** it has on
your wellness

Fixed Mindset

- I'm only good at certain things
- I give up when it gets too hard
- I hate challenges
- I take feedback/criticism personally
- I don't like what I don't know

Growth Mindset

- I can be good at anything
- I try until I get the results I want
- I embrace challenges
- I welcome feedback/criticism
- I like learning about things I don't know

D6 – Summary



Key Questions – Implementation and Verification of Long Term Corrective Actions:

Were the corrective actions implemented as the team expected?

Is there objective evidence that the corrective actions were implemented correctly?

Has the short term corrective action been removed without causing problems?

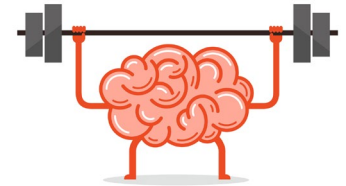
What objective evidence is available to prove the corrective actions effectively eliminated the problem?

Class Exercise – Corrective Actions

Objective: Identify corrective action(s) for the process root cause(s) that was identified.

- Develop a specific corrective action plan.
- Identify the objective evidence needed to prove that the corrective action was implemented correctly.
- Develop the effectiveness verification plan.

Note: You would document this plan in D5 (Long Term Corrective Actions). In D6 you would provide evidence that you executed the plan and that it was effective.



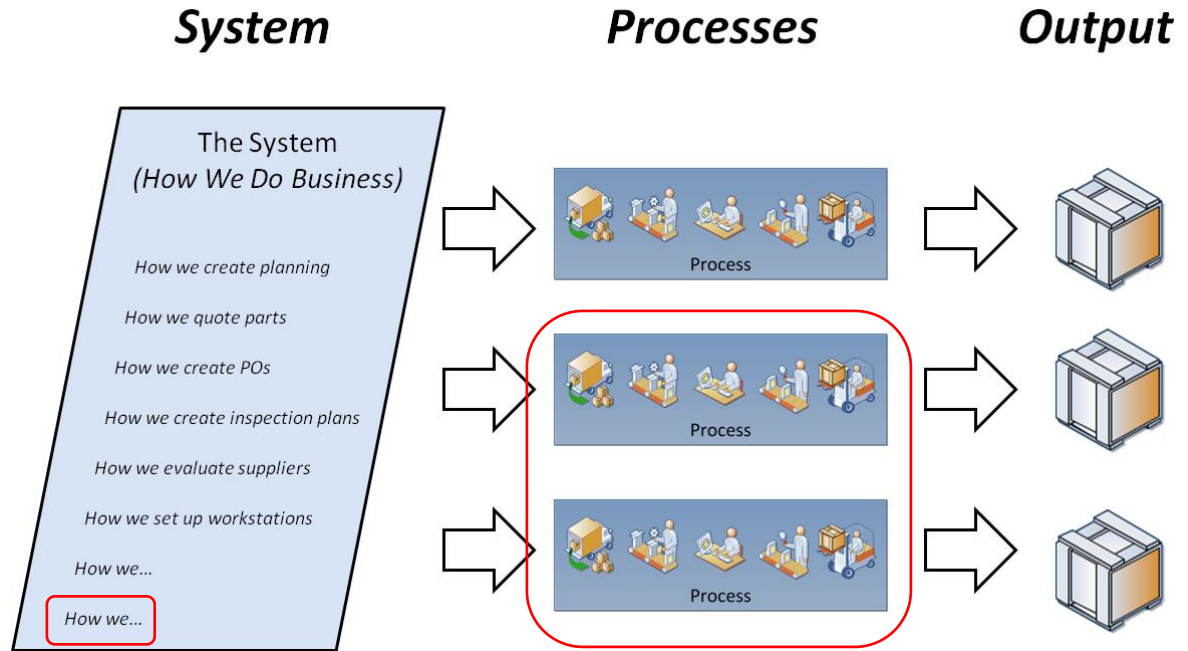
D7 – Preventative Actions

Preventative Actions

The Preventative Actions step is where you have biggest impact.

Preventative actions should address:

- Systemic root causes
- Like parts and similar processes



Preventative Actions



Prevent failures for similar parts and processes that could have the same, or similar, process/design problems.

Example A: Identifying other fixtures that can allow multiple orientations of weldment components, similar to the 271828 bracket. Error-proofing fixtures that are identified.

Addressing any like parts or similar processes is a necessary step in the 8D process and should be completed every time.

Preventative Actions



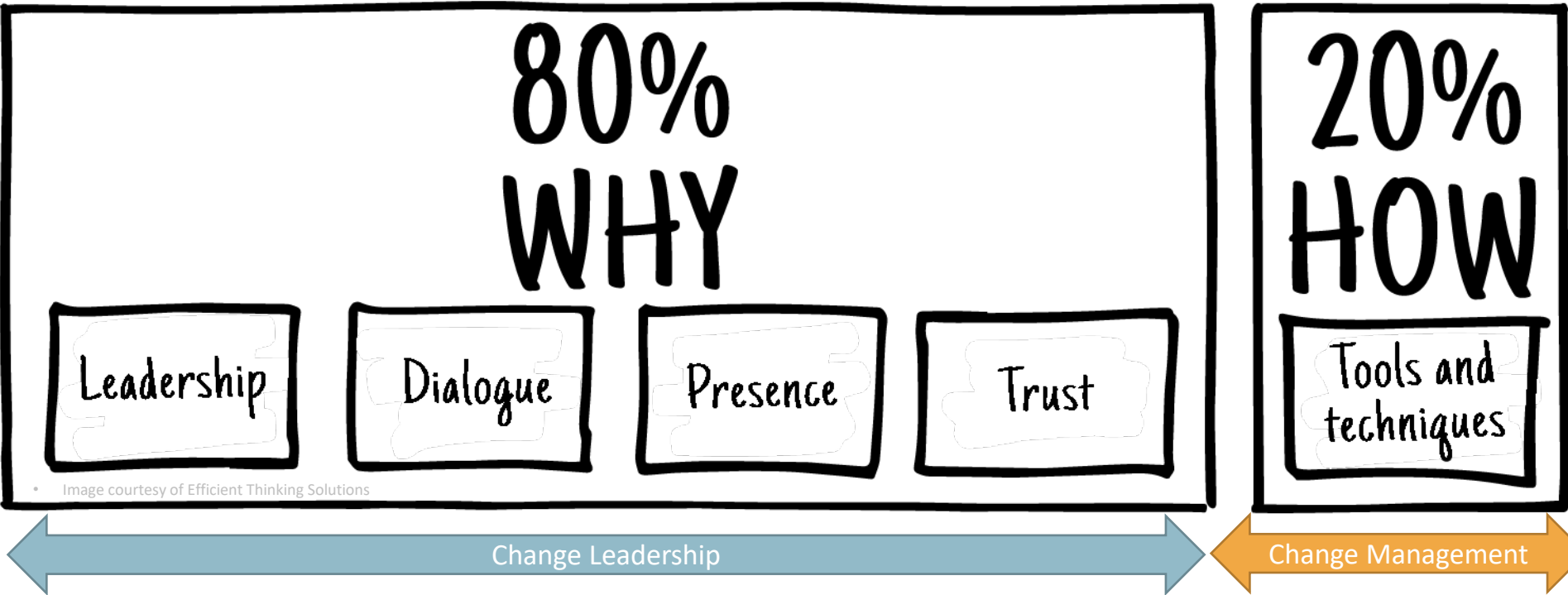
Address systemic causes that were identified during the root cause investigation.

- **Example A:** Project developed to analyze and improve the current processes for the control of fixtures and the design of new fixtures. Project charter developed and approved on 6/21.

(Note: Some projects may take a long time to address systemic or widespread issues. If a project charter or project plan is developed, the 8D does not need to wait on its completion.)

8D Rule 8: If you want the 8D to have real impact,
focus on the systemic corrective actions.

Communication plays a key role



D7 – Summary



Key Questions – Preventative Actions:

Have like parts and similar processes with similar process problems been addressed?

Have any significant systemic root causes been identified?

Should any larger scale continuous improvement plans be initiated (based on the systemic root causes)?

D8 – Congratulate the Team

Congratulate the Team

Successfully completing an 8D is a big deal! The Team Champion should recognize the accomplishments of the team.

- Personal recognition (in-person or via note)
- Recognition during all-hands meetings
- Awards (key contributor, etc.)

You provide the 8D team with recognition so that they will volunteer to be on the next one.



D8 – Summary



Key Questions – Congratulate the Team and Wrap-up:

Has the team received recognition for improvements made to the process and system?

Was the 8D process treated as a continuous improvement activity?

Has the 8D process been documented so that it can be used to help resolve future problems?

Conclusion

Conclusion

Discipline is key to problem solving

1. Follow the process step by step. Don't skip steps!
2. Ensure that each step is completed correctly before moving on.
3. Document your process.
 - You will not be successful the on the first try with every 8D. Documenting your work means that you will not have to start over at the beginning if a solution doesn't work.



Pencil whipping 8Ds leads to solutions that are ineffective, expensive, or both.

Conclusion

A few final notes:

- It takes practice to become a skilled problem solver.
- Make sure to get feedback from other skilled problem solvers.
- Don't be discouraged if your 8D isn't perfect. Ask yourself: "Did I make a permanent improvement to the process or system?"
- Reach out if you need assistance, Oshkosh has people who can help.

Questions?

8D Rule 1: If there's no team, it's not an 8D.
(D1)

8D Rule 2: Incomplete problem descriptions lead to bad solutions. (D2)

8D Rule 3: Never stop after the short term fix, even if the symptoms go away. (D3)

8D Rule 4: Inspection cannot be the root cause. Inspection catches defects. It doesn't prevent them. (D4)

8D Rule 5: Document your root cause analysis, every time. (D4)

8D Rule 6: Human error is not an acceptable root cause. (D4)

8D Rule 7: Without buy in, even the best corrective action in the world will fail. (D6)

8D Rule 8: If you want the 8D to have real impact, focus on the systemic corrective actions. (D7)