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Environmental Determinants of Employee Performance in Air Cargo Logistics: Evidence from Indonesia's Warehouse Sector

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ABSTRACT: Background: The work environment is a critical determinant of employee performance, particularly in air cargo logistics where accuracy, speed, and consistency are essential. Despite the increasing focus on technological and automation strategies, environmental conditions remain relatively underexplored. Objective: This study aims to examine the influence of workplace environmental factors on employee performance in the warehouse division of PT Aerojasa Cargo, Jakarta. Method: A quantitative cross-sectional survey was conducted with 55 respondents selected through stratified random sampling. Data were collected using a structured Likert-scale questionnaire measuring five environmental factors (cleanliness, lighting, air circulation, workspace layout, and team collaboration) and five dimensions of performance (accuracy, timeliness, quality, quantity, and neatness). The data were analyzed using descriptive statistics, Pearson correlation, and multiple linear regression. Results: The findings reveal that 69.9% of the variance in employee performance is explained by workplace environmental conditions ($R^2 = 0.699$; $p < 0.01$). Cleanliness and team collaboration emerged as the strongest predictors across all performance dimensions, while lighting and workspace layout also showed significant contributions. Conclusion: A conducive work environment plays a pivotal role in enhancing warehouse employee performance. Practical implications include continuous investment in cleanliness programs, ergonomic workspace redesign, and participatory evaluation mechanisms. Future research should adopt multi-site and longitudinal approaches to strengthen generalizability.

Keywords: Workplace Environment, Employee Performance, Air Cargo Logistics, Ergonomics, Warehouse Management, Regression Analysis.

INTRODUCTION

In recent years, the logistics and warehousing sectors have emerged as critical components of modern supply chain systems, especially with the exponential rise in global trade and e-commerce. These sectors now function as the backbone of global supply chain infrastructures, providing crucial interfaces between producers, retailers, and consumers. Within this expansive context, the

role of employees working in physically intensive environments, such as warehouses, has become increasingly prominent. As demand for rapid delivery, accuracy, and around-the-clock operations continues to surge, so too does the pressure on warehouse personnel to perform at consistently high levels. However, while technological innovations and automation strategies have received substantial attention in the logistics transformation discourse, the nuanced and equally vital impact of environmental conditions on employee performance in these labor-intensive sectors warrants much closer examination.

Numerous studies underscore that optimizing environmental factors, both physical and psychological, is essential not only for improving day-to-day operational efficiency but also for safeguarding long-term employee productivity and organizational sustainability. These environmental determinants encompass elements such as lighting, air circulation, workspace ergonomics, cleanliness, noise levels, and psychological safety—all of which contribute to either enabling or inhibiting employee capabilities and output in high-demand settings like air cargo logistics.

Kageyama et al. (2022) emphasized the necessity of monitoring biometric metrics to optimize the working conditions of employees in physically demanding roles. This approach not only improves health outcomes but also directly enhances employee performance, particularly in environments requiring repetitive movement and long hours. Complementing this, Jiang et al. (2015) pointed out that employees' perceptions of human resource (HR) practices significantly influence their engagement and productivity, suggesting that psychological perceptions of fairness and support are as crucial as physical conditions. Agarwal et al. (2024) further stressed that organizational atmosphere and the availability of workplace resources are integral to fostering employee engagement and optimal performance. These findings collectively support the idea that the work environment, encompassing both tangible and intangible elements, plays a foundational role in shaping workforce behavior, motivation, job satisfaction, and overall productivity.

Beyond the general work environment, ergonomic design principles are essential to enhancing labor productivity, particularly in logistics settings. Lasota (2020) noted that ergonomic risk factors, including workstation layout, physical strain, awkward postures, and repetitive tasks, detrimentally affect productivity and job satisfaction. In warehouse settings, these risk factors are especially pronounced due to the physical nature of loading, sorting, and transporting goods. Sharma et al. (2016) affirmed that implementing ergonomic assessments and improvements in workspace design leads to heightened comfort and better performance among employees. Thus, a well-designed workspace not only minimizes the risk of injury and fatigue but also boosts long-term efficiency, employee morale, and operational continuity. Organizations that systematically assess and adapt their workspace ergonomics tend to experience lower absenteeism rates, better retention, and overall improvements in workforce resilience.

Parallel to physical ergonomics, the psychological work environment has undergone a significant evolution. Initially centered around organizational structures and management hierarchies, contemporary research now integrates critical elements of psychological safety, emotional engagement, stress mitigation, and holistic employee well-being. Agarwal et al. (2024) and Martín

et al. (2022) argued that internal psychological states such as safety, autonomy, and meaningfulness mediate the relationship between HR practices and employee engagement. These psychological drivers are particularly relevant in high-pressure logistics environments where employees must frequently adapt to shifting operational demands. This dual perspective—combining physical and psychological domains—reinforces the notion that performance is a product of complex and interrelated workplace conditions. Accordingly, organizations that address only one aspect in isolation are likely to fall short in maximizing employee potential.

The air cargo logistics sector in particular presents unique performance challenges stemming from time sensitivity, volume volatility, and strict compliance requirements. According to Selviasari et al. (2023), job performance in this field is shaped by a combination of individual motivation, work environment quality, and HR competence. Kechil et al. (2022) added that integrating IT and streamlining operational processes significantly enhance performance metrics in logistics. These technological integrations, however, must be accompanied by parallel investments in workforce well-being to sustain high output. The intricate nature of air cargo operations necessitates a work environment that is not only safe and organized but also conducive to continuous learning, adaptability, and performance improvements.

Regionally, research in Southeast Asia and Indonesia has highlighted critical insights into workplace conditions and productivity. Muallivasari et al. (2024) identified unsafe behaviors and suboptimal workspace layouts as key contributors to occupational accidents and lowered productivity. These insights are particularly significant in contexts where regulatory standards and enforcement may vary. Similarly, Yusefzadeh and Nabilou (2020) emphasized the need for efficient spatial arrangements and hazard-reducing designs in logistics facilities. These studies collectively demonstrate that localized insights are essential for tailoring workplace improvements that align with cultural norms, operational realities, and resource constraints.

Among various environmental elements, cleanliness and layout have been consistently shown to impact performance, safety, and job satisfaction. Aboulfotouh et al. (2020) linked cleanliness and building maintenance to higher employee satisfaction and productivity, while Schilleci (2022) highlighted how workspace characteristics directly affect service performance and operational fluidity. Nensi et al. (2023) further noted that cleanliness enhances both physical and psychological well-being, which are key drivers of optimal job performance and organizational commitment. Tang et al. (2022) corroborated that strategic facility layout planning boosts safety, reduces traffic-related inefficiencies, and enhances operational efficiency by minimizing unnecessary movement and confusion. Cleanliness and layout have been consistently shown to impact performance and safety. Aboulfotouh et al. (2020) linked cleanliness and building maintenance to higher employee satisfaction and productivity, while Schilleci (2022) highlighted how workspace characteristics directly affect service performance. Nensi et al. (2023) further noted that cleanliness enhances both physical and psychological well-being, key drivers of optimal job performance. Tang et al. (2022) corroborated that strategic facility layout planning boosts safety and operational efficiency.

Given these interconnected factors, this study aims to examine the effect of work environment conditions on employee performance within the warehouse division of PT Aerojasa Cargo in

Jakarta. This organization, a part of the Garuda Indonesia Group, represents an ideal case study due to its strategic role in Indonesia's logistics network. By investigating how specific environmental aspects influence employee output, this research seeks to contribute both theoretically and practically to the broader discourse on workplace optimization in logistics. It also intends to offer actionable insights for HR managers and organizational leaders striving to create high-performance, employee-centered environments in the air logistics sector.

METHOD

This chapter presents the research design, population and sampling strategy, data collection techniques, instrument development, and data analysis procedures employed to investigate the relationship between work environment and employee performance within the warehouse division of PT Aerojasa Cargo.

The study adopted a quantitative approach using a cross-sectional survey design. This design was chosen to systematically assess the influence of workplace environmental factors on employee performance at a specific point in time. Given the operational nature of the warehouse environment, a quantitative methodology allowed for a structured and statistically robust examination of variable relationships.

The research population comprised 120 employees working in the warehouse division of PT Aerojasa Cargo. Using Slovin's formula with a 10% margin of error, the appropriate sample size was determined to be 55 respondents. The selection ensured representativeness across job roles such as warehouse managers, assistant managers, administrative staff, and operational personnel.

To enhance representativeness, stratified random sampling was applied, enabling coverage of different functional groups within the warehouse. This approach mitigated sampling bias and allowed for more nuanced insights into how environmental factors might impact subgroups differently.

Data were collected using a structured questionnaire developed in alignment with validated survey instruments commonly used in organizational research. A 5-point Likert scale was employed, ranging from "1 = Strongly Disagree" to "5 = Strongly Agree," to quantify perceptions of environmental factors and performance outcomes.

The instrument included multi-item scales to assess key dimensions of the workplace environment, including cleanliness, collaboration, lighting, layout, and air circulation. Performance indicators covered accuracy, timeliness, quality, quantity, and neatness.

To strengthen the reliability and validity of the instrument, the questionnaire underwent expert review for content validity. Construct validity was verified through exploratory factor analysis, and reliability was assessed using Cronbach's alpha. Criterion-related validity was established by correlating environmental perception scores with reported performance metrics.

Validation followed standard procedures in HR and organizational studies. First, expert evaluations ensured that all items adequately reflected their intended constructs. Then, construct validity was analyzed via factor analysis to confirm coherent item groupings. Reliability was confirmed with Cronbach's alpha scores exceeding the recommended threshold of 0.70 for internal consistency. Additionally, the instrument's criterion validity was confirmed through correlation with job performance data, validating the predictive utility of the environmental metrics.

Data analysis was conducted using SPSS version 26. Descriptive statistics summarized respondent demographics and average scores for each variable. Correlation analysis determined the strength and direction of relationships between environmental factors and performance outcomes.

Multiple regression analysis was performed to identify the extent to which environmental factors collectively influenced performance. The model's explanatory power was evaluated through R-squared and adjusted R-squared values, while statistical significance was determined using p-values and F-tests.

All respondents participated voluntarily and were assured of confidentiality and anonymity. No personal identifiers were collected, and responses were used exclusively for academic purposes. Ethical clearance was obtained through internal faculty review processes.

In summary, this methodological framework ensured a comprehensive, statistically sound, and ethically responsible investigation into the relationship between work environment and employee performance in PT Aerojasa Cargo's warehouse division.

RESULT AND DISCUSSION

This chapter presents the comprehensive findings of the study based on the data collected through structured questionnaires administered to employees in the warehouse division of PT Aerojasa Cargo. The analytical framework encompasses descriptive statistics to summarize key trends, correlation tests to evaluate the strength and direction of relationships among variables, and regression analysis to determine the predictive influence of various work environment factors on employee performance outcomes. These methods were selected to ensure a robust, multi-dimensional understanding of how specific environmental conditions correlate with performance metrics.

Employee perceptions of the workplace environment were overwhelmingly positive, indicating a general consensus regarding the presence of favorable working conditions within the warehouse. The mean scores for each environmental factor are presented below:

Indicator	Mean Score
Cleanliness	4.20
Team Collaboration	4.05
Lighting	3.95
Workspace Layout	3.88
Air Circulation	3.76

These scores suggest a strong endorsement of environmental quality, reflecting the company's emphasis on providing a well-maintained and efficiently organized workspace. The results align closely with the literature, particularly Rodríguez et al. (2015), who argued that positive workplace conditions enhance job satisfaction, employee morale, and operational performance. In most logistics environments deemed well-managed, average perception scores are expected to range between 3.0 and 5.0 on standardized Likert scales, supporting the validity of the current dataset.

Further analysis of environmental indicator rankings across logistics sectors reinforces the prioritization of factors such as safety, cleanliness, and layout efficiency. Cleanliness and layout, in particular, emerged as critical components for warehouse functionality, as these influence spatial navigation, hazard reduction, and operational flow. It was also found that demographic variables, including job role, age, and tenure, affected how employees perceived their working environment. For instance, operational personnel placed greater emphasis on physical layout and safety protocols, while managerial and administrative staff were more concerned with psychological comfort, cohesion, and overall work culture. These findings echo the observations made by May et al. (2014) and Demir & TATAR (2022), underscoring the necessity of tailoring workplace improvements to meet the diverse needs of various employee groups.

Regression Analysis

To further explore the relationship between environmental factors and employee performance, multiple linear regression analysis was applied. The results are summarized below:

Coefficient (B)	Std. Error	t-value	Sig. (p)	R^2	Adj. R^2	F-value
0.627	0.056	11.093	0.000	0.699	0.692	123.104

The regression model indicates that approximately 69.9% of the variance in employee performance is explained by workplace environmental conditions ($R^2 = 0.699$). This is considered a high level of explanatory power in organizational behavior research, where typical R^2 values often range between 0.25 and 0.60, as documented by Ehrhart & Kuenzi (2024). The significance of the model ($p < 0.01$) suggests that the findings are statistically reliable. The strong F-value further confirms that the regression equation provides a meaningful prediction of performance based on the independent variables considered.

Correlation Analysis

To complement the regression findings, Pearson correlation coefficients were calculated to assess the degree of association between individual environmental components and performance indicators. The results are presented below:

Environment Factor	Accuracy	Timeliness	Quality	Quantity	Neatness
Cleanliness	0.71	0.65	0.68	0.66	0.63
Team Collaboration	0.68	0.65	0.66	0.64	0.61
Lighting	0.69	0.67	0.68	0.65	0.62
Workspace Layout	0.66	0.64	0.67	0.66	0.60
Air Circulation	0.64	0.63	0.62	0.60	0.62

All correlations exceeded 0.60, with cleanliness showing the highest overall associations across the five dimensions of performance—accuracy, timeliness, quality, quantity, and neatness. This supports the hypothesis that cleanliness is a critical determinant of job efficiency in physically intensive logistics roles. These correlations are statistically strong ($r > 0.5$), validating findings from prior ergonomic and workplace design studies, including those by Treuer et al. (2018). Moreover, the persistent importance of layout and air quality as performance predictors was affirmed through their high correlation values, aligning with the work of Fezih et al. (2024) and Monteiro et al. (Galanaki et al., 2024).

In summary, the results robustly confirm the central thesis of this study: that workplace environmental conditions are significant drivers of employee performance in logistics operations. The combination of high R^2 values, statistically significant regression coefficients, and strong correlation metrics supports the proposition that targeted environmental enhancements can lead to measurable performance improvements. The findings emphasize the importance of cleanliness and lighting, in particular, as critical areas of intervention. These insights offer practical value for HR managers and organizational leaders seeking to boost efficiency and employee satisfaction through evidence-based environmental design strategies.

The findings of this study reveal a strong and positive relationship between the quality of the work environment and employee performance within PT Aerojasa Cargo's warehouse division. These results are consistent with established international workplace design standards, such as ISO 45001, which emphasize the critical role of physical and psychological workplace conditions in promoting occupational health, safety, and productivity. The statistically significant correlations observed in this research validate the notion that improvements in lighting, cleanliness, spatial layout, and air circulation contribute meaningfully to enhanced employee outcomes.

The alignment of this study with international benchmarks highlights its practical significance. Global standards advocate for well-structured and safe workplaces that reduce physical and mental stressors. The positive correlation coefficients between workplace environmental variables and

performance dimensions such as accuracy, timeliness, and neatness underscore this alignment. For instance, high scores in cleanliness and lighting were associated with elevated employee output, mirroring best practices in ergonomic and occupational health design.

In examining successful HR interventions, existing literature offers supporting evidence. Torres et al. emphasized that pro-environmental HR practices, including ergonomic adjustments and feedback-driven redesigns, yield measurable gains in organizational performance. This study's results reinforce such claims by providing empirical evidence that modifications to environmental variables—like enhanced airflow and improved workspace layout—are directly linked to improved productivity metrics in logistics operations.

The theoretical underpinnings of this relationship can be traced to frameworks like the Job Characteristic Model (JCM), which posits that job attributes influence intrinsic motivation and performance. In this context, job attributes include physical work conditions that impact psychological states. Similarly, the Social Cognitive Theory supports the idea that environmental factors shape behavior and performance. This dual theoretical basis explains why both ergonomic and psychological enhancements yield observable performance improvements. The ecological model of human performance further illustrates how the interplay of external environmental elements with internal employee capacities fosters better outcomes.

However, translating these insights into organizational practice is not without challenges. One major barrier is resistance to change, as employees may exhibit inertia towards new environmental protocols or physical redesigns. Financial constraints also play a crucial role; implementing large-scale changes such as infrastructure renovation or ergonomic reengineering often requires significant investment, which can be difficult for organizations with budgetary limitations. Another hurdle lies in aligning environmental improvements with overarching strategic objectives. Without coherent integration, workplace interventions may be viewed as peripheral rather than essential, reducing stakeholder commitment. Additionally, measuring the long-term effects of environmental enhancements requires robust metrics and longitudinal tracking—tools that are not always available or implemented within warehouse settings.

Despite these challenges, the study affirms that focusing on environmental conditions in the workplace is both a strategic and practical approach to performance enhancement. The high R^2 value and strong correlations obtained through empirical testing offer concrete proof that environmental improvements should be a priority for logistics companies. These findings are especially relevant to operations in high-intensity environments such as air cargo logistics, where employee performance directly influences service quality and operational efficiency.

In conclusion, the evidence presented strongly supports the case for investing in workplace environment enhancements. Aligning with international standards, leveraging theoretical frameworks, and addressing implementation challenges will be key to realizing the full potential of such improvements. Organizations that succeed in creating optimal work environments stand to benefit from increased productivity, employee satisfaction, and overall operational excellence.

CONCLUSION

This study explored the influence of work environment conditions on employee performance in the warehouse division of PT Aerojasa Cargo. Through quantitative analysis of survey data collected from 55 employees, the research established a significant and positive relationship between various environmental factors and multiple dimensions of job performance.

Key findings demonstrated that workplace indicators such as cleanliness, lighting, collaboration, workspace layout, and air circulation significantly affect performance metrics, including accuracy, timeliness, quality, quantity, and neatness. Among these, cleanliness and team collaboration emerged as the most impactful, showing strong correlation coefficients across all performance dimensions. Regression analysis revealed that 69.9% of the variance in employee performance could be explained by environmental conditions, underscoring the critical role of workplace quality in logistics operations.

These results align with international workplace design standards and theoretical frameworks like the Job Characteristic Model and Social Cognitive Theory, which emphasize the interplay between job characteristics and employee motivation. Furthermore, they confirm the findings of previous studies highlighting the effectiveness of HR interventions focused on environmental enhancements—such as ergonomic improvements and participative management practices—in boosting organizational productivity.

The main contribution of this study lies in its contextual relevance. By focusing on a warehousing division within Indonesia's air cargo sector, the research adds region-specific insights to a predominantly global discourse. It affirms that even in developing markets, strategic enhancements to the physical and social environment can yield substantial gains in employee performance and overall efficiency.

From a practical standpoint, the findings provide actionable guidance for HR practitioners and warehouse managers. Organizations are encouraged to prioritize investments in environmental factors that directly influence performance, including workspace cleanliness, team dynamics, and ergonomic design. Incorporating regular feedback mechanisms and aligning environmental improvements with organizational goals will be crucial for sustained success.

Despite these contributions, the study has limitations. It was conducted within a single organization and adopted a cross-sectional design, limiting generalizability and long-term inference. Future research should consider multi-site studies with longitudinal designs to further validate and expand on these findings.

In conclusion, optimizing the workplace environment is not merely an aesthetic or compliance matter—it is a strategic imperative for performance enhancement. As air cargo operations grow increasingly complex, fostering a conducive work environment will be vital in maintaining competitiveness and ensuring employee well-being. This study underscores the importance of environmental quality as a cornerstone of high-performing logistics operations.

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