
Step 3: Diagnose the Cause

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The third step in the Juran Quality Improvement Process is Diagnose the Cause. There are five activities in diagnosing a problem.

THE JURAN QUALITY IMPROVEMENT PROCESS

1 Identify a Project

2 Establish the Project

3 Diagnose the Cause

- Analyze symptoms.
- Confirm or modify the mission.
- Formulate theories.
- Test theories.
- Identify root cause(s).

4 Remedy the Cause

5 Hold the Gains

6 Replicate Results and
Nominate New Projects

LFQ901

Analyze Symptoms

Before we can begin to analyze a symptom, we must outline the definition of a symptom.

KEY DEFINITIONS

Symptom —→ Outward evidence, measurable

Theory —→ Unproven assertion
of causes

Cause —→ What creates the symptom

Remedy —→ What removes the cause

LFQ902

The tasks the quality improvement team should follow when analyzing symptoms include:

ANALYZE SYMPTOMS

- Develop operational definitions
- Measure the symptoms
- Define boundaries of a problem
- Concentrate on the vital few

LFQ903

"Start, stop, include, exclude"

MEASURE THE SYMPTOMS

- Identify:
 - *What* to measure
 - *Units* of measure
 - *How* to measure

LFQ904

By defining the boundaries of the problem:

- the problem is confined to certain times, places, and so forth
- an especially large project should be broken up into manageable pieces
- key improvement opportunities can be identified

DEFINE BOUNDARIES

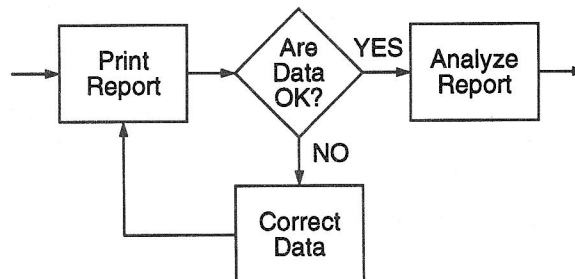
- Evidence in the data
- The size of the project
- The beginning and end points

LFQ905

Flow Diagrams

Flow diagrams are excellent vehicles for identifying rework loops so we can then make the necessary changes to eliminate rework.

FLOW DIAGRAMS: REWORK



LFQ906

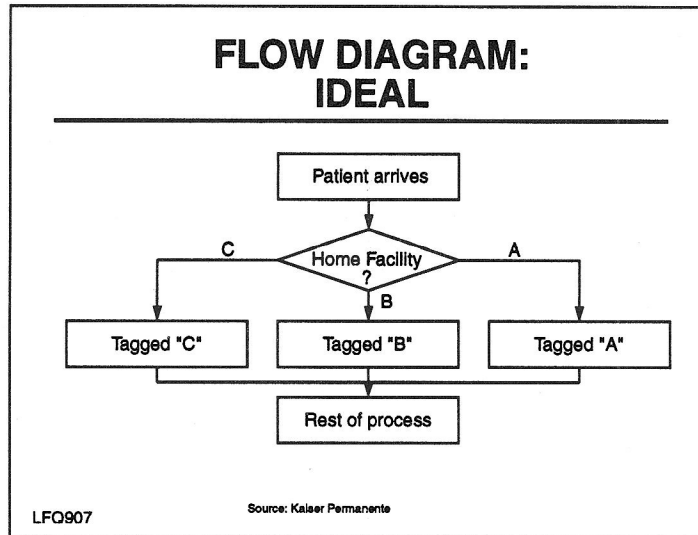
Exercise: Rework

Spend a few minutes writing down rework loops from your own experience.

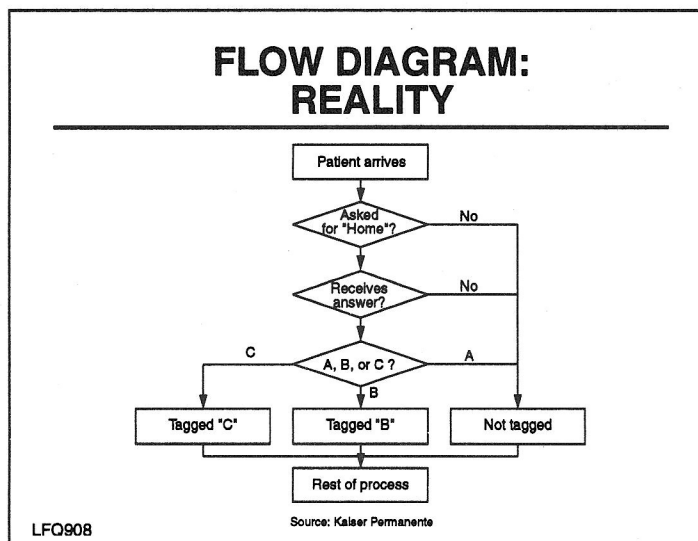
Step 3: Diagnose the Cause

A flow diagram of work processes can be a revealing activity. Often we think we know how work flows through and across departments, but the actual work process may be very different.

The following chart shows the ideal process for managing patient medical charts. The process is designed to assure that medical records are available at the patient's "home" facility for a follow-up visit after a weekend visit to an emergency center.



The chronic problem was that patients often did not have his/her medical records available when a follow-up visit was made back at the "home" facility.



We see that the ideal process is very different from the actual process. The emergency room receptionist either would not ask the patient for his/her "home" facility or would not receive an answer, causing many records to be tagged improperly or not to be tagged at all.

Concentrate on the Vital Few: Pareto Analysis

Dr. Juran developed the term “vital few” to refer to those few contributions which account for the bulk of the problem or cause and “useful many” to those many others which account for a small proportion of the problem.

There are several typical variables to consider when determining the vital few through a Pareto Analysis.

CONCENTRATE ON THE VITAL FEW

Variables to Analyze

- Type of defect
- Time of day, week, month, or year
- Sequence: the first, second, third, etc.
- Type of activity or product

LFQ909

CONCENTRATE ON THE VITAL FEW

Variables to Analyze (cont'd)

- Characteristics of groups or individuals doing the work
- Characteristics of customers
- Place where work is done

LFQ910

Confirm or Modify the Mission

At times, the analysis of symptoms will suggest that the mission should be modified; other times, the analysis will confirm the mission's relevance.

CONFIRM OR MODIFY THE MISSION

- Evaluate the mission statement: manageable and the problem exists
- Determine if mission requires modification
- Notify the Quality Council if modification is required

LFQ911

Formulate Theories

A theory is an unproved statement of what is the cause of a problem (as evidenced by the symptom).

KEY DEFINITIONS

- Symptom* → Outward evidence, measurable
- Theory* → Unproven assertion of causes
- Cause* → What creates the symptom
- Remedy* → What removes the cause

LFQ912

The goal is to develop as many theories as possible and then to organize and analyze the theories in preparation for testing them.

FORMULATE THEORIES

- Generate as many theories as possible
 - All members contribute
 - Promote creativity
 - Avoid judging
- Organize the theories
 - Group or combine similar theories into a cause-effect diagram
- Analyze the theories
 - Check each cause-effect branch for logic, completeness
 - Ask: Is this a potential cause? If removed, would the problem be improved?

LFQ913

Brainstorming

Brainstorming is a good way to create a comprehensive and creative list of theories.

CONCEPTUAL RULES FOR BRAINSTORMING

- No criticism or evaluation
- Be unconventional/freewheeling
- Aim for quantity
- Hitchhike on other ideas

LFQ914

For brainstorming to be most effective, there must be a free flow of ideas and an appreciation of creativity. The most common barriers to the flow and creativity are 1) the inability of the group to suspend judgment and analysis until the list of ideas has been completed, and 2) the dominance of one or a few individuals in presenting ideas.

These guidelines suggest how to overcome some of these potential barriers.

PRACTICAL RULES FOR BRAINSTORMING

- Contribute in turn
- One idea per turn
- You may pass
- Do not explain ideas

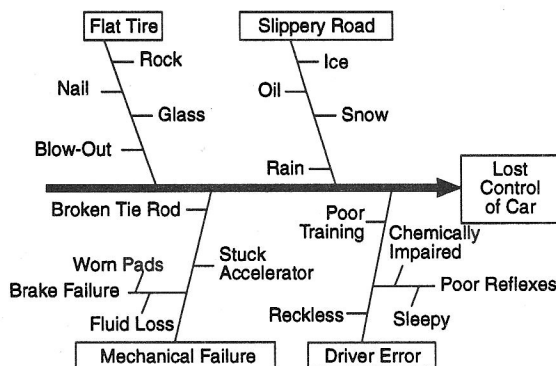
LFQ915

The team should stay focused on **theories** of causes and not prematurely jump to solution.

Cause-Effect Diagram

Cause-effect diagrams help organize brainstormed theories. The cause-effect diagram is an effective way to organize and display the various theories about the root cause of a problem.

CAUSE-EFFECT DIAGRAM



LFQ916

Test Theories

After data are collected and we analyze the data, we can then determine the significant contributors to the problem.

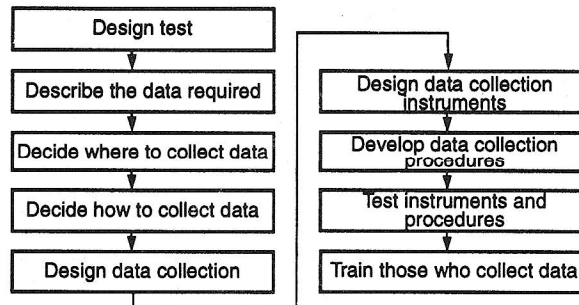
TEST THEORIES

- Decide what theories to test
- Design plan for data collection
- Collect the data
- Analyze results

LFQ917

A team must decide what questions need answering; this determines the data that need to be collected.

DATA COLLECTION DESIGN



LFQ918

Analyze Results

The process of testing and either proving or eliminating theories is outlined below.

TEST THEORIES

- Tabulate the data
- Display the results
- Answer:
 - Which theories are supported by results
 - Which theories are eliminated by the results
 - What new theories are suggested by the results
- Repeat process if all tested theories are eliminated or new theories arise

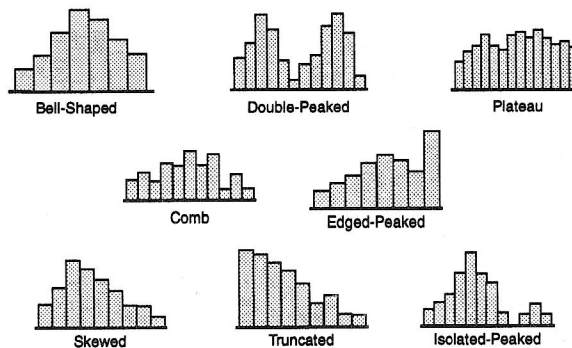
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Histograms

Histograms help us test our theories by displaying data to help us determine which theories are supported (or eliminated) by the results. Everything varies—the height of people in a room, the time it takes to drive to work over the same route, the response of a patient to a medication.

Because a histogram is a picture of the data, a histogram enables us to see this pattern of variation.

HISTOGRAMS



LFQ920

Identify Root Cause(s)

We will now define cause and discuss root causes.

KEY DEFINITIONS

Symptom → Outward evidence, measurable

Theory → Unproven assertion
of causes

Cause → What creates the symptom

Remedy → What removes the cause

LFQ921

IDENTIFY ROOT CAUSE(S)

- Reexamine each data display of possible root cause
- Test new theories identified
- Discard theories inconsistent with data
- Determine if theory of the cause is controllable
- Discard causes that cannot be controlled
- Identify the root cause(s)

LFQ922

ROOT CAUSE - DEFINITION

- A theory that stands up to evidence in the data
 - Having a major impact on the symptom
 - Is able to be controlled

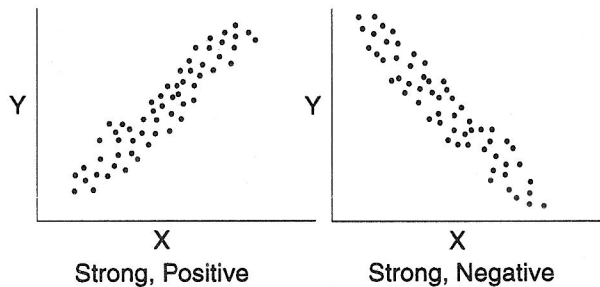
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Scatter Diagrams

The scatter diagram is an ideal way to display data when trying to evaluate a cause-effect relationship. The scatter diagram helps analyze data to verify or disprove theories about the cause of a problem.

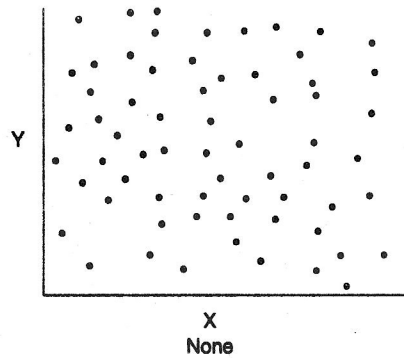
The following charts show scatter diagrams depicting strong positive correlations, strong negative correlations, and no correlation.

SCATTER DIAGRAMS: CORRELATIONS PATTERNS



LFQ924

SCATTER DIAGRAMS: NO CORRELATION



LFQ925