12 February 2020

- Welcome
- Topic
  - Root Cause Analysis (RCA) – Overview and discussion how we can implement this thought process?
    - Cause and Effect Diagram
    - The Five Whys
    - Fault Tree Analysis (FTA)
    - Failure Mode and Effects Analysis (FMEA), Failure Mode and Effects Criticality Analysis (FMECA), and Process Failure Mode Effects and Analysis (PFMEA).
- Summary

What is the Root Cause?

- The root cause is the fundamental underlying reason for a problem. When you eliminate the root cause you eliminate that problem from recurring, you eliminate the problem permanently. It is important that you only include causes that can be controlled by management.

RCA Definitions

- RCA is the methodology used to locate the root cause. RCA helps identify what, how, and why an event occurred. Each Industry and Company should develop their own methodology to suit their situation. This presentation will explore a fundamental methodology common to most situations.
- Symptom – The easily identified fault that something is not normal.

Example: You notice an puddle of oil beneath your car. Some people will say that the problem is the puddle of oil. That is NOT the problem, just a symptom of the problem. If you clean up the oil you'll quickly realize that that is NOT the problem.

Why do we need RCA?

- Regardless of our industry, we are all called upon to solve problems in our daily lives both at home and at work.
- If we don’t have a planned methodology to solve problems, we’ll often not find the root cause.
- We’ll often mistake a symptom for the problem.

Root Cause Analysis (RCA)

- Once the failures or defects are identified, then the real work begins. These are just the symptoms of the problem, the characteristics or outward surfaces of the problem. RCA focuses on fixing the underlying systems, parts and / or processes that cause the problem. Only when you identify and correct the root cause of the problem, can you ensure that the problem will not recur.
- RCA often begins after an event has occurred, and thus is a reactive process. However, the results of the analysis should be used to proactively to eliminate the cause and thus the recurrence of the problem.

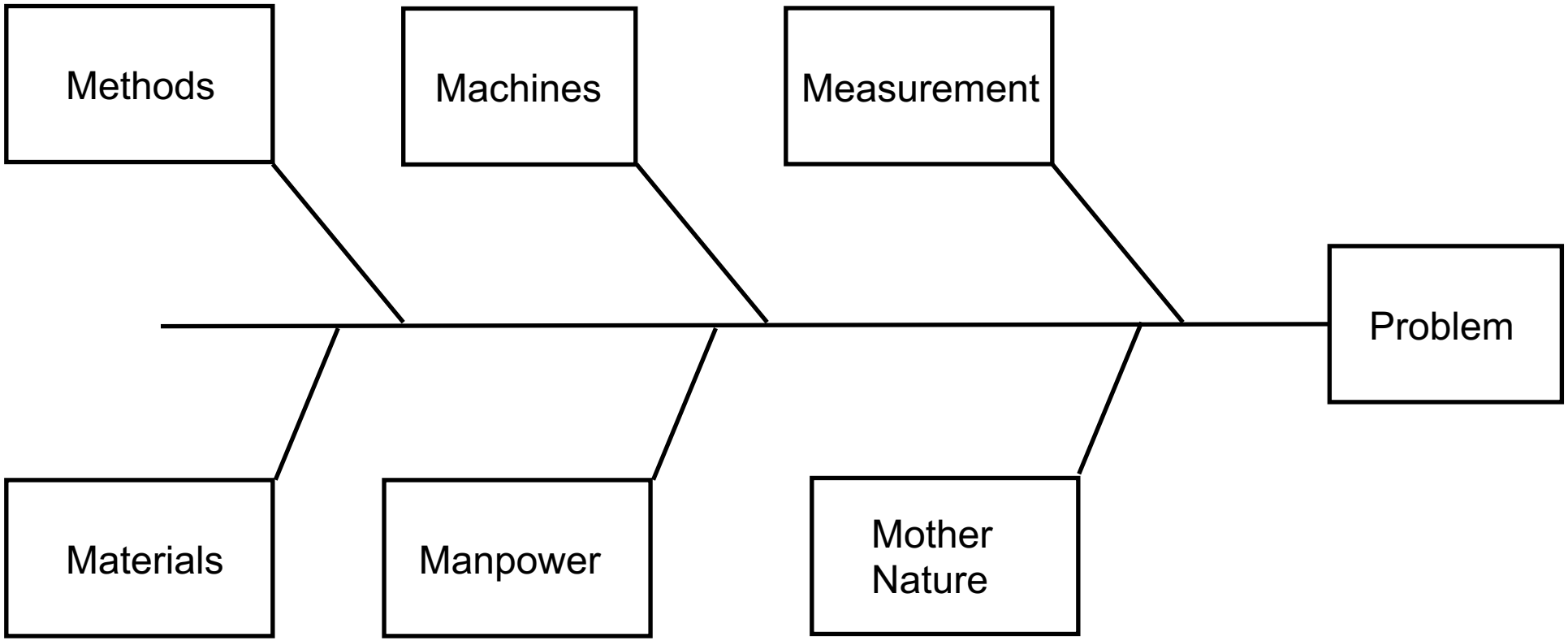
Outline of Steps for RCA

- Define the problem
- Understand the process
- Identify causes
- Collect data
- Analyze data
- Identify potential solutions
- Select solution
- Implement solution
- Verify the solution
- Implement the change

Basic Tools for RCA

- Cause and Effect Diagram
- Five Whys
- Flowcharts
- Scatter Diagrams
- Fault Tree Analysis
- FMEA (Failure Modes and Effects Analysis)
- FMECA (Failure Modes and Criticality Effects Analysis)
- PFMEA (Process Failure Modes and Effects Analysis)

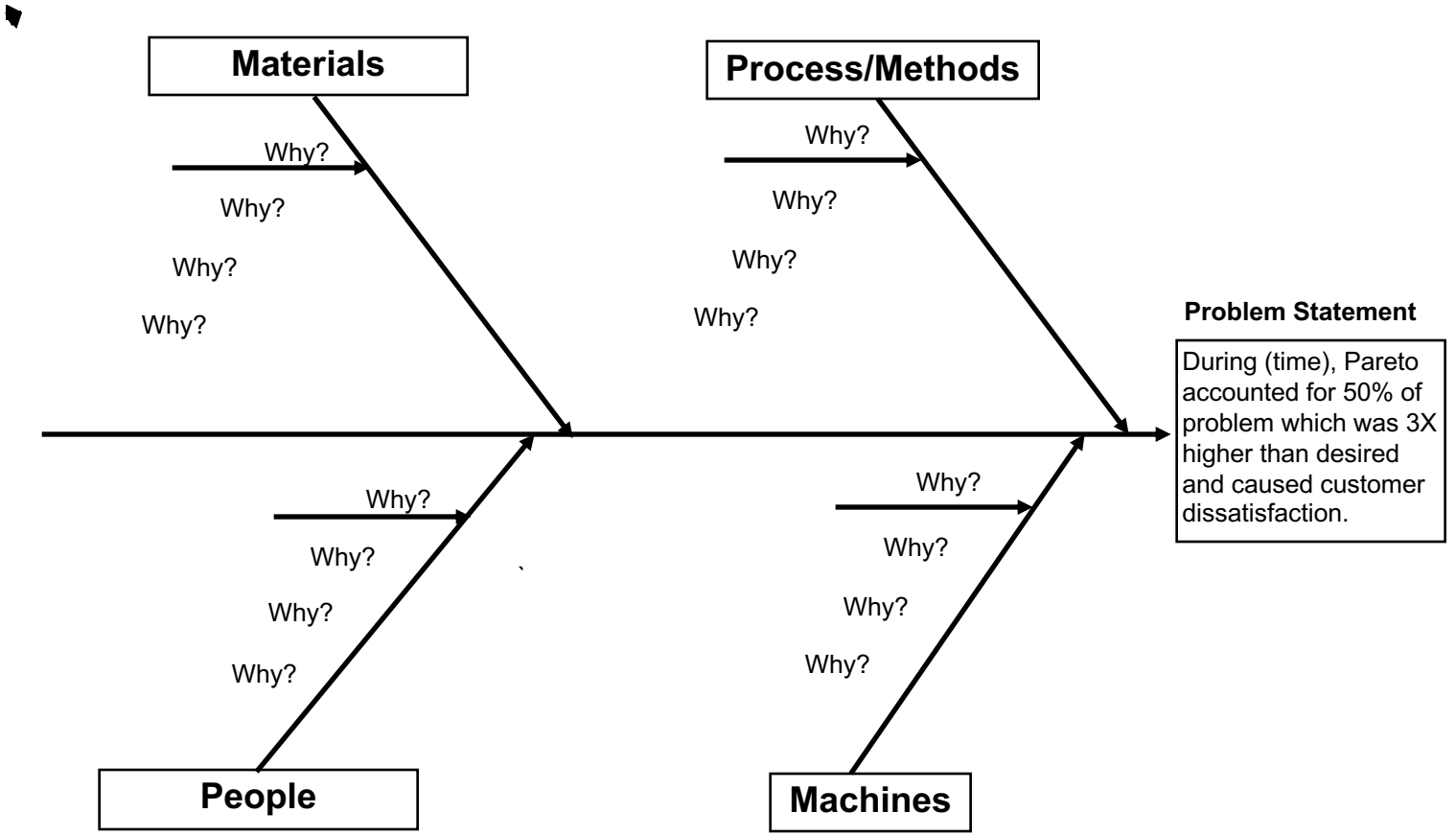
Cause and Effect diagram (Fishbone or Ishikawa diagram)



Five Whys

- Each answer provides more insight into the root cause of the problem
  - 1. Why did the part corrode?
  - Ans – Because the paint did not provide the protection to the environment that it should have.
  - 2. Why didn’t the paint provide the protection to the environment needed?
  - Ans - Because it did not adhere to the material in the part.
  - 3. Why didn’t the paint adhere to the material?
  - Ans - Because the primer was too thin and because the surface wasn’t properly cleaned.
  - 4. Why was the primer too thin and why wasn’t the surface prepared properly?
  - Ans - Because the specification wasn’t followed as to the primer and cleaning.
  - 5. Why didn’t the contractor know that the specification was not followed?
  - Ans - Because the painted surfaces were apparently not properly inspected after the application of the paint.

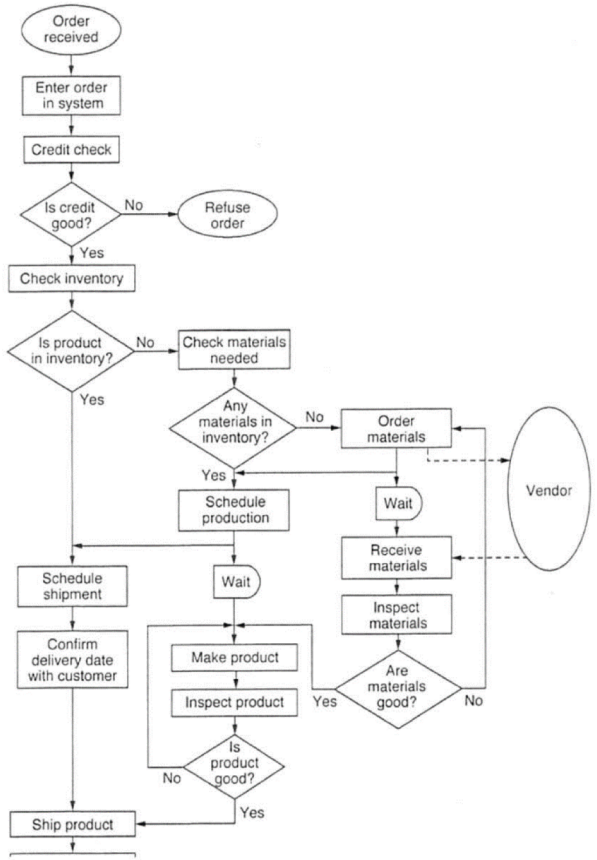
Five Whys used to complete Cause and Effect Diagram



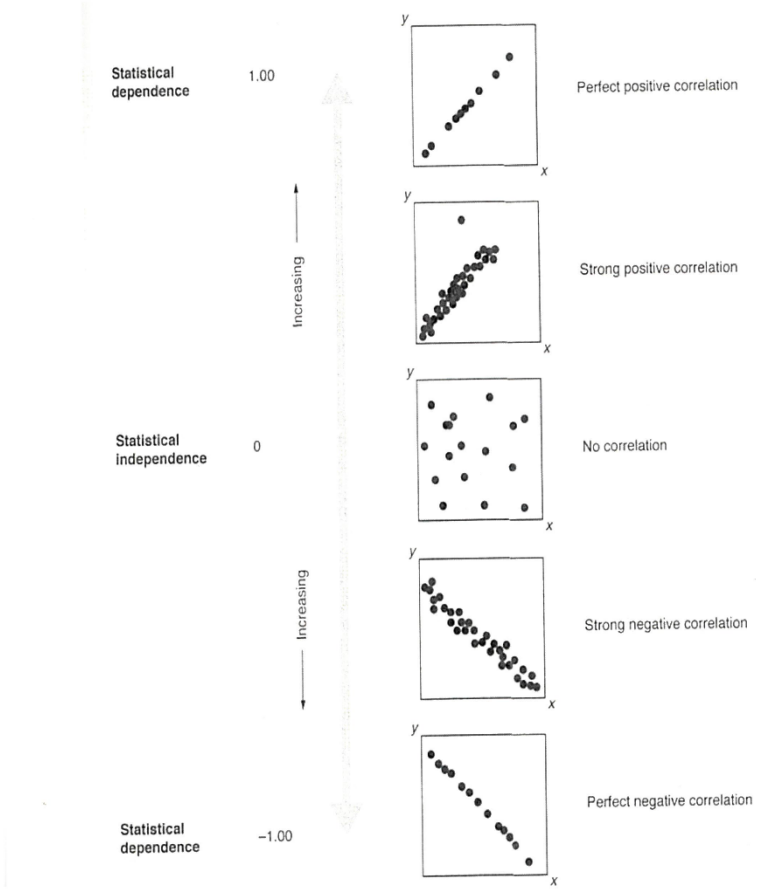
Flowcharts

- A flowchart of the detailed process can often aid in identifying the root cause.

Flowchart


Order received
Enter order in system
Credit check
Is credit good?
No
Refuse order
Yes
Check inventory
Is product in inventory?
No
Check materials needed
Yes
Any materials in inventory?
No
Order materials
Yes
Vendor
Schedule production
Wait
Receive materials
Schedule shipment
Wait
Inspect materials
Confirm delivery date with customer
Make product
Inspect product
Are materials good?
Yes
No
Is product good?
No
Yes
Ship product

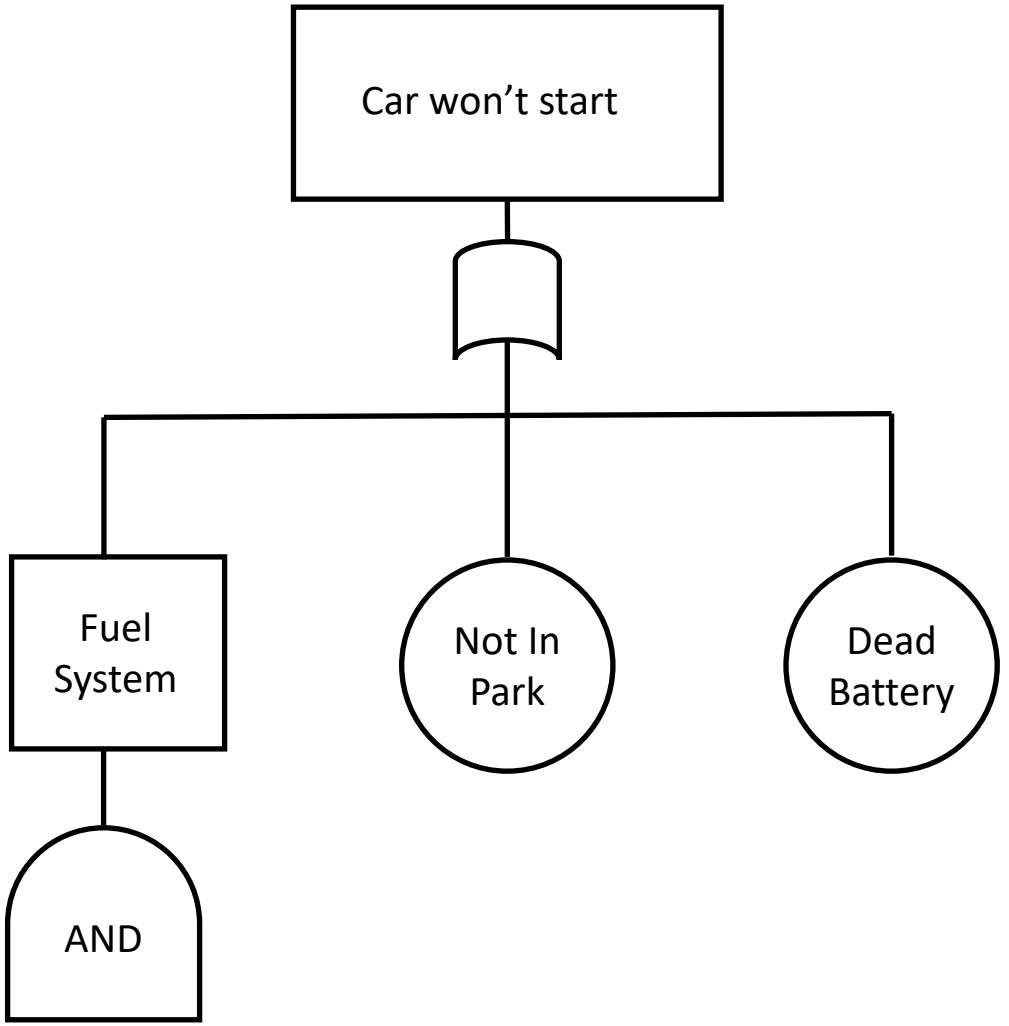
Scatter Diagrams



Fault Tree Analysis (FTA)

- Built from the Top – Down
- The disadvantage of the approach is that some of the details are more likely to be missed.

Fault Tree Analysis



Failure Modes and Effects Analysis (FMEA)

- Built from the Bottom – Up
- This approach is a very tedious but thorough process able to determine all of the modes and the effects.
- Failure Modes and Effects Criticality Analysis (FMECA) and Process Failure Mode Effects and Analysis (PFMEA) are variations of the FMEA process performed with different perspectives.

Summary

- Root Cause Analysis (RCA) – How we can implement this thought process?
  - We discussed that RCA is often required during First Article Testing and other contractually required testing; In some contracts RCA is required for analysis of field failures. Also often integrated as part of the Failure Reporting and Correction Action System (FRACAS).
  - RCA is not limited to use for only failures. In that use, it is a reactive response to an incident. In other, instances it can be used anywhere that process improvement is desired.
  - We mentioned RCA being used in manufacturing, restaurants, schools, etc. to analyze processes and evaluate ways that improvements may be implemented.
  - We reviewed the use of commonly used RCA tools. We also discussed that the tools that are used the same for both reactive and proactive uses.

Presentation Handouts

- **Item 1: Root cause analysis for beginners**

  http://asq.org/quality-progress/2004/07/quality-tools/root-cause-analysis-for-beginners.html

  When you copy and paste the above link a webpage will open. On the right hand side select PDF to down load the book.

  Item 2: The art of root cause analysis

  http://asq.org/quality-progress/2016/01/best-of-back-to-basics/the-art-of-root-cause-analysis.pdf

  When you copy and paste the above link you will have a PDF file of the QP Article.

  Item 3: The ASQ Pocket Guide to Root Cause Analysis

  Unfortunately this item is only available for purchase. I think I got my copy as part of a Member Gift from www.asq.org.

  It only available for purchase $29.00 retail, $20.30 for ASQ members.

  https://asq.org/quality-press/display-item?item=H1460

  The ASQ Pocket Guide to Root Cause Analysis (e-book)
  - **Bjørn Andersen, Tom Natland Fagerhaug**
  - **PDF,** 136 pages, Published 2013
  - Dimensions: Pocket Guide
  - ISBN: 978-0-87389-863-8
  - Item Number: E1460

Questions?

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