# Developing QI Projects: Diagnosing the Problem

Now that we have understood the problem, how do we _define the problem_?

The tools described below can be used to identify root causes and set direction for how to solve the problem. Depending on your project, one tool may be more useful compared to the others. They could also be used together if needed. These tools are used as part of the "P" (Plan) of the PDSA model and the "D" and "M" (Define and Measure) of the DMAIC model described in FAQ #2.

Tools to diagnose and set direction

Fish Bone Diagram (Cause and Effect Diagram)
Identify the many possible causes of a problem and sort ideas into useful categories
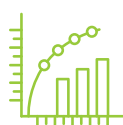
Pareto Chart
Prioritize the most frequent causes of a problem to concentrate improvement efforts on the factors with the greatest impact

Affinity Sort Diagram
Brainstorming with structure to generate creative ideas and spark solutions

When is the best time to use these tools?

Fishbone Diagram	Pareto Chart	Affinity Sort Diagram
• Root cause analysis after a safety event • To solve problems that involve several parties and resources • Organize brainstorming session	• To narrow down a large dataset of causes/factors to the most significant or highest priority • To justify why a team is focusing on certain improvement areas over others	• When ideas are coming in a rapid-fire manner to prevent unproductive chaos • Groups that are unable to reach consensus on the best idea moving forward • Organize results of a survey

Fish Bone Diagram (Cause and Effect Diagram)

A diagram used to identify the many possible causes of a problem and sort ideas into useful categories.

Steps to create a fishbone diagram

1. Write your problem on the right side of a page in a box with a horizontal line to the left. This is your fish spine.
2. Decide on 5-6 categories of causes for the problem. These will become your fishbones. The standard categories are:
   a. Materials
   b. Methods
   c. Equipment
   d. Environment
   e. People
3. For each category, generate a list of the causes that contribute to the problem and draw them as "branch bones". As necessary, draw additional branch bones from the causes to show sub-causes.
4. Analyze the identified causes to determine those that should be addressed further as a means to solve the problem.

Example: Cause and Effect Diagram
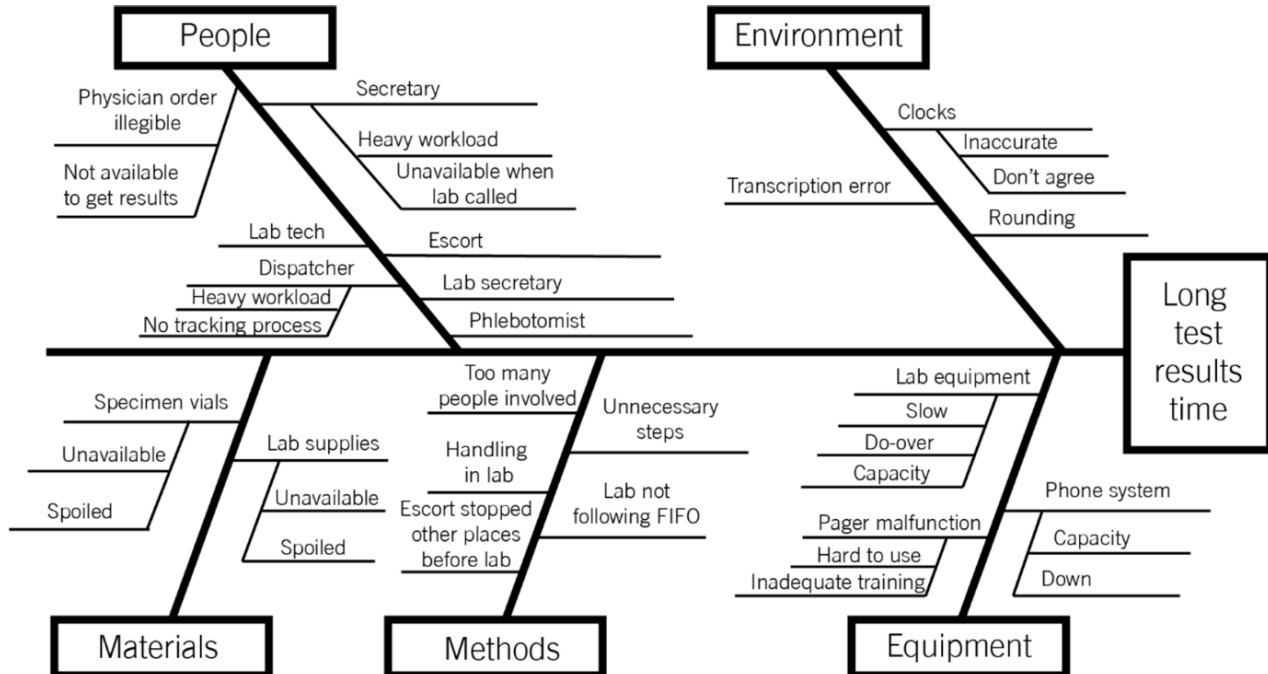
Pareto Chart:

A bar chart used to prioritize the most frequent causes of a problem to concentrate improvement efforts on the factors with the greatest impact.

> **The Pareto principle states, "80% of the effects come from 20% of the causes"**

Steps to Create a Pareto Chart:

Step 1: Collect and organize data into a table that lists the various factors that contribute to an overall problem in order from largest to smallest contribution.

Step 2: Draw a Pareto chart using the data from the table. The bars depict the magnitude of effect and the line graph is the cumulative percentage.

Error type	Frequency	%	Cumulative %
Wrong Supplier	67	46.5	46.5
Excess Count	24	16.7	63.2
Too Few Count	17	11.8	75
Wrong size	10	6.9	81.9
Wrong set	10	6.9	88.8
Missing Item	8	5.6	94.4
Damaged Item	6	4.2	98.6
Other	2	1.4	100
Total	144	100	
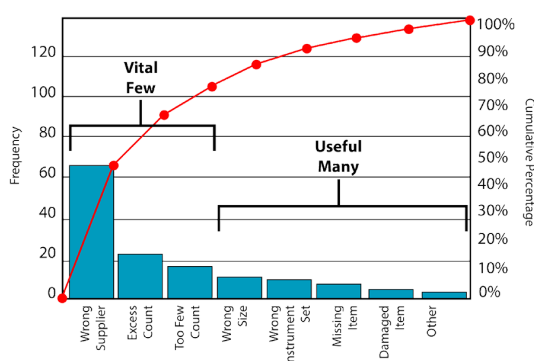
Vital Few: the factors that have the largest contribution to the problem and therefore warrant the most attention

Useful Many: factors that, while useful to know about, have a relatively smaller contribution to the problem


Affinity Sort Diagram:

A diagram that provides structure for brainstorming to generate many creative ideas and combine them to spark solutions

Steps to Brainstorming with Affinity Sort

Step 1: Participants **write ideas on sticky notes** they think will solve the root cause of the problem. This should be done quietly and individually to avoid bias from others.

Step 2: **Group similar ideas into clusters**. There will be different ideas of what is causing the problem and how to address it, but many of the ideas will speak to similar issues or have a similar solution.

Step 3: **Prioritize clusters and determine next steps**. The group revisits each cluster on the diagram, documents appropriate next steps or actions, and then ranks or votes on the clusters that are most important

STEP 1
Generate ideas as sticky notes.

STEP 2
Organize notes into clusters.

STEP 3
Prioritize clusters and next steps.
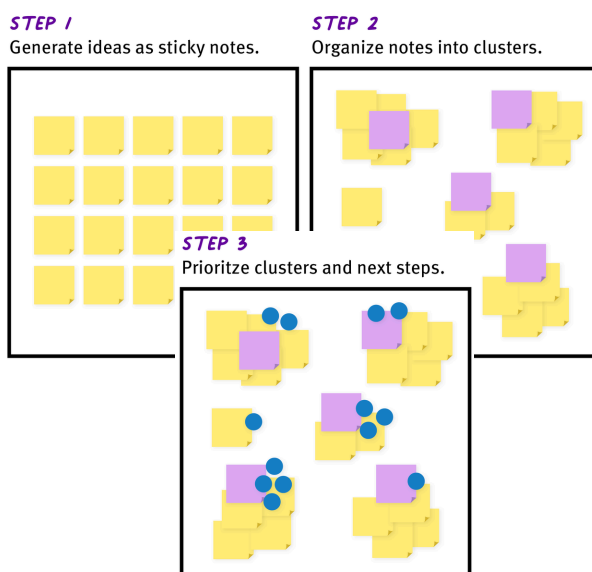
References:

1. *Quality Improvement Essentials Toolkit. Boston: Institute for Healthcare Improvement; 2017. (Available at ihi.org)*
2. Six Sigma Daily. (2021, September 23). *How affinity diagrams support better brainstorming*. Six Sigma Daily. https://www.sixsigmadaily.com/how-affinity-diagrams-support-better-brainstorming/
3. *American Society for Quality. (2024). What Is a Fishbone diagram? Ishikawa Cause & Effect Diagram. ASQ. https://asq.org/quality-resources/fishbone*
4. Pernice, K. (2018, February 18). Affinity Diagramming: Collaboratively Sort UX Findings & Design Ideas. Nielsen Norman Group. https://www.nngroup.com/articles/affinity-diagram/

Stay tuned for future future topics:

QI tools ~ Developing QI projects: data in quality, defining measures and countermeasures, assessing results ~ Quality indicators and metrics ~ How to teach residents about quality ~ Designing a quality rotation vs longitudinal project ~ Sharing results

Interested in more information? **Click here** to see our HOPA Quality website.

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