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THE IMPACT OF TURNAROUND TIME AND MRO FACILITY IN AIRCRAFT MAINTENANCE ON EMPLOYEE PERFORMANCE

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ABSTRACT

This study aims to analyze the influence of Turnaround Time and MRO Facility on Employee Performance in aircraft maintenance activities. Optimal Turnaround Time and adequate maintenance facilities play a crucial role in enhancing Employee Performance, particularly in efficiency, job satisfaction, and productivity. The research employs Structural Equation Modeling-Partial Least Squares (SEM-PLS) with the Blindfolding technique to assess the model's predictive validity. Data were collected through questionnaires from employees involved in aircraft maintenance activities. The results indicate that TAT has a significant moderate effect on employee performance, suggesting that effective turnaround time management enhances work efficiency and overall employee productivity. Meanwhile, the MRO Facility also shows a statistically significant, albeit small, effect on employee performance, indicating that modern and well-equipped facilities contribute positively to performance outcomes. This study contributes theoretically to understanding the key factors affecting employee performance in the MRO sector and offers practical implications for management in optimizing performance improvement strategies. The study is limited by its narrow research scope and exclusion of other potential influencing variables. Future research is recommended to expand the study area and include additional variables such as job satisfaction, leadership style, and organizational culture.

KEYWORDS *Turnaround Time ; MRO Facility ; Employee Performance ; Maintenance.*

INTRODUCTION

The aircraft maintenance, repair, and overhaul (MRO) industry plays an important role in ensuring the safety and operation of airlines. In a highly competitive aviation industry, MRO companies are required to improve operational efficiency to meet safety and customer satisfaction standards. One of the key factors contributing to the effectiveness of aircraft maintenance is the turnaround time (TAT) and the MRO facilities

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available. TAT refers to the duration it takes to complete a maintenance process, which, if not optimal, can impact operational delays and increase employee workload. Meanwhile, adequate MRO facilities can improve the work efficiency of technicians and mechanics in completing their tasks more effectively. Although studies have examined the effect of turnaround time on operational efficiency and customer satisfaction, research addressing its impact on employee performance is limited. Most research focuses more on the relationship between turnaround time and business efficiency and customer satisfaction, without considering how these aspects affect the well-being and performance of employees involved in the maintenance process. Similarly, to MRO facilities, previous research has highlighted their impact on equipment reliability and cost-effectiveness, but has less often highlighted their impact on the performance of aircraft technicians. Therefore, there is a research gap that needs to be filled by analyzing the relationship between turnaround time and MRO facilities on employee performance in the MRO industry. The urgency of this research is based on the increasing demands for efficiency in the MRO sector, where companies are required to optimize maintenance times without sacrificing quality and safety. The performance of employees involved in the maintenance process is greatly influenced by the time available to complete their tasks, as well as the conditions of the work facilities used. Based on these problems, this study aims to analyze the effect of turnaround time on employee performance at PT. XYZ, as well as examining the influence of MRO facilities on employee performance in the company. Thus, the findings of this study are expected to support the development of operational strategies in the MRO sector, especially in improving the efficiency of maintenance and employee performance at PT. XYZ.

Based on the literature review, turnaround time (TAT) is a crucial indicator in the MRO industry that reflects the efficiency of the aircraft maintenance process, where effective TAT management directly impacts employee performance (Liangrokapart & Sittiwatethanasiri, 2023; Lintang Trenggonowati et al., 2021; Dinis et al., 2019). Studies indicate that TAT delays can reduce productivity and increase work pressure on technicians (Iqbal Hayatussalam et al., 2025; Perwirayudha et al., 2023; Citra Ramadhanti et al., 2021), suggesting that TAT positively affects employee performance (Lintang Trenggonowati et al., 2021). Meanwhile, the quality of MRO facilities also significantly influences employee performance, as well-developed and modern facilities can enhance competence, motivation, and work efficiency (Freddy Franciscus, 2019; Ramdani, 2019; Shanmugam & Robert, 2015; Chandola et al., 2022), while inadequate facility management may hinder performance (Ntshebe et al., 2022). Therefore, in the conceptual framework of this study, both TAT and MRO facilities are assumed to have a positive effect on employee performance.

While the relationship between turnaround time and its impact on operational efficiency and customer satisfaction has been widely studied, there is limited research exploring its effect on employee performance within the MRO context. Most studies have focused more on the effects of TAT on business outcomes rather than on the well-being and performance of employees directly involved in the maintenance process. Similarly, previous research on MRO facilities predominantly emphasizes their impact on equipment reliability and operational cost-effectiveness, leaving the influence on employee performance underexplored. Therefore, a research gap exists regarding the effect of TAT and MRO facilities on employee performance in the MRO sector.

The novelty of this study lies in its exploration of how operational time constraints (TAT) and facility adequacy directly affect the performance of MRO personnel, such as technicians and maintenance crews. This contribution is crucial for understanding the underlying dynamics that shape employee performance within this specialized sector. Furthermore, it will address a gap in the literature by providing a comprehensive analysis of how these operational factors can be optimized to improve employee productivity, job satisfaction, and overall performance in aircraft maintenance environments.

Given the increasing demands for efficiency in the MRO sector, this research is timely and essential. Companies are under constant pressure to minimize downtime and improve the speed of maintenance without compromising safety or quality. The performance of employees engaged in these maintenance activities is heavily influenced by both the available time to complete tasks and the quality of facilities at their disposal.

The research presented here aims to investigate the effects of turnaround time and MRO facility quality on employee performance at PT. XYZ, offering practical insights into optimizing operational strategies in the MRO sector. This study's findings could inform management decisions in enhancing work processes, improving the efficiency of maintenance activities, and boosting employee performance within the industry.

METHOD

Types of Research

This research is reviewed based on its type as associative research and is based on a quantitative method approach. According to associative research, it shows the relationship between two or more variables. The object of this research (Sugiyono, 2016) is employees at PT. XYZ. Survey research was used to obtain opinion data from employees of the company.

Variables and Measurements

The variables in this study were measured and operationalized using specific indicators and a Likert scale. Turnaround Time (TAT) was assessed through indicators such as "On-Time Performance," "Workload Management," and "Coordination & Communication," among others. These indicators were quantified using a 1-5 Likert scale, where respondents rated their agreement with statements related to each aspect, with higher scores indicating better performance in the respective areas. Similarly, MRO Facility was measured through indicators like "Adequacy of Equipment," "Work Environment," and "Facility Layout & Accessibility." Respondents rated these aspects on a 1-5 scale, with responses indicating the adequacy of equipment and the comfort of the work environment, among other factors. These ratings were then transformed into quantitative data for analysis. Lastly, Employee Performance was operationalized using indicators such as "Work Productivity," "Quality of Work," and "Problem-Solving

Ability." Participants rated their performance on these aspects using the same 1-5 Likert scale, which was used to assess their perceived efficiency, work quality, and ability to address technical issues effectively. This approach allowed for a systematic and standardized measurement of the variables, enabling a clear analysis of their relationships and impacts. The operationalization of research variables and indicators is shown in Table 1.

Table 1. Operationalization of Research Variables

Variable	Indicators	Question
Turnaround Time	On-Time Performance	Aircraft maintenance work in my hangar is generally completed on time according to schedule.
	Workload Management	The workload during the maintenance process is evenly divided and can be completed efficiently.
	Coordination & Communication	Communication and coordination between teams during the maintenance process went well.
	Resource Availability	Resources, including tools, parts, and personnel, are always available when needed.
	Process Optimization	The work process in maintenance continues to be improved to improve time efficiency.
MRO Facility	Adequacy of Equipment	The available work equipment is sufficient and meets the needs of the work.
	Work Environment	The working environment in the maintenance facility supports work comfort and safety.
	Facility Layout & Accessibility	The layout of the facility facilitates access to equipment and other work areas.
	Safety & Compliance	Maintenance facilities have met applicable safety and regulatory standards.
	Capacity & Utilization	The facility has sufficient capacity to handle the volume of maintenance work.
Employee Performance	Work Productivity (Fatya et al., 2024)	I was able to complete work productively and on time.
	Quality of Work (Fatya et al., 2024)	I always maintain the quality of my work according to the specified standards.
	Adherence to SOP	I always follow work procedures (SOP) in carrying out maintenance tasks.
	Problem-Solving Ability	I was able to solve technical problems quickly and accurately in the work.
	Job Satisfaction	I feel satisfied and motivated in carrying out my daily work.

Source : By Researcher

Population, Samples, and Sampling Techniques

The research population consisted of all employees who worked in one of the Hangars of PT. XYZ, with a total known population of 220 people. In this study, the sampling technique used was random sampling. Random sampling was chosen to provide equal opportunities for all employees in the population to be selected as respondents, so that the results of the study can be better generalized. To determine the number of respondents, the Slovin formula is used with an acceptable margin of error of 5%. Based on a population of 220 people, the number of samples needed is 141 people.

Data Collection Techniques

The questionnaire in this study used a Likert scale of 1–5, where respondents were asked to rate statements related to *Turnaround Time*, *MRO Facility*, and *Employee Performance*. The distribution of questionnaires was carried out directly to employees in one of the hangars of PT. XYZ through Google Forms for easy data collection.

Data Analysis Techniques

The Structural Equation Modeling (SEM) analysis technique with the Partial Least Squares (PLS) method was used in this study. SEM PLS is a useful method for estimating models with various factors or indicators, focusing on explaining the variation of dependent variables in the model. The path model in PLS is used to visualize the hypotheses and relationships between variables analyzed using the SEM method. This study applies a reflective measurement model, where variables are measured through reflective indicators assessed using indicator loadings (outer loadings), internal consistency (rho c, Cronbach's alpha, and Average Variance Extracted/AVE), and *Heterotrait-Monotrait Ratio* (HTMT) as part of the Outer Model evaluation. To evaluate the Inner Model or structural model, the Path Coefficient value is used to test the hypothesis, as well as the values R^2 (R Square) and F^2 (F Square) as indicators of model strength. The *Blindfolding* technique in SEM PLS serves to evaluate the predictive validity of the model, thereby ensuring that the developed model has good predictive capabilities against dependent variables.

Measurement Model (Outer Model)

1. **Indicator Reliability**
   The initial stage in evaluating the reflective measurement model is to review the outer loading value of each indicator in the Outer Model. Outer loading, also known as indicator reliability, reflects how much an indicator has similarities in its characteristics in measuring a particular construct. A high value indicates that the indicator consistently represents the construct in question. According to (Hair et al., 2022), outer loadings are declared eligible if the value is more than 0.708, as this indicates that the construct is able to explain more than 50% of the variation

in the indicator. The remaining percentages reflect unexplained variances or measurement errors. The ability to explain at least 50% of the variance of the indicator means that the contribution of the construct to the indicator is more dominant than the measurement error. If there is a construct with a value above this threshold, then the construct needs to be eliminated so that the analysis results are more accurate and do not experience information repetition (redundancy).

2. **Internal Consistency**
   Internal consistency refers to the extent to which an indicator measures the same construct and is connected to another construct. In SEM-PLS, the main measurements taken are Composite reliability rho c, as well as Cronbach's alpha. According to (Hair et al., 2021), standard values that are considered adequate range from 0.70 to 0.90, as they indicate a level of reliability that is "satisfactory to good." However, if the value exceeds 0.90, this can indicate a recurring question in the indicator, which can actually lower the validity of the construct.
3. **Discriminant Validity**
   Discriminant Validity aims to ensure that a construct is empirically different from another. According to (Hair et al., 2022), one of the methods used to assess this validity is *Heterotrait-Monotrait Ratio* (HTMT), with a recommended value limit of less than 0.90. This method is applied especially to constructs that have conceptual similarities. This method is suggested because it is considered more effective in identifying discriminant validity than the cross-loading method. In addition, the outer loading value of each indicator must also be higher in the measured construct compared to other unrelated constructs.

Structural Model (Inner Model)

1. **Value R^2 (R Square)**
   Analysis of the R^2 (R Square) value on each dependent variable is required to assess the extent to which the dependent variable can be explained by the independent variable. According to (Juliandi, 2018), the interpretation of the R Square value is divided into several categories, namely 0.75 indicates a strong influence, 0.50 indicates a moderate influence, and 0.25 indicates a weak influence.

2. **Value F^2 (F Square)**
   F Square is a measure used to assess the extent to which an independent variable contributes to the dependent variable. By comparing the change in the value of F Square when an independent variable is excluded from the model, it can be seen whether the variable has a significant influence. According to (Sarstedt et al., 2017), the value of F Square is categorized into small (0.02), medium (0.15), and large (0.35).
3. **Path Coefficient**

The path coefficient needs to be analyzed to assess the significance of the influence of independent variables on dependent variables, and to test hypotheses through bootstrapping techniques. The path coefficient value for each variable must meet a certain level of significance, i.e., 1%, 5%, or 10%. According to (Hair et al., 2021), the level of significance is also determined through the P value, where the P value must be at or below the significance limit set by the researcher, which is 0.05 or 5%, to state that the independent variable has a significant influence on the dependent variable. In addition, a t value (T value) is also used by comparing the statistical value t obtained with the value of t in the table (T table).

4. **Blindfolding**
According to (Hair et al., 2022), the blindfolding technique is used to calculate the value of Q^2, which indicates the model's ability to predict dependent variables. The results showed that the Q^2 value obtained was greater than zero, reflecting that the model had good predictive relevance.

RESULTS AND DISCUSSION

Participant Characteristics

This study involved 177 respondents who were employees of PT. XYZ who works in one of the company's hangars. From the results of the questionnaire distribution, the data processed as follows were obtained:

Measurement Model (*Outer Model*)

1. Indicator Reliability

Table 2 shows the reliability indicator of the data that has been processed using *smartPLS software* :

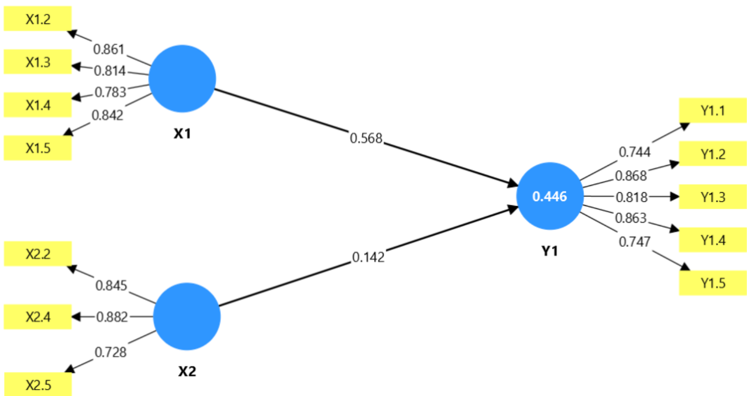
Table 2. Results of Operationalization of Research Variables

Variable	Measurement Items	Measurement Items	Measurement Items
Turnaround Time	X1.1	0.678	Invalid
	X1.2	0.875	Valid
	X1.3	0.790	Valid
	X1.4	0.796	Valid
	X1.5	0.810	Valid
MRO Facility	X2.1	0.647	Invalid

	X2.2	0.807	Valid
	X2.3	0.686	Invalid
	X2.4	0.830	Valid
	X2.5	0.709	Valid
Employee Performance	Y1.1	0.752	Valid
	Y1.2	0.867	Valid
	Y1.3	0.814	Valid
	Y1.4	0.860	Valid
	Y1.5	0.748	Valid

Source: Data processed, 2025

Based on table 2, it was found that X1.1, X.2.1, and X2.3 were invalid with a value of less than 0.708. This is because respondents consider that this factor is not directly influenced by the internal services measured in the variable, or because the variation in perception is too large. Therefore, these three indicators are considered unable to explain the reliability of each variable. When indicators are invalid, they do not contribute strongly to the construct, so they should be removed from the model, so these three indicators need to be removed from the subsequent measurement process. Figure 2 shows the results of the outer model analysis that has been processed in *the smartPLS software*.



Picture 1. Outer Model Analysis at smartPLS
Source: Data processed, 2025

2. ***Internal Consistency***

The next stage is to measure internal consistency to find out the extent to which the indicator measures the same construct and is related to other constructs.

Table 3. Internal Consistency

Variable	Cronbach's Alpha	Composite Reliability	AVE
Turnaround Time	0.846	0.895	0.681
MRO Facility	0.763	0.860	0.674
Employee	0.867	0.905	0.656

Performance		

Source: Data processed, 2025

Based on table 3, it was obtained that *Cronbach's* Alpha was more than 0.70 and AVE was more than 0.5 which showed *good convergent* validity. Based on the above data, it can be concluded that all indicators from the construct in this study have met the reliability requirements and can then be used for further analysis.

3. ***Discriminant Validity***

   Discriminant Validity aims to ensure that a construct is empirically different from another. The following is the measurement of HTMT values.

   a. **HTMT Value**

      Table 4 shows the results of HTMT values that have been processed with *smartPLS software*.

Table 4. HTMT Value

	Turnaround Time	MRO Facility	Employee Performance
Turnaround Time			
MRO Facility	0.788		
Employee Performance	0.744	0.596	

Source: Data processed, 2025

Based on table 4, it is obtained that all HTMT values are below 0.90, so it can be concluded that each variable is considered relevant.

Structural Model (*Inner Model*)

1. **Value R2 (R *Square*)**

   Analysis of the R^2 (R *Square*) value on each dependent variable is required to assess the extent to which the independent variable can explain the dependent variable. Table 5 presents the calculation of the R-squared value, which was processed using *SmartPLS software*.

Table 5. R Value *Square*

Variable	R *Square*	R *Square Adjusted*
Employee Performance	0.446	0.440

Source: Data processed, 2025

Based on the results presented in table 5, the R *Square* of the *Employee Performance* variable is 0.446. Therefore, it can be concluded that *the Employee*

Performance variable can be explained by the *Turnaround Time* and *MRO Facility variables* as much as 44.6% (percent), and as much as 55.4% (percent) can be explained by other variables. These results show that the influence *of Turnaround Time* and *MRO Facility* on *Employee Performance* is relatively weak, thus there are other factors that have a significant role in influencing employee performance that need to be studied more deeply in order to obtain a more comprehensive picture

.

2. **Value F2 (F *Square*)**

F *Square* is a useful measurement to assess the extent to which an independent variable contributes to the dependent variable. By comparing the change in the value of F *Square* When an independent variable is excluded from the model, it can be seen whether it has a significant influence.

Table 6. F Value *Square*

	Turnaround Time	MRO Facility	Employee Performance
Turnaround Time			0.344
MRO Facility			0.022
Employee Performance			

Source: Data processed, 2025

Based on the table above, the result is that the variable *Turnaround Time* has a value of 0.344 where this result shows that *Turnaround Time* has a moderate significant impact on the *Employee Performance*. That is, improvements or optimizations in *Turnaround Time* tend to have a significant influence on the improvement of *Employee Performance*. Next, the variable MRO Facility has a value of 0.022, which shows that the MRO variable Facility has a small, significant impact on *Employee Performance*. This indicates that although the existence and quality of MRO facilities play a role, their influence on Employee Performance is not as much as the influence of *Turnaround Time*.

Hypothesis Testing

1. ***Path Coefficients***

The path coefficient needs to be analyzed to assess the significance of the influence of independent variables on dependent variables, and to test hypotheses through *bootstrapping techniques*.

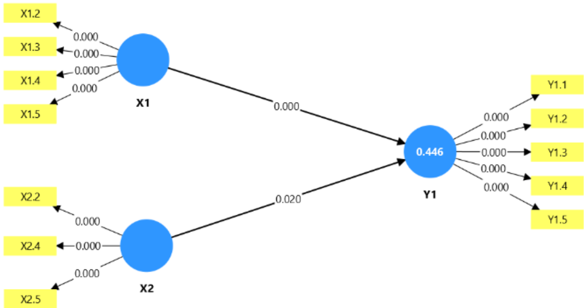
Table 7. *Path Coefficients*

Hypothesis	Relationships between Variables	*Original Sample* (O)	*P-Value*	*Results*

H1	X1->Y1	0.568	0.000	*Accepted*
H2	X2->Y1	0.142	0.020	*Accepted*

Source: Data processed, 2025

Based on table 7, it is found that the value of *P-Value* H1 is 0.000, where this result shows that H1 is accepted, and *P-Value* H1 is 0.020, where this result shows that H1 is accepted because the value is still below 0.050. It can therefore be concluded that both hypotheses are accepted. Figure 3 illustrates the test results *Path coefficient*.



Picture 2. Test Results *Path Coefficient*
Source: Data processed, 2025

2. ***Blindfolding***

The *blindfolding* technique is used to calculate the value of Q², which indicates the model's ability to predict dependent variables. The results showed that the Q² value obtained was greater than zero, indicating that the model had good predictive relevance.

Table 8. Result *Blindfolding*

Variable	Q2 Predict
Employee Performance	0.427

Source: Data processed, 2025

Based on table 8, the *Q2 Predict* is 0.427, based on the criteria described earlier, this research model shows a good level of predictive relevance.

The Effect *of Turnaround Time* (TAT) on *Employee Performance*

Based on the results of this study, the *Turnaround Time* (TAT) variable showed excellent internal reliability with *a Cronbach's Alpha* value of 0.846 and *a Composite Reliability* of 0.895, indicating that the indicators in this variable were consistent in measuring the concept in question. An AVE (*Average Variance Extracted*) value of 0.681 also indicates that this variable has adequate convergent validity, as it is more than the 0.50 threshold. The relationship between *turnaround time* and *employee performance* also showed a fairly strong correlation, with an HTMT value of 0.744 which was still within reasonable limits (below 0.90), which means that there was no problem of multicollinearity between constructs. In addition, the R *Square employee performance* value of 0.446 shows that *turnaround time* and MRO *Facility* together are able to explain about 44.6% variation in *employee performance*, of which *turnaround time* is the main contributor.

This is strengthened by the F *Square* value of 0.344 for the influence *of Turnaround Time* on *employee performance* which is relatively large, showing that the contribution of the effect to the dependent variable is very significant. The *P-Value* of H1 of 0.000 shows a very high significance (*P-Value* < 0.05), so statistically, the effect of *turnaround time* on *employee performance* is proven to be significant. The Q *Square* value of 0.427 also shows that the predictive model has a fairly good relevance to *employee performance*, and *turnaround time* is one of the important aspects that affect that performance. This shows that the more optimal turnaround *time management*, the greater the potential for improvement in *employee performance*, both in work efficiency, technical accuracy, and the achievement of operational targets in the scope of aircraft maintenance.

The Effect of MRO *Facility* on *Employee Performance*

Based on the results of this study, the MRO *Facility* variable also shows fairly good internal reliability, with *Cronbach's Alpha* value of 0.763 and *Composite Reliability* of 0.860, which means that this construct is reliable. An AVE value of 0.674 indicates that more than 67% of the indicator's variance can be explained by the MRO *Facility's latent construct*, so the convergent validity is considered sufficient. However, the relationship between MRO *Facility* and *employee performance* showed a weaker strength compared to *turnaround time*, as evidenced by the HTMT value of 0.596, which, although still within safe limits, shows a less strong relationship. In terms of contribution to *employee performance*, the value of the F *Square* MRO *Facility* is only 0.022, which indicates a very small or almost no substantive effect on employee performance.

Although the *H2 P-Value* of 0.020 indicates that the effect of *MRO Facility* on *employee performance* is statistically significant because (*P-Value* < 0.05), the magnitude of this influence is very small when compared to the effect *of turnaround time*. This means that while an adequate MRO *Facility* can improve employee comfort and work efficiency, its impact on performance is not as great as the influence of maintenance time management. These findings are important as a managerial consideration in determining the priorities of employee performance improvement strategies: investments in facilities must be made, but the management of the TAT process needs to be the primary focus to drive more significant results on employee performance. The model also retains good predictive relevance with a Q *Square* of 0.427, indicating that these two variables, especially TAT, are able to make a meaningful contribution to *employee performance prediction*.

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that both *Turnaround Time* (TAT) and *MRO Facility* have a significant influence on improving employee performance in the aircraft maintenance environment. *Turnaround Time* is proven to have a stronger influence compared to *MRO Facility*. Effectiveness in managing *turnaround time* plays an important role in creating a more efficient workflow, reducing excess workload, and creating a more conducive work atmosphere, thereby being able to boost productivity and overall employee performance. Meanwhile, the existence of adequate and modern *MRO Facilities* also contributes to improving employee performance, albeit on a smaller scale. Complete and sophisticated facilities help support smooth technical work, reduce errors, and speed up the maintenance process, which indirectly affects the results of employee work.

However, this study has a number of limitations. One of them is the scope of the research object, which is limited to one specific work area in the company, so that the findings cannot necessarily be generalized to all other *MRO* units or companies. In addition, other variables that may also affect employee performance, such as leadership, organizational culture, or job satisfaction, have not been included in this research model. Therefore, it is recommended that further research expand the scope of the region and include other relevant variables in order to gain a deeper and more comprehensive understanding of the factors that affect employee performance in the aircraft maintenance industry.

As a practical suggestion for PT. XYZ, the main focus should be directed to optimizing *turnaround time* through improved coordination between teams, planning more precise maintenance schedules, and using digital technology for monitoring work time so that the maintenance process can be completed faster without sacrificing quality. In addition, investment in the development of modern *MRO Facilities* remains important, especially in terms of upgrading equipment and supporting facilities that can make the work of technicians easier and reduce the risk of errors. PT. XYZ could also consider ongoing training for employees to improve their adaptability to new technologies as well as improved work cultures that support efficiency and collaboration. With a combination of optimal *turnaround time* and adequate *MRO facilities*, the company will be better prepared to compete in the global aircraft maintenance industry and improve employee performance on a sustainable basis.

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