RESEARCH ARTICLE OPEN ACCESS

Quality Control System

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Abstract:

In any production line, 80% of the error occurs due to 20% of major faults and 20% of the error occurs due to 80% of minor faults. The QC, as the name narrates, is not only about controlling the quality of the product but also the ways in which the statistics of the occurring errors can be drawn to improve the process of production.The various tools used to draw the statistics of these errors are of 7 types that are **Cause and effect diagram**, **Check sheets**, **Control charts**, **Histogram**, **Pareto chart**, **Scatter diagram&Stratification.**

INTRODUCTION:

The overall production of any component may be scrutinized into the following three steps that goes by INNOVATE-IMPLEMENT-SUPPLY. These are enough if our aim is to only manufacture and supply but if we tend to seek profit out of them, then the most important thing that squeezes its importance between the primal three is the QUALITY CONTROL. This QC, as the name narrates, is not only about controlling the quality of the product but also the ways in which the statistics of the occurring errors can be drawn to improve the process of production.

The tools which are used to draw the statistics of these errors are of 7 types that are:

1. **Cause and effect diagram**- Helps identify the cause(s) for the problem.
2. **Check sheets-** Helps collecting and analysing data of various problems.
3. **Control charts-** Tells if the process is under control or not.
4. **Histogram-** Shows the frequency of occurrence of a set of data.
5. **Pareto chart-** Represents significant factors in a bar chart.
6. **Scatter diagram-** Draws relationship between various data through a graph.
7. **Stratification-** Segregation of various data to obtain the pattern of occurrence.

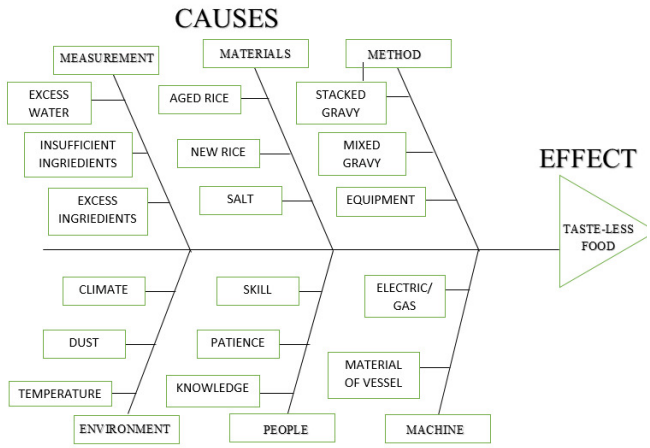
CAUSE AND EFFECT DIAGRAM:

- This method was developed by Kaoru Ishikawa, a Japanese theorist, by 1960's called as Ishikawa diagram or fishbone diagram or cause and effect diagram.
- It can be easily drawn with the help of a white board and marking pens, no software is necessary.
- The problem or effect is drawn as a generic line and its branches discuss the various causes of the problem.
- You may discuss the problem and its causes under broad categories like*Methods, Machines, People, Materials, Measurement, Environment.*
- The problem can be solved by asking the question "why does this occur" repeatedly for every branch or sub-branch of the problem.

EXAMPLE:

There is a cooking competition conducted and one of the participant's food is not very tasty .In spite of following all the procedures properly, his dish didn't turn out very well. Considering the tastelessness as the effect, we analyse the various causes that could have resulted in that problem using cause and effect diagram.

CAUSE AND EFFECT DIAGRAM



CHECK SHEETS:

- The check sheet is used to cumulate various data to analyse the frequency of its occurrence.
- The data that is obtained can be quantitative or qualitative.
- If the obtained data is quantitative, the check sheet is called a tally sheet.
- It can be used to solve various day-to-day problems.

EXAMPLE:

Let us consider a case where the coffee, meal, snack prepared by the food court is not brewed, cooked and baked respectively, properly on random days of a week. To understand the frequency of the occurrence, we can derive a check sheet to effectively understand the problem.

CHECK SHEET

PROBLEM	*MON*	*TUE*	*WED*	*THUR*	*FRI*	*SAT*	*SUN*
COFFEE	3	0	1	2	0	0	0
MEAL	2	0	2	1	0	0	0
SNACK	2	1	3	2	0	0	0

From the above table, we can infer that the preparations that are carried out on Mondays turn out to be defectives and implies it need more attention. This may be due to various reasons that may be analysed using the cause and effect diagram.

CONTROL CHARTS:

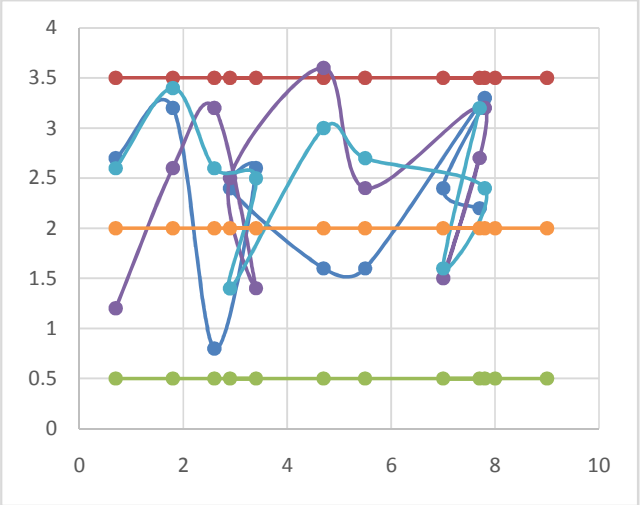
- The control chart is used to study the change in process over time.
- Data are plotted in a chart and always has a central line for the average, an upper line denotes upper control limit and a lower line denotes the lower control limit.
- Even if any one of the point exceeds these UCL or LCL, them the process is concluded to be out of control.

EXAMPLE:

Let us consider a process whose quality index is represented along Y-axis and frequency along X-axis. The colours indicating various types of processes, everything under control except the line coloured yellow since one of its points lie out of the upper control limit.

X/Y	*COLOUR*	*0.7*	*1.8*	*2.6*	*3.4*	*2.9*	*4.7*	*5.5*	*7.8*	*7*	*7.7*
PEN BODY	DARK BLUE	2.7	3.2	0.8	2.6	2.4	1.6	1.6	3.3	2.4	2.2
NIB	YELLOW	1.2	2.6	3.2	1.4	2.5	3.6	2.4	3.2	1.5	2.7
CAP	LIGHT BLUE	2.6	3.4	2.6	2.5	1.4	3	2.7	2.4	1.6	3.2

X-axis: Frequency of test
Y-axis: Quality Index of Parts



UCL- Upper Control Limit
LCL- Lower Control Limit
CL- Control Limit

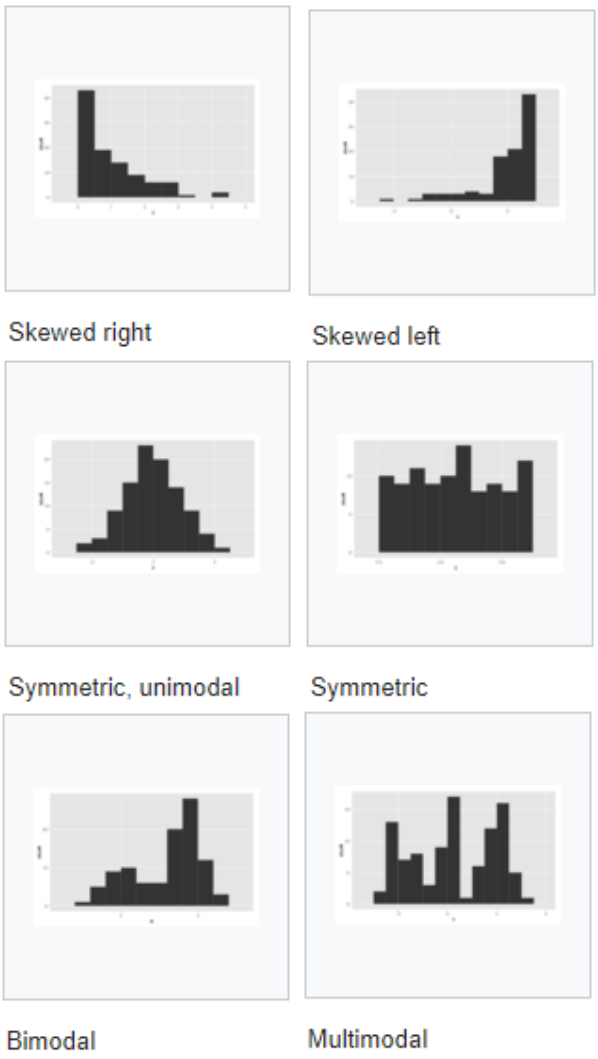
HISTOGRAM:

- This method was developed by Karl Pearson.
- It is a graphical representation of the distribution of numeric data.
- It is done by dividing the entire range of values into series of intervals, called bins.
- The bins may or may not be of equal sizes.
- Depending upon the type of data collected, the charts tend to take various patterns. Analysing formation of the patterns, we can conclude the nature of distribution of the data and also know the areas where the values are too low compared to others.

Depending upon the type of bins, the histogram can be classified into the following:

1) Symmetric, unimodal
2) Skewed right
3) Skewed left
4) Bimodal
5) Multi modal
6) Symmetric

Various types of histogram- graphical representation.

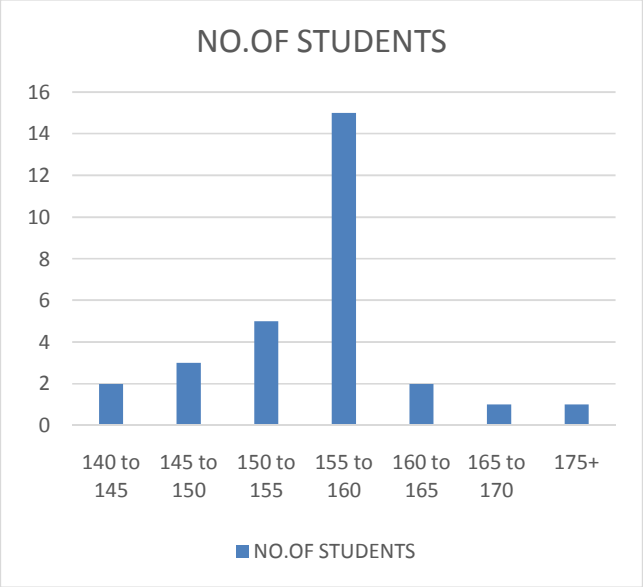


EXAMPLE:

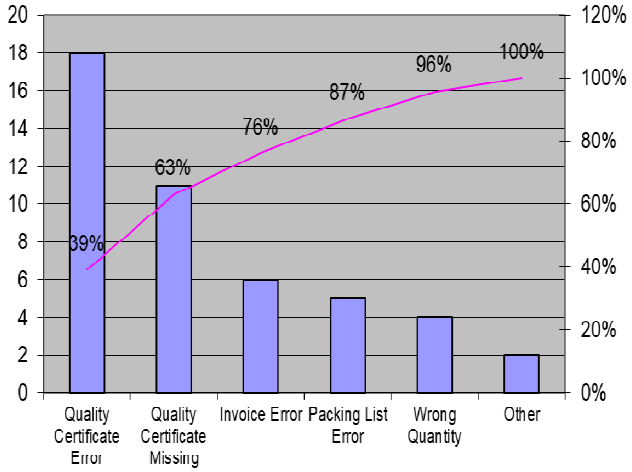
1) Let us consider another example where the statistic histogram is plotted for the heights of students in a classroom. Here, the histogram is plotted in a range of heights.

X-axis- Height in cm
Y-axis- No. of students

HISTOGRAM(RANGE)



PARETO CHART



PARETO CHART:

- Pareto chart is also another type of bar chart.
- The difference between histogram and pareto chart is that in histogram, many variables may be considered for plotting the chart. In pareto chart, any one problem is analysed in detail using bar and line charts.
- The condition for plotting a pareto chart is that the bar chart must be skewed right (descending) and the line chart must be ascending.
- All of the variables along the X-axis must be plotted against the frequency along Y-axis.

EXAMPLE:

The below is a sample of how a pareto chart must be plotted.

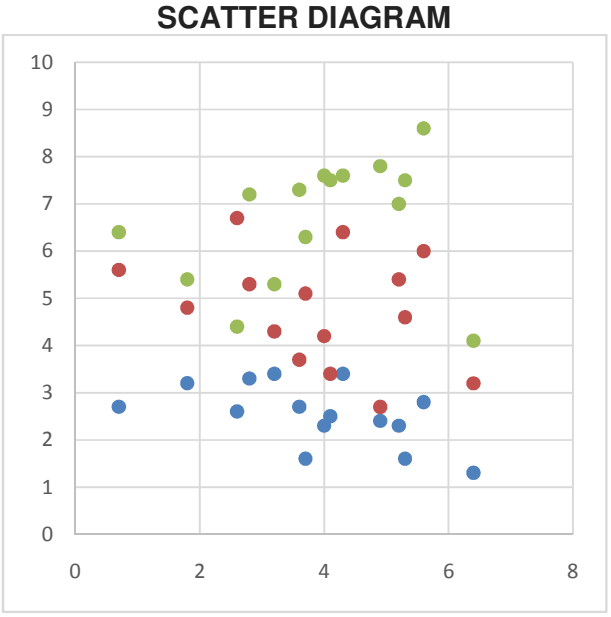
SCATTER DIAGRAM:

- The values of two or more variables are plotted along the axes in a graph.
- The resulting pattern can be analysed to check whether the values are affected or improved. A linearity can be obtained through the plots.
- If the points are denoted by color-codes, one or more variable(s) can be displayed.
- These cumulated points that are plotted along the axes form a cluster of points from which information can be derived.

EXAMPLE:

Consider a case where the rate of declination of pressure with respect to chemicals added is surveyed and plotted as a scatter diagram.

- From the diagram, we can infer that the blue chemical reduces the pressure gradually, the orange chemical's reaction to pressure cannot be analysed properly and the grey chemicals tend to stabilize the pressure within the region 3-5 with slight variations.



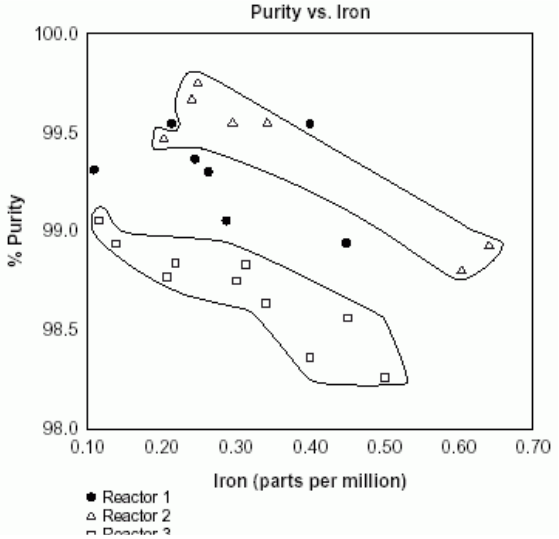
STRATIFICATION:

- When data from a variety of sources are collected together, the meaning of the data can be difficult to understand.
- Through this method, patterns can be seen to obtain the data.

EXAMPLE:

To test the declination of the purity due to parts of iron present, we can use stratification diagram,

STRATIFICATION



From the above diagram, we can see that there is a significant reduction in purity with respect to increase in iron content in reactors 1 and 3.

REFERENCES:

1) http://asq.org/learn-about-quality/seven-basic-quality-tools/overview/overview.html
2) https://en.wikipedia.org/wiki/Histogram
3) https://en.wikipedia.org/wiki/Seven_Basic_Tools_of_Quality
4) https://en.wikipedia.org/wiki/Scatter_plot
5) https://en.wikipedia.org/wiki/Check_sheet

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