JURNAL LOCUS: Penelitian & Pengabdian
Volume 5 No. 9 September 2026, pp 8270-8285
E-ISSN 2829-7334
DOI: 10.58344/locus.v5i9.6388

The Effect of Work Motivation and Workload on Employee Performance Mediated by Work Productivity in Employees of PT Bio Farma (Persero)

Dendi Nurul Fadillah*, Ferikawita Magdalena Sembiring
Universitas Jenderal Achmad Yani, Indonesia
Email: dendi.fadilah@biofarma.co.id*, ferikawita.magdalena@lecture.unjani.ac.id

Keywords:
work motivation, workload, work productivity, employee performance, pt bio farma (persero)

This is an open access article under the CC BY-SA license.

Copyright © 2026 by Author. Published by Riviera Publishing

ABSTRACT

Global health uncertainty and increasing vaccine demand require PT Bio Farma (Persero) to maintain optimal employee performance. However, internal assessments indicate that performance targets have not yet been achieved optimally. This study examined the effects of work motivation and workload on employee performance and evaluated the mediating role of work productivity. A quantitative, descriptive-verificative, cross-sectional research design was applied. Primary data were collected through five-point Likert-scale questionnaires distributed to 326 employees selected from a population of 1,752 using simple random sampling. Data were analyzed using descriptive statistics and partial least squares structural equation modeling (PLS-SEM) with SmartPLS and 5,000 bootstrap resamples. The results showed that work motivation, workload, work productivity, and employee performance were rated as high to very high. Work motivation and workload significantly improved work productivity ($\beta = 0.419$ and $\beta = 0.452$; $p < 0.001$). Work productivity ($\beta = 0.490$; $p < 0.001$) and work motivation ($\beta = 0.345$; $p < 0.001$) significantly enhanced employee performance, whereas workload did not have a significant direct effect ($\beta = 0.017$; $p = 0.365$). Work productivity significantly mediated the effects of both work motivation and workload on employee performance. Therefore, strengthening employee motivation, managing workload proportionally, and fostering productivity were essential strategies for improving employee performance and organizational readiness.

INTRODUCTION

The COVID-19 pandemic that affected Indonesia in early 2020 provided important lessons regarding health security and the national economy (Aisyah et al., 2022; Antriyandarti et al., 2024; Budiman, 2024; Indrawati et al., 2022; Tanra & Tusholehah, 2022). The pandemic disrupted development progress and community economic activities, prompting the government to maintain public purchasing power while accelerating vaccine availability as a long-term strategy to establish population immunity. PT Bio Farma (Persero), as Indonesia's largest vaccine manufacturer, played a significant role in providing COVID-19 vaccines through collaborations with international partners and in-house production facilities in Bandung, West Java, thereby contributing to national economic recovery after the pandemic.

Global health challenges extend beyond the COVID-19 pandemic. Increasing interactions between humans and wildlife are expected to contribute to the rising emergence of zoonotic diseases in the future, particularly because Indonesia's high biodiversity creates

conditions that may increase disease transmission risks. As a vaccine manufacturer in Southeast Asia and among Organization of Islamic Cooperation (OIC) member countries that has obtained prequalification (PQ) certification from the World Health Organization (WHO), Bio Farma has an important responsibility to remain adaptive and responsive in providing vaccines. These include routine vaccines such as measles, polio, novel oral polio vaccine type 2 (nOPV2), tetanus-diphtheria (Td), and bacillus Calmette–Guérin (BCG), as well as newer vaccines such as rotavirus and human papillomavirus (HPV) vaccines for domestic and export markets. Based on company projections, demand for Bio Farma's routine vaccines is expected to increase by 30% by 2030; therefore, optimal employee performance is a key factor in ensuring the company's ability to respond to future challenges.

However, the performance of Bio Farma's employees has not yet reached an optimal level compared with other state-owned pharmaceutical companies. Based on the employee performance ranking of pharmaceutical state-owned enterprises, Bio Farma was categorized as C, below Kimia Farma (B) and Indofarma (B−) (Andina & Luturlean, 2024), as presented in Table 1.

Table 1. Performance Assessment Ranking in Pharmaceutical SOEs

Yes	Company	Categories	Standard
1	Kimia Farma	B	A
2	Indofarma	B-	A
3	Bio Pharma	C	A

Source: Andina & Luturlean (2024)

The data is then validated through internal employee performance data obtained from the Talent Management Department, Bio Farma's Human Capital Services Division. Bio Farma sets an employee performance target at the K100 level for all employees. Table 2 shows that the K100 performance level is still not optimally achieved, while the percentage of low performance levels (K20, K40, and K60) is still relatively high, with almost one-third of the total employees.

Table 2. Bio Farma's Employee Performance Level 2022-2024

Yes	Quantitative Value	Performance Level	2022	2023	2024
1	$K < 70$	K20	0,00%	0,60%	0,45%
2	$70 \leq K < 85$	K40	5,35%	6,40%	7,77%
3	$85 \leq K < 95$	K60	40,41%	32,79%	24,65%
4	$95 \leq K < 105$	K80	53,20%	50,63%	61,71%
5	$K \geq 105$	K100	1,05%	9,58%	5,42%
Number of Employees (people)			1.720	1.671	1.789

Source: Bio Farma's Human Capital Talent Management Department (2026)

The large percentage of low performance levels is suspected to be influenced by several factors, one of which is work motivation which can be reflected in the level of employee attendance delays (Permatasari & Wiguna, 2025). Timely employee attendance consistently reflects discipline, responsibility, and commitment to work, while high attendance delays can disrupt smooth operations and reduce the effectiveness of teamwork.

Table 3. Percentage of Absenteeism for Bio Farma Employees in 2025

Working Hours/ Day	Number of Employees	Number of Normal Business Days	Total Working Hours	Number of Hours Late	Percentage
8	1.788	238	3.404.352	61.552	1,8%

Source: Bio Farma's Human Capital Operational Services Department (2026)

The rate of late absenteeism of Bio Farma's employees in 2025 will be at 1.8%, far above the tolerance desired by management, which is no more than 0% in one year. In addition to work motivation, workload is also an important aspect that needs to be considered because a workload that is too high can reduce employee productivity (Puspa & Sularmi, 2026). One of the indicators of workload can be seen from the number of employee overtime hours, as presented in Table 4.

Table 4. Average Number of Overtime Hours of Employees of the Vaccine Formulation and Filling Department 2

Yes	Work Unit	Average Number of Overtime Hours per Month
1	Production Preparation Section	37 hours
2	Vaccine Formulation Section	27 hours
3	Vaccine Filling Section	36 hours
4	Prefilled Syringe	15 hours

Source: Vaccine Filling Formulation Department 2, Bio Farma (2026)

A high overtime rate is often an indicator that the workload exceeds the normal capacity of employees in regular working hours of 40 hours per week. The average number of employee overtime hours in the Vaccine Formulation and Filling Department 2 shows a fairly high figure, which is around 15 to 37 hours per month. In assessing employee productivity, the Cost of Goods Sold (COGS) value is one of the parameters that can be used, because employee productivity can be seen from the ratio between the company's inputs and outputs (Situmorang & Sudjiman, 2023).

Table 5. Development of COGS Percentage and Number of Bio Farma Employees in 2019 and 2025

Year	COGS Percentage	Number of Employees (people)
2019	43%	1.363
2025	62%	1.739

Source: Accounting and Finance Division; Bio Farma's Human Capital Talent Management Department (2026)

Bio Farma's COGS percentage increased from 43% in 2019 to 62% in 2025, while the number of employees in the same period increased by 27.5% from 1,363 to 1,739 people. The increase in the number of employees was not followed by a proportionate decrease in %COGS, even though Bio Farma targets %COGS in the range of 25-40%. This condition indicates that employee productivity in generating revenue is still a challenge for the company.

One of the novelties in this study is the use of work productivity as a mediating variable in the relationship between work motivation and workload on employee performance. Previous studies have generally analyzed the influence of work motivation and workload on performance directly, so the mechanism that explains how these two variables affect performance has not been comprehensively studied. Theoretically, increasing work motivation and proper workload management does not necessarily result in better performance, but is first reflected in increasing employee work productivity.

To strengthen the initial conjecture regarding the factors that affect the performance of Bio Farma's employees, the authors conducted a pre-research survey of 30 Bio Farma employee respondents related to work motivation, workload, productivity, and employee performance, as presented in Table 6.

Table 6. Results of Pre-Research Survey of Bio Farma Employees (n=30)

Yes	Statement	Yes (%)	No (%)
1	My current work environment is quite comfortable so it makes me more excited to work	73,3	26,7
2	Awards or rewards given by companies make me more motivated to work	83,3	16,7
3	I am satisfied with my role in the company	80,0	20,0
4	My colleagues provide good support and cooperation	80,0	20,0
5	I often have to complete work in a limited amount of time, so overtime is required	46,7	53,3
6	My workload has increased in recent times, so I often feel exhausted	46,7	53,3
7	there's too much work to be done	50,0	50,0
8	I sometimes feel mentally exhausted from work	43,3	56,7
9	I am always able to work efficiently in completing tasks	73,3	26,7
10	My work results are always within the minimum threshold of the criteria set by the company	56,7	43,3
11	Not all work can be completed according to the requested deadline	76,7	23,3
12	I am always productive even when I am under pressure	80,0	20,0
13	I took the initiative to find a job that needed to be completed without having to wait for orders	63,3	36,7
14	I ensure the work complies with the set quality guidelines	100,0	0,0
15	I always get a consistent amount of work done every day	56,7	43,3
16	I am committed to doing my main job to the best of my ability	93,3	6,7

Source: Data processed (2026)

The results of the pre-research survey presented in Table 6 revealed several phenomena relevant to this study, namely: (1) 26.7% of employees felt uncomfortable with the current work environment, which reduced their motivation to work; (2) 50% of employees perceived that their workload was excessive, resulting in increased work demands; (3) 76.7% of employees were unable to complete all assigned tasks within the expected timeframe; and (4) 43.3% of employees felt unable to complete their work consistently on a daily basis.

Based on these phenomena and the previous descriptions, this study aimed to analyze: (1) the conditions of work motivation, workload, work productivity, and employee performance at Bio Farma; (2) the effect of work motivation on work productivity; (3) the effect of workload on work productivity; (4) the effect of work productivity on employee performance; (5) the effect of work motivation on employee performance; (6) the effect of workload on employee performance; and (7)–(8) the role of work productivity in mediating the effects of work motivation and workload on employee performance at Bio Farma. This research was expected to contribute theoretically to the development of human resource management literature, particularly in the vaccine industry, and practically to the Human Capital Services Division of PT Bio Farma (Persero) by supporting more effective management of employee motivation and workload.

METHODS

The research object in this study was employee organizational behavior at PT Bio Farma (Persero), which included work motivation, workload, work productivity, and employee performance. This study employed a descriptive-verificative method with a quantitative approach. The descriptive method was used to describe the research phenomena based on collected data, while the verificative method was applied to test the proposed hypotheses. As the research was conducted within a period of less than one year, a cross-sectional method was

applied, in which data were collected once during a specific period to address the research objectives (Sekaran & Bougie, 2016).

The research variables consisted of independent variables, namely work motivation (X_1) and workload (X_2), an intervening variable, namely work productivity (Y), and a dependent variable, namely employee performance (Z). Each variable indicator was measured using a five-point Likert scale to assess respondents' perceptions of the research variables (Sekaran & Bougie, 2016). The operationalization of the research variables is presented in Table 7.

Table 7. Operationalization of Research Variables

Variable	Sub-variables/indicators	Scale
Work Motivation (X_1), is one of the most important factors in achieving employee performance and job satisfaction (Santamoko et al., 2025)	The Need for Achievement Recognition/Recognition of Work Job Responsibilities The Desire to Grow Opportunities to Thrive Targets to Be Achieved	Interval
Workload (X_2), is the difference between the capacity and ability of workers and the demands of the work that must be faced (Sari et al., 2025)	Employment Conditions Usage of Working Time Mental and Physical Demands	Interval
Work Productivity (Y), is the ability of everyone to produce something desired by utilizing resources effectively and efficiently (Puspa & Sularmi, 2026)	Quantity of Work Work Efficiency Work Effectiveness Resource Utilization Quantity of Work Results Innovation and Continuous Improvement	Interval
Employee Performance (Z), is the result of achievements in carrying out programs and activities that lead to the achievement of the company's goals, goals, vision, and mission (Andina & Luturlean, 2024)	Work Quality Level Responsibility for Work Work Discipline Collaboration Initiatives	Interval

Source: Data processed from a theoretical study (2026)

The data used in this study are primary data collected directly from the original source through the distribution of questionnaires to answer research questions (Sekaran & Bougie, 2016). The population of this study is all employees of PT Bio Farma (Persero) which according to the latest data in May 2026 totals 1,752 people, divided into seven directorates as presented in Table 8.

Table 8. Number of Bio Farma Employee Population by Directorate in 2026

Yes	Directorate	Number of Employees (people)
1	Main Directorate	69
2	Directorate of Principal Vices	386
3	Directorate of Production and Supply Chain	674
4	The Directorate of Human Capital	116
5	Directorate of Research and Development	186
6	Directorate of Finance and Risk Management	209

Yes	Directorate	Number of Employees (people)
7	Sales Directorate	112
Total		**1.752**

Source: Bio Farma's Human Capital Talent Management Department (2026)

The sampling technique used in this study was probability sampling with the simple random sampling method, in which each member of the population had an equal opportunity to be selected as a sample. The sample size was determined using the Slovin formula with a 5% margin of error, resulting in a sample of 326 respondents from a population of 1,752 employees.

The data analysis consisted of descriptive analysis and verificative analysis. Descriptive analysis was conducted by calculating continuum scores to categorize respondents' responses into five levels: very low, low, moderate, high, and very high. Verificative analysis was performed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS software. The structural models were formulated as follows: Model 1 (Work Productivity): $Y = \beta X_1 \rightarrow Y.X_1 + \beta X_2 \rightarrow Y.X_2 + e1$; and Model 2 (Employee Performance): $Z = \beta X_1 \rightarrow Z.X_1 + \beta X_2 \rightarrow Z.X_2 + \beta Y \rightarrow Z.Y + e2$.

The evaluation of the measurement model (outer model) included convergent validity testing through outer loading values (>0.60) and Average Variance Extracted (AVE) values (>0.50), discriminant validity testing through cross-loading analysis, the Fornell–Larcker criterion, and the Heterotrait–Monotrait Ratio (HTMT < 0.90), as well as construct reliability testing using Cronbach's alpha and composite reliability values (≥0.70). The evaluation of the structural model (inner model) included multicollinearity testing using the Variance Inflation Factor (VIF < 5.00), coefficient of determination (R^2), predictive relevance ($Q^2 > 0$), and hypothesis testing through bootstrapping with 5,000 resamples. A hypothesis was accepted when the t-statistic value exceeded 1.645 and the p-value was below 0.05 at a 5% significance level. In addition, the Goodness of Fit (GoF) test was conducted by calculating the square root of the product between average AVE and average R^2 to evaluate the overall model fit.

RESULTS AND DISCUSSION

Respondent Characteristics

The characteristics of the respondents in this study were analyzed based on band level, working period, age, and gender to provide an overview of the representativeness of the sample to the Bio Farma employee population. The results of the recapitulation of the respondents' characteristics are presented in Table 9.

Table 9. Characteristics of Research Respondents (n = 326)

Characteristics	Categories	Percentage (%)
Level Band	Band I	3
	Band II	7
	Band III	29
	Band IV	61
Tenure	0 to 10 years	45
	10 to 20 years	42
	20 to 30 years	10
	> 30 years	3
Age	20 to 30 years old	27
	30 to 40 years old	43

Characteristics	Categories	Percentage (%)
	40 to 50 years old	22
	> 50 years	8
Gender	Men	67
	Women	33

Source: Research Questionnaire (data processed, 2026)

The majority of respondents were in Band IV (61%), namely implementing employees who play a direct role in supporting the company's daily operations. In terms of working period, the majority of respondents were in the range of 0 to 10 years (45%) and 10 to 20 years (42%), which indicates a workforce composition dominated by employees in the early to mid-career phase. Based on age, the majority of respondents were in the productive age range of 30 to 40 years old (43%), while based on gender, the majority of respondents were male (67%). Overall, the distribution of respondents' characteristics was not much different from the composition of Bio Farma's employees as a whole, so the research sample was considered quite representative in describing the condition of the population studied.

Descriptive Analysis Results

Descriptive analysis was carried out to provide an overview of the condition of each research variable based on respondents' responses to 10 statements on each variable. A total recapitulation of scores, percentages, and the fourth category of research variables is presented in Table 10, while the details of scores at the indicator level are presented in Table 11.

Table 10. Recapitulation of Descriptive Analysis Results of Research Variables

Variable	Total Score	Maximum Criterion Score	Percentage (%)
Work Motivation (X_1)	13.241	16.300	81.23 (High)
Workload (X_2)	12.857	16.300	78.88 (High)
Work Productivity (Y)	13.404	16.300	82.23 (High)
Employee Performance (Z)	13.917	16.300	85.38 (Very High)

Source: Data processed (2026)

Table 11. Ideal Score, Total Score, and Percentage per Research Variable Indicator

Variable	Indicator	Ideal Score	Total Score	%
Work Motivation (X_1)	The Need for Achievement	3.260	2.849	87,39
	Recognition/Recognition of Work	3.260	2.417	74,14
	Job Responsibilities	3.260	2.901	88,99
	The Desire to Grow	3.260	2.647	81,20
	Opportunities to Thrive	3.260	2.427	74,45
	Targets to Be Achieved	3.260	2.657	81,50
Workload (X_2)	Employment Conditions	3.260	2.800	85,89
	Usage of Working Time	3.260	2.449	75,12
	Mental and Physical Demands	3.260	2.548	78,16
	Quantity of Work	3.260	2.403	73,71
	Work Efficiency	3.260	2.650	81,29
	Work Effectiveness	3.260	2.676	82,09
Work Productivity (Y)	Resource Utilization	3.260	2.686	82,39
	Quantity of Work Results	3.260	2.620	80,37
	Innovation and Continuous Improvement	3.260	2.772	85,03
Employee Performance (Z)	Work Quality Level	3.260	2.712	83,19
	Responsibility for Work	3.260	2.847	87,33

Variable	Indicator	Ideal Score	Total Score	%
	Work Discipline	3.260	2.883	88,44
	Collaboration	3.260	2.860	87,73
	Initiatives	3.260	2.615	80,21

Source: Data processed (2026)

The work motivation variable obtained a percentage of 81.23% (high category), with the work responsibility indicator as the highest score (88.99%) and work recognition/award as the lowest score (74.14%). The workload variable obtained a percentage of 78.88% (high category), with the highest work condition indicator (85.89%) and the lowest work quantity (73.71%). The work productivity variable obtained a percentage of 82.23% (high category), with the highest indicator of innovation and continuous improvement (85.03%) and the lowest quantity of work results (80.37%). The employee performance variable obtained a percentage of 85.38% (very high category), with the highest indicators of work discipline (88.44%) and the lowest initiative (80.21%). In general, these results show that Bio Farma's employees have good work motivation, are able to manage the workload given, and have high productivity and performance, although aspects of work recognition/reward, quantity of work, and initiative still require further attention from the company.

Verifiable Analysis Results

The verifiable analysis was carried out using the SEM-PLS method with the help of SmartPLS software, starting with testing the validity and reliability of the instrument, followed by the evaluation of the measurement model (outer model), structural model (inner model), Goodness of Fit, and hypothesis testing.

Table 12. Results of the Validity and Reliability Test of Research Instruments

Variable	Range r Calculate	r Table	Cronbach's Alpha	Ket.
Work Motivation (X_1)	0,512 - 0,696	0,108	0,821	Valid & Reliable
Workload (X_2)	0,416 - 0,633	0,108	0,745	Valid & Reliable
Work Productivity (Y)	0,621 - 0,833	0,108	0,910	Valid & Reliable
Employee Performance (Z)	0,452 - 0,781	0,108	0,872	Valid & Reliable

Source: Data processed (2026)

All indicators in the four research variables had a greater calculated r value than the r of the table (0.108), so it was declared valid. Cronbach's Alpha value in all variables was also above the minimum limit of 0.70, so the research instrument was declared to have good internal consistency and was suitable for use in the next analysis.

Measurement Model Test Results (Outer Model)

The evaluation of the measurement model includes convergent validity tests (indicator reliability and Average Variance Extracted), discriminant validity tests (cross loading, Fornell-Larcker criterion, and HTMT), and construct reliability tests. The results of the outer loading testing of all indicators are presented in Table 13.

Table 13. Outer Loading Indicators Research Model

Construct	Indicator	Outer Loading
Work Motivation (X_1)	X_1.1	0,712
	X_1.2	0,760
	X_1.5	0,697

Construct	Indicator	Outer Loading
Workload (X_2)	X_1.6	0,707
	X_1.8	0,786
	X_1.10	0,569
	X_2.1	0,777
	X_2.2	0,733
	X_2.5	0,666
	X_2.9	0,749
	X_2.10	0,796
Work Productivity (Y)	Y1	0,767
	Y2	0,787
	Y3	0,840
	Y4	0,821
	Y5	0,743
	Y6	0,738
	Y7	0,846
	Y8	0,740
	Y9	0,600
	Y10	0,600
Employee Performance (Z)	Z2	0,775
	Z3	0,801
	Z4	0,775
	Z5	0,792
	Z6	0,726
	Z7	0,810
	Z8	0,717
	Z10	0,678

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

All indicators in the measurement model have an outer loading value above 0.60, thus meeting the criteria for convergent validity and being able to adequately represent the latent construct measured. The indicator with the highest loading factor in each construct is the most dominant representation of the construct, as presented in Table 14.

Table 14. Dominant Loading Factor for Each Variable

Yes	Construct	Indicator	Symbols	Loading
1	Work Motivation (X_1)	The Desire to Grow	X_1.8	0,786
2	Workload (X_2)	Quantity of Work	X_2.10	0,799
3	Work Productivity (Y)	Quantity of Work Results	Y7	0,846
4	Employee Performance (Z)	Collaboration	Z7	0,810

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

In the Work Motivation construct, the indicator of desire to develop (X_1.8) is the most dominant indicator; in Workload, the indicator of work quantity (X_2.10) is the most dominant; in Work Productivity, the indicator of quantity of work results (Y7) is the most dominant; while in Employee Performance, the indicator of cooperation (Z7) is the indicator that best reflects the construct. Furthermore, the results of the Average Variance Extracted (AVE), Cronbach's Alpha, and Composite Reliability tests are presented in Table 15.

Table 15. Average Variance Extracted (AVE), Cronbach's Alpha, and Composite Reliability

Construct	Cronbach's Alpha	Composite Reliability	AVE	P Value
Work Motivation (X_1)	0,799	0,806	0,502	0,000
Workload (X_2)	0,806	0,833	0,555	0,000
Work Productivity (Y)	0,913	0,918	0,567	0,000
Employee Performance (Z)	0,895	0,898	0,578	0,000

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

All constructs had AVE values above 0.50, Cronbach's Alpha and Composite Reliability above 0.70, and p-values of 0.000, so that the measurement model was declared to have met the convergent validity and reliability of the construct. The discriminant validity test was then carried out through the cross loading approach (Table 16), the Fornell-Larcker criterion (Table 17), and the Heterotrait-Monotrait Ratio/HTMT (Table 18).

Table 16. Cross Loading Values

Code	Work Motivation (X_1)	Workload (X_2)	Work Productivity (Y)	Employee Performance (Z)
X_1.1	0,712	0,389	0,488	0,443
X_1.2	0,760	0,390	0,465	0,459
X_1.5	0,697	0,445	0,507	0,543
X_1.6	0,707	0,367	0,456	0,579
X_1.8	0,786	0,431	0,536	0,502
X_1.10	0,569	0,396	0,408	0,356
X_2.1	0,466	0,777	0,490	0,406
X_2.2	0,530	0,733	0,661	0,631
X_2.5	0,311	0,666	0,393	0,237
X_2.9	0,359	0,749	0,442	0,292
X_2.10	0,358	0,796	0,472	0,316
Y1	0,510	0,633	0,767	0,541
Y2	0,553	0,536	0,787	0,537
Y3	0,532	0,605	0,840	0,598
Y4	0,533	0,583	0,821	0,613
Y5	0,497	0,500	0,743	0,549
Y6	0,518	0,473	0,738	0,547
Y7	0,534	0,636	0,846	0,602
Y8	0,476	0,504	0,740	0,484
Y9	0,449	0,292	0,600	0,546
Y10	0,479	0,356	0,600	0,513
Z1	0,469	0,424	0,588	0,678
Z2	0,514	0,481	0,617	0,775
Z3	0,587	0,468	0,636	0,801
Z4	0,548	0,389	0,531	0,775
Z5	0,562	0,441	0,570	0,792
Z6	0,480	0,346	0,471	0,726
Z7	0,540	0,416	0,530	0,810
Z8	0,456	0,368	0,505	0,717

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

The results of the cross loading analysis showed that each indicator had a greater loading value in its own construct compared to the cross loading value in other constructs, so that the measurement model had adequate discriminant validity.

Table 17. Fornell-Larcker Criterion Values

Construct	X_1	X_2	Y	Z
Work Motivation (X_1)	0,709			
Workload (X_2)	0,568	0,745		
Work Productivity (Y)	0,676	0,690	0,753	
Employee Performance (Z)	0,686	0,552	0,735	0,761

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

The square root value of AVE on the diagonal of the table (0.709 - 0.761) is greater than the correlation value between constructs in the same row and column, so that all constructs meet the Fornell-Larcker criteria and are declared to have a good degree of discrimination.

Table 18. Value Heterotrait-Monotrait Ratio (HTMT)

Relationship between Constructs	HTMT Value
Workload (X_2) - Work Motivation (X_1)	0,676
Work Productivity (Y) - Work Motivation (X_1)	0,794
Work Productivity (Y) - Workload (X_2)	0,756
Employee Performance (Z) - Work Motivation (X_1)	0,802
Employee Performance (Z) - Workload (X_2)	0,587
Employee Performance (Z) - Work Productivity (Y)	0,813

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

All HTMT values are below the threshold of 0.90, with the highest value in the relationship between Employee Performance and Work Productivity (0.813) and the lowest value in the relationship between Employee Performance and Workload (0.587). Thus, all constructs in this study have met the criteria for discriminant validity so that it is worth continuing at the evaluation stage of the structural model (inner model).

Structural Model Test Results (Inner Model)

The evaluation of the structural model aims to assess the quality of the model in explaining the relationship between latent constructs. The estimated results of the structural model equation are as follows: Work Productivity Model: $Y = 0.419\ X_1 + 0.452\ X_2 + e1$; and Employee Performance Model: $Z = 0.345\ X_1 + 0.017\ X_2 + 0.490\ Y + e2$. Before hypothesis testing, a multicollinearity test was carried out through VIF values (Table 19) as well as determination coefficients (R^2) and predictive relevance (Q^2) tests (Table 20).

Table 19. Value of Variance Inflation Factor (VIF)

Relationship between Constructs	VIVID
Work Motivation (X_1) -> Work Productivity (Y)	1,477
Work Motivation (X_1) -> Employee Performance (Z)	1,910
Workload (X_2) -> Work Productivity (Y)	1,477
Workload (X_2) -> Employee Performance (Z)	1,980
Work Productivity (Y) -> Employee Performance (Z)	2,466

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

All VIF values are below the threshold of 5.00 (ranging from 1.477 - 2.466), so there are no symptoms of multicollinearity between exogenous variables and structural models that are suitable to be continued at the hypothesis testing stage.

Table 20. Values of Determination Coefficient (R^2) and Predictive Relevance (Q^2)

Model/Relationship	Path Coefficients	P Value	f^2	R^2	Q^2
Work Productivity Model	-	-	-	0,594	0,333
X_1 -> Y	0,419	0,000	0,293		
X_2 -> Y	0,452	0,000	0,340		
Employee Performance Model	-	-	-	0,607	0,344
X_1 -> Z	0,345	0,000	0,159		
X_2 -> Z	0,017	0,365	0,000		
Y -> Z	0,490	0,000	0,248		

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

The R^2 value in the Work Productivity model of 0.594 (medium category) indicates that 59.4% of the variation in work productivity is explained by work motivation and workload, with a Q^2 value of 0.333 (> 0) indicating that the model has good predictive relevance. The R^2 value in the Employee Performance model of 0.607 (medium category) indicates that 60.7% of the variation in employee performance is explained by work motivation, workload, and work productivity, with a Q^2 value of 0.344. Workload has the largest effect size (f^2) on work productivity (0.340), while work productivity has the largest effect size on employee performance (0.248) compared to work motivation (0.159) and workload (0.000).

The evaluation of Goodness of Fit (GoF) was carried out by calculating the square root of the average multiplication of AVE and the average R^2. The average of the AVE of the four constructs was (0.502 + 0.555 + 0.567 + 0.578)/4 = 0.5505, while the average of R^2 of the two models was (0.594 + 0.607)/2 = 0.6005, so that GoF = $\sqrt{(0.5505 \times 0.6005)} = \sqrt{0.3306} = 0.575$. This value is above 0.36 so it is included in the large fit category, which shows that the research model has a very good level of suitability in explaining the relationship between constructs comprehensively.

Hypothesis Testing

Hypothesis testing was carried out through a bootstrapping procedure by evaluating the path coefficient, t-statistic, and p-value values. The results of the direct effect and indirect effect tests are presented in Table 21, while the results of the total effects are presented in Table 22.

Table 21. Direct Effect and Indirect Effect Test Results (Hypothesis Testing)

Hypothesis	Relationship between Constructs	Coefficients	t-Statistic	P Value	Remarks
H1	X_1 -> Y	0,419	9,327	0,000	Ha Accepted
H2	X_2 -> Y	0,452	10,170	0,000	Ha Accepted
H3	Y -> Z	0,490	7,417	0,000	Ha Accepted
H4	X_1 -> Z	0,345	5,913	0,000	Ha Accepted
H5	X_2 -> Z	0,017	0,344	0,365	Ha Rejected
H6	X_1 -> Y -> Z	0,205	6,023	0,000	Ha Accepted
H7	X_2 -> Y -> Z	0,221	5,645	0,000	Ha Accepted

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

Table 22. Total Effect Results

Yes	Relationships	Straight	Indirect	Total	t-stat	P Value
1	X_1 -> Y	0,419	-	0,419	9,327	0,000
2	X_2 -> Y	0,452	-	0,452	10,802	0,000
3	Y -> Z	0,490	-	0,490	10,170	0,000
4	X_1 -> Z	0,345	0,205	0,550	4,452	0,000

Yes	Relationships	Straight	Indirect	Total	t-stat	P Value
5	X_2 -> Z	0,017	0,221	0,238	7,417	0,000

Source: Results of SEM-PLS analysis of questionnaire data (processed 2026)

Of the seven hypotheses proposed, six hypotheses were accepted and one hypothesis was rejected. Work motivation and workload had a positive and significant effect on work productivity (H1 and H2), respectively. Work productivity and work motivation had a positive and significant effect on employee performance (H3 and H4), while workload had no significant effect directly on employee performance (H5 was rejected). Work productivity was also proven to be able to significantly mediate the influence of work motivation (H6) and workload (H7) on employee performance. The total effect results showed that the effect of work motivation on employee performance increased from 0.345 to 0.550 after taking into account the mediating role of work productivity, while the influence of workload increased from 0.017 to 0.238, which confirms the strategic role of work productivity as a mediating variable in this study model.

Work motivation has a positive and significant effect on the work productivity of Bio Farma employees ($\beta = 0.419$; $p = 0.000$). These results show that the higher the employee's work motivation, especially in the aspect of job responsibility which is the dominant indicator, the higher the work productivity produced. These findings support the research of Eyanur & Nuzuliati (2024), Rukhviyanti & Ambarwati (2023), Nadut et al. (2022), and Gibran et al. (2025) who also found a positive influence of work motivation on work productivity.

Workload also has a positive and significant effect on work productivity ($\beta = 0.452$; $p = 0.000$), even with a greater coefficient than work motivation. This indicates that in Bio Farma's work environment that has strict operational standards and clear production targets, workload that is still at a manageable level actually encourages employees to work more focused, disciplined, and efficient. These findings are in line with the research of Eyanur & Nuzuliati (2024), Antonia & Hendrawan (2025), Nadut et al. (2022), and Gibran et al. (2025).

Work productivity has a positive and significant effect on employee performance ($\beta = 0.490$; $p = 0.000$) and is the largest direct influence in this research model. The ability of employees to work efficiently, effectively, and continue to innovate has been proven to be the main determining factor for achieving very high performance. These results are consistent with the research of Paresae et al. (2024), Rosmaidah & Suwandi (2023), and Ismah & Hasan (2026).

Work motivation also has a positive and significant effect directly on employee performance ($\beta = 0.345$; $p = 0.000$), although the effect is smaller than work productivity. Employees with a high sense of responsibility tend to be more disciplined and committed to achieving the work targets set by the company. These findings support the research of Mirna et al. (2025), Andina & Luturlean (2024), and Pramiasti & Suryawirawan (2023).

In contrast to other variables, workload did not have a significant direct effect on employee performance ($\beta = 0.017$; $p = 0.365$). These results show that high and low workload does not necessarily determine the high and low performance of Bio Farma's employees, because employees have been able to adapt to the demands of work through a clear division of tasks and the support of a good work system. These findings are in line with the research of Junadi & Qamaruddin (2022), Kurniawati et al. (2023), and Regen et al. (2024).

The results of the mediation test showed that work productivity was able to significantly mediate the influence of work motivation (indirect coefficient 0.205; $p = 0.000$) and workload

(indirect coefficient 0.221; p = 0.000) on employee performance. These findings confirm that work motivation and workload do not necessarily directly improve employee performance, but must first be realized in the form of increasing work productivity, such as more effective use of time, efficient work completion, and continuous innovation and improvement efforts. This finding is a novelty of research because it shows that the influence of workload on performance is indirect and fully explained through work productivity as a mediating variable, in contrast to most previous studies that place workload as a direct predictor of performance.

CONCLUSION

Based on the results of the descriptive and verificative analyses using Partial Least Squares–Structural Equation Modeling (PLS-SEM), it can be concluded that work motivation, workload, work productivity, and employee performance at PT Bio Farma (Persero) were categorized as high to very high, with scores of 81.23%, 78.88%, 82.23%, and 85.38%, respectively. Work motivation and workload had positive and significant effects on work productivity (β = 0.419 and β = 0.452), while work productivity and work motivation had positive and significant effects on employee performance (β = 0.490 and β = 0.345, respectively). Workload did not have a significant direct effect on employee performance (β = 0.017; p = 0.365), but it had a significant indirect effect through the mediation of work productivity. Similarly, work productivity significantly mediated the relationship between work motivation and employee performance. These findings confirm that work productivity serves as an important mechanism linking work motivation and workload with employee performance, representing the main contribution of this research.

Based on these findings, PT Bio Farma (Persero) is recommended to strengthen the relationship between achievement recognition and career development opportunities through the Performance Recognition and Development mechanism and the Individual Development Plan (IDP). The company should also conduct time-based workload evaluations through Workload Analysis to optimize work distribution, strengthen a culture of continuous improvement through simple improvement programs at the work-unit level to maintain work output quality and quantity, and develop a proactive problem-solving culture through clear authority boundaries and micro-coaching to encourage employee initiatives. These efforts are expected to enhance work motivation, manage workload proportionally, and promote work productivity as a strategic factor in improving employee performance, enabling the company to meet increasing demand for routine vaccines and remain prepared for future pandemic challenges.

REFERENCES

Aisyah, D. N., Mayadewi, C. A., Budiharsana, M., Solikha, D. A., Ali, P. B., Igusti, G., Kozlakidis, Z., & Manikam, L. (2022). Building on health security capacities in Indonesia: Lessons learned from the COVID-19 pandemic responses and challenges. *Zoonoses and Public Health, 69*(6), 757–767.

Andina, M. R., & Luturlean, B. S. (2024). The effect of work motivation and workload on employee performance of PT Bio Farma (Persero) Bandung City. *Journal of Socio-Economics and Humanities, 10*(3).

Antriyandarti, E., Barokah, U., Rahayu, W., Herdiansyah, H., Ihsannudin, I., & Nugraha, F. A. (2024). The economic security of households affected by the COVID-19 pandemic in rural

Java and Madura. *Sustainability, 16*(5), 2091.

Budiman, D. (2024). *Strengthening risk communication for pandemic response to enhance global health security: Lessons from Indonesia's COVID-19 response*.

Eyanur, F., & Nuzuliati. (2024). Analysis of the influence of workload and work motivation on work productivity at the Head Office of PT Pelindo Multi Terminal. *Journal of Social Science Research, 4*(3).

Gibran, H. S., et al. (2025). The influence of work motivation, workload, and work environment on employee work productivity at the Simpang Tiga Health Center, Pekanbaru City. *Independent Student Scientific Journal, 5*(2).

Indrawati, S. M., Nazara, S., Anas, T., Ananda, C. F., & Verico, K. (2022). Keeping Indonesia safe during the pandemic 2020–21. In *Keeping Indonesia safe from the COVID-19 pandemic: Lesson learnt from the national economic recovery programme*.

Ismah, V. C., & Hasan, D. (2026). The influence of motivation and work productivity on employee performance. *Balance: Journal of Accounting and Management, 5*(1).

Junadi, & Qamaruddin. (2022). The effect of work ability, work motivation, and workload on employee performance of the Jakarta College of Maritime Sciences. *Indonesian Multidisciplinary Journal, 1*(1).

Kurniawati, F., et al. (2023). The effect of workload, burnout, and work motivation on nurse performance. *Journal of Management Applications, 21*(4).

Mirna, et al. (2025). The effect of workload and motivation on the performance of employees of the Population and Civil Registration Office in Makassar City. *Journal of Economics and Accounting Publications, 5*(3).

Nadut, L. N., et al. (2022). The effect of workload and work motivation on employee work productivity at PT Baliyoni Saguna. *Journal of Economics and Social Sciences*.

Paresae, M., et al. (2024). The effect of work productivity, work motivation, and work discipline on employee performance: Case study at the Mappi Regency Education Office. *Journal of Economics and Information System Management, 6*(1).

Permatasari, F. S. E., & Wiguna, M. (2025). The effect of discipline and work motivation on employee performance of PT Inko Shilla Ekspres Tangerang Regency. *Cakrawala: Journal of Economics, Management, and Business, 2*(2).

Pramiasti, N. R., & Suryawirawan, O. A. (2023). The influence of workload, work discipline, motivation, and career development on employee performance. *Jurnal Ilmu dan Riset Manajemen, 12*(12).

Puspa, M. T., & Sularmi, L. (2026). The effect of work stress and workload on employee work productivity at PT Pratama System Pasar Rebo East Jakarta. *Journal of Economics and Management (JIEM), 4*(2).

Regen, R., et al. (2024). The effect of work motivation, service quality, and employee workload on employee performance. *Journal of Ekobistek, 13*(4).

Rosmaidah, R., & Suwandi. (2023). The effect of productivity and work environment on hospital performance with remuneration as a moderating variable. *Journal of Cultural Accounting and Auditing, 2*(1).

Rukhviyanti, N., & Ambarwati. (2023). The effect of workload and work motivation on the work productivity of PT Toyota Astra Motor NVDC Karawang. *Journal of Techno-Socio Economics, 16*(2).

Santamoko, R., et al. (2025). The effect of workload, work stress, and work motivation on employee performance with job satisfaction as a mediator. *eCo-Fin: Economics and Financial Journal, 7*(3).

Sari, P. S. P., et al. (2025). Analysis of the influence of workload and discipline on the productivity of teachers and employees of the MI Al-Iman Banaran Foundation in Semarang with motivation as an intervening variable. *STIE Semarang Journal, 17*(1).

Sekaran, U., & Bougie, R. (2016). *Research methods for business* (7th ed.). John Wiley & Sons.

Situmorang, I. H. A., & Sudjiman, L. S. (2023). The effect of cost of goods sold and administrative & general costs on profitability in IDX manufacturing companies. *Jurnal Edunomika, 8*(1).

Tanra, A. J., & Tusholehah, M. (2022). Lessons learned from COVID-19 pandemic: Indonesia's perspective. *Taiwanese Journal of Psychiatry, 36*(1), 5–11.