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OISM 470W
April 2, 2001

The Basic Seven Tools of Quality

In the 1960's, Kaoru Ishikawa, a renowned Japanese expert on quality management developed seven basic tools to manage quality. With the correct implementation of the seven tools, Ishikawa claims, 95% of quality related problems can be resolved. These seven tools reinforce the Japanese mindset of continuous improvement, which was introduced in the 1930's and 1940's by Walter Shewhart and W. Edward Deming. Today, companies all over the world have adopted Ishikawa's method of quality management. The seven tools are as follows: Cause and Effect (Fishbone) Diagram, Run Chart, Scatter Diagram, Flowchart, Pareto Chart, Histogram, and Control Chart.

To begin with the Cause and Effect (Fishbone) Diagram, the primary purpose is to work backwards and figure out all the possible causes for a particular effect. The ideal outcome would identify the root cause for a dilemma. Identifying the symptoms is the first step in order to fix the problem. An example of a hospital's use of this diagram is featured in Figure A of the appendix. The problem is a patient waiting for a bed, and it is listed in the main box. The main causes are listed on the arrows pointing to the main arrow. The sub-causes are listed on the branches coming off of the main causes. With an analysis of the chart, many of the causes can be eliminated to help solve the main problem. The chart is dubbed a fishbone diagram because it looks like the skeleton of a fish.

Figure B pictures a Run Chart, which allows a company to observe data for patterns over a specified period of time. This tool is good to implement when a change is being made to your company. If your company takes measurements before, during, and after a change was implemented, you will be able to see the results in the Run Chart. For example, in Figure B, the vertical line is what is being measured, (average number of days for determining eligibility of service). The horizontal line is always a measurement of time (a spread of 13 months in Figure B). Each month the average is plotted on the chart and after 13 months of data the process average is drawn and you can tell how much each month deviates from the process mean. It shows that the average number of days is on a decline.

A Scatter Diagram is used to graph the correlation between two variables with hope of identifying a cause and effect relationship. It is important to know that this diagram cannot prove that one variable causes a change in the other, only that the relationship exists. As it can be seen in Figure C, one variable is listed on the horizontal axis, and the other on the vertical axis. In this example, the diagram is looking for a relationship between line width/spacing and capacitance. After plotting the data, a best-fit line is drawn through the data to show the trend. With analysis, it can be shown that a relationship does exist.

One of the most popular of Ishikawa's tools for a management presentation is the Pareto Diagram. Featured in Figure D of the appendix, this diagram depicts a graphical picture of the most frequent causes for a particular problem. It shows where to put the initial effort to get the greatest possible gain. In the example of Figure D, a comparison is done between January and June bills. A breakdown of what the bills are for is

presented and the bar graph is used to graphically measure the number of bills. After analysis, this company may have a better understanding of why there are so many more bills during January as compared to June.

To graphically illustrate a process it is best to use a flowchart, which can be seen in Figure E. A good flowchart should identify all process steps in an orderly fashion. Under analysis, you should be able to identify critical process points for control, suggest areas for further improvement, and help explain and solve a problem. Flowcharts can be used to illustrate a decision making process as well as a product flow diagram. Symbols such as circles are used to represent the beginning and ending of the process. Triangles are used for buffers, rectangles for an activity, and a diamond for a decision. In the example provided, the path a product takes from when the raw materials are received to when the product is shipped is represented with a flowchart.

A Histogram is used to show a distribution of variables and is pictured as a bar chart. In the example provided in Figure F of the Appendix, the numbers on the x-axis are the occurrences of the event (HOTrip data) throughout the day. The y-axis has increasing numbers and is used to measure how many times an event on the x-axis occurs. With the use of histograms you can see where events are unevenly distributed and you will know where to make changes, e.g. if you wanted the data in Figure F to be evenly distributed, you might want to see why 8:00 is so low and 9:00 is so high on the diagram. With histograms it is also possible to rearrange the bars to form a bell, high to low, or low to high distribution for analysis.

The last of the seven tools of quality is a Control Chart, which was developed by Shewhart and Deming. The purpose of a control chart is to see if the process you are

measuring will produce consistent measurable properties. Using statistical analyses an upper and lower limit is set. If the actual data falls within the limits, the process is in control, if it falls outside the limits, the process is out of control. In Figure G, it is apparent the data are in control because the graph falls within the limits set.

Companies must make sure that these tools are in place and used properly to gain the full advantage. You must be able to understand and interpret the charts to fix the problems that the diagrams outline. Ishikawa's basic seven tools of quality do not fix problems, they merely point out trouble. For additional information on these tools, please look at the sources outlined in the bibliography.

Bibliography

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