# Supplier Quality Management

## Continuous Improvement Training

Root Cause Analysis Tools

**Advanced Quality Team (AQT) | Q2 2026**

# Agenda

- Review Goals
- Review Supplier Performance
- Quick review of Root Cause Analysis (RCA)
- Review Problem Statement
- Examine effective use of 5-Why and common pitfalls
- Apply Fishbone (Ishikawa Cause & Effect Diagram) to (Supplier) issues, prioritize with C&E Matrix
- Q&A
- Closing

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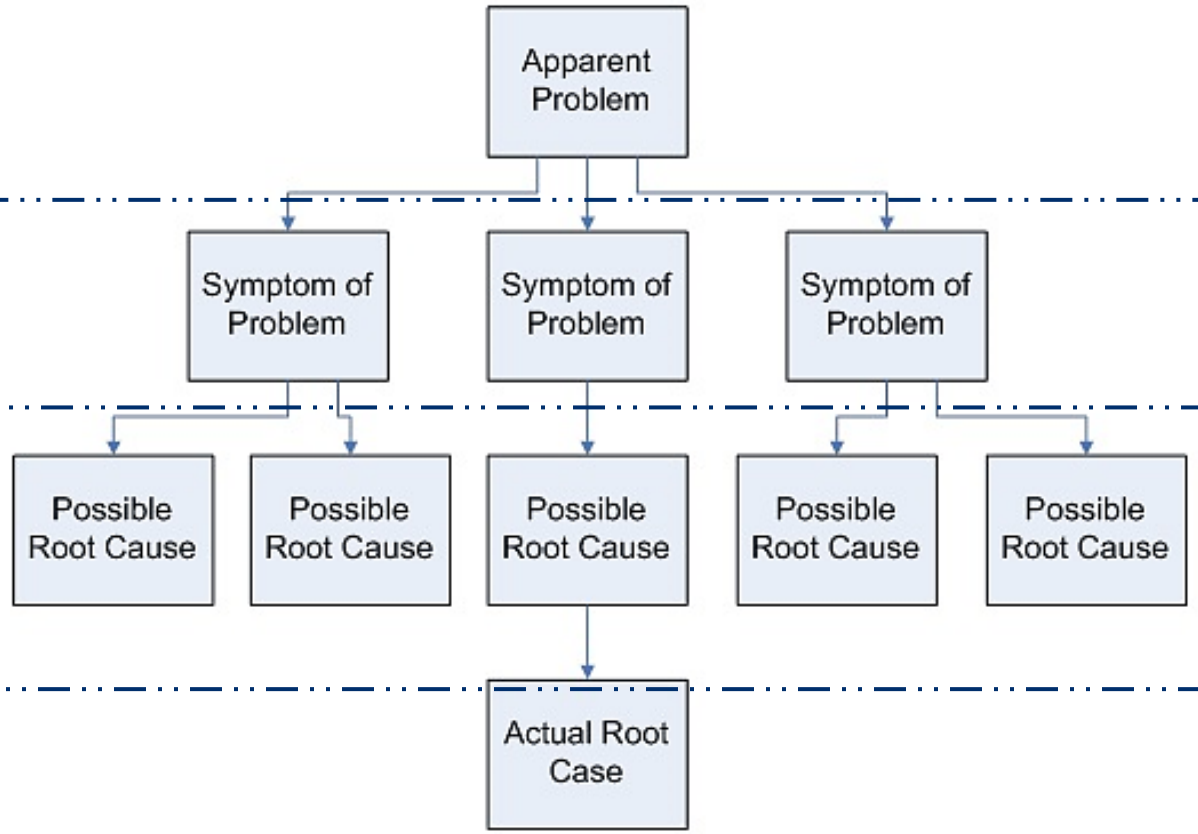
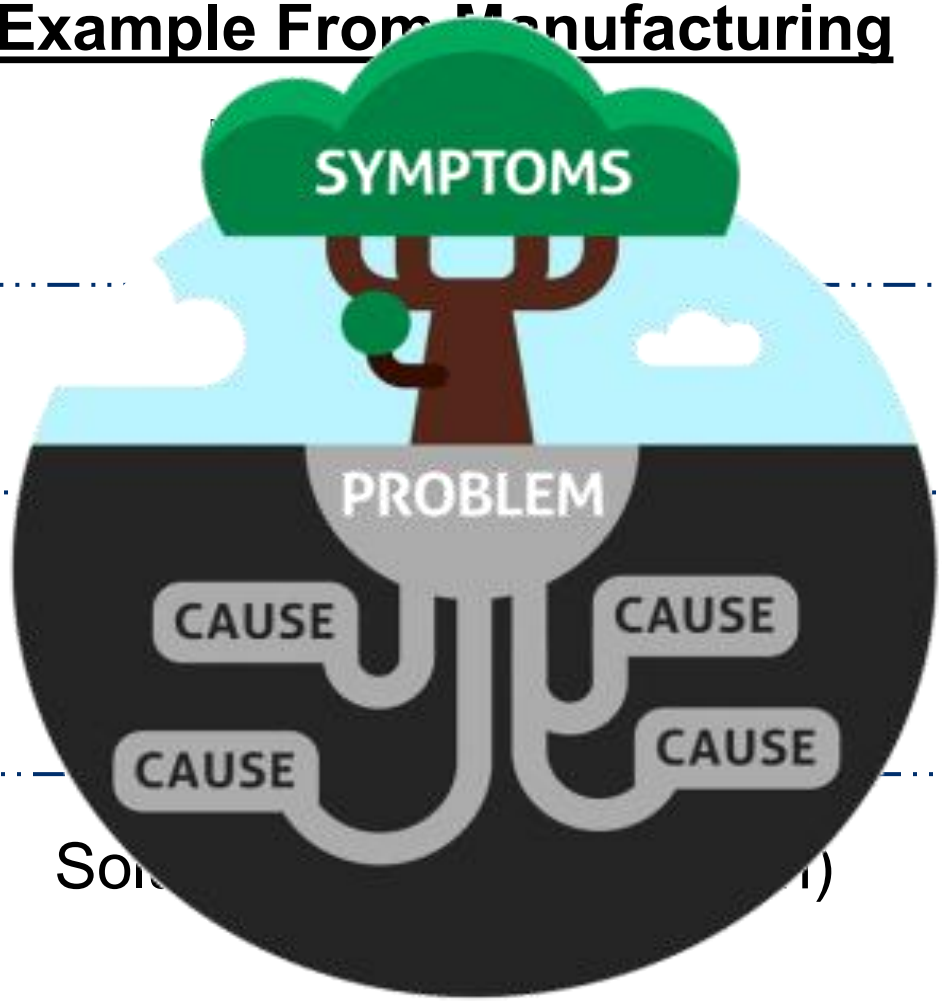
# Supplier Performance Review

**NOTE: This slide to include “Supplier Performance Specific Data Only”, not LMPI data/information.**

# Importance of Root Cause Analysis




## Example From Manufacturing

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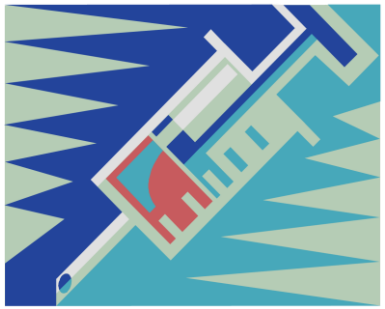
# Importance of Root Cause

What factors are causing our key pain points?

## Treating Symptoms

**VS.**

## Treating Causes



# Problem Statement

**4 W's**

1. What was affected? Be specific about which job numbers, part numbers, customers, and so on, were affected.
2. Where did the problem take place? Be specific about where the problem was found, that is, department, equipment, customer, and so on.
3. When was the problem discovered: Was it discovered at the end of the production run, on a certain shift, and so on?
4. Who discovered the problem? Was it discovered internally or by the customer.?

**2 H's**

1. How much was affected? Think in terms of number of orders, amount of product, number of dollars, number of customers, and so on.
2. How often has this problem occurred? Is this the first time or has the same or similar issue happened in the past?

**1 C**

1. What is the consequence / impact of the situation? What is the potential effect on performance? Did the customer receive a late shipment, or were other orders late because of the situation, and so on?

*Ref.: "Correct! Prevent! Improve!" by Jeanne Ketola & Kathy Roberts*

# Problem Definition (Example of Using the 4W/2H/1C formula)

| | Question | Answer |
|---|---|---|
| W | What was affected? | Part # XJXXX |
| W | Where did the problem take place? | At the Texas facility |
| W | When was the problem discovered? | On 1/08/2020 @ 3:15pm (first shift) |
| W | Who discovered the problem? | Jack Smith – Line A operator |
| H | How much was affected? | 47 units with the same problem online A |
| H | How often has this problem occurred? | First time occurrence – no previous record |
| C | What is the consequence/impact of this situation? | 375 units on hold in finished goods inventory; No in-process units; customer has 187 units on hold at their location. Customer is suspending all future orders until problem is resolved. |

**Problem Description**

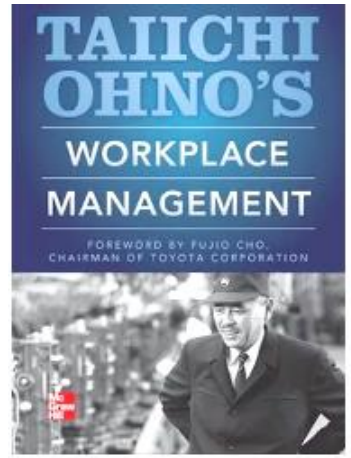
Nonconforming part #XXXXXX was found at the Texas facility on first shift by a Line A operator on 8/15/08 at 3:15 PM. Forty-seven units of the same product with the same problem were also found on production line A. No defective in-process units found. This is a first-time occurrence. 375 units were put on hold in the finished goods inventory, and the customer has also put 187 units on hold at their location. The customer is suspending all future orders until the problem is resolved.

*Ref.: "Correct! Prevent! Improve!" by Jeanne Ketola & Kathy Roberts*

# 5 Why

**What is 5 Why Analysis?**

- 5 Why Analysis is a questioning technique for getting beyond symptoms and uncovering true root causes.
- 5 Why helps identify the root cause of a problem. In addition, the method helps the team recognize the broad network of problems causes and relationship among these causes. It can indicate the best areas to address short- and long-term solutions.




**Why use it?**

- 5 Why Analysis is used to identify root causes that solutions can be built upon.
- Use 5 Why Analysis to determine  the direct, detection, and systemic causes of a problem.

**When to use it?**

- Problem is simple or medium complexity
- A quick response is needed for immediate containment activities
- The team is new to root cause analysis
- 5 Why Analysis is most used to identify the root causes of a problem. It is also typically used in conjunction with Fishbone Diagram to identify the root cause when there are multiple factors/Inputs.

"By repeating why five times, the nature of the problem as well as its solution becomes clear."

Taiichi Ohno
1912-1990

TOYOTA

# 5 Why

**Limitations**

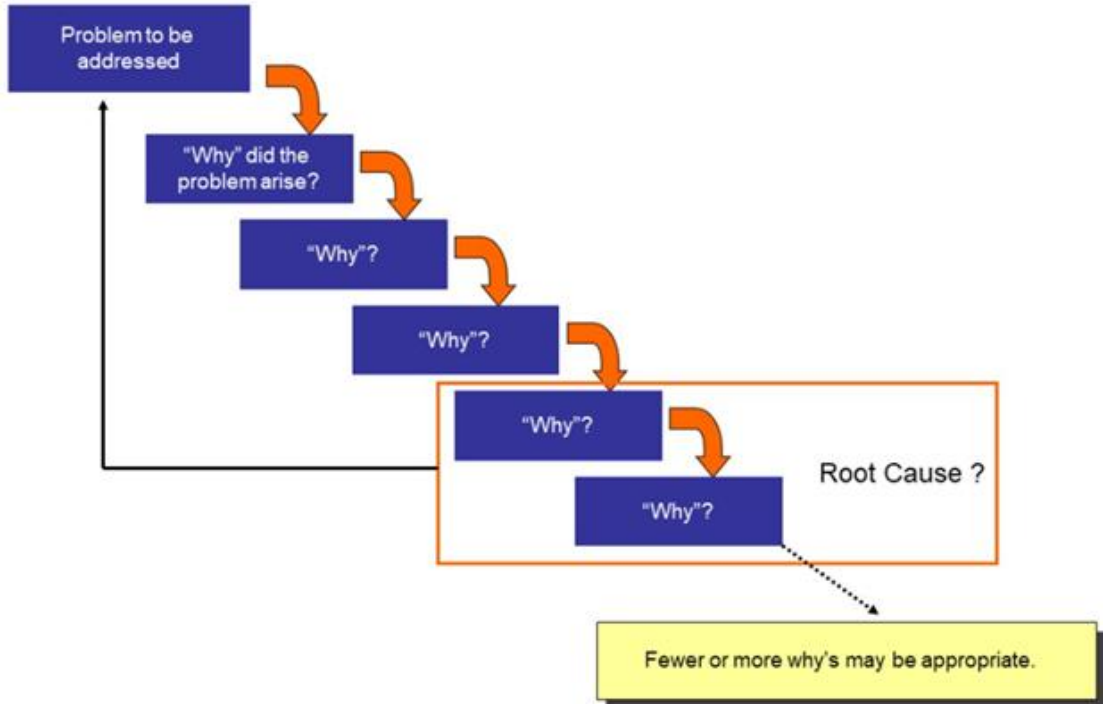
- Can be irritating if “why” is asked too many times (hence 5 times…..)
- Multiple causes or variations
- Not answering the 5-why question correctly – causes a divergence that does not make sense

**When to STOP asking Why?**

- Stop whenever you have reached a potential genuine cause that can be act upon

**Benefits of 5 Why Analysis**

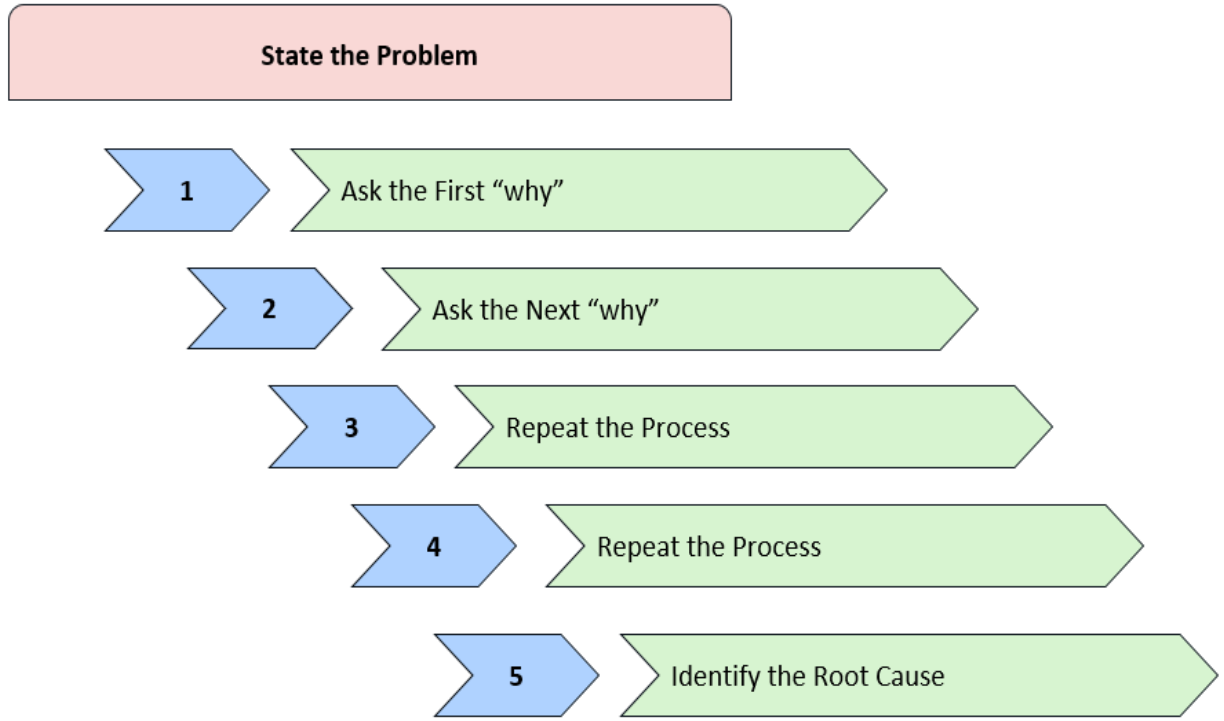
- Fast Reaction Time
- Future Problem Prevention
- Improved Communication



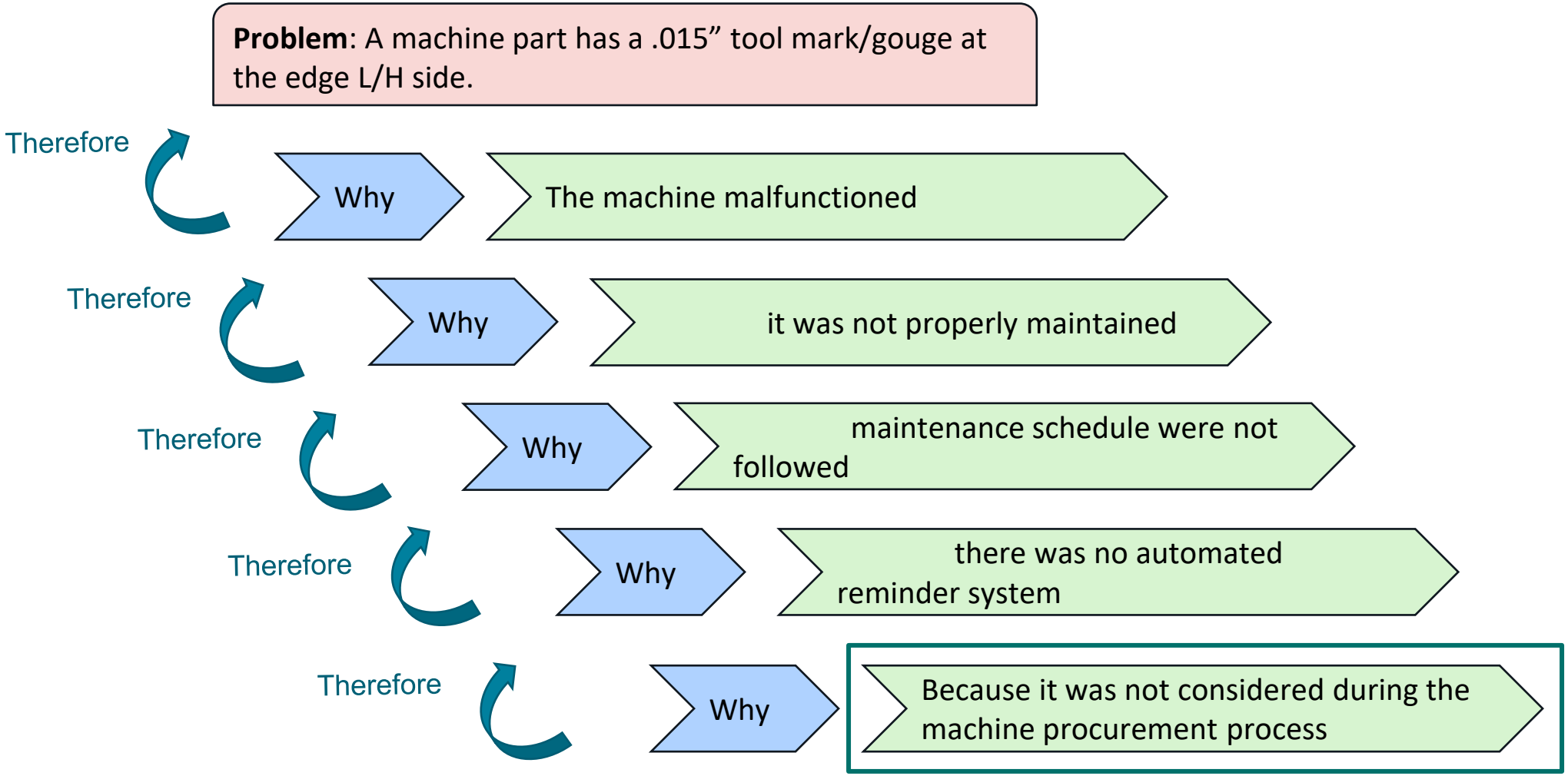
# 5 Why Root Cause Analysis Process

**How to use the 5 Whys process:**

1. **State the Problem**: Clearly define the problem that needs to be solved.
2. **Ask the First "Why":** Ask why the problem occurred and write down the answer.
3. **Ask the Next "Why":** Based on the answer to the first question, ask "Why?" again.
4. **Repeat the Process**: Continue to ask "Why?" for each subsequent answer, digging deeper into the cause-and-effect relationships.
5. **Identify the Root Cause**: Stop when the team agrees they have reached the root cause, which may take fewer or more than five "whys".



# 5 Why




**Root cause:** the lack of an automated reminder system during the machine procurement process. Addressing this root cause can prevent similar defects in the future.

# 5 Why – Good #1

**Problem**: The Memorial Monument in Washington D.C. is deteriorating.

Why → Because harsh chemicals are frequently used to clean the monument.

Why → To clean off the large number of bird droppings on the monument.

Why → Because the large population of spiders in and around the monument are a food source to the local birds.

Why → Because vast swarms of insects, on which the spiders feed, are drawn to the monument at dusk.

Why → Because the lighting of the monument in the evening attracts the local insects. **Root Cause**

**Solution:** Change how the monument is illuminated in the evening to prevent attraction of swarming insects.

# 5 Why – Good #2

**Problem**: Why Did He Stop Working 12 Times in 1 Hour?

Why → Because I had to adjust my body position.

Why → Because my ribs or head hurt.

Why → Because they are hitting the wing structural edges.

Why → The pad is not adequate (non-uniform foam in bag).

Why → I started the job at 10 AM and couldn't find the right pad in this hangar (looked for 20 minutes). Could only find this one.

Root Cause?

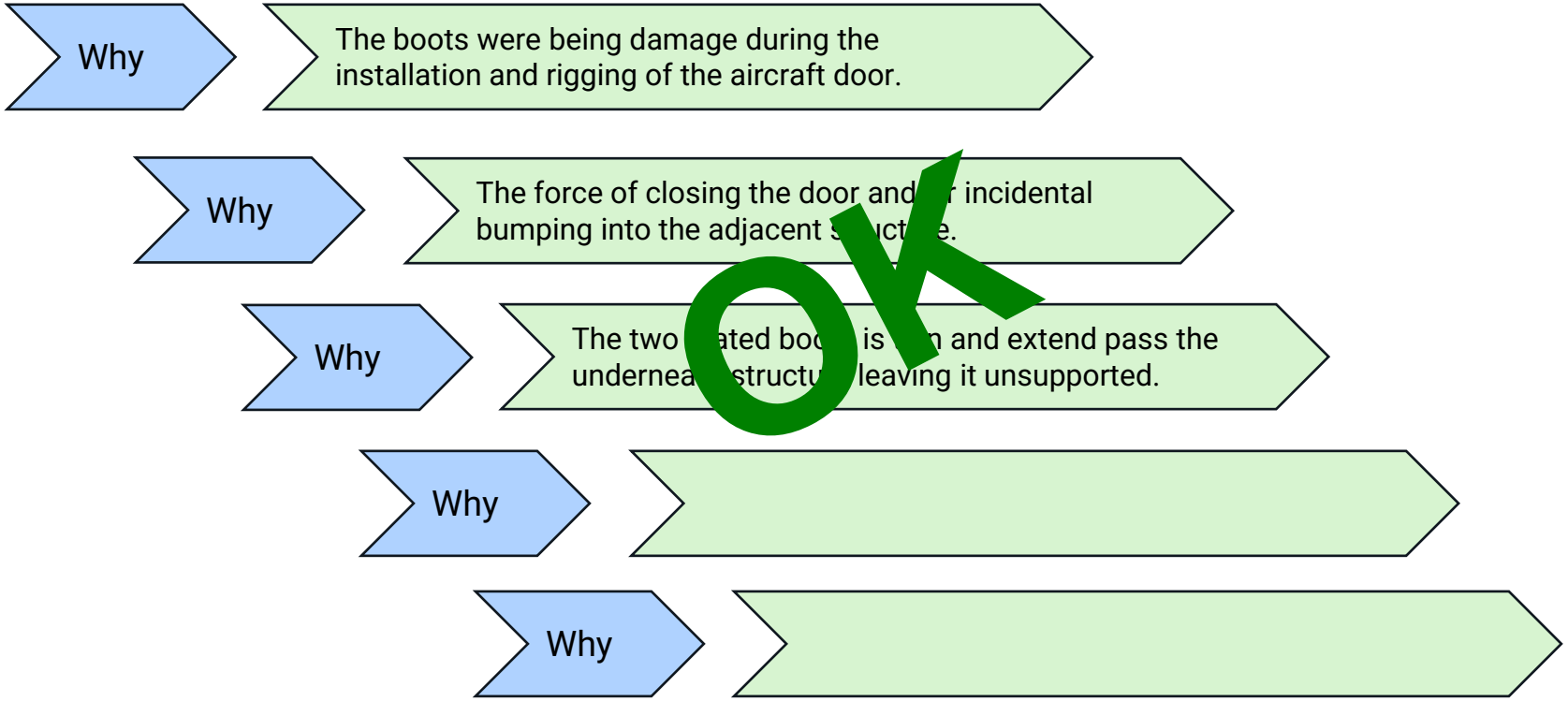
Why couldn't you find the right pad? Because there are not enough pads for everyone that needs them.

? ?

Why did it take 20 minutes? Because there is no standard place to look for them.

# Is This 5 Why Acceptable?

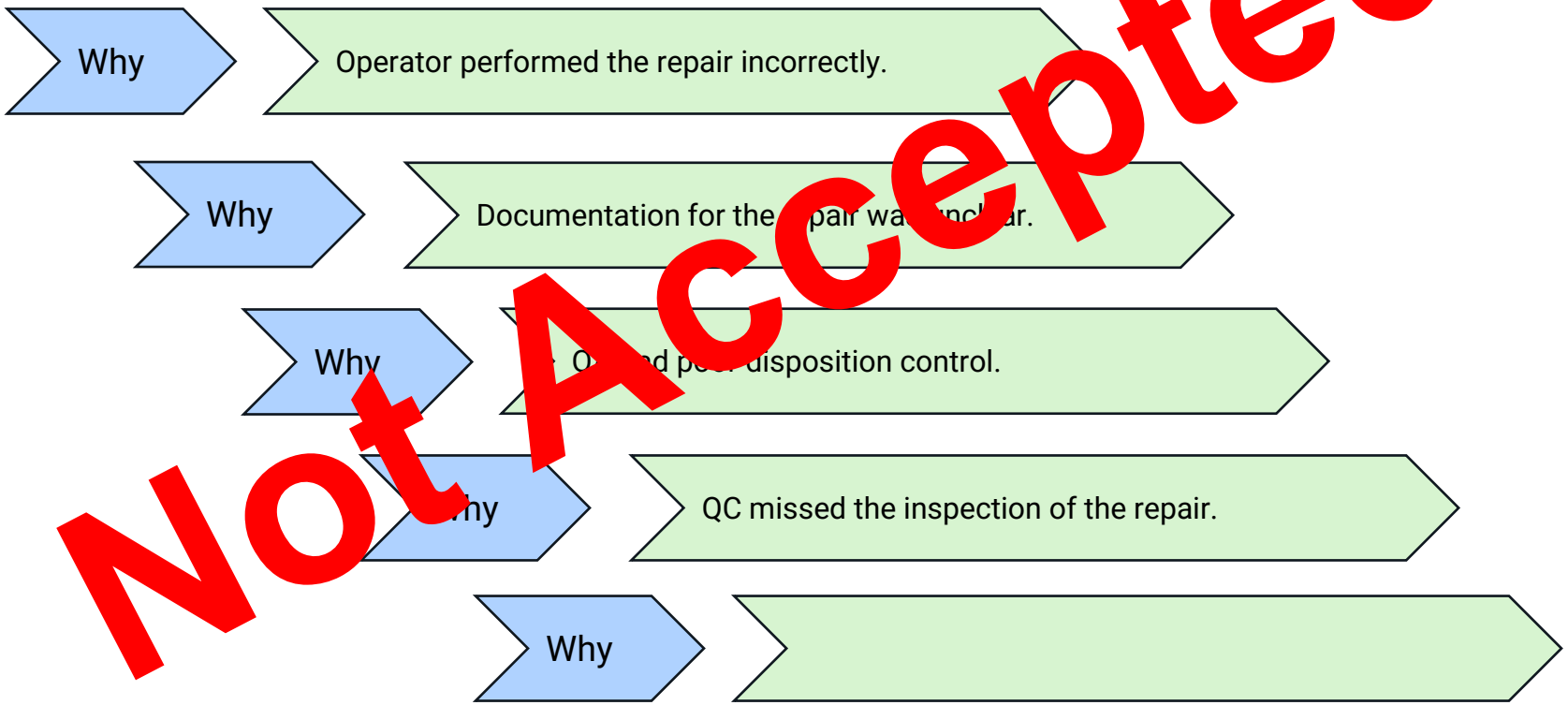
**Problem**: The JSFXXB and JSFXXK Boots has damage at the aft lower tip. This is unacceptable per the limits specified in 2ZZPXXXXX and B/P requirements.




**Solution:** Submitted CRXXXXXX for PMATS 4XXX to change the boot configuration common to the aft corner of the fwd refuel probe door. Replace current boot configuration with a custom molded boot. Break in schedule on UNIT 2BFXX & 2CFXX.

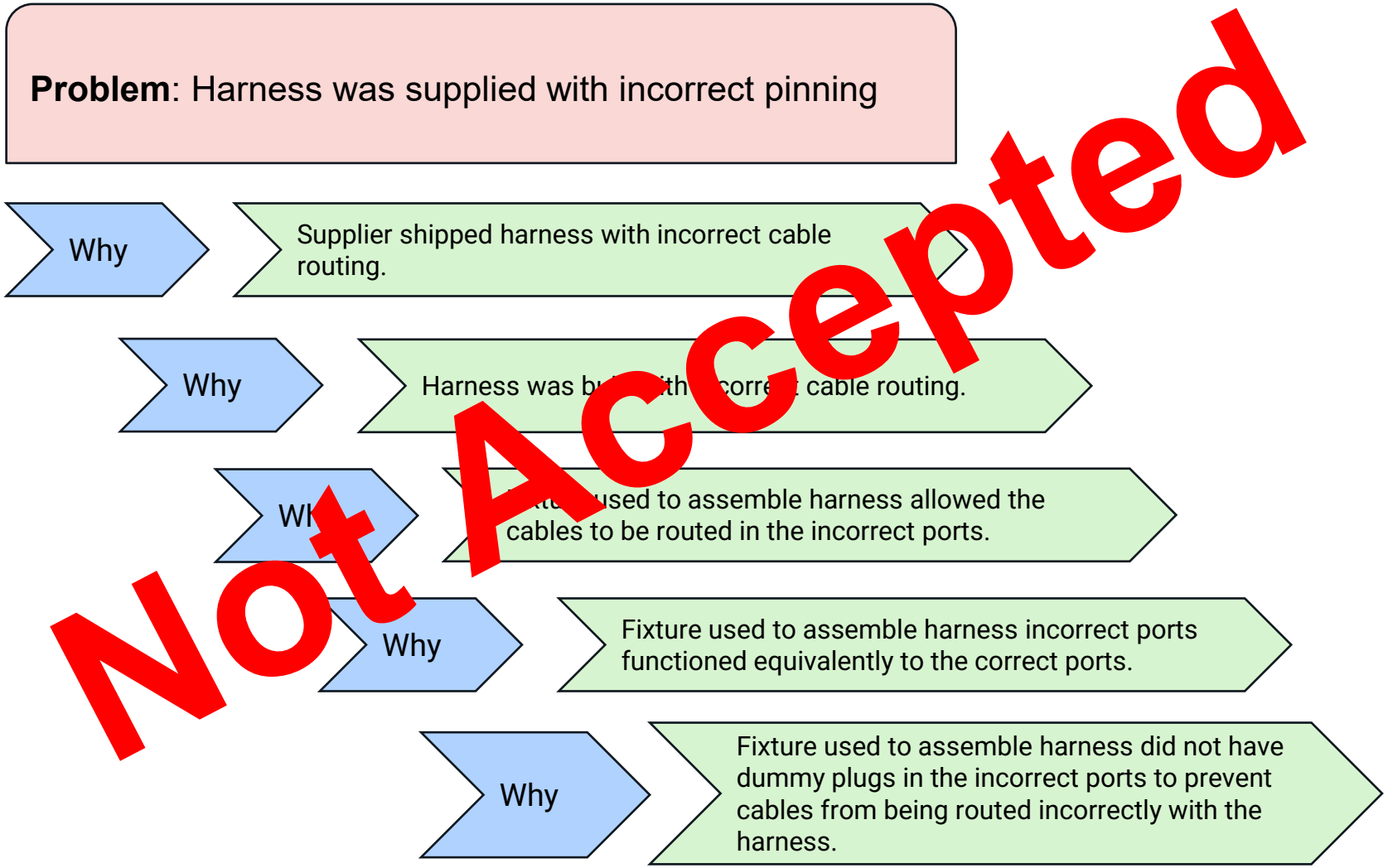
# Is This 5 Why Acceptable?

**Problem**: The part repairs were not done per the repair geometry and location as stated in the requirements document.




Not Accepted

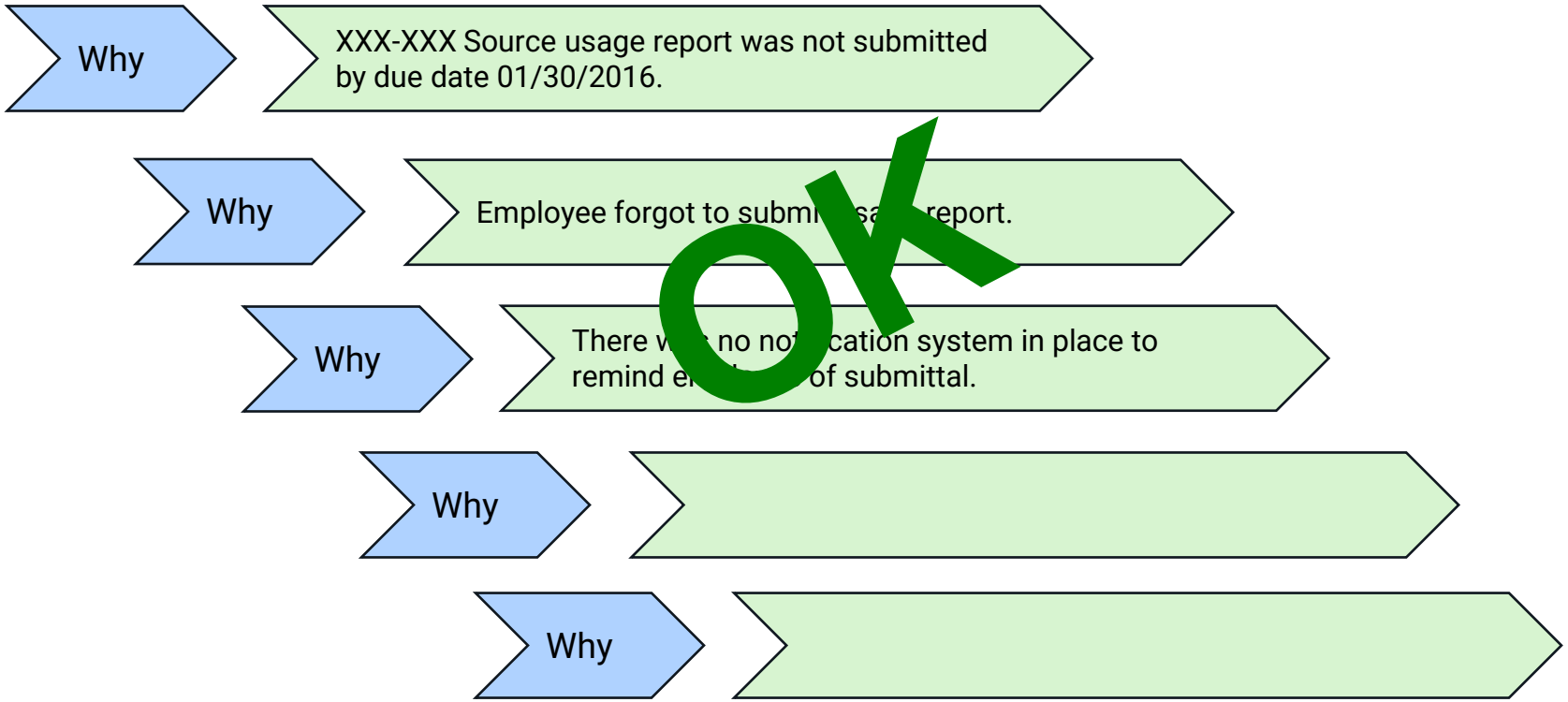
# Is This 5 Why Acceptable?




Not Accepted

# Is This 5 Why Acceptable?

**Problem**: The usage report was due on 1/30/2016 and has not yet been submitted.



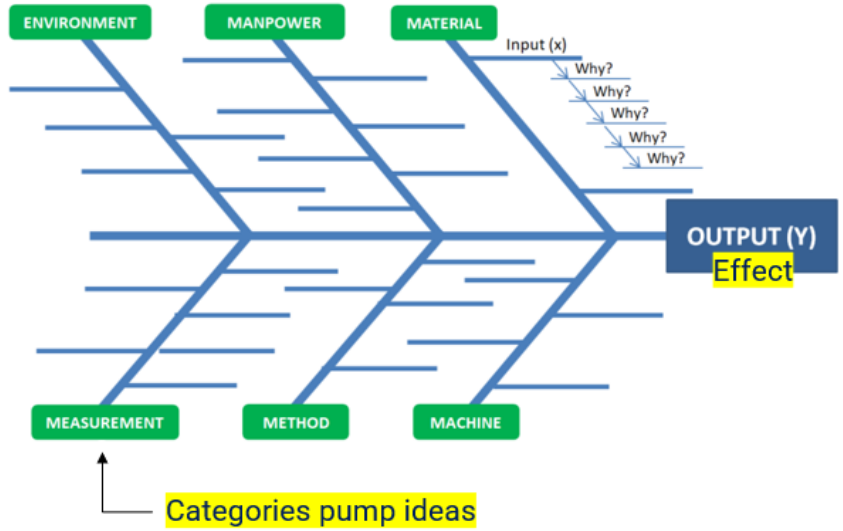
# 5 Why – Common Mistakes

- **Using 5 Why *for* ***EVERYTHING***** 
- **Start with what the team ***believes*** is the root cause** and not with the actual failure data
- **Skipping Steps** – Response does not answer the question of why the previous action / answer occurred
- **Stopping at the first 'root cause'** – not digging deeper to see if there is a deeper root cause for that failure
- **Forcing the 5 Why to arrive at a specific root cause** through skipping or unrelated "Why" responses
- **Passing the buck** – Root cause of the problem being someone else's fault
- **Silo Approach** – Only using Quality personnel, not involving the other affected departments (Production, Engineering, etc.)

# Ishikawa (Cause & Effect) Diagram

**What is It?**

- Identify potential causes: A structured visual brainstorming tool used to isolate ONE specific defect, problem, or undesirable condition and determine the *potential* causes
- Organize the causes into categories, making it easier to analyze and prioritize them
- Visualize relationships: Visualize the relationships between the causes and the problem
- Root cause analysis: *Repeat the 5 Whys technique* for each potential root cause until you've identified the underlying factors that contribute to the problem




**When to Use:**

- Troubleshooting faulty company processes or procedures
- Improving the quality of products or services
- Resolving simple to moderately complex issues

**Benefits of Fishbone Diagrams:**

- Improved problem-solving: Helps to identify the root cause of a problem
- Increased collaboration: Encourages team collaboration and communication
- Better decision-making: Provides a visual representation of the possible causes, making it easier to prioritize and make decisions
- Reduced bias: Helps to reduce bias and assumptions by considering multiple perspectives

# Ishikawa (Cause & Effect) Diagram

## Manufacturing Industry – 6Ms

- Machine
- Method
- Material
- Manpower
- Measurement (Inspection)
- Milieu (Mother Nature–Environment)
- Management
- Maintenance

## Marketing Field – 7Ps

- Product
- Price
- Place
- Promotion
- People
- Positioning
- Packaging

## Service Industry – 5s

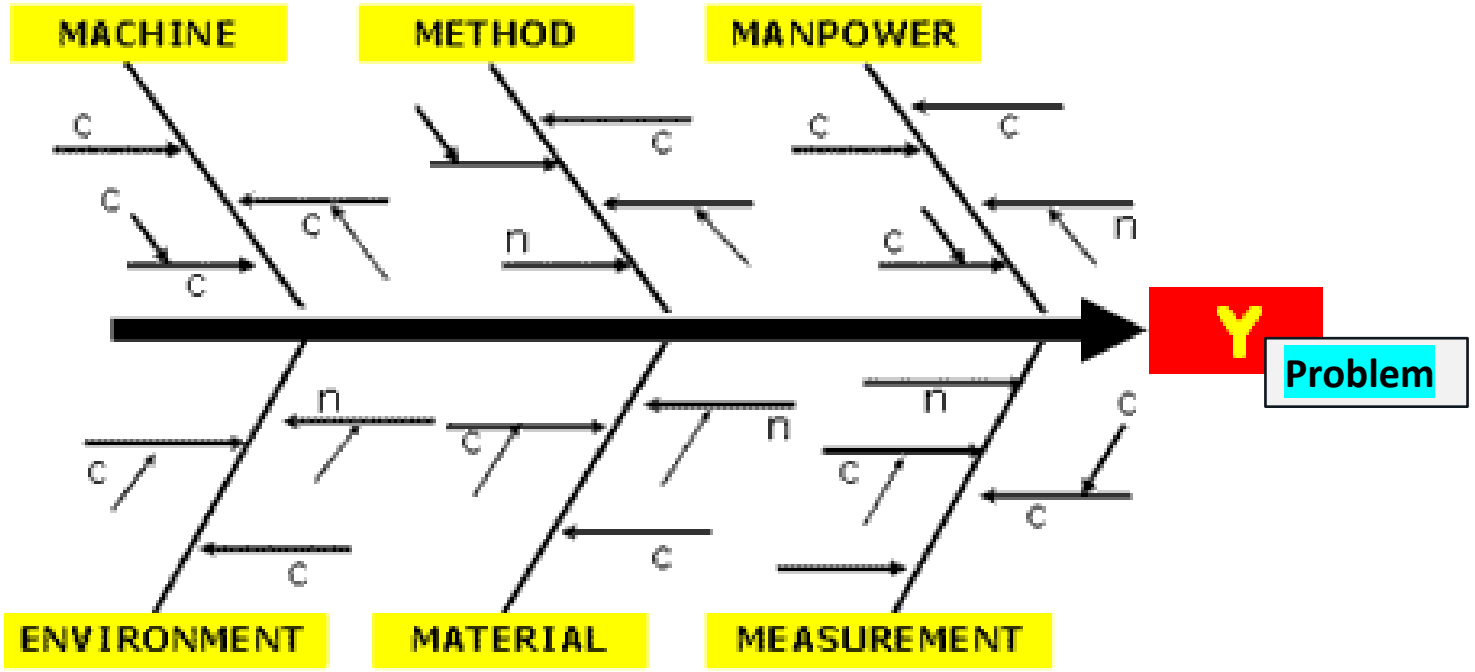
- Surroundings
- Suppliers
- Systems
- Skills
- Safety

# Ishikawa (Cause & Effect) Diagram

## How to use the Ishikawa diagram for root cause analysis - General method

1. **Form a team:** Expertise from various departments, managers, technical experts, and other stakeholders concerned with the issue.
2. **Clearly define the problem:** Team has a shared and clear understanding of the problem.
3. **Create the Ishikawa diagram:**
    1. Create the main column: Draw a horizontal line resembling a fish's spine stemming from the identified problem.
    2. Establish cause categories: Preliminarily identify the general cause categories most relevant that might contribute to the undesirable effect. *The original method's categories are the 6Ms: Machines, Manpower, Material, Methods, Measurement and Medium (often called Environment).*
4. **Brainstorming:** Organize brainstorming sessions with the team to pinpoint as many causes as possible.
5. **Prioritization:** With a list of potential causes in hand, instruct the team to assign which causes are *Controllable and Noncontrollable (Noise)*. This assists in focusing on the most pivotal causes.
6. **Deepening and structuring of causes:** The team transitions to the deepening and structuring phase. 5 Why root cause analysis can be applied here.
7. **Action plan:** Once the primary causes are discerned and understood, devise an action plan to tackle them.
8. **Monitoring and ongoing enhancement:** Gauge the effectiveness of the corrective actions. PDCA methodology to check and adjust as needed to achieve objective goals.
9. **Communication:** Update the entire organization regarding the outcomes of your analysis and the corrective steps undertaken.

# Ishikawa (Cause & Effect) Diagram




**C = Controllable Cause/Input**
**N = Noncontrollable/Noise**

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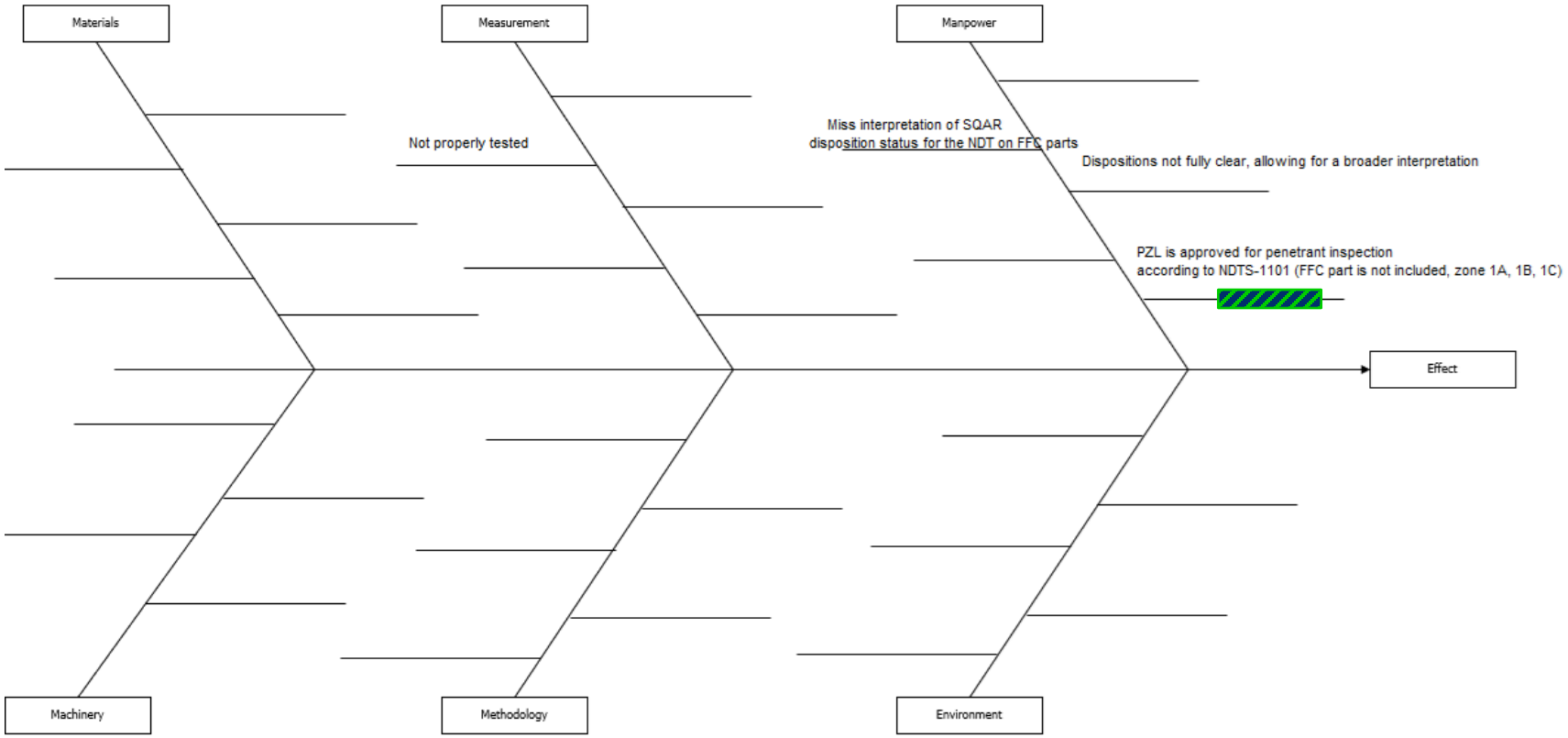
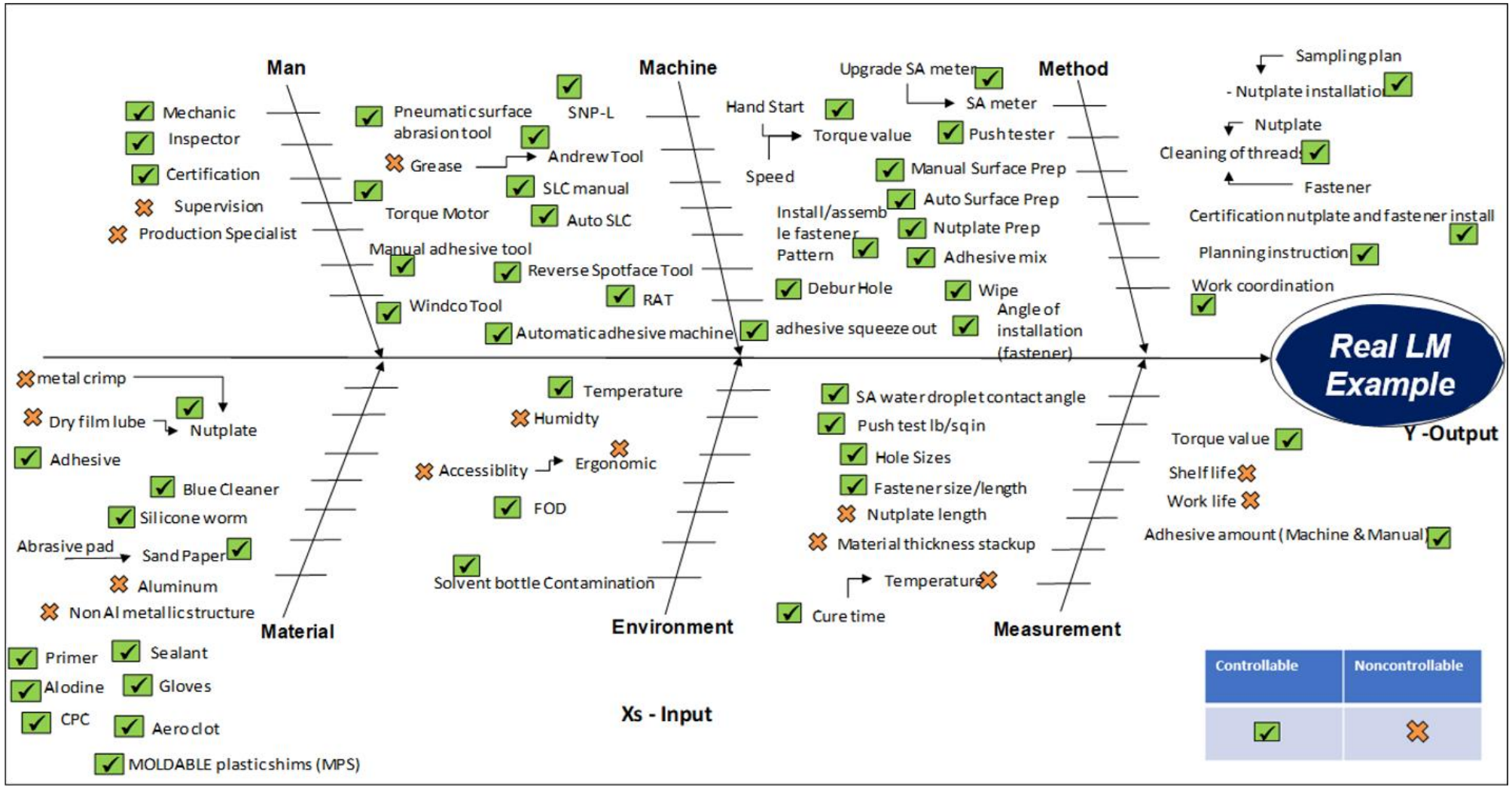
# Supplier Fishbone Review

**Supplier XXX example for Fishbone**

**SCAR XX – Using special processes outside of XXX-XXX qualification (NDT specifically)**



# Ishikawa (Cause & Effect) Diagram



# Ishikawa (Cause & Effect) Diagram

*My brainstorming exercise resulted in 50 controllable inputs. I can not work all 50!*

*Now what do I do?*

# Cause & Effect Matrix

**What is 5 Why Analysis?**

- A tool to prioritize inputs from a fishbone chart

**When to use it?**

- Relates process inputs identified in the fishbone diagram to their relative importance on the output

**Why use it?**

- To correlate inputs to outputs, the important contributors' factor can be identified and focus on
    - Define Key Process Input Variables (KPIVs) that must be addressed to improve the Key Process Output Variables (KPOVs)

| Cause and Effect Matrix | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rating of Importance to Customer | | 10 | 8 | 7 | 9 | 8 | |
| | Customer Requirement | Customer Requirement | Customer Requirement | Customer Requirement | Customer Requirement | Customer Requirement | Total |
| | Process Inputs | | | | | | |
| 1 | Input/Cause | | | | | | 0 |
| 2 | Input/Cause | | | | | | 0 |
| 3 | Input/Cause | | | | | | 0 |
| 4 | Input/Cause | | | | | | 0 |
| 5 | Input/Cause | | | | | | 0 |
| 6 | Input/Cause | | | | | | 0 |

# Cause & Effect Matrix

**Step 2**
Assign an importance ranking to each of the Customer Requirements

**Step 5**
Cross multiply and sum rows across

**Step 1**
Identify Customer Requirements

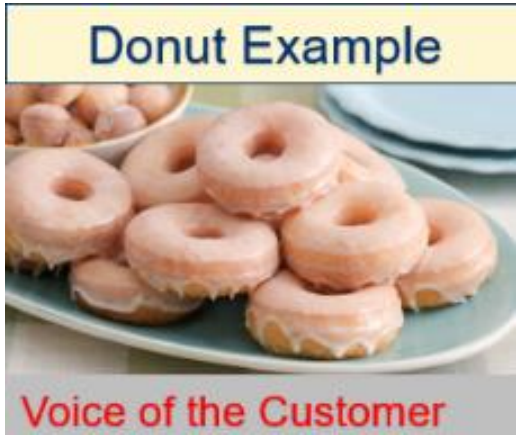
**Step 4**
Correlate Inputs to Customer Requirements

**Step 3**
List all Process Inputs (from Fishbone)

**Step 6**
Sort and rank inputs by highest total

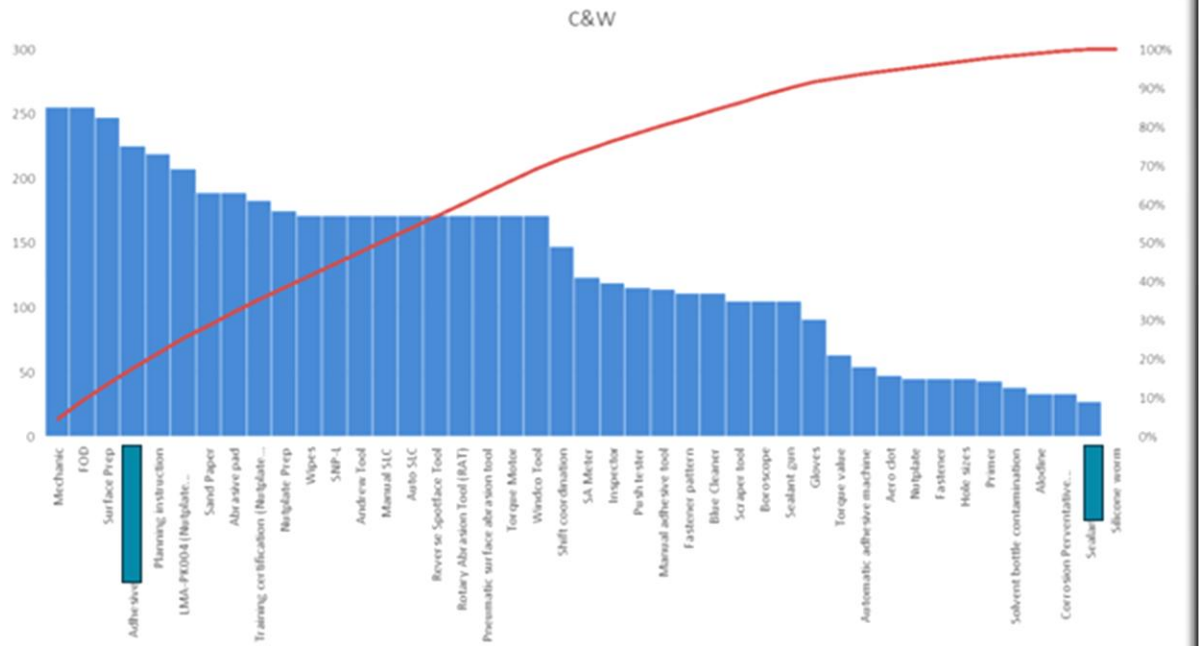
Cause and Effect Matrix

| | | Rating of Importance to Customer | 10 | 8 | 7 | 9 | 8 | |
|---|---|---|---|---|---|---|---|---|
| | | | Customer Requirement | Customer Requirement | Customer Requirement | Customer Requirement | Customer Requirement | Total |
| 1 | Input | | 1 | 3 | 9 | 9 | 3 | 202 |
| 2 | Input | | 3 | 9 | 1 | 3 | 3 | 160 |
| 3 | Input | | | | | | | |
| 4 | Input | | | | | | | |
| 5 | Input | | | | | | | |
| 6 | Input | | | | | | | |



# Cause & Effect Matrix

| | Rating of Importance to Client (Rank 1-10) | 10 | 8 | 9 | 4 | | |
|---|---|---|---|---|---|---|---|
| | Metric No. | 1 | 2 | 3 | 4 | | |
| | Process Outputs (Big Y's) / High-Level Processes (Rank 0, 1, 3, 9) | Nutplate Disbond 1 or less per unit | Compliance to the Standard Work | Standard Repair Cost Reduction in Span Time | Require cure time within 24 hrs | Total | Ranking |
| 1 | Mechanic | 9 | 9 | 9 | 3 | 255 | 1 |
| 2 | FOD | 9 | 9 | 9 | 3 | 255 | 1 |
| 3 | Surface Prep | 9 | 9 | 9 | 1 | 247 | 3 |
| 4 | Adhesive | 9 | 9 | 3 | 9 | 225 | 4 |
| 5 | Planning instruction | 3 | 9 | 9 | 9 | 219 | 5 |
| 6 | (Nutplate installation procedure) | 9 | 9 | 1 | 9 | 207 | 6 |
| 7 | Sand Paper | 9 | 9 | 3 | 0 | 189 | 7 |
| 8 | Abrasive pad | 9 | 9 | 3 | 0 | 189 | 7 |
| 9 | Training certification (Nutplate Cert ) | 9 | 9 | 1 | 3 | 183 | 9 |
| 11 | Nutplate Prep | 9 | 9 | 1 | 1 | 175 | 10 |
| 12 | Wipes | 9 | 9 | 1 | 0 | 171 | 11 |
| 13 | SNP-L | 9 | 9 | 1 | 0 | 171 | 11 |
| 14 | Andrew Tool | 9 | 9 | 1 | 0 | 171 | 11 |
| 15 | Manual SLC | 9 | 9 | 1 | 0 | 171 | 11 |
| 17 | Auto SLC | 9 | 9 | 1 | 0 | 171 | 11 |
| 18 | Reverse Spotface Tool | 9 | 9 | 1 | 0 | 171 | 11 |
| 19 | Rotary Abrasion Tool (RAT) | 9 | 9 | 1 | 0 | 171 | 11 |
| 20 | Pneumatic surface abrasion tool | 9 | 9 | 1 | 0 | 171 | 11 |
| 21 | Torque Motor | 9 | 9 | 1 | 0 | 171 | 11 |
| 22 | Windco Tool | 9 | 9 | 1 | 0 | 171 | 11 |
| 23 | Shift coordination | 3 | 0 | 9 | 9 | 147 | 21 |
| 24 | SA Meter | 9 | 3 | 1 | 0 | 123 | 22 |
| 25 | Inspector | 3 | 1 | 9 | 0 | 119 | 23 |
| 26 | Push tester | 3 | 9 | 1 | 1 | 115 | 24 |
| 27 | Manual adhesive tool | 9 | 3 | 0 | 0 | 114 | 25 |
| 28 | Fastener pattern | 3 | 9 | 1 | 0 | 111 | 26 |
| 29 | Blue Cleaner | 3 | 9 | 1 | 0 | 111 | 26 |
| 30 | Scraper tool | 0 | 3 | 9 | 0 | 105 | 28 |
| 31 | Boroscope | 0 | 3 | 9 | 0 | 105 | 28 |




Preliminary KPIVS after C&E are as follows:

1. Mechanic
2. FOD
3. Surface Prep
4. Adhesive
5. Planning instruction
6. LMA-PK004 (Nutplate installation procedure)

# Resources

- The Root Cause Analysis Memory Jogger
- The Black Belt Memory Jogger
- The Lean Six Sigma Pocket Tool Book, by Michael L. George (Percipio)
- Powered by Skillsoft Percipio. The 5 Whys, From Course: Six Sigma Root Cause Analysis and Waste Elimination
- Powered by Skillsoft Percipio. Fishbone Diagrams, From Course: Six Sigma Root Cause Analysis and Waste Elimination