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Workload Analysis to Establish the Ideal Staffing Level Using the Workload Analysis (WLA) Method (Case study of Manufacturing Design Engineering Production Laboratory, in Indonesia)

Emma Dwi Ariyani[1*], Achmad Muhammad[2], Nabila Hikmatus Sya'diah[3], Supriyadi Sadikin[4], & Yeni Latipah[5]
[1,2,3,4,5] Department of Engineering Technology Management, Faculty of Mechanical Engineering, Politeknik Manufaktur Bandung**, Indonesia**
* Corresponding author: emma@polman-bandung.ac.id
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Abstract

As a pivotal unit in manufacturing process, the Manufacturing Design Engineering Laboratory plays a critical role in the beginning of manufacturing, dealing with the process of designing and developing new products. Hence, assessing the workload perceived by the employees of Manufacturing Design Engineering Laboratory is significant to ensure the optimal number of workers as a way to maintain the productivity and efficiency of manufacturing process. In this study, there are five areas of expertise (KBK) of Manufacturing Design Engineering Laboratory which were evaluated namely Press Tool, Moulding, Jig & Fixture, Metrology, and General Mechanic. By applying workload analysis method, the five expertise were measured based on their workload and other correlated aspects called performance rating and allowance. The Findings show that the average workload for employees in the Press Tool Expertise Area is 91.42%, with an optimal number of 4 employees. Meanwhile, in the Moulding Expertise Area, the average employee workload is 68.2%, with an optimal number of 2 employees. In the Jig & Fixture Expertise Area, the average employee workload is 62.65%, with an optimal number of 2 employees. In the Metrology Expertise Area, the average employee workload is 87.96%, with an optimal number of 3 employees. Lastly, in the General Mechanic Expertise Area, the average employee workload is 90.24%, with an optimal number of 7 employees. Five more workers are needed, bringing the total from 13 to 18, in light of the task difficulties that have been discovered. Even after the number of employees has been established, changes like a fair workload division need to be made.

Keywords: Workload, Manufacturing Design Engineering Laboratory, Workload Analysis (WLA), Total Workforce.

1. Introduction

In the context of rapid technological advancements and intensifying industrial competition, manufacturing companies are demanded to ensure the standard of workers performance in order to meet their organizational objectives (Mijatović, Uzelac & Stoiljković, 2020; Reid & Sanders, 2013). Maintaining the quality and the quantity of the workers is essential for the operational dynamics of an industry and assuring their productivity is necessary for the successful execution of company processes (Putra, Handoko &Haryanto, 2020). One of the major factors affecting employee performance is the scale of the workload. Workload is the outcome of an interplay between various factors such as the tasks, demands, skills, work environment, behavior, and perceptions of the employee (Hidayat & Sutopo, 2021). It is intricately linked to the process of time analysis in the completion of assigned tasks. An excessive workload can induce stress and impair performance, while an insufficient workload may lead to inefficiency or result to wastage (Kurniawan, Yulianah, & Shaura, 2022). Thus, effective workload management is a critical aspect in maintaining both productivity and efficiency of the workforce (Boomer & Fendley, 2018).

A significant challenge in workload management lies in the planning and distribution of tasks among employees, which can lead to either overload or underload. To mitigate this issue, the Workload Analysis (WLA) method could be employed to assess workload and to determine the optimal staffing levels (Wibawa, Sugiono & Efranto, 2014; Hanjani & Singgih, 2019). Workload Analysis (WLA) involves analyzing the workload of each employee based on their individual job descriptions. This analysis is based on productivity, comparing the frequency of activities that align with and deviate from the job descriptions performed by each employee. Before applying workload analysis, it is essential to measure both productive and non-productive activities of employees. Productive activities refer to when employees are performing their job tasks, whereas non-productive activities include time spent on personal matters, fatigue, waiting time, absenteeism, and searching for equipment (Wibawa et al., 2015). In this regard, WLA is also influenced by correlated factors which are called performance rating and allowance (Irwan & Leksono, 2021). By considering skills, effort, working conditions, and consistency according to the rating system, the level of employee adjustment in completing their tasks can be assessed.

Apart from those, in the manufacturing sector, the Design Engineering Production Laboratory plays a pivotal role in the manufacturing process. Employees within this laboratory pose various responsibilities, including product design planning, prototype testing, design refinement, and product evaluation. Establishing the optimal workforce size in the Manufacturing Design Engineering Production Laboratory is crucial for achieving operational efficiency and ensuring high-quality design outcomes. An insufficient number of employees can lead to excessive workload on the remaining staff, resulting in stress, decreased quality of designs, increased risk of errors in the design process, and delays in product development. Conversely, an excessive number of employees can result in high-cost waste, inefficient and suboptimal use of labor, leading to overall wastage. A high level of waste in manufacturing, particularly on the production line, can obstruct the flow to subsequent stages, thereby impeding production time efficiency (Gaspersz, 2011; Magdalena, 2020).

Concerning the issue, the objective of this study is to analyze the workload of employees in the Manufacturing Design Engineering Production Laboratory using the Workload Analysis (WLA) method to ascertain the optimal number of personnel required. To reach this objective, two research questions are formulated, namely:

1. What is the workload encountered by employees in the Manufacturing Design Engineering Production Laboratory?
2. What is the optimal number of employees needed to manage the workload efficiently in the Manufacturing Design Engineering Production Laboratory?

2. Theoretical Studies

2.1. Workload Theory

According to Minister of Home Affairs Regulation No. 12/2008, workload is the amount of work assigned to a specific position or organizational unit, calculated as the product of work volume and time norms. Concisely, workload is a set of activities that must be completed by an organizational unit within a certain period of time. Workload can be categorized into physical workload and mental workload (Diniaty, 2016). In this context, physical workload denotes the disparity between job demands and the worker's ability to meet those demands. Meanwhile, mental workload refers to the discrepancy between the mental demands of a job and the mental capacity of the worker.

The relationship between workload and work capacity is influenced by various complex factors, both internal and external (Soleman, 2011). External factors refer to workload that originating outside of the worker's body, such as physical tasks, work duration, work environment, etc. Meanwhile, internal workload factors stem from within the worker's body itself and arise as a reaction to the existing external load. Internal factors include somatic factors (gender, age, body size, nutritional status, health condition) and psychological factors (motivation, perception, beliefs, desires, and satisfaction).

In this regard, workload measurement can be divided into three main categories (Diniaty, 2016); Subjective Measurement which is based on the worker's assessment of the workload they perceive, usually using a rating scale; Performance measurement which involves observing the worker's behavior or activities, including measuring the time required to complete a task under certain working conditions; Physiological measurement which measures workload by monitoring the worker's physiological responses, such as pupil reflex, eye movements, muscle activity, and other bodily responses while completing specific tasks.

2.2 Waste

Waste refers to activities or processes within production that fail to add value to the final product or service. Such inefficiencies contribute to the increased costs and diminished productivity, without enhancing the quality or utility perceived by the consumer (Gaspersz, 2011). Meanwhile, the types of waste that occur in manufacturing or service processes are often called The Seven Wastes. Those are frequently abbreviated with the term TIMWOOD (transportation, inventory, motion, waiting, over-processing, overproduction, and defects). Within the framework, this study only focuses on "Waste of Waiting". Waste of waiting occurs when semi-finished goods are not moving or being processed. Some waiting time is caused by poor material flow, excessive distance between workstations, or overly long production processes.

This waste can lead to the increasing of workload for employees, putting them at risk of work-related stress, which further decreasing the quality of their work. Waste of waiting hinders the production process, commonly due to a lack of operators or production designers (Magdalena, 2020). In the context of manufacturing design engineering, waste of waiting highly disrupt the process of drawing producing because it increases the lead time for the company. If lead time increases, the company will suffer time-related losses. Thus, the waste should be avoided since it can cause the failure to meet deadlines which further result in the company losing customers or diminishing customer satisfaction.

2.3 Adjustment Factor (Performance Rating)

Dealing with workload analysis, a crucial aspect to be assessed is the appropriateness of the work performance demonstrated by the workers. Performance Rating is an evaluative step following the measurement of work time, aimed to assess the appropriateness of the operator's work speed (Sutalaksana, 2006). This adjustment factor ensures that the measurement of work time aligns with reasonable standards since the work speed that is excessively fast or slow could affect task completion time. It appears to be caused by external or internal factor such as poor working conditions or low motivation.

Several methods could be employed to determine performance rating, namely percentage Method, Shumard Method, and Westinghouse Method. This study purposefully chose Westinghouse as the method, in which the work appropriateness is rated bade on four factors; skill, effort, working conditions, and consistency, as explain in the table 1.

Table 1: Adjustment Factor Westinghouse (Sutalaksana, 2006).

Factor	Category	Symbols	Adjustment (P)
Skill	*Super skill*	A1	+0,15
		A2	+0,13
	Excellent	B1	+0,11
		B2	+0,08
	Good	C1	+0,06
		C2	+0,03
	Average	D	0,00
	Fair	E1	-0,05
		E2	-0,10
	Poor	F1	-0,16
		F2	-0,22
Effort	*Excessive*	A1	+0,13
		A2	+0,12
	Excellent	B1	+0,10
		B2	+0,08
	Good	C1	+0,05
		C2	+0,02
	Average	D	0,00
	Fair	E1	-0,04
		E2	-0,08
	Poor	F1	-0,12
Working Condition	*Ideal*	A	+0,06
	Excellent	B	+0,04
	Good	C	+0,02
	Average	D	0,00
	Fair	E	-0,03
	Poor	F	-0,07
Consistency	*Perfect*	A	+0,04
	Excellent	B	+0,03
	Good	C	+0,01
	Average	D	0,00
	Fair	E	-0,02

The operator's working speed indicates the rate of movement during the work process. If the evaluator believes the operator is working above the normal speed (too fast), the p-value will be greater than one ($p > 1$). Conversely, if the operator is perceived to be working below the normal speed, the p-value will be less than one ($p < 1$). Lastly, if the evaluator believes the operator is working at a reasonable speed, the p-value will be equal to one ($p = 1$).

2.4 Allowance

Allowance refers to additional time allocated to employees for short breaks and personal needs (Wignjosoebroto, 2003). This time is included in the total calculation of the duration of task completion. Allowances are provided for three main reasons; personal allowance, fatigue allowance, and unavoidable disruption allowance (Budaya, 2018). These three types of allowances are crucial for ensuring that employees can work efficiently while maintaining their well-being.

1. Personal Allowance: Covers activities such as drinking, using the restroom, engaging in religious practices, or conversing with colleagues to alleviate stress. These are basic needs essential for maintaining employee productivity and well-being.
2. Fatigue Allowance: Aimed at reducing fatigue that could decrease productivity and work quality.
3. Unavoidable Disruptions Allowance: Addresses interruptions that cannot be avoided in the job, such as waiting for instructions from supervisors, technical issues with equipment, or unexpected tasks.

2.5 Workload Analysis

Workload Analysis is a procedure that provides tools for calculating the number of employees, the standard for labor allocation, and indicates the number of employees needed for each position (Budaya, 2018; Hasibuan, 2018). Ultimately, workload analysis is closely related to fluctuations in market demand for the company's goods and services, as well as to the fulfillment of human resources needed to meet the market demand for commodities (Mangkuprawira, 2003). According to the National Institutes of Health, Workload Analysis is a descriptive representation of the workload required by an organizational unit. It provides information on resource allocation, communication priorities, and identifies the skills and training required by employees to complete their workload.

The analysis method calculates the number of employees needed for a position or extension, and the number required to fill that position (Ahmad et al., 2023). There are three main stages in workload analysis methods (Hermanto & Windyarini, 2020):

1. Questionnaire Method: Involves creating a list of open-ended questions detailing the duties of each employee/position. This method will be adjusted based on job analysis results.
2. Interview Method: involves interviewing each employee or position with specific duties and functions.
3. Direct Observation Method: Involves directly observing the tasks performed by a position holder.

Workload Analysis consists of two parts. The first part involves determining the number of work activities required and what needs to be completed in the upcoming year for each organizational unit. Each work activity, measurement unit, data source used, and other considerations must be clear, consistent, and accurate. The second part involves determining the time required to complete work activities based on their discipline.

Workload can be calculated as follows (Sutalaksana, 2006):

$$\text{Workload} = \frac{Wbx \sum output}{\sum minutes\ of\ observation}$$

$$= \frac{(\%p\ productive \times \sum minutes\ of\ observation) \times p \times (1+l) \times Y}{Y \times \sum minutes\ of\ observation}$$

$$= \%\ productive \times P\ (1+L)$$

P = Performance; L = Allowance; Y = Total minutes of observation

As a reference, the labor workload should ideally approach or be equal to 100%. The calculation of labor, which could result in three possibilities, is as follows:

1. Workload at the time of measurement = 100% means the number of workers and the workload at the time of measurement are well-balanced, indicating that the number of workers is appropriate for the volume of work required.
2. Workload at the time of measurement > 100% indicates that the number of workers and the workload at the time of measurement are generally above normal levels, meaning additional workers are needed because the current workers are handling an excessive workload.
3. Workload at the time of measurement < 100% means the number of workers exceeds the workload at the time of measurement, and a reduction in workers may be necessary to balance the workload and the labor force (Ningrat, 2021).

The workload obtained determines the number of workers needed by the company. The calculation of the required number of workers is as follows:

$$\text{Optimal number of employee} = \frac{total\ \text{workload}}{\text{current number of employee}}$$

The result of this calculation is the optimal number of workers and can provide a basis for the company to make decisions regarding the addition of workers, reduction of workers, or transfer of workers to other divisions to ensure that the workload of each worker is balanced and optimal.

3. Research Method

Research method is a series of steps or procedures used to search for and obtain the necessary data, which is then processed into information relevant to the problem being studied. The procedures consist of problem-solving process which enable researchers to hypothesize, estimate, and analyze the issues. The steps that will be undertaken in this research are as follows:

1. Measurement of Productive and Non-Productive Time: This measurement is conducted to calculate the amount of time needed by employees in the Production Laboratory to complete their tasks, which is done through total minute of observations.
2. Data Uniformity Test: This test is performed to verify whether the data is uniform or falls within the upper control limit (UCL) and lower control limit (LCL). Data is considered uniform if it comes from the same cause system and lies within the control limits. If it comes from different cause systems and lies outside the control limits, the data is considered non-uniform.
3. Measurement of Allowances and Performance Rating: This step involves determining the allowances including personal allowances, fatigue allowances, and unavoidable delay allowances. The adjustment factor, also known as the performance rating, aims to normalize the time obtained from employee performance measurements by accounting for variables such as effort, skill level, and work environment.
4. Measurement of Work Efficiency Rate: The step is to determine the work efficiency rate of the employees in the Production Laboratory based on the total workload percentage for each worker in completing tasks.
5. Measurement of Optimal Employee Number: This step is conducted to determine the optimal number of employees to be assigned in the Production Laboratory of the Manufacturing Design Engineering Department.

The data of respondent was collected from the Production Laboratory in the Department of Manufacturing Design Engineering, as presented at table 2.

Table 2: Data of Areas of Expertise (KBK) Respondent

No	Group of Expertise (KBK)	Total Employee	Status
1	Prestool	1	Lecturer
		2	PLP
2	Moulding	1	PLP
3	Jig & Fixture	1	PLP
4	General Mechanic	6	PLP
5	Metrologi Measurement	2	PLP
	Total	13	1 Lecture, 12 PLP

4. Result and Discussion

4.1 Performance Rating of Each Position

The calculation for determining the Performance Rating (Adjustment) can be conducted by aggregating all factors that influence the speed at which an individual completes a task. The sum of these factors is then increased by a value of 1, representing the standard for normal work performance. The four key factors in this evaluation are: skill, effort, working conditions, and consistency.

Performance Rating = 1 + Sum of adjustment factor values (Skill = + 0.11; Effort = + 0.08; Working Conditions = + 0.02; Consistency =+ 0.03)

Performance Rating = 1 + 0.24 = 1.24

Based on observations, the performance rating adjustment for each employee, determined in accordance with the Westinghouse method, as presented in table 3 below.

Table 3: The Performance Rating Adjustment for Each Employee

Expertise (KBK)	Skill	Effort	Work Condition	Consitency	Performance Rating
	Presstool				
Employee 1	+ 0,11	+ 0,08	+ 0,02	+ 0,03	1,24
Employee 2	+ 0,08	+ 0,10	+ 0,02	+ 0,03	1,23
Employee 3	+ 0,06	+ 0,05	+ 0,02	+ 0,01	1,14
	Moulding				
Employee 1	+ 0,11	+ 0,12	+ 0,00	+ 0,03	1,26
	Jig & Fixture				
Employee 1	+ 0,11	+ 0,08	+ 0,02	+ 0,03	1,24
	Metrologi				
Employee 1	+ 0,11	+ 0,10	+ 0,02	+ 0,03	1,26
Employee 2	+ 0,11	+ 0,10	+ 0,02	+ 0,03	1,26
	General Mechanic				
Employee 1	+ 0,03	+ 0,05	+ 0,02	+ 0,01	1,11
Employee 2	+ 0,03	+ 0,02	+ 0,02	+ 0,01	1,08
Employee 3	+ 0,08	+ 0,10	+ 0,02	+ 0,01	1,21
Employee 4	+ 0,03	+ 0,05	+ 0,02	+ 0,01	1,11
Employee 5	+ 0,00	+ 0,02	+ 0,02	+ 0,01	1,05
Employee 6	+ 0,03	+ 0,05	+ 0,02	+ 0,01	1,11

4.2 Allowance

The determination of the Allowance (Relaxation) is done by summing external factors that influence an individual's need for relaxation while performing their work. These influencing factors are listed in the allowance table and include: exertion of physical effort, working posture, work movements, eye strain, workplace temperature, atmospheric conditions, a favorable environment, and personal needs.

Allowance = Total of Adjustments Value

A: Exerted energy (5,0%); B: Work attitude (1,0%); C: Working Movement (0,0%); D: Eyes' Fatigue (12,0%); E: Working Temperature (0,0%); F: Athmosphere Condition (0,0%); G: Good Working Environment (0,0%); H: Personal Needs (2,0%)

Based on the results of observations and questionnaires distributed to each employee, the calculated allowance (relaxation time) is as follows:

Table 4: The Calculated Allowance (Relaxation Time) for Each Employee

Employee	Allowance %								Total%
	A	B	C	D	E	F	G	H	
				KBK *Presstool*					
1	5,0	1,0	0,0	12,0	0,0	0,0	0,0	2,0	20
2	5,0	1,0	0,0	12,0	0,0	0,0	0,0	2,0	20
3	5,0	1,0	0,0	12,0	0,0	0,0	0,0	3,0	21
				KBK *Moulding*					
1	6,0	1,0	0,0	12,0	1,0	1,0	0,0	2,0	23
				KBK Jig & Fixture					
1	5,0	1,0	0,0	12,0	0,0	0,0	0,0	2,0	20
				KBK Metrologi					
1	7,0	2,0	0,0	12,0	1,0	1,0	0,0	2,0	25
2	7,0	2,0	0,0	12,0	1,0	1,0	0,0	2,0	25
				KBK General Mechanic					
1	5,0	1,0	0,0	12,0	0,0	0,0	0,0	3,0	21
2	5,0	1,0	0,0	12,0	0,0	0,0	0,0	3,0	21
3	5,0	1,0	0,0	12,0	0,0	0,0	0,0	2,0	20
4	5,0	1,0	0,0	12,0	0,0	0,0	0,0	2,0	20
5	5,0	1,0	0,0	10,0	0,0	0,0	0,0	2,0	18
6	5,0	1,0	0,0	10,0	0,0	0,0	0,0	2,0	18

4.3 Workload Analysis

The calculation of workload aims to determine the extent of the workload received by each employee within each expertise group (KBK) in the Manufacturing Design Engineering Laboratory. Below is an example of the workload calculation for the Presstool expertise group (KBK):

Workload (WLA) = (% productive time × performance rating) × (1 + allowance)

= (0.8311 × 1.24) × (1 + 0.2)

= 123.7

Based on the above calculation, the workload for Employee 1 in the Presstool expertise group (KBK) is 123.7. This workload is considered overload, as the workload exceeds 100.

Below are the results summary of the workload calculations for all expertise groups in the Manufacturing Design Engineering Laboratory.

Table 5: The Calculated of Workload Analysis for Each Employee

Areas of Expertise (KBK)	WLA	Workload
	Presstool	
Employee 1	123,7	*Overload*
Employee 2	128,6	*Overload*
Employee 3	113,4	*Overload*
	Molding	
Employee 1	136,4	*Overload*
	Jig & Fixture	
Employee 1	125,3	*Overload*
	Metrologi	
Employee 1	131,6	*Overload*
Employee 2	132,3	*Overload*
	General Mechanic	
Employee 1	105,1	*Overload*
Employee 2	107,0	*Overload*
Employee 3	114,0	*Overload*
Employee 4	104,0	*Overload*
Employee 5	96,9	*Underload*
Employee 6	103,6	*Overload*

Based on the above calculations, it can be concluded that the majority of employees in the Manufacturing Design Engineering Laboratory experience an overload workload, except for Employee 5 in the General Mechanic expertise group, with a workload of 96.9. The highest workload was found in the Moulding group, with a value of 136.4. Therefore, after determining the individual workloads of each employee, the next step is to calculate the total workload for each expertise group (KBK) in order to determine the required number of workers, ensuring that no employee experiences an overload.

4.4 The Calculation of Optimal Employee Number

In calculating employee work efficiency based on their workload for each expertise group (KBK), these figures can be used to determine the actual number of employees needed. The calculation for each expertise group is as follows.

1. Expertise Group (KBK) Presstool
   After conducting the study, the average workload for operators is found to be 121.9%, which is categorized as overload. Therefore, it is recommended that the Presstool expertise group increase the number of employees from 3 to 4, bringing the average workload down to 91.42%, ensuring that no additional tasks need to be assigned.
2. Expertise Group (KBK) Moulding
   After conducting the analysis, the average workload for employees is found to be 136.4%, categorized as overload. Therefore, it is recommended that the Moulding expertise group add one more employee, increasing the total number of employees to 2, with an average workload of 68.2%. In consequent, more tasks should be assigned to each employee.
3. Expertise Group (KBK) Jig & Fixture

After the study, it was found that the average workload received by employees is 125.3%, which is categorized as overload. It is therefore recommended that the Jig & Fixture expertise group add one more employee, increasing the total to 2, and reducing the average workload to 62.65%. However, more tasks should be assigned to each employee.

4. Expertise Group (KBK) Metrology
   After conducting the analysis, the average workload for employees is found to be 131.95%, categorized as overload. Therefore, it is recommended that the Metrology expertise group add one more employee, increasing the total number to 3, with an average workload of 87.96%.
5. The average workload for employees is found to be 105.28%, categorized as overload. Therefore, it is recommended that the General Mechanic expertise group add one more employee, increasing the total to 7, with an average workload of 90.24%. Additionally, more tasks should be assigned to each employee. If adding employees is not feasible, it is necessarily to redistribute tasks among employees to ensure those with underloaded workloads can assist with tasks from those experiencing overload.

4.5 Analysis and Interpretation

Based on the WLA calculations, it is observed that several employees have a high workload, with values exceeding 100%. However, there is one operator with a notably lower workload, below 100%.

Since all groups have workloads exceeding 100%, additional personnel are needed to reduce the workload below 100%, thereby preventing negative impacts on employee well-being in both the short and long term.

Table 6: Total Employee Before and After Optimalization

No.	Areas of Expertise (KBK)	Before Optimalization		WLA	After optimalization		WLA	Additional Employee
		Employee	Workload		Employee	Workload		
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*(6-3)*
1.	*Presstool*	3	121,9%	*Overload*	4	91,43%	*Underload*	1
2.	*Molding*	1	136,4%	*Overload*	2	68,2%	*Underload*	1
3.	*Jig & Fixture*	1	125,3%	*Overload*	2	62,65%	*Underload*	1
4.	*Metrologi*	2	131,9%	*Overload*	3	87,96%	*Underload*	1
5.	*General Mechanic*	6	105,2%	*Overload*	7	90,24%	*Underload*	1
Total		13			18			5

Based on the calculations, an additional 5 employees are required, increasing the total from 13 to 18. While the number of workers has been determined, adjustments such as equitable workload distribution must be implemented.

For additional Considerations, experts have noted frequent mismatches between expertise groups and tasks, leading to situations where tasks are reassigned to employees with lower workloads to expedite work. Therefore, while the calculation provides an optimal number of staff, it does not account for all expertise groups. The average workload across the Manufacturing Design Engineering Laboratory should be evaluated to ensure effective workforce allocation. To finalize the staff requirements, the average workload across the entire laboratory needs to be calculated, which will provide a clearer picture for further adjustments and task redistribution. Further research suggestions are to add qualitative data from interviews with managers and/or other employees to enrich and validate the accuracy of the quantitative research calculation results.

The waste of waiting that takes place in the laboratory can be decreased by increasing the number of staff because there won't be any work piled up and waiting because no one is doing it. Additionally, if workers are given a regular workload, they will work as efficiently as possible to prevent mistakes and finish duties on time. The results of this study are consistent with earlier research (Boomer & Fendley, 2018), which found that maintaining workforce productivity and efficiency requires appropriate workload management.

5. Conclusion

This study has conducted the workload assessment using the Workload Analysis (WLA) method, carried out at the Manufacturing Design Engineering Laboratory. The workload analysis involved 13 workers which were segmented into 5 specialized areas namely press tool, moulding, jig & fixture, metrology, and general mechanic. The findings reveal the average workload for Press tool specialization group is 121.9% (Overload). In the Moulding specialization group, the average workload is 136.4% (Overload). Meanwhile, in the Jig and Fixture specialization group, the average workload is 125.3% (Overload). Additionally in the Metrology specialization group, the average workload is 131.95% (Overload). Lastly, in the General Mechanic specialization group, the average workload is 105.28% (Overload). Given the identified workload burdens, 5 additional employees are required, increasing the total from 13 to 18. While the number of workers has been determined, adjustments such as equitable workload distribution must be implemented.

In light of the above discussion and conclusions, certain recommendations are proposed. First, an understanding of individual workload levels could provide a fruitful information for institution to ensure appropriate staffing levels. Thereby, workload analysis is an essential tool to be applied in the recruitment decision. Secondly, in the case of where there is an excess of staff or where some employees are underutilized, they should be reassigned the tasks that require more labor and have higher workload demands. Thus, employees with underload scores could achieve a more balanced workload distribution.

The recommendation to analyze workloads and reassign tasks aligns with broader trends in workforce management in manufacturing by supporting lean, agile, and data-driven operations. Reassigning tasks not only maximizes employee productivity and engagement, but also enables the workforce to adapt to changing technology and labor market dynamics. Implementing this approach will help manufacturing companies create a resilient, efficient, and future-ready workplace.

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