

The Woodmill Company Case Study

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Summary

The Woodmill Company reduces the dimensions of lumbers. There are two processes through which the company decides the exact width of the pieces. They determine the width manually or by the scanner. The board width of 100 boards is given for both scanner and manual processes. The main objective of the company is to determine which one of the processes will be beneficial for them. Using an optical scanner, a business in Oregon has created the ability to accurately measure the rip widths. Trim for windows and doors is produced by the Wood Mill firm. Both the manual and the scanner approaches are employed by the company to slice the dimensions into little bits. I have been tasked with finding out whether an optimal scanner is more advantageous than manual process-based data analysis.

Frequency Distribution, descriptive statistics, and their analysis

In a data set, frequency is the number of times a particular value or observation occurs. The frequency distribution is a graphical or tabular depiction of the observations and their corresponding frequencies that are used in frequency analysis. The scanner data is negatively skewed, and the manual data is positively skewed. From the descriptive statistics, we can see that the scanner data has a higher mean than the manual data, but the manual data has higher variability than the scanner one (National Institute of Standards and Technology, n.d.-a).

The frequency distribution of Manual values

As we can see in the chart, the frequency distribution of manual values is approximately normal as its shape is approximately bell-shaped and similar to the normal curve.

The frequency distribution of Scanner values

Similarly, the frequency distribution of manual values follows a normal curve and has a roughly bell-shaped form. We can also observe it by using the box plot.

Box plot, also known as box-and-whisker diagrams, represents the distribution of data based on the five measures: minima, maxima, first quartile, median and third quartile of the data. It contains a box

whose bottom side represents the first quartile, and the top side represents the third quartile (Minitab, LLC, n.d.-a).

The desired box plots are shown in the Chart diagram

As the box plot of both has no outliers and the whisker's line of both boxes' plots appears to be the same, thus the distribution of both processes is approximately normal with no outliers. Obtain the descriptive statistics of both measures, manual and scanner, which includes Average, Minimum, Maximum, Quartiles, Median, and Standard Deviation, etc.

Use the Minitab technology to obtain the descriptive statistics of the manual and scanner values with the following steps: (Minitab, LLC, n.d.-b)

Enter the data values with column names "Scanner Value" and "Manual Value", as a few values are shown below:

1. Go to Stats-> Basic Statistics-> Display Descriptive Statistics.
2. Select Scanner and Manual values under Variables and check the desired statistics.
3. Press Ok.

Thus, the obtained results are:

Thus, the average values of the scanner and manual values are 30.009 and 22.837, respectively, while the standard deviations are 7.444 and 8.501, respectively. The standard deviation shows the variability of the data, i.e., it indicates how far the data points from its sample mean are. Thus. The manual value has more variability than the scanner value since the standard deviation of the manual process, 8.501, is greater than the standard deviation of the scanner process, 7.444 (National Institute of Standards and Technology, n.d.-b).

The process generates more value.

As the scanner process has a smaller standard deviation and forms a bell-shaped distribution thus, the optical scanner process generates more values. It shows that the manual process is less reliable as it has larger variability in the values, while the scanner process has less relative variability due to the lower standard deviation.

The process has less variability.

From the frequency table, we can see that the values in the manual data vary more than the values of

the scanner data. Manual data are dispersed more sparsely. Some are very low, and some are towards the high end. So, the scanner data has less relative variability.

From the descriptive statistics, we use the formula for the relative variability (National Institute of Standards and Technology, n.d.-c).

Relative variability = SD / absolute value of mean.

Relative variability for scanner = 0.2454

For manual values = 0.3772

Hence, the scanner data has less relative variability.

An optical Scanner is the best option.

Thus, it concludes that the scanner process (optimal scanner process) is the best option for the company compared to the manual process since the scanner process has no outliers, is normally distributed, and has less variability in values. The scanner has a lower variability since the standard deviation of the process is lower.

As we can see, the optical scanner has less variability, and this is the best option. For any data, less variability is always acceptable, which indicates that the data is more consistent. Also, the SE is less for the scanner data, which tells us that the error in this data is lower than that of the manual data.

Recommendations

The scanner is programmed to detect flaws and calculate the best rip widths to maximize the board's resale value. The tear widths of 100 test boards were measured using a scanner. There was no actual ripping done to the boards. Each of the 100 boards was graded by a lumber grader, presuming that the rips detected by the scanner had been made. These 100 boards were then manually ripped in accordance with standard procedure. Each board was graded by a grader after the manual ripping process had been completed.

Therefore, approximately three values are more than two standard deviations from the mean. The mean value (μ) is 22.8372, and the standard deviation (SD) is 8.5014. The limits for the 2 SDs from the μ are 5.8344 and 39.84. Therefore, approximately two values are more than two standard deviations from the mean. The scanner process generates more values than the 2 SDs from the mean. Here, the scanner process has less variability than the manual process due to lower SD. Therefore, the scanner process has less variability. By observing the above conclusion, it can be concluded that the optical scanner process will help the process to give better results than the manual process. Therefore, the scanner process is the best option.

As a result, we can observe that the optical scanner aids in the creation of better boards and outperforms the manual approach. As a result, there were four values in the case of the optical scanner but only two values beyond the two standard deviation threshold in the case of the manual method. Optical Scanner has less variability because the process's standard deviation is lower.

References

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