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The Impact of Occupational Safety, Health, and Environment (OSHE) on Work Productivity: A Case Study of The Sumedang Regional Hospital Building Project

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ABSTRACT
This study aims to evaluate the impact of Occupational Safety, Health, and Environment (OSHE) practices on work productivity and to analyze the effect of OSHE implementation on worker productivity in the construction project of the Sumedang Regional General Hospital. This study employs a quantitative approach, involving 60 construction workers as respondents. Data were collected through a questionnaire and analyzed using multiple linear regression with IBM SPSS Statistics version 27. The variables studied included Occupational Safety and Health (X_1), Work Environment (X_2), and Work Productivity (Y). The results showed that Occupational Safety and Health had a positive and significant effect on work productivity ($t = 5.617$; $p = 0.000$). Similarly, the Work Environment variable positively and significantly influenced productivity ($t = 2.937$; $p = 0.005$). Simultaneous testing confirmed that both variables significantly affected productivity ($F = 66.492$; $p = 0.000$). The regression equation obtained was $Y = 1.295 + 0.799X_1 + 0.403X_2$. The coefficient of determination ($R^2 = 0.697$) indicated that OSHE implementation explained 69.7% of the variation in workforce productivity, while 30.3% was attributable to other factors. These findings highlight the importance of effective OSHE implementation in improving productivity within healthcare construction projects.

Keywords: *Construction Projects; Multiple Linear Regression; Occupational Safety Health and Environment (OSHE); Work Productivity.*

1. Introduction

The construction industry is widely regarded as one of the most hazardous occupational sectors due to the complexity of construction operations, the extensive use of heavy equipment, work at elevated heights, and the dynamic nature of construction site conditions. These factors increase the likelihood of workplace accidents, occupational diseases, project delays, and financial losses. Consequently, the implementation of an Occupational Health and Safety Management System (OHSMS) has become an integral component of effective construction project management. ISO 45001 emphasizes that occupational safety and health should be managed systematically through hazard identification, risk assessment, preventive control measures, and continual improvement to ensure a safe and healthy working environment [1].

In addition to meeting cost, quality, and schedule objectives, the success of a construction project is strongly influenced by the productivity of its workforce. Work productivity reflects employees' ability to efficiently and effectively transform available resources into high-quality outputs. Work performance theories suggest that several factors, including individual competence, motivation, and organizational support, determine employee performance. In the construction sector, workforce productivity is also affected by operational management practices, resource utilization, and workplace conditions. Therefore, effective safety management and a supportive work environment are recognized as key factors in achieving optimal project performance [2], [3], [4].

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1.1 Literature Review

a. Occupational Safety and Health

Occupational Safety and Health (OSH) is a systematic framework for preventing workplace accidents and occupational illnesses by identifying hazards, assessing risks, and applying appropriate control measures. Within construction projects, OSH forms an essential part of the broader Occupational Safety, Health, and Environment (OSHE) system, which integrates safety management, health protection, and environmental control into construction operations.

The implementation of OSH is grounded in risk management theory, which emphasizes the systematic identification, evaluation, and mitigation of hazards through a structured hierarchy of controls. ISO 45001 establishes a comprehensive guideline for occupational health and safety management systems, emphasizing leadership involvement, risk-based decision-making, and continuous improvement through the Plan–Do–Check–Act cycle [1].

In construction settings, OSH plays a crucial role due to the inherently high risks associated with activities such as working at heights, material handling, and operating heavy machinery. Empirical studies have demonstrated that effective implementation of OSH practices contributes to a reduction in workplace accidents, fewer work disruptions, and improved labor productivity [1], [5], [6], [7]

b. Working Environment

The working environment refers to the physical and operational conditions surrounding construction activities, including lighting, ventilation, noise levels, cleanliness, material arrangement, and spatial organization. A well-managed working environment contributes to improved worker comfort, safety, and efficiency during construction tasks.

From a theoretical standpoint, the quality of the working environment is closely associated with the environmental management principles outlined in ISO 14001, which emphasize systematic planning, implementation, and continuous improvement to control environmental impacts. In addition, ergonomic theory holds that alignment among workers, tasks, and workplace design can reduce physical strain and enhance overall work performance [4]

Empirical evidence suggests that a supportive and well-structured working environment has a positive effect on worker productivity by reducing fatigue, improving concentration, and minimizing disruptions in work processes

c. Construction Work Productivity

Construction work productivity is defined as the efficiency of labor resources in converting inputs into measurable construction outputs while maintaining cost, time, and quality standards. Productivity is commonly expressed as the ratio between output and input, reflecting the effectiveness of resource utilization in construction projects.

The theoretical foundation of productivity in this study is the theory of work performance, which holds that performance is influenced by ability, motivation, and environmental conditions[2]. In construction projects, productivity is affected by technical factors, managerial systems, and workplace conditions.

Furthermore, OSHE implementation plays an important role in improving productivity by reducing workplace risks, minimizing disruptions, and maintaining work continuity. Several studies confirm that safety and environmental conditions are closely related to construction productivity performance [2], [4].

d. Conceptual Relationship between OSHE and Productivity

The relationship between Occupational Safety, Health, and Environment (OSHE) implementation and construction work productivity can be understood through the perspectives of risk management theory, ergonomics, and human factors engineering. The effective application of OSHE practices helps minimize workplace hazards, create safer and more supportive working conditions, and improve workers' concentration, efficiency, and overall job performance.

Risk management theory suggests that systematic hazard identification and appropriate control measures reduce the occurrence of workplace accidents and ensure the continuity of construction activities [6]. Likewise, ergonomic principles propose that designing work environments and tasks to match workers' capabilities can reduce physical fatigue and improve work performance [4]. Human factors engineering further emphasizes that the interaction among workers, equipment, and

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the work environment plays a crucial role in determining productivity and operational effectiveness [2].

Taken together, these theoretical perspectives indicate that the implementation of OSHE is a fundamental factor influencing construction productivity, as it contributes both directly and indirectly to improving worker safety, health, environmental conditions, and overall project performance.

In recent years, construction researchers have increasingly recognized that occupational safety and health management should not be viewed solely as a regulatory obligation but also as a strategic factor that directly contributes to workforce productivity and project performance. Effective safety management systems reduce work interruptions, enhance workers' confidence, improve compliance with operational procedures, and minimize productivity losses associated with occupational accidents and unsafe conditions [8] [9], [10], [11], [12]. Furthermore, construction projects with well-managed workplace environments generally demonstrate higher operational efficiency because workers are able to perform their tasks under safer and more comfortable physical conditions [14], [15]

1.2 Research Gap and Research Objective

Research that simultaneously examines the effects of Occupational Safety and Health and the Working Environment on workforce productivity in hospital construction projects is still relatively limited. Unlike conventional construction projects, hospital construction is characterized by more rigorous safety requirements, greater complexity of construction activities, limited workspace, and stricter environmental control measures to ensure both worker safety and uninterrupted project implementation. These unique project characteristics suggest that the findings of studies conducted on general construction projects may not be directly applicable to hospital construction settings [1], [5], [7].

Hospital construction projects involve stricter infection control requirements, continuous coordination among multiple disciplines, limited workspaces, and uninterrupted healthcare operations. Consequently, occupational safety and environmental management practices become more complex than those required in conventional building projects, highlighting the need for project-specific empirical evidence [16], [17]

Accordingly, this study was undertaken to assess the implementation of Occupational Safety and Health and the Working Environment and to investigate their effects on construction work productivity in the Sumedang Regional Hospital Building Project using a quantitative research approach. In contrast to earlier studies that primarily addressed conventional construction projects, this research offers empirical evidence from a hospital construction project, where occupational safety and environmental management requirements are considerably more demanding. The results are expected to broaden existing knowledge of Occupational Safety, Health, and Environment (OSHE) implementation and to provide practical guidance for project owners and contractors on strengthening safety management systems and improving workforce productivity.

2. Materials And Methods

2.1 Research Design

This research adopted a quantitative explanatory approach to examine the effect of Occupational Safety, Health, and Environment (OSHE) implementation on construction work productivity. The overall research framework and procedures applied in this study are illustrated in Figure 1.

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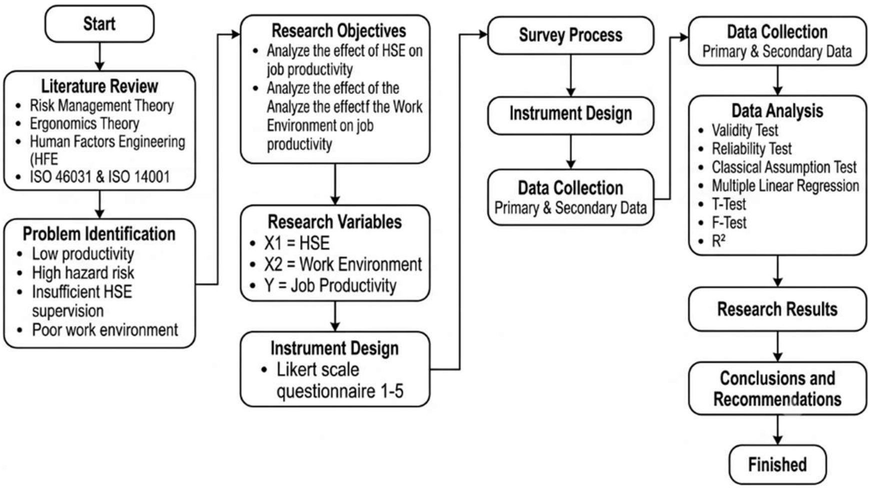

Figure 1. Research Flowchart
Source: Developed by the authors, 2025.

The study was carried out in a series of systematic stages, beginning with a comprehensive literature review, followed by problem identification, the formulation of research objectives, the determination of research variables, questionnaire design, data collection, and statistical analysis. The literature review served as the basis for developing the research's conceptual and theoretical framework. Subsequently, the collected data were analyzed using validity and reliability tests, classical assumption tests, and multiple linear regression analysis to evaluate the relationships among the variables.

The research model consisted of Occupational Safety and Health (X_1) and Working Environment (X_2) as independent variables, with Construction Work Productivity (Y) as the dependent variable. The selection of these variables was based on findings from previous studies, which highlighted occupational safety practices and workplace conditions as key factors influencing workforce productivity and overall project performance in the construction industry [4], [5], [6]. Previous studies also indicate that integrating occupational safety management with continuous environmental monitoring contributes not only to accident prevention but also to sustainable productivity improvement by reducing delays, absenteeism, and work disruptions [10], [11], [17].

2.2 Study Site

The study was conducted at the Sumedang Regional Hospital Building Construction Project in West Java, Indonesia. This project was chosen as the research site because hospital construction projects are characterized by elevated occupational risks arising from the complexity of construction processes, stringent safety standards, concurrent work activities, and restricted workspace conditions. These unique project characteristics make the site particularly suitable for assessing the implementation of Occupational Safety, Health, and Environment (OSHE) practices and their relationship with construction workforce productivity.

2.3 Research Participants

The study population consisted of construction workers who were actively engaged in the Sumedang Regional Hospital Building Project. A purposive sampling method was used to identify respondents who met the established inclusion criteria: direct participation in construction activities, relevant work experience within the project, and voluntary participation in the research. Individuals whose responsibilities were limited to administrative, consulting, or other non-field construction functions were excluded from the study. Based on the established selection criteria, 60 respondents were recruited, comprising engineers, supervisors, forepersons, and construction workers representing various occupational roles within the project. This sampling strategy ensured that the data were obtained from individuals with firsthand experience and sufficient understanding of the implementation of Occupational Safety, Health, and Environment (OSHE) practices and their relationship with construction work productivity.

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2.4 Research Variables

This study incorporated two independent variables and one dependent variable to investigate the relationship between Occupational Safety, Health, and Environment (OSHE) implementation and construction work productivity. The independent variables were Occupational Safety and Health (X_1) and the Working Environment (X_2), whereas Construction Work Productivity (Y) was the dependent variable. Occupational Safety and Health (X_1) was assessed using indicators related to the implementation of safety management practices, including compliance with personal protective equipment (PPE) requirements, participation in safety training, hazard identification, adherence to work procedures, and the effectiveness of safety supervision. The Working Environment (X_2) was measured using indicators of workplace conditions, including lighting adequacy, ventilation quality, workplace cleanliness, noise control, and site organization. Construction Work Productivity (Y) was defined as the ability of workers to perform construction activities effectively and efficiently while meeting the required standards of quality, quantity, and project schedule [1], [2], [8].

The research indicators were adopted from relevant previous studies and further modified to reflect the specific characteristics of the Sumedang Regional Hospital Building Project. The operational definitions and measurement indicators for each variable were established based on the existing literature to ensure that the questionnaire accurately captured the constructs investigated in this study. The selected indicators are consistent with previous quantitative studies evaluating occupational safety, workplace environment, and construction productivity, thereby ensuring the content validity of the measurement instrument [9], [10], [15]. A detailed summary of the research variables and their corresponding indicators is provided in Table 1.

Table 1. Research Variables and Indicsators

Variable	Dimension	Indicators	Number of Items
X_1 - OSH	Safety compliance	PPE usage, adherence to SOP	20
	Safety control	Safety supervision, hazard identification	
	Safety training	Participation in safety induction and training	
X_2 - Work Environment	Physical condition	Lighting, ventilation, noise level	15
	Site condition	cleanliness, material arrangement	
Y - Work Productivity	Output quality	work quality, conformity to specification	15
	Output quantity	work volume achieved	
	Efficiency	time effectiveness, resource utilization	

Source: Developed by the authors based on previous studies, 2025

2.5 Data Collection

Primary data were obtained through a structured questionnaire distributed directly to construction workers. The questionnaire consisted of statements representing each research indicator and was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Secondary data were collected from project documentation, field observations, company reports, and relevant literature to support the interpretation of research findings [1], [3]. Before data collection, the questionnaire was carefully reviewed to ensure each item was clear, relevant, and appropriate to the characteristics of the respondents and aligned with the study's objectives. Responses to all questionnaire items were measured using a five-point Likert scale ranging from strongly disagree to strongly agree, as outlined in Table 2.

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Table 2. Likert Scale

Score	Response
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

Source: Developed by the authors, 2025

2.6 Data Analysis

Data analysis was carried out using IBM SPSS Statistics Version 27. Initially, descriptive statistical analysis was employed to describe respondent characteristics and to summarize the distribution of responses for each research variable. This was followed by inferential statistical analysis to examine the relationships among the variables and test the proposed hypotheses. Before testing the proposed hypotheses, the questionnaire instrument was evaluated for validity and reliability to confirm its ability to accurately and consistently measure the research variables. The dataset was then examined using several classical assumption tests, namely normality, multicollinearity, and heteroscedasticity tests, to ensure that the regression model fulfilled the required statistical assumptions. Once these requirements were met, multiple linear regression was applied to investigate the relationship between Occupational Safety and Health (X_1), Working Environment (X_2), and Construction Work Productivity (Y). In addition, hypothesis testing was conducted using the t-test to identify the individual contribution of each independent variable. At the same time, the F-test was employed to determine their combined effect on productivity. The model's explanatory strength was further assessed using the coefficient of determination (R^2), which indicates the extent to which the independent variables explain variations in productivity. The resulting model can be formulated as follows:

$$\boldsymbol{Y = a + b_1X_1 + b_2X_2 + e} \tag{1}$$

where:

- Y = Construction Work Productivity
- a = Constant
- b_1, b_2 = Regression coefficients
- X_1 = Occupational Safety and Health
- X_2 = Working Environment
- e = Error term

The analytical procedure adopted in this study is consistent with quantitative approaches commonly applied in construction management research to examine the influence of occupational safety and workplace conditions on labor productivity [4], [5], [6].

3. Results and Discussions

3.1 Respondent Characteristics

A total of 60 respondents participated in this study. All respondents were construction workers directly involved in the implementation of the Sumedang Regional Hospital Building Project. The respondents represented various age groups, educational backgrounds, work experiences, and job positions, providing comprehensive information regarding the implementation of Occupational Safety, Health, and Environment (OSHE) practices at the project site.

The distribution of respondents indicates that the collected data adequately represent the characteristics of the construction workforce involved in the project.

Figures 2-6 and Table 3 show that the respondents represent diverse demographic and occupational characteristics, including age, educational level, work experience, job title, and job type. This diversity indicates that the sample adequately reflects the workforce involved in the Sumedang Regional Hospital Building Project, thereby providing reliable data for analyzing the relationship between Occupational Safety, Health, and Environment (OSHE) implementation and construction work productivity.

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Table 3. Distribution of Participant Characteristics

		Age	Educational Level	Work Experience	Job Tittle	Job Type
N	Valid	60	60	60	60	60
	Missing	0	0	0	0	0
Mean		2.20	2.15	3.03	1.62	1.62
Minimum		1	1	1	1	1
Maximum		4	4	4	5	3

Source: Processed primary data, 2025.

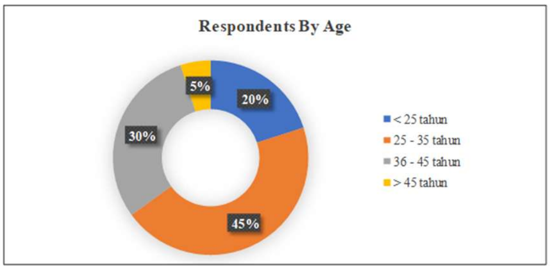

Figure 2. Respondents by Age
Source: Processed primary data, 2025

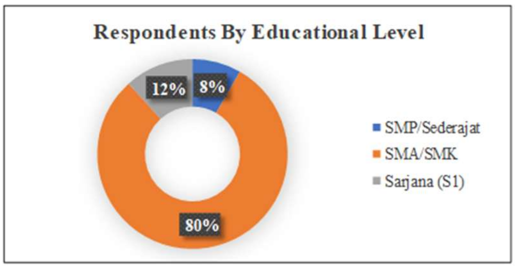

Figure 4. Respondents by Educational Level
Source: Processed primary data, 2025

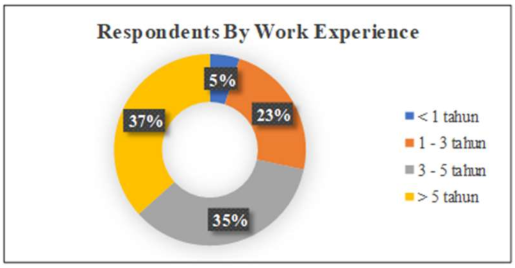

Figure 3. Respondents by Work Experience
Source: Processed primary data, 2025

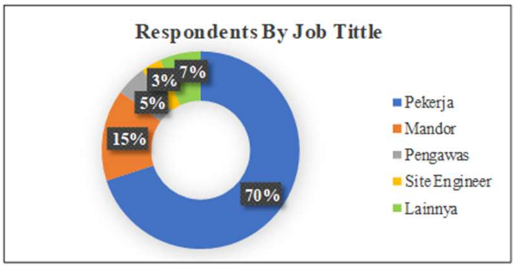

Figure 5. Respondents by Job Title
Source: Processed primary data, 2025

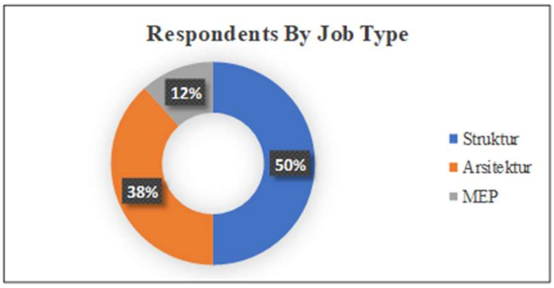

Figure 6. Respondents by Job Type
Source: Processed primary data, 2025

3.2 Instrument Testing

Before proceeding with hypothesis testing, the questionnaire instrument underwent validity and reliability assessments to verify its effectiveness in accurately and consistently measuring the variables investigated in this study.

Validity Test

The validity test was conducted to evaluate each questionnaire item's ability to measure the intended research variables. The analysis employed the Pearson Product-Moment correlation in IBM SPSS Statistics version 27. The decision criteria applied in this study were that an item is considered

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valid when the calculated correlation coefficient (r-count) exceeds the r-table value and the significance value (Sig.) is less than 0.05.

With a total of 60 respondents, the r-table value at a 5% significance level was 0.254. The test results showed that all questionnaire items met the minimum validity requirements under both criteria. Nevertheless, to enhance measurement quality and ensure stronger construct representation, only items with a correlation coefficient of at least 0.500 were retained for further analysis. This criterion was applied to ensure that the selected indicators demonstrate a moderate to strong level of association with their respective constructs, thereby improving the robustness of the measurement instrument. Consequently, the final set of valid items used in subsequent analyses is presented in Table 4.

Table 4. Summary of Validity Test

Variable	Number of Items	Valid Items
Occupational Safety and Health (X_1)	13	13
Working Environment (X_2)	13	13
Construction Work Productivity (Y)	15	15

Source: Processed primary data, 2025.

All retained items met the required validity criteria and were deemed suitable for use in subsequent statistical analyses.

Reliability Test

Reliability analysis was conducted using Cronbach's Alpha coefficient to assess the internal consistency of the measurement instrument. The findings demonstrate that all research variables achieved high reliability, indicating strong internal consistency among the questionnaire items.

The reliability of each research variable was evaluated using Cronbach's Alpha, and the corresponding results are presented in Table 5.

Table 5. Reliability Test Results

Variable	Cronbach's Alpha	Interpretation
Occupational Safety and Health	0.859	Very Reliable
Working Environment	0.873	Very Reliable
Construction Work Productivity	0.959	Excellent Reliability

Source: Processed primary data, 2025.

Since all Cronbach's Alpha values exceeded 0.70, the questionnaire was considered reliable and suitable for further statistical analysis.

3.3 Classical Assumption Test

Before conducting multiple linear regression analysis, several classical assumption tests were performed.

Normality Test

The Kolmogorov–Smirnov test produced an Asymp. Sig. value of 0.200, which exceeds the significance level of 0.05. To ensure that the regression model satisfies the normality assumption, a normality test was performed, and the results are presented in Table 6.

Table 6. Normality Test

Statistic	Value
Asymp. Sig. (2-tailed)	0.200

Source: Processed primary data, 2025.

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These findings indicate that the regression residuals are normally distributed.

Multicollinearity Test

The results of the multicollinearity analysis revealed that all independent variables met the required statistical criteria, with tolerance values exceeding 0.10 and Variance Inflation Factor (VIF) values remaining below 10. These findings indicate no significant multicollinearity among the predictor variables, suggesting that each variable contributes independently to the regression model.

A multicollinearity test was subsequently carried out to examine the relationships among the independent variables, as summarized in Table 7.

Table 7. Multicollinearity Test

Variable	Tolerance	VIF	Decision
Occupational Safety and Health	>0.10	<10	No Multicollinearity
Working Environment	>0.10	<10	No Multicollinearity

Source: Processed primary data, 2025.

These results indicate that there is no multicollinearity among the independent variables.

Heteroscedasticity Test

The heteroscedasticity assessment indicated that the regression model satisfied the required assumptions. The Glejser test yielded p-values exceeding 0.05 for all variables, suggesting the absence of heteroscedasticity. This conclusion was further supported by the scatterplot analysis, which showed no discernible pattern and revealed that the residuals were randomly distributed around the zero line. Therefore, the residuals' variance can be considered constant across the range of predicted values. The results of the heteroscedasticity test are presented in Table 8, while the scatterplot of the standardized residuals is illustrated in Figure 7.

Table 8. Glejser Test

Variable	Sig.
Occupational Safety and Health	0.093
Working Environment	0.905

Source: Processed primary data, 2025.

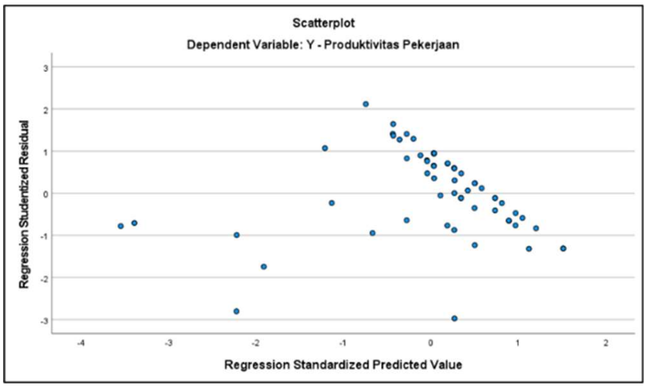

Figure 7. Scatter plot graph.
Source: Developed by the authors, 2025

Both the statistical and graphical assessments consistently indicate that heteroscedasticity is absent. The non-significant Glejser test results and the random distribution of residuals suggest that the regression model satisfies the homoscedasticity assumption.

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3.4 Multiple Linear Regression Analysis

To evaluate the effects of Occupational Safety and Health and the Working Environment on construction work productivity, multiple linear regression analysis was conducted. This statistical method was applied to determine both the direction and magnitude of the relationship between the independent variables and the dependent variable.

Table 9 summarizes the regression coefficients describing the relationship between the independent variables and construction work productivity.

Table 9. Multiple Linear Regression Analysis

Variable	B	t	Sig.
Constant	1.295	0.209	0.835
Occupational Safety and Health	0.799	5.617	0.000
Working Environment	0.403	2.937	0.005

Source: Processed primary data, 2025.

Based on the analysis results, the following multiple linear regression equation was obtained:

$$\boldsymbol{Y = 1.295 + 0.799X_1 + 0.403X_2} \qquad (2)$$

The regression results indicate that both independent variables positively influence construction work productivity. Occupational Safety and Health (X_1) has a greater effect than Working Environment (X_2), as reflected in its higher regression coefficient (0.799 vs. 0.403). This finding implies that safety-related aspects play a more dominant role in enhancing productivity within the observed construction project. These results confirm that both Occupational Safety and Health (OSH) and the Working Environment have a significant positive effect on construction work productivity, with OSH identified as the more dominant influencing factor.

3.5 Hypothesis Testing

Partial Effect (t-test)

A partial hypothesis test was performed to evaluate the individual contribution of each independent variable to work productivity. This analysis was intended to determine whether Occupational Safety and Health and the Working Environment independently exerted a statistically significant influence on construction work productivity when assessed separately within the regression model. The significance of each predictor was examined through the partial (t) test, with the results presented in Table 10.

Table 10. Partial Hypothesis

Variable	t-value	Sig.	Decision
Occupational Safety and Health	5.617	0.000	Accepted
Working Environment	2.937	0.005	Accepted

Source: Processed primary data, 2025.

Both variables were found to have statistically significant effects on construction work productivity.

Simultaneous Effect (F-test)

The simultaneous hypothesis test was conducted to assess the collective effect of the independent variables on construction work productivity. The results revealed a p-value below 0.05, indicating that Occupational Safety and Health and the Working Environment jointly exert a statistically significant influence on construction work productivity. The joint effect of the independent variables was evaluated using the F-test, as reported in Table 11.

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Table 11. Simultaneous Test (ANOVA)

F-value	Sig.
66.492	0.000

Source: Processed primary data, 2025.

The model demonstrates a significant simultaneous effect on construction work productivity. This finding confirms that the combined implementation of effective safety practices and favorable workplace conditions plays an important role in enhancing workforce performance and productivity.

Coefficient of Determination Analysis (R^2)

The regression model's explanatory power was evaluated using the coefficient of determination (R^2), which reflects the proportion of variance in construction work productivity explained by the independent variables. The explanatory power of the regression model was assessed using the coefficient of determination (R^2), as summarized in Table 12.

Table 12. Model Result

R	R^2	Adjusted R^2
0.835	0.697	0.686

Source: Processed primary data, 2025.

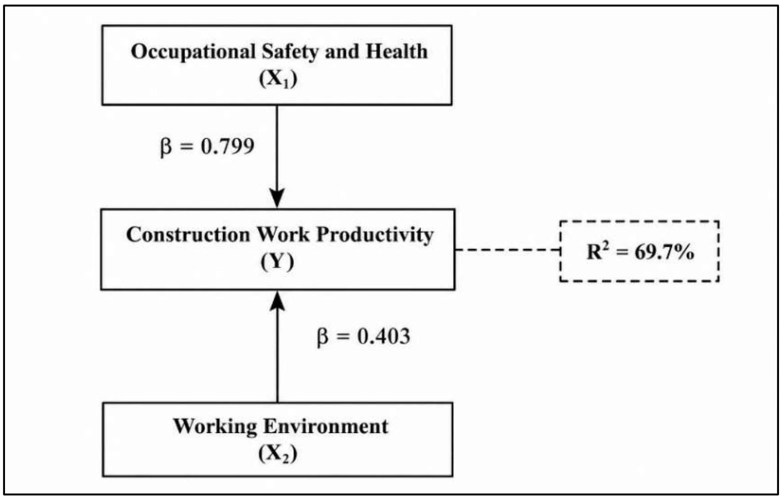

Figure 8. Graphical Representation of the Coefficient of Determination (R^2).
Source: Processed primary data, 2025.

Figure 8 illustrates the explanatory capability of the proposed regression model. The findings indicate that 69.7% of the changes in construction work productivity can be explained by the independent variables incorporated in the model. Meanwhile, the remaining 30.3% may be associated with additional factors outside the scope of this investigation.

3.6 Descriptive Analysis of Research Variables

An overview of respondents' evaluations for each research variable is provided through the descriptive statistics summarized in Table 13.

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Table 13. Descriptive Statistics of Research Variables

Variable	Overall Mean	Highest Indicator (Mean)	Lowest Indicator (Mean)
Occupational Safety and Health	4.44	Work methods are designed by considering safety aspects (4.75)	Routine OSH training (3.97)
Working Environment	4.53	Ventilation system maintains air quality (4.77)	Construction waste is properly managed (4.15)
Construction Work Productivity	4.77	OSHE implementation improves work productivity (4.88)	Productivity is evaluated periodically (4.58)

Source: Processed primary data, 2025.

The descriptive statistics reveal generally favorable evaluations across all research variables. Among the three variables examined, Construction Work Productivity recorded the highest overall mean score (4.77), followed by the Work Environment (4.53) and Occupational Safety and Health (4.44). At the indicator level, safety-oriented work methods, adequate workplace ventilation, and the perception that OSHE implementation improves productivity received the highest ratings. Meanwhile, periodic OSH training, construction waste management, and routine productivity evaluation obtained comparatively lower scores. These results suggest that, although OSHE practices have been implemented effectively, greater attention to training activities, environmental management, and productivity monitoring could further strengthen overall project performance.

3.7 Discussion

The results of the study indicate that Occupational Safety and Health (OSH) has a greater influence on construction productivity than the Work Environment. This is demonstrated by the regression coefficient for OSH (B = 0.799), which is higher than that for the Work Environment (B = 0.403). This finding is consistent with the descriptive analysis, which showed that safety-related indicators, particularly work methods designed with safety in mind, received a high average score (4.75). Furthermore, the productivity indicator with the highest average score (4.88) indicates that respondents strongly believe that implementing Occupational Safety, Health, and Environment (OSHE) can enhance work productivity. This suggests that integrating safety measures into every construction activity not only helps reduce the risk of workplace accidents but also improves workforce performance and project execution efficiency.

These findings are in line with the study conducted by Djaelani and Retnowati, who reported that consistent implementation of occupational safety programs accompanied by effective supervision significantly improves workers' productivity in construction projects. Likewise, Widiana et al. [16] emphasized that systematic implementation of occupational safety practices not only reduces workplace risks but also enhances overall project performance through better compliance with safety procedures.

The findings of this study are consistent with the principles of ISO 45001 [1], which emphasize that systematic occupational safety and health management supports organizational performance through continuous risk assessment and improvement. Campbell and Wiernik [2] further argue that employee performance is strongly influenced by organizational support, including the provision of a safe and healthy working environment. Similarly, Collier and Evans [3] explain that operational productivity depends on the effectiveness of management systems implemented within an organization.

The present findings are also supported by previous empirical studies. Hammad et al. [4] identified occupational safety and workplace conditions as important determinants of labor productivity in construction projects. Bavafa et al. [5] demonstrated that effective safety management systems contribute to improved project performance by strengthening hazard identification and risk control. Similar conclusions were reported by Batubara and Purba [6], Djaelani and Darmawan [7], Ayuwardani [9], Hakim [10], Amin and Bararah [11], and Herlinawati and Zulfikar [12], who consistently found that better occupational safety implementation leads to higher workforce productivity.

In addition, the positive influence of the Work Environment identified in this study is consistent with the findings of Aprilia et al. [8], who reported that supportive workplace conditions significantly improve employee productivity. This conclusion is further reinforced by Putra and Darmawan [14], who emphasized that productivity improvement is more sustainable when occupational safety practices are integrated with a conducive working environment.

Although all indicators received favorable evaluations, the descriptive analysis revealed that periodic OSHE training and construction waste management obtained relatively lower mean scores than the remaining indicators. These findings indicate that greater managerial attention should be directed toward strengthening workers' competence through regular safety training while simultaneously improving waste management practices to optimize overall OSHE implementation. Similar observations were reported by Rahmawati et al. [15], who concluded that continuous implementation of occupational safety programs contributes to productivity improvement by minimizing occupational accidents and reducing operational disruptions throughout construction activities.

Furthermore, the coefficient of determination ($R^2 = 0.697$) indicates that Occupational Safety and Health together with the Work Environment explains 69.7% of the variation in construction productivity. This result confirms that both variables play substantial roles in improving workforce performance within hospital construction projects. Nevertheless, the remaining 30.3% of productivity variation may be explained by other factors that were not included in the present model, such as workers' competence, leadership style, motivation, project planning, communication effectiveness, and construction management practices. This finding is consistent with Sutrisna and Goulding[18], who argued that construction productivity is influenced by multiple managerial and organizational factors beyond occupational safety implementation alone. Therefore, future studies should consider incorporating additional organizational and behavioral variables to obtain a more comprehensive understanding of productivity determinants in construction projects.

Overall, the findings demonstrate that Occupational Safety and Health remains the dominant factor influencing construction productivity, while the Work Environment provides additional support by creating conditions that enable workers to perform their tasks more effectively. Consequently, construction companies should strengthen Occupational Safety, Health, and Environment (OSHE) implementation through continuous safety training, regular supervision, and improved workplace environmental management to achieve sustainable productivity improvement. This recommendation is consistent with the recent literature review conducted by Shafira et al. [17], which concluded that comprehensive Occupational Safety and Health implementation has a positive contribution to long-term productivity improvement in construction projects.

4. Conclusions

Occupational Safety and Health (OSH) and the Work Environment were found to have positive, statistically significant effects on construction productivity in the Sumedang Regional General Hospital Construction Project. Among these variables, Occupational Safety and Health demonstrated the strongest influence, highlighting the importance of effective safety management in improving workforce performance and productivity.

The descriptive findings revealed that safety-oriented work methods and adequate workplace ventilation received the highest average scores, indicating favorable perceptions among respondents. Conversely, routine Occupational Safety and Health (OSH) training and construction waste management recorded relatively lower average scores, suggesting the need for further improvement despite the overall satisfactory implementation of Occupational Safety, Health, and Environment (OSHE) practices.

The findings confirm that the effective implementation of Occupational Safety, Health, and Environment (OSHE) enhances construction work productivity. The integration of safety principles

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into everyday construction activities not only reduces the risk of workplace accidents but also enhances operational efficiency and project performance.

Based on the study findings, project owners and contractors are encouraged to reinforce periodic safety training, improve construction waste management practices, and maintain safe and conducive working environments to enhance workforce productivity and overall project performance further.

Future studies are recommended to investigate additional determinants of construction work productivity, including worker competence, leadership, organizational culture, and project management practices, to provide a more comprehensive understanding of the factors affecting productivity in construction projects.

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