Problem Solving and 8D Discipline

Guidelines Rev.0

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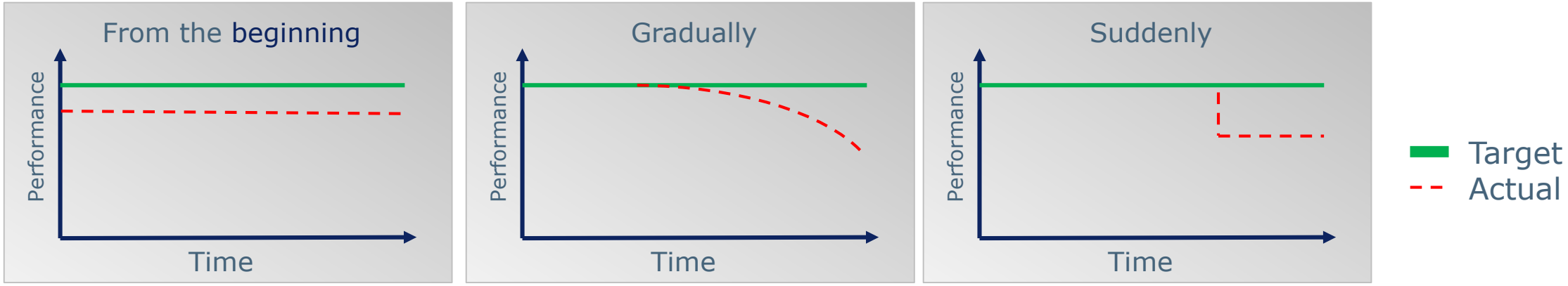
Safety first

What is a Problem

- Problem is a deviation from defined target.
- Target may be either defined by customer or mutually agreed upon.
- Problem may not be present at the beginning of product development lifecycle, it can occur at any phase



When to use the Problem Solving

- ✓ The causes of the problem/issues/situations are **unknown**
- ✓ There are risks of **negative consequences**
- ✓ The **complexity** of the problem/issues/situations requires the effort of more people (team)

Strong Points

- ✓ **Simple and effective** methodology
- ✓ **Eliminate the root causes** to avoid recurrence in the future
- ✓ Optimize times by providing **quick solutions** in similar cases

How to approach a Problem (Correct Attitude):

GENBA→REAL PLACE

ATTITUDE:

- **USE YOUR LEGS AND YOUR EYES !**
- **Interview** of the actors of the problem
- **JUMP OUT OF BOX** (office, preconceived ideas)

BENEFIT:

- NO PLACE FOR IMAGINATION
- **OBSERVE AND UNDERSTAND**
- Be able to **ANALIZE**

GENBUTSU→REAL PARTS

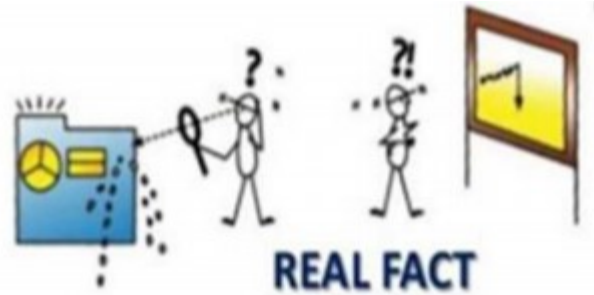
ATTITUDE :

- **COMPARE GOOD AND BAD, OK and NOK** (parts, situations…)
- **COMPARE** versus **STANDARD** (drawings, technical specifications…)

BENEFIT :

- Detect the DIFFERENCES
- Detect the DEVIATIONS versus the Standard
- Identify RELEVANTS FACTORS

GENJİTSU→REAL DATA



ATTITUDE :

- Speak with **FACTS** and **DATA**
- Ask for **EVIDENCES** and data
- Forbid the words as ”I think”, ”Maybe”, ”Perhaps”

BENEFIT :

- Be PRECISE
- Be CONVINCED and be CONVINCING
- Earn time, Avoid time loss

DO NOT TALK WITH YOUR IMAGINATION

Why the 8D Methodology

- The purpose of using the 8D method is to eliminate problems in products or processes and avoid the recurrence of similar or same problems.
- Method improves effectiveness and efficiency in problem solving
- Create and expand a database of past failures and lessons learned to prevent problems in the future
- The 8D method enables you to:
  - Identify and eliminate the root cause of the problem
  - Process complaints, internal or external, in a rapid and systematic manner.
  - Document problem-solving process, continuously and in a systematic manner
  - Inform or involve the relevant stakeholders and focus on team identification in case of cross-functional problems.
  - Transfer the lessons learned to similar products and processes.

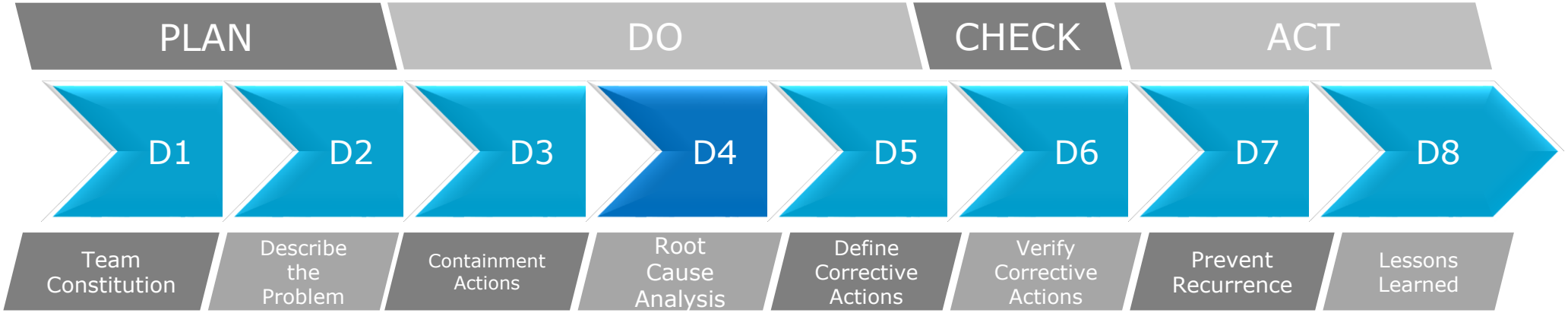
Background

- ✓ Born in the military field
- ✓ Included in the Automotive manual by the Ford Motor Company (1987) like a valid Problem Solving tool
- ✓ Developed in accordingly to PDCA method Deming Model

Overview

- Eight disciplines (8Ds) problem solving is a method used to approach and to resolve problems, typically employed by engineers or other professionals
- Focused on product and process improvement, its purpose is to identify, correct, and eliminate recurring problems.
- It establishes a permanent corrective action based on statistical analysis of the problem and on the origin of the problem by determining the root causes.

Steps of 8D Process



Applicable to Customer Claims, Internal and Suppliers non-conformities

- **You might use 8D Methodology in the following cases:**
  - Issues related to Safety related characteristics
  - Issues related to Critical to Quality characteristics
  - Functional impact to the Customer (installation / product usage or first handover issues)
  - Unsolved repetitive issues (more than 3 times in 3 months)
  - Production stop

Quick Response Approach Timeline

Within **2** working days*	D1 and D2 steps completed as far as possible. Containment actions (D3) reported.
Within **7** days*	8D report completed with root cause analysis (D4).
Within **14** days*	Corrective actions plan(D5) must be reported and actions for D6 and D7 steps must be defined.
Within **60** days*	Entire 8D Report must be verified and completed.

*from Claim or non-conformance date

D1-Team Constitution

Who is working on the issue?

(Ensure a cross-functional team is selected)

Form a small group of people (3-5) with the **right knowledge** of the project/process; define **authority** and **responsibilities**. The team must have a coordinator and work together over time.

Team Leader

- ✓ is responsible for the work of the team,
- ✓ is the leading person (speaker),
- ✓ schedules and guides the meetings in accordance with the agenda,
- ✓ Update 8D documentation after each meeting.

Team Members

Are responsible for:

- ✓ Investigate the problem
- ✓ finding the root cause and perform the analysis,
- ✓ following actions and track improvements
- ✓ sharing the Corrective Actions and to verify implementation.

D2-Describe the Problem

1. Problem Statement Principles:

- ✓ States the effect
- ✓ Measurable
- ✓ Does not imply the solution

Problem solving must be based on facts, not opinions. It is important to clarify the issue type; what was wrong, when did it happen, how big the failure extent is and how many times it has happened. The description must be specific and easy to understand.

2. Problem Definition (5W2H):

Describe the problem quantitatively with questions like **What? Why? When? Who? Where? How? How many?**

Collect information, data, facts and figures about the problem

Gather and evaluate the date objectively

Data samples can include:

- Drawings
- Logs
- Flow charts
- Pictures
- Affected product samples, etc..

D2-Describe the Problem

5W2H

- Who is affected by the problem?
- What type of problem is it?
  - What was wrong with the failing feature?
  - What caused the product not to function properly?
- Why is it a problem?
  - Why was the issue a problem for the customer?
  - Why did the part fail?
  - Why did the defect not meet customer's expectations?
- Where was the problem observed?
  - Where on the product was the problem or defect located?
  - Where was the product physically located when the product or defect was found?
- When was the problem first noticed?
  - When (day, time, shift) was the problem detected?
  - When since first detection has the problem been seen again?
  - What time pattern is it seen? E.g. every Wednesday on 2nd shift?
- How did the problem occur?
- How often does the problem occur?
  - What is the failure rate of problem?
  - How big is a single defect, size?
  - How many defects are on one unit?
  - Is there trend increasing or decreasing seen?

D2-Describe the Problem

D2 Checklist

1. Has the problem been sufficiently defined?
2. Analysis has been performed (who, what, where, when, why, how, and how often)?
3. Have defective products been investigated/tested?
4. Are all figures, data or facts related to the problem available to the 8D Project team?
5. Is the impact on the customer product known and described?
6. Which products are affected?
7. How large is the range of parts affected?

D3-Containment Action

The primary purpose of this discipline is to isolate the issue and protect the customer from receiving more parts with same quality defect.

1. Secure the Customer, the Employees, Internal processes.

2. Define and implement actions stop the occurrence of the same issue. These actions must be maintained until the implementation of the definitive corrective actions.

3. Verification of containment actions must be conducted in a predefined range of time and as earlier as possible. In order to ensure that the Customer (internal or external) uses products that are fully compliant immediately after reporting.

- Determine the most appropriate containment actions
- Containment actions therefore serve only as a safeguard and often bear no relation to the cause of the problem
- A schedule for implementing the containment actions must be developed and the effectiveness of the measures must be assessed
- Block all parts, stock (in house, transit, Customer)
- Sort all parts blocked (Pick the bad ones out)
- Document the containment actions in the 8D report
- Instant information about the implementation and result of containment actions shall be shared

D3-Containment Action

D3 Checklist

1.	Have effective containment actions been implemented?
2.	Has the effectiveness of the containment actions been verified?
3.	Is the work force responsible for executing the containment actions sufficiently instructed?
4.	Do the containment actions give the customer adequate protection against further defects?
5.	Are defective products being identified and rejected as early as possible in current process sequence?
6.	Does the customer know how and from when they will be protected from defective products?

D4-Root Cause Analysis

"Identify and correct the **root causes** of events, rather than to simply address the symptoms". The **focus on the correction** of the root cause has the goal of entirely preventing problem recurrence.

- Do not jump to conclusions without facts.
- Involve operators and all involved parties in the analysis.
- Compare good/bad/standard.
- Determine technical and systemic root cause using at least 5Whys quality tool.
- Verify after each why on facts/tests/data.
- Determine why the problem did not occur before.
- Determine why the problem was not detected earlier.
- Determine why the non-conformity, technical and system-related, occurred.
- Document the root cause analysis done.

Common Mistakes in Root Cause Analysis:

- Immediate causes are NOT root causes, they are just symptoms of the true root cause.
- Some common immediate causes are:
  - Operator error
  - Inspection not recorded by the operator
  - Operator not trained
  - Failure to follow procedures / work instructions
- Common reasons why true root cause could not be identified:
  - Problem description was not well defined
  - Possibly because of incorrect data some of the "facts" were not true.
  - 8D team is working on symptoms instead of the real problem.
  - The right people were not included to fully understand the problem.

D4-Root Cause Analysis

Identify Root cause for Occurrence:

- What in the process or system failed and allowed the deviation to be created?
- Root cause on operative/technical level that results from description of logical and functional relationships (cause effect relationship)
- Examples:
  - Physical / Chemical function properties of materials. (e.g. Colour , strength , strain)
  - In technical process.
  - Tooling worn.

Identify Root Cause for Non-detection:

- What in the process or system left the deviation undetected?
- The non-detection root cause should focus on the occurrence of the root causes, as well as the deviation itself.
- Examples:
  - Dimension not included on SPC chart.
  - Tester not capable to detect the issue.
  - Characteristic is not part of the inspection plan.

Identify System Root Cause:

- What in the quality planning process failed to identify the opportunity of the occurrence and non-detection root causes to happen?
- Examples:
  - Risks are not assessed or priority number wrongly defined.
  - Instructions for the process / product not created, incomplete or unclear.
  - Core tools with faulty implementation, faulty application or unclear.

D4-RCA Problem Solving Tools: Brainstorming

Background

- ✓ Began to spread in 1957 by the advertising executive Alex Faickney Osborn.
- ✓ It is a group creativity technique to get ideas to solve a problem. Synthetically, given a problem, it is held by proposing free solutions of each type.
- ✓ The main result can consist of a:
  - new and complete solution of the problem,
  - new approach to a subsequent solution,
  - list of ideas that will be transformed into the drafting of a work program to find following a solution.

How to do it

1. Assign a moderator
2. Lay out the problem you want to solve and everyone to understand it
3. Set a time limit
4. Write Down and/or Sketch Everything
5. Don't Judge
6. Encourage crazy ideas
7. Start General, End Specific
8. Create synergy
9. Avoid group thinking
10. Include an outsider

D4-RCA Problem Solving Tools: 5WHYs

Background

- ✓ The method **was born in Toyota** in the '30s and was established in the '70s with the TPS (Toyota production system)
- ✓ The 5Whys strategy pursues the maximum focus on the problem by placing the **Why question for 5 times**.
- ✓ The final aim is to investigate the core of the issue in order to definitively **remove the root causes** of the problem examined.
- ✓ By repeatedly asking the question "Why", you can peel away the layers of symptoms which can lead to the real root cause of a problem.
- ✓ You may find that you will need to ask the question fewer or more times than five before you find the issue related to a problem.

How to do it (example)

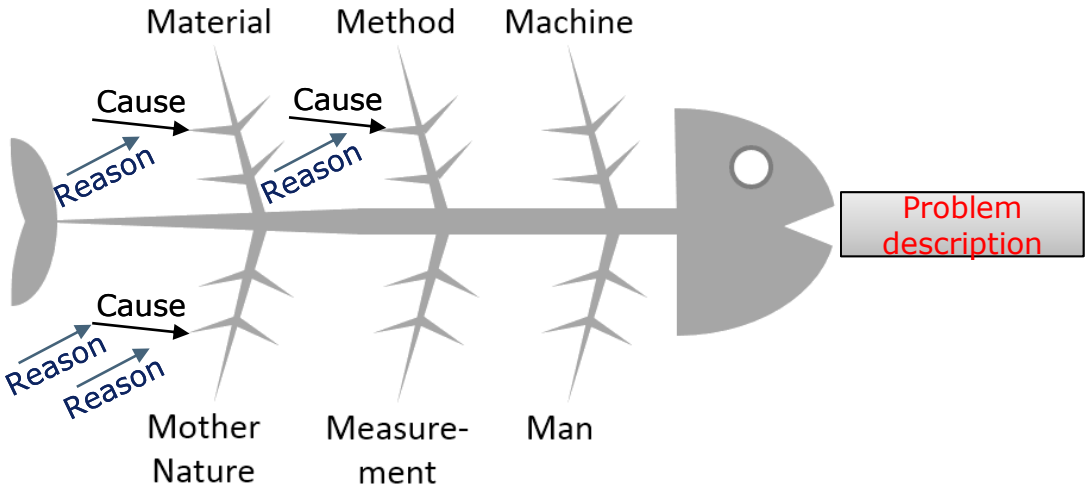
The vehicle will not start. (the problem)

1. Why? - The battery is dead. (First why)
2. Why? - The alternator is not functioning. (Second why)
3. Why? - The alternator belt has broken. (Third why)
4. Why? - The alternator belt was well beyond its useful service life and not replaced. (Fourth why)
5. Why? - The vehicle was not maintained according to the recommended service schedule. **(Fifth why, a root cause)**

D4-RCA Problem Solving Tools: Ishikawa (Fishbone Diagram)

The Ishikawa diagram has the purpose to identify the potential causes that have impact on the problem.
The causes can be categorized based on the **6M model**:

- **M1 – METHOD** (cycle, expected operation, times and ways of executing, layout of the workplace, ergonomics)
- **M2 – MAN** Factors related to Human ability to do properly the work: Training, Communication conditions for example.
- **M3 – MACHINES** (Factors related to the machine capabilities, Poka Yoke and software)
- **M4 – MATERIAL** (Factors related to the Material or components used for the manufacturing of the defective part)
- **M5 - MEASURE** (measurement tools)
- **M6 – MOTHER NATURE** (environment, temperature, humidity, dust,…)



D4-Root Cause Analysis

D4 Checklist

1. Why did the problem occur?
2. Have all sources of information been considered in determining the root causes?
3. Why was the problem not detected?
4. Have the technical, non-detection and systemic root cause verified?
5. Is there a provable connection between the problem and particular processes?

D5-Define and set-up Corrective Action(s)

Define and verify the corrective actions to address the root cause of the problem
The **implementation of corrective actions** start by drawing up a plan in which it is necessary to clearly define:

- ✓ responsibility
- ✓ timing
- ✓ support activities
- ✓ verification methods

The plan must be shared with all the **interested parties** and then applied.

D5 Checklist

1.	Have all possibilities for determining permanent corrective actions been thoroughly examined?
2.	Have the "correct " indicators been used to prove the effectiveness of the corrective actions?
3.	An action plan has been defined (responsibilities assigned; timing established; required support determined)?
4.	Is there any emergency plan in case corrective actions do not result in the desired success or if the actions cause other/new defect?

D6-Verify Corrective Action(s) Efficacy

It is necessary to provide **appropriate controls** to verify that the real cause has been eliminated (e.g.: through AUDIT).

WHERE

- ✓ Where the NC coming from
- ✓ Similar process
- ✓ Similar product
- ✓ Similar area
- ✓ Other sites
- ✓ Other Customers

Note:
Once the effectiveness of the corrective action has been verified, the containment action can be eliminated.

D6-Verify Corrective Action(s) Efficacy

D6 Checklist

1.	Has a schedule been created for the implementation of the corrective actions?
2.	What monitoring methods have been defined? (evidence of effectiveness)
3.	Are all the changes documented? (e.g. P/DFMEA, Control Plan, Process Flow Chart)?
4.	Do the selected corrective actions represent the best possible long term solution?
5.	Have the containment actions, implemented in D3, been removed?

D7-Prevent Recurrence

Goals

- ✓ Identify and establish measures to prevent recurrence of similar problems
- ✓ Respect our promises to Interested Parties
  - ❑ Audit and check
  - ❑ Learn from our mistakes root causes from:
    - Occurrence
    - Non detection
    - Management
- ✓ Deploy & Share

Systems and Tools

- ✓ DFMEA
- ✓ PFMEA
- ✓ Quality Control Plan
- ✓ PPAP/ISIR
- ✓ Work instructions
- ✓ Training needs
- ✓ Technical specifications/Drawings
- ✓ Poka-Yoke
- ✓ Maintenance plan
- ✓ Packaging Specifications

In order to prevent it's suggested to:

- Modify the management systems, operation systems, practices and procedures related to similar problems.
- Transfer acquired experiences via Lessons Learned to other/comparable products, processes, production sites and divisions.

D7-Prevent Action - Standardization

D7 Checklist	
1.	Have actions been implemented to prevent a reocurrence?
2.	Have all the affected processes been adequately checked and improved?
3.	Have all the relevant process documents been revised? (e.g work instructions, Control Plans, process FMEA, Inspection Plans etc)
4.	Are there similar situations/processes elsewhere in your plant/division/company which can benefit from what your team has learned?
5.	Have audits been established to assess the use and effectiveness of the solution to ensure that the gains are held?

D8-Lessons Learned, Communication and Congratulation

Standardize, make the whole experience available to future users and recognize the results achieved by the team.

D8 Checklist	
1.	Has the customer been notified of the final conclusion?
2.	Have all the corrective actions been implemented?
3.	Have the root causes been eliminated?
4.	Team process has been evaluated and lessons learned identified and shared?
5.	Have monitoring processes been put in place?
6.	Did the Champion/Sponsor review and approve the 8D's report ?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