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Analysis of The Effect of Work Environment and Human Resource Aspects on Employee Performance Quality In Building Maintenance Work

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ABSTRACT

The rapid development of infrastructure in Indonesia has not been matched by adequate attention to building maintenance activities. Many buildings experience deterioration before reaching their intended service life due to weak maintenance management, particularly in terms of human resources. Worker performance plays a crucial role in maintenance success and is influenced by various factors, including discipline, motivation, work environment, training, ability, and tools. This study aims to analyze the influence of HR aspects and the work environment on worker performance quality in building maintenance projects at PT XYZ, as well as to evaluate the importance and performance levels of each indicator using a combined method. A quantitative approach was applied using structural equation modeling with partial least squares (SEM-PLS) via SmartPLS 3.0 software. Additionally, importance-performance analysis (IPA) was employed to identify improvement priorities. The results indicate that, among the six variables, only discipline has a positive and significant impact on worker performance (path coefficient = 0.243; $T = 2.026$; $P = 0.043$). Other variables, including the work environment, were not statistically significant. Mediation analysis revealed an indirect effect of the work environment on discipline and motivation (coefficient = 0.281; $T = 1.921$; $P = 0.055$). Discipline is the most dominant factor in improving performance, while enhancing training and the work environment remains essential as a long-term managerial strategy. IPA identified training-related indicators and supervisor motivation support as top priorities for improvement.

KEYWORDS *Worker Performance, Human Resources, SEM-PLS, IPA, Building Maintenance.*

INTRODUCTION

Increasing infrastructure development in Indonesia until 2024 has made significant progress. In terms of budget, there has been an increase of around 7.8% from 2023 to 2024. The infrastructure budget in 2024 reached IDR 422.7 trillion, up from IDR 392 trillion in 2023 (Ahmadsyah et al., 2024; Mhlanga, 2021; Setianda et al., 2025). Additionally, during the 2015–2023 period, the number of completed National Strategic Projects (*Proyek Strategis Nasional* or PSN) experienced substantial growth, with 158 out of 210 projects finished by July 2023 at an investment value of IDR 1,102.7 trillion, covering sectors such as toll roads, airports, dams, and other infrastructure (Kristantyo Wisnubroto, 2023).

However, the rapid progress of infrastructure development has not been matched by serious attention to building maintenance activities (Usman and Winandi, 2009). Many grandiose and beautiful buildings quickly deteriorate and become unfit for use before reaching their planned lifespan. In fact, maintenance is an integral part of the project life cycle, from the initial idea stage through planning, construction, operation, and upkeep (Adibah et al., 2024; Besiktepe et al., 2020; Carrasco et al., 2024; Ehab et al., 2024; Sholeh & Malelak, 2019).

Infrastructure maintenance is divided into two main aspects: the main structure and complementary facilities. Main structures—such as columns, beams, foundations, and building frames—must be maintained to withstand loads according to the original design and prevent structural damage. Meanwhile, complementary facilities, such as electrical installations, water lines, and lighting systems, require routine maintenance through a preventive approach. Preventive maintenance aims to avert damage before it occurs and is performed periodically to keep system performance optimal (Amani et al., 2012; Anbari Moghadam & Besiktepe, 2025; Challender & Challender, 2024; Orooje & Latifi, 2021). However, the implementation of both structural and facility maintenance is greatly influenced by the quality and capacity of the involved human resources.

Human resources (HR) are a crucial component in the success of maintenance projects. The effectiveness of HR management determines whether maintenance runs according to standards. In the context of construction and maintenance projects, employee performance reflects an individual's achievements in carrying out their duties. Optimal employee performance results in quality projects completed on time and within budget. Conversely, low-quality human resources can lead to delays, increased costs, and reduced results (Dewi, Sudipta and Setyowati, 2016).

Factors affecting employee performance include work discipline, motivation, work environment, training, technical skills, and availability of tools. Work discipline reflects adherence to schedules, procedures, and professional ethics. Motivation serves as an internal driver for workers to deliver optimal results, while a comfortable and supportive work environment boosts productivity. Training is essential for enhancing technical capabilities and adapting to new technologies amid modern maintenance challenges. Adequate tools and facilities also significantly impact work efficiency and safety.

The work environment is one of the key HR aspects. An ergonomic, safe, and supportive work environment not only directly affects performance but also influences other factors, such as discipline and motivation. Therefore, this study analyzes the work environment both as a direct independent variable on performance and as a factor potentially affecting other HR aspects.

This research was conducted at PT XYZ, a Tier IV data center service provider operating for over a decade and leading in Southeast Asia. PT XYZ manages seven data centers across locations including Cibitung, Karawang, and Jakarta, with a total power capacity nearing 1,000 megawatts. The company achieves a service availability rate (Service Level Agreement or SLA) of 99.999%, allowing only five minutes of annual downtime—a remarkable feat in the data center industry. PT XYZ is also the only Southeast Asian operator with Tier IV certification from the Uptime Institute for all facilities and operations.

Based on 2024 maintenance project data, PT XYZ handled 1,460 projects across three locations: 1,042 in Cibitung, 268 in Karawang, and 150 in Jakarta. A total of 200 incidents were recorded, with 146 in Cibitung, 32 in Karawang, and 22 in Jakarta. These occurred over more than 100.6 hectares, encompassing ten buildings. The high project volume and incident count highlight the complexity of maintenance management at PT XYZ, particularly in HR aspects.

Field observations reveal that HR issues remain the primary cause of maintenance disruptions. Low employee motivation manifests as a lack of troubleshooting initiative, leading

to repair delays. Weak work discipline is evident in late worker arrivals at sites, disrupting schedules. An unergonomic and cramped work environment reduces productivity. Additionally, not all technicians receive adequate training, risking procedural errors. Incomplete tools further extend downtime during maintenance.

PT XYZ's success in maintaining high operational performance stems from effective strategies, including predictive maintenance technology and automation. Nevertheless, in multi-location maintenance project management, HR remains central. Thus, this study aims to analyze the influence of the work environment and other HR aspects on employee performance quality in building maintenance work. A quantitative approach uses SmartPLS 3.0 to measure direct and indirect variable influences. Importance-Performance Analysis (IPA) maps improvement priorities based on indicator importance and performance levels.

Integrating these approaches provides a comprehensive view of priority HR improvements, including how the work environment affects performance directly and indirectly via factors like motivation and discipline. These findings offer a strategic foundation for enhancing HR management in dynamic, multi-location building maintenance.

This study's problem identification focuses on key issues necessitating better HR management at PT XYZ: the high volume of maintenance projects signaling execution gaps; suboptimal employee performance marked by delays and errors; and an unsupportive work environment impacting motivation and discipline. Additionally, dominant HR aspects influencing employee performance in multi-location projects lack clarity, as do improvement priority mappings from respondent perceptions.

The research questions address measuring HR aspects' influence on employee performance quality, identifying dominant aspects, and evaluating HR indicator importance and performance via IPA. The objectives are to examine the work environment and HR aspects' impact on employee performance and to evaluate their influence and dominance using statistical models and perception analysis.

This research contributes scientifically and practically to HR management theory and practice, benefiting universities, companies, and future researchers. Its novelty lies in integrating influence analysis with importance-performance evaluation, via simultaneous SEM-PLS and IPA—methods rarely combined in similar studies—offering a new framework for building maintenance contexts.

METHOD

The research process begins with the identification of information needs related to employee performance in building maintenance projects, where the research background explains the urgency and problems that exist, such as delays and low quality of work, as well as Human Resources (HR) factors that are suspected to be the causes, such as lack of training and motivation. After formulating the problems and objectives of the research, the researcher identifies the influential aspects of human resources, such as discipline, motivation, training, work environment, abilities, and tools. A literature study was conducted to support the theory and instruments, followed by an inventory of data needs, which included the collection of primary data through questionnaires and secondary data from the project document. Expert

validation is done to ensure the instrument used is relevant, and if the data is invalid, revisions are made.

Valid data is then analyzed using the SEM-PLS method to measure the relationship between variables and identify dominant factors that affect employee performance. After the analysis, the Importance Performance Analysis (IPA) method was carried out to map improvement priorities based on the importance and performance of the indicators. Conclusions and suggestions are compiled based on findings, including recommendations to improve human resources, such as regular training and increased motivation. Thus, this study aims to provide a comprehensive understanding of the influence of human resources on employee performance and develop the necessary strategic actions in the field.

RESULTS AND DISCUSSION

R-SQUARE (R^2)

R-Square (R^2) analysis is used to measure how much independent variables (human resource aspects) are able to explain variations from dependent variables (Employee Performance). The value of R^2 ranges from 0 to 1. The closer it is to 1, the better the model's predictive ability of endogenous variables.

The coefficient of determination is very important because: 1) Shows the predictive power of the model. 2) Provides information to the extent to which exogenous constructs explain endogenous constructs. 3) It is the basis for evaluating the quality of structural models in SEM-PLS.

According to Chin (1998), the general interpretation of the value of R^2:

$R^2 \geq 0.67$ = substantial (Strong)
$R^2 \geq 0.33 – < 0.67$ = moderate
$R^2 \geq 0.19 – < 0.33$ = weak
$R^2 < 0.19$ = very weak

Table 1. Result R-Square (R^2)

Variable endogenous	R Square	R Square Adjusted	Category
Discipline (X1)	0.511	0.502	Moderate
Motivation (X2)	0.602	0.595	K
Employee Performance (Y)	0.805	0.780	Strong

Source: Processed Researcher (2025)

Based on the results of the analysis, it was obtained:

The discipline (X1) has an R^2 value of 0.511. This means that the Work Environment variable (X3) is able to explain 51.1% of the variation on Discipline. It belongs to the medium category, showing quite a significant influence. Motivation (X2) with an R^2 value of 0.602, means that the Work Environment is also quite strong in explaining 60.2% of motivation variations, falling into the category of moderate to strong.

Employee Performance (Y) has an R^2 of 0.805, belonging to the strong category. This means that the human resource variables studied (Discipline, Motivation, Work Environment, Training, Abilities, and Tools) together are able to explain 80.5% of changes or variations in Employee Performance. The remainder (19.5%) could be due to other factors outside of this

research model, such as organizational culture, reward systems, or external factors of the project.

The R^2 values in this study show that the structural model built has good predictive power, especially for the Employee Performance variable. This shows that the model is reliable to explain the influence of HR aspects on the quality of performance in building maintenance projects. The high R^2 value on the Y variable (Employee Performance) also supports that this model is relevant.

PATH COEFFICIENT TEST

The path significance test aims to find out how much of a direct influence between constructs in the structural model, based on the results of SEM processing using the SmartPLS 3.0 application. This test is the main basis for confirming the truth of the hypothesis that has been formulated in the research.

The test is carried out through a bootstrapping process, with the output in the form of values: 1) Path Coefficient: indicates the direction and strength of influence (positive/negative, weak/strong). 2) T-Statistics are obtained from the T distribution table by taking into account the number of respondents and the number of variables. P-Value: used to test the statistical significance of such influences.

Significance criteria: 1) T-Statistic ≥ 1.67 and P-Value ≤ 0.05 → Significant influence (accepted hypothesis) **(TABLE T).** 2) T-Statistic: < 1.67 or P-Value > 0.05 → Influence is insignificant (hypothesis rejected). Results of the intervariable path test using bootstrapping:

Table 2. Intervariable Pathway Test Results

Hypothesis	Path	Coefficient	T Statistics	P Value	Results
H1	Employee Discipline → Performance	0.243	2.026	0.043	Accepted
H2	Employee Motivation → Performance	0.137	0.947	0.344	Rejected
H3	Work Environment → Discipline	0.715	5.475	0.000	Accepted
H4	Work Environment → Motivation	0.776	7.958	0.000	Accepted
H5	Employee Work Environment → Performance	0.255	1.318	0.188	Rejected
H6	Employee Performance → Training	0.103	0.596	0.551	Rejected
H7	**Employee Performance → Ability**	0.262	1.523	0.128	Rejected
H8	Employee Performance → Tools	-0.005	0.027	0.979	Rejected

Source: Processed Researcher (2025)

Based on the results of Table 4.7, it is obtained:

H1 (Accepted): Discipline has a direct and significant influence on Employee Performance. This means that the higher the level of discipline of the worker, the better the performance will be produced. H2 (Rejected): Motivation does not have a significant influence on Employee Performance. This suggests that despite being motivated, workers may still be constrained by other factors such as skills or tool availability.

H3 and H4 (Accepted): The Work Environment has a significant influence on Discipline and Motivation. A comfortable, safe, and orderly work environment has been proven to

increase the discipline and motivation of workers. H5 (Rejected): The Work Environment does not have a direct influence on Employee Performance. Although it contributes to good working conditions, its impact on the outcome of work needs an intermediary (e.g. discipline).

H6–H8 (Rejected): Training, Skills, and Tools have no significant effect on Employee Performance. This indicates the existence of possible mismatches between training and work, a lack of capability actualization, or tools that are available but not used optimally.

The path coefficient test showed that out of 8 direct path hypotheses, only 3 were successfully accepted, namely H1, H3, and H4. Thus: 1) Discipline is the only aspect that directly improves Employee Performance significantly. 2) The Work Environment is very important as an indirect influence because it plays a role in shaping discipline and motivation. 3) Aspects such as motivation, training, abilities, and tools require a review or other approach to be more effective in improving performance.

MEDIATION EFFECT TEST

The mediation effect test was carried out to determine whether there was an indirect influence of independent variables on dependent variables through one or more mediator variables. In this study, it was tested whether the Work Environment (X3) has an indirect influence on Employee Performance (Y) through mediator variables, namely Discipline (X1) and Motivation (X2).

The test was carried out using the bootstrapping method on SmartPLS 3.0, with significance criteria, Statistical Significance Limit Criteria: 1) T-Statistic ≥ 1.67 indicates that the path of influence is significant at a 95% confidence level ($p \leq 0.05$). 2) If the T-Statistic < 1.67 and the P-Value > 0.05, then it is considered statistically insignificant.

Total Indirect Effects

The following table shows the total influence of the Work Environment on Employee Performance through indirect channels (through Discipline and Motivation).

Table 3. Hasil Total Inderict Effects

Mediation Pathway	Coefficient	T Statistics	P Value	Information
Work Environment → Employee Performance (via X1 and X2)	0.281	1.921	0.055	Insignificant

Source: Processed Researcher (2025)

From the results of Table 3 the results are obtained: 1) The coefficient value of 0.281 indicates that there is a positive indirect influence of the Work Environment on Employee Performance. 2) There is a Statistical T-value = 1.921 above the limit of the t table = 1.67, and the P-Value = 0.055 is greater than 0.05, so it is not statistically significant at the 95% level. 3) This effect is important to study further in follow-up research because it shows the potential influence of relevant mediation.

Specific Indirect Effects

The following are the results of testing the specific indirect influence on each mediation path.

Table 4. Hasil Specific Indirect Effect

Mediation Pathway	Coefficient	T Statistics	P Value	Information
Work Environment → Employee Discipline → Performance	0.174	1.800	0.072	Insignificant
Work Environment → Employee Motivation → Performance	0.107	0.939	0.348	Insignificant

Source: Processed Researcher (2025)

Based on table 4. above, it can be explained that:

For lines X3 → X1 → Y:

The coefficient of 0.174 indicates a positive direction. However, with T = 1,800 and P = 0.072, this effect was not significant at the 95% level, so it was not strong enough to support the hypothesis.

For the X3 → X2 → Y lines:

The value of the coefficient of 0.107 indicates a weak influence. With T = 0.939 and P = 0.348, this pathway is not significant, so it does not support the existence of mediation by Motivation.

With the results of the analysis, then: The results show that the Work Environment does not significantly affect Employee Performance through Discipline and Motivation**,** either in total or specifically. Despite the tendency towards positive relationships and T-values that are close to significant (marginal), the H10 and H11 hypotheses are not statistically acceptable at a 95% confidence level**.** This suggests that the influence of the Work Environment on Employee Performance is likely to be more effective directly through improved discipline, without involving complex mediation.

Model Fit Test (Model Fit)

The model fit test or model fit aims to assess whether the constructed structural model can represent the empirical data well. In SEM-PLS, the fit model is not the only reference for model validity, but it is still important as a supporting indicator that the structure of the relationship between variables is statistically correct. Some of the fit model indicators used in SmartPLS 3.0 include: 1) Standardized Root Mean Square Residual (SRMR). 2) Normed Fit Index (NFI). 3) Chi-Square, d_ULS, d_G. 4) RMS Theta. 5) AIC, BIC, and HQ Criteria (used in alternative selection models).

General Criteria of Fit Models (Hair et al., 2021): 1) SRMR < 0.08 → Fit model. 2) NFI is approaching 1 → Model fit is getting better. 3) RMS Theta < 0.12 → Excellent quality of the outer model (reflective only)

Table 5. Fit Model Results

	Saturated Model	*Estimated Model*
SRMR	0.071	0.084
d_ULS	3.018	4.246
d_G	7.682	7.857
Chi-Square	1.317.812	1.328.750

NFI	0.571	0.567
RMS Theta	0.211	-

Source: Processed Researcher (2025)

Based on the table above, it can be explained that:

The SRMR in the saturated model (0.071) is below the 0.08 limit, indicating that overall this model is acceptable (fit**)**. The NFI is still below the ideal value (0.9), but it is not an absolute limit in SEM-PLS. As long as the SRMR is good, the model remains valid. Theta's RMS of 0.211 indicates that the quality of the reflective outer model is not optimal, but it is still acceptable for an exploratory context such as this study. The values of d_ULS and d_G and Chi-Square indicate the accuracy of the estimate, but are more used in comparisons between alternative models.

In general, the results of the model fit test show that the SEM-PLS model in this study has an adequate level of compatibility**.** This is reinforced by SRMR values that meet the fit standard**,** although RMS Theta and NFI indicate the need for further refinement if these models are to be used for broader generalizations. This model can be used as a basis for decision-making on the influence of HR aspects on Employee Performance, because it statistically shows a valid relationship structure between variables**.**

Hypothesis Evaluation

The following is a description of the results of the hypothesis testing:

H1 (Accepted): Discipline has a significant effect on Employee Performance ($p = 0.043$). Discipline has proven to be a dominant factor in improving performance. H2 (Rejected): Motivation had no significant effect on Employee Performance ($p = 0.344$). This can happen because the motivation they have is not strong enough or irrelevant to the load and type of work.

H3 (Accepted): Work Environment has a significant effect on Discipline ($p = 0.000$). This means that good working conditions will increase discipline. H4 (Accepted): Work Environment has a significant effect on Motivation ($p = 0.000$). A supportive environment is able to build work morale. H5 (Rejected): Work Environment has no direct effect on Employee Performance ($p = 0.188$). The impact is greater through other variables.

H6 (Rejected): Training had no significant effect on Employee Performance ($p = 0.551$). It can be caused by the irrelevance of training to daily tasks. H7 (Rejected): Ability has no significant effect on Employee Performance ($p = 0.128$). It is most likely affected by the lack of assignment placement according to ability. H8 (Rejected): The tool had no significant effect on Employee Performance ($p = 0.979$). It can happen if tools are available but not used effectively.

H9–H10 (Declined): The indirect effects of the Work Environment through Discipline and Motivation on Employee Performance were not significant ($p > 0.05$). H11 (Accepted): based on an R^2 value of 0.805, which shows that simultaneously the variables of Discipline, Motivation, Work Environment, Training, Abilities, and Tools affect Employee Performance.

The Order of Dominance of HR Aspects on Employee Performance

Which aspect of human resources (HR) has the greatest to the least influence on Employee Performance (Y) based on the results of the path coefficient test, f^2 effect size value, T-statistics, and P-value. This analysis is very important to develop a performance improvement strategy based on HR policy priorities.

Table 6. The Dominant Variable of HR Aspects on Employee Performance

Rank	HR Aspects	Path Coefficient	T-Statistics	P-Value	f^2 Effect Size	Status Significance
1	Discipline (X1)	0.243	2.026	0.043	0.111	Significant
2	Ability (X5)	0.262	1.523	0.128	0.082	Insignificant
3	Work Environment (X3)	0.255	1.318	0.188	0.047	Insignificant
4	Motivation (X2)	0.137	0.947	0.344	0.031	Insignificant
5	Training (X4)	0.103	0.596	0.551	0.014	Insignificant
6	Tools (X6)	-0.005	0.027	0.979	0.000	Insignificant

Source: Processed Researcher (2025)

Discipline is the most dominant factor that should be the main focus in HR management strategies to improve the quality of work on building maintenance projects. Discipline (X1) ranks first as the most dominant factor and has a significant influence on performance. This means that improving discipline will directly encourage the improvement of the quality of Employee Performance on building maintenance projects.

Ability (X5) shows a moderate, but not significant, contribution. This can be due to a lack of adjustment between competencies and job placement, or perception measurements that are not optimal. The Work Environment (X3) has a moderate direct influence, but it is also not statistically significant. This is interesting because X3 indirectly affects X1 and X2 which then affects Y.

Motivation (X2) although considered important in many HR studies, in the context of this building maintenance project it did not show a significant influence. Training (X4) and Tools (X6) are the two aspects that have the least impact on performance. This could be a reflection that the training material is irrelevant to the task or the tools are already available but not being used optimally.

From these results, it can be concluded that Discipline is the factor that needs to be considered and developed by project management. The strategy to improve the quality of Employee Performance must be directed first to fostering discipline, before improving other aspects such as abilities and work environment.

Importance Performance Analysis (IPA)

In this Importance Performance Analysis (IPA) method, the next calculation is then carried out, namely the calculation of the value of the level of importance/expectation and the level of employee performance. Then calculate the average performance level ($\bar{X}$) and the average level of importance ($\bar{Y}$) and then the results will be mapped into a cartesian diagram divided into 4 quadrants.

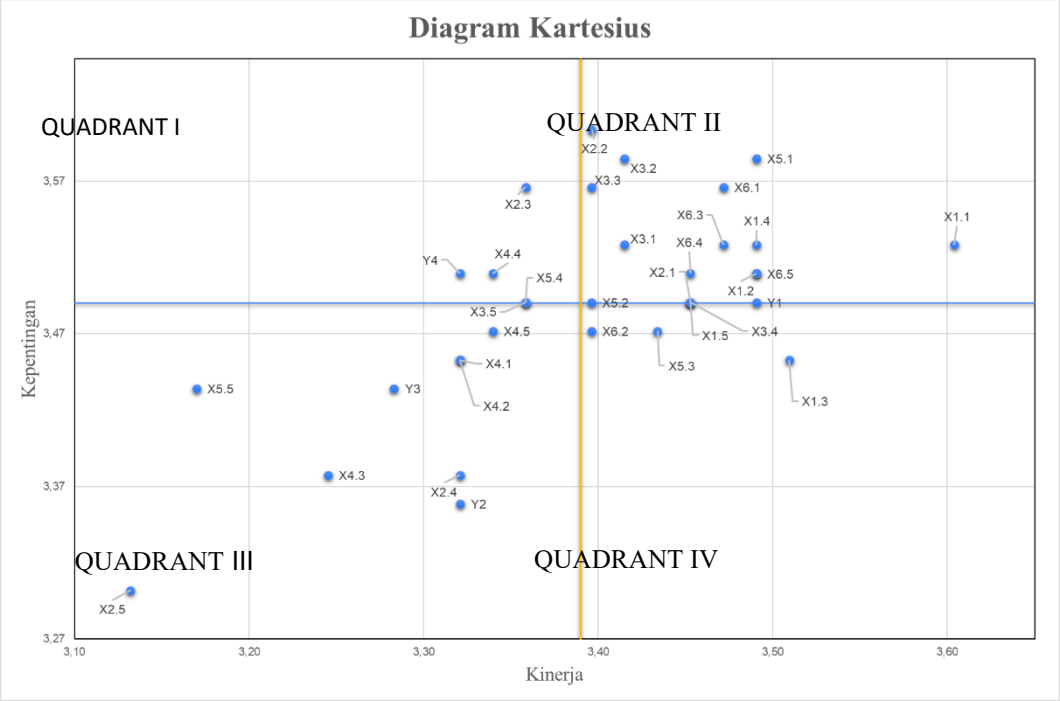
Table 5. Average Calculation Results of All Variables

No	Variable	Performance Level (X)	Interest Level (Y)	Average (X)	Average (Y)
1	X1.1	191	187	3,60	3,53
2	X1.2	185	186	3,49	3,51
3	X1.3	186	183	3,51	3,45
4	X1.4	185	187	3,49	3,53
5	X1.5	183	185	3,45	3,49
6	X2.1	183	185	3,45	3,49
7	X2.2	180	191	3,40	3,60
8	X2.3	178	189	3,36	3,57
9	X2.4	176	179	3,32	3,38
10	X2.5	166	175	3,13	3,30
11	X3.1	181	187	3,42	3,53
12	X3.2	181	190	3,42	3,58
13	X3.3	180	189	3,40	3,57
14	X3.4	183	185	3,45	3,49
15	X3.5	178	185	3,36	3,49
16	X4.1	176	183	3,32	3,45
17	X4.2	176	183	3,32	3,45
18	X4.3	172	179	3,25	3,38
19	X4.4	177	186	3,34	3,51
20	X4.5	177	184	3,34	3,47
21	X5.1	185	190	3,49	3,58
22	X5.2	180	185	3,40	3,49
23	X5.3	182	184	3,43	3,47
24	X5.4	178	185	3,36	3,49
25	X5.5	168	182	3,17	3,43
26	X6.1	184	189	3,47	3,57
27	X6.2	180	184	3,40	3,47
28	X6.3	184	187	3,47	3,53
29	X6.4	183	186	3,45	3,51
30	X6.5	185	186	3,49	3,51
31	Y1	185	185	3,49	3,49
32	Y2	176	178	3,32	3,36
33	Y3	174	182	3,28	3,43
34	Y4	176	186	3,32	3,51
Average		**6114**	**6100**	**115,36**	**118,62**

Source: Processed Researcher (2025)

Cartesian Chart Per Variable

To determine the intersection of two perpendicular lines ($\bar{X}$) and ($\bar{Y}$) as the division of the area using equations (4) and (5).



$$\bar{\bar{X}} = \frac{115{,}36}{53} = 3{,}39 \qquad \bar{\bar{Y}} = \frac{118{,}62}{53} = 3{,}49$$

Figure 4.1 Variable Cartesian Diagram
Source: Processed Researcher (2025)

After the calculation was carried out using the Importance Performance Analysis (IPA) method using Microsoft Excel, the results of mapping 34 indicators of HR variables in the form of Cartesian Diagrams were obtained based on data on the level of importance and performance according to respondents. This assessment is based on the perception of workers on the implementation of building maintenance projects at PT XYZ, so that an idea is obtained of the extent to which each aspect of human resources has been implemented effectively and according to expectations. The results of mapping indicators to the quadrants in the diagram are as follows:

1) Quadrant I (focus improvement)

Shows the variables that affect the quality of Employee Performance. This is an area that contains factors that are considered important by employees, but in reality these factors do not yet live up to the expectations of employees (the level of satisfaction obtained is still low). The variables included in this quadrant must be increased (Suhendra & Prasetyanto, 2016). Judging from Figure 4.3 of the diagram, the variables included in quadrant I are:

X4.1 – The scope of training provided is inadequate.
X4.2 – Training is not yet fully up to the needs of the project.
X4.3 – Insufficient training duration.
X2.4 – Lack of motivational support from direct superiors.
Y2 – Employee job satisfaction is considered not as expected.

These five variables are considered very important by respondents, but have a level of performance that is not optimal, so it requires immediate attention and improvement.

2) Quadrant II (maintain performance).

Showing the variables that affect the performance of the supervisory consultant. Those in this quadrant show the elements of basic services that have been successfully carried out by the company, for which it must be maintained. This element is considered very important and very satisfying (Sulistianingsiha, 2016). Judging from the diagram 2, the variables included in quadrant II are:

X1.1 – Arrive on time
X1.2 – Obey company regulations
X1.4 – Adhering to working hours
X1.5 – Responsible for tasks
X2.1 – Have a high work ethic
X2.2 – Motivated to complete tasks
X3.1 – Adequate workspace
X3.2 – Comfortable working atmosphere
X3.3 – Availability of assistive devices in the workplace
X3.4 – Peer support
X5.1 – Have the ability to perform tasks
X5.2 – Have relevant work experience
X6.1 – Adequate work equipment
X6.3 – Efficient work aids
X6.4 – Work tools available as needed
X6.5 – Safe work tools to use
Y1 – Performance according to quality standards

These aspects need to be maintained and made a standard in HR management in building maintenance projects.

3) Quadrant III (medium-low priority).

Shows the variables that affect employee performance. The attributes/statements contained in this quadrant have a low level of importance/expectation and their performance is also rated as poor by customers (Wisudawati et al., 2023). Judging from the diagram 2, the variables included in quadrant III are:

X2.4 – Lack of motivation in stressful conditions
X2.5 – Not motivated in repetitive tasks
X4.1 – Training is rarely given
X4.2 – No regular training
X4.3 – Less interesting training
X4.5 – Lack of training evaluation
X5.5 – Not given a job according to skill
Y2 – Performance has not been optimal in cost efficiency
Y3 – Performance has not been maximized in completion time

9 indicators are included in Quadrant C (Low Priority), which means that although their performance is low, their level of importance is also low, so they are not a priority for improvement.

4) Quadrant IV (reduce emphasis)

Showing that the variables that affect the performance of employees in this quadrant are considered excessive in their implementation. Attributes are considered unimportant for consumers while the level of performance provided is good and consumers feel satisfied so they are considered excessive and are expected to reduce their performance level (Mega & Lim, 2023). Judging from the diagram 4.3 figure, the variables included in quadrant IV are:

X1.3 – Obeying the dress code
X5.3 – Can complete tasks without guidance
X6.2 – Modern work equipment

aspects that have a high level of performance, but the level of importance is relatively low. This means that resource allocation to indicators such as work experience (X5.3) and compliance with rules (X1.3) can be re-evaluated so that there is no waste or overallocation.

CONCLUSION

This study evaluated the influence of HR aspects on employee performance quality in building maintenance projects using SEM-PLS and IPA methods, revealing that HR factors explained a strong 80.5% of performance variance ($R^2 = 0.805$). Among six variables, only Discipline (X1) showed a significant positive effect (path coefficient = 0.243, T-statistic = 2.026, P = 0.043), emerging as the dominant factor, while Motivation, Ability, and Work Environment had positive but insignificant impacts, and Training exhibited a negative influence. IPA identified five key Quadrant I indicators needing priority improvement, such as inadequate training and insufficient superior-driven motivation, to enhance HR quality and performance. For future research, longitudinal studies could track the long-term effects of targeted interventions in these Quadrant I areas, incorporating qualitative data from employee interviews to uncover underlying barriers in multi-location maintenance contexts.

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