

Performance Measures

Performance measure is the process of collecting analyzing and/or reporting information regarding the performance of an individual or organization. Managing an organization without performance measures is like a captain of a ship navigating without instrumentation.

1. Basic Concept of Performance Measures

- **Objectives:** Typical objectives are-
 - Establish baseline measures and trends,
 - Determining improvement areas,
 - Process gains and losses,
 - Compares goals with actual performance
 - Provide information for decision making,
- **Typical measurements:** Some of the items to be measured are-
 - Human Resource
 - Customer
 - Production
 - Suppliers
 - Marketing/sales
 - Administration
- **Criteria:** Measures should be simple and few in number. They should have relevance to the business and customer. Focus should be on improvement. Cost and time are also important criteria

2. Establishing Strategic Measurement System

The quality council has the overall responsibility for the performance measures. Often measures are integrated into a total system of measures. For this purpose, appropriate information is obtained from all of the stake-holders. They will utilize the core values, goals, mission, and vision statements as well as the objectives and criteria. With this information, the strategic measurement system is created.

Example of such a system that involves several functions is:

- **Quality:** Reduction in cost of poor quality, percent of certified suppliers, reduction in supplier base, reduction in corrective action cycle time
- **Cost:** increase in inventory turnover, reduction in data transactions, increase in output dollars per employee, reduction in floor space utilization
- **Flexibility:** reduction in cycle time, reduction in lot/batch size, increase in common materials used per product
- **Reliability:** Process capability, reduction in down time, reduction in warranty costs, reduction in design changes
- **Innovation:** reduction in new product introduction time, increase in new patents granted
- **Down Time:** average time that a system is non-operational.

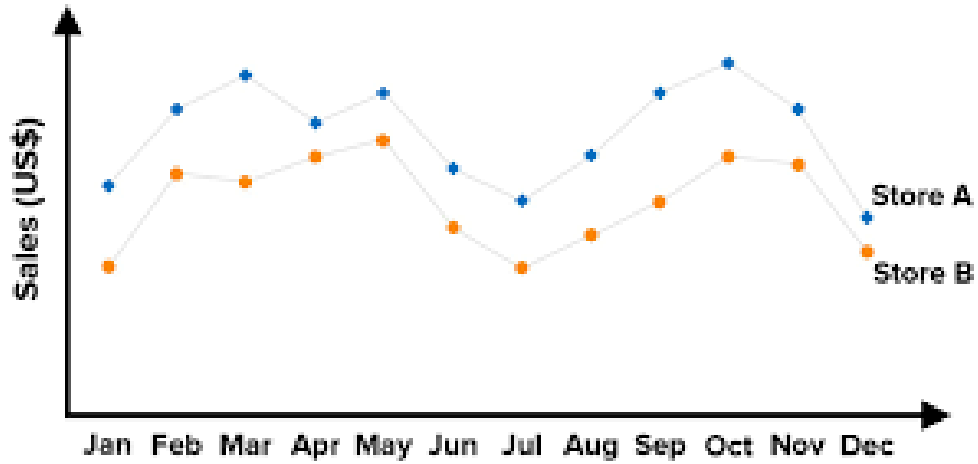
3. Performance Measure Presentation

There are six basic techniques for presenting performance measures:

- Time series graph
- Control Charts
- Capability Index
- Taguchi Loss Function
- Cost of Poor Quality
- performance measurement based on the criteria of national/international
- Quality awards such as Malcolm Baldrige National Quality Award

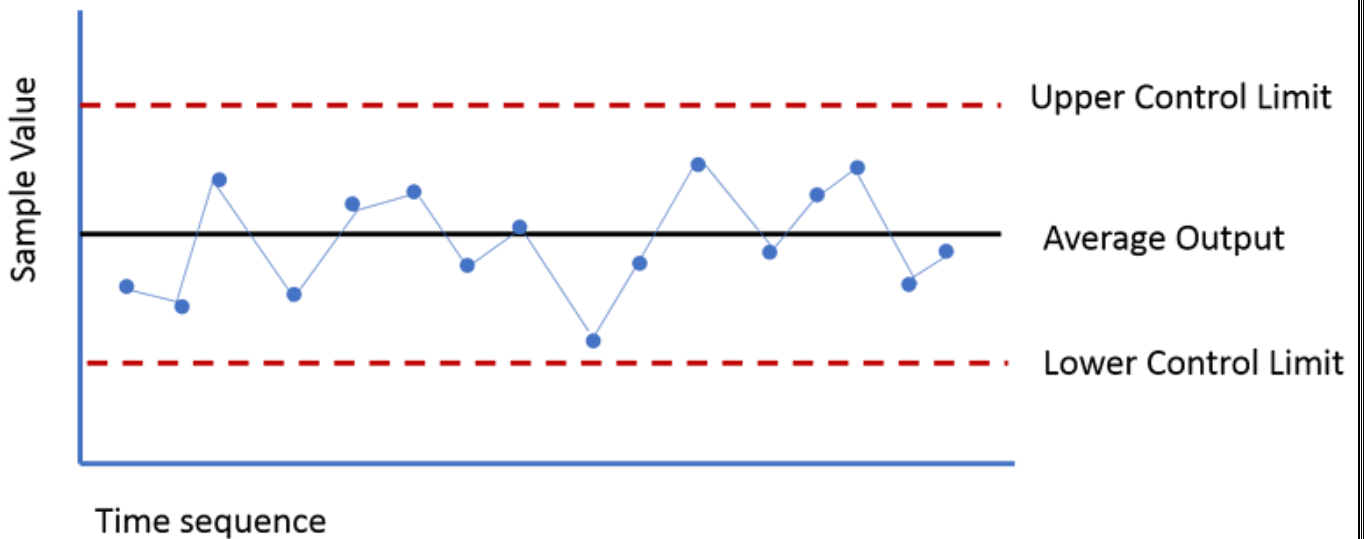
4. Time Series Plot

- The simplest and most common technique is the time series graph
- Time as measured by days, weeks, months, and so forth, is shown on the horizontal axis, and the performance measure is shown on the vertical axis.
- This type of graph benchmarks the process and shows favorable and unfavorable trends in the measure.



5. Control Chart

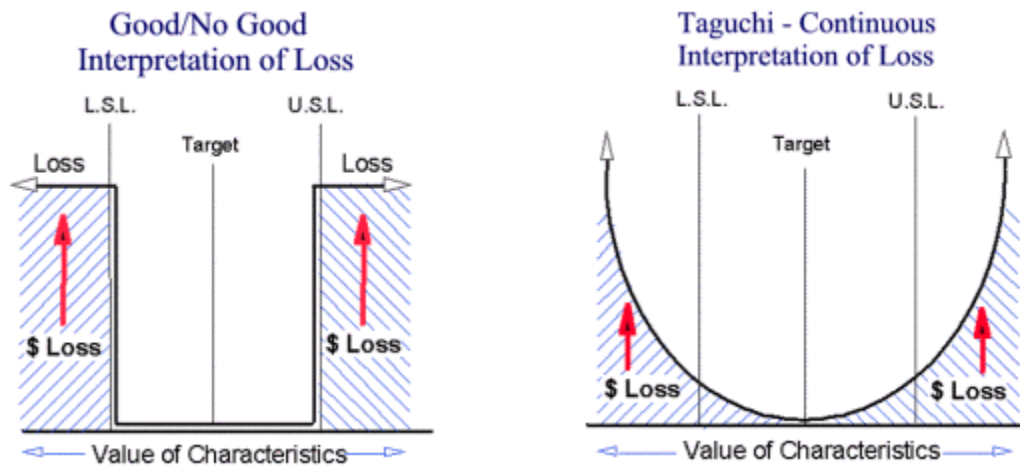
Control charts, also known as Shewhart charts (after Walter A. Shewhart) or process-behavior charts, are a statistical process control tool used to determine if a manufacturing or business process is in a state of control.



6. Taguchi Loss Function

The **Taguchi loss function** is graphical depiction of loss developed by the Japanese business statistician Genichi Taguchi to describe a phenomenon affecting the value of products produced by a company.

The Taguchi loss function is important for a number of reasons—primarily, to help engineers better understand the importance of designing for variation.



Taguchi Loss Function for Nominal-the-best

7. Quality Costs

- The value of quality must be based on its ability to contribute to profits.
- The goal of most organizations is to make money therefore, decisions are made based on evaluating alternatives and the effect each alternative will have on the expense and income of the entity.
- The efficiency of a business is measured in terms of dollars. The cost of poor quality can add to the other costs used in decision making, such as maintenance, production, design, inspection, sales, and other activities.
- A reduction in quality costs leads to increased profit

Quality Costs are defined as those costs associated with the non-achievement of product or service quality as defined by the requirements established by the organization and its contracts with customers and society. **Simply stated, quality cost is the cost of poor products or services.**

8. Quality Cost Program

Quality Costs are used by management in its pursuit of quality improvement, customer satisfaction, market share and profit enhancement. It is the economic common denominator that forms the basic data for TQM. When quality costs are too high, it is a sign of management ineffectiveness, which can affect the organization's competitive position. A quality cost program provides warnings against oncoming, dangerous financial situations.

Categories and Elements:

- **PREVENTIVE COST:** These are expenditures incurred that are intended to minimize the number of defects in products and services
- **APPRAISAL COST:** These are the costs that a company incurs to detect defective inventory before it is shipped to the customers.
- **INTERNAL FAILURE COST:** These are cost of quality associated with product failures that are associated before a product leaves the factory. These failures are discovered through the firm's internal inspection process.
- **EXTERNAL FAILURE COST:** These are cost of quality associated with product failures that are associated after a product leaves the factory. These failures are discovered through the customers review.

9. Quality Costs: Collection, Reporting and Analysis

- **Collection and Reporting:**
 - **Collection System Design:** The development of the collection system requires the close interaction of the quality and accounting departments. Because accounting cost data are established by departmental cost codes, a significant amount of quality cost can be obtained from this source.

Quality Costs

Total Quality Management

- **Quality Cost Bases:** Quality costs by themselves present insufficient information for analysis. A baseline is required that will relate quality costs to some aspect of the business that is sensitive to change. Typical bases are labor, production, sales, and unit. When these baselines are compared with quality costs, an index is obtained.
 - **Quality Cost Report:** The basic quality cost control instrument is the quality cost report, which is usually issued by the accounting department. Provision is made to report the quality costs for the current month for each cost element as well as the current and prior year-to-date values. Applicable indexes and ratios are shown at the bottom of the report.
- **Analysis**
 - **Trend Analysis:** It involves simply comparing present cost levels to past levels
 - **Pareto Analysis:** Pareto Analysis is a statistical technique in decision-making used for the selection of a limited number of tasks that produce significant overall effect. It uses the Pareto Principle (also known as the 80/20 rule) the idea that by doing 20% of the work you can generate 80% of the benefit of doing the entire job. Take quality improvement, for example, a vast majority of problems (80%) are produced by a few key causes (20%). This technique is also called the vital few and the trivial many.

We can apply the 80/20 rule to almost anything:

- 80% of customer complaints arise from 20% of your products and services.
- 80% of delays in the schedule result from 20% of the possible causes of the delays.
- 20% of your products and services account for 80% of your profit.
- 20% of your sales force produces 80% of your company revenues.
- 20% of a systems defects cause 80% of its problems.

Pareto Analysis

Here are eight steps to identifying the principal causes you should focus on, using Pareto Analysis:

1. Create a vertical bar chart with causes on the x-axis and count (number of occurrences) on the y-axis.

2. Arrange the bar chart in descending order of cause importance that is, the cause with the highest count first.
3. Calculate the cumulative count for each cause in descending order.
4. Calculate the cumulative count percentage for each cause in descending order. Percentage calculation: $\{\text{Individual Cause Count}\} / \{\text{Total Causes Count}\} * 100$
5. Create a second y-axis with percentages descending in increments of 10 from 100% to 0%.
6. Plot the cumulative count percentage of each cause on the x-axis.
7. Join the points to form a curve.
8. Draw a line at 80% on the y-axis running parallel to the x-axis. Then drop the line at the point of intersection with the curve on the x-axis. This point on the x-axis separates the important causes on the left (vital few) from the less important causes on the right (trivial many).

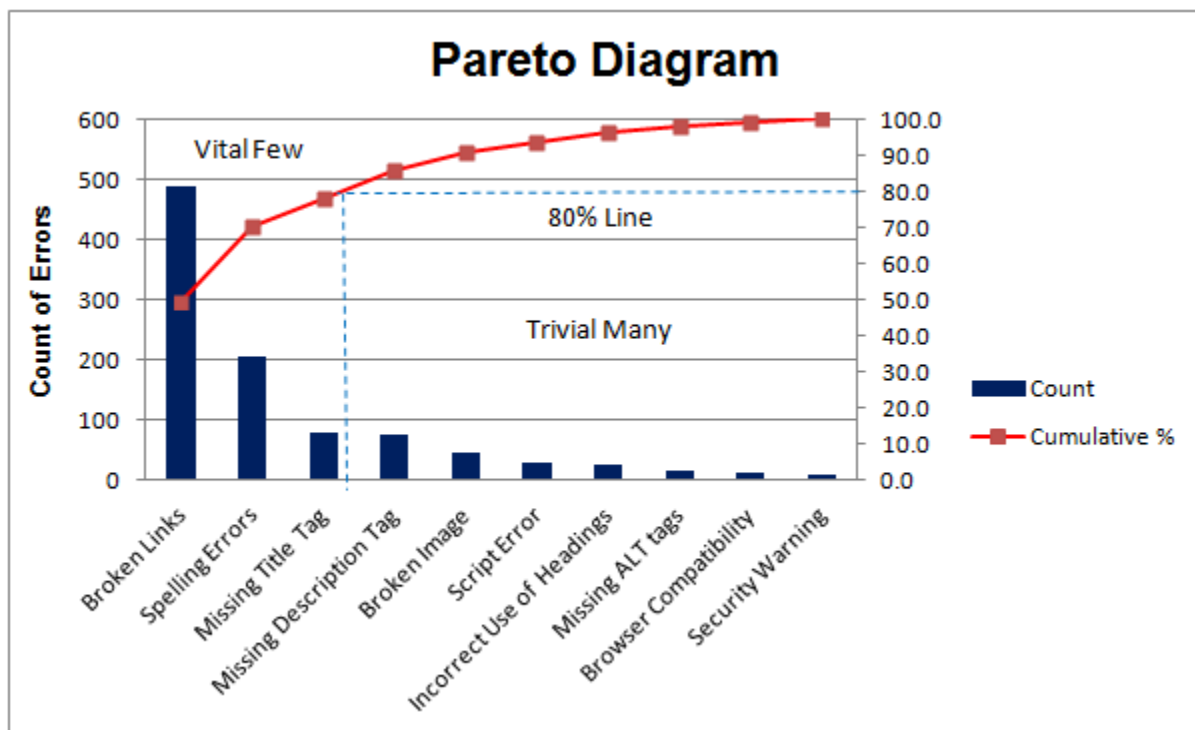


Figure: Pareto Analysis Diagram

- **Optimizing Costs**
 - Compare performance with other organizations
 - Optimize the individual categories

10. Quality Improvement Strategy

The idea of a quality improvement strategy is that each failure has a root cause, causes are preventable, and prevention is cheaper.

Based on this concept, the following strategy is used:

- Reduce failure costs by problem solving
- Invest in the “right” prevention activities
- Reduce appraisal costs where appropriate and in a statistically sound manner.
- Continuously evaluate and redirect the prevention effort to gain further quality improvement.

11. Program Implementation

Organizations take following steps for implementation:

- Decide about potential benefits
- Seek approval from top management
- Ensure involvement and commitment of top management
- Carry out pilot/ trial implementation
- Provide requisite training to key personnel
- Revise basic accounting procedures to accommodate changes
- Expand trial program to entire organization