

► **BACKGROUND**

In industrial context, it is important to act strategically and focus not only on daily challenges but also on the future ones. Hoshin Kanri is a methodology that builds a link between strategic and operational management. Problem identification and process understanding are key factors for this method, they can be facilitated through labor standards, which can be set through the time studies of a process. For a reliable study of time, it is necessary to define the task in study, divide it in measurement points, define how many times the task will be measured (sample size), measure the time and calculate the variance, average, maximum and minimum values. The determination of sample size is indispensable for an adequate study of time.

► **OBJECTIVES**

The present work aims to review the current literature for statistical and conventional analyses regarding to sample size currently used in the time studies in a company's production line in which Hoshin Kanri methodology has been implemented and compare the methods found. In future works this literature review will be important once the statistical and conventional methods will be used to analyze real data from the company and evaluate whether or not both methods are adequate

► **METHODOLOGY**

Statistical Analysis

Statistics techniques can be used to determine the required sample size or the number of observations equal to n, to provide reliable results, in a given level of confidence.

- \bar{x} : mean of the observations.
- s: standard deviation of average time from the preliminary observations.
- z: number of standard normal deviate (or z-score) corresponding to the level of confidence selected.
- p: desired precision or accuracy.

Thus, the sample size is calculated using the equation:

$$n = \left(\frac{z \cdot s}{p \cdot \bar{x}} \right)^2$$

By calculating this, one can find out that either a larger sample is needed or that the sample taken was adequate for the measurement. Figure 1 summarizes the method.

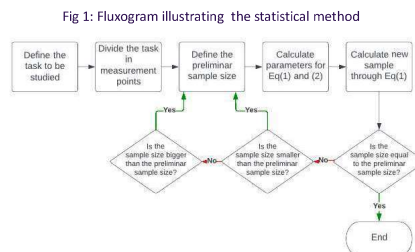


Fig 1: Fluxogram illustrating the statistical method

Conventional Analysis

Considering the susceptibility to several inaccuracies of statistical methods, it is presented a conventional guide for the number of observations, the sample size to be collected, based on the total number of minutes per cycle. In the case of adopting the conventional, it is important to make the observations continuously, once occasional elements, also called periodicals, may appear.

Table 1: Number of recommended cycles for time study

Minutes per cycle (min)	0 10 25 0.50 0.75 1 0.2 0.5 0.10 0.30 0.40 0
Number of cycles recommended	200 100 60 40 30 20 10 8 5 3

The total time in minutes taken for each activity inside the line in analysis is usually between 1 and 2 minutes, which implies a sample size of 20 measurements according to the Table 1. Figure 2 illustrates the conventional method.

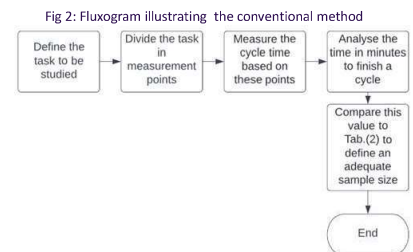


Fig 2: Fluxogram illustrating the conventional method

► **RESULTS AND CONCLUSIONS**

While comparing both methods it can be stated that one disadvantage for statistical method is the time spent for this sample size analysis, which may costly for a company, for the conventional one, once it is based on a previously-defined table, it may be susceptible to subjectivity and may also cause erroneous decisions on sample size, but as it is not so laborious, it is been more used currently in some companies.

Time studies are globally needed once it provides gains in processes, in product's costs and in various performance parameters. So it is important that the sample size to perform the time analyzes is as suitable as possible.

For the production lines, it could be verified that both conventional guide and statistical methods could be applied for checking if the current sample size used for measurements inside a company is adequate.

For future works it is expected that an automatized spreadsheet will be created to estimate and compare the sample size, using both conventional guide and statistical methods mentioned in this paper.

► **BIBLIOGRAPHY**

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