



An Analysis of the Mental Workload on Procurement and General Affairs Department Employees at PTPN IV Directors Office Medan Master of Management Universitas Sumatera Utara

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Abstract. Perkebunan Nusantara IV (Persero) is a state-owned enterprise that is engaged in the agro-industry business field. The purpose of this research is to analyze the mental workload of employees and determine the cause of the mental workload with the fishbone diagram method. The population of this study was 32 workers in the procurement and general affairs department, and the number of samples was 32 workers with a saturation sampling technique. The selected system was NASA-TLX, which is a method that calculates mental workload subjectively. This methodology measures the workload components: Mental Demand, Physical Demand, Temporal Demand, Own Performance, Effort, and Frustration. The results of the measurements show aspects of TD and MD most dominant by values of 37% and 31%. Based on the calculation of the final NASA TLX score, it is known that six employees have a high level of mental workload, 25 people have a medium mental workload, and 1 person has a very high mental workload. Based on the fishbone diagram, the factors that affect the cognitive burden on procurement and general employees are increased work activities and additional work outside the job description due to the reduced number of employees. In addition, the high time pressure at work caused by the short working time is the reason for the increased mental workload felt by employees.

Keywords: Fishbone Diagram · Mental Workload

1 Introduction

Each person's ability can be seen from two things, namely, physical and mental. From a physical point of view, it is related to the individual's ability to work using his limbs or body. Meanwhile, from a mental point of view, it is related to the mental and perceptual abilities of the individual in dealing with work situations or with his work. The workload can be interpreted as the number of activities carried out by employees for a certain period under normal working conditions [1]. The disparity between the workload demands of a task and the optimal mental load capacity of an individual in a motivated state is called mental workload [2].

In order not to experience significant fatigue, the workload given to employees must be adjusted and balanced with the physical and mental abilities of the employees who are given responsibility for the work [3]. Workload analysis has several benefits, including as a basis for planning the time used

To complete a job, optimizing existing human resources so that there is no shortage of work or excessive work and also as a basis for determining the balance of the division of labour between units or parts that need to be worked on exist in a company or organization [4].

In creating a more agile, efficient, and effective organization, PTPN IV Medan has restructured the organization from 14 sections to 9. These changes, of course, create an additional workload for each section head because there is a merging of two or three sections into one section and a streamlining of the number of subsection heads.

The Procurement and General Affairs Section is one of the sections in PTPN IV Medan, which has increased roles and responsibilities after the organizational restructuring. After organizational restructuring, there was a change in the divisions and subsections, where there was a merger between the logistics and general divisions into procurement and general divisions. There was also a change in the subsections where initially, five subsections became four.

The organizational restructuring also led to a change in the number of employees in the general procurement department. The Table 1 shows the number of employees in the general procurement department before and after organizational restructuring. The data is show by Table 1.

The Table 1 shows that there is a change in the number of employees in the procurement and general department, where the number of employees decreased by

Nineteen people after the organizational restructuring. The transfer of employees to the plantation unit and other parts resulted in the addition of job descriptions and workloads in the positions left by the employee. If work demands exceed one's capacity, this condition can cause overstress and work accidents. Conversely, work demands that are lower than one's capacity can lead to stress and burnout [5].

According to the explanation above, it is known that since the organizational restructuring and the joining of the procurement and general divisions, there have been complaints of an increase in the mental burden on employees caused by multiple jobs and additional work activities due to the delegation of tasks from one worker to another due to the limited number of employees. A too-high workload will result in a high-stress level, while a low workload will create a sense of saturation and boredom or stress [6].

Table 1. Data on the Number of Employees of the General Procurement Section of PTPN IV Medan.

No	Part	Before Organizational Restructuring	After Organizationa; restructuring
1	Procurement	29	16
2	General	22	16
Amount		51	32

Workload includes several factors that influence workers' mental processing of information, decision-making processes, and responses from a person. In a study conducted by Junaedi et al. [7] regarding the measurement of mental workload with the NASA-TLX method, it was found that 13 operators with high workload levels, four operators with very high workload levels, and two operators with medium workload levels. Several factors positively correlate with the mental workload, namely age, gender, type of work, and profession [8].

In measuring the mental workload, the researchers used the NASA-TLX method to subjectively measure the mental workload of employees. Furthermore, the fishbone diagram method is used to determine the cause of the mental workload of the six indicators in the NASA-TLX questionnaire calculation and provide suggestions regarding improvements to reduce the mental workload experienced.

Based on additional information from the author's interview with the Head of Procurement and General Affairs. He said that since the organizational restructuring from 14 to 9 divisions and the merging of the procurement division with the general division, there is no definite guideline for calculating the mental workloads that occur. The company wants to know whether the mental workload in the company is optimal. Therefore, mental workload analysis is essential.

1.1 Research Purposes

Under the background and formulation of the problem, this study aims to

1. Calculate and analyze the factors that affect the mental workload of employees in the procurement and general office of the directors of PTPN IV Medan using the NASA-TLX method.
2. Provide recommendations for improvement proposals to minimize the mental workload experienced by employees of the procurement and general office of the PTPN IV Medan board of directors.

1.2 Literature Review

Job analysis is a procedure carried out to determine the duties of the position and the specifications of the right human resources to occupy the position [9]. The workload is the level of work that must be carried out. For example, the working hours are very high, and the amount of work pressure and responsibility is significant for the work at hand [10]. Anisa & Arastawa, [11] It has categorized the workload measurement into two, namely:

1. Subjective measurement is a measurement carried out under the assessment and reporting by employees of the perceived workload on a task that must be completed. In general, the measurement will be done with a rating scale.
2. Performance measurement is a measurement that is carried out by observing aspects of the actions that employees take. One measure of this type is the dimension in which the measurement is carried out concerning the working time to complete a particular job.

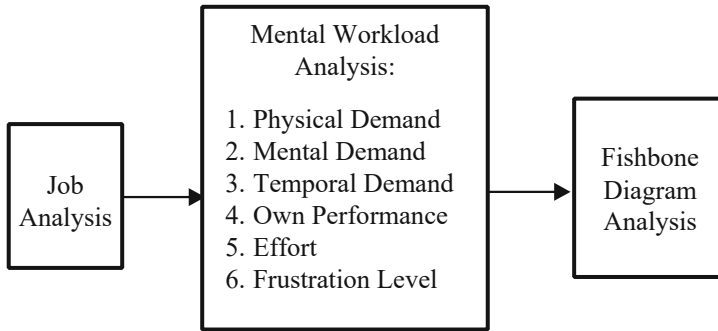


Fig. 1. Conceptual Framework

The conceptual model illustrates that job description data will be obtained by conducting a job analysis, which will influence the mental workload analysis with NASA-TLX. The NASA-TLX method consists of weighting and rating in the form of MD, PD, TD, OP, EF, AND FL. Furthermore, the fishbone diagram method is used to determine the cause of the mental workload of the six indicators in the calculation of the NASA-TLX questionnaire and provide suggestions regarding improvements to reduce the mental workload experienced.

Based on this description, it can be described in the proposed conceptual framework as follows: (see Fig. 1).

2 Methods

The research to be carried out is descriptive, a method that aims to provide a systematic, factual, and accurate description of the facts and characteristics of a subject that will be used in research [12]. The purpose of this study is to investigate in detail the activities and work of a person to find facts that are known from the results of interviews and observations, but not to test the hypothesis.

This research was conducted at the Office of the Board of Directors of PT Perkebunan Nusantara IV Medan, located on Letjen Suprpto Street No. 2 Medan, and will be held from March 2022 to June 2022. The population of this study was 32 workers in the procurement and general affairs department, and the number of samples was 32 workers with a saturation sampling technique.

The stages of data collection are distributing questionnaires, observations, and in-depth interviews with tall employees who will be examined. Data were collected using the methods of observation, interviews, focus group discussions (FGD), and the NASA-TLX questionnaire. The system that was chosen was NASA-TLX, which is a method that calculates mental workload subjectively. This methodology measures the workload components, namely MD, PD, TD, OP, EF, and FL. Table 2 show mental workload scale as follow:

Table 2. Mental Workload Scale

No.	Scale Type	Rating	Information
1.	MD	Low, High	How much mental effort is required in your work?
2.	PD	Low, High	How much physical effort is required to tint your work?
3.	TD	Low, High	How much pressure that related to time to finish your work?
4.	OP	Perfect, Fail	How big is your level of success in doing your work?
5.	EF	Low, High	How much mental and physical work is needed to complete your work?
6.	FL	Low, High	How many levels of anxiety, and feeling of stress do you feel when doing your work?

The measurement steps using NASA-TLX are as follows [13]:

1. Weighting

In this section, the respondent will be asked to determine one of the two indicators which according to him is the dominant factor in influencing the mental workload in a job. The NASA-TLX questionnaire is presented in the form of pairwise comparisons. From the questionnaire, a calculation will be made of each indicator that is considered the most dominant in giving effect. The number of tallies becomes a weight for each indicator of mental load.

2. Rating

In this section, the respondents will be asked to give an assessment of the six indicators of mental load. The assessment is carried out in a subjective manner according to the mental burden felt by each respondent. In order to find out the load score, After knowing the weights and ratings of each indicator, it will be multiplied and calculated then the last step is to divide by 15.

3. Calculating product value

This is obtained by multiplying the ranking by the weight of the factors on each descriptor. This will result in 6 product values on 6 indicators:

$$\text{Product} = \text{rating} \times \text{weight factor}$$

4. Calculating Weighted Workload (WWL) Acquired by adding up the six product values

$$\text{WWL} = \sum \text{product}$$

5. Calculating the average WWL

Acquired by dividing WWL by the total weight

$$\text{score} = \frac{\sum \text{product}}{15} \tag{1}$$

6. Score Interpretation

Based on the NASA-TLX theory, the workload score obtained is divided into five parts, namely: (see Table 3).

Table 3. Mental Workload Classification

Category	Score
Very Low	0–9
Low	10–29
Medium	30–49
High	50–79
Very High	80–100

3 Result and Discussion

3.1 Characteristics of Respondent

Table 4 show frequency distribution of employees at PTPN IV Medan as follow:

Based on Table 4, it is known that there are 17 male employees or 53.1%, and 15 female employees, or 46.9%. It is also known that the majority of employees are over 45 years old, namely 14 people (43.8%, at the age of 26-35 years as many as 6 people (18.8%), and at the age of 36-45 years as many as 12 people (37.5%). It is also known that the majority of employees are 12 people (37.5%) graduate, 4 people (12.5%) have a postgraduate background, 5 people (15.6%) have a diploma, 9 people (28.1 %) high

Table 4. Distribution of employees at PTPN IV Medan

No.	Characteristic		Frequency	
			No.	Percent (%)
1.	Gender	Male	17	53.1
		Female	15	46.9
2.	Age	26–35	6	18.8
		36–45	12	37.5
		>45	14	43.8
3.	Education Level	Junior High School	2	6.3
		High School	9	28.1
		Diploma	5	15,6
		Bachelor	12	37,5
		Master	4	12.5
4.	Work Period	1–10 years	4	12.5
		11–20 years	15	46.9
		21–30 years	11	34.4
		>30 years	2	6.3

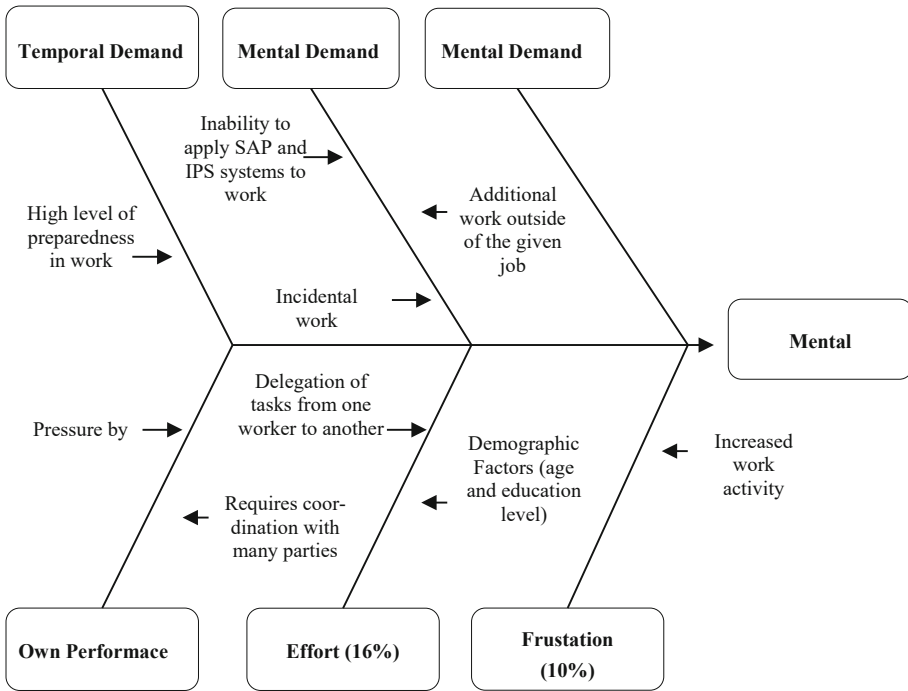


Fig. 2. Mental workload analysis based on fishbone diagram

school graduates, and 2 people (6.3%) who have a junior high school background. It is also known that the majority of employees have a working period of 11-20 years as many as 15 people (46.9%), 4 people work 1-10 years (12.5%), 11 people work 21-30 years (34, 4%) and working period > 30 years as many as 2 people (6.3%).

3.2 Fishbone Diagram

Fishbone diagrams aim to show the correlation between cause and effect besides that they can help show the possible causes of certain events. One of the benefits of a fishbone diagram is that it can help determine the root cause of a problem with a structured approach [14]. The causes of the mental burden on procurement and general employees, which are presented using the fishbone diagram method, can be seen in Fig. 2.

3.3 Discussion

Mental Workload Analysis Using the NASA-TLX Method

Figure 3 show classification of mental workload of procurement and general employees.

Based on Fig. 3, it is known that 25 (78.1%) employees have a moderate mental workload, 6 (18.8%) have a high mental workload and 1 (3.1%) have a very high mental workload. This shows that most of the procurement and general employees have a moderate mental workload. Employees who have a heavy mental workload are mostly

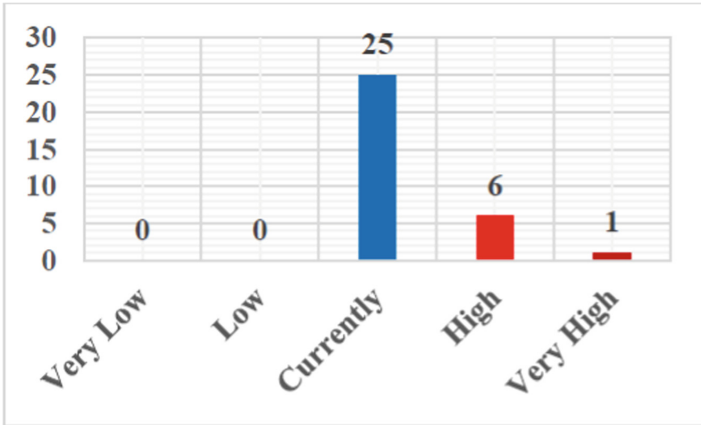


Fig. 3. Classification of mental workload of procurement and general employees.

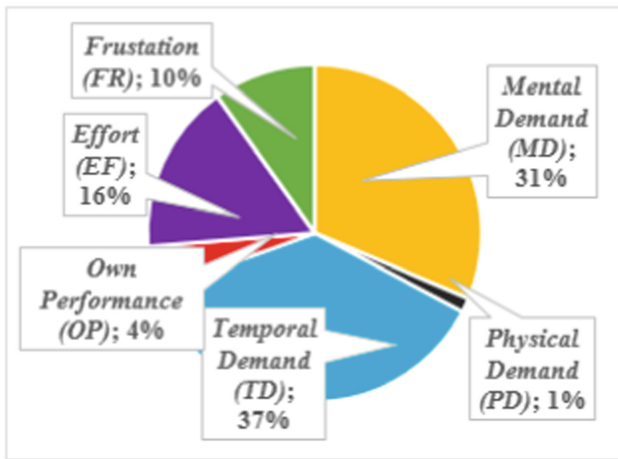


Fig. 4. Mental Workload Percentage for Each Indicator.

procurement clerks, household affairs clerks, and transportation/protocol clerks. Figure 4 show mental workload percentage for each indicator.

Based on Fig. 4, the indicators that most influence the mental workload of procurement and general employees are Temporal Demand at 37%, followed by Mental Demand at 31%, Effort at 17%, Frustration at 10%, and Own Performance at 4%. While the lowest is Physical Demand at 1%.

3.4 Managerial Implication

The company should be able to further clarify the division of duties and responsibilities of each employee in the procurement and general department, both main tasks and additional tasks so that employees can know with certainty the tasks and responsibilities

that must be completed. Thus, there are no more employees who feel burdened with additional work that comes from their superiors and previous employees.

The company also can provide education and training for household affairs assistants related to improving the ability to operate the SAP system (Application and Processing System) and the IPS system (Integrated Procurement System) on the job. Providing education and training can create optimal work results and reduce the mental burden experienced by employees.

In dealing with the high mental workload of experienced procurement assistants and Transportation/protocol officers, Companies can do job enrichment and job enlargement for employees with a low mental burden. Companies can shift some of the work from employees with a high mental burden to employees with medium and low mental loads. When the workload is in the high category, it will cause stress at work due to the inability of the worker or individual to fulfill the assigned task or job [15].

The company needs to review the description of the main tasks and how the employees work so that there is no stress or overstress on the mental workload of employees. Often excessive workloads are caused by workers having too much work to do every day [16]. When a given task exceeds one's capacity, the person concerned must adapt to the situation or it can cause a decrease in his performance [17].

4 Conclusion

1. Based on the calculation of the final NASA-TLX score, it is known that 6 workers have a high level of mental workload, 25 people have a medium mental workload, and 1 person has a very high mental workload. Workers who have a high mental workload are Procurement Assistants, Household Affairs Assistants, and Transportation/Protocol Officers. The aspects that most influence the magnitude of the mental workload on procurement and general employees are the temporal demand and mental demand aspects of 37% and 31%, respectively.
2. Based on the fishbone diagram, the factors that affect the mental burden on procurement and general employees are the increase in work activities and additional work outside the job description due to the reduced number of employees. In addition, the high time pressure at work caused by the short working time is the reason for the high mental workload felt by employees.

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