PARETO ANALYSIS

Category: Analysis Tools

ABSTRACT

Pareto Analysis[(G)] is a statistical technique in decision making that is used for the selection of a limited number of tasks that produce significant overall effect. It uses the Pareto Principle (also know as the 80/20 rule) the idea that by doing 20% of the work you can generate 80% of the benefit of doing the whole job. Or in terms of quality improvement, a large majority of problems (80%) are produced by a few key causes (20%)

KEYWORDS

Pareto Analysis, Pareto Paradigm, Pareto Chart[(G)], Pareto Principle, Quality Control, organizing data, frequency of impact of problems, process improvement

OBJECTIVES

A Pareto chart has the following objectives:

- Separate the few major problems from the many possible problems so you can focus your improvement efforts.

- Arrange data according to priority or importance.

- Determine which problems are most important using data, not perceptions.

FIELD OF APPLICATION

Pareto diagrams could be applied in:

- designing of medical processes in order to identify errors, faults, incidents or in the construction of a system that reduces the risk of medical care.

- analyzing performance data in health organizations.

RELATED TOOLS

Fishbone diagram, Scatter Diagram, Run Charts, Flow Charts

DESCRIPTION

The Pareto diagram is named after Vilfredo Pareto, a 19th-century Italian economist who conducted a study in Europe in the early 1900s on wealth and poverty. He found that wealth was concentrated in the hands of the few and poverty in the hands of the many. The principle is based on the unequal distribution of things in the universe. It is the law of the "significant few

versus the trivial many." The Pareto Principle is a rule-of-thumb, which states that: "20 percent of the problems have 80 percent of the impact." The 20 percent of the problems are the "vital few" and the remaining problems are the "trivial many."

From the quality point of view, this diagram was introduced by the professor J. M. Juran, as an instrument for the classification of the problems of quality:

- Major problems, they are only a few, but their results are quite important;

- Secondary problems, there are also a great deal of minor problems, but their results are limited.

A Pareto Diagram is a good tool to use when the process investigated produces data that are broken down into categories and you can count the number of times each category occurs. A Pareto diagram puts data in a hierarchical order, which allows the most significant problems to be corrected first. The Pareto analysis technique is used primarily to identify and evaluate nonconformities, although it can summarize all types of data. It is the perhaps the diagram most often used in management presentations.

Typical observations from Pareto diagram analyses might reveal:

- 80% of all warranty repairs of a product were attributed to 20% of its parts.

- 75% of quality defects [G] result from 15% of operations within a process.

- 10% of the items inventoried represent 70% of the total cost of inventory.

HOW TO USE IT:

Pareto Diagram helps teams focus on the small number of really important problems or causes of problems. This tool is useful in establishing priorities by showing which are the most critical problems to be tackled or causes to be addressed. Comparing Pareto diagram of a given situation over time can also determine whether an implemented solution reduced the relative frequency or cost of that problem or cause

If one is trying to take action based upon causes of accidents or events, it is generally most helpful to focus efforts on the most frequent causes. Going after an "easy" yet infrequent cause will probably not reap benefits.

HOW TO CONSTRUCT

The chart is similar to the histogram or bar chart, except that the bars are arranged in decreasing order from left to right along the abscissa. Each bar represents only a category of faults, arranged in a decreasing way, from left to the right, according to their importance.

The steps necessary to construct a Pareto diagram are:

Step 1 - Record the raw data. List each category and its associated data count.

Step 2 - Order the data. Prepare an analysis sheet, putting the categories in order and placing the one with the largest count first.

Step 3 - Label the left-hand vertical axis. Make sure the labels are spaced in equal intervals from 0 to a round number equal to or just larger than the total of all counts. Provide a caption to describe the unit of measurement being used.

Step 4 - Label the horizontal axis. Make the widths of all of the bars the same and label the categories from largest to smallest. An "other" category can be used last to capture several smaller sets of data. Provide a caption to describe them. If the contributor names are long, label the axis A, B, C, etc. and provide a key.

Step 5 - Plot a bar for each category. The height of each bar should equal the count for that category. The widths of the bars should be identical.

Step 6 - Find the cumulative counts. Each category's cumulative count is the count for that category added to the counts for all larger categories.

Step 7 - Add a cumulative line. This is optional. Label the right axis from 0 to 100%, and line up the 100% with the grand total on the left axis. For each category, put a dot as high as the cumulative total and in line with the right edge of that category's bar. Connect all the dots with straight lines.

The major advantage of Pareto Diagram is the fact that is easier to see on such a diagram the most important faults, and the main disadvantage is the hierarchical system of the faults, of non-conformities that frequently depend on the person that makes it.

BENEFITS

Pareto diagrams:

- Solves efficiently a problem by the identification and the hierarchisation, according to their importance, of the main causes of the faults.

- Sets the priorities for many practical applications. Some examples are: process improvement efforts for increased unit readiness, customer needs, suppliers, investment opportunities.

- Shows where to focus efforts.

- Allows better use of limited resources.

PREREQUISITES

- Trained personnel.

- Efforts focused on the most frequent causes.

- Analysis performed over a fixed time interval of performance indicator results.

- Special team combined of key users of the process or experienced personnel related to methods and techniques used in the choosed process.

- Availability of data

EXAMPLES – CASE STUDY

In order to illustrate the operation mode of thePareto Diagram, we will use the following example:

The city hospital has to analyse and solve the various complaints of the patients, which are submitted to the Head Nurse Office. In order to analyse the complaints and claims we use the Pareto Diagram.

In our case, we consider 845 received complaints, starting from the complaint forms filled in by the medical service beneficiaries, which were grouped in the following categories:

Table 1: Complaints by categories

Category	Number of complaints
Information provided	210
Time table	60
Received treatment	92
Forms missing	13
Solving time	320
Too many formalities	75
Personnel skill	18
Waiting line time	53
Other	4

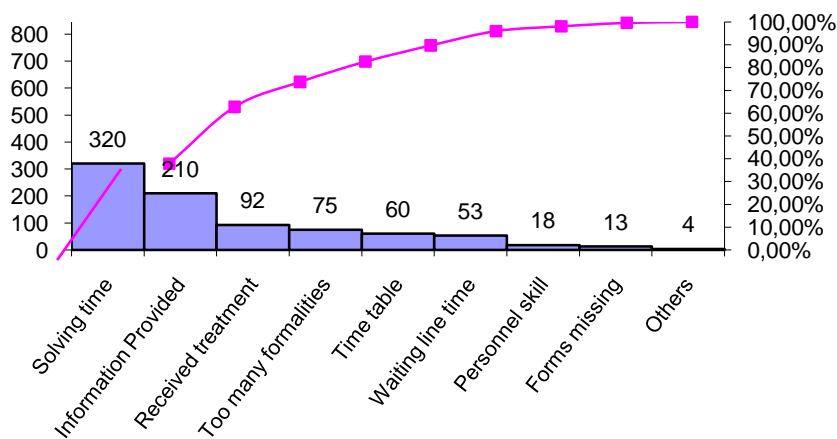| No	Category	Absolute frequency	Cumulated absolute frequency	Unit relative frequency [%]	Cumulated relative frequency [%]
1	Solving time	320	320	37,9	37,9
2	Information Provided	210	530	24,9	62,8
3	Received treatment	92	622	10,9	73,7
4	Too many formalities	75	697	8,9	82,6
5	Time table	60	757	7,1	89,7
6	Waiting line time	53	810	6,3	96
7	Personnel skill	18	828	2,1	98,1
8	Forms missing	13	841	1,5	99,6
9	Others	4	845	0,4	100
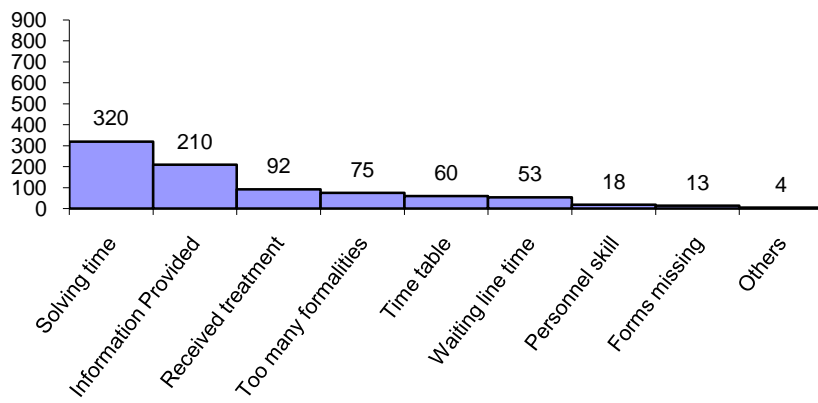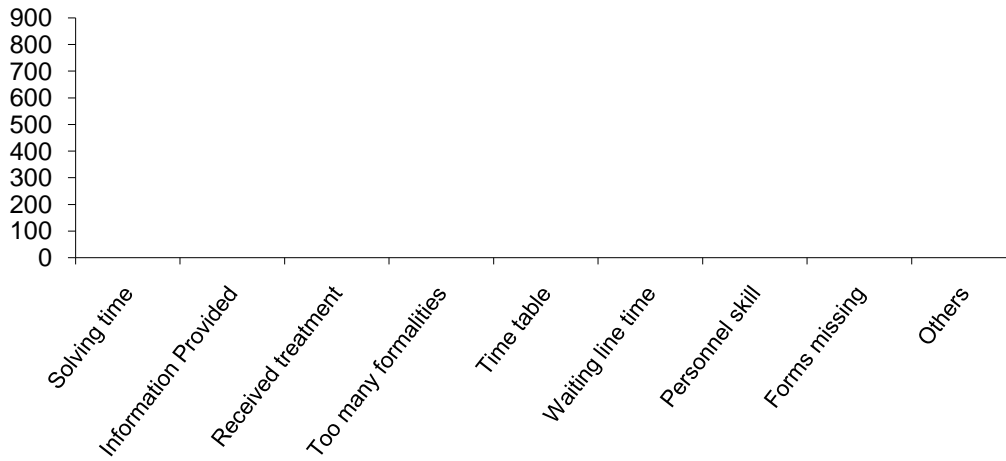
Diagram analyze.   At the first look it is not difficult to obtain valid conclusions regarding the main causes of the complaints. We can see that almost 2/3 of them (68%) are caused by the following cathegories: the "solving time" and „information provided", the first of the two being the one who accumulated the greatest number of complaints.

Taking into consideration that it is easier to reduce a high frequency than a low one, the diagram shows that it would be more useful that the improvement focuses on the first two causes (few and vital) rather than on the low incidence ones (many and trivial).

Once implemented the appropriate actions to reduce these two causes, another diagram can be drawn up in order to check the decrease of the complaints at each of the two categories.

BIBLIOGRAPHY

1. HCi. "Pareto Analysis" http://www.hci.com.au/hcisite2/toolkit/paretos.htm

2. Juran J M, "Juran's Quality Control Handbook", McGraw-Hill, 1988

3. MindTools.   "Pareto Analysis: Selecting the Most Important Changes to Make."
    http://www.mindtools.com/pages/article/newTED_01.htm

4. Russell, Roberta S. and Taylor III, Bernard W. Operations Management. Prentice Hall, Inc.: Upper Saddle River, New Jersey, 2003.