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Cause-Effect Diagrams

Key Learning Points

1. Describe the importance of Cause-Effect Diagrams.
2. Explain how to develop a Cause-Effect Diagram.
3. Utilize Cause-Effect Diagrams in improvement projects.

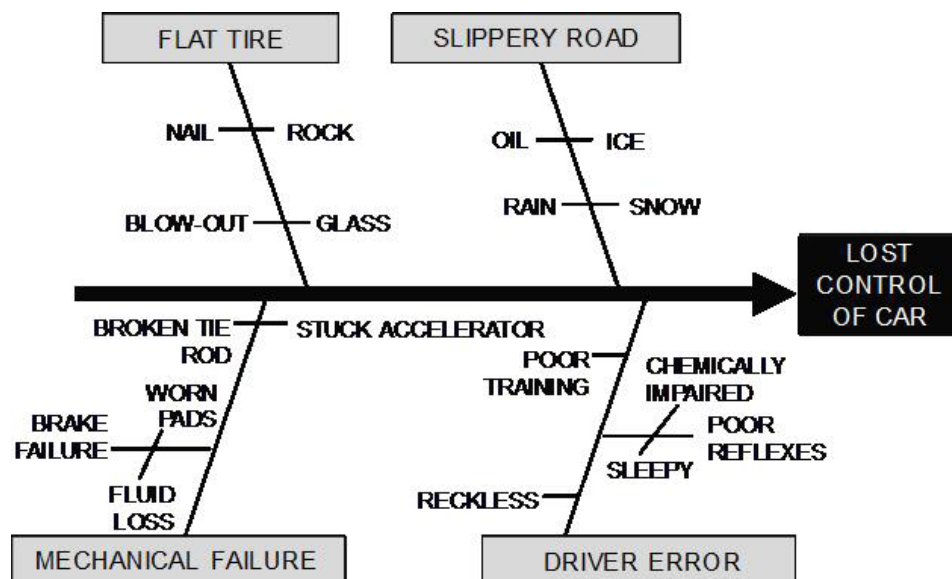
What is a Cause-Effect Diagram?

Cause and Effect Analysis uses a fish bone diagram to organize theories (potential causes) and the relationship to each other. For this reason it is often called a fish bone diagram or Ishikawa Diagram (named after famous Japanese professor).

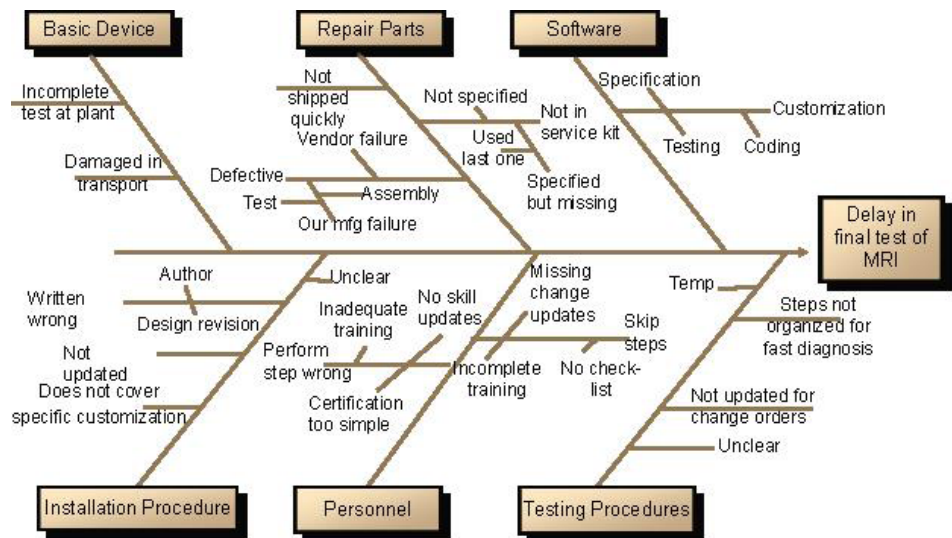
The diagram challenges team members to come up with new theories by asking “Why?” for each factor they list.

The main purpose of a C-E diagram is to suggest theories of root causes (possible vital few Xs) and help the team focus on the possible Xs. Possible sources of cause are at the farthest point from the main branches. Detailed theories are listed off of that “spine” as shown in the following slide.

Cause-Effect Diagram Examples

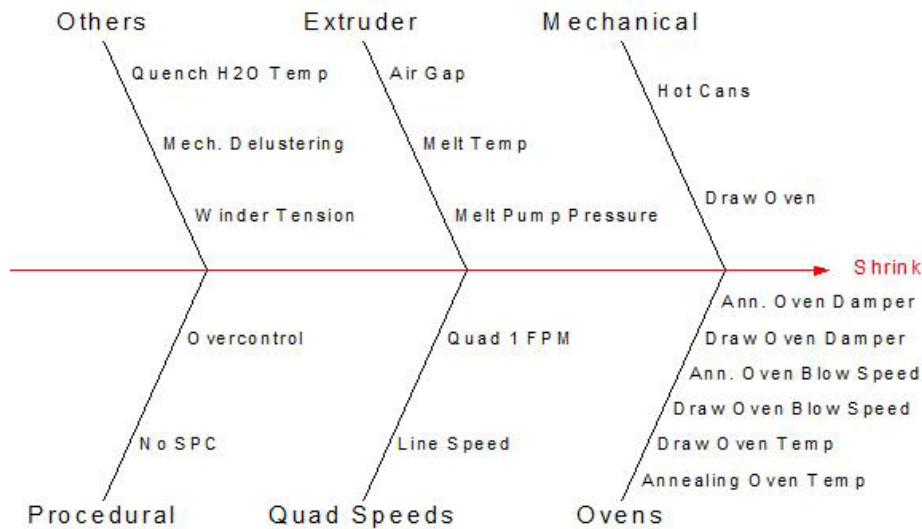


Healthcare



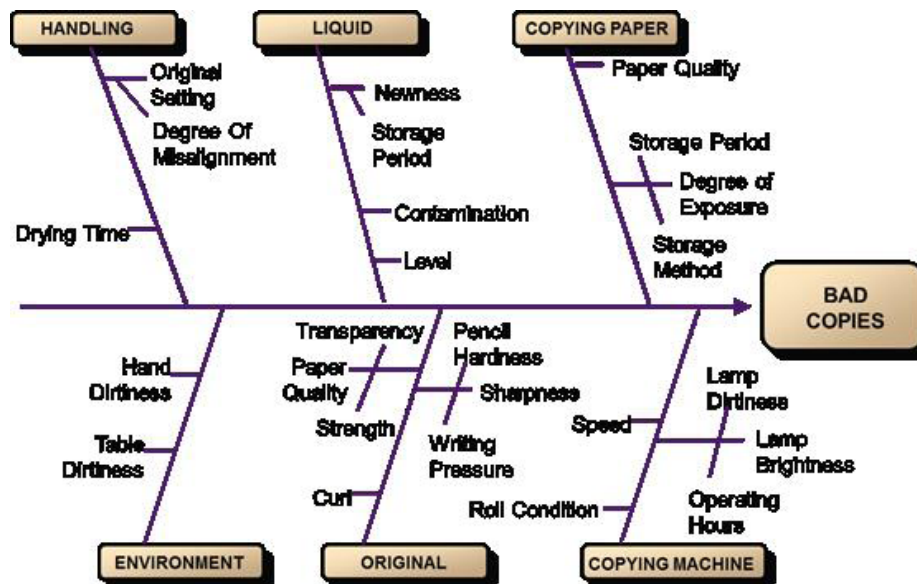
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Manufacturing



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Service



Steps to Construct Cause-Effect Diagrams

1. Clearly Define the effect or symptom for which causes must be identified. The effect should be directly related to the team's problem statement.
2. Place the effect or symptom at the right, enclosed in a box. Draw the central spine as a thicker line pointing to it.
3. Use brainstorming or a step-by-step approach to identify the potential causes.
4. Each of the major areas (categories) of causes are placed in a box and are connected with the central spine by a line at an angle of about 70 degrees.

5. Add subsidiary causes for each cause already entered. each of these causes is drawn at the end of a line which is drawn:
 - a. To connect with the line associated with the factor that causes it.
 - b. Parallel with either the main line or the central spine.
6. Continue adding possible causes to the diagram until each branch reaches a root cause. You should only stop when the last cause of each causal chain is a potential root cause and it is controllable.
7. Check the validity of each causal chain.
8. Check for completeness. Look for the following:
 - a. Main branches with fewer than three causes.
 - b. Main branches with substantially fewer causes than most others.
 - c. Main branches that go into less detail, with fewer levels of subsidiary causes than others.
 - d. Main branches that have substantially more causes than most of the others.

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Analyzing Cause-Effect Diagrams

The cause-effect diagram does not provide an answer to a question, as some other tools do. Its main value is to serve as a vehicle for producing, in a very focused manner, a list of all known or suspected causes which potentially contribute to the observed effect. At the time of generating the cause-effect diagram, it is not usually known whether these causes are responsible for the effect or not.

A well-prepared cause-effect diagram is a superb vehicle for helping teams reach a common understanding of a complex problem, with all its elements and relationships clearly visible at whatever level of detail is required.

- Ask how each of the 5 Ps might apply to the effect.
- Have at least 3-4 additional branches off the main branch.
- Substantially fewer causes on the main branch means nobody has a full understanding of that element of the process.
- Verify that the cause at the end of each causal chain is potentially a root cause by tracing a logical causal relationship through all its intermediate causes to the final effect being explained. That cause is, in principle, directly controllable. Once shown to be true, that cause could be eliminated and the effect would disappear or be reduced.

When Should A Cause-Effect Diagram Be Used?

Cause-effect diagrams are used in Measure and Analyze when there is a need to identify root causes of a problem.

A cause-effect diagram is created prior to data collection.

Important Points

Consider all possible sources of causation. Remember to ask “Why?” 5 times.

Use the “5 Ps”

- People (employees)
- Provisions (Supplies)
- Procedures
- Place (Environment)
- Patrons (Customers)

Use the “5 Ms”

- Man
- Material
- Methods
- Machines
- Measurements

Pitfalls to Avoid

- Confusing the orderly arrangement of theories
- Failure to test for logical causal relationships
- Limited theories
- Constructing the diagram before adequate analysis of symptoms

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