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Elements that affect the effectiveness of occupational safety and health (OSH) in the construction project of the eye clinic in Batu City, as well as its impact on worker safety

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Abstract

This study aims to analyze the influence of aspects of occupational safety, occupational health, and work environment on work potential, work quality, and commitment and job satisfaction in the construction project of the ISHK Tolaram Eye Clinic in Batu City. The research uses a quantitative approach with questionnaire, observation, and interview instruments. Multiple linear regression, the t-test, and the F test were used to analyze the data using SPSS 27. The findings indicated that the aspect of occupational safety had a significant effect on work potential, while occupational health and work environment had no significant effect. Simultaneously, the three aspects of OSH have a significant effect on job potential, but not on quality or commitment and job satisfaction. These findings affirm the importance of occupational safety in increasing worker potential, while health and the work environment need to be strengthened to more optimally support productivity and labor satisfaction.

Keywords: OSH, occupational safety, occupational health, work environment, work potential, job satisfaction.

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INTRODUCTION

One of the most important factors in the construction industry is Occupational Safety and Health (OSH), as this sector is synonymous with a increased chance of accidents at work, injuries, and even death[1]. Construction projects involve work at heights, the use of heavy equipment, a changing work environment, and human interaction with potentially hazardous materials and tools[2]. Therefore, the effective implementation of the OSH system is an absolute necessity to ensure the safety of workers and the smooth implementation of projects[3].

The construction business has a reputation for having a high risk of workplace accidents[4]. Activities in the field involve strenuous physical work, the use of construction equipment, and complex working environment conditions[5]. This makes the implementation of Occupational Safety and Health (OSH) an important factor that must be considered, not only to comply with government regulations, but also to protect workers and ensure the sustainability of the project.[6]

In Indonesia, efforts to implement OSH have been regulated in various regulations, such as Law No. 1 of 1970 concerning Occupational Safety[7] and Permenaker No. 5 of 2018 concerning Occupational Safety and Health in the Workplace[8]. However, its implementation in the field still often encounters obstacles, especially in medium and small-scale construction projects[9]. Common problems include lack of commitment from project management, lack of training for workers, inconsistent use of Personal Protective Equipment (PPE), weak supervision system, and low awareness and culture of occupational safety among workers [10].

The effective implementation of OSH depends not only on the rules set, but also on several important interrelated elements [11]. First, the aspect of occupational safety, which includes the application of PPE (personal protective equipment), supervision in the field, and safe work procedures[12]. Second, occupational health aspects, which are related to the prevention of occupational diseases, environmental cleanliness, and protection against physical and chemical hazards at the project site[13].

In addition, the aspect of the work environment also plays a big role in creating a safe and comfortable working atmosphere [14]. A poorly organized work environment, such as a narrow, dusty, or noisy work area, can increase the potential for accidents and degrade workers' health[15]. The next factor is work potential, namely the ability of workers to carry out tasks in accordance with their competencies[16]. Good work potential will affect the level of safety and effectiveness of workers in the field[17].

Furthermore, the quality of work is an element that determines the success of the project[18]. Good work quality can be achieved if workers work safely, healthily, and in accordance with standard procedures[19]. However, the quality of work can decline if the implementation of OSH is ignored[20]. Finally, workers' commitment and job satisfaction are also closely related to the effectiveness of the implementation of OSH[21]. Workers who are satisfied with working conditions and have a commitment to safety will be more disciplined in following OSH procedures and motivated to work better[22].

In the context of the construction of an Eye Clinic in Batu City, these six elements are very important to be researched. Health facility construction projects demand high safety and quality standards, both in the construction process and in the final building results[23]. However, in the field, challenges are still often encountered such as low awareness of the use of PPE, inadequate working environment conditions, and weak commitment of some workers to the implementation of OSH[24].

Considering this, this research was conducted to examine the extent to which occupational safety aspects, occupational health aspects, work environment aspects, work potential, work quality, and commitment and job satisfaction affect the effectiveness of the implementation of OSH in the Eye Clinic construction project in Batu City, as well as how it impacts worker safety. Unlike previous studies, which have generally examined occupational safety, occupational health, and work environment factors separately or evaluated them only against a single outcome, this study offers a novel contribution by simultaneously testing all three OSH aspects against three distinct outcome variables (work potential, work

quality, and commitment and job satisfaction) within the specific context of health-facility construction, thereby filling a gap that prior construction-safety research has not addressed in an integrated manner. The study's findings are anticipated to significantly advance improving OSH management in construction projects, so that it can reduce the number of work accidents while increasing the productivity and welfare of workers.

METHOD

This study uses a quantitative approach with a descriptive method, because it aims to analyze the influence of the elements of the implementation of Occupational Safety and Health (OSH) including aspects of occupational safety, occupational health, work environment, work potential, work quality, and commitment and job satisfaction to worker safety in the construction project of the Eye Clinic in Batu City. The research was conducted at the ISHK Tolaram Eye Clinic,

The study population included all project workers involved in the construction of the ISHK Tolaram Eye Clinic during the December 2024–February 2025 observation period, encompassing several trades in addition to handymen. From this population, the sample was determined using purposive sampling restricted to handymen, since this group performs tasks most directly and continuously exposed to the occupational safety, occupational health, and work-environment conditions under investigation, making them the most relevant respondents for evaluating the effectiveness of OSH implementation. The purposive criteria applied were: (1) working as a handyman directly involved in the construction process, (2) having been actively engaged on the project for at least one month at the time of data collection, and (3) being willing to complete the questionnaire and, where needed, participate in a brief interview. Applying these criteria to the handyman group yielded a final sample of 51 respondents, which corresponds to the full set of handymen meeting the inclusion criteria at the time of data collection (a total/census sampling of the eligible subgroup) rather than a subset drawn from a larger handyman population. The research variables consisted of independent variables (implementation of occupational safety and health) and dependent variables (worker performance).

Data were collected through observations, questionnaires, and interviews as primary sources, as well as literature and project documents as secondary sources. The research instrument used a Likert scale of 1–5, where the score indicates the level of suitability of the respondents' perceptions. Pearson correlation was used for validity tests, and Cronbach Alpha was used for reliability tests using SPSS version 27.

Data analysis was carried out descriptively, quantitatively, and inferentially. The partial influence of each independent variable is tested using the t test, but the simultaneous influence of independent factors on dependent variables is determined using the F test.

Based on the research framework described above, the following hypotheses were formulated and tested:

H1: The occupational safety aspect has a significant partial effect on work potential, work quality, and commitment and job satisfaction.

H2: The occupational health aspect has a significant partial effect on work potential, work quality, and commitment and job satisfaction.

H3: The work environment aspect has a significant partial effect on work potential, work quality, and commitment and job satisfaction.

H4: The occupational safety, occupational health, and work environment aspects simultaneously have a significant effect on work potential, work quality, and commitment and job satisfaction.

RESULT AND DISCUSSION

This study involved 51 construction worker respondents at the Ishak Tolaram Eye Clinic in Batu City with characteristics of age, gender, education, and length of work. Age-wise, the bulk of responders (55.1%) were between the ages of 30 and 39, indicating that workers are at productive age. In terms of gender, all respondents were male (100%), in accordance with the dominance of the male workforce in the construction sector. Based on education, most respondents had a high school education (42.9%), indicating that skills and experience take precedence over formal education backgrounds. Meanwhile, from the length of work, the majority of respondents have 6–10 years of experience (53.1%), which indicates that the worker has experience in the construction field.

Validity tests and reliability tests were used to test the study instruments. While the reliability test assesses the degree of consistency in respondents' responses to the research tool, the validity test seeks to ascertain the amount to which the questionnaire can measure what ought to be assessed.

The purpose of the validity test is to evaluate the reliability of a statement item in the survey. If the correlation value r is determined to be greater than the r table, the item is deemed genuine. A table r value of 0.233 was obtained with 49 responders in total.

Table 1 Validity Test

No	Calculation						r_{table}	Conclusion
	X_1	X_2	X_3	Y_1	Y_2	Y_3		
1	0,447	0,401	0,738	0,542	0,428	0,444	0,233	Valid
2	0,408	0,612	0,762	0,443	0,582	0,441		Valid
3	0,501	0,327	0,465	0,650	0,485	0,609		Valid
4	0,499	0,663	0,501	0,403	0,477	0,439		Valid
5	0,575	0,587	0,578	0,421	0,712	0,515		Valid
6	0,610	0,529	0,738	0,422	0,454	0,436		Valid
7	0,660	0,685	0,812	0,683	0,436	0,532		Valid
8	0,760	0,515	0,578	0,426	0,444	0,446		Valid
9	0,504	0,646	0,457	0,517	0,439	0,421		Valid
10	0,415	0,780	0,417	0,448	0,498	0,444		Valid

Based on Table 1, it can be seen that all research indicators meet the validity requirements, because the value of r is calculated > r table (0.233). Thus, the indicators of occupational safety aspects (X1), occupational health aspects (X2), work environment aspects (X3), work potential (Y1), work quality (Y2), and work commitment and satisfaction (Y3) are all declared valid.

The purpose of the reliability test was to gauge the research instrument's degree of confidence. Reliability testing uses the Cronbach Alpha coefficient, with

the criterion that if an instrument's alpha value is higher than 0.60, it is deemed dependable.

Table 2 Reliability Test

Indicator	*Alpha Cronsbach*	*Alpha*	Information
(X_1)	0,734	0,60	Reliabel
(X_2)	0,776		Reliabel
(X_3)	0,812		Reliabel
(Y_1)	0,662		Reliabel
(Y_2)	0,707		Reliabel
(Y_3)	0,614		Reliabel

According to Table 2, every study variable has an Alpha Cronbach value more than 0.60, indicating that every statement item in this research tool is deemed credible. Thus, research instruments are suitable for further analysis stages.

Based on the results of the validity and reliability test, all statement items in the research instrument are declared valid and reliable, so that they can be used at the next stage of analysis. Therefore, the data obtained through the questionnaire deserves to be further processed using multiple linear regression analysis to answer the formulation of the research problem.

The t-test was conducted to determine the partial influence of the variables of the aspect of occupational safety (X1), occupational health aspect (X2), and work environment aspect (X3) on work potential (Y1), work quality (Y2) and commitment and job satisfaction (Y3). The following table shows the magnitude of each influence of the independent variable on the bound variable.

Table 3 Results of the T Test on Work Potential

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	15.697	5.977		2.626	.012
	Aspects of Occupational Safety	.433	.162	.403	2.672	.010
	Occupational Health Aspects	.142	.132	.180	1.078	.287
	Aspects of the Work Environment	.017	.123	.021	.140	.889
a. Dependent Variable: Potential for work						

The variable of Occupational Safety Aspects had a computed t-value of 2.672 with a significant value of 0.010, according to the findings of the t-test shown in Table 3. Work Potential is significantly impacted by the Occupational Safety Aspect, according to the significance value of 0.012 < 0.05 and the t count (2.672) > t table (2.012). Furthermore, for the Occupational Health Aspect variable, the calculated t-value obtained was 1.078 with a significance value of 0.287. Since t is calculated to be smaller than t of the table and the significance value is greater than 0.05, it can be concluded that the Occupational Health Aspect does not have a significant effect on Work Potential. In addition, the variable Aspects of the Work Environment has a calculated t-value of 0.140 with a significance value of 0.889. Because the calculated t value is smaller than the t table and the significance value is much greater than 0.05, it can be concluded that the Work Environment Aspect also does not have a significant effect on the Work Potential.

Table 4 Results of T Test on Work Quality

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	29.706	5.990		4.959	.000
	Aspects of Occupational Safety	.128	.163	.131	.790	.434
	Occupational Health Aspects	.228	.132	.317	1.724	.091
	Aspects of the Work Environment	-.043	.123	-.058	-.351	.727
a. Dependent Variable: Quality of Work						

Based on the findings of the t-test shown in Table 4, it can be stated that the Occupational Safety Aspect does not have a significant influence on Work Quality. This is demonstrated by a significance value of 0.434, which is higher than 0.05, and a computed t value of 0.790, which is lower than the t table (2.012). Furthermore, the Occupational Health Aspect also did not have a major impact on Work Quality, with a calculated t value of 1.724 which was smaller than the t table (2.012) as well as a significant value of 0.091 which was greater than 0.05. Finally, the Work Environment Aspect also did not have a major impact on Work Quality, with a calculated t-value of -0.351 which was smaller than the t table (2.012) as well as a significant value of 0.727 which was much greater than 0.05. Overall, the three variables, namely Occupational Safety Aspect, Occupational Health Aspect, and Work Environment Aspect, did not show a significant influence on Work Quality in the regression model used.

Table 5 Results of the T Test on Commitment and Job Satisfaction

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	33.024	6.723		4.912	.000
	Aspects of Occupational Safety	.199	.182	.189	1.090	.281
	Occupational Health Aspects	.089	.148	.116	.601	.551
	Aspects of the Work Environment	-.054	.138	-.069	-.395	.695
a. Dependent Variable: Commitment and job satisfaction						

Table 5's t-test results tell a fairly consistent story across all three predictors. None of them reached the required threshold: the Occupational Safety Aspect fell well short (t = 1.090 against a t-table of 2.012; Sig. = 0.281), the Occupational Health Aspect was even further from significance (t = 0.601; Sig. = 0.551), and the Work Environment Aspect likewise showed no discernible influence (t = -0.395; Sig. = 0.695). Taken together, none of the three OSH aspects individually explains variation in Commitment and Job Satisfaction. Overall, these results show that the three variables of the OSH aspect (Safety, Health, and Work Environment) do not contribute significantly to the commitment and job satisfaction of project personnel in the construction of the ISHK Tolaram Eye Clinic in Batu City.

The simultaneous F test is a statistical test to determine the influence of the variables of occupational safety aspects (X1), occupational health aspects (X2), and

work environment aspects (X3) on work potential (Y1), work quality (Y2) and commitment and job satisfaction (Y3) at the ISHK Tolaram Eye Clinic in Batu City together/combined, based on the results of the analysis that have been carried out as a result of hypothesis testing presented in the following table.

Table 6 F Test on Work Potential

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	230.370	3	76.790	6.388	.001[b]
	Residual	564.964	47	12.021		
	Total	795.333	50			
a. Dependent Variable: Potential for work						
b. Predictors: (Constant), Aspects of the Work Environment, Aspects of Occupational Safety, Aspects of Occupational Health						

The computed F value was 6.388, whereas the table's F value was 2.80, based on the F test results shown in Table 6. Given that the significant value is 0.001 < 0.05 and that F is computed (6.388) > F table (2.80), it can be said that the variables of Work Environment Aspect, Occupational Safety Aspect, and Occupational Health Aspect simultaneously have a significant effect on Work Potential. Thus, these three aspects together make an important contribution to increasing the labor potential of the workforce in construction projects.

These results show that the implementation of safety, health, and work environment aspects in the project is not only an administrative complement, but the main factor that supports the optimization of workforce potential in the field. Therefore, it is necessary to make continuous efforts to strengthen the implementation of OSH so that productivity and project performance can continue to increase optimally.

Table 7 F Test on Work Quality

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	92.712	3	30.904	2.560	.066[b]
	Residual	567.445	47	12.073		
	Total	660.157	50			
a. Dependent Variable: Quality of Work						
b. Predictors: (Constant), Aspects of the Work Environment, Aspects of Occupational Safety, Aspects of Occupational Health						

An F value of 2.560 with a significance value of 0.066 was calculated based on the F test results shown in Table 7. Given that the significance value is higher than 0.05 and the computed value of F (2.560) is less than the table's F (2.80), it can be said that the variables of Work Environment Aspect, Occupational Safety Aspect, and Occupational Health Aspect simultaneously do not have a significant effect on Work Quality. Thus, these three aspects together have not been able to make a real contribution to raising the standard of the construction projects under study.

These results suggest that although aspects of safety, health, and the work environment are well implemented, other factors related to project management, planning, and implementation in the field may have more influence on the quality of work. Therefore, it is important to identify and manage other variables that can improve work efficiency, so that more optimal construction quality can be achieved.

Table 8 Test F on Commitment and Job Satisfaction

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	44.630	3	14.877	.978	.411[b]
	Residual	714.665	47	15.206		
	Total	759.294	50			
a. Dependent Variable: Commitment and job satisfaction						
b. Predictors: (Constant), Aspects of the Work Environment, Aspects of Occupational Safety, Aspects of Occupational Health						

Based on the findings of the F test presented in Table 8, a F value was achieved computed of 0.978 with a significance value (Sig.) of 0.411. Because the significance value is more than 0.05, it may be argued that simultaneously, the variables of Work Environment Aspect, Occupational Safety Aspect, and Occupational Health Aspect do not have a significant effect on Work Commitment and Satisfaction. In addition, the calculated F value of the table F (2.80) reinforces the conclusion demonstrated the variance in Job Commitment and Satisfaction could not be adequately explained by the regression model that was evaluated..

Thus, these results suggest that factors related to safety, health, and the work environment have not been significant enough in influencing commitment and job satisfaction. Therefore, it is necessary to conduct a more in-depth evaluation of other variables that can affect these two aspects, such as project management, leadership, and work culture in the field.

In essence, the coefficient of determination (R2) gauges how far the model influences in explaining the variation of dependent variables. According to Chin (1998), the value of R^2 is divided into three categories based on how strongly the model can explain the variables being studied.

$R^2 \geq 0.67$: Substantial or strong category

$0.33 \leq R^2 < 0.67$: Moderate category

$R^2 < 0.19$: Weak category

If the R^2 value of a model reaches or exceeds 0.67, then the model is considered to be very good at explaining the variability of the data. Values between 0.33 and less than 0.67 indicate moderate strength, while values below 0.19 indicate weak strength in explaining the variability of dependent variables. The following table displays the findings of the determination coefficient (R2) test:

Table 9 Test of Coefficient of Determination on Work Potential

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.538[a]	.290	.244	3.467
a. Predictors: (Constant), Aspects of the Work Environment, Aspects of Occupational Safety, Aspects of Occupational Health				

The R value of 0.538 indicates that there is a reasonably strong link between the predictor variables, according to the table of 9 Model Summary that was generated, namely Work Environment Aspect, Occupational Safety Aspect, and Occupational Health Aspect, to the bound variable. With an R-Square value of 0.290, the three independent variables account for 29% of the variation in the bound variables, with other factors not included in this study model influencing

the remaining 71%. After controlling for the number of predictors, the Adjusted R Square value of 0.244 shows that independent factors contribute 24.4% to dependent variables. Meanwhile, the Standard Error of the Estimate value of 3.467 indicates the magnitude of the average prediction error in the model, where the value is still moderate. Overall, these results suggest that the model has a fairly good relationship, although there are other factors outside the study that also influence the bound variables

Table 10 Test of Determination Coefficient on Work Quality

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.375[a]	.140	.086	3.475
a. Predictors: (Constant), Aspects of the Work Environment, Aspects of Occupational Safety, Aspects of Occupational Health				

Based on the table of 10 Model Summary obtained, the R value of 0.375 indicates a fairly low relationship between the predictor variables, namely Work Environment Aspect, Occupational Safety Aspect, and Occupational Health Aspect, to Work Quality. With an R-Square value of 0.140, these three independent variables can only account for 14% of the variation in work quality. Other factors that were not part of the model had an impact on the remaining 86%. After accounting for the number of predictors in this model, the Adjusted R Square value of 0.086 shows how these three factors contribute to a worse Quality of Work. The Standard Error of the Estimate value of 3.475 indicates the level of prediction error in this model, which is still moderate.

Table 11 Test of Determination Coefficient on Commitment and Job Satisfaction

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.242[a]	.059	-.001	3.899
a. Predictors: (Constant), Aspects of the Work Environment, Aspects of Occupational Safety, Aspects of Occupational Health				

Based on the table of 11 Model Summary, an R value of 0.242 was obtained, which shows that the relationship between Work Environment Aspects, Occupational Safety Aspects, and Occupational Health Aspects on Job Commitment and Satisfaction tends to be weak. Only 5.9% of the variation in Commitment and Job Satisfaction can be accounted for by these three independent variables, according to an R-Square value of 0.059. Other factors not included in this model had an impact on the remaining 94.1%. Even after controlling for the number of predictors, the model's ability to explain the variation in Commitment and Job Satisfaction was not very good, as indicated by the Adjusted R Square value of -0.001.

According to the findings of the analysis of the Coefficient of Determination (R2), the F Test, and the Hypothesis test of the T Test, the following elements are significant:

1. T Test

The Occupational Safety aspect has a significant effect on Work Potential because the calculation (2.672) > t table (2.012) and the significance value is 0.012 < 0.05. Thus, partially, the Occupational Safety Aspect makes a significant contribution to increasing work potential in the implementation of construction projects. This indicates that the higher the implementation of the occupational safety aspect, the better the work potential produced by the workforce in the field.

2. Test F

Aspects of the Work Environment, Aspects of Occupational Safety, and Aspects of Occupational Health simultaneously have a significant effect on Work Potential because F calculation (6.388) > F table (2.80) and significance value of 0.001 < 0.05.

This indicates that the dependent variable, work potential, is significantly impacted by the three independent variables taken together. This reinforces that the management of the workplace, the application of safety regulations, and good occupational health efforts will encourage an increase in overall work potential in construction projects.

3. Coefficient of Determination (R2)

The results of the determination coefficient analysis showed that the R^2 value was 0.538, which means that 53.8% variation in Work Potential can be explained by three independent variables, namely Work Environment Aspect, Occupational Safety Aspect, and Occupational Health Aspect. Other factors not covered in this study had an impact on the remaining 46.2%. This value shows that the model used has a strong and relevant relationship to explain the influence of the OSH factor on work potential in the context of the implementation of construction projects.

CONCLUSION

This study found that the occupational safety aspect had a significant effect on work potential, while the occupational health and work environment aspects did not show a significant effect when partially tested. However, simultaneously the three aspects of OSH, namely: occupational safety aspects, occupational health aspects and work environment contribute to increasing work potential. On the other hand, both partially and simultaneously, the aspect of OSH does not have a significant effect on the quality of work or on commitment and job satisfaction.

These findings confirm that the application of occupational safety aspects has an important role in optimizing the potential of the workforce in construction projects. The results of this study provide practical implications for project management to strengthen the implementation of safety and increase the effectiveness of health and work environment aspects. In addition, this research also makes a scientific contribution in enriching the literature on the effectiveness of OSH in the construction sector.

This study has several limitations. First, the sample was limited to 51 handymen at a single construction site (the ISHK Tolaram Eye Clinic project), which restricts the generalizability of the findings to other construction projects or types of health-facility construction. Second, the cross-sectional design captured worker perceptions and conditions only at one point in time, so the causal direction of the relationships and how OSH implementation and worker outcomes evolve over the course of a project could not be assessed. Third, data collection

relied primarily on self-reported questionnaires, which may be subject to response bias, and the relatively modest R\u00b2 values obtained (0.140\u20130.290) indicate that important explanatory variables beyond the three OSH aspects examined here were not captured by the model. Future research is recommended to (1) expand the sample to multiple construction projects and sites to improve external validity, (2) adopt a longitudinal design to observe how OSH implementation and its effects on worker potential, quality, and satisfaction change over the project lifecycle, (3) incorporate additional variables such as project management practices, leadership style, and organizational safety culture, which this study's regression models suggest may explain a substantial share of the unexplained variance, and (4) consider mixed-methods approaches that combine the quantitative CSAT-style measurement used here with qualitative interviews to better understand the mechanisms underlying worker satisfaction and commitment.

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