IJCEE Vol.9 No.1 Juli 2023, Page 31-38 **ISSN 2598-2931**

Occupational Health and Safety (OHS) Impact on Time and Cost of East Java'S National Road Projects

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Received : 31 Dec 2022
Approved : 5 June 2023
Published : 31 July 2023

***Abstract*:** *Road infrastructure development has increased in the last three years. Like the construction of other infrastructure projects, the implementation of this road project also carries a high risk of work accidents. Therefore, knowledge of Occupational Safety and Health (OHS) is needed to minimize the potential risk of work accidents. The purpose of this study is to determine the implementation of Occupational Safety and Health (OHS) in national road projects in East Java and review what can be done so that the implementation of Occupational Safety and Health (OHS) in national road projects in East Java can run better. This research began with data collection through the questionnaire method, distributed to the national road project head office in East Java, with the respondents being project managers or project leaders. Furthermore, the collected questionnaire data were analyzed using the Partial Least Square (PLS) method. The results of the partial least squares analysis show that the factor that most influences the application of OHS is the Management Role Factor (X2) which ranks first, with the Management Role variable having an effect of 25.07%.*
Keywords: *implementation; OHS; management role factor; PLS*

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INTRODUCTION

Occupational Health and Safety (OHS) is a form of systematic approach carried out in the workplace, such as sharing responsibility for actions related to OSH in the workplace, establishing work standards and frameworks to achieve these standards, emphasizing the regulation of OSH, as well as facilitating the enforcement of rules/policies. Several factors can cause accidents at work. Among them are human factors, equipment factors, and work environment factors. However, the dominant factor in work accidents is caused by human factors due to a lack of awareness and knowledge of the importance of work safety (Firdaus Yahya, 2019). Based on the Bureau of Labor Training report, the cause of work accidents in construction projects that have occurred so far is caused by the behaviour of workers who ignore work safety for themselves and others.

The implementation of occupational safety and health in the industrial sector has not shown the expected results, and this is indicated by the relatively high level of work accidents. Data on the number of work accidents in Indonesia in 2020 was 192,911 people (BPJS Ketenagakerjaan, 2020). Most cases of work accidents occur in the productive age group. Death results from a work accident that cannot be measured economically. Work accidents that result in lifelong disability, in addition to having an impact on non-material losses, also cause very large material losses, even greater than the costs incurred by sufferers of serious diseases such as heart disease and cancer.

This is because construction work is a complex activity that involves large amounts of labour, building materials, and construction equipment, both individually and in groups, which can trigger work accidents on construction projects. However, this is not based on the actors of construction workers, both workers, construction service entrepreneurs, supervisors and even the owners of the construction project itself. Work

accidents will hurt the company with financing problems, repairing damaged machines, treatment of employees, compensation for disability if employees experience physical disabilities, and even the production process can be stopped due to the work accident.

PLS is a powerful analytical system because it is not based on many assumptions. Data does not have to be normally distributed multivariate (indicators with theoretical scales, ordinal, and intervals to ratios are used in the same figure), and the sample does not have to be large. Unless it can be used for confirmatory theory, PLS can also explain that there is no relationship between latent variables. Because it focuses more on data and with a limited estimation procedure, the miss-specification of figures like that impacts the estimation parameters. PLS can analyze all constructs composed of reflexive and formative indicators, which is not possible in covariance-based SEM because there will be unidentified figures (Latan and Ghozali, 2012).

From the explanation, the authors are interested in researching the level of awareness of workers about the use and implementation of occupational safety and health at work. The authors intend to research factor analysis of the implementation of occupational safety and health on costs and time to workers to find out what factors influence the implementation and use of occupational safety and health for workers in the implementation of national road construction projects by direct observation to the field.

RESEARCH METHOD

This research generally consists of two stages: preliminary research and data processing using the Partial Least Square (PLS) method. Data were processed using the survey method, namely distributing questionnaires to respondents.

The research conducted by the author is research to identify Factors Analysis of Occupational Health and Safety (OHS) on the time & cost of work on the implementation of the national road project in East Java; the research was carried out through a survey, namely distributing questionnaires to workers who know about the Health Management System, and Occupational Safety such as Project Managers, Site Engineers, Site Managers, Consultants and Executors.

Data Processing With Partial Least Square (PLS) System

This research was carried out in the implementation of a national road project in East Java. The objects of this research are project workers, namely Project Managers, Site Engineers, Site Managers, Consultants and Executors, safety supervisors, and management of the implementation of national road projects in East Java. The time for conducting this research was in August 2022. The data from this research was obtained by distributing questionnaires and processing the data.`

The data processing stage is to process 82 questionnaire data from the results of the respondents' answers that have been collected with the PLS system, which is carried out with two levels, namely the outer sample and inner sample stages. Partial Least Square (PLS) is a Structural Equation Modeling (SEM) choice; PLS is suitable for prediction purposes with a small number of samples; data can be nominal, group, ordinal, interval, and ratio (Ghozali, 2006).

1. The Outer Model Stage (Exemplary Evaluation) is the level of testing the relationship between latent variables and indicators. Exemplary Outer Testing consists of Convergent Validity, Discriminant Validity, and Composite Reliability. An indicator is said to meet convergent validity if it has an outer loading score > 0.70. The Discriminant Validity test compares the scores from the AVE root of each variable with the correlation involving the variable concerned with the other variables in the model. If the score from the AVE root is greater than the correlations between variables, it can be concluded that discriminant validity has been fulfilled. Composite reliability A variable is said to meet reliability if it has a composite

reliability score > 0.70 (Ghozali, 2016).

2. The Inner Example Stage (Structural Example), namely the level of testing between latent variables. Structural example is measured by applying the R-Square, Q-Square, and t test. The results of this test will highlight the magnitude of the change order impact on rates and time.

The variable elements that cause the implementation of Occupational Health and Safety along with the indicators used in this study are as follows :

Table 1. Variable factors causing the implementation of OHS

Factor	Indicator	
Worker Involvement (X1)	X1.1	The company provides regular and continuous briefings in the form of presentations on OHS
	X1.2	OHS briefing before starting work by safetyman
	X1.3	Coordination between the safetyman and the foreman and implementer takes place all the time
	X1.4	All workers are directly involved in the briefing on OHS
	X1.5	All workers wear standard Personal Protective Equipment (PPE).
	X1.6	Workers are involved in the planning of the OHS program
	X1.7	Workers are involved in conveying information
	X1.8	Workers are asked to remind other workers about hazards and OHS
	X1.9	The company provides an explanation of the types of fires that may occur in the workplace and how to handle them
	X1.10	Workers share accidents at the job site
	X1.11	The company investigates the accident that occurred
Management Role Factor (X2)	X2.1	The company gives top priority to problems that occur during the implementation of OHS
	X2.2	There are continuous efforts to improve OHS performance over a certain period
	X2.3	There is monitoring carried out by management onimplementation of OHS
OHS Rules & Procedures (X3)	X3.1	OHS regulations and procedures are very necessary
	X3.2	There are sanctions for violations of OHS rules and procedures
	X3.3	OHS rules and procedures are easy to understand
	X3.4	OHS regulations and procedures are easy to implement consistently
	X3.5	OHS rules and procedures are periodically revised to improve employee understanding of OHS
Working conditions & environment (X4)	X4.1	Good lighting and lighting conditions make it easier to do work
	X4.2	The level of compatibility between the type of work and the space provided by the company is very necessary to do a job
	X4.3	The level of conformity between the type of work and the layout of work equipment and machines can support work process activities
	X4.4	Sufficient supply of work equipment can support the implementation of the work properly
	X4.5	Good air temperature conditions can support the

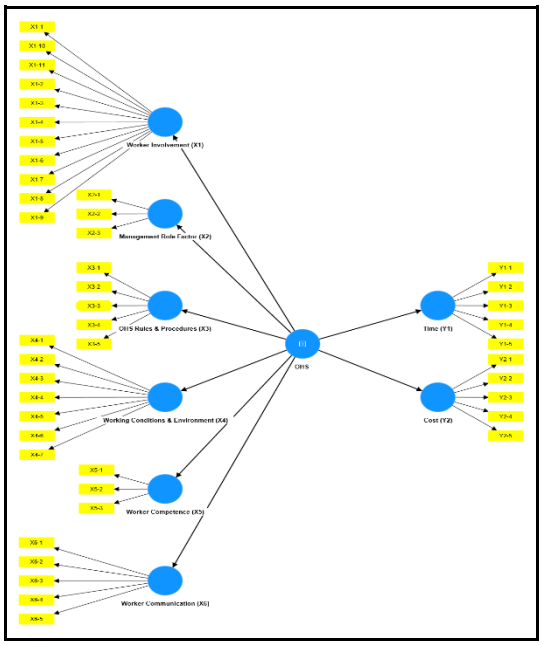
Factor		Indicator
		implementation of a good job
	X4.6	The level of influence of noise and vibration is sought so as not to affect the work result
	X4.7	Cleanliness of the work environment affects the level of work comfort
	X4.8	Good lighting and lighting conditions make it easier to do work
Worker Competence (X5)	X5.1	Workers must be responsible for OHS
	X5.2	Workers are fully aware of the risks of their work
	X5.3	Workers prioritize OHS
Worker Communication (X6)	X6.1	Workers get information about OHS
	X6.2	Employees are satisfied with the delivery of job information
	X6.3	Workers receive information about work accidents
	X6.4	There is good communication between workers and management
	X6.5	Layout and management of communications in the field

Table 2. Variable Influence of OHS Implementation

Factor		Indicator
Time (Y1)	Y1.1	Arranging the placement of work infrastructure
	Y1.2	Equipment and work materials
	Y1.3	Extension of time for the duration of work
	Y1.4	Extension of time for additional work, rework/redesign
	Y1.5	Delay in the procurement of equipment and materials
Cost (Y2)	Y2.1	Implementation of occupational safety and health management system
	Y2.1	Increased excess costs
	Y2.3	Additional disassembly fee
	Y2.4	Additional overtime costs
	Y2.5	Layout and management of communications in the field

RESULTS

The results of the study regarding the analysis of occupational health and safety factors on the time & cost of work on the implementation of the national road project in East Java, the research data were grouped based on the respondent's profile, and the results of the SmartPLS 4 data test were derived from the respondents' questionnaire answers.



Picture 1. Research Model.

The results of data processing using the PLS system with the SmartPls 4.0 program for the research example are as follows.

1. Outer Model (Model of Assessment)

   The test results for convergent validity found that each indicator for each research variable generally has an outer loading point above 0.70, except for indicators X1.6; X1.7; X4.1; X4.2; Y1.4; Y1.5; Y2.1 where each of these indicators has an outer loading below 0.70 so that these two indicators are invalid in evaluating research variables or do not meet convergent validity. Next, the sample is re-estimated by eliminating the two invalid indicators. The re-estimation results have met convergent validity because all outer loadings are above 0.70.

   Discriminant Validity testing is by comparing points from the AVE. The following is a discriminant validity test that compares the AVE and the correlation between variables.

Table 3. Average Variant Extracted (AVE)

Variable	(AVE)
Cost (Y2)	0.711
Management Role Factor (X2)	0.829
OHS Rules & Procedures (X3)	0.749
Time (Y1)	0.843
Worker Communication (X6)	0.57
Worker Competence (X5)	0.815
Worker Involvement (X1)	0.662
Working Conditions & Environment (X4)	0.733

Based on the data presented in Table 3, it is known that the AVE value of the internal audit variable, the competency of the account officer and the effectiveness of financing risk management is > 0.7. Thus it can be stated that each variable has good discriminant validity.

The last Exemplary Outer test is composite reliability. The composite reliability score of each research variable from the test results is more than 0.6, so it can be concluded that each variable meets the desired reliability criteria. The following is the composite reliability score for each research variable.

Table 4. Composite Reliability

Variable	(rho_a)	(rho_c)
Cost (Y2)	0.939	0.907
Management Role Factor (X2)	0.91	0.935
OHS Rules & Procedures (X3)	0.941	0.937
Time (Y1)	1.078	0.941
Worker Communication (X6)	0.83	0.869
Worker Competence (X5)	0.889	0.93
Worker Involvement (X1)	0.925	0.932
Working Conditions & Environment (X4)	0.928	0.932

2. Inner Model (Structural Model)

   The first evaluation of the inner model is observed from the R-Square score. According to data processing with SmartPLS 4.0, the R-Square score is realized as follows.

   Table 5. Average Variant Extracted (AVE)

Variable	R^2	Adjusted R^2
Cost (Y2)	0.549	0.538
Time (Y1)	0.478	0.466

The correlation effect of the application of occupational safety and health (OHS) with time performance on the National Road construction project in East Java shows that the results of the R-squared value for Time (Y1) are 0. 478. This means that the ability of the independent variables, namely OHS, to explain the variable Time (Y1) is 47.8%. It means that the remaining 52.2% of the effect is explained by other variables outside those discussed in this study also shows that the results of The R-squared value for Cost (Y2) are 0. 549. This means that the ability of the independent variables, namely X1 to X6, to explain the variable Cost (Y2) is 54.9%. This means that the remaining 45.1% of the effect is explained by other variables outside those discussed in this study.

In the PLS model, the goodness of fit assessment is known from the Q^2 value, the higher the Q^2 value, the more fit the model can be with the data.

Table 6. Q-squared

Variable	Q^2 predict
Cost (Y2)	0.059
Time (Y1)	0.011

The Q2 predict value for Variable above 0 indicates the model has predictive relevance. The Y2 value is 0.059 where this value is above 0. Thus, it can be concluded that all variables can predict the model well.

The next test is the t-test of the research hypothesis, based on the value of the path coefficient (original sample estimate) and the calculated t-value (t-statistic) in the inner model.

Table 7. Coefficient Value Result

Hypothesis	Effect	TStatistics	Result
H1	OHS → Cost (Y2)	2.701	Significant
H2	OHS → Time (Y1)	1.823	Significant

The point of the impact path coefficient of the Occupational Health and safety variable on Tariffs is 2,701, and this shows that there is a significant positive impact between Occupational Health and Safety on the tariffs of construction projects that are the research samples. The effected path coefficient point of the Occupational Health and Safety variable on Time is 1.823, which shows a significant positive impact between Occupational Health and Safety on project processing time.

CONCLUSION

The occurrence of Occupational Health and Safety in the progress of the National Road Project in East Java has a positive and significant impact on rates, time, and quality of the progress of the National Road Project in East Java. And the quantity of the impact given the implementation of OHS at a rate of 54.9% to time 47.8%

SUGGESTIONS

Use of data sources, it is better to use secondary data in evaluating tariff and time variables. By using secondary data, the assessment will be more precise so that the research results will better represent the situation during the construction process.

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