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**PMEducation**

CAUSE & EFFECT

**WHAT IT IS**

The Cause & Effect Diagram was developed to represent the relationship between some outcome or “effect” and all its possible “causes”, and to find the Root Causes of the effect. A Root Cause is the most elementary reason to explain all we know about an effect.

This tool appears in 3 processes: Plan Quality Management, Control Quality, and Identify Risks. In Quality Management, the **effect is a Quality Problem;** either a problem we want to avoid (in Quality Planning) or a problem we already have (in Quality Control). In Risk Management, the **effect is the Risk** (in Identify Risks)**.**

The effect (or Problem or Risk) is stated on the right side of the chart and the Categories of the causes are listed to the left. A well-detailed Cause & Effect Diagram will take on the shape of fish bones and hence the alternate name “Fishbone Diagram”. The creator of this method was Kaoru Ishikawa, so sometimes these are called “Ishikawa Diagrams”.

Cause & Effect Diagrams are drawn to clearly illustrate the various causes affecting an effect, by sorting out and relating the causes. For every effect there are likely several categories of causes. The categories might be: Manpower, Machine, Methods, and Materials (4 M’s). Alternately, it might be more helpful to use 4 P’s: Policies, Procedures, People, and Plant. You may use any category that emerges and helps people to think creatively.

**HOW IT WORKS**

1. Begin with the outcome (effect). One undesirable outcome could be “Poor Quality Product”. Place this on the diagram as the fish’s head. This is the Effect.
2. Then brainstorm all possible causes; in our case all causes that could lead to Poor Quality Product. Even after brainstorming, keep looking for possible causes that did not appear in the brainstorming session in order to have as complete a list of causes as possible.
3. Categorize the brainstormed causes. Categories for “Poor Quality Output” could be: Working Conditions, Raw Materials, Management, Technology, Machine, Workers. Draw the major “bones” (categories) pointing to the fish’s head (effect).
4. Place each brainstormed cause on “smaller bones”, leading into the categories of causes. For example a brainstormed cause could be Quality of Materials, so place that under Raw Materials.
5. Now, for each brainstormed cause ask the question “Why?” and list the responses as branches off the brainstormed cause. We are drilling down to get to the underlying causes. In our example, “Why is there a problem with Quality of Materials?” leads to the responses “Because of Storage, Mechanical Properties, and Material Composition.”
6. To get even deeper, for each response received in Step 5, ask “Why?” This will take you one level deeper. Then ask “Why?” again to get deeper still. This is how we get to Root Causes.
7. Continue to ask “Why?” drilling deeper until responses go outside the realm where a solution is likely to be found. It is expected that continuing to ask “Why?” five times will get you as deep as possible and therefore identify the Root Causes of the Effect. We understand that by addressing the Root Causes of the Effect, the hierarchy is addressed all the way back up to the Categories.
8. Now look at your completed Fishbone Diagram. Are there any Root Causes that appear in more than one Category? Are there any Categories that have most of the Root Causes? This is useful information for **Planning Risk Responses** and helps you know where to spend more of your time.

**KEY ELEMENTS**

For this method to be effective, the following key elements must be used:

* Representative selection of knowledgeable participants
* Agreement in the group about the need to find causes and Root Causes
* Use as few words as possible to keep the diagram legible
* Do not become overly concerned about where to place a cause or a Root Cause. Mainly focus on getting everything on the diagram
* Do not be concerned if you cannot reach 5 levels of “Why”. The idea is to go as deep as reasonably possible.

ADVANTAGES and DISADVANTAGES

Of CAUSE & EFFECT

ADVANTAGES

* Highly visual. Easy to see and to explain to others
* Identifies relationships between causes and effects
* Provides vehicle for Stakeholder Engagement
* Generates discussion amongst participants
* Allows creative thinking
* Gets to Root Causes, not just symptoms
* Illustrates Root Causes that appear in more than one Category and Categories that have most of the Root Causes

DISADVANTAGES

* Diagram takes a lot of space
* May take longer time than available
* Could get pre-occupied with where to place a brainstormed cause or a Root Cause.

FINAL NOTE: This tool is useful for Identifying and Categorizing Risks but also useful anytime the causes of a problem need to be categorized and Root Causes need to be found.

Below you will find the Cause & Effect Diagram for “Poor Quality Product”. Due to space limitations we are only showing one or 2 levels (“Why”) under each category.

