The Effects of Driving Factors on Safety Culture, Knowledge, Motivation and Performance of Employees in the Oil Refining Industry in Thailand

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Article History
Received: 10 June 2019 **Revised:** 27 July 2019 **Published:** 30 September 2019

Abstract
In this objective, the researcher considers (1) the influence of safety climate, risk management, and organization safety support on safety culture (2) the influence of safety climate, risk management, organization safety support, and safety culture on safety knowledge (3) the influence of safety climate, risk management, organization safety support, and safety knowledge on safety motivation (4) the influence of safety culture, safety knowledge, and safety motivation on safety compliance (5) the influence of safety culture, safety knowledge, and safety motivation on safety participation and (6) the congruence of a causal relationship model, the influence of safety climate, risk management, and organizational safety support on safety culture, safety knowledge, safety motivation, safety compliance, and safety participation. In this research investigation, it tested Western theories with employees in the oil refining industry in Thailand. Employing a questionnaire as a research instrument for collecting germane empirical data and utilizing the simple random sampling method from 679 employees. In analyzing the data collected, the researcher employed confirmatory factor analysis (CFA) and structural equation modeling (SEM). The further findings of SEM analysis revealed the following: (1) Risk management and organization safety support exhibited positive influence on safety culture (2) Safety climate, organization safety support, and safety culture evinced positive influence on safety knowledge (3) Safety climate, Organization safety support, and safety knowledge displayed positive influence on safety motivation (4) Safety culture, safety knowledge, and safety motivation exhibited positive influence on safety compliance and safety participation.
Keywords: Risk Management, Safety Culture, Safety Performance

Introduction
Oil industry has important role again Thailand economic development, either for energy, fuel, state income in which could hand up multiplier effect where the oil industry taken place. The current situation businesses in Thailand that consumers have higher demand, it is found that

crude oil in the world market is a rise from a particular situation or may occur in a sustainable manner according to the recovery of the global economy. Thailand has net oil imports. So that, the rising oil prices of the world market will affect the economy of Thailand which cannot be avoid. (Kitwasin, 2018) Thai workers still play an important role in the oil production industry. The oil production process starts from exploration, drilling, refining and production, transportation, as well as providing services at the gas station to consumers in each order for economic driving, and industries in regional of Thailand. The oil refining process is a unique production process that is dangerous and there is a high risk of accidents. Therefore, work safety are important in the operation because will have a directly impact on the loss production, stop work and loss business opportunities. Therefore, the safety workers is stability or competition and continuous development and encouragement that workers can return to the organization more costly than the organization has lost. (Dawabsheh, Hussein and Jermsittiparsert, 2019; Mearns, Whitaker and Flin 2003) The safety performance results directly affect life and the assets of the workers as well as the organization. Therefore, the safety management and development and effective safety systems that necessary to establish. (Hughes and Ferrett, 2011) The situation with the literature reviewed can be finding the relationship between each variable in the context of Thailand. According to the research question that "What is the effects of driving factors on safety performance?", the objectives of this work to study influencing of safety culture, knowledge, motivation on safety compliance and participation and to congruence of the model with empirical data.

Significance of Safety Performance

The researcher is interested this study; safety climate is personal perceived about policies, procedures and safety workplace guidelines. Safety climate of the group related to mutual perceived of the group as a result of the perception of the individual as a group. (Neal and Griffin, 2006) Risk management is proceeding by prediction, analysis, evaluation, assessment, and identification and include risk migration and risk control. Risk management consists of 4 dimensions: (1) communication (2) training (3) preventive planning, and (4) active monitoring (Fernandez, Montes and Vazquez, 2014) and organization safety support is the organization supports the safety in workplace. Especially in expressing concern and caring for the needs of employees, feedback, developing new skills, and encouraging employees to express opinions about various concerns that will lead to better safety performance, such as goals, achievements, and values. (May, Gilson and Harter, 2004)

Safety culture is a specific behavior of employee group that focuses on the components of introducing the best behavior to employees in order to achieve the goals associated with the health organization. Safety culture is measured by 3 dimensions related, consisting (1) strategic decisions to ensure safety (2) human resource practices for safety driving and (3) daily activities and behaviors to safety support. (De Castro, Gracia, Tomas and Peiro, 2017) The safety culture of the organization can built from a good safety climate. Risk management has been applied with the goal of enhancing the safety culture of the organization. (Eamon, Robin, Tony and Simon, 2016) Organization support is the management commitment and disclosure of organization intention in employees to receive that the employees are valuable. The researcher determined the following: safety climate (H_1), risk management (H_2), and organization safety support (H_3) influencing on safety culture. Contribute to the objectives 1 of the research.

Safety knowledge is general knowledge about how to work safely, such as handling hazardous chemicals, risk procedures operation, and emergency response correctly, etc., which are knowledge revealed. Including process knowledge and related safety workplace skills. (Guo, Yiu and Gonzalez, 2016) Safety climate can built from the employees know how the operation safety management. The skills learned from safety management will lead to the work of employees. (Vinodkumar and Bhasi, 2010) Providing safety knowledge about risks

to employees before work is important. (Christian, Bradley, Wallace and Burke, 2009) The organization will determine the strategy related to safety, which comes from the organization's mission, leadership and norms. (Hejduk and Tomczyk, 2015) In addition, safety culture reflects the quality of procedures and action. (International Atomic Energy Agency, 2009) The researcher determined the following: safety climate (H_4), risk management (H_5), organization safety support (H_6), and safety culture (H_7) influencing on safety knowledge. Contribute to the objectives 2 of the research.

Safety motivation is the intention of the person trying to push for safety behavior, including elements related to maintaining behavior and the intention to reduce the risk to ensure safety. (Neal and Griffin, 2006) Good attitude and safety driving of safety culture will be increased motivation action. (Fang and Wu, 2013) Risk management will to employees received that the organization will protect the welfare of employees at work, which will to higher employee satisfaction. (Fernandez, Montes and Vazquez, 2014) In addition, organization support from the effects on the intellectual safety motivation mechanism. (Hu, Griffin and Bertuleit, 2016) The role of safety knowledge has a direct effect on behavior protection of employee and indirectly through colleagues. Therefore, employees to have safety motivation in objectives and operational goals, and awareness their own safety and colleagues are important. The researcher determined the following: safety climate (H_8), risk management (H_9), organization safety support (H_{10}), safety culture (H_{11}), and safety knowledge (H_{12}) influencing on safety motivation. Contribute to the objectives 3 of the research.

Safety performance is performance components that represent the main dimensions of performance behaviour that contribute involved in the work received. Safety performance consists of 2 dimensions: (1) safety compliance and (2) safety participation. Safety compliance is behavior that helps improve the safety of employees (Griffin and Neal, 2000) and related to behaviors that may be considered as part of the role of employee in safety. (Fernandez, Montes and Vazquez, 2014) Organization safety culture maintain to increase safety compliance necessary for achieving results in an effective safety culture and safety knowledge and motivation are direct on safety compliance of employees. (Christian, Bradley, Wallace and Burke, 2009) Safety participation is participation in voluntary safety activities that demonstrate initiatives and efforts to improve safety workplace (Neal, Griffin and Hart, 2000) which includes behaviors that support overall safety in the organization (Griffin and Neal, 2000) involving more voluntary elements, and including behavior other than the official role of the employee, such as behavior of citizen. (Clarke, 2006; Fernandez, Montes and Vazquez, 2014) Integrated safety culture will help increase participation in safety activities. (Choudhry, Fang and Mohamed, 2007) The organization can increase safety participation by enhancing employee safety knowledge (Guo, Yiu and Gonzalez, 2016) and safety motivation can be increase by allowing employees to accept about ownership and responsibility in the workplace. The researcher determined the following: safety culture (H_{13}), safety knowledge (H_{14}), and safety motivation (H_{15}) influenced on safety compliance, safety culture (H_{16}), safety knowledge (H_{17}), and safety motivation (H_{18}) influencing on safety participation. Contribute to the objectives 4 of the research.

Research Objectives

The objectives of this research to study influencing are (1) safety climate, risk management, and organization safety support on safety culture (2) safety climate, risk management, organization safety support, and safety culture on safety knowledge (3) safety climate, risk management, organization safety support, and safety knowledge on safety motivation (4) safety culture, knowledge, and motivation on safety compliance and participation, and (5) to congruence with empirical data of driving factors on safety culture, knowledge, motivation and performance as displayed by employees in the oil refining industry in Thailand.

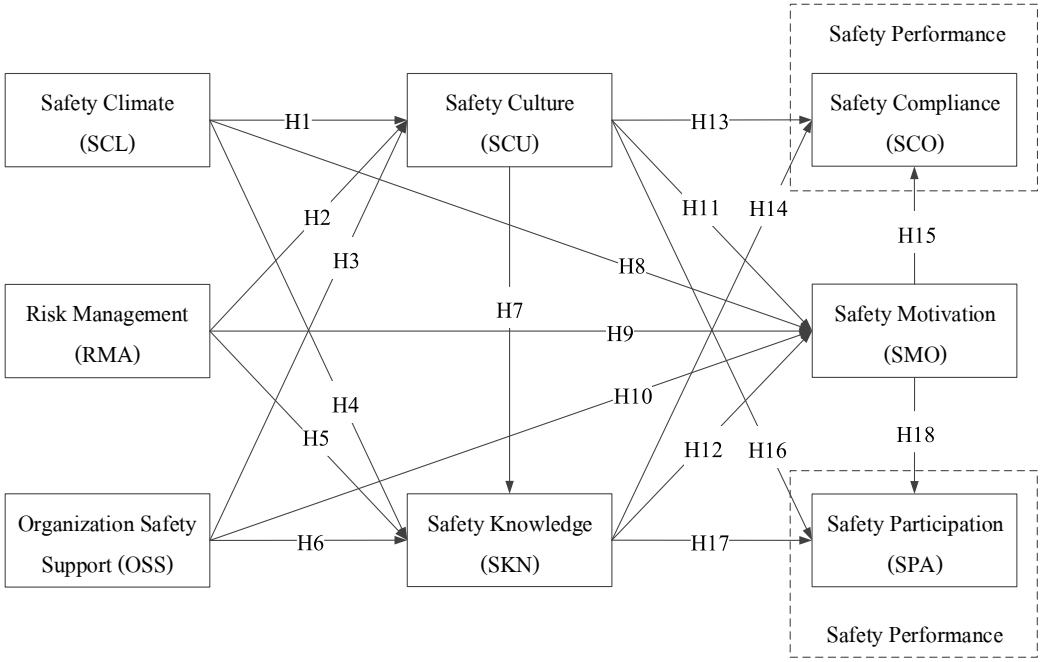

Figure 1 Conceptual Framework

Research Methodology

Sample size and sampling

1) The population is employees who work in relation to oil refining industry which is the region of the north, central and eastern in Thailand, including executive, management, supervisor, specialist, engineering, operator, and contractors. The specialist must above middle-management level and had experience working in the oil industry for at least 5 years.
2) using simple random sampling. Specifying the sample size in the SEM with the LISREL program, which shows the relationship between latent variables and observed variables in the hypothesis testing. The researcher used techniques of maximum likelihod (MLE) as the estimation (Hair, Black, Babin and Anderson, 2014) of 20 multiply of 34 observed variables. The sample size of this research has a sample size of 20x34 = 680 samples.

Instrument for data collection

A questionnaire as a research instrument for collecting germane empirical data from employees in the oil refining industry in Thailand, encompassing the 12-month period from September 2017 to August 2018, is considered. Divided into 9 parts which a rating scale of 5 levels.

Validity and reliability

The investigator examines the quality of the instrument, including content validation with the method of index of item-objective congruence (IOC) by 5 experts who professor of the doctor of philosophy program related in safety. In addition, the examination of the reliability, including Cronbach's alpha coefficient must have a value from 0.70 (Hair, Black, Babin and Anderson, 2014) and corrected item-total correlation must have a value from 0.3. (Everitt and Skrondal, 2010) Researcher examined the reliability by using pre-test data (n = 48) and actual data collected (n = 679). Results found all variables passed the criteria with a reliability of between 0.807 and 0.918. The results are shown in Table 1.

Data analysis methods

The researcher analyzed the CFA and found that standardized factor loading passing all criteria value are observed variables must have a standardized factor loading since 0.5, latent variables must have an average variance extracted (AVE) since 0.5, and construct reliability (CR) since 0.7. (Hair, Black, Babin and Anderson, 2014) CFA results found that all variables

passed the criteria. Therefore, researcher did not remove any questions out from the variables. Reliability and CFA is shown in Table 1. The researcher used data analysis method with descriptive statistics, multivariate statistical, and examined the preliminary agreement for data analysis, including normality, homoscedasticity, and linearity. The data analysis found that all variable data is based on 3 basic terms.

Table 1 Results of the reliability and confirmatory factor analysis

Latent Variable	Cronbach's Alpha	Average Variance Extracted (AVE)	Construct Reliability (CR)
Safety climate	.884	0.618	0.866
Risk management	.911	0.738	0.918
Organization safety support	.894	0.625	0.909
Safety culture	.918	0.824	0.933
Safety knowledge	.824	0.591	0.852
Safety motivation	.841	0.574	0.870
Safety compliance	.807	0.522	0.814
Safety participation	.811	0.517	0.811

Research Findings

Overview of the samples who employees in the oil refining industry in Thailand. A total of 679 from 702 people, mostly male, aged 31-40 years, bachelor's degree, operational level employee, and work experience 6-10 years. Overall employees has opinion on safety climate is high, risk management is high, organization safety support is high, safety culture is high, safety knowledge is high, safety motivation is very high, safety compliance is high, and safety participation is high.

The research results according to objectives 1 found that (1) H_1, safety climate negative influenced on safety culture of employees in the oil refining industry in Thailand with statistical significance, with the path coefficient -0.066 (2) H_2, risk management positive influenced on safety culture of employees in the oil refining industry in Thailand with statistical significance at the level .01, with the path coefficient 0.867 (3) H_3, organization safety support positive influenced on safety culture of employees in the oil refining industry in Thailand with statistical significance at the level .01, with the path coefficient 0.164.

The research results according to objectives 2 found that (1) H_4, safety climate positive influenced on safety knowledge of employees in the oil refining industry in Thailand with statistical significance at the level .05, with the path coefficient 0.134 (2) H_5, risk management non-influenced on safety knowledge of employees in the oil refining industry in Thailand with statistical significance, with the path coefficient 0.098 (3) H_6, organization safety support positive influenced on safety knowledge of employees in the oil refining industry in Thailand with statistical significance at the level .05, with the path coefficient 0.157 (4) H_7, safety culture positive influenced on safety knowledge of employees in the oil refining industry in Thailand with statistical significance at the level .05, with the path coefficient 0.397.

The research results according to objectives 3 found that (1) H_8, safety climate positive influenced on safety motivation of employees in the oil refining industry in Thailand with statistical significance at the level .05, with the path coefficient 0.155 (2) H_9, risk management non-influenced on safety motivation of employees in the oil refining industry in Thailand with statistical significance, with the path coefficient 0.319 (3) H_{10}, organization safety support positive influenced on safety motivation of employees in the oil refining industry in Thailand with statistical significance at the level .05, with the path coefficient 0.181 (4) H_{11}, safety culture negative influenced on safety motivation of employees in the oil

refining industry in Thailand with statistical significance, with the path coefficient -0.425 (5) H_{12}, safety knowledge positive influenced on safety motivation of employees in the oil refining industry in Thailand with statistical significance at the level .05, with the path coefficient 0.460.

The research results according to objectives 4 found that (1) H_{13}, safety culture influenced on safety compliance of employees in the oil refining industry in Thailand with statistical significance at the level .05, with the path coefficient 0.130 (2) H_{14}, safety knowledge influenced on safety compliance of employees in the oil refining industry in Thailand with statistical significance at the level .01, with the path coefficient 0.399 (3) H_{15}, safety motivation influenced on safety compliance of employees in the oil refining industry in Thailand with statistical significance at the level .01, with the path coefficient 0.368.

The research results according to objectives 5 found that (1) H_{16}, safety culture influenced on safety participation of employees in the oil refining industry in Thailand with statistical significance at the level .01, with the path coefficient 0.305 (2) H_{17}, safety knowledge influenced on safety participation of employees in the oil refining industry in Thailand with statistical significance at the level .01, with the path coefficient 0.346 (3) H_{18}, safety motivation influenced on safety participation of employees in the oil refining industry in Thailand with statistical significance at the level .01, with the path coefficient 0.264. The results of SEM analysis was very good as follows: (1) relative chi-square (χ^2/df) less than 2.00 (here = 1.09); (2) probability value (p value) was higher than .05 (here = 0.156); (3) root mean square error of approximation (RMSEA) less than .05 or .08 (here = .011); and (4) goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) were higher than .95 (here GFI = .974; AGFI = .945). This findings also showed CFA.

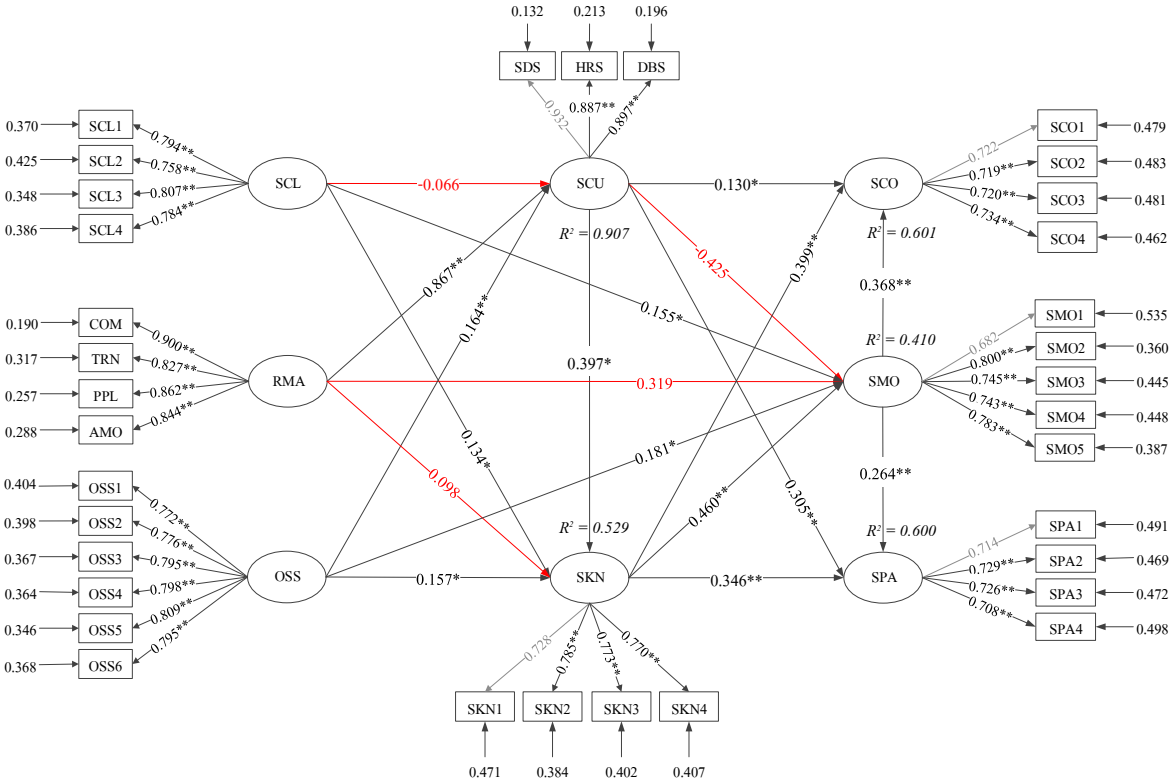

Figure 2 Structural equation model after adjusting the model for analysis model.

Table 2 Direct effect, indirect effect and total effect

Effect / Cause variable	SCU			SKN			SMO			SCO			SPA		
variable	**DE**	**IE**	**TE**	**DE**	**IE**	**TE**	**DE**	**IE**	**TE**	**DE**	**IE**	**TE**	**DE**	**IE**	**TE**
SCL	-0.066 (0.043)		-0.066 (0.043)	0.134* (0.067)	-0.026 (0.021)	0.108 (0.065)	0.155* (0.075)	0.077* (0.038)	0.232** (0.073)		0.120** (0.046)	0.120** (0.046)		0.079* (0.040)	0.079* (0.040)
RMA	0.867** (0.063)		0.867** (0.063)	0.098 (0.182)	0.344* (0.164)	0.442** (0.060)	0.319 (0.227)	-0.165 (0.209)	0.154* (0.062)		0.346** (0.051)	0.346** (0.051)		0.457** (0.051)	0.457** (0.051)
OSS	0.164** (0.055)		0.164** (0.055)	0.157* (0.076)	0.065 (0.038)	0.222** (0.072)	0.181* (0.085)	0.032 (0.050)	0.213** (0.080)		0.188** (0.050)	0.188** (0.050)		0.183** (0.045)	0.183** (0.045)
SCU				0.397* (0.188)		0.397* (0.188)	-0.425 (0.239)	0.182 (0.096)	-0.243 (0.232)	0.130* (0.052)	0.069 (0.128)	0.199 (0.129)	0.305** (0.055)	0.073 (0.102)	0.378** (0.110)
SKN							0.460** (0.077)		0.460** (0.077)	0.399** (0.073)	0.169** (0.032)	0.568** (0.079)	0.346** (0.071)	0.121** (0.027)	0.467** (0.072)
SMO										0.368** (0.053)		0.368** (0.053)	0.264** (0.051)		0.264** (0.051)
Observed variable	SCL1	SCL2	SCL3	SCL4	COM	TRN	PPL	AMO	OSS1	OSS2	OSS3	OSS4	OSS5	OSS6	SDS
Reliability	0.630	0.575	0.652	0.614	0.810	0.683	0.743	0.712	0.596	0.602	0.633	0.636	0.654	0.632	0.868
Observed variable	HRS	DBS	SKN1	SKN2	SKN3	SKN4	SMO1	SMO2	SMO3	SMO4	SMO5	SCO1	SCO2	SCO3	SCO4
Reliability	0.787	0.804	0.529	0.616	0.598	0.593	0.465	0.640	0.555	0.552	0.613	0.521	0.517	0.519	0.538
Observed variable	SPA1	SPA2	SPA3	SPA4											
Reliability	0.509	0.531	0.528	0.502											
Endogenous variables	SCU			SKN			SMO			SCO			SPA		
R^2	0.907			0.529			0.410			0.601			0.600		

χ^2 = 307.075, df = 283, χ^2/df = 1.09, p value = 0.156, RMSEA = 0.011, GFI = 0.974, AGFI = 0.945

Conclusion and Recommendation

Risk management (Gao, Fan, Wang, Li and Pei, 2019) and organization safety support (Amaya, Rovira, del Cerro, Grillo, Nomen and Sempere, 2019) positive influenced on safety culture. In accordance with the research results, the organization has communicated by meeting together about safety issues and having a special preventive plan for each job, will result in the employee recognizing that the organization has strategic decisions to ensure safety when establishing procedures and operation of the plant and shows little concern and strongly considers goals and values for employees, will result in employees being aware that the organization has strategic decisions to ensure safety when establishing procedures and operation of the plant. Furthermore, safety climate negative influenced on safety culture. (Sexton, Adair, Leonard, Frankel, Proulx, Watson, Magnus, Bogan, Jamal, Schwendimann and Frankel, 2018) This study need to be viewed that feedback and higher safety culture by management in some departments having bias in select work settings where they feel comfortable rounding.

Safety climate (Barbaranelli, Petitta and Probst, 2015), organization safety support (Guo, Yiu and Gonzalez, 2016) and Safety culture (Oyemomi, Liu, Neaga, Chen and Nakpodia, 2019) positive influenced on safety knowledge. In this regard, knowledge can be thought the employees received that management places a strong emphasis on workplace health and safety, will result in employees know how to maintain or improve the workplace to be safe and reduce the risk of accidents and incidents in the workplace and received that the organization has strategic decisions to ensure safety when the organization establishing procedures and operation of the plant, will result in employees know what are the hazards associated with them jobs and the necessary precautions to be taken while doing them job. In addition, the organization shows little concern and strongly considers goals and values for employees, will result in employees know how to maintain or improve the workplace to be safe and reduce the risk of accidents and incidents in the workplace. Furthermore, risk management non-influenced on safety knowledge. (Alkhadim, Gidado and Painting, 2018) This study can to be concluded that perceived poor information has a positive influence on perceived safety.

Safety climate, safety knowledge (Barbaranelli, Petitta and Probst, 2015) and organization safety support (De Boeck, Mortier, Jacxsens, Dequidt and Vlerick, 2017) positive influenced on safety motivation. In this result, the employees received that safety is given a high priority by management will result in employees feel that it is worthwhile to put in effort to maintain or improve personal safety and know how to maintain or improve safety workplace, will result in employees feel that it is worthwhile to put in effort to maintain or improve personal safety. In addition, the organization really cares about safety of employees, will result in employees feel that it is worthwhile to put in effort to maintain or improve personal safety. Furthermore, risk management (Okunogbe, Meredith, Chang, Simon, Stockdale and Rubenstein, 2018) and safety culture (Marzuki and Sularso, 2018) non-influenced on safety motivation. This study can suggest that the cooperation in caring for work with high stress is not positively related to satisfaction in creating motivation for helping critically ill patients. Moreover, the nature of the surveys can present related to the context of the studied variables only but cannot directly reflect all the information and can to be concluded that occupational safety culture no significant impact on employees safety motivation included motivation play some role to goad their employee how to get it and it will boost employee spirit so they have best performance and use all skill to realize what has been the company goal.

Safety culture (Cornelissen, Van Hoof and De Jong, 2017) knowledge (Barbaranelli, Petitta and Probst, 2015) and motivation (Hedlund, Gummesson, Rydell and Andersson, 2016) positive influenced on compliance and participation. In accordance with the research results, the employees received that the organization has strategic decisions to ensure safety when

establishing procedures operation of the plant, will result in employees promote the safety program within the organization. In addition, the employees know how to maintain or improve safety workplace and reduce the risk of accidents and incidents in the workplace, will result in employees put in extra effort to improve the safety of the workplace. Moreover, the employees feel that it is worthwhile to put in effort to maintain or improve personal safety and believe that it is important to reduce the risk of accidents and incidents in the workplace, will result in employees ensure the highest levels of safety when they carry out them job.

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