

# ASA ANNUAL CONFERENCE 2017 RESTON, VA

---

## THE 8D DISCIPLINE TO EFFECTIVE PROBLEM SOLVING

# **G. RINGGER CONSULTING, INC.**

***Celebrating +38 years in the  
aerospace/aviation industry!***

***Providing Engineering, Quality System, Training,  
Airworthiness, and Business Development  
Services to the aviation industry***

office 954-655-6509

fax 954-680-5326

***[George.Ringger@gmail.com](mailto:George.Ringger@gmail.com)***

***[www.georgeringger.com](http://www.georgeringger.com)***

# Business Consulting Services

## Business Services

- Crisis Mitigation
- Expert Testimony
- Corporate training
- Root Cause Analysis
- Corrective Action
- Internal audits
- Supplier audits
- FOD Awareness

## Engineering

- FAA-DER
- Structural Design
- Analysis
- Repair & Alteration
- FAA-PMAs
- Interior Mods
- Flammability Test Plans

## Quality Systems

- FAA- AC0056
- ISO 9001
- AS-9100
- AS9110
- AS9120
- ASA-100
- CASE 3A
  
- FAR-145
- FAA-PMA
- FAA-TSOA

## Airworthiness

- FAA-DAR Mfg.
- FAA-DAR Maint.
- FAA Airworthiness Approvals
- FAA Part Conformity
- FAA installation Conformity

# Corporate Training

## Business Development

- Better Decision Making
- How to Gain a Competitive Edge
- Human Factors
- Making the numbers in a tough economy
- Management Tools for Decision Makers
- Risk Management
- SMART<sup>2</sup> Goal Setting
- Supplier Performance
- Supply-Chain Auditing
- SWOT Analysis for success

## Quality Systems

- AC 0056
- AS-9120 /AS9110/AS9100
- ASA-100 / CASE 3A
- ISO 9001
- FAA - Repair Station
- FAA-PMA
- Corrective Action
- FOD Awareness & Prevention
- Internal Auditing
- Preventive Action
- Process vs Procedure Audits
- Receiving Inspection
- Root Cause Analysis
- QA Manager Training

## Airworthiness

- FAA-PMA Systems - *SAE Approved*
- Accident Related Aircraft Parts
- FAA SUPs
- Counterfeit Parts
- Documentation & Acceptable Traceability
- FAA-CFRs
- Human Factors for Repair Stations – *FAA IA Approved*
- OEM versus PAH parts
- Safety Management Systems (SMS) - *FAA IA Approved*
- User-Centric Design

# THE 8D DISCIPLINE

---

TO EFFECTIVE PROBLEM  
SOLVING

# Course Objectives

To enable attendees to :

- Solve problems using the 8D Discipline process
- Apply the proper quality tools
- Identify fundamental root cause & contributing factors
- Implement Corrective Action
- Focus on Mistake-Proofing whenever possible

# 8D Historical Perspective

- Developed in 1987 at Ford Motor Company, Power Train organization
- From the growing frustration that results when the same problems were recurring year after year
- System focuses in using a cross-functional team
- Most effective in dealing with chronic recurring problems
- Focus is to discover weaknesses in management systems that allow the problem to occur in the first place.

# Problem Solving – Based in Science

- A formal approach to problem solving requires your assessment and the effectiveness of your solution on data, - not speculation or opinions.
- *Beware of the ‘imagined order’ trap!...*
  - Objective reality (e.g. science; gravity)
  - Subjective reality (e.g. within the individual; superstitions)
  - Inter-subjective reality (e.g. within groups; if many people believe it, it must be true)
- Fundamental statistical tools are used for problem solving to ensure measurable results.

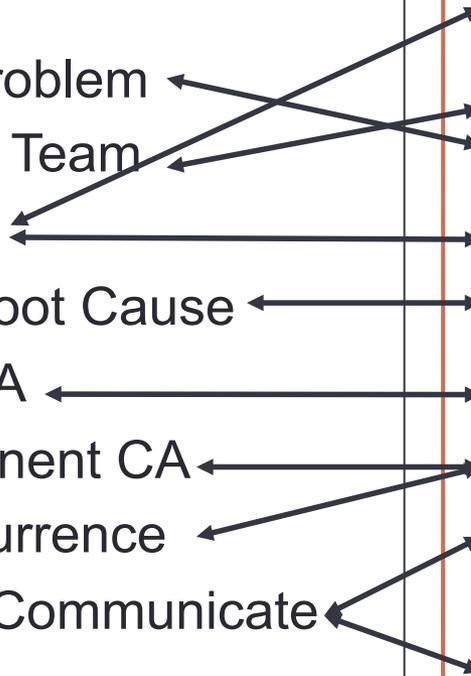
# 8D is consistent with ARP9136

## 8D

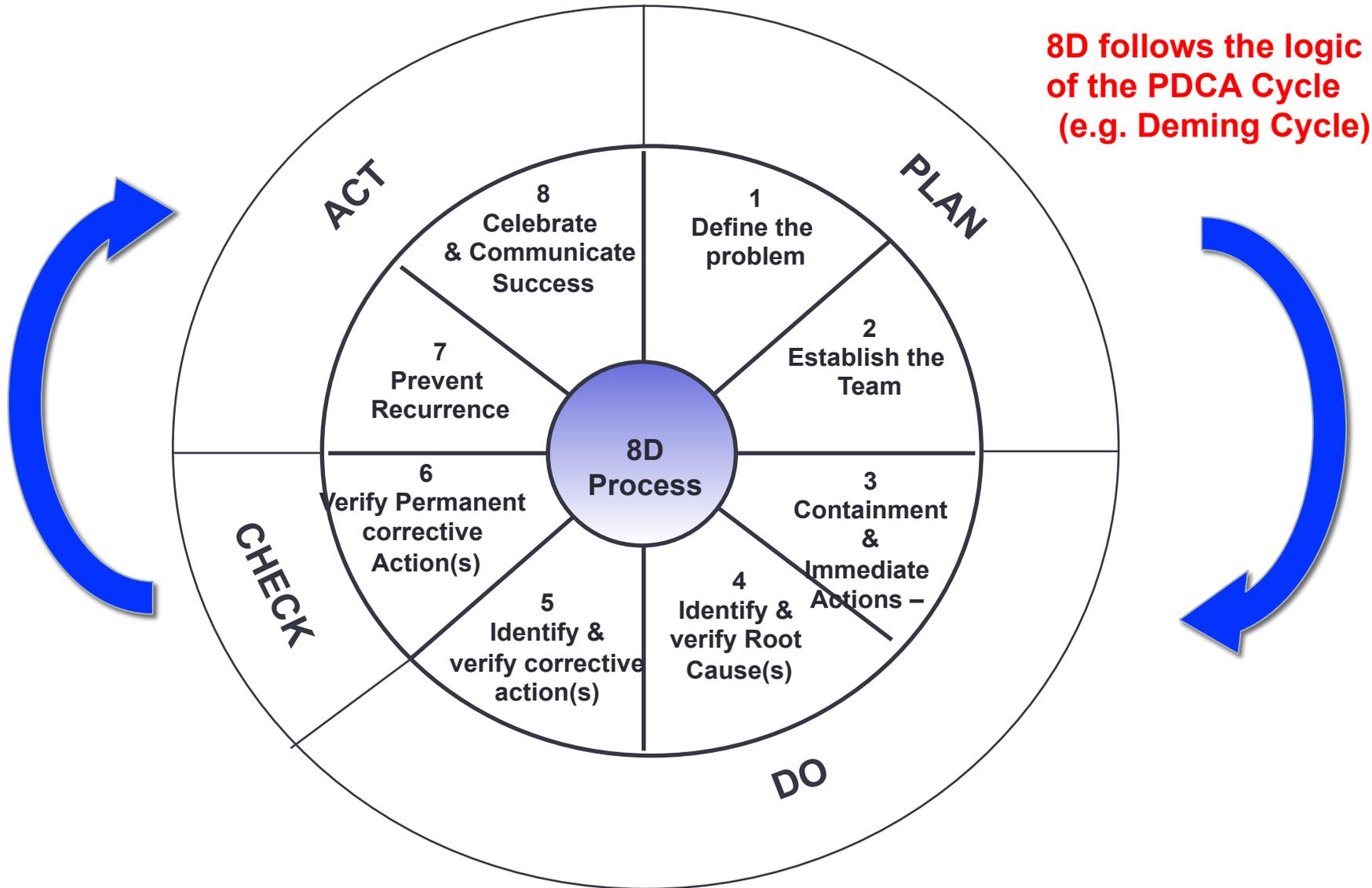
1. Define the Problem
2. Establish the Team
3. Containment
4. ID & verify Root Cause
5. ID & verify CA
6. Verify Permanent CA
7. Prevent Recurrence
8. Celebrate & Communicate

## ARP9136

0. Start containment
1. Build the Team
2. Define the Problem
3. Containment
4. ID Root Cause
5. Define & Select CA
6. Implement CA
7. Standardize & transfer Knowledge
8. Recognize & Close the Team

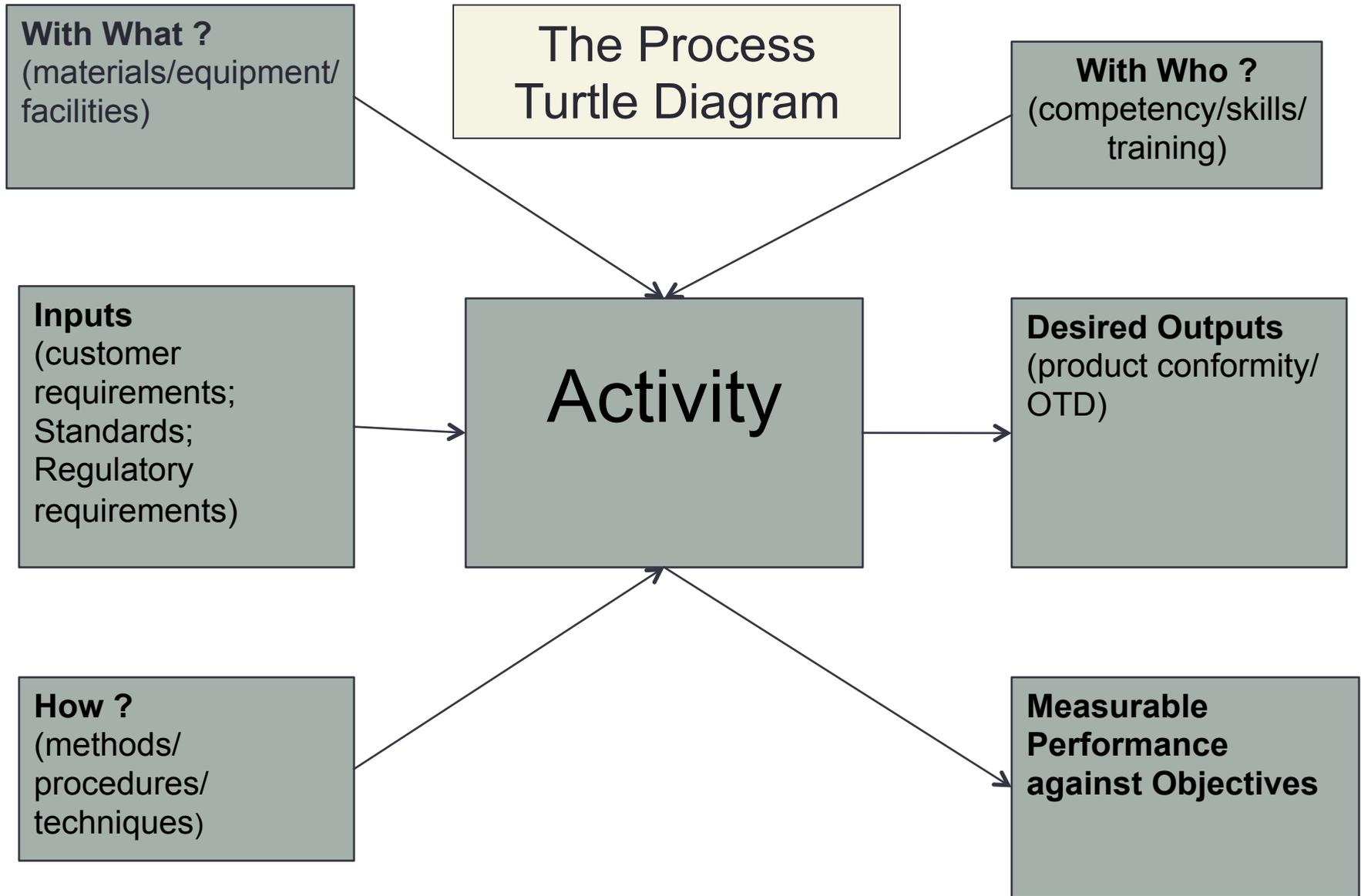


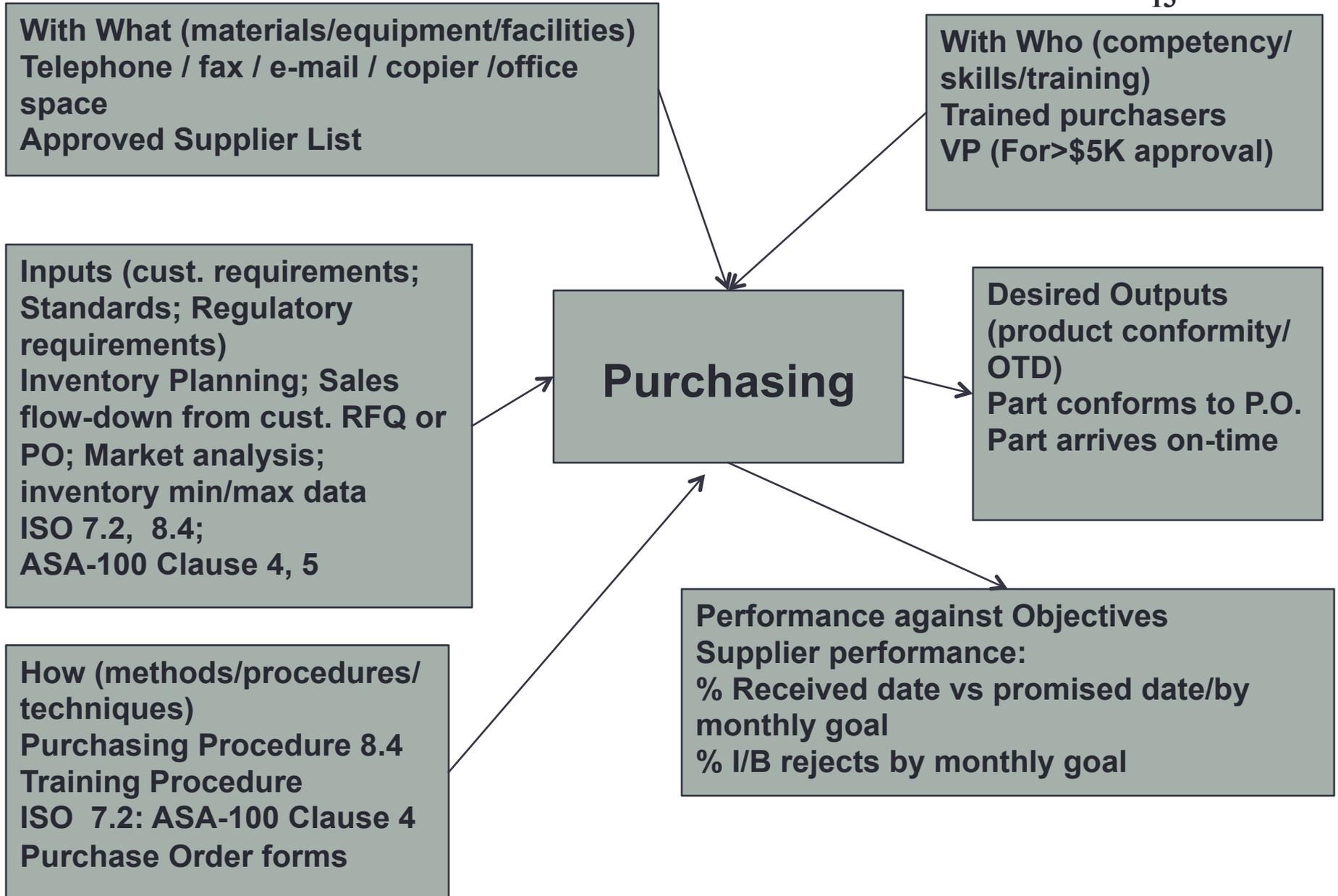
# 8D Problem Solving Process

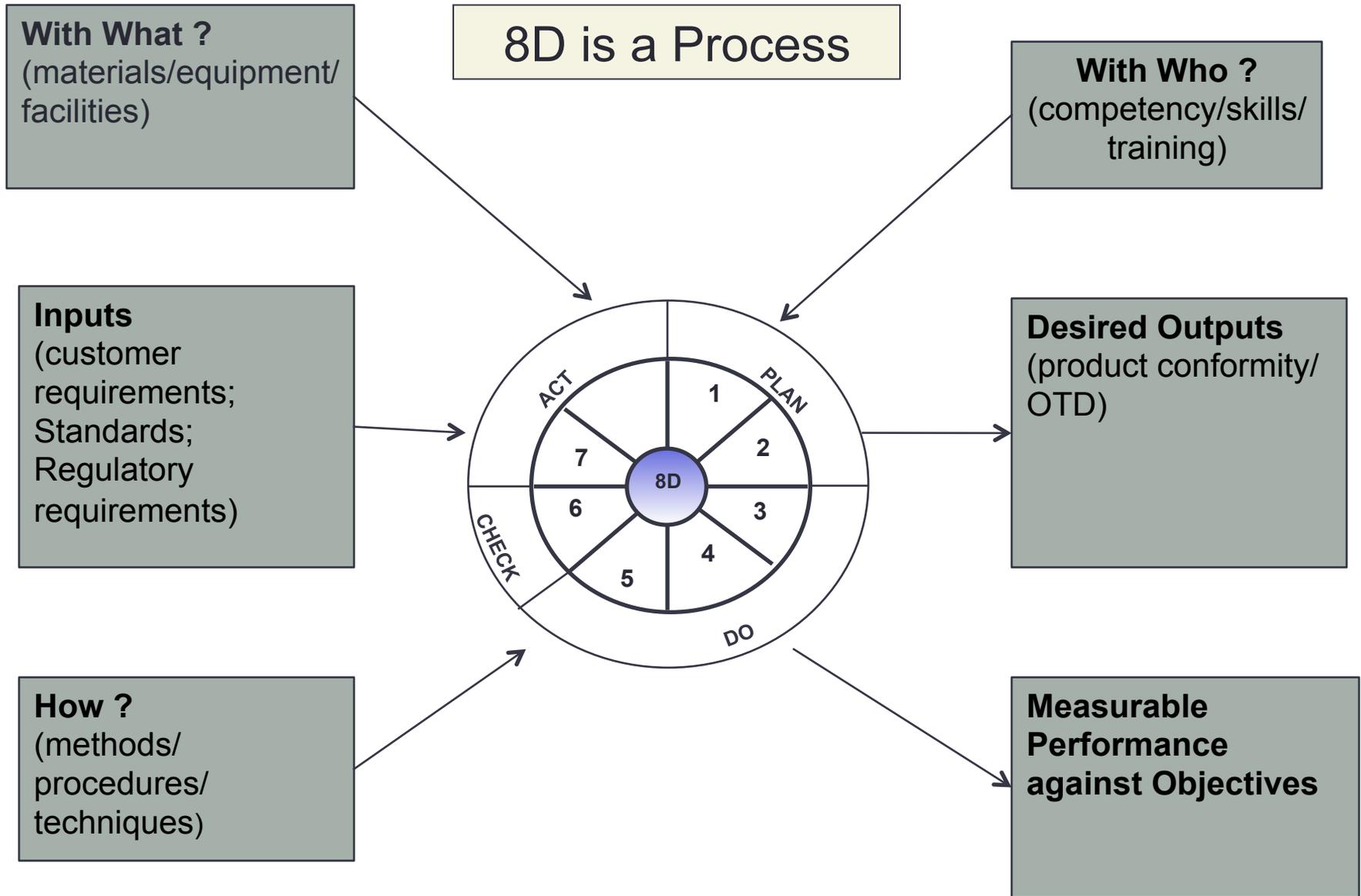


## 8D Problem Solving Characteristics

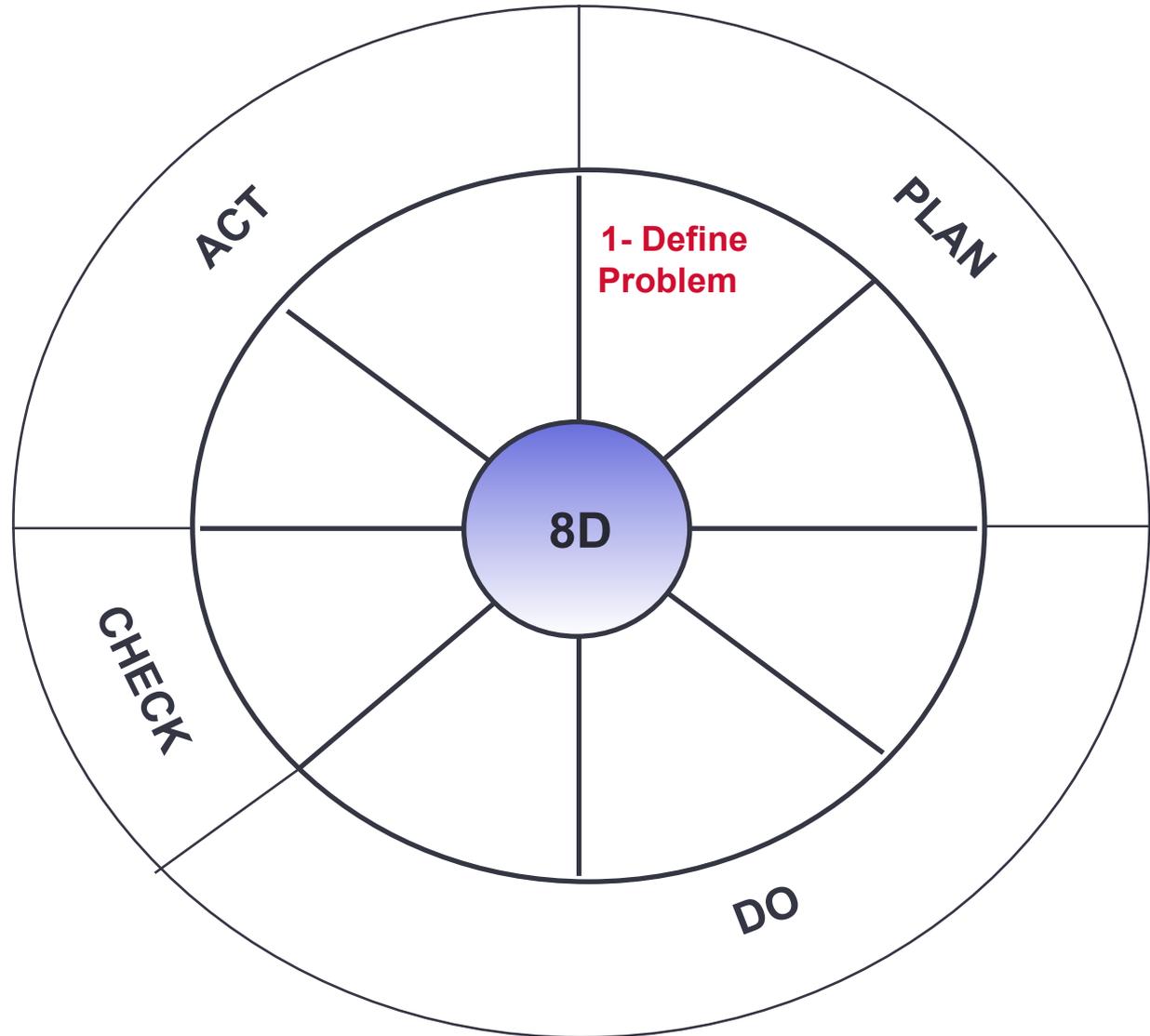
- Works on problems that are ***specific, manageable*** and ***well defined***
- Team oriented process
- Analyzes all aspects of a problem
- Develops rationale for proposed solutions
- Gathers critical data & proposed solutions
- Plans how to implement & evaluate the action successfully







# 8D Process Step 1



# Step 1: Define the Problem

1. Define the (issue, concern, non-conformity, complaint)
2. Collect and analyze data to narrow down the problem to be addressed
3. Develop a formal problem statement

# Step 1: Define the Problem

## - Problem Statement -

- A clear statement of the problem in measurable terms:
  - Based on data, not speculation; not emotion
  - No causes! - Root cause has not yet been developed
  - No solutions! - Solutions must target the root cause
- Problem Statement must include:
  - The “Current state” or “as is” condition
  - The “Desired state” or required position
  - The “Gap” or difference between the current and desired states.

# Step 1: Define the Problem

## - General Process -

### Develop and Write a Problem Statement

- Write the “Current state” describing the present situation.
- Write the “Desired state” describing the requirement or specification.
- Identify the gap.
- Combine the three to generate the Problem Statement

# Example 1: Define the Recurring Problem

## Requirement: ASA-100; 5B

A system shall be in place to assure that special requirements are adequately communicated to the distributor's sources, so that parts conform to the customer's purchase request and that deviations are disclosed and approved by the customer.

## Problem (Nonconformity):

Customer placed PO # 1111 for an Airbus bracket, PN A12345-99. However the company purchased and drop-shipped a FAA-PMA bracket, PN A12345-99ABC instead, without obtaining the customer's prior approval. This is the third time this has happened.

## The following Problem Statement:

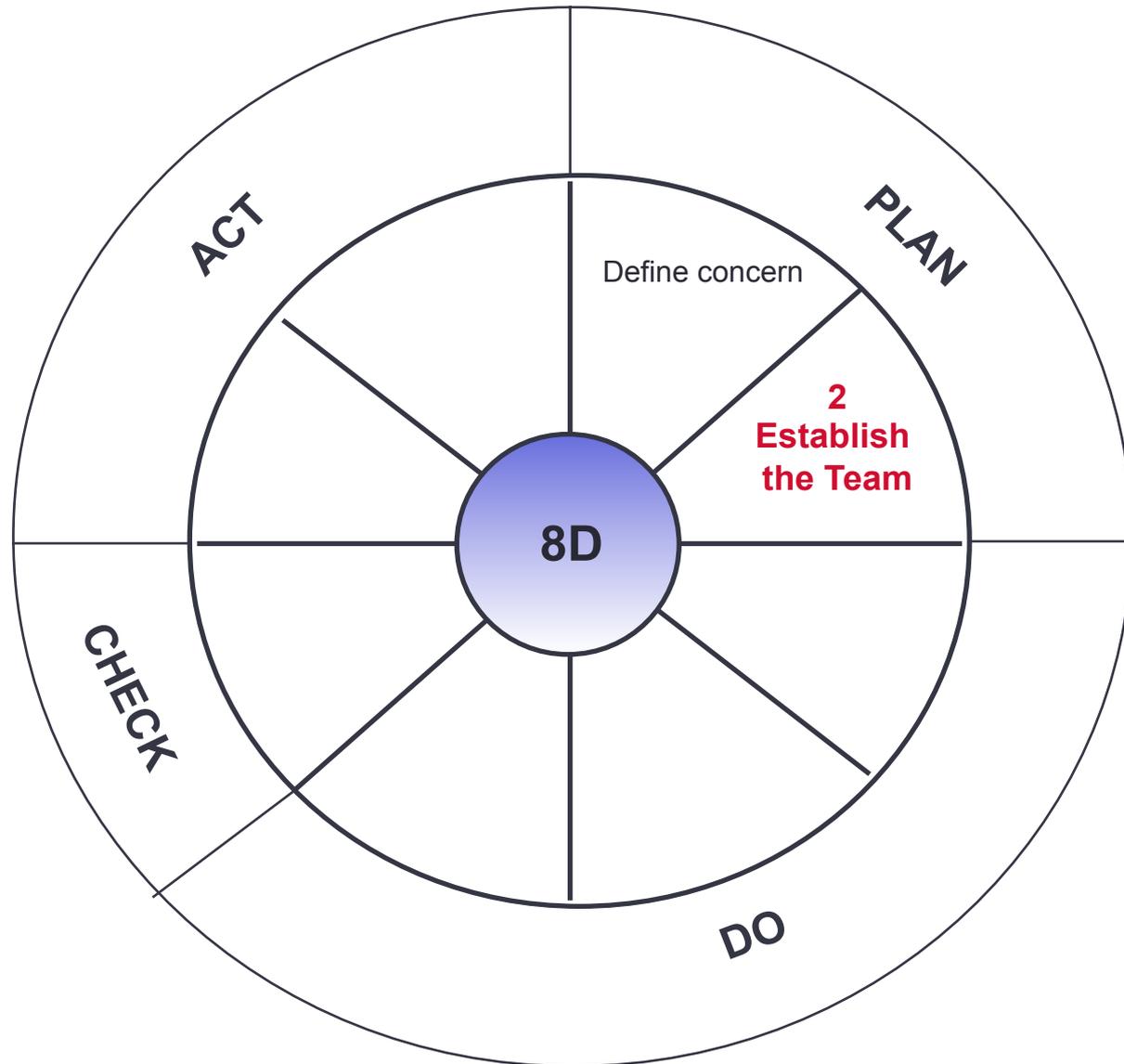
A deviation to the customer PO was not disclosed and approved by the customer prior to acceptance and shipment.

## Review of the statement

1. Is it based on data? Yes
2. Are there causes in the statement? No
3. Are there solutions in the statement? No
4. Is the statement too general? No

**Conclusion:  
Problem Statement  
meets the general criteria**

# 8D Process Step 2



# Step 2: Establish the Team

## Membership

- Stakeholders
- Knowledgeable people / technical experts
- People accountable & responsible for problem area

## Team Size

Ideally, 4 to 6 members to:

- Enhance interaction
- Promote communication
- Drive commitment to the task

## Scope, Objective, Roles and Responsibilities

Identify what the team is expected to address

Review the team's availability

Clarify the level of decision-making authority

## Step 2: Establish Team - Checklist

1. Should suppliers &/or customers be included on the team?
2. Do we have the appropriate in-house team members to proceed to the next step?
3. Is any specific technical expertise needed for this team?
4. Are team roles, responsibilities, scope and objectives established and understood ?
5. Have meeting and decision-making processes and schedules been agreed upon?

## Step 2: Establish Team - Checklist

### Problem Statement:

Recurring deviations to the customer POs is not being disclosed and approved by the customer prior to acceptance and shipment.

### Team Members:

1. Purchasing
2. QC
3. Who else???

### What about:

3. Sales?
4. Suppliers?
5. FAA Technical expert?

## Example 2: Follow the money!

- Distributor receives a customer order for 200 widgets.
  - Distributor has 209 in stock (new but old)
  - Sends out all to a repair station for inspection (“fresh tag”)
  - RS ships 204 serviceable widgets back to distributor.
- 

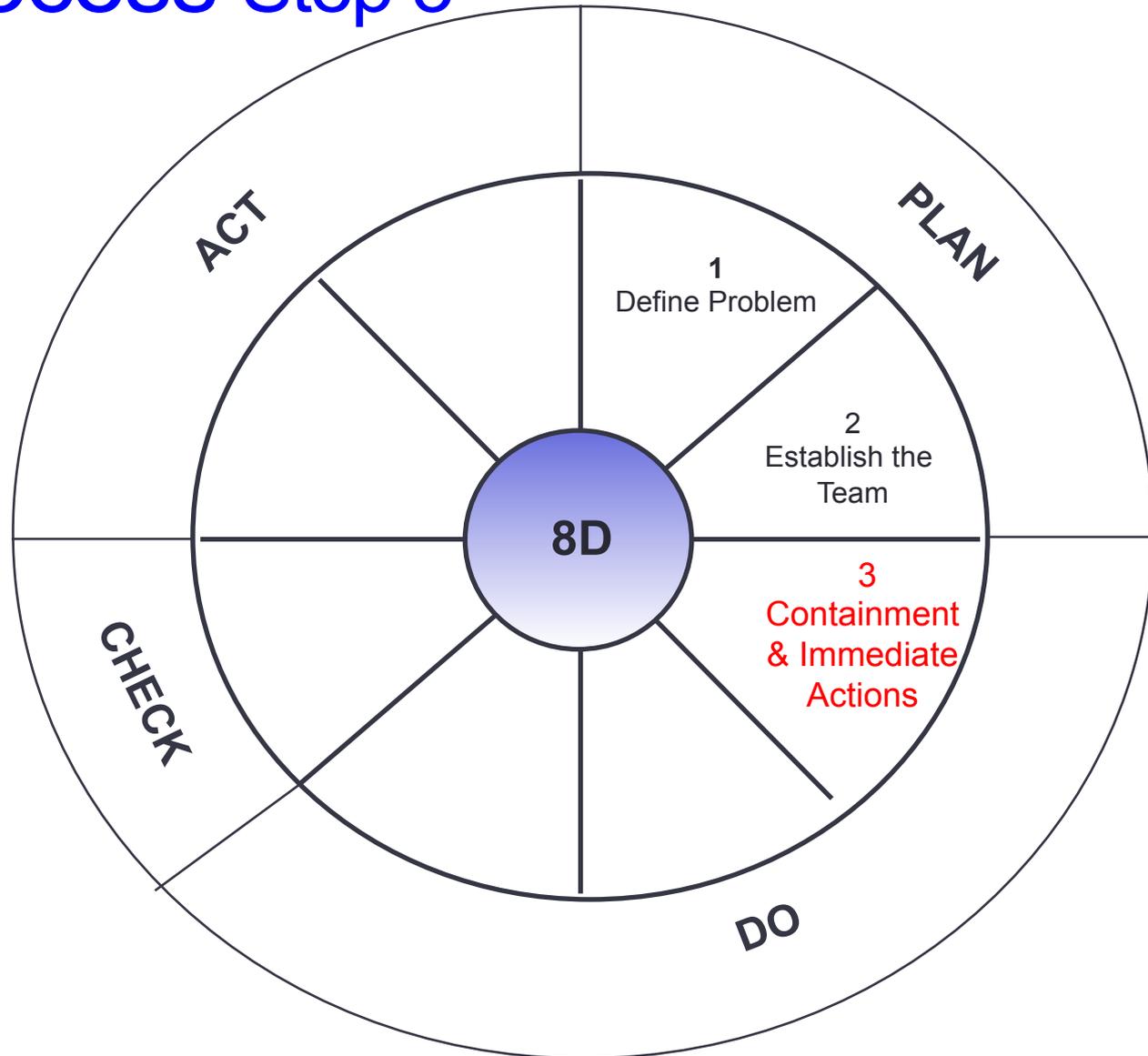
### **Discovered during an Internal Audit:**

- 209 sent to RS. Received back 204. (missing 5???)
- The 204 inspected at distributor. Rejected 1 (missing 8130-3)
- Distributor shipped 200 to customer
- Paid Repair Station for 209 @ \$1,200 each.
- Overpaid by \$6,000??? ;
- Rejected 1 in-house @\$1,200
- Total loss = \$7,200 ???

### **Team?:**

- Sales; Purchasing
- Inspection; Inventory
- Supplier; Accounts Payables

# 8D Process Step 3



## Step 3: Containment - Example

### Problem Statement:

A deviation to the customer PO was not disclosed and approved by the customer prior to acceptance and shipment.

### Typical responses:

**Response #1:** *“Issue the customer an RMA.”*

**Response #2:** *“Revise the Quality Manual to describe a procedure when a different part number is shipped to the customer.”*

So, what do you think?.....

## Step 3: Containment - Contain Problem

1. Identify and select containment action(s)
2. Develop and launch a containment plan
3. Analyze the effectiveness of your containment actions

## Step 3: Containment – Contain Problem -

**Containment** - Known as short-term corrective action

- Objective: to take immediate interim action to prevent the problem from impacting the customer
  - conducted while the root cause is investigated;
  - Typically involves sorting, screening or testing with rework as required, and sequestering effected product or materials while awaiting disposition.

## Step 3: Containment - General Process

1. Select interim containment action(s);
2. Verify extent of containment – encompass incoming, outgoing, and in-transit materials;
3. Plan for implementation;
4. Implement containment actions;
5. Verify interim actions are in place and effective.

# Step 3: Contain Problem

## – The Implementation Plan -

### **Planning Objective**

- To ensure formal actions are taken in a systematic fashion;
- Using a formal structured tool (e.g. Gantt chart, etc.)

### **General Process**

1. Break tasks down into achievable steps;
2. Assign task responsibilities;
3. Set up time frame and milestones;
4. Track the progress of the implementation;
5. Plan should include strategies for communicating and gaining commitment, contingency plans, and measures to evaluate progress.

## Step 3: Contain Problem - Checklist

1. Have potential containment actions been identified?
2. Have containment actions been identified?
3. Have containment actions been implemented?
4. Are the containment actions effective at protecting the customer from defects?
5. Have containment actions been verified?
6. Do we have the right team members to proceed to the next step?
7. Have we communicated our Containment plan to our customer?

# Step 3: Initial Analysis - General Process

1. Identify the issue to be addressed
  - Ensure the issue is defined correctly by confirming it with data or by personal observation
  
2. Assess the magnitude of the issue, considering impact on
  - Isolated or systemic
  - Business levels
  - Internal processes
  - Customers / suppliers
  
3. Identify the problem topics that may surround the issue, and select the problem target area.

## Step 3: Initial Analysis - General Process

4. Brainstorm and record the team's ideas about the problem area
5. Collect data to determine the extent of the problem
  - Establish what Standard or Specification applies to the problem;
  - Consider all available sources of information that may relate to the problem (including external sources)
6. Develop and implement a general plan for approaching the problem.

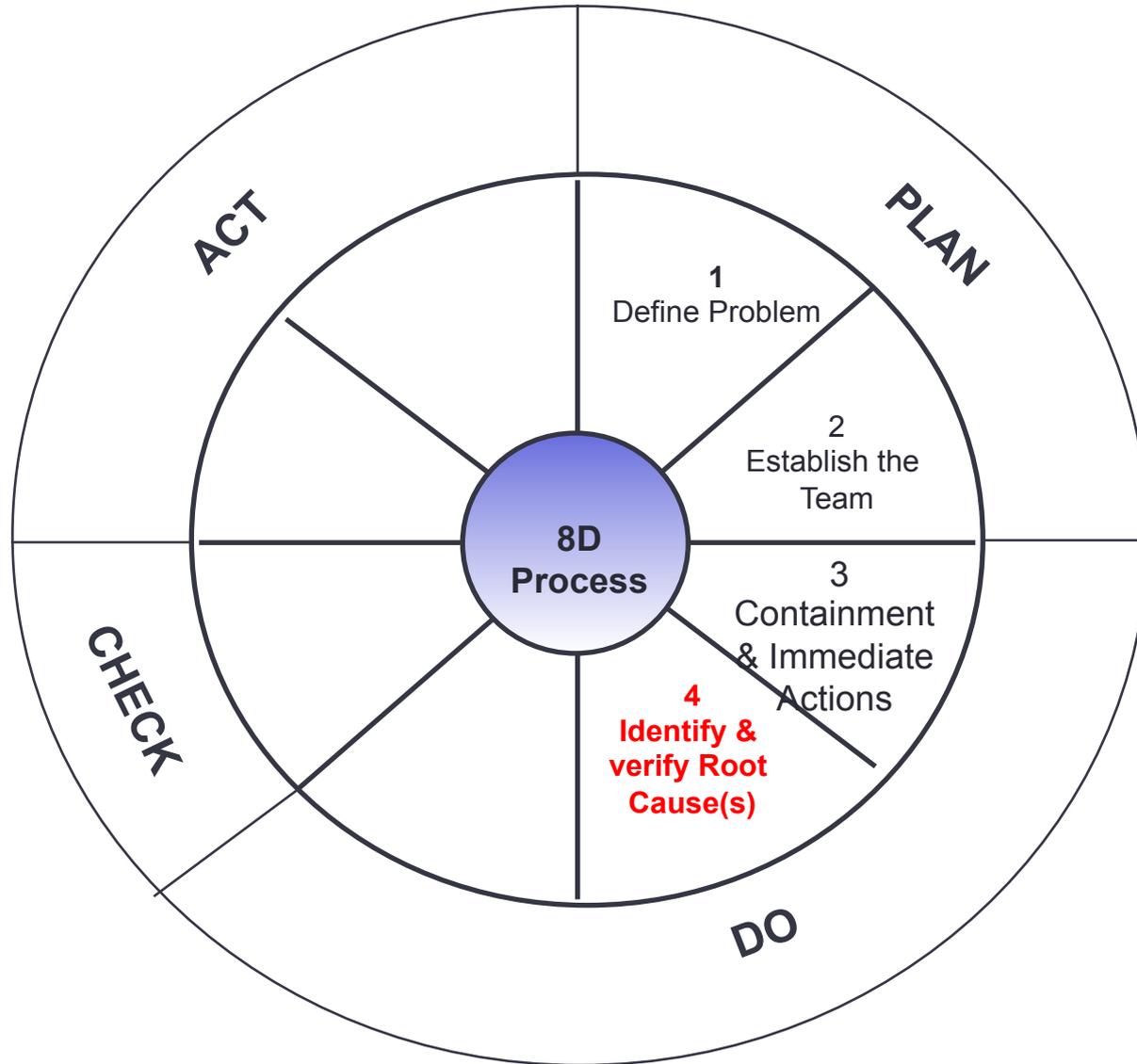
## Step 3: Initial Analysis - Checklist

1. Has data about the problem been taken and peer-reviewed by the team?
2. Has the problem been identified by What, When, Why, Where, How, and How Much?
3. Has the extent of the problem been defined in measurable terms?
4. Have all stakeholders provided input to the problem?

## Step 3: Initial Analysis - Checklist (continued)

5. Have the applicable standards been identified?
6. Has the scope of the problem been defined?
7. Have all in-transit defective materials been identified & considered (both incoming & outgoing)?
8. Has a general project/milestone plan been developed?

# 8D Problem Solving Step 4



## Step 4: Diagnose Root Cause & Contributing Factors - Objectives -

1. Identify the probable cause(s) of the problem
  - Root Cause(s)
  - Contributing Factors(s)
2. Analyze Probable Causes
3. Select Root Cause(s) for Corrective Action

## Step 4: Diagnose Root Cause & Contributing Factors - General Process -

1. Identify Probable Causes:
  - Brainstorm
  - 5-Whys
  - Cause and Affect Diagram
  
2. Analyze Probable Causes
  - Rank causes by correlation to effect: Strong, Moderate or Weak
  - Select probable causes for data collection
  - Determine collection method (e.g., Check-sheets)

## Step 4: Diagnose Root Cause & Contributing Factors - General Process -

### 3. Select Root Cause(s) for Corrective Action

- A. Prioritize root cause(s);
- B. Select root cause(s) to work on.
- C. Determine if taking action is within the scope of the team or if additional resources are needed;
- D. Develop and implement experiments to test and validate root cause(s);
- E. Revise problem statement (if required);

# Step 4: Diagnose Root Cause & Contributing Factors

## - Cause and Effect Analysis -

### Cause and Effect Diagram

- A structured form of Brainstorming
- Identifies, explores, and displays a problem (effect) and all possible causes

### Uses

- Analysis of a problem
- Guide for discussion
- Illustrate level of technology
- Evaluate knowledge of a process
- Collection of data
- Education tool

# Step 4: Diagnose Root Cause & Contributing Factors

## - Cause and Effect Analysis

Most common cause categories (6-M's)

Manpower

Machine

Materials

Methods

Milieu (environment)

Measurement

# Step 4: Diagnose Root Cause & Contributing Factors

## - Cause and Effect Analysis

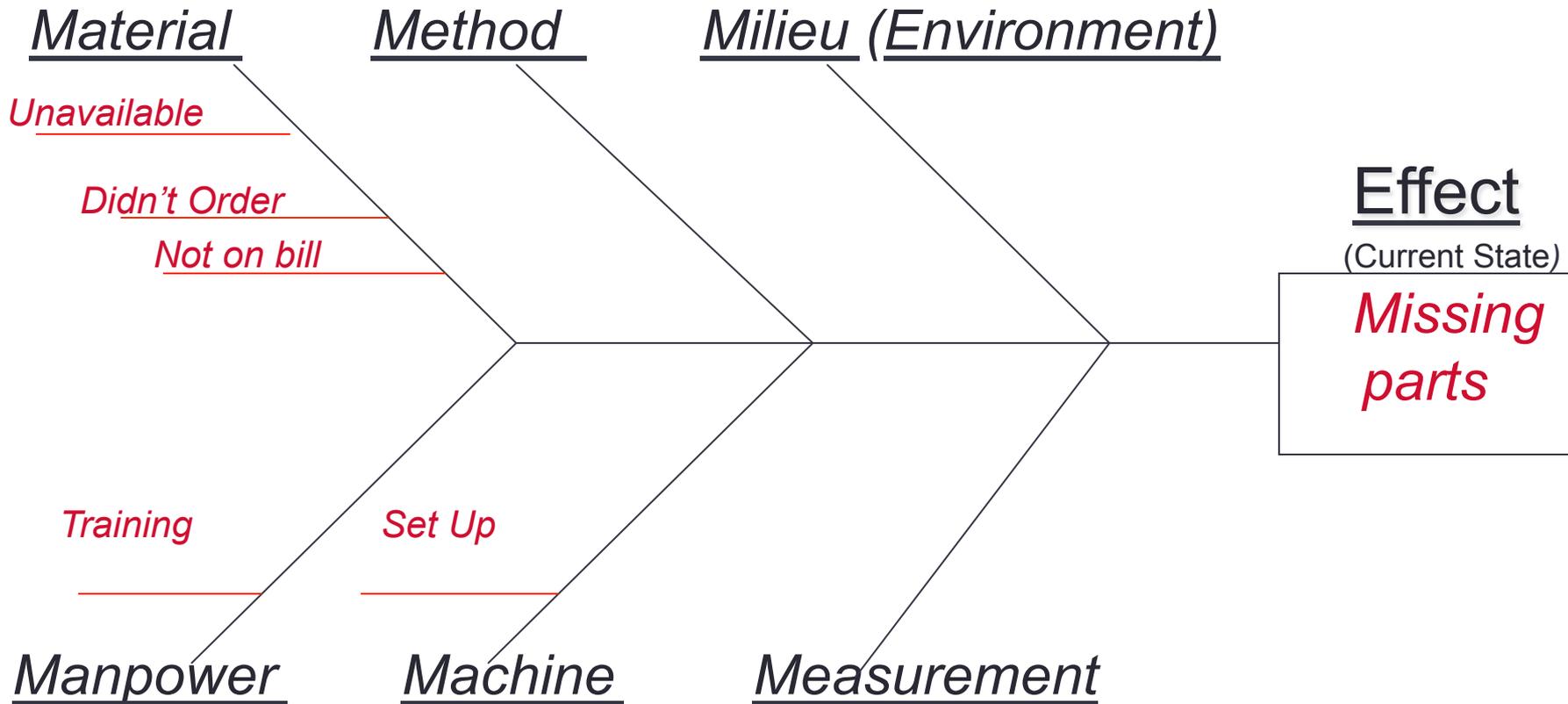
Name:

Date:

Time-frame:

(6-M's)

### Causes



# Step 4: Diagnose Root Cause & Contributing Factors

## - Cause and Effect Analysis

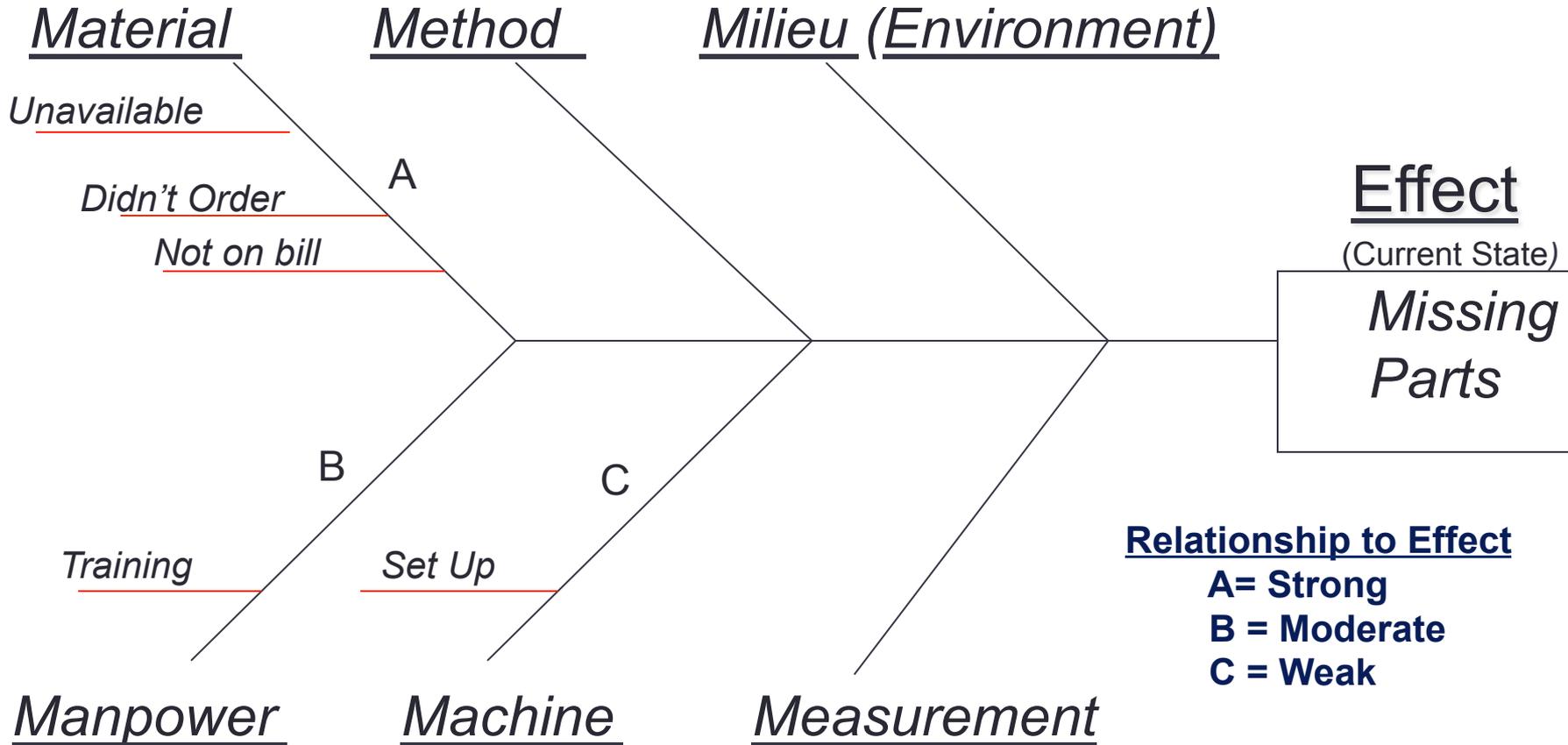
Name:

Date:

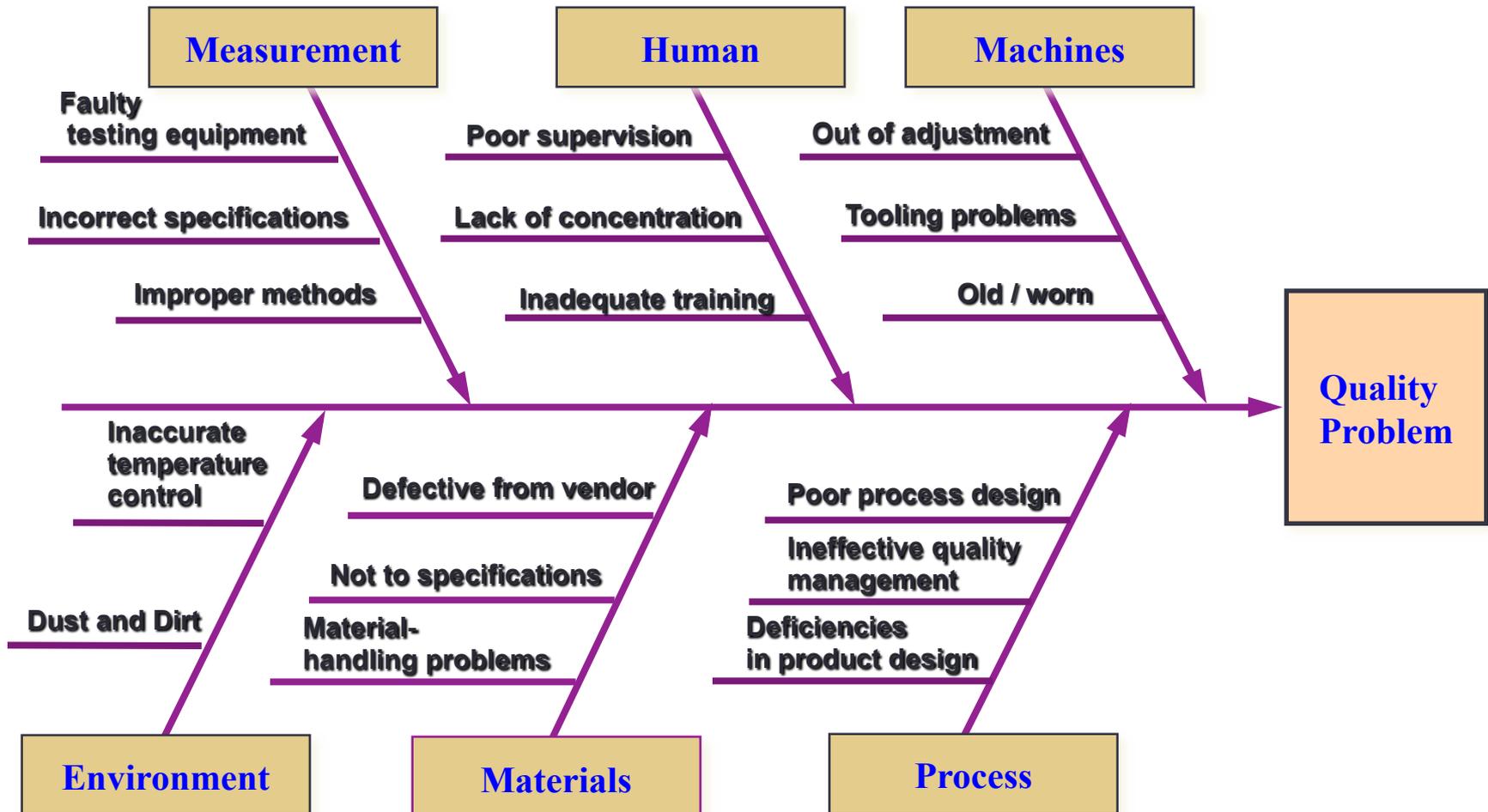
Time-frame:

(6-M's)

### Causes



# Cause-and-Effect Diagram



## Step 4: Diagnose Root Cause & Contributing Factors

### - Team Activity -

#### Goals

1. Brainstorm the possible causes of the problem, using a cause and effect diagram.
2. Rank the possible causes and collect supporting data.
3. Select possible root cause(s).
4. Investigate to confirm the root cause(s).
5. Revise the problem statement, if necessary.

## Step 4: Diagnose Root Cause & Contributing Factors - Checklist -

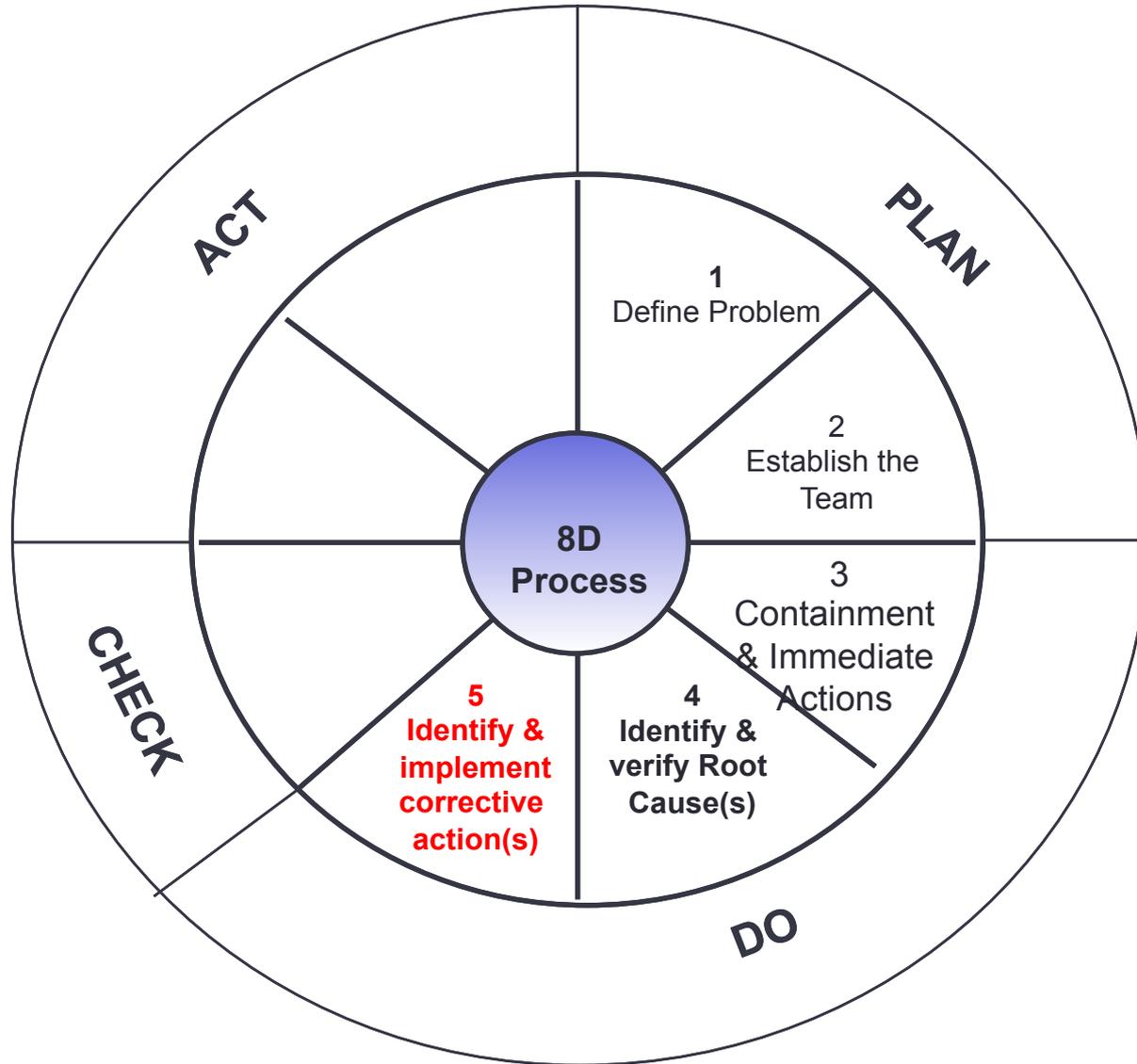
1. Has the problem statement been reviewed?
2. Have probable causes been identified?
3. Has data been collected on the probable causes?
4. Have root causes been prioritized and selected?
5. Have potential corrective actions / solutions been identified and clarified?
6. Do you have the right team members to proceed to the next step?

## Step 4: Diagnose Root Cause & Contributing Factors - Checklist

### ROOT CAUSE VERIFICATION QUESTIONS

- Can you ask “Why” one more time and get another controllable root cause?
- Can you turn the problem on and off with the root cause?
- Is this root cause controllable?

# 8D Problem Solving Step 5



# Step 5: Identify & Implement Corrective Actions

## - Objectives -

1. Select the corrective actions to be taken
2. Develop and agree upon a corrective action implementation plan

# Step 5: Develop Corrective Action Plan - General Process

## Goals

1. Select the corrective action criteria
2. Use criteria to select the best *potential* corrective action
3. Develop an implementation plan

## Step 5: Develop Corrective Action Plan - Team Activity -

1. Select the corrective action criteria considering:  
Time - Resource - Control - Cost
2. Use criteria to select the best *potential* corrective action:
  - Input from all team members;
  - Using problem-solving tools (e.g. Brainstorm; 5-Whys)
  - Assess benefits and drawbacks;
  - Agree on best *potential* corrective action(s) –
    - Must be actionable!

# Step 5: Develop Corrective Action Plan

## - Team Activity -

### 3. Develop an implementation plan:

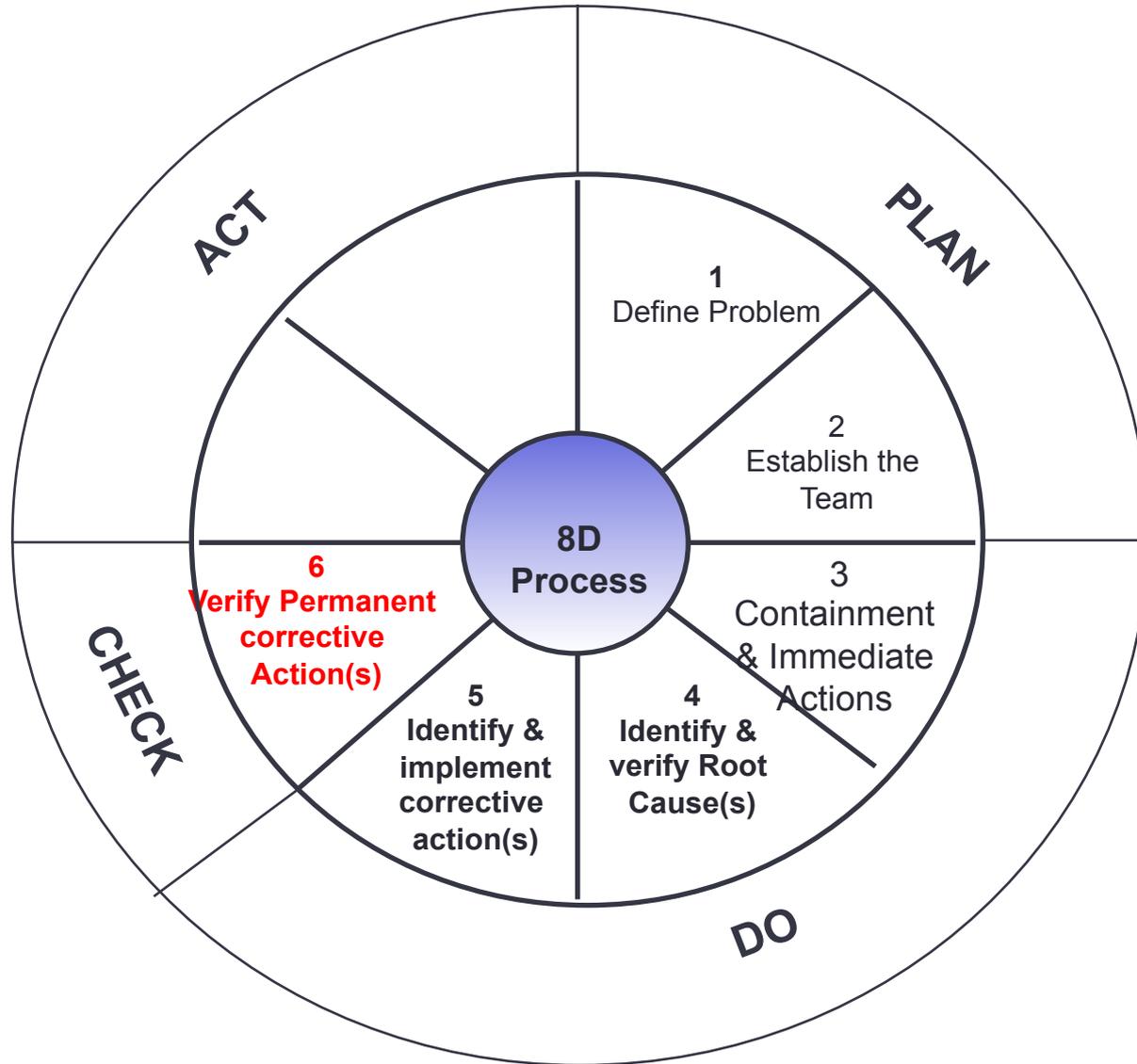
- Include action items and a schedule;
- Arrange for resources (including supplier and customer, if needed);
- Assign and review responsibilities ;
- Consider applicable measures, contingency plans, and pilot tests (if appropriate).

# Step 5: Develop Corrective Action Plan

## - Checklist -

1. Have potential corrective actions / solutions been filtered and combined?
2. Has criteria been identified?
3. Has a corrective action plan been developed?
4. Has the impact of the corrective action on other processes or customers been evaluated?
5. Based on evaluation, will the corrective action eliminate the root cause?
6. Do we have the right team members to proceed to the next step?

# 8D Problem Solving Step 6



## Step 6: Verify Permanent Corrective Actions - Objectives -

1. Test the intended corrective action(s) and adjust the plan if required.
2. Implement the corrective action(s) and verify that the root cause has been eliminated.
3. Remove the containment action and verify that the problem does not recur.

## Step 6: Verify Permanent Corrective Actions - General Process -

1. Prepare to implement:
  - A. Review the problem statement
  - B. Restate the root cause
  - C. Review the corrective action plan
  - D. Train / review plan with all effected personnel
  
2. Implement the corrective action:
  - A. Implement the corrective action plan
  - B. Remove the interim (short term) containment action
  - C. Track implementation progress
  - D. Communicate with all effected personnel

# Step 6: Verify Permanent Corrective Actions

## - General Process -

### 3. Evaluate the effectiveness of the action:

- Collect results data
- Analyze data in comparison with:
  - Previous analysis;
  - Business objectives;
  - Evaluate effectiveness;
  - Determine if a gap remains.

### 4. Complete the evaluation

- Address the gap (if any);
- Identify and address any new problem areas created by the solution(s) (unintended consequences)
- Designate Mistake Proof Method and Level

# Step 6: Verify Permanent Corrective Actions

## - General Process -

### 5. Standardize the changes:

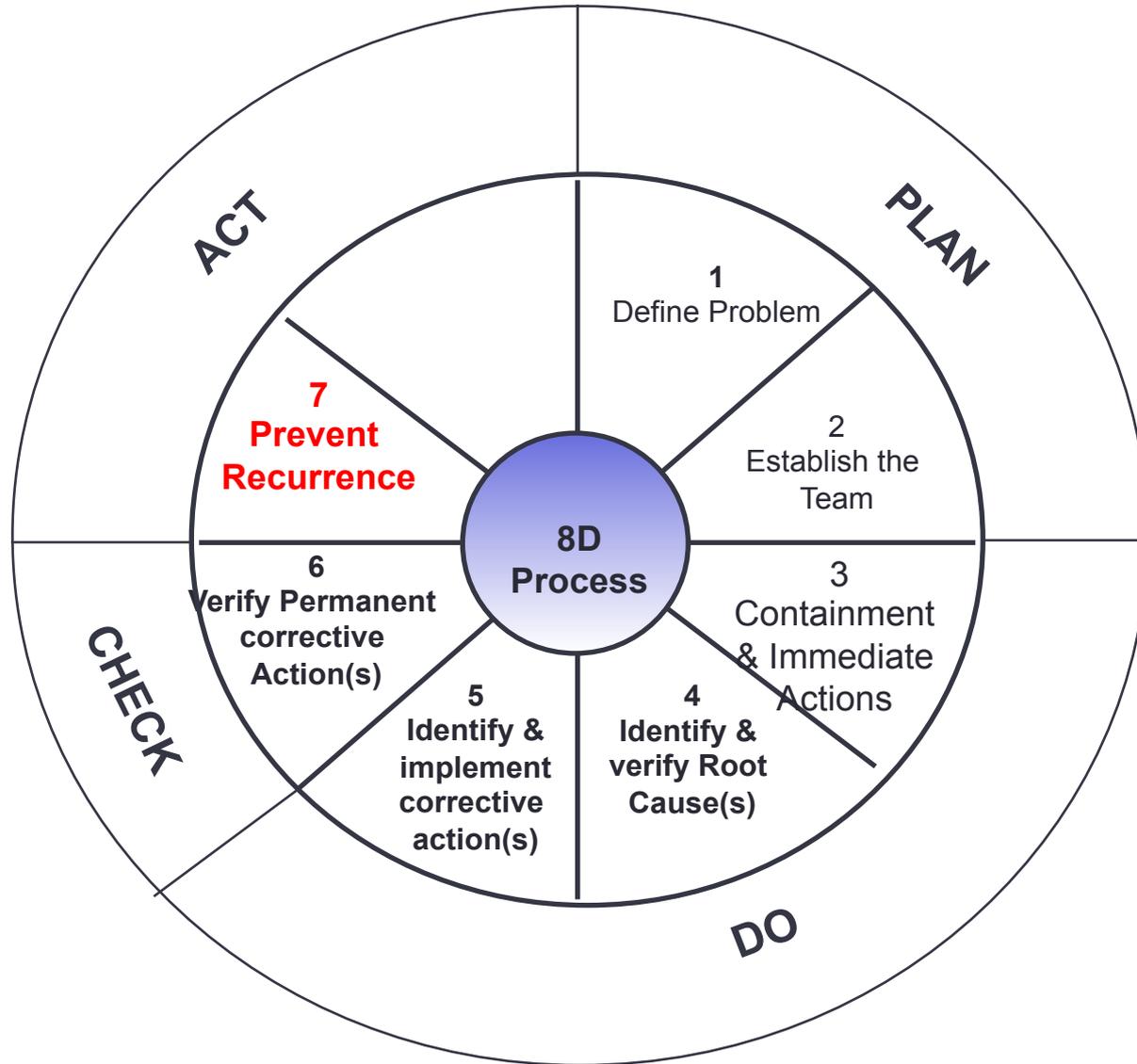
- Revise any standard processes to make the change systemic.
- Train to ensure compliance and formalize management control:
  - Inspection plans
  - Process Specifications
  - Operating Instructions
  - Work Instructions
  - Standard Operating Procedures
  - Product / Component Prints and Specifications
  - Customer/supplier contract T&Cs
  - Risk Assessments ( e.g. FMEA's)

# Step 6: Verify Permanent Corrective Actions

## - Checklist -

1. Has data been collected?
2. Has success been achieved based on closing the problem-gap and addressing customer feedback?
3. Have new problems (unintended consequences) been identified?
4. Has a Validation Plan Timeline been established?
5. Do we have the right team members to proceed to the next step?

# 8D Process Step 7



## Step 7: Prevent Recurrence – Objectives -

1. Verify the corrective action plan is being followed
2. Develop and implement the systemic controls
3. Look for other opportunities to use the action taken
4. Review Poke-Yoke or Mistake Proofing Initiatives

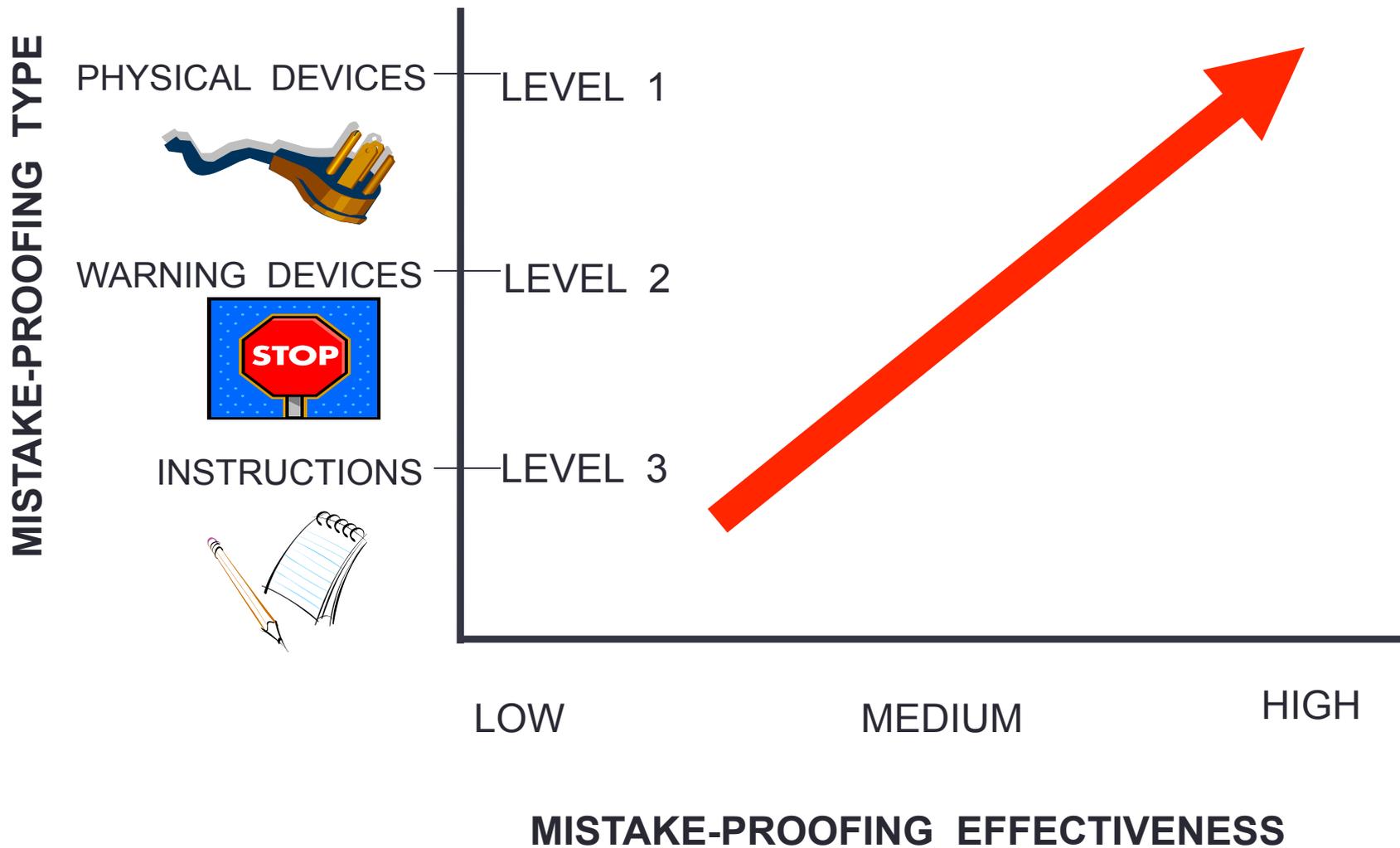
## Step 7: Prevent Recurrence - General Process -

1. Verify that the implementation plan is complete:
  - Ensure enough checks are scheduled over time to establish consistent results.
  
2. Review the control plan:
  - Ensure that controls are in place to monitor critical parameters associated with the effected process
  - Ensure enough checks are implemented over time to establish consistent results.
  - Evaluate the plan to ensure any unfavorable trends trigger action prior to a nonconformance occurring.

## Step 7: Prevent Recurrence - General Process

3. Look for additional applications of the action:
  - Other products, processes, operations, customers, etc. related to the business may benefit from the same corrective measures
4. Review and update Work Instructions, SPC Charts, and Associated Forms
5. Review and revise Risk Assessment (FMEA) based newly implemented controls
6. Calculate a timeline when expected Validation can occur

# Mistake Proofing



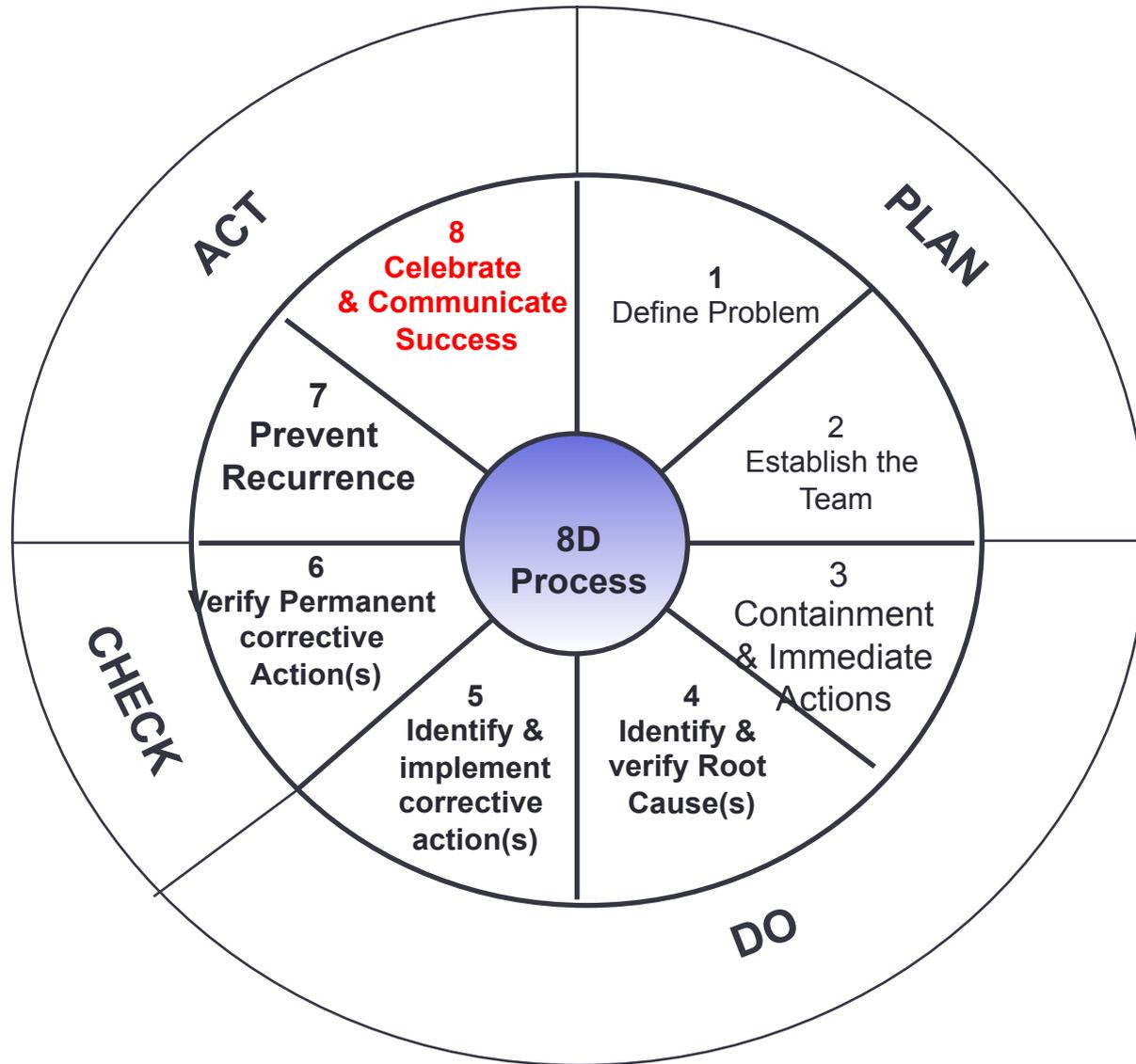
## Step 7: Prevent Recurrence - Checklist

1. Has the problem statement been reviewed?
2. Has the Corrective Action plan been reviewed and all the steps implemented?
3. Has all the appropriate paperwork been reviewed and revised to assure prevention?
4. Have new problems (if any) been formally addressed?
5. Has the customer confirmed that the problem has been resolved to their satisfaction?

## Step 7: Validation & Permanent Controls - Objectives & General Process -

1. Validate all corrective actions and Mistake Proofing are still in place and effective over time.
3. Communicate the outcome of validation to those effected (both internal & external).
4. Support customer focus by proving the company appreciates & recognizes emphasis on prevention.

# 8D Problem Solving Step 8

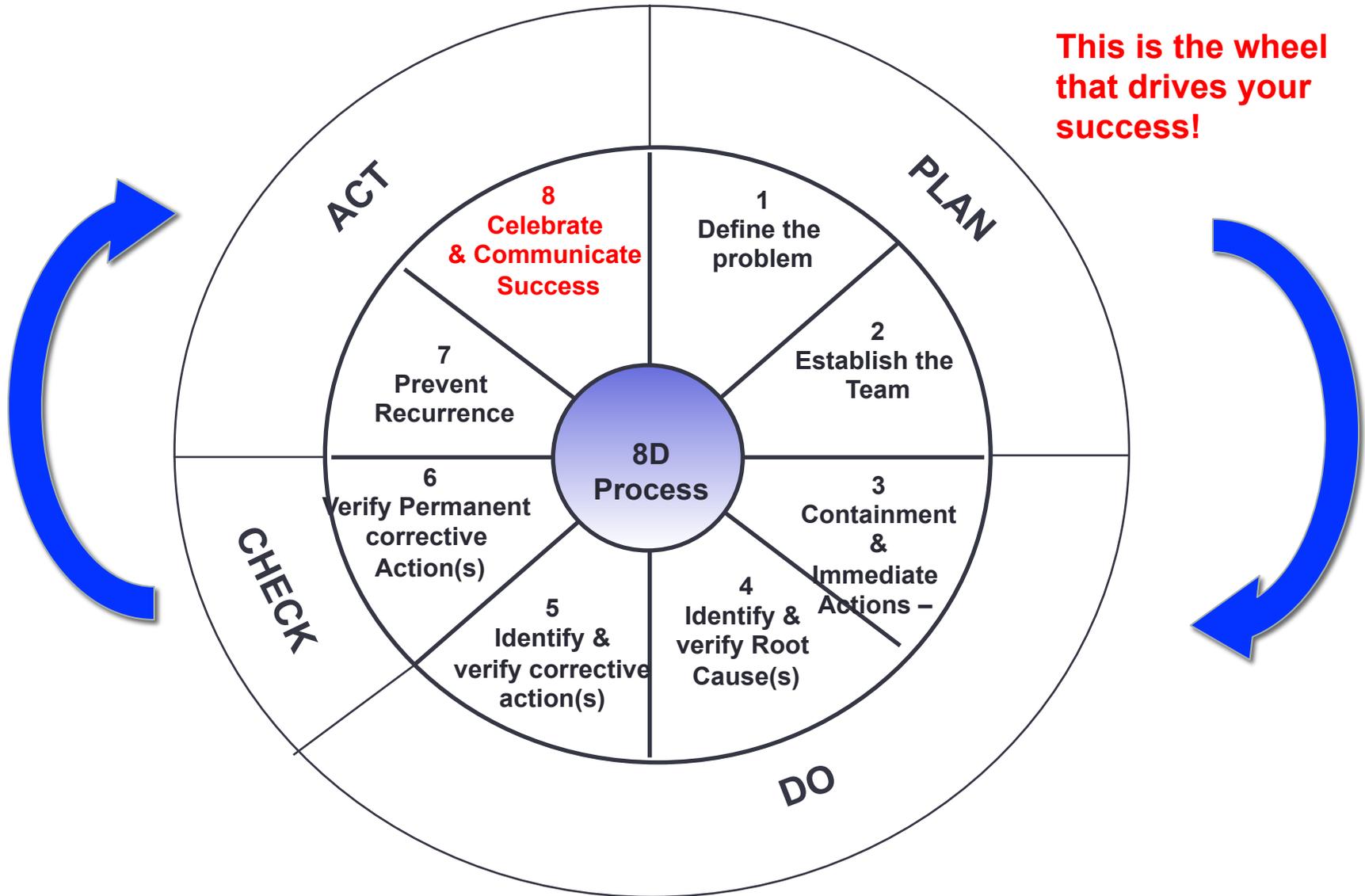


## Step 8: Celebrate & Communicate Success - Objectives -

Has the 8D team been recognized by Top Management?

- To appreciate the efforts of the Team;
- To motivate all company employees;
- To communicate across the organization the company's dedication to improving our performance;
- To communicate to customers the company's dedication to improving our performance.

# 8D Problem Solving Process



# THE 8D DISCIPLINE

---

QUESTIONS?

# Thanks for attending!

## and remember...

*“To stop learning.... is to stop living.”*

George J. Ringger

*G. Ringger Consulting, Inc.  
George J. Ringger, MSA, P.E.  
FAA-DER FAA-DAR  
www.gringger.com*

**Assistant Professor  
College of Aeronautics  
Embry-Riddle Aeronautical University**

# **G. RINGGER CONSULTING, INC.**

***Celebrating +38 years in the  
aerospace/aviation industry!***

***Providing Engineering, Quality System, Training,  
Airworthiness, and Business Development  
Services to the aviation industry***

office 954-655-6509

fax 954-680-5326

***[George.Ringger@gmail.com](mailto:George.Ringger@gmail.com)***

***[www.georgeringger.com](http://www.georgeringger.com)***