The Influence Of Workload And Physical Work Environment On Employee's Work Productivity With Employee Engagement As An Intervening Variable (Case Study At PT PLN (Persero) UPT Cirebon)

Aziz Nur Arifyanto[1]*, Dian Indiyati [2]

[1,2] School of Economic and Busines, Telkom University, Bandung, Indonesia.
*Corresponding Author:
Email: dianindiyati@telkomuniversity.ac.id

Abstract

PT PLN (Persero) Unit Pelaksana Transmisi Cirebon is a PLN Unit tasked with maintaining the operational reliability of High Voltage and Extra High Voltage electrical equipment in the West Java region. The company has an duty to transmit 100% of the power produced from power plants to customers. The situation observed over the last five assessment periods reveals that the number of the employee's work productivity has been highly fluctuating. Employee's work productivity is influenced by several factors, one of which is employee engagement. The 2023 Employee Engagement survey results indicate that Work Engagement has reached 88.93% of the 88% target. However, certain dimensions have not met the target, namely the Work Conditions dimension (85.84%), which includes two factors: workload and physical work environment. The workforce at PT PLN (Persero) UPT Cirebon is still understaffed (96.8%), leading to frequent and prolonged overtime work. The Physical Work Environment at PLN UPT Cirebon is also not entirely satisfactory due to malfunctioning work facilities and equipment. This research aims to determine the influence of Workload and Physical Work Environment on Employee Engagement and its implications for Employee's Work Productivity at PT PLN (Persero) Unit Pelaksana Transmisi Cirebon. This study employs a quantitative method with a descriptive research type. The research respondents consist of 219 employees of PT PLN (Persero) UPT Cirebon, utilizing non-probability sampling with saturated sampling. The processed data will be analyzed using descriptive analysis techniques with SEM-PLS. This research hypothesizes that Workload and Physical Work Environment simultaneously have a significant influence on Employee Productivity through Employee Engagement as an intervening variable at PLN UPT Cirebon. The research results indicate that the Physical Work Environment has a positive and significant influence on both Employee Engagement and Employee's Work Productivity. Similarly, Employee Engagement was found to have a positive and significant influence on Employee's Work Productivity. However, Workload did not show a significant influence on either Employee Engagement or Employee's Work Productivity, whether directly or through the intervening variable. A coefficient of determination value of 0.631 indicates that 63.1% of employee productivity is explained by these three variables, while the remainder is influenced by other factors. This research has limitations in its scope of the variables considered. Therefore, further research is recommended to explore other variables such as leadership style, work-life balance, organizational culture, or to conduct qualitative studies to gain a deeper understanding of the phenomena.

***Keyword**: Work Load; Physical Work Environment; Employee Engagement and Employee Productivity.*

I. INTRODUCTION

PT PLN (Persero) Transmission Implementation Unit (UPT) Cirebon, later abbreviated to PLN UPT Cirebon, was established in 2015 as part of the reorganization of the Java Bali Load Distribution and Regulatory Center (P3B JB) in accordance with the Regulation of the Board of Directors of PT PLN No. 019.P/DIR/2015. Along with the development of organizational patterns, currently PT PLN (Persero) UPT Cirebon is defined as an Implementation Unit under PT PLN (Persero) Central Java Transmission Main Unit (PLN UITJBT) based on the Regulation of the Board of Directors of PT PLN No. 0086.P/DIR/2023.PLN UPT Cirebon is located in the city of Cirebon, precisely on Jl. Brigjen HR Dharsono (By Pass) with 4 (four) Transmission and Substation Service Units (ULTG) namely ULTG Cirebon, ULTG Jatibarang, ULTG Ciamis and ULTG Garut. PLN UPT Cirebon is responsible for managing electricity transmission assets in an area covering several cities / districts in the province of West Java with an electricity transmission network covering various voltage levels, such as 500 kV, 150 kV and 70 kV.

This unit functions as a connecting bridge between upstream electricity generation and downstream energy distribution, with a major impact on the overall efficiency of PLN operations. In its operations, PLN UPT Cirebon collaborates with several other PLN units, namely the Cirebon Customer Service Unit (UP3),

Indramayu UP3, Majalaya UP3, Sumedang UP3, Garut UP3 and Tasikmalaya UP3 and serves high voltage consumers in strategic areas in terms of government, economy, and business. Serving 13 (thirteen) cities/regencies, namely Bandung Regency, Ciamis Regency, Cirebon Regency, Indramayu Regency, Garut Regency, Kuningan Regency, Majalengka Regency, Pangandaran Regency, Sumedang Regency, Tasikmalaya Regency, Banjar City, Cirebon City and Tasikmalaya City.

II. LITERATURE REVIEW

In this chapter, the author will discuss the theoretical foundations used as a reference in identifying the variables studied. The author will explain the basic concepts of organizational behavior and industrial and organizational psychology. Furthermore, there are four variables in this study: Workload, Physical Work Environment as independent variables, Employee Work Productivity as dependent variable, and Employee Engagement as intervening variable.

Previous Theories and Research

According to Mondy (2008), HRM is the process of utilizing individuals to achieve organizational goals. According to Wirawan (2015), human resources are the most important resource in a company. Without human resources, other resources will be useless. In a company, human resources drive all strategies to achieve the vision and mission established by the company. Therefore, a company requires a sound human resource management system to achieve its goals. This underlies the importance of human resource management.In an organization, human resource management encompasses all aspects of human resources within the organization, ensuring they actively participate in efforts to achieve established goals. This encompasses processes related to the implementation of management functions, from planning, organizing, directing, to monitoring, which play a crucial role in effectively and efficiently supporting the achievement of individual and organizational goals, as explained by Suryani and John (2019).

Human Resource Management Objectives

According to Armstrong and Taylor (2020: 3) the objectives of human resource management are as follows:

1. Supporting organizations in achieving their goals by developing and implementing Human Resource management strategies that align with the company's business strategy.
2. Contribute to the development of a culture of optimal performance.

Employee Work Productivity

According to Demartini (2023), productivity is a measure of economic performance that compares the quantity of goods and services produced with the quantity of inputs used to produce those goods and services. Productivity is the result of efficient input management and effective goal achievement, where high efficiency and effectiveness will result in high productivity (Bukit et al., 2017). Productivity can be defined as the ability to complete tasks or work effectively and efficiently, so that every improvement or completion of daily tasks, even small ones, will have a significant impact on long-term productivity in a person's career (Clear, 2018). According to Qomariah (2020), productivity is generally defined as the ratio between output, including products and services, and inputs, namely labor, materials, and capital. Robbins and DeCenzo, in their book on labor productivity by Wijaya & Manurung (2021), state that productivity is the total output of goods and services produced divided by the inputs required to create them. The definition of productivity, as outlined in Ministerial Regulation No. 1 of 2014, cited by Zulfiyandi et al. (2021), is the ratio between results or output and inputs used. This concept emphasizes the magnitude of labor's contribution to the added value of products in economic processes, with labor productivity defined as the ratio between products, both goods and services, and labor used within a certain period.

According to Sedarmayanti (2021), overall productivity is the result created from all inputs within an organization, where the scope of this can be expressed in terms of efficiency, effectiveness, and quality. The concept of productivity also involves strategic thinking and the use of available resources to achieve optimal output, an idea that Darpin and his colleagues consider to be the main foundation for operational efficiency (Darpin et al., 2023). The definition of productivity from experts is the ratio of output to input, clarified by Watson JR., (2023) that productivity is a ratio usually expressed as a percentage to measure the relationship

between total output and total input where output can be materials, products, goods, or services, while inputs are employees, equipment, materials, energy units, relevant information, land, and financial resources.Based on the explanation of the definition of productivity, the author concludes that productivity is the ratio between output, either in the form of goods or services, and the input required to produce the output, which reflects the efficiency and effectiveness in the use of resources, especially human resources.

Productivity Dimensions and Indicators

Employee productivity is a crucial factor influencing a company's long-term success, often defined as the effective allocation of employees' time to tasks requiring execution and output (Singh et al. 2022). Measuring productivity can be challenging, particularly due to diverse research approaches that can complicate comparisons (Limoa, 2020). According to Chizema (2020), productivity dimensions include a productive work environment, listening to employee input, workplace safety, and harmonious relationships between management and employees. According to Azan & Zebua (2021), productivity dimensions are effectively achieved goals and high levels of effectiveness and efficiency. This opinion is supported and complemented by Nurjaman (2014), who states that other productivity dimensions, in addition to those mentioned by Azan & Zebua (2021), include discipline and work ethic. According to Nurjaman (2014), productivity dimensions can be measured through indicators.

III. METHODS

This research was conducted to test the hypothesis with the intention of confirming or strengthening the hypothesis, with the hope that it can ultimately strengthen the theory used as a basis. The type of research used in this study is descriptive causal verification research to determine the effect of workload and the physical work environment on employee productivity, with employee engagement as an intervening variable presented in numerical form and supplemented by descriptive and statistical analysis. Causally, this study will prove the hypothesis based on the theory used and previous research literature.The approach used in theory development is deductive, meaning the approach method is carried out by searching for research topics using literature reviews of previous research and theories used, then forming hypotheses to be proven true. Based on the methodology, this study uses quantitative methods, meaning this research is proven by significant numbers or by using statistical calculations. Operational variables and measurement scales.

Operationalization of Variables

According to Sekaran & Bougie (2020), variables can be defined as things that can be used to obtain diverse or different values. Sugiyono (2021) states that variables have two categories used in research.

Data Analysis Techniques

The analysis used to answer the hypothesis is structural equation modeling using the Partial Least Squares (PLS) approach. This approach is used because the latent variable estimation in PLS is an exact linear combination of indicators, thus avoiding indeterminacy issues and producing accurate component scores. Furthermore, the PLS analysis method is powerful because it can be applied to all data scales, does not require many assumptions, and does not require a large sample size.In quantitative research, data or information is numerical and needs to be quantified to answer research questions. Structural Equation Modeling - Partial Least Squares (SEM-PLS) was used to analyze the descriptive data and hypotheses in this study.

According to Hamzah (2019:137), descriptive analysis is an analytical procedure that attempts to describe a phenomenon, event, or incident that is the focus of attention without giving it any special treatment. Descriptive analysis aims to provide an overview or description of data so that the data presented is easier to understand and informative for those who read it. In interpreting the variables studied, categorization was carried out on the average score of respondents' responses, which was then processed into a continuous line to facilitate classification in this study.

Model Evaluation.

The measurement model or outer model with reflective indicators was evaluated using the convergent and discriminant validity of its indicators and the composite reliability of the indicator blocks. The structural model of the inner model was evaluated by looking at the percentage of explained variance,

namely by looking at the R^2 for the exogenous latent construct using the Stone Gaisser Q-Square test and also looking at the magnitude of the structural path coefficient. The stability of these estimates was evaluated using a t-statistic test obtained through a bootstrapping procedure.

IV. RESULTS AND DISCUSSION

This chapter will present the results of data processing collected through questionnaires from 211 respondents at PT PLN (Persero) UPT Cirebon. The presentation will begin with the characteristics of the respondents, followed by a descriptive analysis of the research variables, namely Workload (X1), Physical Work Environment (X2), Employee Engagement (Y), and Employee Work Productivity (Z). Next, the results of the Structural Equation Modeling – Partial Least Square (SEM-PLS) analysis will be presented, which includes evaluation of the measurement model (outer model), evaluation of the structural model (inner model), and hypothesis testing. Finally, an in-depth discussion of the research results will be conducted.

Respondent Characteristics

The characteristics of the respondents in this study are described based on demographic data collected from 211 employees of PT PLN (Persero) UPT Cirebon. Respondents were categorized by several characteristics, including gender, education, age, employee level, and length of service. The author describes the results of the respondent characteristics obtained from the questionnaire.The respondent characteristics determined by the author also illustrate the statistical distribution of personnel at PT PLN (Persero) Cirebon Transmission Implementation Unit. In this study, these characteristics will influence the questionnaire responses for each variable indicator. The author determined several respondent characteristics with the aim of obtaining comprehensive data on each variable in this study, thus enabling the author to understand the condition of the variables from various aspects.

Recapitulation of Employee Work Productivity Variables (Z)

The author summarizes the overall results of respondents' responses to the Employee Work Productivity variable, which includes three dimensions: Concentration, Collaboration, and Communication. Based on the calculation of respondents' responses to all dimensions, the results of the Employee Work Productivity variable recapitulation are as follows.

Table 1. Results of Employee Work Productivity Variables

Dimensions	Percentage	Category
Concentration	76.78%	Tall
Collaboration	75.69%	Tall
Communication	78.37%	Tall
Average Percentage of Variables		**76.94%**
Variable Categories		**Tall**

Source: Author's processed results, 2025

The table above describes the recapitulation of the Employee Work Productivity variable in each dimension with a total of 3 (three) dimensions. Based on the data recapitulation, it is known that the Concentration dimension obtained a score of 76.78% with a High category, the Collaboration dimension obtained a score of 75.69% with a High category, and the Communication dimension obtained a score of 78.37% with a High category. From the recapitulation, it can be concluded that the Communication dimension has the highest score, namely with a total of 78.37% with a High category, while the Collaboration dimension is the dimension with the lowest percentage, namely 75.69% but still in the High category.

Research result

The research results were analyzed using Structural Equation Modeling (SEM) based on Partial Least Squares. According to (Gozali and Fuad, 2008) in Sarjono and Julianita (2019), Structural Equation Modeling (SEM) is a multivariate analysis that can analyze relationships between variables in a more complex manner. This technique allows researchers to examine the relationship between latent variables and manifest variables (measurement equations), the relationship between one latent variable and another (structural equations), and to explain measurement errors.

Model evaluation in Partial Least Square (PLS) consists of two stages: evaluation of the inner model or structural model (structural measurement), evaluation of the measurement model is grouped into reflective models and formative models. The second stage is evaluation of the outer model or measurement model. In this model, validity and reliability are determined by individual loading, internal composite reliability, average variance extractor, and discriminant validity. If the data meets the requirements in the measurement model, then significance will be tested using the path coefficient, t-statistic, r-squared value, and Goodness of Fit (Haryono, 2017).

Evaluation of Measurement Model (Outer Model)

This study tested the outer model using Smart PLS-4. The outer model was tested to determine its validity and reliability. The outer model consists of convergent validity, discriminant validity, and internal consistency reliability. The following are the results of the outer model used in this study.

1. Convergent Validity

In this study, the evaluation of the outer model uses reflective measurements, so that it uses validity tests in the form of Loading Factor calculations, T-Statistic Tests, and P-Values, as well as reliability tests in the form of Cronbach's Alpha and Composite Reliability (CR) calculations.

*Convergent Validity*used to examine the validity of each measurement indicator for a variable. Convergent validity indicates a measure that is positively correlated with other measures (e.g., reflective) of the same construct using different indicators. When evaluating a formative measurement model, it is important to test whether the construct being measured formatively is highly correlated with the reflective measure of the same construct (Hair et al., 2017).

a. *Outer Loading*

Convergent validity is determined by examining the outer loading factor values for endogenous and exogenous variables. Based on the criteria, the recommended value is a loading factor >0.7, but this value can be tolerated up to ≥0.5 (Musyaffi et al., 2021). Outer loading is used to evaluate construct validity in PLS-SEM. A high outer loading coefficient indicates that the indicator strongly influences the latent variable it represents. Conversely, a low outer loading coefficient may indicate that the indicator does not adequately represent the latent variable. The following are the convergent validity results in this study.

Table 2. Outer Loading Results

Item	BK (X1)	LKF (X2)	EE (Y)	PK (Z)	Information
TL1	0.807				Valid
TL2	0.655				Valid
TL3	0.673				Valid
MEL1	0.510				Valid
MEL2	0.512				Valid
PSL1	0.630				Valid
PSL3	0.743				Valid
PSL2	0.802				Valid
AK1		0.537			Valid
AK2		0.740			Valid
SU1		0.728			Valid
SU2		0.811			Valid
KC1		0.723			Valid
KC2		0.781			Valid
KB1		0.858			Valid
KB2		0.808			Valid
TR1		0.825			Valid
TR2		0.750			Valid
EEV1			0.774		Valid
EEV2			0.579		Valid

EEV3			0.903		Valid
EED1			0.783		Valid
EED2			0.505		Valid
EEA1			0.742		Valid
EEA2			0.855		Valid
EEA3			0.731		Valid
PCC1				0.750	Valid
PCC2				0.761	Valid
PCC3				0.552	Valid
PCC4				0.741	Valid
PCL1				0.772	Valid
PCL2				0.544	Valid
PCL3				0.547	Valid
PCL4				0.766	Valid
PCM1				0.694	Valid
PCM2				0.763	Valid
PCM3				0.807	Valid
PCM4				0.667	Valid

Source: SEM-PLS Processed Results (Simulation), 2025

Based on Table 4.19 above, it can be seen that the outer loading for all items has a score of ≥0.5. It can be concluded that based on the Smart PLS-04 processing, the data is said to be valid for all items.

b. *Average Variance Extracted*(AVE)

Average Variance Extracted(AVE) is used to assess the quality of indicators related to research variables. According to Sekaran and Bougie (2017), the AVE value is calculated by squaring the factor coefficients from the CFA and comparing them to the square of the correlation coefficients between the measured constructs. The expected AVE value criterion is ≥0.5.The AVE (Average Variance) indicates how much of an indicator's variation can be explained by the latent variables it represents. A high AVE value indicates that the latent variable has good validity and is able to explain most of the variation in its indicator. Conversely, a low AVE value indicates that the indicators do not adequately represent the latent variable. The AVE data in this study is presented below.

Table 3. Results of Average Variance Extracted (AVE)

Variables	Average Variance Extracted (AVE)
Workload (X1)	0.556
Physical Work Environment (X2)	0.579
Employee Engagement (Y)	0.555
Work Productivity (Z)	0.594

Source: SEM-PLS Processed Results (Simulation), 2025

Based on the calculation results using Smart PLS-4, it is known that all AVE score values are > 0.50, which indicates that convergent validity has been met.

2. *Discriminant Validity*

*Discriminant Validity*is a concept used to ensure that constructs measured separately in a model have significant differences from each other (Sekaran and Bougie, 2017). To demonstrate discriminant validity, the correlation coefficient between the measured constructs must be smaller than the square root of the AVE of each construct. In other words, different constructs must have a lower correlation than their own variations (Hair et al. 2017). This discriminant validity test is divided into two stages, namely Fornell Larcker and Cross Loading.

a. *Fornell-Larcker Criterion*

The Fornell-Larcker test helps researchers evaluate the extent to which the constructs being measured are truly distinct from one another and whether there is significant overlap between them. If

discriminant validity is not met, it may indicate a problem with construct validity or the need for changes to the measurement model being used.*Fornell Larcker*This test is conducted by comparing the correlation of latent variables with constructs in the AVE. The test criterion is that the square root value must be greater than the value of the other construct variables (Musyaffi et al., 2021: 26). The following is a table of Fornell Larcker correlation scores in this study:

Table 4. Fornell Larcker Results

Variables	BK (X1)	LKF (X2)	EE (Y)	PK (Z)
BK (X1)	0.675			
LKF (X2)	-0.083	0.761		
EE (Y)	-0.118	0.533	0.745	
PK (Z)	-0.104	0.588	0.769	0.703

Source: SEM-PLS Processed Results (Simulation), 2025

Based on testing using Smart PLS-4, the Fornell Larcker calculation showed that the square root value was greater than that of other variables. From this calculation, it can be concluded that the square root of the AVE of each construct is greater than its correlation with other constructs, indicating good discriminant validity. Thus, the variables in this study have met the Fornell Larcker criteria.

b. *Cross Loadings*

In SEM-PLS, cross-loading analysis is used to evaluate construct validity and measure the degree of overlap or cross-influence between latent variables in a model. Cross-loading measures the extent to which indicators from one latent variable load or represent other latent variables in the model. Based on testing using Smart PLS-4, the cross-loading calculation is as follows:

Table 5. Cross Loading Results

Item	BK (X1)	LKF (X2)	EE (Y)	PK (Z)
TL1	0.807	-0.065	-0.057	-0.069
TL2	0.655	0.030	-0.091	0.012
TL3	0.673	0.026	-0.091	-0.006
MEL1	0.510	-0.036	-0.042	0.034
MEL2	0.512	-0.162	-0.098	-0.091
PSL1	0.630	0.058	-0.058	0.049
PSL3	0.743	-0.029	-0.049	-0.108
PSL2	0.802	-0.066	-0.102	-0.113
AK1	-0.043	0.537	0.455	0.444
AK2	-0.015	0.740	0.517	0.562
SU1	0.001	0.728	0.341	0.376
SU2	-0.062	0.811	0.379	0.392
KC1	-0.018	0.723	0.193	0.297
KC2	-0.069	0.781	0.294	0.384
KB1	-0.056	0.858	0.499	0.514
KB2	-0.138	0.808	0.437	0.493
TR1	-0.107	0.825	0.424	0.471
TR2	-0.113	0.750	0.307	0.375
EEV1	-0.108	0.332	0.774	0.605
EEV2	-0.085	0.263	0.579	0.530
EEV3	-0.144	0.458	0.903	0.689
EED1	-0.080	0.342	0.783	0.540
EED2	-0.131	0.298	0.505	0.361
EEA1	-0.070	0.669	0.742	0.598
EEA2	-0.074	0.422	0.855	0.640
EEA3	-0.014	0.263	0.731	0.546

PCC1	-0.020	0.461	0.665	0.750
PCC2	-0.070	0.512	0.633	0.761
PCC3	-0.142	0.591	0.467	0.552
PCC4	-0.054	0.493	0.559	0.741
PCL1	-0.152	0.399	0.628	0.772
PCL2	-0.143	0.235	0.389	0.544
PCL3	0.012	0.172	0.240	0.547
PCL4	-0.082	0.355	0.587	0.766
PCM1	-0.009	0.310	0.410	0.694
PCM2	-0.026	0.342	0.568	0.763
PCM3	-0.074	0.432	0.566	0.807
PCM4	-0.090	0.473	0.548	0.667

Source: SEM-PLS Processed Results (Simulation), 2025

*Cross loading*This is a phenomenon where an indicator in a confirmatory factor analysis (CFA) has a significant correlation with more than one measured factor. Based on testing using Smart PLS-4, cross-loading calculations showed that the data for all variables were valid. Thus, the variables in this study met the criteria for discriminant validity.

3. *Internal Consistency Reliability*

*Internal Consistency Reliability*Internal consistency reliability is described as a measure used to evaluate the internal consistency or correlation between items in a measurement instrument that measure the same construct (Hair et al., 2017). Internal Consistency Reliability refers to the extent to which the indicators used to measure a latent variable consistently measure the same construct. Internal Consistency Reliability provides information about the reliability of the measurement in measuring the construct or latent variable. Internal consistency reliability testing consists of composite reliability and Cronbach's alpha.

a. Composite Reliability

Composite Reliability(CR) is an alternative method used in confirmatory factor analysis (CFA) and Structural Equation Modeling (SEM) to measure internal consistency reliability. Composite Reliability combines the factor loadings and residual variances of the indicators representing a construct to calculate a composite reliability coefficient. This coefficient provides an estimate of the extent to which the items are consistent in measuring the same construct. (Hair et al., 2017).

Composite reliability results range from 0 to 1, with higher values indicating higher reliability. As a general guideline, a Composite Reliability value above 0.7 or 0.8 is considered adequate to indicate good reliability. The composite reliability test is outlined in Table 4.23 below.

Table 6. Composite Reliability Results

Variables	Composite reliability
BK (X1)	0.831
LKF (X2)	0.925
EE (Y)	0.898
PK (Z)	0.914

Source: SEM-PLS Processed Results (Simulation), 2025

Based on the composite reliability test using Smart PLS-4, the result was ≥0.8. This indicates that it is sufficient to indicate good reliability and high reliability.

b. Cronbach's Alpha

*Cronbach's Alpha*Calculating the internal reliability coefficient by considering the correlation between items representing a construct. This coefficient provides an estimate of the extent to which the items are consistent in measuring the same construct. Based on the criteria, the minimum expected value is 0.7. This value is still tolerable up to ≥0.6 (Musyaffi et al., 2021). The following are the Cronbach's alpha results from this study:

Table 7. Results*Cronbach's alpha*

Variables	Cronbach's alpha
BK (X1)	0.848
LKF (X2)	0.918
EE (Y)	0.879
PK (Z)	0.906

Source: SEM-PLS Processed Results (Simulation), 2025

Based on the test results using Smart PLS-4, data for all variables were obtained with values >0.7. This concludes that the variables in this study met Cronbach's alpha criteria and can be considered reliable.

Structural Model Evaluation (Inner Model)

Inner model testing refers to the steps taken in SEM to evaluate the relationship model between latent variables in confirmatory factor analysis (CFA) or SEM PLS. This study conducted inner model testing using Smart PLS-4. Inner model testing was conducted to identify and observe the relationship between exogenous and endogenous variables (Musyaffi et al., 2021). The inner model consists of collinearity issues, Coefficient of Determination – R^2, and Predictive Relevance-Q^2. The following are the results of the inner model in this study.

1. Collinearity Issues

*Collinearity Issues*Collinearity refers to a situation where there is a strong correlation between two or more independent variables in a regression analysis or other statistical model. Collinearity issues are tests conducted to determine the relationship between indicators. The criterion for collinearity testing is a VIF value ≤ 5, which indicates no collinearity issues (Musyaffi et al., 2021).

Based on the calculation results using Smart PLS-4, it was found that the results of the collinearity test showed a figure ≤ 5 so it can be concluded that all indicators in the variable do not have collinearity issues.

2. Coefficient of Determination – R^2

*Coefficient of Determination – R^2*is a statistical measure that describes the proportion of variation in the dependent variable that can be explained by the independent variables in a regression model. R^2 is generally used to evaluate how well a regression model fits the data and to assess the model's predictive power. Coefficient of Determination – R^2 is a test conducted to examine the joint influence on variable Y. The R value explains the variation of the exogenous variable on the endogenous variable (Musyaffi et al., 2021:135). It is known that the criteria for the R value are if it has a value ≥0.67 meaning strong, ≤0.33 meaning moderate, and ≤0.19 meaning weak (Musyaffi et al., 2021). The results of the calculation of the coefficient of determinant can be seen in Table 4.26 below:

Table 8. Results of the Coefficient of Determination – R^2

Variables	R-square	R-square adjusted
PK (Z)	0.636	0.631

Source: SEM-PLS Processed Results (Simulation), 2025

Based on the calculation results using Smart PLS – 4, it is known that the Coefficient of Determination – R^2 for the above variables is in the moderate category.

3. Predictive Relevance – Q^2

*Predictive Relevance – Q^2*is a test conducted to determine the predictive power of a model through a blindfolding procedure (Musyaffi et al., 2021). Q^2 is a measure of the predictive power of a model, examining whether the model accurately predicts data not used in the model parameter estimation (Hair et al., 2017). Based on the criteria, the Q^2 value is categorized as small if it has a value of 0.02, categorized as medium if it has a value of 0.15, and categorized as large if it has a value of 0.35 (Musyaffi et al., 2021). Below, the author presents the results of the Predictive Relevance – Q^2 test in this study:

Table 9. Predictive Relevance Results – Q^2

Variables	Predictive Q^2
EE (Y)	0.159
PK (Z)	0.293

Source: SEM-PLS Processed Results (Simulation), 2025

Based on the results of the Predictive Relevance calculation using Smart PLS-4, the Q^2 value in this study was found to be moderate, with results ranging between 0.15 and 0.35. Therefore, this study has a fairly good observation value because the Q^2 value in this study is included in the moderate category.

3.1. Hypothesis Testing

This hypothesis testing was conducted using Smart PLS-4 and obtained through bootstrapping. The implementation of the hypothesis testing is based on the output from the inner model testing, which includes collinearity issues, the coefficient of determination (R^2), and predictive relevance (Q^2). This testing is conducted by examining the path coefficient results to determine whether the hypothesis is rejected or accepted. The null hypothesis is based on the idea that any change or difference is entirely the result of random error. The alternative hypothesis states that there is a difference between the compared groups. If the null hypothesis is accepted, there is no difference between the groups. However, if the null hypothesis is rejected and the alternative hypothesis is accepted, the conclusion is that there is a change or difference in the behavior, attitude, or similar measurements of the tested groups (Hair et al., 2020). The author attaches the following graph of the hypothesis testing results:

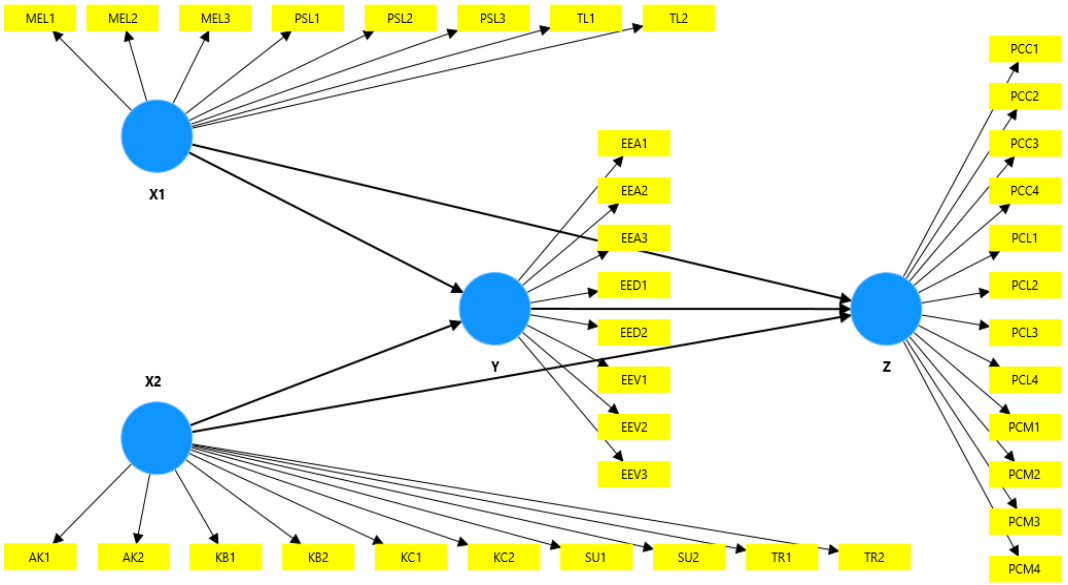

Fig 2. Path Coefficient Results

Source: Author's processed results, 2025

To directly see the relationship between variables, the Path Coefficient value can be explained in the following table:

Table 10. Path Coefficient and T-Statistics on the Direct Relationship between Variables

	Original Sample(O)	Sample mean (M)	Standard Deviation (STDEV)	T statistics(|O/STDEV|)	P Values
BK (X1) -> EE (Y)	-0.074	-0.092	0.067	1,104	0.270
BK (X1) -> PK (Z)	-0.009	-0.002	0.085	0.102	0.919
LKF (X2) -> EE (Y)	0.527	0.531	0.050	10,623	0,000
LKF (X2) -> PK (Z)	0.249	0.243	0.059	4,256	0,000
EE (Y) -> PK (Z)	0.635	0.636	0.056	11,320	0,000

Source: SEM-PLS Processed Results (Simulation), 2025

From the data, it can be seen that the research model produces varying T-statistics. The T-Table value – df(nk = 211-4 = 207) is 1.971. There are 2 variable relationships that have values below 1.971, namely the relationship between the Workload variable (X1) and Employee Engagement (Y), and the relationship between the Workload variable (X1) and Employee Work Productivity (Z). The results of the path coefficient and p-value tests are as follows.

Table 11. Path Coefficient and P-Values in Direct Relationships between Variables

	Path Coefficient	**P Values**	**Information**
BK (X1) -> EE (Y)	-0.074	0.270	*Ha d*refuse
BK (X1) -> PK (Z)	-0.009	0.919	*Ha*rejected
LKF (X2) -> EE (Y)	0.527	0	*Ha*accepted
LKF (X2) -> PK (Z)	0.249	0	*Ha*accepted
EE (Y) -> PK (Z)	0.635	0	*Ha*accepted

Source: SEM-PLS Processed Results (Simulation), 2025

The significance level of this study is 5%, thus it is concluded that the maximum p-value is 0.05. Based on Table 4.23 above, the following conclusions can be drawn:

a. Workload has a very weak, insignificant negative influence on Employee Engagement.
b. Workload has a very weak, insignificant negative influence on employee work productivity.
c. Physical Work Environment has a significant positive effect on Employee Engagement.
d. Physical Work Environment has a significant positive effect on Employee Work Productivity.
e. *Employee Engagement*has a significant positive influence on performance.

To see the indirect relationship in this study, it will be explained through the data in the following table:

Table 12. Path Coefficient and T-Statistics on Indirect Relationships between Variables

	Original Sample	**Sample mean**	**Standard Deviation**	**T statistics**	**P value**
BK (X1) -> EE (Y) -> PK (Z)	-0.047	-0.059	0.044	1,073	0.283
LKF (X2) -> EE (Y) -> PK (Z)	0.335	0.338	0.047	7,179	0,000

Source: SEM-PLS Processed Results (Simulation), 2025

From this data, it can be seen that the research model produces a positive T-statistic. The path coefficient and p-values are explained in the following table:

Table 13. Path Coefficient and P-Values in Indirect Relationships between Variables

	Original Sample	**P value**	**Information**
BK (X1) -> EE (Y) -> PK (Z)	-0.047	0.283	*Ha*rejected
LKF (X2) -> EE (Y) -> PK (Z)	0.335	0,000	*Ha d*iReceived

Source: SEM-PLS Processed Results (Simulation), 2025

Based on the table above, the following conclusions can be drawn:

a. Workload has a very weak, insignificant negative influence on Employee Work Productivity through Employee Engagement as an intervening variable.
b. Physical Work Environment has a significant positive influence on Employee Work Productivity through Employee Engagement as an intervening variable.

Discussion of Research Results

Based on participant responses to the questionnaire and Structural Equation Modeling (SEM) analysis, several test results were obtained. These results include the evaluation of the measurement model (outer model), the evaluation of the structural model (inner model), and hypothesis testing conducted through path coefficient analysis. The following discussion is classified based on the variables that are the focus of this study, namely workload, physical work environment, employee engagement, and employee work productivity. The research findings indicate a statistically significant influence between the variables of workload, physical work environment, employee engagement, and employee work productivity in the PT PLN (Persero) Cirebon Transmission Implementation Unit. The researcher will describe the research findings according to each variable analyzed in the context of this study.

Workload at PT PLN (Persero) Cirebon Transmission Implementation Unit

This study examines workload as an independent variable at PT PLN (Persero) Cirebon Transmission Implementation Unit. This study involved 211 employees as respondents. Three main dimensions in measuring workload were identified: Time Load, Mental Effort Load, and Psychological Stress Load. The results of the overall analysis of respondent response data indicate that the workload variable obtained an average score of 50.4%, which in aggregate was perceived as "Ideal."Within the Job

Demands-Resources (JD-R) theoretical framework, an "ideal" workload may reflect the point at which job demands do not exceed individual or organizational resource capacity. However, this "ideal" perception is subjective and can be influenced by various factors, including work experience, skill level, and social support (Lesener et al., 2019).

Specifically, Item 8 ("I have to work continuously") showed the highest perception of psychological burden (59.72), indicating employee burnout due to continuous tasks and lack of holidays. This indication is in line with the author's observations regarding the background of this study, which emphasized that overtime hours for employees, especially field employees, reached an average of 32.22 hours per employee per month. This occurred because more than 25% of field work at PLN UPT Cirebon could only be done on holidays when consumer electricity usage patterns were lower and PLN's work could be carried out. This made overtime very difficult to avoid. However, with the large amount of overtime work carried out on holidays, employees did not receive compensation for substitute holidays, because on weekdays there were also work plans that required personnel to carry out the work.

Physical Work Environment at PT PLN (Persero) Cirebon Transmission Implementation Unit

This study examines the Physical Work Environment variable as an independent variable at PT PLN (Persero) Cirebon Transmission Implementation Unit. The physical work environment variable is measured through five dimensions, namely: work equipment, air circulation, lighting, noise, and work space layout. The results of the descriptive analysis indicate that respondents' perceptions of the physical work environment are generally in the good category, with an average score reaching 76.99% on the continuum line.The research instrument for this variable consisted of 14 items. Dimensional analysis indicated that the Workspace Layout dimension received the lowest score, while the Air Circulation dimension received the highest score. The statement item "I feel that the workspace is spacious enough for high mobility" received the lowest score, although it is still in the "Good" category, indicating potential areas for improvement. Conversely, the item "I feel that my workplace has good and cool air circulation" received the highest score, implying that employees generally perceive that the workspace has good air circulation, but the workspace is still not spacious enough or not well organized, which reduces employee mobility and comfort.Field observations in early 2025 provide context for these findings. It was discovered that many buildings within the Cirebon Transmission Implementation Unit of PT PLN (Persero) had been standing since before 1985.

The main office building of the Cirebon Transmission Implementation Unit of PT PLN (Persero) was built in 1978. These older buildings were certainly designed based on the company's needs at that time. Meanwhile, the development of electricity transmission operations continues to this day, with more equipment and more personnel, while the building remains the same. Effective spatial design goes beyond mere aesthetics. Good spatial design must support workflow, facilitate necessary communication and collaboration, and provide an appropriate level of privacy for different types of work (Nakpodia & Urien, 2021). At the Cirebon Transmission Implementation Unit of PT PLN (Persero), the combination of individual work requiring high concentration and teamwork requiring intensive interaction is crucial. Flexible and adaptive spatial design is crucial.The air circulation in the office of PT PLN (Persero) Cirebon Transmission Implementation Unit is perceived as good and cool by employees because the company management cares about employee comfort at work. This is evidenced by the existence of an AC maintenance budget, with an amount sufficient to accommodate the maintenance of all AC units in the work area of PT PLN (Persero) Cirebon Transmission Implementation Unit once every 3 months. It can be concluded that the high score on the item related to "air circulation" correlates with AC maintenance efforts at the research location.

***Employee Engagement*at PT PLN (Persero) Cirebon Transmission Implementation Unit**

Within the framework of this study, employee engagement is positioned as an intervening variable. This variable has three dimensions: vigor, dedication, and absorption. Employee engagement was measured using 22 items. Of all the items distributed, the Vigor dimension showed the highest percentage, namely 86.35%. The statement with the highest score in this dimension was item 20, "I have the enthusiasm to learn new things," with a score of 89.29%. This indicates that the level of employee engagement at PT PLN (Persero) Cirebon Transmission Implementation Unit is at a very positive level.A "Good" level of Employee

Engagement (Y) (average score of 82.31%) is crucial for PT PLN (Persero) UPT Cirebon. High employee engagement is positively correlated with various desired organizational outcomes, including improved performance, innovation, customer satisfaction, and higher retention rates (Shuck et al., 2021). The prominence of Vigor (enthusiasm and energy) as the highest engagement component indicates that employees possess strong psychological resources to cope with work demands.The management of PT PLN (Persero) Cirebon Transmission Implementation Unit is continuously making comprehensive improvements to its organizational conditions.

As part of the periodic implementation of the Employee Engagement Survey (EES), management follows up on opportunities for improvement identified from the EES results through the Bipartite Cooperation Institution (LKS Bipartit) forum.One of the management strategies of PT PLN (Persero) Cirebon Transmission Implementation Unit in improving employee engagement is through the implementation of the Bipartite LKS. The Bipartite LKS is a forum consisting of representatives of management and labor unions. This forum is tasked with discussing various organizational issues with the aim of creating a conducive work climate and harmonious industrial relations. This forum serves as an effective communication platform between management and employees, enabling management to respond quickly to organizational constraints. The significant increase in the level of employee engagement of PT PLN (Persero) Cirebon Transmission Implementation Unit in the recent period is one indicator of the success of this program in supporting employee engagement.The existence of this communication forum demonstrates the seriousness of PT PLN (Persero) Cirebon Transmission Implementation Unit's efforts in responding to the results of an employee engagement survey conducted with all employees, thereby building employee trust in the company's sustainability.

When employees have a positive perception of the company's reputation, their engagement will increase, which in turn drives optimal work productivity. This aligns with Kruse's view in Hastuti and Setiawan (2022), which states that work effectiveness and productivity, as the primary demands of an organization from its employees, can be achieved through employee engagement. Employees who feel connected or engaged with the company will be motivated to make maximum contributions to help the company achieve its goals. They will dedicate more time, energy, and initiative to the company's success. Employee engagement reflects a condition in which employees work not solely for financial compensation or promotions, but on behalf of the organization and its goals.Furthermore, effective communication management and management responsiveness to employee needs can foster employee confidence. They feel cared for, which in turn increases their sense of responsibility. This finding aligns with research by Azicz (2022), which suggests that employees feel needed by the company. The company assigns equal responsibility for each employee's work. This engagement also affirms that employees are an integral part of the company. Respect and a positive relationship between employees and the company can create a family-like atmosphere, where open communication and dedication can thrive. This contributes to increased employee engagement with the organization.

Employee Work Productivity at PT PLN(Persero) Cirebon Transmission Implementation Unit

This study examines the variable of Employee Work Productivity as a dependent variable at PT PLN (Persero) Cirebon Transmission Implementation Unit. This variable is measured through three dimensions, namely: concentration, collaboration, and communication. The variable of employee work productivity is measured using 12 statement items. Of all the items distributed, the communication dimension shows the highest percentage, namely 78.36%. The statement with the highest score in this dimension is item 34, "I feel satisfied with activities that involve collaboration" with a score of 80.95%.The descriptive analysis results show that respondents' perceptions of employee work productivity are generally high, with an average score of 76.94% on the continuum. This indicates that employees feel capable of meeting performance expectations. The high score on the Communication dimension, as a contributor to productivity, underscores the importance of effective information flow.

In complex organizations, the ability to convey and receive information accurately and timely is crucial for coordination, decision-making, and problem-solving, all of which lead to productivity (Chen et al., 2019).However, the relatively lower score on the "Work-Life Balance" aspect (though still "Quite High")

within the Concentration dimension is a warning sign. The demand for constant connectivity or blurred boundaries between work and personal life, especially with technological advancements, can lead to stress and burnout, ultimately negatively impacting concentration and productivity (Molino et al., 2020). Even if productivity is currently high, the potential for productivity decline due to work-life imbalance can occur unnoticed. Therefore, initiatives that support healthy work-life balance or boundary management, as well as a culture that values rest and well-being, are increasingly important for long-term productivity sustainability.

The Relationship between Workload and Employee Engagement at PT PLN (Persero) Cirebon Transmission Implementation Unit

Based on the results of statistical testing using the SEM PLS method, it can be seen that Workload (X1) does not have a significant effect on Employee Engagement (Y) (P-value = 0.270 > 0.05). This is an interesting finding as it implies that at the current perceived "Ideal" workload level, variations in the workload are not strong enough to significantly change the level of employee engagement. As mentioned, the JD-R model (Lesener et al., 2019) explains that the effect of job demands can be neutralized or even turned positive if balanced with strong job resources.The Dedication aspect, which questions employees' willingness to work outside of normal working hours, scored the lowest among the other dimensions. This aligns with the workload analysis, which found that employees are often required to work on holidays.

PT PLN (Persero) Cirebon Transmission Implementation Unit as a whole has a compensation system, in-kind or benefits, career development opportunities that are perceived as adequate by employees, so that the existing workload does not drain the psychological energy needed for engagement. Furthermore, it is important to consider the nature of the workload itself. If the workload is more of a challenge demand (demands seen as opportunities for development) than hindrance demands (demands that hinder the achievement of goals), then the impact on engagement can be neutral or even positive (Crawford et al., 2010).

The Relationship between the Physical Work Environment and Employee Engagement at PT PLN (Persero) Cirebon Transmission Implementation Unit

Based on the results of statistical testing using the SEM PLS method, it can be seen that the Physical Work Environment (X2) has a positive and significant influence on Employee Engagement (Y) (P-value = 0.000 < 0.05). This confirms the crucial role of tangible aspects in shaping employee psychological experiences. The physical work environment is not just a place to work, but also a manifestation of the organization's values and concern for its employees. Good, safe, and comfortable facilities can increase a sense of belonging, reduce physical burden, and create a more conducive atmosphere for focus and positive interactions.This aligns with research showing that positive perceptions of the physical work environment correlate with job satisfaction, organizational commitment, and ultimately, engagement (Zhang & Liu, 2020). These findings provide strong justification for organizations to continue investing in improving and maintaining the physical work environment, not simply to meet standards, but as a proactive strategy to improve business process continuity. Improvements in the spatial aspect, previously identified as the lowest-scoring area, have the potential to deliver more substantial engagement gains.

The Relationship between Workload and Employee Work Productivity at PT PLN (Persero) Cirebon Transmission Implementation Unit

Based on the results of statistical testing using the SEM PLS method, it can be seen that Workload (X1) on Employee Work Productivity (Z) has a P-value = 0.919 > 0.05. This shows that within the current perceived workload range ("Ideal"), increasing or decreasing the workload does not directly and significantly change the level of productivity reported by employees.This could be due to several reasons. First, employees may have developed efficient work strategies or adapted to existing work rhythms, thus maintaining productivity despite minor fluctuations in workload. Second, productivity may be more sensitive to factors other than workload, such as the quality of the tools and technology used, the clarity of goals and performance expectations, or the effectiveness of internal work processes. Third, as mentioned previously, the workload-productivity relationship is often non-linear. This finding is consistent with research by Jumantoro et al. (2019) and Nugroho (2021), which also found no significant direct effect.

The Relationship between the Physical Work Environment and Employee Work Productivity at PT PLN (Persero) Cirebon Transmission Implementation Unit

Based on the results of statistical testing using the SEM PLS method, it can be seen that there is a positive and significant influence of the Physical Work Environment (X2) on Employee Work Productivity (Z) (P-value = 0.000 < 0.05). A well-designed physical work environment directly reduces physical and cognitive barriers to performance. Proper lighting can reduce eye fatigue and errors, a comfortable temperature improves concentration, and an ergonomic layout reduces the risk of injury and increases movement efficiency (Suhardi et al., 2019).

A well-maintained and modern physical work environment can also convey a sense of professionalism and quality, which can indirectly motivate employees to produce better output. Research by Kusumadewi (2022) found a positive and significant effect of the physical work environment on work productivity. This indicates that a conducive physical environment plays a key role in increasing employee productivity. Even the smallest effort to improve the comfort of the physical workplace environment has the potential to yield significant results in the form of increased productivity.

The Relationship between Employee Engagement and Employee Work Productivity at PT PLN (Persero) Cirebon Transmission Implementation Unit

Based on the results of statistical testing using the SEM PLS method, it can be seen that Employee Engagement (Y) has a positive and significant effect on Employee Work Productivity (Z) (P-value = 0.000 < 0.05). This is one of the main pillars in HR management. Engaged employees are not only present at work, but they are fully cognitively, emotionally, and physically invested in their roles (Al-Maharmeh, 2020). This energy investment is manifested in various productive behaviors: they are more focused on tasks, more proactive in finding solutions, more persistent in overcoming obstacles, and more willing to collaborate. In other words, engagement turns potential into actual performance.Perceived employee productivity levels are already high at PT PLN (Persero) UPT Cirebon, but the role of engagement as a key driver cannot be ignored. Strategies aimed at further enhancing engagement—such as enriching jobs, providing more compensation, increasing recognition, and building stronger relationships—are likely to result in further productivity gains.

The Relationship between Workload and Physical Work Environment on Employee Engagement and its Implications on Employee Work Productivity at PT PLN (Persero) Cirebon Transmission Implementation Unit

Based on the results of statistical testing using the SEM PLS method, information was obtained that for the variables of workload and physical work environment on employee engagement and employee work productivity in the Rsquare data was 0.631. This means that the magnitude of the influence of workload and physical work environment on employee engagement and its implications on employee work productivity at PT PLN (Persero) Cirebon Transmission Implementation Unit was 63.1%. The value of 100% - 63.1% = 36.9% of the remainder is influenced by variables not discussed in this study. Several studies that use other variables such as an example is from (Fitria, 2023) who examined the effect of employee education level and physical work environment on optimizing employee work productivity. In this study, it was found that From this study, it was found that education level and physical work environment have a positive and significant influence on employee work productivity.

Furthermore, the indirect influence of the relationship between variables can be concluded as follows:

1. The indirect effect of workload (X1) on employee productivity (Z) through employee engagement (Y) is insignificant (P-value = 0.283 > 0.05). This is consistent with the absence of a significant direct effect of workload on either engagement or productivity. This also confirms that in the current conditions at PT PLN (Persero) UPT Cirebon, the perceived "ideal" workload does not trigger significant changes in employee engagement, and therefore, does not indirectly affect productivity through the engagement pathway.
2. The Indirect Effect of Physical Work Environment (X2) on Employee Productivity (Z) through Employee Engagement (Y) is significant (P-value = 0.000 < 0.05). This indicates that Employee Engagement serves as a crucial bridge connecting the quality of the Physical Work Environment with the

level of Employee Productivity. A superior physical work environment not only makes work easier and more comfortable physically (a direct effect on productivity), but also fosters positive feelings, engagement, and motivation (increased engagement), which then translates into greater work effort and higher productivity. This illustrates a cascading effect where investments in physical aspects have a psychological impact that then strengthens performance outcomes. This finding supports the argument that creating a "great workplace" is not just about facilities, but about how those facilities contribute to the overall employee experience and engagement (Karatepe & Avci, 2019).

V. CONCLUSION AND SUGGESTIONS

In this chapter, the author will present the conclusions from the research results that have been described in the previous chapter, as well as the implications and suggestions that can be given based on the research findings regarding the influence of Workload and Physical Work Environment on Employee Work Productivity with Employee Engagement as an intervening variable at PT PLN (Persero) Cirebon Transmission Implementation Unit.

Conclusion

Based on the results of the data analysis and discussion that has been carried out, the following conclusions can be drawn:

1. Employees generally perceive the workload at PT PLN (Persero) Cirebon UPT as ideal. However, the Psychological Stress dimension is perceived as the most burdensome aspect.
2. The level of the Physical Work Environment at PT PLN (Persero) UPT Cirebon is generally perceived as ideal by employees, with the Air Circulation dimension receiving the highest perception.
3. The Employee Engagement level of employees at PT PLN (Persero) UPT Cirebon is in the very good category, indicating that employees have high enthusiasm, dedication, and absorption in their work.
4. The level of employee work productivity at PT PLN (Persero) UPT Cirebon is generally perceived as ideal, with the Communication dimension receiving the highest perception.
5. Workload has a negative and insignificant effect on Employee Engagement of employees at PT PLN (Persero) UPT Cirebon.
6. The Physical Work Environment has a positive and significant influence on Employee Engagement of employees at PT PLN (Persero) UPT Cirebon.
7. Workload has a negative and insignificant effect on Employee Work Productivity at PT PLN (Persero) UPT Cirebon.
8. The physical work environment has a positive and significant effect on employee work productivity at PT PLN (Persero) UPT Cirebon.
9. *Employee Engagement*has a positive and significant effect on Employee Work Productivity at PT PLN (Persero) UPT Cirebon.
10. The influence of workload and physical work environment on employee work productivity through mediation with employee engagement at PT PLN (Persero) Cirebon Transmission Implementation Unit is positive and significant at 63.1%.

Suggestion

Company management should evaluate time allocation for planning, executing, and monitoring work. Ensure that tasks are distributed equitably and in accordance with employee capacity and competency to avoid the perception of excessive workload on certain individuals. Management needs to address work-life balance, which has been identified as a weak point. Review policies related to working hours, overtime, and paid vacation days to ensure employees have sufficient recovery time, which is crucial for long-term productivity sustainability.

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