

WORK MEASUREMENT BASED ON WORK SAMPLING, CASE STUDY: SMALL FOOD COMPANY (MOLE)

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Digital Object Identifier: <https://doi.org/10.61117/ipsumtec.v2i1.16>

Abstract-- This research will show the impact of performing a work sampling in a food SME, which seeks to know the standard production time and especially to know the specific time it should take for the preparation of a piece of mole, for this study was applied to a small food company for the production of special red mole. It is sought to identify the standard time to produce and for this a work sample was applied, which is a technique for measuring work analysis to establish standards, improve methods, as well as determine the percentage of machine utilization, activities, delays, etc., and determine tolerances by taking a large number of observations. Consequently, this brings great benefits, as well as operational to form intelligent systems. For this purpose, a work sample was implemented to know the standard time to produce a part in minutes.

Keywords: work sampling, time standardization, continuous improvement.

INTRODUCTION

Recent events worldwide, especially those related to the global economic and financial crisis, have generated concerns and an interesting debate about the future of business, business performance and the world economy itself. This is of particular significance for the small and medium-sized enterprise (SME), in particular for

especially those of emerging countries. Consequently, the importance of making adequate and reliable measurements (of the time variable) of an industrial activity with a view to calculating the standard time by means of an adequate recording of the average observed time and the normalized time. The importance of the use of probabilistic sampling, as a necessary scientific method, in the calculation of the number of times an activity should be observed, is emphasized [1].

DEVELOPMENT

For this research it is important to know relevant aspects of sampling as a discipline that deals with the set of techniques to obtain a sample, and seeks to guide the activities of researchers who need to collect data by sampling. It was organized from the definition of technical terms and continued with the classification of sampling techniques according to their selection and complexity.

On this last point, the techniques of complex sampling for survey design stand out, which has become the most common and powerful tool for obtaining information from very large populations at a relatively low cost. Therefore, sampling is useful in any organization that needs timely, reliable information at the lowest possible cost.

The article concludes with a review of the most relevant aspects of acceptance sampling used in quality control processes [2].

Sample population

One of the most contentious issues for communicators is to identify how much is the population and how much is the sample, and to determine the criteria that will be used to select the sample components.

All sciences make use of sampling. For some the object of study is the population, for others, such as agronomists, it will be fruit trees, plots of land, or for doctors the sample is patients with certain pathological symptoms; for communicators the population of study is not only people but also videos, films, press articles, radio programs, television programs, newsletters and others. In this part of the review we will try to understand and differentiate the important concepts of population, sample and sampling.

In many investigations, the size of the population is large and it is not possible to analyze it in its entirety due to the high costs involved,

Can you imagine a population of 10,000 people?

Can you do 10,000 surveys, how much money would you spend, it is out of the budget for a communication student. The sample and sampling allows to study only a part of it that will be representative of the rest of the population, in order to generalize the results to the whole population [3].

The representativeness of a sample makes it possible to extrapolate and thus generalize the results observed in the sample to the accessible population and, from , to target population. , a sample will be representative or not only if it was selected at random, i.e., if all the subjects of the target population had the same possibility of being selected in this sample and thus being included in the study; and on the other hand, if the number of subjects selected represents numerically the population that gave rise to it with respect to the distribution of the variable under study in the population, i.e., the estimation or calculation of the sample size.

Thus, the analysis of a sample allows inferences to be drawn, extrapolating or generalizing

The sample is considered representative of the target population when the distribution and value of the various variables can be reproduced with calculable margins of error. Thus, the objective of sampling is to study the relationships between the distribution of a variable in the white population and the distributions of this variable in the sample under study [4].

Implementation of work sampling in manufacturing. According to [5], the primary objective was to determine the time standards to know the productive capacity of the company, thanks to the knowledge of which activities generated and which did not generate value to the products marketed by the company. In this way, it was possible to diagnose the existence of unproductivity and propose methodologies to reduce it [5].

Advantages:

It is important to note that the work sampling method has several advantages over obtaining data by the usual time study procedure [6].

- It does not require continuous observation by an analyst over a long period of time.
- Office work time decreases.
- The total number of work-hours to be performed by the analyst is generally much lower.
- The operator is not exposed to long periods of chronometric observations.
- The operations of groups of operators can be easily studied by a single analyst.
- Continuous improvement in SMEs.

Currently, SMEs are constantly improving their performance; the improvement process is an adequate methodology to overcome the first two years of an SME start-up, many organizations mention, from their statistics, that if an SME survives and overcomes the first two initial years, it is already on the other side, consolidated and with market share [7].

The process of implementing continuous improvement in small companies is a complex process that requires everyone's participation and knowledge of the technique. This article shows a set of ideas collected from different research articles that deal with the implementation of continuous improvement in SMEs, analyzing the obstacles and techniques to carry out a correct methodology for the implementation. In addition, a model will be suggested for the implementation of a continuous improvement model in an SME, dividing the process into groups or areas of improvement [8].

The vast majority of the Spanish industrial fabric is made up of small and medium-sized enterprises (SMEs) that struggle hard every day to be more competitive with their customers.

Despite this reality, most of them are reluctant to incorporate Continuous Improvement and Lean into their management. Either because they are not familiar with it, or because they think that it is something to be used exclusively in large companies, or because they are convinced that its use requires resources that they cannot afford [9].

Under this premise, SMEs supplying large companies and those participating in administrative contracting are the ones that tend to implement management systems.

These systems allow them to directly comply with the purchasing criteria established by their customers, in addition to enabling them to contribute to improvement of national and international trade through compliance with the requirements related to being part of the value chain [10].

It is important to consider the realization of the work sampling in a small company, several factors were considered among them the indicators of the quality department, the samples that indicate work, as well as the number of pieces produced per day.

In order to carry out the measurement of work a company, different methods of observation are used, either direct or indirect, one of the most important of which is to measure the work performed.

The most commonly used method is the time study (direct) since its execution is out through random observation of each employee while he/she is working.

The study of time began to be used successfully in the 1980s by Taylor, considered as the father of scientific management, who used it to establish in an adequate and exact way the time that a process lasts, that is to say, the right working day.

Time study is an activity that involves the technique of establishing a standard of time allowed to perform a given task, based on the measurement of the work content, the method established with due consideration of fatigue, tolerances, personal delays and unavoidable delays.

In general, the time study is carried out through the use of a stopwatch to establish the exact time needed for each production process.

There are two types of time studies: normal time, which is the time used to manufacture a product without considering unproductive time in production, and standard time, which considers both the time invested in a production process, including the time for the tolerances that may occur.

Through the realization of this work, it was possible to know the percentage of importance that this technique for measuring work time within the production process of a certain good or product.

In addition, it is necessary to mention that in every production process there is unproductive time generated both by the organization of the company and by the workers [11].



Image 1: Mole containers (2019).

By means of observations, the times and movements used by the collaborators to perform their work were obtained, then the processes were studied and improvements were made and these were made known through training. After the training, the study of times and movements of the company's collaborators for the production of the typical cuts was carried out again, making comparisons with the study, obtaining a benefit with this study since there was increase in production, reducing the production times of these products, improving productivity [12].

It is important to emphasize that the goal of managing people is to achieve the highest possible output, but without sacrificing quality, service or responsiveness. The operations manager uses job design techniques to structure the job to meet the physical and psychological needs of the human worker.

Methods for measuring work are used to establish the most efficient means of performing a given task, as well as to set reasonable standards for its performance. People are motivated by many things, and monetary compensation is just one of them.

Operations managers can structure these rewards to not only motivate consistently high performance, but also

to reinforce the most important aspects of the work [13].

There are a large number of external factors and these are largely responsible for the fact that deterministic models of planning, scheduling and controlling production systems do not work as they theoretically should. Among the innumerable external factors that affect productivity are the following:

- Availability of raw materials.
- Availability from hand of skilled labor.
- Political tax climate.
- Tariff regime.
- Existing infrastructure.
- Government economic adjustments.

However, as mentioned above, not all factors are beyond the control of organizations, since there are internal factors that can be optimized, thus increasing the productivity of any system. Among the most common internal input factors are the following:

- Land and Buildings.
- Materials.
- Energy.
- Machinery, tools and equipment.
- Human resources.
- The degree of utilization of resources (internal factors) determines the productivity of an organization, whether it is an industrial producer of goods, a commercial service provider or a mixed organization [14].

The manufacturing processes are the "engine" of any transformation company, so they must be conveniently measured and studied, that is to say, standardized, both from the point of view of the work methodology and of the assessment of the operations that make up the processes.

The current trend in companies in such a competitive environment is towards process automation, directly linking innovation in the facilities to increased productivity in manufacturing, and

on the other hand, leaving aside the analysis and study of the overall processes.

Every company must start from the basis of a capacity study in order to know exactly where it is and how far it can go, to know its costs and its margins... in other words, it must measure its process, whether it is automated or manual.

It is said that studies of methods and times are obsolete, but when years ago it was an end, to squeeze the staff so that the production was greater based on an increase of the effort, now they have become the ideal and indispensable tool for any company that wants to improve.

Logically, there are areas where the study of methods and times is of little value, or processes where the time of operations in which the personnel directly participates has a lesser impact on obtaining production than the time of a machine or a mechanized system, taking into account, likewise, that all automation must involve a feasibility study, where the knowledge of capacity hypotheses becomes indispensable.

On the other hand, the vast majority of current manufacturing processes are slowly evolving towards automation, basing production on the handling of the product by the personnel, and making studies of the work methodology and obtaining the values of the operations that make up the process the indispensable basis for the knowledge of its capacity and for approaching and involving the company in a process of continuous improvement.

We must keep in mind that wages tend to be higher in highly automated industries with minimal labor content, thus tending to force up wages in non-automated industries, whose strongest competition comes from countries with lower wages and lower standards of living.

The use of measurement systems remains one of the key processes for the company.

The data acquisition systems have been improved, however, achieving a faster resolution speed.

The result is a high demand for the highest measurement and analysis capability for the development of work processes free of waste and inefficiencies [15].

In view of the growing need for better utilization of labor and reduction in production, better utilization of human and material resources is necessary.

If you look at the factors involved in the elaboration of industrial costs, you will see that in addition to raw materials and manufacturing expenses, the cost of labor plays a very important role, the supervisor feels the need to know if he is using the effort of the workers efficiently, if each of the operations performed by them is executed in the correct time and if the administration is supported on solid bases on which to develop production programs, cement incentive systems, etc.

In view of the needs of company management and supervision, work measurement has emerged as a tool that, if applied by properly trained people, will give satisfactory results.

Work measurement: Quantitative part of the study of work, which indicates the result of the physical effort developed as a function of the time allowed to an operator to complete a specific task, following a predetermined method at a normal pace.

From the above definition it can be seen that the immediate objective of labor measurement is the determination of standard time, that is, the measurement of the amount of human labor required to produce an item in terms of a type or standard, which is time.

Standard Time: standard that measures the time required to complete a unit of work, using standard methods and equipment, for a given unit of work.

worker who possesses the required skill, developing a normal speed that can be maintained day after day, without showing symptoms of fatigue.

Applications of Standard Time: At present, there are multiple applications of standard time, among them the following can be mentioned:

To determine the salary payable for that specific task: It is only necessary to convert the time to monetary value.

Aids production planning: Production and sales problems may be based on standard times after having applied work measurement to the respective processes [16].



Image 2: Mole preparation (2019)

The production process of a company is of great importance for its operation; if it were interrupted, the company would stop generating profits, lose customers and brand recognition.

Similarly, an inefficient or problematic production process would generate similar results, but on a smaller scale. Nowadays, companies are becoming more and more competitive among themselves and in an increasingly globalized environment where a great variety of products from competing companies abound, it is of vital importance for a company to be able to supply the demand for its products.

customer with products that meet their requirements in terms of time, quantity and quality [17].

Nowadays, companies achieve excellence through a process of continuous improvement. Improvement in all fields: of personnel skills, of resource efficiency, of relations with the public, of the link between the members of the firm, and in every area of the organization that can be optimized and translates into improvements in the quality of the product or service offered.

The objective of this work sample is to measure the installed capacity to satisfy its customers and to increase customer satisfaction for both internal and external customers. The general actions necessary to carry out this process are:

- Analysis and evaluation of the existing situation to identify areas for improvement.
- The establishment of objectives for improvement.
- The search for solutions to achieve these objectives.
- The selection of solutions.
- Implementation of the actions decided.
- Analysis of the results of the actions implemented to determine whether the objectives have been achieved.

In the field of quality, numerous tools have been developed to facilitate the work of continuous improvement teams, which make the company more productive and competitive for several reasons:

- They allow a greater capacity adapt to the customer's needs and to comply with them.
- Errors, waste and costs are reduced, increasing efficiency.
- Errors and failures are prevented in all areas of the organization by improving the products and services delivered to the customer, thus reducing complaints and claims.

An improvement project.

The Continuous Improvement process proposes a departure from the traditional trial-and-error approach to address chronic organizational problems.

Table: 1 data for standard time calculation in a master production schedule.

Factor de calidad	Muestras que indicaron trabajo (x)	Número de piezas producidas por día (N)
.83	45	70
.90	65	90
.92	35	80
.87	40	73
.92	55	93

Time: 5 Hrs Days:

Monday - Friday.

The following formulas will be used for this purpose:

Total Time Hrs ----- min

Quality factor $FC = FC/n$

Percentage of worked time $Ptt = \epsilon X / \epsilon N$

Total parts produced $TPP = \epsilon N / (\# \text{ Days})$ Standard time: $TS =$

$(\text{Total time} \times \text{percentage of time worked} \times \text{Quality factor}) / (\text{Total number of parts produced}) +$
SUPPLEMENTS

SUPPLEMENTS = Time in minutes (100-ptt) Total Time

5 HRS ----- 300 min

Quality factor $FC =$

$(4.44) / 5 = 0.88$

Percentage of time worked $Ptt =$

$240 / 486 = 0.49$

Total, parts produced $TPP =$

$486 / (5 \text{ days}) = 97.2$

Standard time: $TS = (300 \times 0.49 \times 0.88) / (97.2) + (300 \times .51) / (97.2)$

$1.33 + 1.57 = 2.9 \approx 3 \text{ min}$ [to produce one piece.]

DISCUSSION AND ANALYSIS OF RESULTS

According to the results obtained, the standard time to produce a part is 3 minutes per part,

This will allow us to standardize production times and comply with the master production plan. Likewise, the process tends to be more productive and competitive.

CONCLUSIONS

This research showed the impact of applying work sampling, which in turn facilitates the standardization of times, as well as their interpretation, thus increasing their installed capacity and the optimization of their resources, as well as making their processes more efficient for a global productivity.

RECOMMENDATIONS

It is considered essential to train their operators, as it depends on the quality of the product and on meeting the established work goal, meanwhile, it is important to perform work measurements, for this you can use the Ishikawa diagram to identify the "6 "M of a production process to subsequently make a checklist and run in a certain time sampling work to avoid waste and to streamline their processes, with zero defects.

ACKNOWLEDGMENTS

We are grateful to the availability of the Business Management students and to Professor Vianey Ríos Romero.

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