

Identifying Root Causes

This training module was designed by ICA Colleagues Jim Troxel and Karen Snyder when they were part of Millennia Consulting, LLC. This module was developed for an employee involvement program with labor-management groups of city and state government agencies. It would be akin to “process improvement” or TQM programs. Circa 2000.

Often the real causes of a problem may be different from those that appear on the surface. If we begin solving for the wrong causes of a problem, we waste time and resources. We need to collect data to identify the **root causes** of the problem we are tackling. In this module we will review two types of tools to identify root causes:

- Cause & Effect Diagram (fishbone diagram)
- Pareto Chart

Learning Objectives

- To understand the principles of cause and effect by constructing a cause and effect diagram.
- To increase understanding of how focusing on the “vital few” can be more effective than focusing on the “trivial many.”
- To understand and create a Pareto Chart by utilizing data obtained through the checklist method.

Cause & Effect Diagram

Mapping the factors that affect a problem.

The purpose of a cause and effect diagram is to map out factors thought to effect a problem, thereby identifying the root causes. The cause and effect diagram gives structures to many possible causes of a problem.

Benefits of the cause and effect diagram include:

- Leads to greater understanding and appreciation of a problem
- Identifies possible contributing factors or causes of a problem
- Provides an opportunity for discussion and shared learning
- Focuses discussion on the issue, thereby reducing or eliminating irrelevant complaints or discussion
- Requires and allows for an active search for root causes
- Can be applied to any problem
- Illustrates the level of employee understanding; the more complex the diagram the higher the workers' understanding of the process

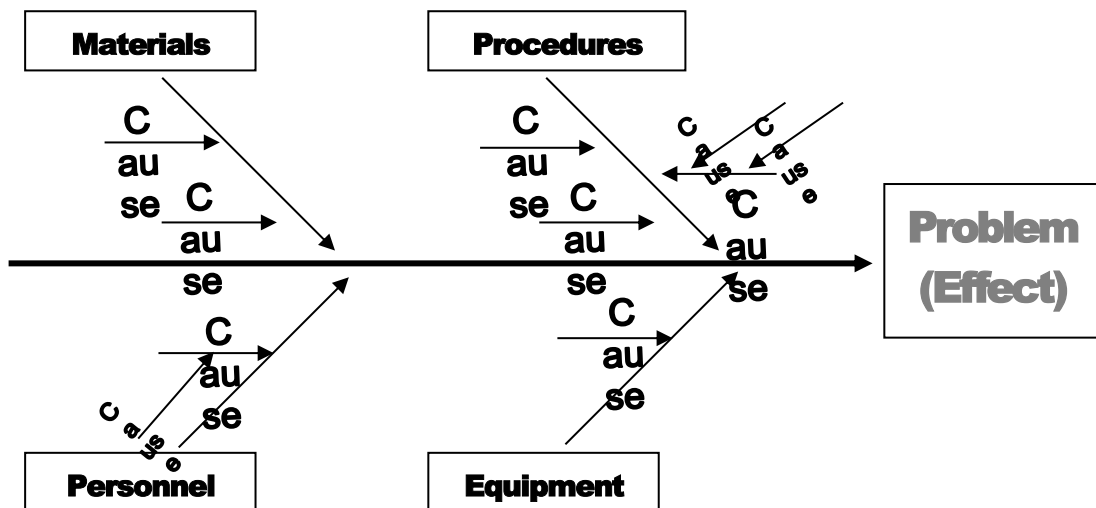
Overview: Cause & Effect Diagram

1. Identify and obtain consensus on the problem statement and post on flipchart
2. Draw a large arrow pointing to the name of the problem
3. Brainstorm possible causes, writing the causes on post-its (one cause per post-it). Avoid the “blame trap” – the causes tend to be process related, not people issues. Focus on causes, not symptoms or solutions
4. Draw branches off the large arrow to represent main categories of potential causes, i.e. categories – equipment, personnel, materials, etc.
5. Small arrows representing subcategories are drawn off each main branch

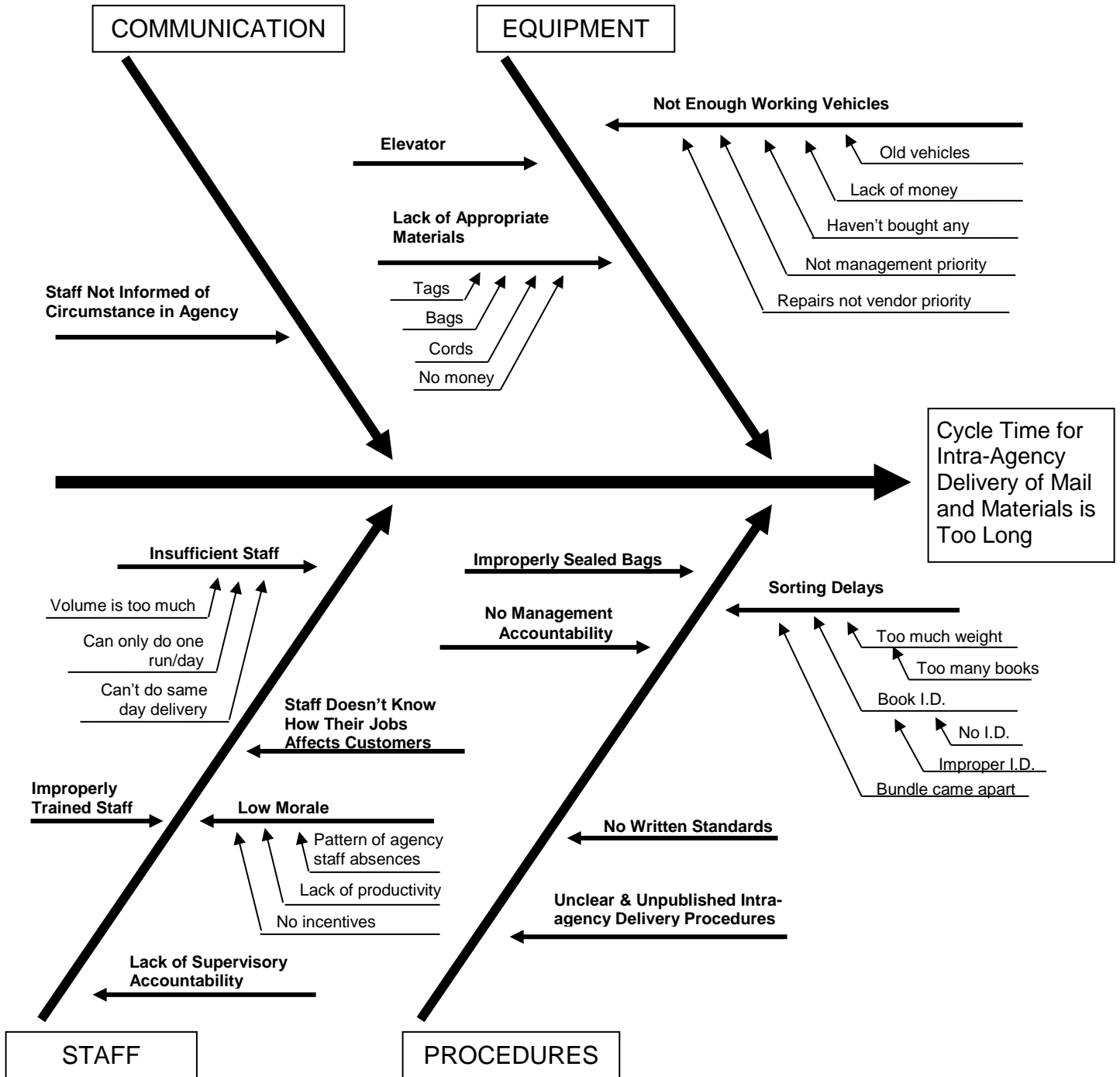
Causes of a problem tend to be grouped around basic categories

**POSSIBLE
“CAUSES” CATEGORIES**

Equipment
Facilities
Input
Materials
Personnel
Policies
Procedures
Process



Cause and Effect Diagram – Public Library



Creating a Cause and Effect Diagram:

Example: Bob was late for work 75 times during 700 workdays over the three-year period 1/1/99 through 12/31/01

1. Create a template for the fishbone with an “effect” box and main category boxes.
2. Ensure everyone agrees on the wording of problem definition. Write the problem definition in the “effect” box at the right (the head of the fish.)
3. Use the affinity process to brainstorm and group a list of potential causes into four or five major categories.
4. Place the major category titles in the boxes at the ends of the major spines.
5. Arrange the post-its along sub-spines under the appropriate category (if one cause causes another, be sure to put it on a smaller branch of the sub-spine).
6. Draw in spines with arrows for each cause to show the appropriate cause and effect relationship.
7. Evaluate all causes in the fishbone and circle those that are the most likely to cause the effect.
8. For most likely causes on the fishbone, ask “why” 5 times, and for each answer add even more sub-spines to ensure that you get to the root of the problem. (“Why does _____ happen?”) Discuss and eliminate or add as agreed upon.
9. Develop plan to verify most likely causes with data

SELECT TEAM MEMBERS

A S . . .

- ✓ Timekeeper
- ✓ Facilitator
- ✓ Reporter
- ✓ Scribe

TIPS

- ✓ Keep the fishbone as flexible as possible for as long as possible.
- ✓ Causes may appear in more than one category.
- ✓ Avoid symptoms of the problem; focus on causes.
- ✓ Avoid listing manifestations or effects of the problem.
- ✓ Avoid listing solutions to the problem.

Problem Causes (Reasons Bob Was Late)

- Argued with spouse, took time to try to make up
- Battery went dead in car had to find alternative
- Car has flat tire; had to change it
- Car pool late to for pick up
- Child got to the bathroom first
- Child needed last minute homework help
- Coffee pot blew a fuse; had to replace
- Dropped off divorce papers at lawyer's office on way in
- El train delayed; unknown problem up ahead
- Forgot to set alarm clock
- Got caught up in reading about the Bulls in the sports section
- Had to iron a shirt first
- Had to make juice for the family
- Had to pack lunch
- Hot water heater pilot went out; had to re-light and let heat before taking shower
- Inexact bus fare – bus driver wouldn't let me on bus
- Low gas in car, had to stop and get more
- Needed to stop at ATM to get some cash first
- Newspaper weather report erroneous
- Next door neighbors had argument all night; kept me up; overslept
- No blades for razor; had to run out and get some more
- Out of toothpaste; had to use baking soda instead; didn't enjoy
- Parking lot full; had to find another lot; was further away
- Power went out during night; alarm clock didn't ring
- Radio traffic report gave wrong information
- Ran out of cereal, had to make eggs instead; took longer
- Ran out of coffee; couldn't adjust to no caffeine
- Spouse had to leave early leaving me to making kid's lunches
- Big traffic jam on usual route
- Train schedule had wrong information

Pareto Chart

The “vital few” versus the “trivial many”

The Pareto Chart originated from the Pareto Principle 80/20 rule, created by economist Vilfredo Pareto, which states that 80% of the trouble comes from 20% of the problems. The principle was applied to management by Dr. Joseph M. Juran, who stressed focusing on the vital few not the trivial many.

The Pareto chart is used to determine priorities by creating bars that indicate the frequency or impact of a problem. With this data, the focus can be directed toward the vital few causes instead of getting bogged down by the trivial many. A Pareto chart answers the question: “What does the data tell us about the occurrence of this problem?”

WHEN TO USE

- ✓ to identify a problem to be studied
- ✓ to narrow the causes of the problem that should be addressed first
- ✓ to build consensus in a group

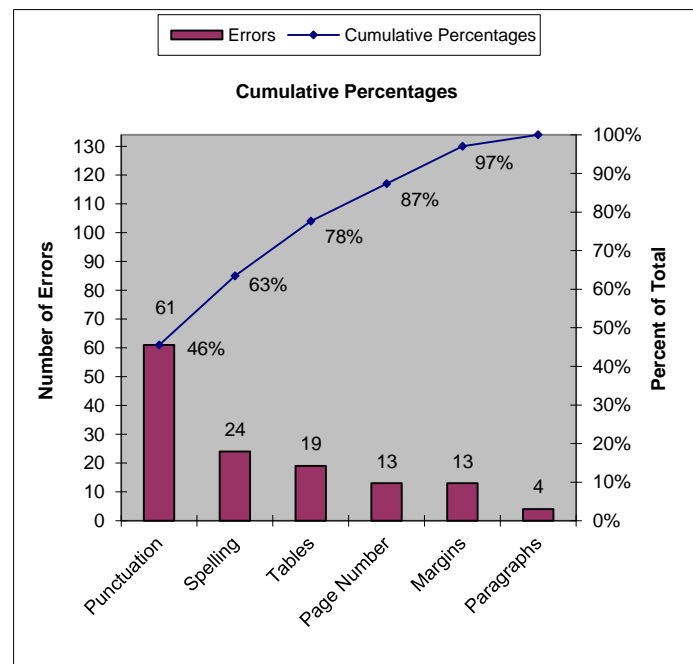
Steps to Construct a Pareto Chart

1. Determine what events or problems will be observed.
2. Select a standard unit of measurement
3. Define the time period to be studied
4. Develop a data collection instrument and gather data by category (see sample at right)
5. Rank order the data collected according to actual units counted, e.g. frequency, cost, etc.
6. Label horizontal axis (categories or causes tabulated) by listing causes or categories in descending order.
7. Identify frequencies on vertical axis ending above the highest value
8. Plot count in descending order of height from left to right such that the categories represented by the tall bars on the left are relatively more important than those on the right
9. Draw bars of equal width for each category/cause

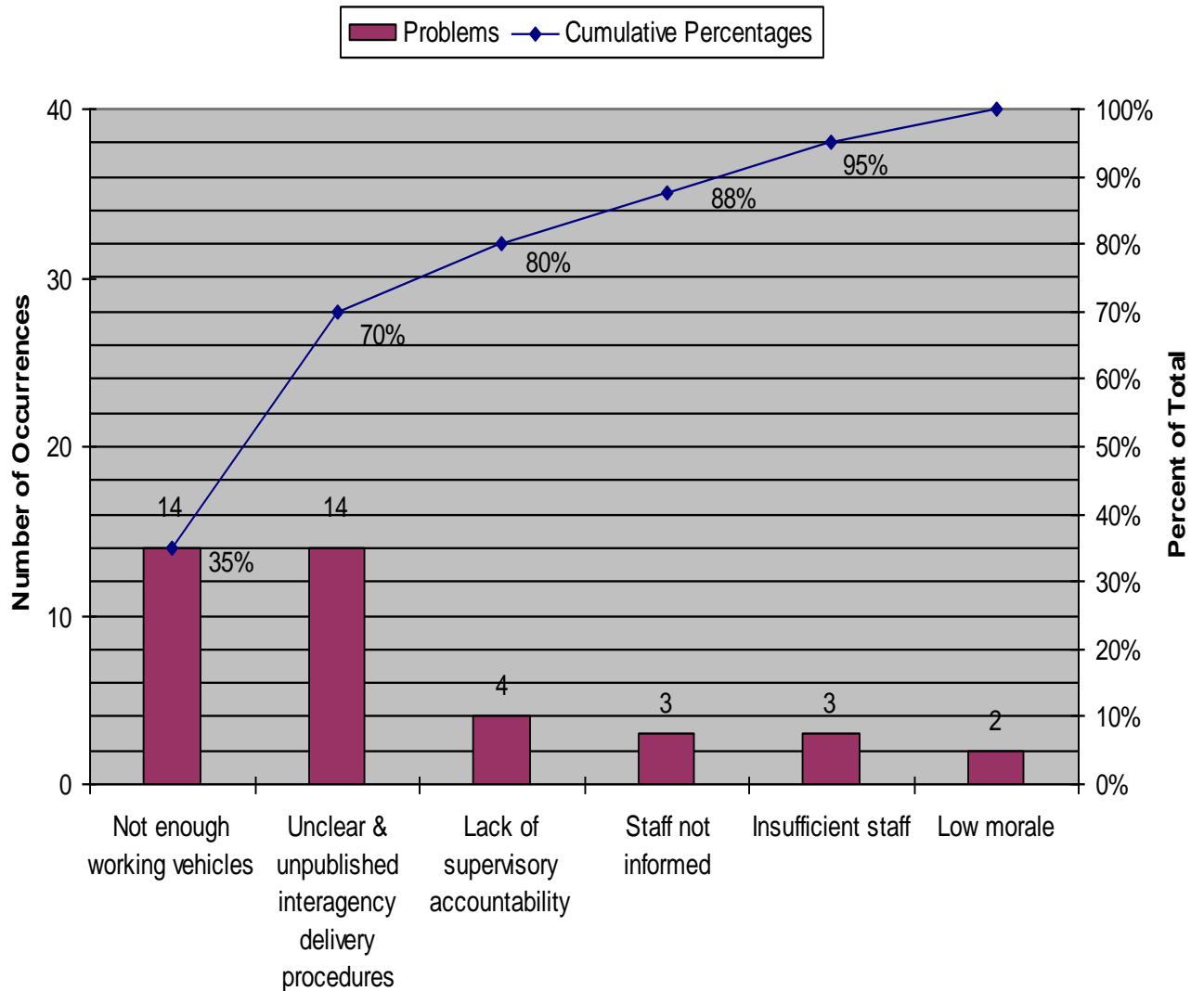
Checklist -- Typing Errors						
Types of Mistakes	Mon	Tue	Wed	Thu	Fri	Total
Spelling						24
Punctuation	 				 	61
Wrong Page Number						13
Uncentered or Uneven Margins						13
Missing Paragraphs						4
Poor Tables						19
TOTAL	28	26	27	23	35	134

Analyzing the Chart

10. Calculate total
11. Compute percent of total for each category
12. Compute cumulative percent
13. Draw a vertical scale on right for percents
14. Plot the cumulative percent line



PARETO CHART FOR LONG CYCLE-TIME FOR INTERAGENCY DELIVERY



CONCLUSION: Eighty percent of the long cycle-time problem in the interagency delivery system is due to:

- Not enough work vehicles
- Unclear & unpublished interagency delivery procedures
- Lack of supervisory accountability

Exercise:

Bob is experiencing stress due to constantly feeling like his mornings are rushed, causing him to be late to work. As a result, Bob is falling behind on some of his work, further increasing his stress level. Bob wants to be more proactive and get control of his mornings. He decides to track the reasons he arrived late for work during a nine-month period. The causes for his tardiness and the frequency of their occurrence are shown at the right.

Problem Definition

Bob has been late for work 25 times during the first nine months of 2001.

Steps:

1. Select a timekeeper, scribe, and a facilitator
2. Rank order the reasons
3. Construct the Pareto diagram by:
 - Determining the information for the horizontal and vertical axes
 - Plotting the data collected
 - Drawing the bars to display frequencies
4. Calculate percentages and cumulative percentage
5. Group Discussion Questions:
 - What reason(s) seemed to be causing the majority of Bob's tardiness?
 - What impact did the rest of the causes have, if any?
 - What steps can Bob begin to take to address the vital few causes of his tardiness problem?

Reason	Freq
Child got to the bathroom first	1
Child needed last minute homework help	7
Had to make juice for the family	4
Inexact bus fare – driver wouldn't let me on	12
Parking lot full; had to find another further away	3
Big traffic jam on usual route	2
Total	29