

# Measurement of the production performance through the comparison between the budgeted and the actually achieved time: a Case Study

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**Abstract:** This article aims to present a statistical study utilized for the verification and performance measurement regarding the used labor time for the achievement of the metallurgic production process in an industry of this segment, located in Castro, Paraná State. The work demonstrates a comparative study between the budgeted and the actually achieved time, presenting as well, the advantages and objectives that can be realized through the performance and productivity measurement. According to the results, the possibility of improvement in processing time could be verified, reducing the hand labor costs and increasing the competitiveness of the company.

**Key words:** Performance Measurement. Labor Time. Productivity.

## Medição de desempenho da produção através da comparação entre o tempo orçado e o tempo efetivamente alcançado: um Estudo de Caso

**Resumo:** Este artigo visa apresentar um estudo estatístico utilizado para a verificação e desempenho no que se refere à medição do tempo utilizado de trabalho para a realização do processo de produção metalúrgica em uma indústria desse segmento, localizada em Castro, Paraná. O trabalho demonstra um estudo comparativo entre o tempo orçado e o tempo efetivamente alcançado, apresentando também as vantagens e os objetivos que podem ser realizados através da medição do desempenho e da produtividade. De acordo com os resultados, a possibilidade de melhora no tempo de processamento pode ser verificada, reduzindo o custo da mão-de-obra e aumentando a competitividade da empresa.

**Palavras-chave:** Medida de Desempenho. Tempo de Trabalho. Produtividade.

## INTRODUCTION

The competition and competitiveness existing in the market force the companies to better alternatives for reaching satisfactory results. In the case of small and medium companies, which have bigger difficulty due to the low bargain condition comparing to larger and multinational enterprises, the alternatives are restricted, complicating their growth.

For Hecksher and Duarte (2003), one of the greatest challenges for small and medium companies consists in achieving better performance indexes in productivity and in the final quality of their products, to become more competitive in the national and international market.

Then, it is observed the necessity of studies achievement regarding the performance and productivity measurement. These studies can improve, considerably, the activities of control and planning, which provide improvements according to the time of task execution and activities developed.

These controls of performance and productivity are quite important for the reduction of the production costs. Tubino (1999, p. 112) comments that “the lower the conversion time from raw materials to finished products, smaller will be the costs of the productive system related to the needs of the clients.”

Several companies possess production and productivity goals. To check and confirm these goals, a statistical study is necessary, regarding the performance measurement, especially related to the process time.

According to Reis (2003), the definition and utilization of a system for the production performance measurement is extremely important to verify if the strategy is really functioning in agreement with the planning and if the goals are actually being achieved.

This article presents a case study carried out in a metallurgical industry, where performance measurements are adopted regarding the labor time for the achievement of the manufacture process. Comparisons between the budgeted and the achieved time are apprehended, aiming to improve the processing time.

As stated by Slack *et al.* (2002), when the company produces with quickness, it keeps its deadlines and tries to carry out the task in the cheapest possible way; consequently the company earns in competitive, mainly in function of the credit of reliability and also for the advantage of cost to its consumers.

The main objective of this study consists in checking if the productivity estimated goals are being fulfilled and carried out by the production, with specific purposes of obtaining the costs reduction with hand labor and, consequently, increasing the profit and market competitiveness.

## PERFORMANCE MEASUREMENT: THEORETICAL CONCEPTS AND OBJECTIVES

When a company is proposed to take some measures aiming at the improvement of the production, the process of performance measurement becomes extremely necessary.

All the operations inside the chain of production need some forms of performance measure, which is an extremely necessary prerequisite for the study of the production improvement (SLACK *ET AL.*, 2002).

The performance consists of the result obtained through the decisions taken in determined circumstances, once the quality of these decisions are straightly related to the quality and quantity of available information for the labor achievement (KAYDOS, 1991).

There are many factors that can influence the companies to acquire a performance control in all departments and levels.

According to Almeida; Marçal and Kovalski (2004), the companies carry out the control and performance measurement to be able to:

- Identify which are the tasks and activities that contribute the most for the increase of the aggregate value of the products and services offered by the company;
- Do the right comparisons between the results obtained by the company with its direct competitors;
- Review all the organizational strategies to improve its results for short, medium and long term.

Upon utilizing performance measures, normally some comparisons are carried out, which are necessary to get the conclusions and desired results.

For Slack *et al.* (2002), there are different ways that the standards of performance can be derived. Among them are the historical standards, comparing the present performance with previous ones; the target performance standards, comparing the present performance with some standard established as reasonable and performance standards of the competition, comparing with the performances of other concurrent companies from the same segment.

When some performance measurements are commented, they can be carried out and obtained in distinct groups of results.

The main performance criteria that must be observed in the production can be divided in producing to the smallest possible cost; having better performance quality than the competition; reliability and quickness to meet deadline and conditions to fast reaction to unexpected changes (TUBINO, 1999).

Through the performance measurement, several objectives can be achieved to reach a constant improvement in the processes.

According to Almeida; Marçal and Kovaleski (2004), the evaluation of the performance should have as main objective to promote the personal and professional development of the collaborators, promoting a bigger productivity and better organizational performance as well.

One of the essential and main characteristics for a company evolution consist of applying successfully its indicator to its performance measurement, enabling a bigger control and knowledge about its processes and procedures, permitting also a continuous evaluation of the efficiency of its activities and collaborators (GONÇALVES, 2002).

When the company possesses the control and realizes the necessary studies regarding the performance and the productivity of the developed tasks, the tendency is that it constantly improves its activities and processes, becoming more and more competitive.

As stated by Tubino (1999), it is important to establish some parameters of performance that are prominent for the company, aiming to supply advantages for the competitive market.

Using adequate approaches for the achievement of performance measurements, some studies related to the verification of the production processes are possible.

For Costa (2004), the indexes of capacity of the processes measure as much the process is going to meet all the specifications requested by the client and by the planning.

All the previously information are important to the understanding of the objectives to be achieved through the performance measurements of the production.

## **METHODOLOGY**

### **CLASSIFICATION OF THE RESEARCH**

According to the classical classification of researches, presented and characterized by Silva and Menezes (2001), this article can be classified of the following form:

- From its nature: Applied Research;
- As the form of the problem approach: Quantitative;
- From the point of view of its objectives: Exploratory;
- Its adopted technical procedures: A Case Study.

The article is classified as an applied research; therefore, it has the objective of exploring a practical situation regarding the management of the production of a company from the metal-mechanic sector.

In a conceptual way, Silva and Menezes (2001) show up that the applied research has as objective to generate knowledge for practical application, which are driven to the solution of some specific problems involving truths and local interests.

This work carries out, in general, a quantitative approach of the facts and found results, through the tabulation and the presentation of the data from a statistical and numerical form.

The research can be classified as exploratory, because it aimed to find an inquiry that provides a bigger familiarity with the treated problem.

As cited by Lakatos and Marconi (2001, p. 77), “the exploratory studies collaborate to develop hypotheses, increase the familiarity of the researcher with an environment, fact or phenomenon, for the achievement of a future research to modify and clarify concepts”.

Regarding the technical procedures utilized, this article is classified as a case study, because it involves a deepened study about a real event.

As mentioned by Yin (2005), the case study can be utilized in several situations, contributing for an increase of the knowledge related to diverse individual phenomena.

### **3.2 Instruments of research**

The instrument utilized for the collection of the data was the systematic observation, through the verification of determined aspects of the reality in a planned way, with the desire to collect information that helps answering the pre-established purposes.

In this phase, the observation of documents from the coordination, management of the production and from the planning and control of the production department was realized, which was possible to perform important analyses regarding the labor time for the execution of the activities by the production employees.

During the phase of collection of data, some interviews were carried out in a non-structured form, with the objective of exploring broadly some important aspects and collect information in an informal way.

## **STUDY OF THE LABOR TIME FOR THE PRODUCTION**

Within the existing possibilities for the performance measurements, this case study approaches specifically the comparative study between the budgeted labor time with the actually utilized one for the achievement of production processes of some pieces and equipment.

This survey of the labor time is realized by the planning and control of the production department, which is responsible for the control of the production.

The control of the production is a function of the responsible for the planning and control of the production department, who does the comparisons between the initial planning and programming solicitation with the production effective results, detecting possible errors and its causes, requesting corrections for the personal in charge (RUSSOMANO, 2000).

The proposal of the goal to be reached by the production, stipulated by the direction of the company, is to manufacture the requests with 10% of reduction of labor time regarding the stipulated time initially done during the process of budget.

For the achievement of this study of goals verification and of the production performance, the last 91 manufacturing services realized by the company were analyzed, observing that the bigger the number of studied samples the better the

level of confidence shown at the obtained results.

According to the corroboration of Costa (2004), when there is the possibility of increasing the number of performed measures, better results are obtained.

The data was collected and presented according to table 1 in the sequence, where each column indicates: the service, the budgeted labor time for the manufacturing, the actually achieved labor time and the percentage of the utilized labor time regarding the budgeted labor time.

Service	Budgeted Time (hours)	Achieved Hours	% Utilized
1	615	612	99,51 %
2	186	123	66,13 %
3	1444	1367	94,67 %
4	744	740	99,46 %
5	92	73	79,35 %
6	170	209	122,94 %
7	314	340	108,28 %
8	96	64	66,67 %
9	96	86	89,58 %
10	500	352	70,40 %
11	677	636	93,94 %
12	330	437	132,42 %
13	154	138	89,61 %
14	300	172	57,33 %
15	130	95	73,08 %
16	18	11	61,11 %
17	920	896	97,39 %
18	45	27	60,00 %
19	68	79	116,18 %
20	17	11	64,71 %
21	154	107	69,48 %
22	20	14	70,00 %
23	245	148	60,41 %
24	165	104	63,03 %
25	279	342	122,58 %
26	168	112	66,67 %
27	237	211	89,03 %
28	254	234	92,13 %
29	8	5	62,50 %
30	37	25	67,57 %
31	124	79	63,71 %
32	82	56	68,29 %
33	110	111	100,91 %
34	21	14	66,67 %
35	1550	996	64,26 %
36	3046	3003	98,59 %
37	2108	1410	66,89 %
38	2600	2840	109,23 %
39	810	943	116,42 %
40	685	452	65,99 %
41	1744	2259	129,53 %
42	904	872	96,46 %
43	1015	1048	103,25 %
44	25	17	68,00 %
45	890	775	87,08 %
46	329	404	122,80 %
47	35	30	85,71 %
48	115	72	62,61 %
49	1405	1610	114,59 %
50	8	5	62,5 %

51	32	21	65,63 %
52	23	25	108,70 %
53	115	90	78,26 %
54	41	26	63,41 %
55	117	122	104,27 %
56	106	98	92,45 %
57	186	160	86,02 %
58	130	81	62,31 %
59	968	624	64,46 %
60	1350	821	60,81 %
61	618	607	98,22 %
62	300	189	63,00 %
63	350	240	68,57 %
64	367	334	91,01 %
65	1325	1465	110,57 %
66	88	76	86,36 %
67	800	519	64,88 %
68	50	32	64,00 %
69	200	125	62,50 %
70	12	10	83,33 %
71	5	3	60,00 %
72	75	59	78,67 %
73	1000	673	67,30 %
74	94	81	86,17 %
75	1792	1283	71,6 %
76	138	92	66,67 %
77	485	482	99,38 %
78	246	189	76,83 %
79	200	138	69,00 %
80	32	31	96,88 %
81	25	17	68,00 %
82	45	30	66,67 %
83	1769	1224	69,19 %
84	253	279	110,28 %
85	692	463	66,91 %
86	246	170	69,11 %
87	690	886	128,41 %
88	585	440	75,21 %
89	538	524	97,40 %
90	77	56	72,73 %
91	1929	2055	106,53 %

Source: The authors

Table 1 – Comparison between the Budgeted and the Actually Achieved Labor Time in Manufacturing

Checking the data on table 1, some statistical calculations were carried out for the verification of the medium percentage index of the labor time utilized in the achievement of the 91 manufacturing services.

The statistical calculations presented the following results:

- Average of 82,87% of utilization of the budgeted labor time;
- Variance of 4,09% in the sample;
- Standard error of 20,23% in the sample.

## ANALYSIS OF THE FOUND RESULTS

Through the measurement and monitoring of the production labor time, it is possible be verified that the initial objective was achieved, seen that the goal was to reduce in 10% the production labor time estimated in the budget and the final results indicated an average reduction of 17,13%.

The standard error accentuated indicates some considerable variations regarding the found final average. It means that some services were done in a quite lower time than the estimated one and others also surpassed the estimated time in the initial. In these cases, it is necessary to have a serious study to verify if it was some kind of misconception at the moment of the time estimative or if

the production really overcomes or failures in its activities of manufacturing processes.

All these found results provide a more effective monitoring and accompaniment regarding the time for the execution of the manufacturing tasks. As seen, it is possible to plan a continued improvement of the processing time, through the verifications of faults and correction of them.

For Tubino (1999) it is very important to improve the processing time, once it is the only one that aggregates value to the final product. It means not alone fulfill with the time cycle established in the initial planning, but also seek for the continuous improvement in the operational functions.

With the activities of performance measurement of the production, the planning and control of the production department can improve the quality of the production management and manufacturing processes.

According to Hecksher and Duarte (2003), the process of monitoring and time measurement of production perfect and implement activities as definition of terms, accompaniment of the productivity, definition of the production costs and verification of the margin of contribution by performed service.

The found results regarding the improvement of the hand labor time and the constant search for continuous improvement of the production are entirely in agreement with the theory presented by Slack et al. (2002) and Gonçalves (2002).

Besides presenting the performance of the production related to hand labor time for manufacturing, the found results were also used for some comparisons between the time and cost of the company with the direct competition.

For Almeida; Marçal and Kovaleski (2004), Slack et al. (2002) and Tubino (1999), this result is quite interesting, according to the big competitiveness of the present market.

The found data in this study were also shared with the Commercial and Sales Departments, for improvement in indexes for the determination of delivery terms and also for the costs regarding the manufacturing labor.

According to the concepts of Costa (2004), it is always important to determine the costs and terms that attend the needs of the clients.

## CONCLUSION

With the data in this study, showing the monitoring and measurement of the performance regarding the labor time for manufacturing, the company can confirm if the stipulated goals are being reached.

The found results can be utilized to perform internal comparisons, which aim continuous improvement in the processing time, and comparisons with the direct

competition, what is very important for the growth of the company. It can receive more orders and become more and more competitive, mainly if it works with smaller costs than the competitors do.

Through the found final data, it is possible to determine secure indexes for the achievement of new budgets and sales, which observes the real capacity and productivity of the company. These results are also important to help in the determination of reliable delivery terms to the clients, which can actually be fulfilled.

Finally, it is possible to be concluded that, according to all of the found results, companies that work with performance measurement become more favorable to the growth, once they work with clear objectives: costs reduction and improvements in the processing time.

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