

Obstacle Factor Influencing the Application of Health, Safety, and Environment (HSE) Management on Construction Projects in Indonesia

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Abstract: Activity along the construction project is one of the most hazardous compared to other industry. In Indonesia, many construction projects are still facing numerous accidents and or fatalities during the project. It shows by the high rate of work accidents in the construction sector throughout 2017 where at least there are any 7 the national strategy projects that have been in an accident. This indicates the Health, Safety, and Environment (HSE) may have not been implemented properly in the project. The aim of this research is to identify the obstacle factors influencing the implementation of health, safety and environment management on construction projects in Indonesia. The questionnaire method was used to collect the data. The research identified 10 obstacle factor in implementing of health and safety management i.e lack of attention to safety by workers, lack of attention to safety by main contractors, problem sub-contractor, an absence of safety provisions in contractual clause, lack of integration of safety in the construction activities, rules and regulation, financial pressure, insufficient safety training, tight schedule and low labor education. From a total 10 factors identified, respondent agreed that lack of attention to safety by workers as the highest obstacle factor in implementing HSE management in the construction project. The finding can be used to manage HSE risk efficiently and effectively for another construction project.

1 INTRODUCTION

The construction industry related to numerous of the accident which occurs worldwide (Gunduz & Ahsan 2018). According to (Bavafa et al., 2018) the percentage of the accident on the construction project in developing countries are relatively high, including Indonesia. For instance in Indonesia, in 2017 it has been reported that from a total of 47 national strategy projects there was accident occurred in 7 national strategy projects. Oswald et al. (2018) and Bavafa et al. (2018) pointed out as common the accident in the construction project is mainly caused due to the unique characteristic including the unique working environment of the project itself. Additionally, the construction industry is having complicated characteristics, and site conditions that differentiate it from other industries (Alruqi et al., 2018). Unfortunately, the accident in a construction project can cause various direct and indirect cost in the project (Bavafa et al., 2018). Moreover, Mohammadi

et al. (2018) mentioned the cost of the accident will increase up to 15% to the project cost.

Nowadays, Safety issues are considered as the major concerns related the cost of these occurrences can be huge and they are borne by the victims, their families, employers, the industry, government and society as a whole (Manu et al., 2018). Ironically, the previous study by Harvey et al. (2016) mentioned that Occupational Safety and Health in construction has been slower than in other sectors. To implementing HSE properly in the project, it is needed for active participation not only by the contractor but also the owner since the planning phase until the completion of the project (Gunduz & Ahsan 2018).

Following to Mohammadi et al. (2018) construction industry is including as the main factor of development for countries, then it is needed any special attention to the construction project. Hence, since safety management is a key element to the success of the project, it also needs special attention in implementing safety to the project properly since in the planning phase. Gunduz & Ahsan (2018)

Table 1: Obstacle Factor Influencing the Application of HSE

No	Main factors	References	Obstacle Factors in this research
1	HSE competency and behaviour	(Mohammadi et al., 2018); (Gunduz & Ahsan 2018)	Lack of attention to safety protection by workers
2	HSE competency and behaviour	(Mohammadi et al., 2018); (Gunduz & Ahsan 2018)	Lack of attention to safety management by main contractors/project managers
3	Subcontractors	(Bavafa et al., 2018); (Gunduz & Ahsan 2018)	Problem with sub-contractor
4	Contract formation	(Tanabe & Turco 2016); (Loganthan & Siddiqui 2018)	An absence of safety provisions in contractual clause
5	Safety program and management systems	(Bavafa et al., 2018); (Gunduz & Ahsan 2018); (Manu et al., 2018)	Lack of integration of safety in construction activities
6	Rules and regulation	(Manu et al., 2018); (Mohammadi et al., 2018)	Rules and regulation
7	Financial aspects	(Mohammadi et al., 2018)	Financial pressure
8	Safety training	(Mohammadi et al., 2018); (Bavafa et al., 2018); (Manu et al., 2018); (Gunduz & Ahsan 2018)	Insufficient safety training
9	Work pressure	(Mohammadi et al., 2018)	Tight schedule
10	Low education level	(Mohammadi et al., 2018); (SAEED, 2017)	Low labor education

mentioned that safety management is one of the important keys to the success of the construction project in order to minimize costs and delays the project. The number of problems caused by improper application of HSE causes the question actually what obstacle factors in implementation HSE to the project. The aim of this research is to identify the obstacle factors influencing the implementation of health, safety and environment management of the construction project in Indonesia.

2 RESEARCH METHODOLOGY

The survey was sent to numerous respondent that participate in the construction industry. From a total of 30 respondent, there were 5 consultants, 20 contractors, and 5 owners out of 30 respondents. Respondents from various professional background and expertise engaged in the construction sector were selected. Out of 30 respondents, there were 8 managers, 10 project engineers, 5 owners and 7 others involved in the construction.

The total years of the construction work experiences of the respondents are categorized into 3 groups of less than 5 years (<5 years), 5 – 10 years

and more than 10 years experience. Over a half of respondents have been practicing in the construction industry for 5 to 10 years as seen in Figure 1 the number of respondents based on total years of construction experience.

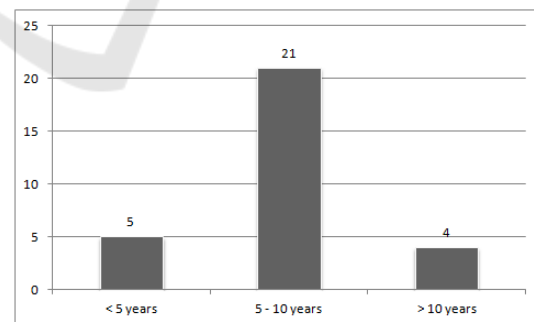


Figure 1: The Number of Respondents Based on Total Years of Construction Experience.

A questionnaire survey was used to gather information and collect the data. The questionnaire survey was divided into two section: 1) respondents information and 2) assessing obstacle factor HSE. The first section was used to gain background

information of the respondent. This section requires the respondent to give information relating to organization type, job designation and total years of work experience in the construction industry. Section two containing 10 obstacle factors the application of HSE in the construction project. Furthermore, respondents were requested to assess the obstacle factor on 5 points Likert scale (1= very low, 2= low, 3= moderate, 4= high and 5=very high).

Several factors were used as obstacles factor in the implementation of HSE in construction projects in Indonesia. These factors are shown in Table 1.

Furthermore, the results of the respondent's questionnaires will be analyzed using mean rank analysis. In the mean rank analysis, the observation value on each row is ranked and the average is sorted to find out the ranking of an observation. Mean rank can be calculated by using Equation 1 and 2.

$$\text{mean rank} = \frac{R_i}{n} \quad (1)$$

$$R_i = \sum_{i=1}^n X_i \quad (2)$$

Where, n is the number of respondents, R_i is the number of respondent's assessment data and X_i represents observation value obtained from respondents.

3 RESULTS AND DISCUSSION

This research has identified a total number of 10 obstacle factors influencing the application of HSE management in the construction project in Indonesia. Detail analysis was shown in Table 2.

Based on Table 2, respondents assess lack of attention to safety protection by workers as the highest obstacle factor influencing the application of Health, Safety, and Environment (HSE) management on construction projects in Indonesia. Previous studies showed that attitude and behavior is one of the important factor influencing application HSE in construction project (Mohammadi et al., 2018), furthermore, according to Mohammadi et al. (2018) negative attitude of worker that underestimate the risk and take short to done the job was major root of causes of accident in construction project. Similar with factor 1, obstacle factor lack of attention to safety management by the main contractor/ project managers was also one of the important factors. Mohammadi et al. (2018) pointed out the importance

of managers to identify and control the factors influencing the safety performance of the project.

Table 1: Obstacle Factor Influencing the Application of Health, Safety, and Environment (HSE) Management on Construction Projects in Indonesia.

No	Factors	Average
1	Lack of attention to safety protection by workers	4,70
2	Lack of attention to safety management by main contractors/project managers	4,43
3	Problem with subcontractors	4,43
4	An absence of safety provisions in contractual clause	4,40
5	lack of integration of safety in the construction activities	4,37
6	Rules and regulation	4,30
7	Financial pressure	4,10
8	Insufficient safety training	4,07
9	Tight schedule	3,83
10	Low labor education	3,80

In this research, the problem with subcontractor was ranked in the top three the obstacle factor influencing the application of HSE in the construction project in Indonesia. Similar with the previous study according to (Gunduz & Ahsan 2018) subcontractors safety behavior is important in implementing HSE (rank 16 out of 40), so the problem was made by the subcontractor can be dangerous to the project. Furthermore Bavafa et al. (2018) mentioned that is important to select subcontractors personnel by considering their safety and health performance. According to Mohammadi et al. (2018) the main contractor must ensure subcontractors to follow safety protocol and are integrated with safety culture during the project.

The previous study pointed plan for safety as a basis of an effective construction safety program (Bavafa et al., 2018). Furthermore, according to (Gunduz & Ahsan 2018) owner must be actively participating in project safety since the project still in planning phase i.e making safety guidelines to contractors, incorporate safety requirement in the contract and push contractors to set safety as goals in the project. In this research, respondent asses this factor into middle group, it means lack of integration of safety in construction activities including safety planning is one of the main obstacle factor influencing the application HSE in the project.

According to Mohammadi et al. (2018), rules and regulation are one of the major factor influencing safety performance on the construction project, this factor includes safety rules, rules compliance, and

paperwork of regulation. The previous study by (Manu et al. 2018) pointed this factor categorized into the high category in implementing HSE in Malaysia, but in Vietnam and Cambodia, this factor categorized into the moderate category similar with the result of this research.

Financial is one of the obstacle factors in implementing HSE in the construction project. According to Mohammadi et al. (2018) project cost would be increased up to 15% if there is an accident in the project. Although in this research, this factor is not included in 3 the highest obstacle factors in applying HSE, but the range average still more than 4 (in Likert scale which used 4 means high). This means financial is one of the important factors in applying HSE to the project. (Manu et al., 2018) mentioned that is important to allocate price in covering HSE requirement in every project. Furthermore Mohammadi et al. (2018) argued that the financial in the project can reduce by cutting of the safety budget, unfortunately, this can lead to polemics in Indonesia where many procurement systems are more using the lowest price bidding system than best-value method. High demand for implementing HSE in the project but not balanced with a qualified finance as the result of procurement system chosen will result in financial pressure in the project.

Then, Contrary with previous study, respondent asses insufficient safety training in 3 lowest obstacle factor influencing the application HSE in the construction project. While the previous study pointed safety training as one of the most critical factors for effective implementation of safety programs in construction project (Bavafa et al., 2018). Similar with Bavafa et al, according to Mohammadi et al. (2018) HSE competency, including safety experience, training, and education, is one of the main factor influencing safety performance in the construction project. Furthermore Mohammadi et al. (2018) pointed out that in the end, the age and experience of the workers as the important factor to make safety condition in the construction project. This also contrary with the result that asses low labor education as the lowest obstacle factor influencing the application of HSE in the construction project in Indonesia. The gap between this research with the previous study may happen caused by the different perception of the respondent. (Gunduz & Ahsan 2018) pointed out that the perception of safety changes with more safety experience. In this research, most of the respondents are from category 5 to 10 years experience while the respondents in the previous study are having more than 10 years experience in the construction project.

Furthermore, there are any 2 kind obstacle factors that having a mean average less than 4 but still almost in the high category, a thigh schedule and low labor education (mean average 3.83 and 3.80). According to Mohammadi et al. (2018) the work pressure factor includes production pressure, work overload, fatigue and burnout, working pace, working time, overtime work and schedule delay. Additionally, the previous study pointed out that tight schedule can make workers only focus to complete the work quickly despite their knowledge of the possible outcomes (Mohammadi et al., 2018).

The last obstacle factor is low labor education, the previous study mentioned that different individual with different educational and different background experiences will approach safety in the different way (Provan et al., 2018). Unfortunately, in project there are a number of people with any kind of educational background whose active participating to the project, but almost construction workers are employed for their skill of education are low which it can be barriers to the application of HSE in project (Harvey et al., 2016) added with and contract system which used limits opportunities to invest in people. So it is needed for any person in charge may emphasize to make sure all individual including subcontractors to follow safety protocol and are integrated with safety culture during the project.

4 CONCLUSION

This study has identified a total number of 10 obstacle factor influencing the application of HSE in the construction project as perceived by the private sector. i.e lack of attention to safety by workers, lack of attention to safety by main contractors, problem sub-contracting, an absence of safety provisions in the contractual clause, lack of integration of safety in the construction activities, rule and regulation, financial pressure, insufficient safety training, tight schedule, and low labor education. This research showed the highest obstacle factor influencing the application of HSE is Lack of attention to safety protection by workers. While the lowest obstacle factor is low labor education. The outcome of this study would help the construction and safety professional on assessing and quantifying the safety obstacle factor the application of HSE also it can be used to manage HSE risk efficiently and effectively for the construction project in Indonesia.

REFERENCES

- Alruqi, W. M., Hallowell, M. R. & Techera, U., 2018. "Safety Climate Dimensions and Their Relationship to Construction Safety Performance: A Meta-Analytic Review", *Safety Science*, Vol. 109, No. September 2018, pp. 165–73.
- Bavafa, A., Mahdiyari, A. & Marsono, A. K., 2018. "Identifying and Assessing the Critical Factors for Effective Implementation of Safety Programs in Construction Projects", *Safety Science*, Vol. 106, No. February 2018, pp. 47–56.
- Gunduz, M. & Ahsan, B., 2018. "Construction Safety Factors Assessment through Frequency Adjusted Importance Index", *International Journal of Industrial Ergonomics*, Vol. 64, pp. 155–62.
- Harvey, E. J., Waterson, P. & Dainty, A. R. J. 2016. "Applying HRO and Resilience Engineering to Construction: Barriers and Opportunities", *Safety Science*, in Press.
- Loganthan, S. K. & Siddiqui, N. A. 2018. "Development & Evaluation of Smart HSE [Health Safety & Environment] Assurance Program in a Construction", *International Journal of Technical Innovation in Modern Engineering & Science*, Vol. 4, No. 7, pp. 347–62.
- Manu, P., Mahamadu, A. M., Phung, V. M., Nguyen, T. T., Ath, C., Heng, A. Y. T. & Kit, S. C., 2018. "Health and Safety Management Practices of Contractors in South East Asia: A Multi Country Study of Cambodia, Vietnam, and Malaysia", *Safety Science*, Vol. 107, pp. 188–201.
- Mohammadi, A., Tavakolan, M. & Khosravi, Y., 2018. "Factors Influencing Safety Performance on Construction Projects: A Review", *Safety Science*, Vol. 109, No. December 2017, pp. 382–97.
- Oswald, D., Sherratt, F. & Smith, S., 2018. "Problems with Safety Observation Reporting: A Construction Industry Case Study", *Safety Science*, Vol. 107, No. April, pp. 35–45.
- Provan, D. J., Dekker, S. W. A. & Rae, A. J., 2018. "Benefactor or Burden: Exploring the Professional Identity of Safety Professionals", *Journal of Safety Research*, Vol. 66, pp. 21–32.
- Saeed, Y. S. 2017. "Safety Management in Construction Projects", *The Journal of The University of Duhok*, Vol. 20, No. 1, pp. 546–60.
- Tanabe, M. & Turco, C., 2016. "Technical-HSE Management System in the Design Phase of an LNG Plant Project", *15Th International Symposium on Loss Prevention and Safety Promotion (Loss 2016)*, Vol. 48, pp. 541–46.