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How Safety Leadership Affects Safety Performance Through Safety Climate at The Mining Contractor Company

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Abstract: Safety performance in the mining sector in Indonesia has declined over the past three years. This study was conducted to analyze how safety climate mediates the relationship between safety leadership and safety performance in coal mining contractor companies. Research data were obtained by distributing questionnaires to production employees using proportionate random sampling, involving a total of 150 respondents. Data analysis used a structural equation modeling approach. The results showed that safety leadership had a positive effect on safety climate and safety performance. Safety climate had a positive impact on safety performance. The direct effect of safety leadership on safety performance was greater than that through safety climate. These findings emphasize the importance of leadership in building a safety climate to achieve optimal safety performance in the mining industry.

Keywords: Safety Performance, Safety Leadership, Safety Climate

INTRODUCTION

Activities in the mining sector are classified as high risk for occupational accidents (Stemn et al., 2019). Every accident can cause both material and non-material losses, including accidents that have caused damage (accidents) and those that have not had a direct impact (near misses) (Friend & Kohn, 2007). In general, a workplace accident is an unexpected event that can cause injury to workers, damage to equipment, and disruption to operational activities (Hughes & Ferrett, 2016).

Workplace accidents are not random events, but rather the result of a series of specific causes related to the characteristics of the job. Therefore, accidents can be prevented by controlling the factors that cause them (Friend & Kohn, 2007). Prevention efforts are carried out by identifying and monitoring sources of risk originating from individual workers, equipment or machinery, work management, and working conditions (Reese, 2012). The cause of accidents can be explained using the domino theory, which describes accidents as a sequence of events from various causal factors. According to this theory, accidents occur due to a lack of control, personal factors, work conditions, unsafe conditions, and unsafe actions (Bird Jr & Germain, 1990).

The number of accidents that occur in a company is an indicator of safety performance. The higher the accident rate, the lower the safety performance achieved (Armstrong, 2006; Curcuruto et al., 2015). Based on data from the Directorate General of

Mineral and Coal, the average number of mining accidents in Indonesia resulting in fatalities in the 2022–2024 period shows a figure of 54 accidents. Thus, the company's target of achieving zero incidents has not been met. A company's safety performance is influenced by various internal and external factors. Several previous studies have confirmed that safety leadership has a significant relationship with improved safety performance (Skeepers & Mbohwa, 2015).

Safety climate is also an important element in determining the level of occupational safety in a company. Several studies show that a positive safety climate contributes to better safety performance (Huang et al., 2018; Siu et al., 2004; Wu, 2008). A meta-analysis of 90 studies concluded that safety performance is influenced by various factors, including work motivation, company regulations, workforce competence, safety investment, resources and equipment, working conditions, safety culture and climate, leadership, worker behavior, and safety management systems (Mohammadi et al., 2018).

Based on the above description, the phenomenon of an increase in the number of fatal mining accidents or deaths and previous research findings form the basis for this study. The main objective of this study is to examine the mediating role of safety in the relationship between safety leadership and safety performance in coal mining contractor companies.

This study is expected to contribute theoretically to the development of occupational safety management science, particularly in the mining sector. Empirically, this study seeks to examine and analyze the extent to which safety leadership and safety climate can improve a company's safety performance. In addition, this study also highlights the role of safety climate as a mediating variable in influencing safety leadership on safety performance. From a practical perspective, the results of this study are expected to be taken into consideration by the leaders of coal mining contractor companies in formulating policies and strategies to improve safety performance. Improved safety performance can be achieved through the implementation of safety-oriented leadership and the strengthening of the safety climate in the work environment.

METHOD

1) Population and Sample

This study is a quantitative study that uses a questionnaire containing a number of statements in accordance with the indicators of each research variable. The questionnaire is also equipped with filling instructions to facilitate respondents. The questionnaire was distributed online via instant messaging applications to respondents, either directly or through their superiors and colleagues.

The research population included all workers in the production department of coal mining contractors operating in South Kalimantan Province. The population consisted of field supervisors, heavy equipment operators, and production truck drivers, totalling 280 people from 10 national-scale mining contractors.

The sampling method used was simple random sampling because the population studied had relatively homogeneous characteristics, namely, all related to the implementation of occupational safety practices in the coal mining environment (Sanusi, 2017). The sample size was determined using the Slovin formula, then adjusted proportionally to the number of employees in each company. Of the total 160 questionnaires received, 7 were deemed inconsistent, and 3 were incomplete, resulting in a total of 150 valid questionnaires.

2) Measurement of Variables

Safety Leadership

The safety leadership variable was measured using four main indicators, namely attention to safety, safety control, safety motivation, and safety policy (Gracia et al., 2020; Shang et al., 2011; Wu, 2008). Each indicator is measured through several statements using a five-point Likert scale, ranging from strongly disagree to strongly agree.

The validity test results show that all items have a correlation value above the minimum limit (0.1547), thus declared valid. The reliability test produced a Cronbach's Alpha value of 0.824, which exceeded the threshold value of 0.70. Thus, the instrument for the safety leadership variable was declared reliable (Nunnally & Bernstein, 1994).

Safety Climate

The indicators used in measuring safety climate include safety competence, safety communication, safety training, and work pressure (Antonsen, 2009; Du & Sun, 2012; Kvalheim & Dahl, 2016; Neal & Griffin, 2006). All indicators were measured with two statement items, using a scale ranging from strongly disagree (1) to strongly agree (5). The validity test of all existing safety climate statement items produced an r-count value greater than r-table (0.1547), so that all statement items could measure the safety climate (Sanusi, 2017). The reliability test results for the safety climate statement variable produced a Cronbach Alpha score of 0.856 (greater than 0).

Safety Performance

Safety performance is measured using four main indicators, namely accident rate, accident frequency, accident severity, and near misses (Armstrong, 2006; Feng et al., 2014). Each indicator consists of two statements that are assessed using a five-point Likert scale. The validity test results show that all items have a significant correlation value ($\alpha = 0.05$) that exceeds the critical table value, so they are considered valid. The reliability test produced a Cronbach's Alpha value of 0.801, which is greater than 0.70, indicating that the safety performance measurement instrument has an adequate level of reliability.

3) Data Analysis

Data analysis was conducted using two main approaches. First, descriptive analysis was used to describe the respondents' tendencies in assessing each research variable. Second, structural equation modeling was used to test the causal relationships between variables through two stages, namely the measurement model and the structural model (Hair et al., 2014).
Next, a model fit test was conducted to assess whether the constructed model met the goodness of fit criteria (Ferdinand, 2014). The convergent validity of the latent variables was assessed through confirmatory factor analysis (CFA) using factor loading, average variance extracted (AVE), and construct reliability (CR) measures (Ghozali, 2017). Hypothesis testing was conducted by examining the regression weight value. The hypothesis was accepted if the critical ratio value was greater than 1.96 or the probability value was less than 0.05; conversely, if the critical ratio value was less than 1.96 or the probability was greater than 0.05, the hypothesis was rejected (Ferdinand, 2014; Ghozali, 2013).

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RESULTS AND DISCUSSION

1) Descriptive Analysis

The results of the descriptive analysis show that, in terms of safety leadership variables, the indicator that contributes the most is safety policy. This means that the better the policies implemented by company leaders regarding occupational safety, the stronger the workers' perception of the quality of leadership in the field of safety.

For the safety climate variable, the most prominent indicator is safety communication, which indicates that a well-established safety communication process within the company can play an important role in supporting the safety climate in the workplace. The safety performance variable is most strongly reflected by the accident severity indicator, which means that the lower the severity of injuries resulting from accidents, the higher the overall safety performance of the company.

2) Confirmatory Analysis and Model Validity

The results of confirmatory factor analysis show that all indicators in the exogenous and endogenous variables have factor loadings above the minimum threshold of 0.50. In addition, the average variance extracted (AVE) and construct reliability (CR) values are also higher than the thresholds of 0.50 and 0.70, so all indicators can be considered valid and reliable.

Table 1. Results of Confirmatory Analysis of Safety Leadership

Variabel	Indicator	*Loading Factor*	*Cut-Off*	Prob	Conclusion
Safety Leadership	Safety Concern	0,748	0,50	0,000	Valid
	Safety Control	0,838	0,50	0,000	Valid
	Safety Motivation	0,830	0,50	0,000	Valid
	Safety Policy	**0,893**	0,50	0,000	Valid
Average Variance Extract (AVE):		0,687	cut-off: 0,50		Valid
Construct Reliability (CR):		0,897	cut-off: 0,70		Reliable

Source: Research Data (2025)

The results from the table above show that all indicators on the safety leadership variable significantly and represent the measured this construct.

Table 2. Results of Confirmatory Analysis of Safety Climate

Variabel	Indicator	*Loading Factor*	*Cut-Off*	Prob	Conclusion
Safety Climate	Compliance	0,854	0,50	0,000	Valid
	Participation	0,821	0,50	0,000	Valid
	Initiative	0,950	0,50	0,000	Valid
	Awareness	0,730	0,50	0,000	Valid
Average Variance Extract (AVE):		0,709	cut-off: 0,50		Valid
Construct Reliability (CR):		0,906	cut-off: 0,70		Reliable

Source: Research Data (2025)

The results from the table above show that all indicators on the safety climate variable significantly and represent the measured this construct.

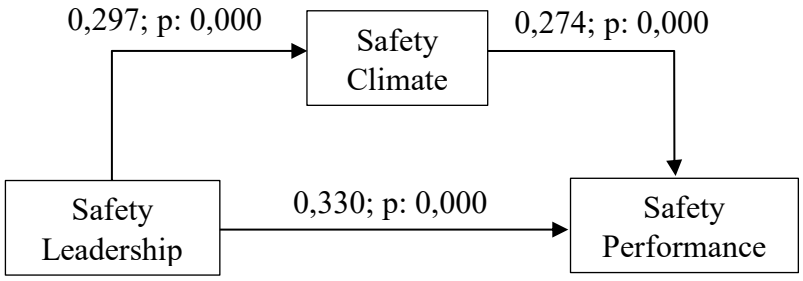
Table 3. Results of Confirmatory Analysis of Safety Performance

Variabel	Indicator	*Loading Factor*	*Cut-Off*	Prob	Conclusion
Safety Perfor,ance	Accident Rate	0,716	0,50	0,000	Valid
	Frequency rate	0,835	0,50	0,000	Valid
	Severity Rate	0,792	0,50	0,000	Valid
	Near Miss	0,783	0,50	0,000	Valid
Average Variance Extract (AVE):		0,612	cut-off: 0,50		Valid
Construct Reliability (CR):		0,863	cut-off: 0,70		Reliable

Source: Research Data (2025)

The results from the table above show that all indicators on the safety performance variable significantly and represent the measured this construct.

3) Path Analysis and Hypothesis Testing



Source: Research Data (2025)
Figure 1. Path Analysis

The path analysis results as shown in Figure 1 above indicate that the relationship between safety leadership and safety performance has a regression coefficient value of 0.330 with a probability of 0.000. Therefore, it can be concluded that safety leadership has a positive effect on safety performance, thus statistically proving hypothesis 1. The results of this hypothesis are in line with the research by Skeepers & Mbohwa, (2015) and Wu, (2008) which concluded that safety leadership affects safety performance.

The relationship between safety leadership and safety climate yields a regression coefficient value of 0.297 with a probability of 0.000, thus statistically indicating that safety leadership has a positive effect on safety climate, thereby statistically confirming hypothesis 2.

The relationship between safety climate and safety performance yields a regression coefficient of 0.274 with a probability of 0.000. Statistically, this indicates that safety climate has a positive effect on safety performance, thus proving hypothesis 3 statistically.

The proof of hypothesis 4, that safety leadership affects safety performance through safety climate, can be explained by the direct influence value between safety leadership and safety performance of 0.330, while the indirect influence value through safety climate is 0.297 x 0.274 = 0.0814, so that the total influence value is 0.411. The total influence value in the causal relationship between safety leadership and safety performance through safety climate is greater than the direct influence value, so it can be concluded that safety climate is able to mediate the relationship between safety leadership and safety performance. Hypothesis 4, which states that safety leadership influences safety performance through the safety climate, is statistically proven. The direct influence value of safety leadership on safety performance is greater than the influence value through the safety climate, indicating that the direct influence path is stronger in influencing safety performance than the path through the safety climate, so that the safety climate mediates the relationship between safety leadership and safety performance.

CONCLUSION

This study shows that safety leadership has a positive effect on the safety performance of coal mining companies. The better the implementation of safety-oriented leadership, the higher the level of work safety that can be achieved by the organization. The results of the study also confirm that safety leadership plays an important role in improving the safety climate. When leaders issue safety-related policies, they will have an impact on increasing workers' initiative in complying with safety regulations in the company. In addition, the safety climate plays an important role in improving safety performance. When safety values have become an integral part of the organizational culture, workers will exhibit safer work behavior and comply with applicable procedures. This study also proves that the safety climate acts as a mediating variable in the relationship between safety leadership and safety performance. However, the direct

influence of leadership on safety performance is more dominant than the indirect influence mediated by the safety climate.

Overall, the results of this study emphasize the importance of effective leadership and workers' initiatives to work safely in improving safety performance in the mineral and coal mining sector.

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