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EXPLANATORY ANALYSIS OF THE SAFETY LEADERSHIP AND SAFETY CLIMATE AT POWER PLANT

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Abstract

The purpose of this study is to examine and explain the effect of a safety leadership on safety climate in coal fired power plant. The design of this study is a survey and the data collection is cross section through a questionnaire. The unit of analysis is the employee who have experience work with at least 1 year. Mechanical determination of sample units in this study is a simple random sampling. The method of data analysis in hypothesis testing that is the Smart PLS (Partial Least Square). The results of this study indicate that direct safety leadership gives significant effect on safety climate. The practical implications of this research is useful for the management of power plant as they need to increase the role of safety leadership in the effort of increasing the safety climate especially for its communication to employee about Environment Health Safety.

Keywords : Power Plant, Safety Leadership, Safety Climate, Occupational Health & Safety (OHS).

Introduction

Occupational Health and Safety has the purpose to free employees and companies from losses. Losses are the risk of an accident and it can be injury, illness, property damage, and environment loss. The loss is a risk that can arise from an accident that occurred. It is known that the risk is not something that can be eliminated because there is a hazard in every human activity and risk always follow the hazard. However, what can be done is to control the risk so that the risk will not become an accident. The term safety climate is more appropriate to describe the perceptions, attitudes and beliefs of employees related to risk and safety (Fruhen, Mearns, Flin, & Kirwan, 2014). Safety climate and safety culture will not be materialized without the existence of safety leadership in an organization. Safety leadership is as a process of interaction between leader and follower, in which the leader uses his influence on the follower to achieve organizational safety goals (Fernández-Muñiz, Montes-Peón, & Vázquez-Ordás, 2017). The establishment of safety climate is strongly influenced by the existence of safety leadership at a coal mining company (Du & Sun, 2012). Safety climate partially mediates the relationship between safety leadership and safety performance (Wu, Chen & Li, 2007). Transformational leadership/leadership levels are associated with higher levels of compliance and participation in safety behaviors, safety climate moderates leadership-safety compliance (Kapp, 2012). Employee perceptions of safety climate have a negative impact when leaders do not actively promote safe work behavior and practices

(Mullen & Kelloway, 2009). Management's commitment to safety is the biggest positive perception for employees (Cooper, 2018).
Referring to those studies, this research would focus on influence of safety leadership to safety climate in coal-fired power plant. This research would be conducted in coal-fired power plant in East Java. Power plant is one of the workplace that has sufficient source of danger and high risk to the occurrence of work accident. In addition to the oil and gas, aviation, mining and nuclear industries, power generation is one of the industries that is often significantly affected by the processes that cause harm to its people and assets (Gu, Liang, Bichindaritz, Zuo, & Wang, 2012). Furthermore, in addition to the environmental impacts of thermal power plants, it also have an impact on occupational diseases and cause injuries that can cause major impact on the economy due to loss of productive hours, labor losses and compensation for victims of occupational accidents (Kumar et al., 2015).

Safety Leadership

Safety leadership is a process that describes an expected condition, prepares the team to succeed and engages in discretionary efforts that drive the value of salvation. Safety leadership is widely recognized as a critical element in the success of a business. Ineffective safety leadership can hinder the company's ability to achieve business goals (von Thiele Schwarz, Hasson, & Tafvelin, 2016). Ineffective safety leadership stems from a lack of understanding of the company's safety management system and related policies. This leads to uncertainty in terms of responsibility and accountability of safety leadership as well as the authority to make improvements (C. Wu, Li, & Fang, 2017). Companies that are good at managing safety are also good at managing operations (Fernández-Muñiz et al., 2017). According to TR Krause (2005), there are seven key characteristics of safety leadership and related behaviors that may affect safety culture: (1) Credibility - what the leader says is consistent with what he does; (2) Action orientation - the leader acts to address unsafe conditions; (3) Vision - the leader "paint a picture" for superior safety in the organization; (4) Accountability - the leader ensures that employees take accountability for critical safety in their activities; (5) Communication - the way the leader communicates about safety to create and maintain the safety culture of the organization; (6) Collaboration - a leader who encourages employees' active participation in resolving issues of safety issues and promotes employee ownership in the issue; (7) Feedback and Recognition - immediate, certain and positive recognition encourages safe behavior

Safety Climate

Safety climate as a measure of transient culture safety conditions, subject to similarities between individual perceptions of the organization (Zhang, Wiegmann, von Thaden, Sharma, & Mitchell, 2002). Based on the situation, it refers to the perceived safety conditions at a given place at any given time, relatively unstable, and may change depending on the current environmental features or prevailing conditions. (Zhang et al., 2002) explained the safety climate to 3, namely (1) Safety climate is a psychological phenomenon that is usually defined as the perception of safety conditions at a certain time; (2) Safety climate is closely related to intangible issues such as situation and environmental factors; (3) Safety climate is a momentary phenomenon, a "snapshoot" of safety culture, relatively unstable and likely to change. The safety climate variable is measured by 3 (three) indicators developed by (Fruhen et al., 2014). Each indicator is described as follows: (a) *Procedure*, it explains that management plays an important role in shaping the safety climate in the form of working procedures within the company, namely in the ease of understanding of company work procedures; easy access to existing working procedures; and work procedures that must be updated on a regular basis; (b) *Work pressure*, it describes the aspect of workload in the company to achieve the production objectives, namely the primacy that the company focuses on production and safety conditions; and the prohibition of employment for

employees if the conditions are dangerous; (c) *Safety Competence*, it explains how the skills and knowledge about the safety is needed by employees in running the production process, for example training according to the needs of occupational risks and refreshment training for high-risk jobs.

Methods

This study aimed to examine the causal effect causal between safety leadership and safety climate. The result of this study is about the clarity of the effect between variables is built on a model equation based on relevant concepts (explanatory research). The location of this study is at Coal Fired Power Plant at East Java as is the second largest region in Indonesia which has many accidents occurred in the latest 4 years. This research is conducted within a three month period that is from March to May 2018. The population in this study are all employee who work at power plant with minimum 1 minimum year experienced. The sample size in this study is there are as many as 136 employee to 150 questionnaires distributed and drawn. There are 7 indicators proposed by (Krause, 2005) used by the author in this study for the measurement of safety leadership. Furthermore, 3 safety climate indicators from (Mearns & Flin, 1999), and (Kouabenan, Ngueutsa, & Mbaye, 2015). The methods of data collection is a survey combination with others technique to support the reality behind the quantitative analysis and give a substantial explanation. The scale of data in this study uses a Likert scale to measure opinions, behaviour and the respondents perceptions. Analysis of relationship patterns from this study is among variables aimed to determine the effect of dependent and independent variables by using path model analysis. Dependent variable in this study is safety leadership (X), while independent variable is safety climate (Y). The validity test shows each item r arithmetic>0.30, as well as reliability test results showing each item of Cronbach's Alpha value ≥ 0.5. Dependent variable has a significant impact on the independent variable whether the p-value<0.05.

Result and Discussion

The analysis used to address this study uses a modeling equation of SmartPLS(Smart Partial Least Square). Based on the results of the output of SmartPLS on the evaluation of structural model and the overall model of this study, it is found out that R-Square values can be used to examine the relationship of latent independent variables on latent dependent variables whether they have substantial effects. The result obtained from SmartPLS output shows that the value of R-Square is 0.592 which means that the models created in this study can explain all the analyzed variables with 59.20%. Safety leadership diversity variables, and Safety Climate can be clarified by this model for 59.20% and the remaining 40.80% is clarified by other variables outside this model. It can be concluded that R-Square values obtained from this study model can be said to form a good model. The greater the R-Square value obtained, the better is the model. The construct validity test is discriminant validity. The instrument of this research is said to be valid if the root of AVE is greater than the correlation coefficient of variables (the correlation coefficient is 0.769). Overall, the research instrument of safety indicators and safety climate variables are valid. The reliability test of research instruments performed is Cronbcah Alpha analysis, where if alpha> 0.60 then the research instrument is considered as reliable. Overall, the research instrument of safety leadership indicator and safety climate variable can be considered as reliable. The result is shown at Table 1.

Table 1: CONSTRUCT REALIBILITY AND VALIDITY

	Cronbach's Alpha	R-Square	Composite Reliability	Average Variance Extracted (AVE)
CLIMATE	0.825	0.592	0.895	0.740
LEADERSHIP	0.901	0.911	0.922	0.629

Based on the results of SmartPLS analysis, it appeared that the feedback and recognition indicator had the smallest outer loading of positive 0.717 and significant at $\alpha = 5\%$ (t-statistic = 14.631) so it was still an indicator that can reflect safety climate variable, feedback and recognition indicator about employee input to improve performance safety. Meanwhile, communication indicator had the biggest outer loading that was positive 0.867 and significant at $\alpha = 5\%$ (t-statistic = 44.223) so this indicator was the most important indicator in reflecting variable of safety leadership. The results of interviews with employee respondents also indicated that the most important thing affecting the safety leadership was the company's management which always communicates the purpose of safety (Environment Health Safety) either directly or indirectly through meetings of Internal Safety Comittee which was performed periodically every month. The performance of OHS, findings of OHS non-conformity which need to be followed up, and employee input related to findings of non-conformity were discussed in this meeting. Communication is carried out routinely through scheduled meetings such as the monthly meeting of the Internal Safety Committee. This meeting discussed the findings of unsafe actions & unsafe conditions and received input from employees related to the discrepancy. Furthermore, there are field coordination meetings with management that are held routinely every semester showing OHS performance for one semester; OHS inspection activities that are routinely carried out between senior management and employees; posters and appeals and management's commitment to work safety displayed in several locations serve as communication material of OHS. Meanwhile, feedback and recognition management was a major concern for management to create activity programs that can stimulate employees to actively participate through inputs and advice to management within the scope of safety (Cooper, 2018). Any input related to unsafe action & unsafe condition submitted immediately followed up. To appreciate the participation of employees and contractors in implementing OHS in the company, management created a Recognition program in the form of a reward that is conducted once a year at the supplier gathering forum and the OHS Month

Based on the test result of safety climate variables, it could be seen that work pressure indicator that is prohibition for workers to work in hazardous condition was the most important indicator to reflect safety climate variable with outer loading of positive 0.871 and significant at $\alpha = 5\%$ (t-statistic = 43.760) . However, the safety competence indicator that explains the implementation of refreshment training routinely had the smallest outer loading that was 0.840. In the work pressure indicator, it could be explained that the prohibition for workers to work in hazardous conditions had been the main concern of the management due to many events that endanger the safety of workers during the last 4 years, so that workers feel safe doing work activities on the site despite the high job risks. In addition, there needs to be an increase in the material refreshment training for workers on a regular basis, especially safety training in high-risk jobs so that workers' understanding of safety will be better (von Thiele Schwarz et al., 2016).

Table 2: PATH COEFFICIENTS

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
X12 <- LEADERSHIP	0.765	0.761	0.049	15.517	0.,000
X21 <- LEADERSHIP	0.745	0.742	0.039	19.100	0.000
X33 <- LEADERSHIP	0.783	0.779	0.039	20.172	0.000
X44 <- LEADERSHIP	0.843	0.842	0.027	31.063	0.000
X51 <- LEADERSHIP	0.867	0.866	0.020	44.223	0.000
X63 <- LEADERSHIP	0.819	0.818	0.032	25.367	0.000
X73 <- LEADERSHIP	0.717	0.717	0.049	14.631	0.000
Y113 <- CLIMATE	0.869	0.865	0.031	27.747	0.000
Y122 <- CLIMATE	0.871	0.870	0.020	43.760	0.000
Y132 <- CLIMATE	0.840	0.839	0.030	28.279	0.000
LEADERSHIP -> CLIMATE	0.769	0.772	0.042	18.377	0.000

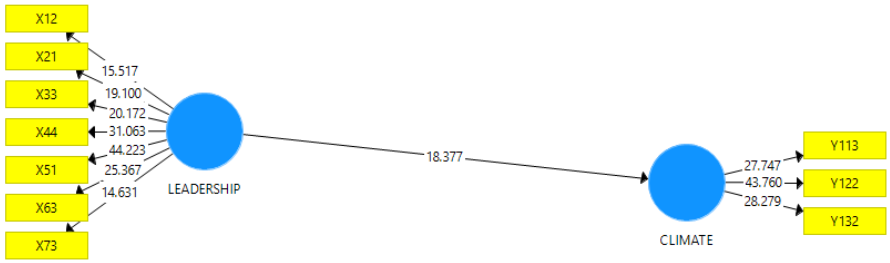

FIGURE 1. PATH DIAGRAM SAFETY LEADERSHIP AND SAFETY CLIMATE

The effect of safety leadership variable to safety climate is significantly. The path coefficient of this study is 0.769 and t-statistics of 18.377 (Table 2 and Figure1). This could be interpreted that the safety leadership had a significant effect directly on the safety climate. The results of this data analysis were in accordance with previous research hypothesis by Zohar (2002), Oah, Na, and Moon (2018), Wu, Liu, dan Lu (2007), Wu et al. (2007)

CONCLUSION

The purpose of this research is to determine the effect of safety leadership on the formation of the safety climate at coal-fired power plants East Java. The results of this study concluded that safety leadership has a positive influence on the safety climate. Company management must immediately understand the role of safety leadership in the formation of safety climate. For management must immediately create a program that has implications for the improvement of the character of safety leadership in the company. As described in the previous study, Xuesheng and Wenbiao (Du & Sun, 2012) who conducted research at a coal mining company in China stated that the establishment of safety climate is strongly influenced by the existence of safety leadership. Kelloway, Mullen and Francis suggested that employee perceptions of safety climate had a negative impact when leaders did not actively promote safe work behavior and practices (Mullen

& Kelloway, 2009). Management's commitment to safety was the biggest positive perception for employees (Fruhen et al., 2014).

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