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Employee Workload Assessment in The Service and Manufacturing Industry

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Abstract

In the face of the COVID-19 pandemic, the industry has implemented new policies in managing its workforce, one of which is by reducing employees. The reduction of employees in the industry causes an excessive workload on several work units in the industry, both the service industry and the manufacturing industry. To perform better manpower management, management in the industry needs to know the workload of employees in each work unit.

This is quantitative research by taking a case study of one sample of the service industry involving 110 respondents and the manufacturing industry involving 90 respondents. The Modified Cooper Harper (MCH) method is applied as a tool to get an overview of the workload of employees in each category in the two industries. The workload of employees in the observed division was calculated using the MCH formula, and then heavy, medium, and light workloads were classified accordingly. In addition, an analysis will be carried out to determine the factors that influence the achievement of the workload. From the results of the study, it was found that the classification of the heavy, medium and light workloads occurred in both the service industry and the manufacturing industry. There are significant differences between each workload classification in the service industry. However, these results did not occur in the manufacturing industry. External and internal factors affect the workload of employees in the two industries, but their influence in the two industries is different.

Keywords: Workload, Service Industry, Manufacturing Industry

INTRODUCTION

In carrying out business activities, the industry needs to be supported by a good performance from its employees. Employee performance is the result of the quality and quantity of work achieved by employees in an industry. Employee performance will continue to increase if the tasks or responsibilities assigned are in accordance with their work abilities. Therefore, the industry is required to consider and regulate the workload of its employees so that each employee has a portion of the workload that is in accordance with his work abilities.

In the face of the COVID-19 pandemic, the industry has implemented new policies for managing its workforce. This policy is a challenge for industry participants in Indonesia. According to a press release issued by the Ministry of Industry on September 25, 2020, the Director-General of KPAII of the Ministry of Industry, Dody Widodo, there are eight challenges that industry players in the country are facing as a result of the COVID-19 pandemic's impact, one of which is a decrease in production utility due to physical distancing, with the number of employees being reduced until temporary layoff (Siaran Pers Kemenperin, 2020).

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Some industries also reduce imports of raw materials and sales. Some employees are laid off and work alternately, reducing production capacity, demand for orders decreases, and sales turnover also decreases drastically (Pikiran Rakyat, 2020). According to the Ministry of Industry's 2020 Edition of Industrial Media, there were 6.9 million unemployed workers, 3.5 million laid-off employees, and 3 million new workers (Media Industri Kemenperin, 2020). The condition of reduction in the workforce resulted in an increase in the workload of certain work units in the industry. The number of work activities that are not balanced with the number of employees results in an increase in the workload of employees. One of the determining factors for employee workloads is the intensity of work assignments. (Nwinyokpugi, 2018). Work units with heavy workloads require an additional workforce to balance the workload of their employees, according to various studies that recommend adding employees to work units with heavy workloads (Irlana,2020; Maesaroh, 2021). Work assignments also need to be adjusted to the competencies and capacities of employees. The competence and capacity of employees in accordance with their work assignments will make the balance of workload and assigned tasks to be fulfilled (Inegbedion,2020).

An increase in workload certainly occurs not only in the manufacturing industry but also in the service industry. There are differences in job characteristics, interactions between humans and machines, and product outputs between the two industries. In the manufacturing industry, the increase in workload is more measurable than in the service industry. This occurs because the manufacturing industry's output is physically apparent. While the characteristics of services are generally not visible, so the difference between the manufacturing and service industries is obvious (Gasperz, 1997).

Workload research that has been carried out so far has focused on measuring physical workloads in the manufacturing industry. Many workload studies also examine the relationship between workload and other factors but do not measure the weight of their workload. There have been no simultaneous measurements of the physical and mental workload of employees in the service and manufacturing industries. This research will take each type of service and manufacturing industry. The sample of the service industry is a banking company (PT.X), and the manufacturing industry is a company that produces steel (PT.Y). In both industries, one work unit was selected that had the highest employee workload complaints. The work unit studied at PT. X involved 110 employees, and the work unit studied at PT. Y involved 90 employees. All employees in the selected units were used as respondents, and their workload was assessed using the Modified Cooper Harper (MCH) method. This method is a subjective assessment method with an approach that takes into account the combination of scales between physical and mental work; this approach is also very easy, efficient, and suitable for use in various fields of work, especially in human systems that require perception, monitoring, evaluation, communication, and decision making from man.

The purpose of this research was to get an overview of the workload of employees in each category in both industries. The factors that influence the workload in the two industries will also be analyzed. By knowing the category of workload, management is expected to be able to do better manpower planning.

LITERATURE REVIEW

The workload is a collection or number of activities that must be completed by an organizational unit or position holder within a certain period of time. The workload can be in the form of task demands or work, organization, and work environment (Manuaba, 2000). The workload can be in the form of physical or mental (Tarwaka, 2004). Each employee has different abilities in relation to the workload. There are people who are better suited to take on physical responsibilities, but there are others who are better suited to doing work that places more mental or social responsibilities on them. The type of work affects the workload received by its employees, whether it is a physical workload that requires muscle strength or a mental workload that requires more thought. In addition, the workload can also be interpreted as a combination of quantitative and qualitative workloads (Munandar, 2011).

Quantitative workload arises because the tasks are too many or too few. While the qualitative workload, if the worker feels unable to carry out the task or the task does not use the skills or potential of the worker (Munandar, 2011). Too much workload can cause tension in a person, causing stress. This can occur when the required degree of skill is too high, the work speed is too fast, the job volume is too large, and so on (Sunyoto, 2012).

Various forms of research have been done., but there is no research that describes the workload of the service industry and the manufacturing industry simultaneously. Previous workload research looked at the relationship between workload and other factors. In research that looked at the relationship between the workload of nurses and caring for nurses in the medical emergency department, Prof. Dr. R. D. Kandou Manado found that there was a relationship between the workload and caring for nurses and recommended increasing the number of implementing nurses working in the emergency department (Robot, 2015). In addition, there was a research that analyzed the relationship between workload and satisfaction of nurses in the inpatient installation of Aceh Tamiang Regional General Hospital. From the findings of the research, it was found that there was a relationship between qualitative workload and job satisfaction among nurses (Kurniawan, 2021). Another study analyzed the effect of compensation and workload on employee performance and found that there was no simultaneous influence between compensation and workload variables on employee performance at PT. Ocean Puranabile Abadi Bitung (Ramenusa, 2021). Several studies have also applied the modified Cooper Harper method, but only in one industry. Research in recent years includes research on the mental workload analysis of supply chain division employees and improvement with the Cooper Harper method. The finding shows that there are two activities that fall into the category of heavy workload (Handika, 2021). There is also research on the analysis of the production workload using the DRAWS and MCH methods at PT. Sendang Biru Tuban, and it was found that there was a physical workload on shift 1 and a mental workload on shifts 2 and 3 (Widyasti, 2021).

Physical Workload

The physical workload is work that requires the physical energy of human muscles as a source of energy (Tarwaka, 2004). Physical work is also a manual operation where work performance will completely depend on humans who function as sources of energy or work controllers. Physical work can also be connoted with vigorous work during the working period. In physical work, energy consumption is the main factor that is used as a benchmark for determining the weight/lightness of a job. Physical work will result in changes in the function of the body's organs which can be detected through (Tayyari, 1997) :

1. Oxygen consumption

2. Heart rate
3. Circulation of air in the lungs
4. Body temperature
5. Concentration of lactic acid in the blood
6. Chemical composition in blood and urine
7. Evaporation rate
8. Other factors

Physical work will release energy which is closely related to energy consumption. Energy consumption at a working time is usually determined in an indirect way, namely by measuring:

1. Heart rate
2. Oxygen consumption

The severity of the workload received by an employee can be used to determine how long a worker can carry out his work activities in accordance with the ability of work capacity in question. The heavier the workload, the shorter a person's time to work without fatigue and significant physiological disturbances or vice versa. On the other hand, if the workload given is too light, it will cause boredom for someone or an employee. The main need in muscle movement is the need for oxygen carried by the muscles for burning substances to produce energy. One indicator of loading during work is the amount of oxygen consumed by the body. As a result, every job activity requires the use of energy generated by the combustion process.

Mental Workload

Mental workload is the difference between mental work demands and the mental abilities of the employee concerned. The workload that arises from mental activity in the work environment is caused, among others, by the need to remain in a state of high alertness for a long time, making decisions that involve great responsibility, decreased concentration due to monotonous activities, lack of contact with other people and an isolated workplace.

Measurement of mental workload can be done with two approaches, namely the objective method and the subjective method (Young & Stanton, 2002). Measurement of mental workload with objective methods can be measured using a physiological approach from workers such as measuring heart rate, eye blinking, and muscle tension. At the same time, the subjective method is a workload measurement based on the subjective perception of employees. The subjective measurement method is the easiest way to estimate the mental workload of an employee. In general, the method involves asking employees how they feel about the load range on the task they are performing. The formation of a rating scale is acceptable and easy for employees to do in determining the weight of their workload. Questionnaires and personnel interviews might be implemented.

Factors Affecting Workload

There are many factors that affect the workload. But in general, the factors that affect the workload consist of two factors, namely external factors and internal factors. According to (Manuaba, 2000) the factors that affect the workload are:

1. External Factors

The external factor of workload is the workload that comes from outside the worker's body. External workload aspects are often referred to as stressors. Included in the external workload are:

a. Tasks

There are physical tasks, such as work layout, work stations, work tools and facilities, working conditions, work attitudes, and work aids. There are also mental tasks, such as the complexity of the work and responsibility for the work.

b. Work organization

Work organization affects workload, for example, length of work time, rest time, shift work, wage system, night work, duties, and authority.

c. Work environment

The work environment that can affect the workload is included in the additional burden due to the work environment. For examples, the physical work environment (lighting, noise, mechanical vibration), chemical work environment (dust, air pollutant gases), biological work environment (bacteria, viruses, and parasites), and psychological work environment (labor placement).

2. Internal Factors

Internal factors workload is factors that come from within the body itself a result of a reaction from the external workload. This reaction is known as strain. Included in the internal workload are:

a. Somatic factors, namely gender, age, body size, health condition, nutritional status.

b. Psychological factors, namely motivation, perception, belief, desire, satisfaction, etc.

The Modified Cooper Harper (MCH) Method

The Modified Copper Harper method is a method used to analyze the physical and mental workload faced by employees who have to perform various activities in their work. The MCH method is a subjective assessment method. This subjective assessment method has advantages, namely a high level of validity, easy to implement, easy to understand by respondents, does not require high costs, and does not interfere with the work of respondents because it can be done after the work is done.

In the MCH method, this rating scale is in the form of a decision tree, stating that this approach is very easy, efficient, and suitable for use in a variety of work fields (Gawron,2000). The Cooper Harper scale was one of the first standardized scales for measuring workload, which was originally developed to evaluate aircraft handling qualities. Furthermore, the instrument was developed so that it can be applied more broadly to various types of work involving human-machine systems that require perception, monitoring, evaluation, communication, and decision making from humans.

The MCH scale consists of a decision tree and a 10-point score scale that ranges from easy (1) to impossible (10) (Wierwille and Casali 1986)

The paradigm in the Modified Cooper Harper method is divided into 4 factors :

1. Statement of adequacy for the selection of the job or operator required.

2. Characteristics of the job.

3. Fulfilling the needs of operators in selecting the required work.
4. Assessment of operator workload categories.

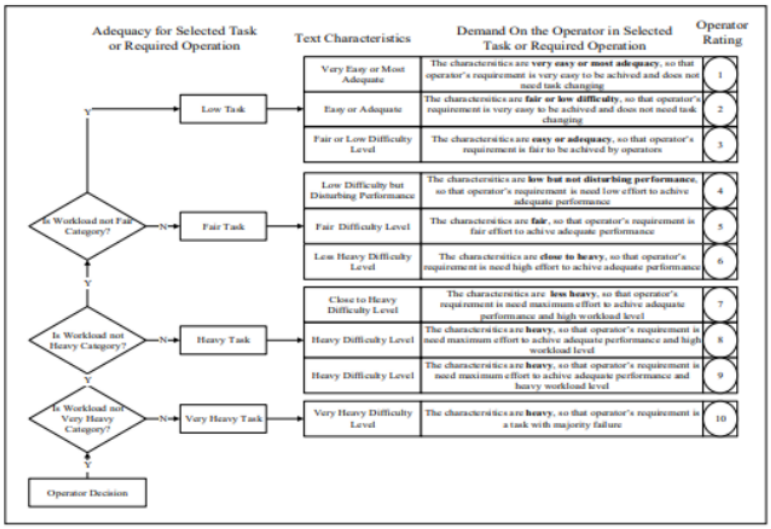

Figure 1 MCH Method Scale

The stages of assessing the employee's workload category are as follows:
1. Determination of Rating (Rating) Employee Workload Category on Job Characteristics
Determination of the rating (rating) of the employee on the characteristics of the work given a value or score (scale) between 1 to 10 where the distribution is adjusted to the category of job characteristics of the employee.
2. Determination of Employee Workload Weighting

After the stage of measuring the workload using the Cooper Harper Scale method, then determining the weighting of the workload on the work carried out by the employee with the following conditions:
1. For the light work category, with very easy/very desirable work characteristics, the weighting of the workload is less than 10% (<10%).
2. For the light work category, with very easy/quiet desirable work characteristics, the weighting of the workload is between 11% to 20% (11% - 20%).
3. For the light work category, with normal work characteristics/light difficulty level, the weighting of the workload is between 21% to 40% (21% - 40%).
4. For the medium work category, with light difficulty level work characteristics but interfering with performance, the weighting of the workload is between 41% to 45% (41% - 45%).

5. For the medium work category, with medium difficulty work characteristics, the weighting of the workload is between 46% to 55% (46% - 55%).
6. For the medium work category, with the difficulty level of work tending to be heavy characteristics, the weighting of the workload is between 56% to 60% (56% - 60%).
7. For the heavy work category, with slightly difficult work characteristics, the weighting of the workload is between 61% to 65% (61% - 65%).
8. For the heavy work category, with quite difficult work characteristics, the weighting of the workload is between 66% to 75% (66% - 75%).
9. For the heavy work category, with heavy difficulty work characteristics, the weighting of the workload is between 76% to 80% (76% - 80%).
10. For the very heavy work category, with very heavy work characteristics, the weighting of the workload is between 81% to 100% (81% - 100%).

METHODOLOGY

This research is a case study using a quantitative research approach. The research began by conducting preliminary research on PT. X represented the banking service industry and PT. Y represented the manufacturing industry of steel producers. Data collection techniques in this preliminary research are:
a. Literature Research
Literature research is intended to obtain a theoretical basis related to research.
b. Field Research
This research begins with discussions with companies in both industries to determine the division where the data is collected. The division where the data was collected was determined by several considerations, namely the division where there was a reduction in the employees, the type of work handled was quite a lot, and there were employee complaints related to the workload. From the results of the discussion, the Frontend and production divisions were selected, then proceeded with a direct review to PT. X in the Frontend division and PT. Y in the Production division.
From the preliminary research, it was found that the company's problems in more detail were related to the workload of employees.

The next stage is collecting data using a questionnaire. Questionnaires were distributed to 110 employees in the front-end of PT.X and 90 employees in the production of PT.Y. The selection of respondents in both industries is by purposive sampling method, which is adjusted to research objectives.

In the MCH Questionnaire, respondents will provide self-identity, assessment of workload categories, and rating values on work activities carried out. At the stage of giving an assessment of the workload category, the respondent will give an assessment of the light (R), medium (S), heavy (B), and very heavy (SB) categories. Then from this assessment, respondents give a rating of their work activities with a score of 1 to 10 depending on the perceived workload. Rating 1 indicates the lowest load, and rating 10 indicates the heaviest load. Rating assessment is carried out to find out which work activities have a higher workload than other work activities. From the overall rating assessment, the workload weight of each work activity will be generated. The working weight of each work activity will be classified into industrial work weights into heavy workload values, medium, and light.

In the next stage, the researchers conducted a Focus Discussion Group to formulate the factors that affect the value of the workload in each industry by referring to the factors stated in Manuaba, 2000

FINDINGS AND DISCUSSION

Service Industry Workload

At PT.X the Frontend work unit is divided into 3 work units, namely the Pdu, Xdy, and 30dpd sections. The assessment of workload categories, rating values , and workload weights is carried out in the three parts of the work unit. Table 1 shows the classification of heavy workloads; table 2 shows the classification of medium workloads, and table 3 shows the classification of light workloads.

Table 1 Heavy Workload Weight

Work Unit	Activity	Workload Weight (%)	Category
Pdu	Employees call customers with the system	78,00	Heavy work category with heavy difficulty work characteristics
Xdy	Employees visit customers to the office/home	75,71	Heavy work category with heavy difficulty work characteristics
30dpd	Employees visit customers to other places	76,00	Heavy work category with heavy difficulty work characteristics
	Employees visit customers to the office/home	77,60	Heavy work category with heavy difficulty work characteristics

Table 2 Medium Workload Weight

Work Unit	Activity	Workload Weight (%)	Category
Pdu	Employees print customer bill	46,80	Medium category with medium difficulty work characteristics
Xdy	Employees print customer bill	45,14	Medium category with medium difficulty work characteristics

Table 3 Light Workload Weight

Work Unit	Activity	Workload Weight (%)	Category
Pdu	Employees call customers manually	24,00	Light work category, with normal work characteristics/light difficulty level
	Employees meet customers at the Jakarta Kota branch	32,00	Light work category, with normal work characteristics/light difficulty level
	Employees call customers with the system	13,43	Light work category, with very easy/quite desirable work characteristics
Xdy	Employees call customers manually	32,00	Light work category, with normal work characteristics/light difficulty level
	Employees meet customers at the Jakarta Kota branch	33,71	Light work category, with normal work characteristics/light difficulty level
30dpd	Employees prints customer bill	32,00	Light work category, with normal work characteristics/light difficulty level
	Employees meet customers at the Jakarta Kota branch	20,80	Light work category, with normal work characteristics/light difficulty level

From the table, it can be seen that the heavy workload weight in the service industry ranges from 76 to 78%. This value illustrated the characteristics of the work of the level of difficulty. Medium workload weight ranges from 45 to 47%. This value illustrated the level of difficulty is medium and low but interferes with performance. Light workloads range from 14 to 32%. This value illustrated the work characteristics are easy, and reasonable and the level of difficulty is light.

Manufacturing Industry Workload

At PT. Y the Production work unit is divided into 4 work units, namely the cutting, drilling, welding, and setting. The assessment of workload categories, rating values, and workload weights is carried out in the four parts of the work unit. Table 4 shows the classification of heavy workloads, table 5 shows the classification of medium workloads, and table 6 shows the classification of light workloads.

Table 4 Heavy Workload Weight

Work Unit	Activity	Workload Weight (%)	Category
Cutting	Cutting	68,33	Heavy work category, with quite difficult work characteristics
Welding	Welding	70,50	Heavy work category, with quite difficult work characteristics
	Grinding	73,50	Heavy work category, with quite difficult work characteristics
Setting	Assembling	76,43	Heavy work category, with heavy difficulty work characteristics
	Pre-Welding	70,00	Heavy work category, with quite difficult work characteristics

Table 5 Medium Workload Weight

Work Unit	Activity	Workload Weight (%)	Category
Cutting	Final Check	53,33	Medium work category, with medium difficulty work characteristics
Drilling	Drilling	54,23	Medium work category, with medium difficulty work characteristics
Welding	Cleaning	47,00	Medium work category, with medium difficulty work characteristics
Setting	Lifting	57,14	Medium work category, with the difficulty level of work tending to be heavy characteristics,

Table 6 Light Workload Weight

Work Unit	Activity	Workload Weight (%)	Category
Cutting	Measurement	29,33	Light work category, with normal work characteristics/light difficulty level
	Smoothing	34,00	light work category, with normal work characteristics/light difficulty level
Drilling	Clamp	26,54	light work category, with normal work characteristics/light difficulty level
	Marking	34,62	light work category, with normal work characteristics/light difficulty level
	Center punch	30,38	light work category, with normal work characteristics/light difficulty level
Welding	Post cleaning	32,00	light work category, with normal work characteristics/light difficulty level
Setting	Final assembly	32,86	light work category, with normal work characteristics/light difficulty level

From the table, it can be seen that the heavy workload in the manufacturing industry ranges from 68 to 77%. This value illustrated the work characteristics of the difficulty level are quite heavy to heavy. Medium workload weight ranges from 53 to 57%. This value illustrated the level of difficulty is moderate to tends to be heavy. Light workloads range from 27 to 35%. This value illustrated the characteristics of a job with a light difficulty level.

Based on the result findings, there are significant differences between each workload weight in the service industry. However, this is not the case in the manufacturing industry.

In the service industry, heavy workloads occur in work activities that involve interaction between humans and humans, while in medium and light workloads, work activities involve interactions between humans and machines.

Factors that affect the workload in the service industry

1. External factors: more mental tasks than physical tasks
2. Internal factors: the existence of psychological factors, trust, and desire to complete work targets

Both of these factors are related to the interaction between humans and humans.

Factors that affect the workload in the manufacturing industry
1. External factors: more physical tasks than mental tasks
2. External factors: influenced by the physical work environment
3. Internal factors: influenced by somatic factors, namely gender, age, body size, and health conditions.

CONCLUSION

The conclusion of this research is that the classification of heavy, medium and light workloads occurs in both the service industry and the manufacturing industry. The heavy workload weight value is 76 to 78% in the service industry and 68 to 77% in the manufacturing industry. The medium workload weights value is 45-47% in the service industry and 53-57% in the manufacturing industry. The light workload weights value is 14-32% in the service industry and 27-35% in the manufacturing industry. From the value of the workload weight, it can be seen that there is a significant difference in weight in the service industry. Employees' subjective assessments of their workload can have an impact on these differences.
External and internal factors affect the workload of employees in the service and manufacturing industries, but the influence in the two industries is different. The service industry is more influenced by mental tasks and related interactions between humans and humans. In the manufacturing industry, there are more physical work tasks than mental tasks, and the interactions involved in work activities are more human-machine interactions. Improvements need to be made by management in an industry, especially in work units that have a heavy workload, while still paying attention to government regulations and policies applied to the industry in the face of the COVID-19 pandemic.
The limitation of this research is that the number of samples only represents one service and manufacturing industry. Further research can be developed by increasing the number of industry samples so that the findings are more representative of the actual workload of employees in both types of industries.

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