

OREM 7315 – Systems Quality Engineering
HW Assignment – 4

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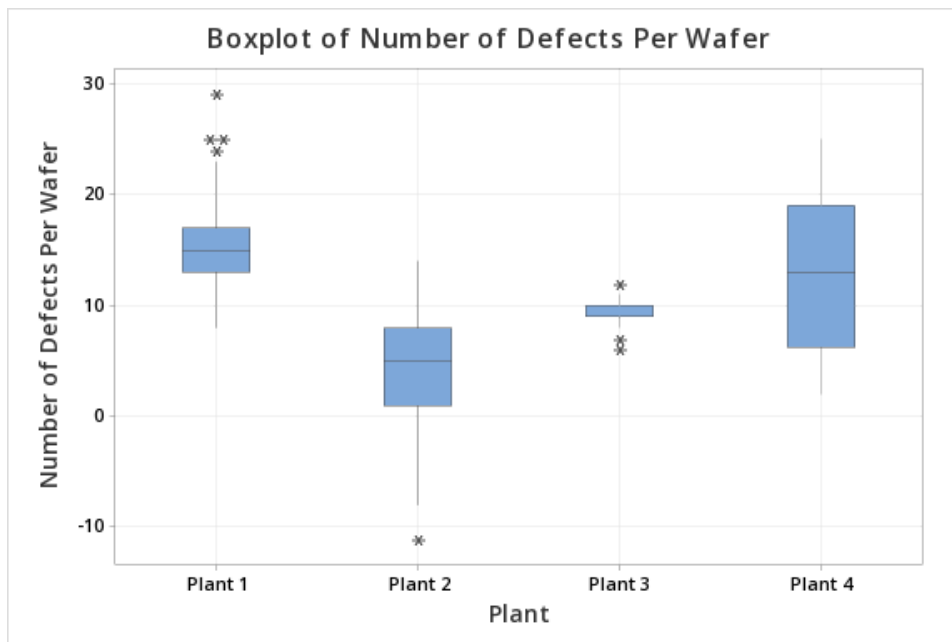
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1. At four semiconductor fabrication plants, the number of defects on a wafer (containing integrated circuits) is measured.

a) Using Assignment 5 dataset and Minitab, create a boxplot with groups (i.e., showing each plant in a separate category)



b) Which plant has the best performance (i.e., less defects) and why?

Plant 2 has the best performance. It has the least number of defects, mostly in the range of 1 to 8 and has only one outlier.

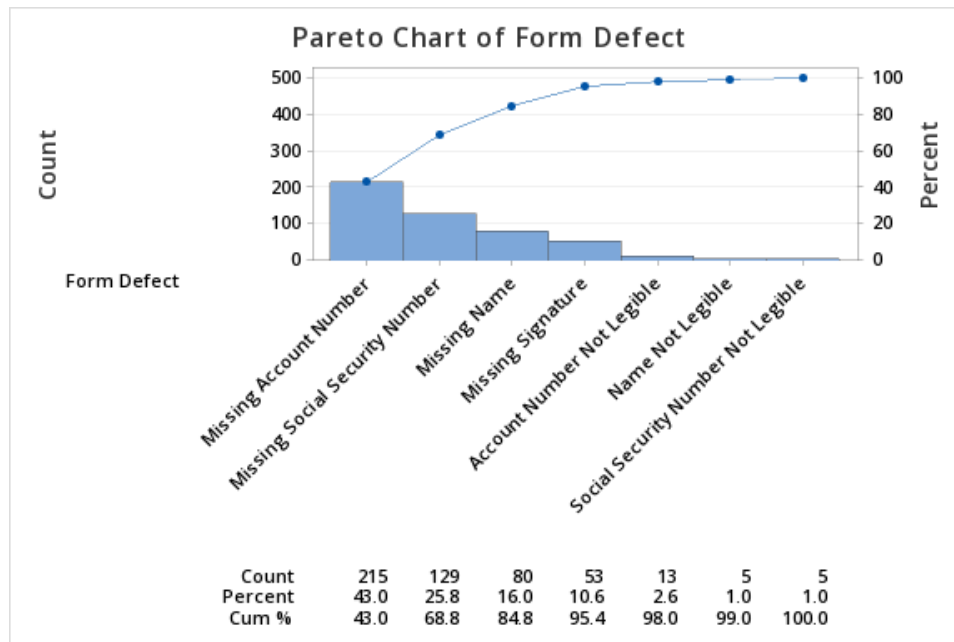
These two factors make it the plant with the least defects per wafer while also being one of the most stable ones.

c) Which plant has the most consistent (i.e., least amount of variation) performance and why?

Plant 3 is the most consistent one (least variation) as its q1, median and q3 lie close to each other approximately in the range of 9 to 10. It has only 3 outliers in the range of 5 to 12.

2. At SMU Financial, account opening forms are reviewed by back-office analysts for NIGO (Not In Good Order) and the defects are recorded.

a) Using Assignment 5 dataset and Minitab, create a Pareto chart of defects. Display all defect categories on the chart.



b) Identify the largest defect categories that together make up more than 80% of all defects.

Largest defect categories that make up more than 80% of the defects are:

- Missing Account Number
- Missing Social Security Number
- Missing name

3. At a metal fabrication facility, the amount of metal removed (inches), spindle speed of the milling machine (RPM), and time spent (minutes) for each batch are measured.

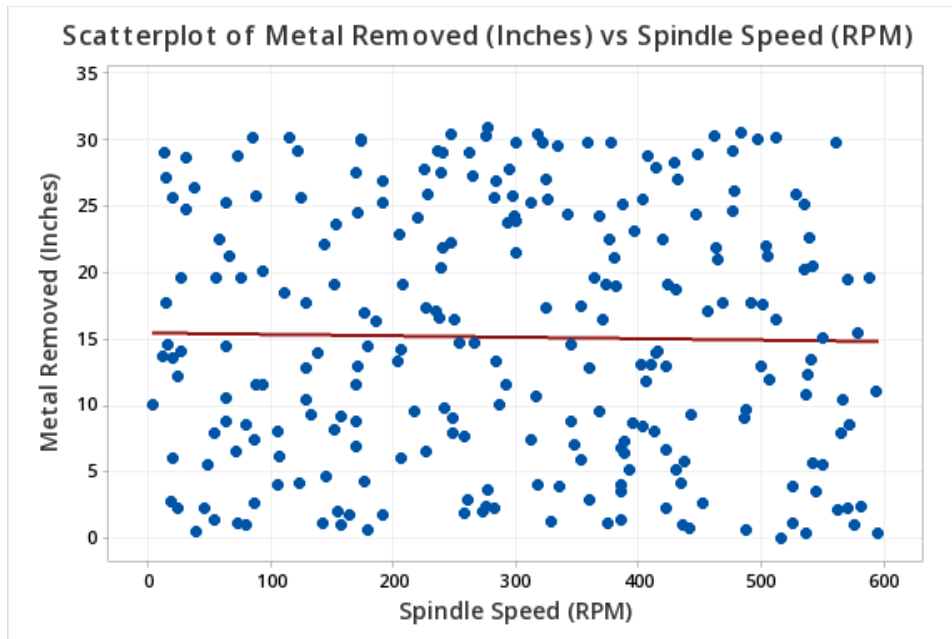
a) What is the Y variable?

Y variable is the Amount of metal removed in inches.

b) What is / are the X variable(s)?

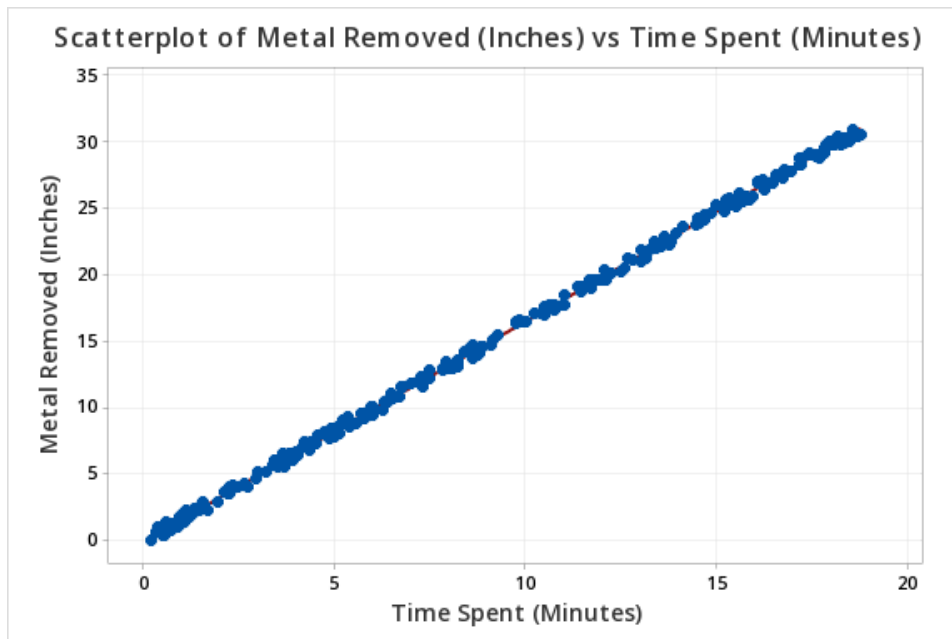
X variables are the Time spent in minutes, Spindle speed in RPM (later found that metal removed has no dependent relationship with this), batch number.

c) Using Assignment 5 dataset and Minitab, please create a scatterplot of metal removed and spindle speed. Are these two variables related?



- There seems to be no relationship between the X and Y variable plotted here.
- The values are scattered everywhere in a random fashion without any relatable trend.

d) Using Assignment 5 dataset and Minitab, create a scatterplot of metal removed and time spent. Are these two variables related?

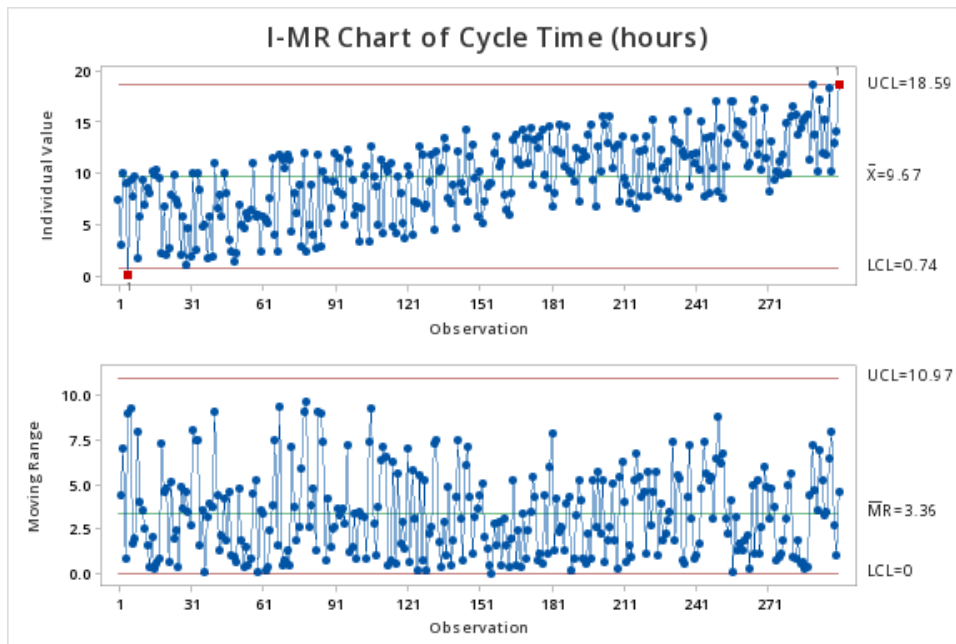


- The variables plotted here are related to one another.
- The Y variable increases along with the X variable continuously.

- It also fits the line of regression.

4. At a food manufacturing plant, the cycle time (in hours) of a batch process is measured every day.

a) Using Assignment 5 dataset and Minitab, create a run chart or I-MR chart. If needed, please assume that subgroup size is 1.



b) Is the process stable? Why or why not?

The process is stable because the number of outliers is very small and most of the points lie within the UCL and LCL which shows its stability of level extremely close to 3-sigma.

5. According to class notes & discussion, please list three subjective tools and three analytical tools (i.e., three for each category) for root cause analysis (0.25 points)

Subjective Tools:

- 5 Why's
- Process Flow Analysis
- FMEA

Analytical Tools:

- Data Collection and Analysis
- Scatter Plot
- Variation Studies- Histogram
