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Improving Safety Performance through Safety Leadership and Safety Behaviors

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Abstract

The number of severe accidents and deaths at mining companies in Indonesia in 2020 is still relatively high. This study aims to investigate the effect of improving safety performance through safety leadership and safety behavior. This study uses data from perceptions of workers at coal mining contractor companies in East Kalimantan Province. Determination of the sample using proportionate random sampling, with a comprehensive selection of 161 workers in the production department. The structural equations modeling approach is used in the data analysis process. According to the findings of this study, leadership and safety behavior have a partly beneficial impact on safety performance. Direct safety leadership is more successful than safety behavior in terms of increasing safety performance in the workplace. The impact of safety leadership on safety performance is mediated in part by the safety behavior of those in charge of it.

Keywords: *Safety Leadership, Safety Behavior, Safety Performance.*

INTRODUCTION

The increasingly competitive industry competition requires companies to optimize all of their resources. Therefore, a reliable and rugged workforce is needed to support the company's business to compete (Rajapathirana & Hui, 2018; Sharp et al., 1999). In addition to the force (TK), companies usually use high-tech machines to support the production process to increase company productivity and achieve effectiveness and efficiency (Pham & Thomas, 2012; Tortorella & Fettermann, 2018). The use of high-tech equipment creates safety and health risks for workers. This risk can affect the workforce anytime and anywhere, requiring special attention from various related parties such as workers, employers, government, and management (Lindgreen et al., 2009; Edwards & Jabs, 2009). This risk makes the workforce realize the importance of a healthy, safe and comfortable work environment.

Work safety is an effort made by workers and companies to prevent work accidents and occupational diseases (Akpan, 2011; Thimason & Pozzebon, 2002). Occupational safety and health is the maintenance of human resources as the main actors so as not to get injured or sick and the maintenance of facility resources, namely facilities and infrastructure, so that they are not damaged (Friend & Kohn, 2007; Sari, 2009). Care of human resources and facility resources is carried out to prevent work accidents.

Work accidents are unwanted, unplanned, and unexpected events that can cause losses, namely injury to humans and damaged property (Kirchsteiger, 1999; Dong et al., 2017). There are work accidents that have caused losses; namely, there have been workers who have suffered injuries, or there have been damaged equipment which is often called accidents, and accidents that have occurred but have not caused losses are called near misses or near misses (Friend & Kohn, 2007; Kasap, 2011). Accidents in companies also cause injury to humans, and equipment is damaged and can cause environmental damage and business opportunities for companies (Hughes & Ferrett, 2016; Lingard & Rowlinson, 2004). Accidents occur because of causes, and accidents can be analyzed using the theory of accident-causing models. One of the most widely used accident-causing model theories in the mineral and coal mining industry is the accident domino theory. The domino theory explains that accidents are a sequence of factors that cause accidents, and these factors can be predicted in advance (Friend & Kohn, 2007; Cameron & Hare, 2008).

The number of accidents that occur in the company describes the company's work safety performance, meaning that if more accidents happen in the company, the company's work safety performance will be low and vice versa if the number of accidents that occur is small, it means that the company's work safety performance is high (Armstrong, 2006; Curcuruto et al., 2015). Work safety performance is part of the company's overall performance, and work safety performance is more focused on the frequency of accidents that occur (frequency rate), the level of accidents that occur (the incident rate), and the severity rate (the severity rate) (Armstrong, 2006; Wang et al., 2020). Safety performance is a measure of the company's success in preventing accidents (Hasan & Jha, 2013: Mohammadi et al., 2018).

Improvements in the effectiveness of occupational safety and health protection are inextricably bound up with the planned, measured structured integrated implementation of occupational safety and health through SMK3 to ensure the

establishment of an occupational safety and health system in the workplace by involving elements of management, workers/labor, and trade unions or labor unions to prevent and reduce workplace accidents and occupational diseases and to create a comfortable, efficient and productive workplace (Ahmed & Faheem, 2021).

The potential danger of accidents in coal mining work activities is still relatively high (Stemn et al., 2019). Accidents will result in losses such as workers' injuries and equipment damage (Friend & Kohn, 2007). An accident is an unplanned event that can cause harm to workers, damage to equipment, and disrupt business processes (Hughes & Ferrett, 2016). Accidents that occur have specific causes and are not accidental so that the causes of accidents can be identified to prevent work accidents (Friend & Kohn, 2007). Accident prevention can be done by monitoring the sources of accidents, namely workers, machines, management, and working environmental conditions (Reese, 2012). The analysis of the accident-causing model generally uses the accident domino theory. The process of the occurrence of an accident is a chronological sequence of previous events, which are the factors that cause accidents (Friend & Kohn, 2007). According to the domino theory, the factors that cause accidents sequentially are lack of control, personal characteristics, work factors, unsafe acts, and unsafe conditions (Bird Jr. & Germain, 1990).

The number of accidents in a company describes the company's safety performance. The lower the number of casualties, the higher the safety performance (Armstrong, 2006; Curcuruto et al., 2015). The number of mining accidents with severe consequences and deaths that occur in mineral and coal mining companies in Indonesia in 2020 is still relatively high, namely 95 cases for severe injuries and 17 cases for worker deaths, even though the company's target for accidents is the absence of accidents while doing work. The target to be achieved by the company regarding the number of accidents that occur is safety performance (Armstrong, 2006). From these data, the safety performance target for mining companies in Indonesia has not been achieved.

Previous study has demonstrated that the effectiveness of safety leadership is impacted by the effectiveness of safety leadership (Skeepers & Mbohwa, 2015; Wu et al., 2008). Internal safety and behavioral compliance, such as the use of personal protective equipment and adherence to safety protocols, have a significant impact on overall performance in the area of safety (Liu et al., 2015). Curcuruto et al. (2015), in their research, concluded that safety behavior is negatively correlated with the rate of accidents that occur; the more safety behavior of workers increases, the accident rate will decrease. The safety behavior of truck drivers in trucking companies in the USA harms near-miss rates (Murphy et al., 2019). Research in the aviation industry has different conclusions regarding the effect of safety behavior, namely worker participation, an indicator of safety behavior that has a positive impact on the number of accidents, which is an indicator of safety performance (Singh et al., 2019). Mohammadi et al. (2018), in a study that reviewed 90 previous studies on safety performance, concluded that the factors that influence the achievement of safety performance are work motivation, existing regulations in the company, worker competence, safety investment, resources, and equipment. , working conditions, safety culture, safety climate, safety leadership, employee safety behavior, organizational requirements, and safety management system.

On the basis of the description of the background, namely, the high number of mining accidents resulting in severe and fatal consequences in mining companies that continues to occur, as well as the findings of previous studies, the purpose of this study is to investigate the effect of improving the performance of coal mining companies' safety leadership and behavior in Indonesian coal mining companies. Indonesia.

The research is intended to yield theoretical advantages, specifically the development of knowledge in the area of workplace safety. Particularly relevant to this study is the examination and analysis of the roles of safety leadership and safety behavior in the improvement of safety performance in coal mining contractor companies, as well as the role of safety behavior as a mediator between the roles of safety leadership and safety performance in the improvement of safety performance in coal mining contractor companies. On a practical level, the findings of this study may be utilized to inform policy decisions made by the leaders of coal mining contractor firms, such as attempts to enhance the company's safety performance through safety leadership and the mediating role of safety behavior.

LITERATURE REVIEW

Relationship between Safety Leadership, Safety Behavior, and Safety Performance

Safety performance is part of the performance of non-financial companies because safety performance measures are a form of competitive advantage (Zainal et al., 2018). Safety performance in a company can be measured through the level of accidents, the frequency of accidents, and the severity (Armstrong, 2006; IS: 3786, 1983). The company's safety performance measurement can also be calculated based on minor injuries, equipment damage, injuries that cause lost-time injuries, and near misses that occur in the company (Curcuruto et al., 2015). Measuring safety performance on a project is as important as measuring its success in carrying out its work, measured in time, quality, and cost (Hasan & Jha, 2013). Safety leadership influences subordinates carried out by a leader to pay attention to safety aspects (Wu et al., 2008). Safety leadership is management's commitment to managing safety in the work area by preparing the necessary

resources (Roughton & Mercurio, 2002). Safety leadership is part of leadership in organizations, and safety leadership focuses on how to invite workers to carry out safety rules in the workplace (Wu, 2008). As people responsible for their work areas, leaders must provide insight and direction to workers regarding safety aspects at work (Lu & Yang, 2010). Safety behavior is an action from workers to run and support company safety programs (Friend & Kohn, 2007). Safety behavior includes a series of activities that individuals carry out in the workplace to keep their work area safe by aligning individual actions to comply with safety rules and procedures applicable to the organization (Kapp, 2012). Safety behavior is a particular action against existing safety rules or policies; if individual steps are not following the rules, an accident can occur (Seo et al., 2015).

The company's safety performance is impacted by the safety leadership provided by its leaders, particularly in the area of safety control indicators. The more important the influence of safety leadership when mediated by the safety climate, the better the company's safety performance (Wu et al., 2008). According to the findings of construction industry research, safety leadership has a significant impact on the accomplishment of safety performance goals (Skeepers & Mbohwa, 2015). A company's safety culture has an impact on its safety performance; if the company's safety culture improves, the company's safety performance will improve as well (Feng et al., 2014). Improved safety performance in mining firms will be facilitated by a more developed safety culture (Stemn et al., 2019).

The Mediation Role of Safety Behavior

Safety behavior is an act of workers to carry out safety programs (Friend & Kohn, 2007). Safety behavior means aligning individual actions with safety rules and procedures that apply in the company (Kapp, 2012). In their research, Seo et al. (2015) explain that safety behavior reflected by individual actions will affect accidents. The unsafe behavior of workers is a predictor of near-miss events in the company (Mearns et al., 2001). Dangerous actions and hazardous conditions can cause work accidents (Bird Jr & Germain, 1990; Wills et al., 2009). Unsafe behavior factors cause 85% of workplace accidents (Hermann et al., 2010). Safety behavior has a negative relationship with the number of casualties (Curcuruto et al., 2015). Safety behavior is also negatively correlated with a near miss (Murphy et al., 2019). The level of worker injury is influenced by worker compliance in wearing personal protective equipment, compliance with work safety procedures, and worker initiatives to work safely (Liu et al., 2015). Worker participation, an indicator of safety behavior, positively affects safety performance in the aviation industry (Singh et al., 2019).

The conceptual framework in this study is built based on a causal relationship between safety leadership, safety behavior, and safety performance, which is as follows:

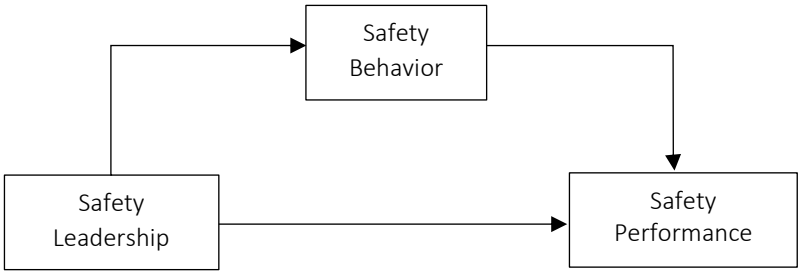

Figure. 1. Conceptual Model

From the conceptual model above, the hypotheses in this study are:

Hypothesis 1. Safety leadership affects safety performance. When there is the treatment of safety leadership, it will affect safety performance.
Hypothesis 2. Safety behavior affects safety performance. If there is the treatment of safety behavior, it will affect the achievement of safety performance.
Hypothesis 3. Safety leadership affects safety performance when mediated by safety behavior.

In particular, it will compare the direct and indirect effects or when mediated by safety behavior on the relationship between safety leadership and safety performance and determine whether safety behavior is a mediating variable in this relationship.

METHOD

The methodology used in this study is descriptive, describing respondents' proclivity for evaluating research variables (Sanusi, 2017), and structural equation modeling, which elucidates the causal link between the variables mentioned in the measurement equation and the structural model equation (Hair et al., 2014). The population in this study were production workers, namely supervisors, heavy equipment operators, and production truck drivers at 11 coal mining contractor

companies in East Kalimantan Province - Indonesia, totaling 286 workers. Determination of the sample to be taken is done by a proportionate random sampling method because the variables used in this study are relatively homogeneous, namely examining the application of work safety practices in coal mining contractor companies (Sanusi, 2017). Determination of the number of samples using the Slovin formula, which is then calculated proportionally for each coal mining contractor. The questionnaires filled in and returned are 170 questionnaires, five are inconsistent in value, and four are incomplete. In this study, 161 questionnaires were used, or the respondent rate was 96%.

RESULT AND DISCUSSION

Measurement of the Validity and Reliability of Safety Leadership Variables

The indications of safety leadership include safety caring, safety controlling, safety motivation, and safety policy. Four statements assessed safety concern, three statements assessed safety handling, two statements assessed safety motivation, and three questionnaire statements assessed safety policy. Each statement question is completed using a Likert Scale, which ranges from 1 to 5, or strongly disagree to strongly agree. The results of the validity test indicate that all values for each indicator are greater than the crucial threshold (0.1547), indicating that the research instrument is legitimate (Sanusi, 2017). Cronbach's alpha value for reliability is 0.824; this number is larger than the crucial threshold of 0.70, indicating that the instrument is trustworthy (Nunnally & Bernstein, 1994).

Measurement of Safety Behavior Validity and Reliability

Safety behavior is quantified using markers of compliance, involvement, safety initiatives, and safety awareness. Three statement questions were used to assess safety compliance and involvement, while two statement items assessed safety awareness, using a score scale ranging from strongly disagree (1) to strongly agree (5) strongly. Testing the validity of all statement items pertaining to safety behavior results in an r-count value greater than the r-table value (0.1547), implying that all statement items may be used to quantify safety behavior (Sanusi, 2017). Cronbach Alpha value of 0.873 is obtained from the reliability test results for the safety behavior statement items (greater than 0.70). The statement items relating to safety behavior are reliable when used to make measurements (Nunnally & Bernstein, 1994).

Safety Performance Validity and Reliability Measurement

Accident rate, accident frequency rate, accident severity rate, and near-miss measure safety performance. Each indicator is measured using 2 statement items by giving a value of 1 to 5, which describes powerfully disagree to agree strongly. Each statement item is tested for validity so that the correlation coefficient value is obtained at the significance level (α): 0.05, which is greater than the table correlation coefficient, so all statement items are said to be valid or can be used to measure safety performance (Sanusi, 2017). Reliability tests performed on all statement items resulted in a Cronbach Alpha value of 0.801, more significant than the Cronbach Alpha critical value of 0.70 (Nunnally & Bernstein, 1994). So it can be concluded that all statement items are reliable or reliable to measure safety performance.

Descriptive Analysis

The results of the descriptive analysis conclude that the safety policy indicator provides the most considerable contribution to safety leadership. The safety participation indicator contributes the most to shaping safety behavior, and safety performance is formed the most by the accident severity rate indicator.

Structural Equation Modelling Assumption Analysis

The results of the data normality test give a multivariate critical ratio value = 2.549; this value is still below the critical value (0.258) so that the data meet normality (Ghozali, 2017; Latan, 2013), there is no outlier data with probability values (p2) all greater of 0.000 (Ghozali, 2017), the multicollinearity value = 0.462 is still below the critical value (0.90) (Ghozali, 2013a), and all standardized residual covariance values < 2.58 (Bryne, 2010; Ghozali, 2017).

Confirmatory Factor Analysis and Goodness of Fit Mode

Confirmatory factor analysis for exogenous variables gives the following results:

Table 1. Results of Confirmatory Factor Analysis Exogenous Variable

Variable	Indicators	*Loading Factor*	*Cut-Off*	Prob.	Conclusion
Safety Leadership	Safety Caring	0.748	0.50	0.000	Valid
	Safety Controlling	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: Primary data prepared (2021)

The indicators on safety leadership are safety caring, safety controls, safety motivation, and safety policy, all factor loading values are above the critical value (0.50), and the AVE and CR values are also above the crucial importance so that these four indicators can characterize safety leadership (Ghozali, 2017; Hair et al., 2014).

Table 2. Results of Confirmatory Factor Analysis Endogenous Variable

Variable	Indicators	*Loading Factor*	*Cut-Off*	Prob.	Conclusion
Safety Behavior	Safety Compliance	0.854	0.50	0.000	Valid
	Safety Participation	0.821	0.50	0.000	Valid
	Safety Initiative	0.950	0.50	0.000	Valid
	Safety 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
Safety Performance	Accident Rate	0.716	0.50	0.000	Valid
	Accident Frequency Rate	0.835	0.50	0.000	Valid
	Accident 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: Primary data prepared (2021)

All indicators on safety behavior have a factor loading value more significant than the critical value (0.50), the AVE and CR values for safety behavior are also more remarkable than the critical value so that the indicators of safety compliance, safety participation, safety initiatives, and safety awareness can characterize safety behavior. (Ghozali, 2017; Hair et al., 2014). The factor loading values for safety performance, AVE, and CR are more significant than critical values . The accident rate, accident frequency rate, accident severity rate, and near-miss indicators can characterize safety performance (Ghozali, 2017; Hair et al., 2014).

The results of the model suitability analysis for the three variables in this study, namely the value of X2 (chi square) at df = 161 was 185.106, still below the cut-off value (191.608); probability value 0.094 (≥ 0.05); RMSEA value = 0.031 (≤ 0.08); GFI value = 0.904 (≥ 0.90); CMIN / DF value = 1.150 (≤ 2.00); AGFI value = 0.875 (≥ 0.90); TLI value = 0.987 (≥ 0.90); CFI value = 0.989 (≥ 0.90); PGFI value = 0.693 (≥ 0.50) and PNFI value = 0.780 (≥ 0.60). Of the 10 conformity indices of the existing model, 9 indices meet the good criteria and 1 model meets the marginal criteria so that the proposed model can be accepted (Ferdinand, 2014; Ghozali, 2013b; Latan, 2013; Schumacker & Lomax, 2004).

Path Analysis and Hypothesis Testing

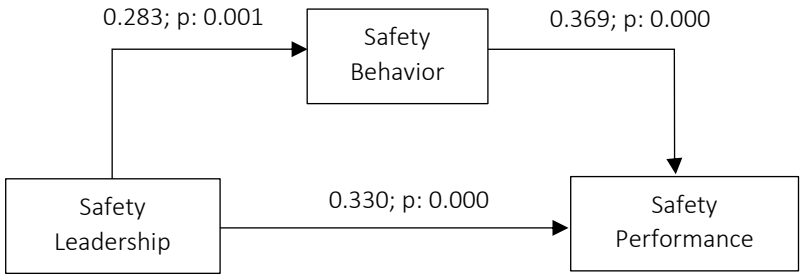

Figure 2. Final Path Analysis with Standardized Coefficients

In accordance with the findings of the path analysis, as depicted in Figure 2 above, it can be concluded that safety leadership has a positive effect on safety performance, with a regression coefficient of 0.330 and a probability of 0.000. As a result, hypothesis 1 is statistically tested, and the results of the path analysis are positive. Skeepers & Mbohwa (2015) found that safety leadership has an impact on safety performance, which is consistent with the findings of Wu et al. (2008), who found that safety leadership had an impact on safety performance.

Safety behavior has a positive effect on safety performance, according to the relationship between them, which has a regression coefficient of 0.365 and a probability of 0.000. Thus, statistically, it can be explained that safety behavior has a positive effect on safety performance, and hypothesis 2 is statistically tested. According to Singh et al. (2019), worker

participation in safety has a positive effect on safety performance, which is in contrast to the findings of Curcuruto et al. (2015) and Murphy et al. (2019), who concluded that safety behavior has a negative effect on the accident rate, which is an indicator of safety performance.

In order to demonstrate hypothesis 3 that safety leadership affects safety performance through safety behavior, it can be explained that the direct influence value between safety leadership and safety performance is 0.330, while the indirect effect value is through safety behavior is 0.283 x 0.369 = 0.104, resulting in a total influence value of 0.434 for safety leadership and safety performance. In this study, we found that safety behavior has a greater real influence on the causality relationship between safety leadership and safety performance than does the direct effect, which leads us to believe that safety behavior can act as a mediator in the relationship between the influence of safety leadership and safety performance. The statistical validity of Hypothesis 3, which claims that safety leadership influences safety performance through safety behavior, is investigated. There is a larger monetary value to the direct influence of safety leadership on safety performance than there is to the impact of safety behavior on safety performance. This implies that the direct influence channel is more important in influencing safety performance than the pathway through safety behavior, and that safety behavior plays a role in mediating this connection to some extent.

Discussion

As a result, this study investigated the direct influence of safety leadership and safety behavior on safety performance as well as the indirect influence of safety leadership on safety performance through behavior safety. The respondents who were focused on in this study were workers in the production division of coal mining operations, which included supervisors, heavy equipment operators, and dump truck drivers. In conclusion, the safety leadership practices described by leaders in the field are used to inform all company safety policies to workers, explain to workers their duties and responsibilities, and set clear and measurable safety goals in their work area. This will provide understanding to workers, primarily related to the duties and responsibilities of workers in the field of safety, so that workers' kinesthetic awareness is increased. The direct influence of safety leadership on safety performance is stronger than the indirect influence of safety leadership on safety behavior because, with the role of leadership in the work area who constantly informs workers of safety policies, workers will constantly be reminded of the importance of safety rules at work, reducing the likelihood that they will be involved in an accident.

This study lends credence to the theoretical view on the relationship between safety behavior and safety performance, which holds that safety behavior has a beneficial impact on the overall safety performance of a firm. Liu et al. (2015) found evidence to support the conclusion that safety behavior has a positive effect on safety performance, and Singh et al. (2019) found evidence to support the conclusion that safety behavior has a negative effect on safety performance. However, there is no evidence to support the conclusion that safety behavior harms safety performance (Curcuruto et al., 2015; Murphy et al., 2019). Prosocial and proactive conduct, as well as driving behavior indicators, have been used in previous studies to reach the conclusion that safety behavior is detrimental to performance. Safety performance, on the other hand, makes use of the same degree of accidents that occur. In terms of safety performance, there are only two ways to look at it: as an indication of its own or as a wider unit of its own performance. Based on the findings of this study, which support the notion that safety behavior has a positive influence on overall safety performance, safety performance should be considered as an important component of the overall performance of the organization.

Given that the findings of this study confirm prior research, namely that safety leadership has an impact on safety performance, this study is being conducted in the wake of past research (Skeepers & Mbohwa, 2015; Wu et al., 2008) In the event that safety behavior has a favorable impact on safety performance (Singh et al., 2019), the mining contractor company's management must take steps to improve safety performance. There are a number of activities that may be taken care of to ensure that field leaders always notify employees of the company's security policy, educate workers on their safety obligations, and create clear and quantifiable safety targets in their respective work areas of responsibility. Workers will be encouraged to engage in the implementation of safety programs and to adhere to safety regulations as a result of these activities, which will help to prevent accidents.

CONCLUSION

According to the conclusions of this study, safety leadership has a beneficial impact on safety performance; the more successfully safety leadership is implemented in a firm, the greater the improvement in safety performance. Safety behavior also has a beneficial influence on the company's overall safety performance; the greater the improvement in workers' safety behavior, the greater the improvement in the company's overall safety performance. Because the direct effect of safety leadership on safety performance is greater than the indirect influence of safety behavior, safety behavior serves as a partial mediating factor in this connection.

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