

Identification of Occupational Health and Safety Management System Indicators Based on Indonesian Government Regulation Number 50 Year 2012 and ISO 45001:2018 on Safety Culture in EPC Projects

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Abstract

The construction industry has a very high risk of danger, and the EPC (Engineering, Procurement, Construction) industry is no exception. An EPC Company in Indonesia has a TRIR (Total Recordable Incident Rate) below 1 (one) but has a high record of near miss and unsafe conditions. This has an impact on the safety culture level based on Bradley Curve of DuPont which currently on “independent” level and plans to reach “interdependent” level in 2023. The purpose of this study is to identify the indicators of OHSMS (Occupational Health and Safety Management System) based on Indonesian Government Regulation Number 50 Year 2012 and ISO 45001:2018 on Safety Culture in EPC Projects. The study is conducted by validating sub-variables and indicators by experts. Results show that there are 12 sub-variables and 39 indicators of OHSMS based on Indonesian Government Regulation Number 50 Year 2012, 9 sub-variables and 38 indicators of OHSMS based on ISO 45001:2018, and 4 sub-variables and 7 indicators on safety culture.

Keywords

OHSMS, Safety Culture, EPC Project

1. Introduction

Contract with EPC (Engineering-Procurement-Construction) system generally applicated in on Oil and Gas, Factory, and Power Plant including its infrastructures construction projects (Adi and Yunwati 2014). EPC Project will face risk factors that greatly affect performance of the project starts from the design stage, procurement stage, to the construction stage (Adi and Yunwati 2014).

The construction industry is always blamed for high accident rates death, this places the construction industry among the industries with an unreasonable accident rate, permanent and non-permanent disabilities, and even fatalities (Hosseinian and Torghabeh 2012). Accidents in the construction industry are a problem around the world, for example in 2011 to 2015 in Korea, the number of work accidents in construction industry reached 118,532 and deaths reached 2,663 cases (Jo et al. 2017). The causes of workplace accidents are largely due to lack of planning, unsafe conditions at work, and human factors, which may have psychological disorders or reflect social and cultural problems and/or organizational training (Vasconcelos and Junior 2015). Judging from the chain of causes of modern accidents, safety culture is the most important part of a company’s safety management system and provides direction on the design of the organizational structure and operating procedures and will help organizations to prevent accidents and improve safety performance (He et al. 2012).

Company X, an EPC company in Indonesia, has successfully maintained its TRIR (Total Recordable Injury Rate) below 1 (one). Despite the TRIR is below 1 (one), it was found that the unsafe acts and unsafe conditions and near miss cases were still high (See Table 1). Near miss is an incident that is not planned that does not result in injury, disease, or damage but has the potential to occur (Mbuvi et al. 2015). Near miss consists of unsafe conditions, unsafe actions, incidents with loss of property, incidents with possible environmental damage, incidents with the potential to

cause more damage, and incidents on a challenging basis (Zhou et al. 2019). Company X is one of EPC companies in Indonesia that currently handling several EPC projects.

Table 1. Record of incidents in EPC projects (source: company X)

Project name	Total employee	Unsafe act/conditions	Near miss
Previous project	10,427	47,594	130
Project A	679	6,982	44
Project B	6,446	1,426	17
Project C	1,443	4,342	0
Project D	299	689	0
Project E	771	776	3
Project F	133	677	0
Project G	596	1,21	0
Project H	926	9,866	0
Project I	128	693	0
Project J	183	76	0

Company X is currently on “independent” level of safety culture refer to Bradley Curve of DuPont, while company X determines to achieve “interdependent” level in 2023. According to (Hewitt 2011), there are 4 categories of safety culture for a company that is “reactive”, “dependent”, “independent”, and “interdependent”. There is a linear relationship between safety culture and safety performance where the higher the level of safety culture and the lower the death rate makes for excellent safety performance (He et al. 2012). The “independent” level indicates that the company already has an active involvement in safety practices and recognizing individual safety achievements (Hewitt 2011). To reach “interdependent” level, team workers must have ownership of safety, are responsible for themselves and others, do not tolerate low standards of safety, actively communicate, create safety improvements that only team will be able to achieve, and increase the possibility of no incidents or incidents occurring.

1.1 Objectives

Implementing OHSMS (Occupational Health and Safety Management System) is important for an organization because it can protect employees and reduce injury, illness, damage to property and equipment and costs caused by accidents. Complying with laws and other mandatory and voluntary guidelines will avoid fines and, in this way, will not undermine the publicity of the organization or company (Djapan et al. 2010). Regulation of OHSMS in Indonesia is explained in Government Regulation 50/2012 about OHSMS implementation and International Standard for OHSMS is ISO 45001:2018. OHS conditions in EPC projects are not only in the system (OHSMS), but also in safety culture. Although Company X has implemented OHSMS, but it still has near-miss incidents and records of unsafe actions and unsafe behaviours in project site, so evaluation based on OHSMS indicators is needed. The implementation of OHSMS can be seen as an important strategy for developing a safety culture (Nævestad et al. 2019). The purpose of this study is to identify the OHSMS indicators based on both national regulation and international standard on safety culture.

2. Literature Review

Winge et al. (2020) has conducted a comparative analysis between Safety Management and Safety Performance in 12 (twelve) construction projects in Norway. Safety performance is seen from (1) Total Recordable Injury Rate (TRIR) where TRIR is the total of Lost Time Injuries (LTI) and Medical Treatment Injuries (MTI) per 1 (one) million working hours; (2) Analysis of all registered hazard situations; (3) Report from OHSMS audit or inspection; (4) Interviews with client project leaders regarding hazard assessment and hazard situations and their relationship to project size; and (5) Interview with the OHSMS inspector regarding hazards and hazard situations and their relationship to project site. The results show that the performance of companies with high OHSMS is better than the performance of companies with low OHSMS, including accident rate.

According to OHSAS 18001:2007, incidents are work-related events in which injury or ill health (regardless of severity) or death occurred. Incidents consists of accidents and near-miss. Near-miss is an unplanned event that does not result in injury, illness, or damage – but has the potential to occur. Only breaking the lucky chain of events prevents

injury, death, or damage; in other words, a very near error (NSC 2013). Using near-miss to inform safety management can help strengthen safety culture (Cooper 2000).

Safety culture is a characteristic of an organization that is reflected in a consistent way of dealing with important safety issues, which is characterized by organizational commitment to safety, management involvement and employee empowerment related to safety issues, systems that reward employees for safety behavior, and systems encourage reporting of safety issues (Strauch 2020). Research by Machfudiyanto and Latief (2017), by developing theories from Zhang and Gao (2012) regarding safety culture, has developed 4 (four) safety culture dimensions in shaping character, namely physical, behavioral, ideological, and norms and management culture. This study will use these 4 dimensions as indicators of safety culture. It is found that there are two ways of conducting research on elements of safety culture, one by summarizing the elements used in previous research through literature review, another with a questionnaire developed in elements of safety management systems to investigate organizational safety culture targets and then extract safety culture elements based on data (He et al. 2012).

The OHSMS according to Indonesian Government Regulation 50/2012 is a part of the company’s overall management system in the context of controlling risks related to work activities to create a safe, efficient, and productive workplace. According to ISO 45001:2018, OHSMS results in a better company ability to create conditions for a safe and healthy workplace, preventing work-related injuries and/or health problems. Sub-variables of OHSMS are identified based on both regulations. Theoretical framework of this study can be seen on Figure 1.

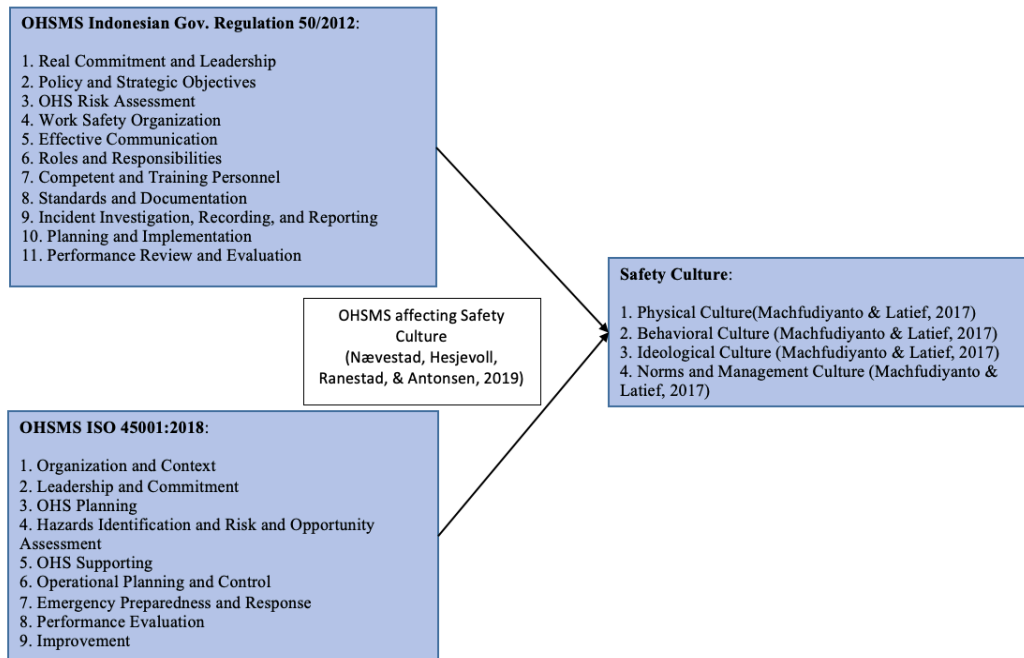


Figure 1. Research theoretical framework

3. Methods

Research methods used in this study are by using literature studies and validation experts in the field of Indonesian Government Regulation of number 50 Year 2012, ISO 45001:2018, OHSMS, and Safety Culture in EPC Projects as illustrated in the Figure 2. Validity in qualitative research means “appropriateness” of the tools, processes, and data. Whether the research question is valid for the desired outcome, the choice of methodology is appropriate for answering the research question, the design is valid for the methodology, the sampling and data analysis is appropriate, and finally the results and conclusions are valid for the sample and context (Leung 2015).

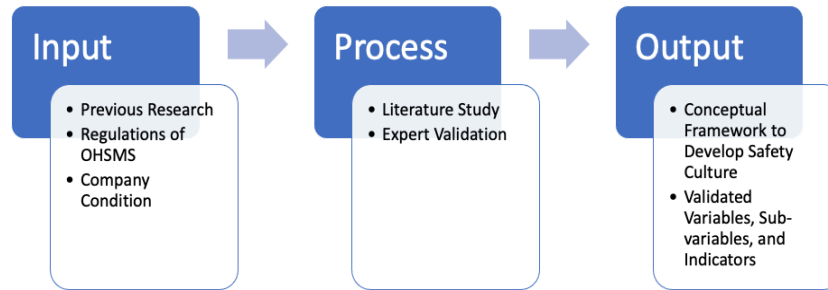


Figure 2. Research methodology

4. Data Collection

Variables, Sub-variables, and Indicators are collected through literature study and expert validation. Expert validation is conducted through online survey and online interview regarding recent COVID-19 pandemic. As Lobe et al. (2020) note that although the Covid-19 pandemic is considered a “100-year event”, using diverse methods of connecting with research participants is as old as the field itself.

5. Results and Discussion

5.1 Results

The result of this study identifies indicators from expert validation. Expert validation is collected from 8 (eight) experts on OHSMS and Safety Culture, in this case, practitioners from similar fields. Details of experts are presented in Table 2.

Table 2. Details of experts

No.	Name	Company	Position	Experience
1	Expert 1	E&C Company	HSE Manager	> 20 Years
2	Expert 2	Natural Gas Transportation & Distribution Company	HSSE Project Analyst	5- 10 Years
3	Expert 3	Oil & Gas Company	Project & Development	> 20 Years
4	Expert 4	EPC Company (Company X)	Project HSE Manager	> 20 Years
5	Expert 5	EPC Company (Company X)	Project HSE Manager	10 – 20 Years
6	Expert 6	EPC Company (Company X)	VP HSE	10 – 20 Years
7	Expert 7	EPC Company (Company X)	Project HSE Manager	10 – 20 Years
8	Expert 8	EPC Company (Company X)	Corporate HSE Manager	5- 10 Years

From expert validation conducted by online survey and virtual meeting, there are 39 indicators identified from OHSMS based on 12 sub-variables of Indonesian Government Regulation Number 50 Year 2012 (See Table 3).

Table 3. Indicators of OHSMS validated by experts based on Indonesian Government Regulation Number 50 Year 2012

Sub-variables		Indicators	
X1.1	Real Commitment and Leadership	1.	Project Leader's Written Commitment
		2.	Commitment of Leaders in OHS Workshop
		3.	Involvement of Project Leaders in Project Site
		4.	OHS Awards
X1.2	Policy and Strategic Objectives	5.	OHS Policy
		6.	Placement of Project's OHS Policy
		7.	OHS Policy Socialization
		8.	OHS Policy Review
X1.3	OHS Risk Assessment	9.	Potential Hazard
		10.	OHS Risk Assessment
		11.	OHS Risk Control
		12.	Work Permit
X1.4	Work Safety Organization	13.	Organizational Culture
		14.	OHS Advisory Committee
X1.5	Effective Communication	15.	Regular Meetings with Discussion of OHS Aspects
		16.	Safety Patrol and Management Walkthrough
X1.6	Roles and Responsibilities	17.	OHS Achievement Indicators (Leading and Lagging)
		18.	Completion and Analysis of OSH Patrol Findings and Management Walkthrough
		19.	The Role of Workers in the Promotion of OHS
X1.7	Competent Personnel and Training	20.	Competent Personnel
		21.	Induction Training
		22.	Mandatory Training
		23.	Refresh Training
		24.	Emergency Response Simulation
X1.8	Standards and Documentation	25.	OHS Standards
		26.	OHS Report
X1.9	Investigating, Recording, and Reporting Incidents	27.	Incident Investigation and Identification of Root Problems and Resolving Corrective and Preventive Actions
		28.	Incidents Recording
		29.	Incidents Reporting
		30.	Socialization of Incident Investigation Results
X1.10	Planning and Implementation	31.	Project's OHS Planning
		32.	OHS Planning Implementation Monitoring
X1.11	Performance Review and Evaluation	33.	OHS Performance Measurement
		34.	OHS Performance Reporting and Evaluation
		35.	Evaluation of OHS Regulation Compliance
X1.12	Performance Measurement, Monitoring, and Audit	36.	OHSMS Performance Measurement
		37.	OHSMS Audit
		38.	Subcontractor's OHSMS Performance Audit
		39.	Improvement of Audit Results

There are 38 indicators identified from 9 sub-variables of OHSMS based on ISO 45001:2018 (see Table 4).

Table 4. Indicators of OHSMS validated by experts based on ISO 45001:2018

Sub-variables		Indicators	
X2.1	Organization and Context	1.	Organization and Context
		2.	Identify the Needs and Expectations of Workers and Other Parties
		3.	OHSMS Scope
		4.	Establishment, Implementation, and Control of OHSMS
X2.2	Leadership and Commitment	5.	OHS Leadership and Commitment from Top Management
		6.	OHS Policy
		7.	OHS Roles, Responsibilities and Authorities of the Organization
		8.	Worker's Participation and Consultation in the Project's OHS Programs
X2.3	OHS Planning	9.	OHS Regulations and Standards
		10.	OHS Achievement Indicators
X2.4	Hazards Identification and Risk and Opportunity	11.	Hazard Identification
		12.	OHS Risk
		13.	OHS Objectives
		14.	OHS Risk Mitigation and Opportunities
		15.	Recording and Distribution of OHS Risk Analysis to Workers
		16.	Worker's Understanding of OHS Hazards and Risks
X2.5	OHS Supporting	17.	Workers Qualifications
		18.	Communication
		19.	Awareness
		20.	Documented Information
X2.6	Operational Planning and Control	21.	Management of Change
		22.	Inspection
		23.	OHS Risk and Fulfillment of Subcontractors or Suppliers
		24.	OHS Award and Punishment Program
X2.7	Emergency Preparedness and Response	25.	Emergency Situation Planning
		26.	Emergency Situation Training and Simulation
X2.8	Performance Evaluation	27.	Evaluation and Supervision of Compliance with OHS Regulations and Standards
		28.	Internal Audit
		29.	External Audit
		30.	Management Review
		31.	Closing of Audit Findings
		32.	Monitoring the Implementation of Audit Findings Closing
X2.9	Improvement	33.	Incident Investigation
		34.	Incident Reporting
		35.	Non-Conformity
		36.	Corrective Action
		37.	Continual Improvement Objectives
		38.	Continual Improvement Process

Seven indicators of safety culture with 4 sub-variables based on Machfudiyanto and Latief (2017) are identified below (see Table 5).

Table 5. Indicators of safety culture validated by experts based on Machfudiyanto and Latief (2017)

Sub-variables		Indicators	
Y.1	Physical Culture	1.	Workers' Health
		2.	Break Time/Time Off
Y.2	Behavioral Culture	3.	Safe Behavior at Work
		4.	Leaders as Behavioral Role Models
		5.	Balance of Reward and Punishment Programs
Y.3	Ideological Culture	6.	Worker's Understanding of OHS
Y.4	Norms and Management Culture	7.	Employee's Obedience with Regulations

6. Conclusion

Results of this study identify indicators of OHSMS on safety culture. All indicators identified are validated by experts. For OHSMS based on Indonesian Government Regulation Number 50/2012, with 12 sub-variables, there are 39 indicators identified. OHSMS based on ISO 45001:2018 with 9 sub-variables, there are 38 indicators identified. Safety Culture which sub-variables taken from previous research by Machfudiyanto and Latief (2017) with 4 sub-variables, there are 7 indicators identified.

These indicators will be developed for further research to find out the correlation model between OHSMS and safety culture indicators and the development of strategies for safety culture improvement in EPC Projects, especially in company X.

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Biographies

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