

## Determining the Number of Workers Based on Standard Time with the Work Sampling Method for the Office Section at PT. Solo Murni Bandung Branch

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**ABSTRACT:** This research was conducted at PT. Solo Murni's Bandung branch to address the decline in office performance caused by a shortage of human resources (HR). The imbalance in workload, especially on certain days like Saturdays, has led to suboptimal task completion. The main issue identified is the shortage of HR, which has resulted in excessive workloads and a decrease in operational efficiency. The method used was Work Sampling based on standard time, with data collected through direct observation and interviews. The research results show that the current workforce is insufficient, especially on days with high workloads, leading to decreased employee efficiency and productivity. The conclusion of this study is that to improve performance and operational efficiency, the company is advised to increase its workforce to enhance operational efficiency and ensure more optimal task completion.

**Keywords:** Human Resources (HR), Work Sampling, Workforce Determination

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### NOMENCLATURE

| Symbol | Description                    | Unit         |
|--------|--------------------------------|--------------|
| W      | Effective working time         |              |
| t      | Time unit in minutes           | 60 minutes   |
| s      | Duration of each visit         | 10 minutes   |
|        | Average produktivity           |              |
|        | Average                        |              |
| pi     | Percentage productive/period i |              |
| ni     | Number of observations per day |              |
| k      | Number of observations days    |              |
| UCL    | Upper Control Limit            |              |
| LCL    | Lower Control Limit            |              |
| N'     | Required number of data points |              |
| Wn     | Normal time                    |              |
| Ws     | Standard time                  | Minutes/unit |
| RF     | Rating factors                 |              |
| ALL    | Allowance                      |              |
| BK     | Workload                       | Unit/minutes |
| WT     | Available time                 | minutes      |
| JTK    | Number of workers              | people       |

### I. INTRODUCTION

The working world is a realm where a group of individuals engage in activities with a shared goal in line with the vision and mission, whether within a company or an organization. Human resources are one of the elements within a company and play a crucial role in the company's continuity, with its success and decline influenced by the role, performance, and quality of its personnel.

PT. Solo Murni is a company engaged in the manufacturing of stationery and office supplies. The company has many branches throughout Indonesia, including PT. Solo Murni's Bandung branch, which serves as a storage (warehousing) facility for its products. Like other companies, the role of human resources (HR) at PT. Solo Murni Bandung branch is very important. This study found a decline in employee performance in the office department due to a lack of HR.

This lack of HR not only causes a decrease in employee performance but also leads to an overload of work that should be handled by three or more people being shifted to one or two people, resulting in less optimal work completion times. According to an interview with one of the office staff, Mrs. Tantin, there is a problem with insufficient HR, causing delays and inefficiencies in workload completion. This issue is compounded by

the shortage of available office workers. On Saturdays, when sales staff come to the office for weekly reports, the office workload increases drastically compared to other days. This excessive workload often leads to employee complaints as tasks that should be handled by three or more people are left to one or two people, resulting in longer completion times.

## II. METHODS

The research steps begin with literature review and field observations until the data collection goals are achieved. Following this, data processing is carried out by determining visit times using random numbers to calculate productive/non-productive activities and the percentage of productive work using Work Sampling. Additionally, other tasks include determining performance ratings and allowances for setting standard times before determining labor requirements.

### A. DETERMINING VISIT TIMES

In this calculation, the first step is to determine the working time and effective working time, then calculate the number of visits using random numbers obtained from a random number generator within the range of 1-50. The number of visits required is calculated as per equation (1).

$$Kunjungan \dots\dots\dots(1)$$

Where:

- W = Effective working time
- t = Time unit in minutes
- s = Duration of each visit

### B. WORK SAMPLING CALCULATION

Work sampling is a method used to measure productivity relatively easily. Work sampling, or often referred to as the Random Observation Method, is a direct measurement activity. This method is based on probability theory or sampling [1]. Therefore, observation of an object under study does not need to be done comprehensively (the entire population) but rather by taking random samples.

A randomly taken sample from a large population group tends to have the same distribution pattern as that of the population. If the sample is sufficiently large, its characteristics will not differ significantly from the characteristics of the population. This work measurement method aims to determine the percentage of productive time a worker has during normal working hours. A worker is assumed to have average skill in completing a task under normal conditions, with allowances added for personal needs, reducing fatigue, and unforeseen events [3].

Steps for conducting work sampling are as follows:

1. Conduct preliminary sampling according to the preparation steps, collecting a sample of more than 30 data points to obtain a value. The formulas used for calculating average productivity are given in equations (2) and (3).

$$\dots\dots\dots(2)$$

$$\dots\dots\dots(3)$$

Where:

- = Average productivity
- = Average
- pi = Percentage productive/period i
- ni = Number of observations per day
- k = Number of observation days

2. Observe the uniformity of the data, determining control limits using equations (4) and (5).

$$\text{Upper Control Limit} \dots\dots\dots(4)$$

$$\text{Lower Control Limit} \dots\dots\dots(5)$$

Calculate the number of observations needed for a 5% precision level and 95% confidence level using equation (6).

$$N' \dots\dots\dots(6)$$

Where:

- N' = Required number of data points

3. Once data collection is complete, and N' N is determined, the p (proportion) obtained is the value to be assessed.

4. Based on the P information, further processing is done. For calculating standard time, the standard time is calculated using equation (7).

$$Wb \dots\dots\dots(7)$$

### C. PERFORMANCE RATING

Performance Rating is a comparison of the actual performance of an operator with the concept defined under normal performance conditions [4]. Performance measurement can be done in four ways:

1. Skill and Effort Rating: This involves determining ratings based on the skills and efforts demonstrated by the operator during work, considering other allowances.
2. Speed Rating: Based on a single factor, which is the speed or pace of the operator's work. This method involves comparing the speed or pace of the operator's work with the normal capability concept.
3. Westinghouse System's Rating: A method used to measure an individual's work performance against four criteria: skill, effort, working conditions, and consistency in performing tasks.
4. Synthetic Rating: A method for evaluating an operator's work pace based on predetermined time values. The procedure involves usual work measurement and comparing the measured time with the known standard times for work elements.

**D. ALLOWANCE**

Allowance is typically used to represent the amount permitted as a percentage of the standard time, which is then added to that time. The required allowances are classified into three categories: Personal Needs Allowance, which considers the time needed for workers to attend to personal needs; Fatigue Allowance, which accounts for the fatigue experienced during a job; and Delay Allowance, which covers delays that are unavoidable due to factors beyond the worker's control [3].

In the work sampling method, an allowance is something that must first be established by standardizing the work methods used. By identifying idle times, the primary goal of this activity is to minimize activities classified as "Non-productive" to the smallest possible percentage. This can be achieved by improving work methods, accurately allocating machine or human workloads, and other related measures (Wignjosoebroto, 1995) [5].

**E. STANDARD TIME**

Standard Time is the time required to complete a work cycle using standard work methods and normal speed, considering adjustment factors and adding allowance time for personal needs and other unforeseen circumstances [2]. The formulas for calculating standard time are as follows in equations (8) and (9):

Normal Time (W<sub>n</sub>) .....(8)

Standard Time (W<sub>s</sub>) .....(9)

Where:

W<sub>n</sub> = Normal Time

W<sub>s</sub> = Standard Time

RF = Rating Factors

ALL = Allowance

**F. DETERMINATION OF WORKFORCE REQUIREMENTS**

Calculating the number of workforce requirements aims to determine the optimal number of workers needed to match the actual activities. In this research, the calculation of workforce requirements is based on observations of productive time usage [6]. Once the standard time is known, and the data is consistent and sufficient, the next step is to calculate the workload and the total time required to complete the product. This will allow for determining the standard workforce requirements, as outlined in equations (10), (11), and (12):

BK .....(10)

WT .....(11)

JTK .....(12)

Where:

BK = Workload

WT = Available Time

JTK = Number of Workers

**III. RESULTS AND DISCUSSION**

The results and discussion obtained from this study consist of both primary and secondary data that are related. The working hours are from 08:00 WIB to 16:00 WIB, with a total working time of 8 hours and a 1-hour break from 12:00 WIB to 13:00 WIB. Performance rating is also used according to the Westinghouse system, which evaluates four factors considered essential for assessing fairness or unfairness in an operator's work: skill, effort, working conditions, and consistency in work, as shown in Table 1.

**Table 1 Performance Rating**

| No | Rating Performance | Value       |
|----|--------------------|-------------|
| 1  | Skill              | Good + 0.06 |
| 2  | Effort             | Good + 0.05 |

|              |                    |        |             |
|--------------|--------------------|--------|-------------|
| 3            | Working Conditions | Good + | 0.02        |
| 4            | Consistency        | Good + | 0.01        |
| <b>Total</b> |                    |        | <b>1.14</b> |

There are also factors influencing allowances as shown in Table 2.

**Table 2: Factors Affecting Allowance**

| No                       | Faktor   | Allowance (%) |
|--------------------------|--|---------------|
| 1                        | Labor expended   | 10%           |
| 2                        | Work attitude  | 3%            |
| 3                        | Work movements   | 4%            |
| 4                        | Eye fatigue  | 7%            |
| 5                        | Working temperature (normal)                               | 3%            |
| 6                        | Atmospheric conditions (good ventilation)                  | 5%            |
| 7                        | Good environmental conditions (work cycle 30 - 60 seconds) | 3%            |
| <b>Total</b>             |  | <b>35%</b>    |
| <b>Kebutuhan pribadi</b> |  | <b>2%</b>     |
| <b>Allowance total</b>   |  | <b>37%</b>    |

The allowance obtained must be further increased by an additional 2% for personal needs, resulting in a total allowance of 35% + 2% = 37%. Additionally, sales data per month obtained from the sales staff is shown in Table 3.

**Table 3: Sales Data for 2022**

| No | Month     | Total Sales |
|----|-----------|-------------|
| 1  | January   | 17,346      |
| 2  | February  | 7,206       |
| 3  | March     | 10,523      |
| 4  | April     | 6,544       |
| 5  | May       | 6,427       |
| 6  | June      | 13,082      |
| 7  | July      | 15,785      |
| 8  | August    | 17,759      |
| 9  | September | 15,246      |
| 10 | October   | 12,956      |
| 11 | November  | 11,865      |
| 12 | December  | 12,357      |

In the data processing phase, the obtained data, both from primary and secondary sources, will be analyzed using the Work Sampling method through several stages. Given that the working hours are 8 hours with a 1-hour break, the effective working time is 7 hours. Productive and non-productive elements are identified as shown in Table 4.

**Table 4: Elements**

| Elements         |                    |
|------------------|--------------------|
| Productive       | Non-Productive     |
| A. Journal Entry | D. Chatting        |
| B. Archiving     | E. Using Phone     |
| C. Photocopying  | F. Going to Toilet |

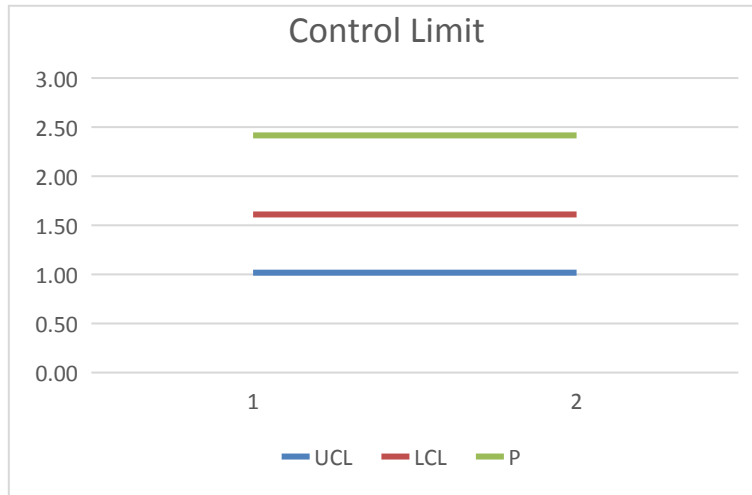
The result of the visit calculation using Equation (1) is 42 visits. When calculated using random numbers, the result is 1 visit per day. The next step involves testing data consistency, with Table 5 summarizing Bu Tantin's data and Table 6 summarizing Pak Edo's data. This is followed by calculations using Equation (2) for average productivity and Equation (3) for average quantity, then using Equations (4) and (5) to determine control limits.

**Table 5: Recap of Bu Tantin's Data**

| Activity | Observed Frequency Day- | Total |
|----------|-------------------------|-------|
|----------|-------------------------|-------|

|                       |          |          |          |    |
|-----------------------|----------|----------|----------|----|
|                       | <b>1</b> | <b>2</b> | <b>3</b> |    |
| <b>Productive</b>     | 20       | 28       | 28       | 76 |
| <b>Non-Productive</b> | 7        | 7        | 4        | 18 |
| <b>Jumlah</b>         | 27       | 35       | 32       | 94 |
| <b>% Productive</b>   | 74%      | 80%      | 88%      |    |

After calculation, Bu Tantin's productivity percentage is 74% with an average productivity of 80.52% (0.81) and an average quantity of 31. Thus, the upper control limit (UCL) is 1.02 and the lower control limit (LCL) is 0.59. As shown in Figure 1 below, the UCL is below, the LCL is in the middle, while productivity is above. Therefore, Bu Tantin's data is considered non-uniform.

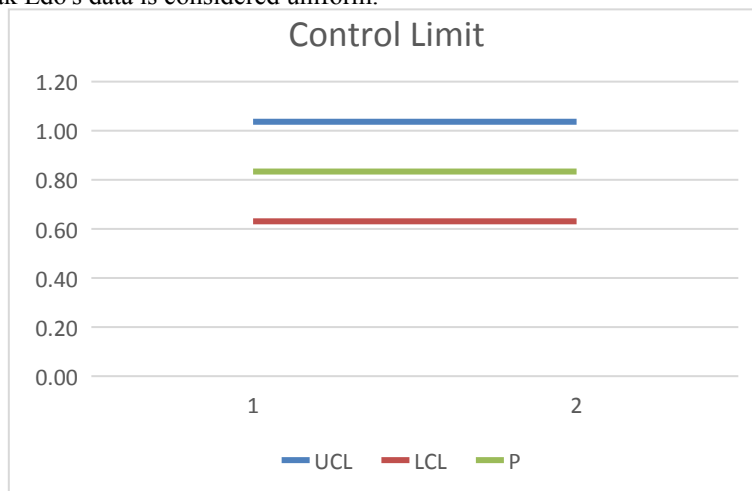


**Fig. 1 Data Consistency Test Graph for Bu Tantin**

**Table 6: Recap of Pak Edo's Data**

| Activity              | Observed Frequency Day- |     |     | Total |
|-----------------------|-------------------------|-----|-----|-------|
|                       | 1                       | 2   | 3   |       |
| <b>Productive</b>     | 25                      | 29  | 222 | 76    |
| <b>Non-Productive</b> | 5                       | 5   | 5   | 15    |
| <b>Jumlah</b>         | 30                      | 34  | 27  | 91    |
| <b>% Productive</b>   | 83%                     | 85% | 81% |       |

Pak Edo's productivity percentage is 83% with an average productivity of 83.37% (0.83) and an average quantity of 30. Thus, the upper control limit (UCL) is 1.04 and the lower control limit (LCL) is 0.63. As shown in Figure 2 below, the UCL is above, the LCL is below, and productivity is between the two control limits. Therefore, Pak Edo's data is considered uniform.



**Figure 2: Data Consistency Test Graph for Pak Edo**

Next, a sufficiency test is conducted using Equation (6). For Bu Tantin's data, the average productivity is 0.81 and the total data is 94, with the required data amount being 24. Hence,  $N' < N$  indicates that the data is sufficient. For Pak Edo's data, the average productivity is 0.83 and the total data is 91, with the required data amount being 20. Hence,  $N' < N$  indicates that the data is sufficient. Standard time is then established using Equation (8) for calculating normal time and Equation (9) for calculating standard time. The calculations for Bu Tantin result in a normal time of 0.9234 and a standard time of 0.9277 minutes per unit. For Pak Edo, the calculations result in a normal time of 0.9462 and a standard time of 0.9497 minutes per unit.

The final step involved determining the number of labor requirements using Equation (10) for workload, Equation (11) for available time, and Equation (12) for the number of workers needed. The total sales for 2022 amounted to 147,096 units, with an average monthly sale of 12,258 units. In the payment processing section, where Bu Tantin was observed, the workload was calculated to be 11,371 units per minute, with available time being 5,760 minutes, resulting in the need for 0.001974 workers. In the marketing department, where Pak Edo was observed, the workload was calculated to be 11,641 units per minute, with available time also being 5,760 minutes, resulting in the need for 2.0217 workers.

#### IV. CONCLUSION

1. From the calculations and analysis, applying the work sampling method has proven to be quite effective in helping determine the number of employees needed in the office department. By implementing the work sampling method, a clear picture can be obtained regarding how employees' work time is utilized, including both productive and non-productive activities. This approach also allows for the collection of representative data without the need for continuous observation, making it more efficient in terms of time and resources. Consequently, this method aids in making more accurate decisions regarding labor requirements in the office department.
2. Based on the processed data, using standard time analysis as a reference, the optimal number of employees in the office department can be determined to efficiently handle the workload. This ensures that there is neither an excess nor a shortage of labor, which ultimately can enhance productivity and operational efficiency in the office department.

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