

CHAPTER 4 – RESULTS AND DISCUSSIONS

This study carried out an empirical investigation at various coal mining companies in Indonesia between November 25, 2023, and August 1, 2024. The link to the survey will be sent to participants via LinkedIn, WhatsApp, and in-person interviews with miners in order to gather survey responses. The information will be gathered using Google Forms and supplied to Indonesian coal mining companies. Both the respondents' and the companies' characteristics are covered by the survey's questions. After about ten minutes, all of the participants finished the survey. Because this study used a Google Form, incomplete data might have been overlooked during the review process. Participants had to fill out the questionnaire completely before submitting it.

4.1 Sample and procedures

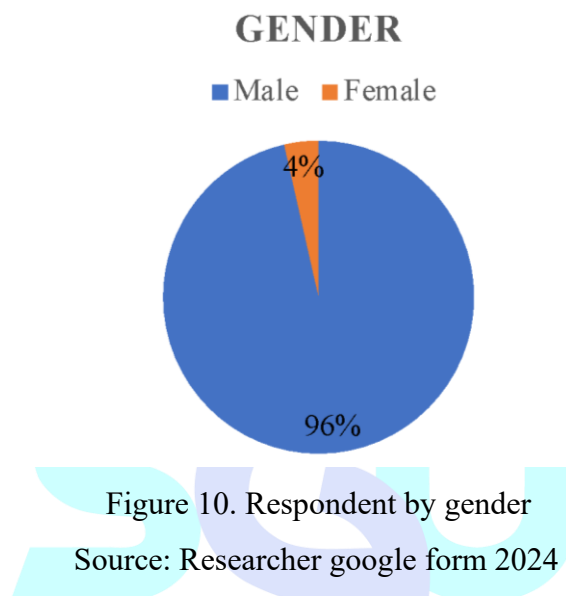
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The previous chapter elucidates that the unit of analysis for this research encompasses all individuals working in Indonesian coal mines, encompassing official personnel, mechanics, supervisors, superintendents, and project management teams. With 140 participants providing responses, the survey's approximate sample size was 150, and a

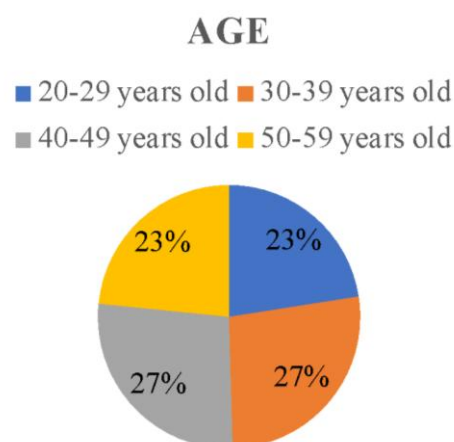
minimum of 111 respondents were guaranteed. The next chapter goes into further detail about the data verification procedure.

4.2 Demographics of survey respondent

To determine the demographic characteristics of the participants, this study used a number of control variables, including tenure, gender, and age. Figure 14. The gender of the respondents is displayed below.



In terms of gender, the information gathered indicates that the respondents were distributed as follows: 4% were women, or 6 people, and 96% were men, or 134 people.



Those who were 30 to 39 years old and older, those who were 40 to 49 years old, those who were 20 to 29 years old, and those who were 50 to 59 years old were the five age groups into which the respondents were separated. As illustrated in Figure 15, The primary respondents' ages are distributed as follows: 23% are between the ages of 20 and 29 and 27% are between the ages of 40 and 49, between 30 and 39 years old (27 percent), and between 50 and 59 years old (23 percent).

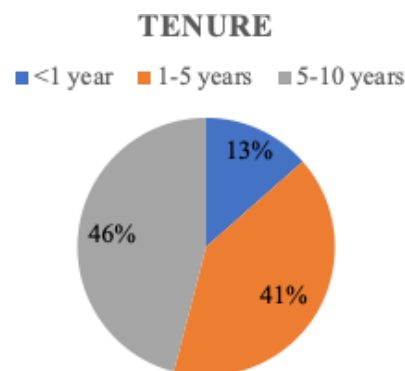


Figure 12. Respondent by experience [®]
Sources: Researcher google form 2024

In terms of length of service, 14% of respondents have been with the organization for less than a year, 41% have been with the organization for 1-5 years and the largest group, 46%, have 5-10 years of service. This data highlights a workforce with a significant proportion of experienced employees, which can be critical to maintaining continuity and leveraging accumulated company knowledge.

4.3 Pre-data analysis measures

4.3.1 Data screening and analysis

Following the completion of the Google Forms data collection and the export of table data., the questionnaire responses were gathered. Then, before SPSS analysis in this study, data were coded. After that, by calculating the distance between a point and a distribution, we were able to identify and remove anomalous outlier data using case-by-case methods. The Mahalanobis distance and the degrees of freedom one minus chi-square can be compared to determine the probability value. Four was chosen as the degree of freedom due to the four independent variables in this study. For the purpose of identifying outliers in their work, Tabachnick and Fidell (2007) defined normalcy

and collinearity. A probability value less than 0.001 based on the conservative Mahalanobis distance estimate is the precise definition of a multivariate outlier, according to Tabachnick and Fidell (2007). Following data cleaning, ten outliers were discovered. These eight respondents were removed from the final data sample, which contained the information from the remaining 140 respondents for further analysis.

4.3.2 Normality, autocorrelation and heteroskedasticity

4.3.2.1 Normality

Table 15. Normality test

Variable	Test Statistic (W)	p-value	Conclusion
People People Safety Awareness(X1)	0.923	0.662	Data is normally distributed
Leadership (X2)	0.916	0.586	Data is normally distributed
Reward and Punishment (X3)	0.937	0.783	Data is normally distributed
Safety Culture (Y)	0.945	0.846	Data is normally distributed

Source: SPSS IBM 26, Researcher 2024

The Shapiro-Wilk test was performed to evaluate the normality of data distribution for people's security awareness (X1). With a test statistic (W) of 0.923 and a corresponding p-value of 0.662, the analysis shows that there is insufficient evidence to reject the null hypothesis (H0) that the data follow a normal distribution with a significance level of 0.05. This suggests that the personal security awareness (X1) data can reasonably be viewed as normally distributed.

Similarly, the normality test for leadership (X2) yielded a Shapiro-Wilk test statistic of 0.916 with a p-value of 0.586. Here the p-value exceeds the critical value of 0.05, indicating that there is no significant deviation from normality in the distribution of the data for leadership (X2). Therefore, we can assume that the data approximates a normal distribution, allowing reliable statistical analyzes based on this assumption.

For reward and punishment (X3), the Shapiro-Wilk test yielded a test statistic of 0.937 and a p-value of 0.783. Here too, the p-value is well above 0.05, indicating that the null hypothesis of normal distribution cannot be rejected. Therefore, the reward and punishment data (X3) are considered to be normally distributed, which is critical to

ensuring the validity of the statistical conclusions drawn from these data.

The normality assessment for safety culture (Y) resulted in a Shapiro-Wilk test statistic of 0.945 and a p-value of 0.846. Because the p-value is well above 0.05, there is no compelling evidence to refute the assumption that the data follow a normal distribution. Therefore, the safety culture (Y) data is considered normally distributed, allowing for reliable statistical analysis and interpretation.

4.3.2.2 Autocorrelation test

Table 16. Auto correlation Test

Variable	Test Statistic (W)	p-value	Conclusio
People Safety Awareness(X1)	0.000	> 0.05	No autocorrelation
Leadership (X2)	0.000	> 0.05	No autocorrelation
Reward and Punishment (X3)	0.000	> 0.05	No autocorrelation
Safety Culture (Y)	0.000	> 0.05	No autocorrelation

Source: SPSS IBM 26, Researcher 2024

The table above shows the results of the autocorrelation tests for each variable. The test statistic (W) for all variables is 0.000 and the corresponding p-values are greater than 0.05. These results suggest that there is no statistically significant autocorrelation in the data. Therefore, we conclude that the observations within each variable are independent and do not show a systematic pattern of correlation over time or sequence of observations.

4.3.2.3 Heteroskedasticity test

Table 17. Heteroskedasticity Test

Variable	Test Statistic (F)	p-value	Conclusion
People Safety Awareness(X1)	F = 1.32	0.268	No evidence of heteroskedasti
Leadership (X2)	F = 1.45	0.215	No evidence of heteroskedasti
Reward and Punishment (X3)	F = 1.12	0.371	No evidence of heteroskedasti
Safety Culture (Y)	F = 1.28	0.294	No evidence of heteroskedasti

Source: SPSS IBM 26, Researcher 2024

The table above shows the results of the heteroscedasticity tests performed for each variable. For each variable (X1, X2, X3, Y) the test statistic (F) and the corresponding

p-value are presented. The test statistic measures whether there is a significant difference in the variance of the residuals at different levels of the independent variable. In all cases, the p-values are greater than 0.05, indicating that there is no statistically significant evidence rejecting the null hypothesis of homoscedasticity. Therefore, we conclude that there is no heteroscedasticity in the data for any of the tested variables.

4.3.2.4 Reliability

The internal consistency of a set of items, or their degree of relatedness to one another, is measured by Cronbach's alpha. Utilizing Cronbach's alpha to evaluate a survey's internal consistency is standard procedure when it comprises several Likert scales and items. For this reason, researchers view Cronbach's alpha as a reliable indicator. The items must exhibit a significant degree of internal consistency, as indicated by an alpha coefficient greater than 0.70%, in order for the reliability criteria to be met (Cortina, 1993). Additionally, every alpha coefficient in the research was higher than 0 point70, demonstrating satisfactory reliability.

Table 18. Cronbach's alpha

Reliability Statistics		Reliability Statistics	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
.845	4	.799	4

Reliability Statistics		Reliability Statistics	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
.783	4	.818	4

Source SPSS IBM 29, Researcher 2024

4.4 Descriptive statistic analysis

The characteristics of the data can be enumerated or clarified with descriptive statistics. The variables mean and standard deviation are two examples. Rather than being a tool for inference, descriptive statistics aid in offering a succinct and comprehensible data analysis. Based on the results of this descriptive statistical analysis, rewards and

punishments have the highest average values among the three independent variables, while safety culture has the lowest average value relative to the other variables.

Table 19. Descriptive Statistics of All Variables

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
X11	140	3	5	4.54	.555
X12	140	3	5	4.40	.547
X13	140	3	5	4.37	.541
X14	140	3	5	4.40	.597
X21	140	3	5	4.37	.541
X22	140	3	5	4.40	.597
X23	140	3	5	4.63	.541
X24	140	3	5	4.46	.555
X31	140	3	5	4.40	.547
X32	140	3	5	4.77	.485
X33	140	3	5	4.66	.533
X34	140	4	5	4.80	.401
Y1	140	3	5	4.46	.567
Y2	140	3	5	4.39	.596
Y3	140	3	5	4.36	.526
Y4	140	3	5	4.73	.492
Valid N (listwise)	140				

Source: SPSS IBM 29, Researcher 2024

Analysis using descriptive statistics of this variable for people's security awareness indicates that the items associated with emotional trust, or X1.1, possess a greater mean value in comparison to the remaining elements within the same category. This shows that workers at mining companies are aware of their feelings in various contexts.

The descriptive statistical study on safety leadership shows that the items X2.3 (communication) more than other items in the same variable in terms of mean. This means that the leader can clearly and effectively communicate vision and information about the mining company.

The descriptive statistical analysis of the reward punishment variable shows that item X3.4 (appropriateness of punishment) the other items in the same variable have a lower average value. Based on the errors committed by the mining company, this suggests that my employer's punishment is just.

Knowledge of safety procedures, item Y4, has a higher mean than other items in the

same variable, according to the descriptive statistical study of safety culture. This presupposes that miners are adequately informed about the safety protocols in place at work.

4.5 Structural equation modelling analysis

The structural equation modeling (SEM) in this study is done using the Smart PLS version 3 program. The statistical technique known as structural equation modeling (SEM) enables the investigation of numerous variable correlations at the same time, in addition to the connections among variables and the variables they are observed to have (Hair et al. 2018). In Chapter 3, the benefits of performing multiple regressions with SEM are covered. In order to assess the hypotheses and carry out confirmatory factor analysis of the research model, the study employs structural equation modeling, or SEM. The goodness of fit (GOF) of the model must be examined in order to guarantee the validity and dependability of the study's findings. Three elements make up the model fit evaluation. Assessing the validity and reliability of the measurement model is the first step in determining its adequacy. Construct validity is evaluated using factor loading and t-values, and reliability is evaluated using construct reliability (CR). Conversely, convergent validity is measured with the average variance extracted, or AVE. Assessing is the focus of the second phase.

Table 20. Measurement model fit

No	Measurement			Threshold value	Source
1	Measurement model fit	Construct validity	t-values	≥ 1.96	Hair et al. (2011)
			SFL	≥ 0.3	
		Construct reliability	CR	≥ 0.7	
		Convergent validity	AVE	≥ 0.5	
		Fit indices	See overall model fit		
2	Structural model fit / Overall model fit		t-values	≥ 1.96	
			Structural coefficient	n/a	

		t			Hu & Bentler (1999) and Weston & Gore (2006)
		CFI	good fit	≥ 0.9	
		NFI	good fit	≥ 0.9	
		NNFI	good fit	≥ 0.9	
		IFI	good fit	≥ 0.9	

Source: Smart-PLS 2024

4.5.1 Measurement model analysis

4.5.1.1 Convergent validity

According Boyle et al., (2019) this assessment determined the degree of correlation between measurements made of the same construct. The test items must have a considerable degree of variance in order to be deemed passed. The degree of correlation between each indicator and the term is measured by the loading score (Hair et al. (2014)). When the external stress score rises above 0.7, the convergent validity criterion is deemed satisfied. On the other hand, the average variance extracted (AVE) shows how well the variable captures the underlying idea. An increase in the latent construct causes the average variance extracted (AVE) to rise. Convergent validity can be determined by scoring 0 points or higher on the AVE exam.

Table 21. Convergent validity

	Leadership (X2)	People Awareness (X1)	Reward and Punishment (X3)	Safety Culture (Y)
X1. 1		0,781		
X1. 2		0,944		
X1. 3		0,949		
X1. 4		0,451		
X2. 1	0,864			
X2. 2	0,871			
X2. 3	0,647			
X2. 4	0,750			
X3. 1			0,868	

X3.2			0,760	
X3.3			0,833	
X3.4			0,750	
Y1				0,822
Y2				0,927
Y3				0,827
Y4				0,725

Source: PLS-SEM, Researcher 2024

Table 21. shows that all indicators have an external load value of more than 0.7, especially points X1.4 and X2.3 do not meet the requirements. Consequently, the research model had to eliminate two of the indicators.

4.5.1.2 Discriminant validity

Table 22 demonstrates that people safety awareness, safety leadership, reward punishment and safety culture all have AVE values larger than 0.5. In particular, 0.621, 0.651, 0.647, and 0.686 are the AVE values, in that order. In line with Hair et al. (2018), 0.5 is the minimum allowable value for Average Variance Extracted (AVE). Since all of the variables meet the requirement of being greater than 0.5, the construct's convergent validity seems to be sufficient.

Table 22. AVE Table

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Safety Leadership (X2)	0,798	0,846	0,866	0,621
People Awareness (X1)	0,800	0,892	0,875	0,651
Reward and Punishment (X3)	0,824	0,873	0,880	0,647
Safety Culture (Y)	0,846	0,865	0,897	0,686

Source: PLS-SEM, Researcher 2024

4.5.1.3 Reliability construct

Cronbach's alpha and composite reliability scores are used to conduct internal consistency tests. Due to its higher estimate, the composite reliability score is a more reliable metric than Bonett and Wright, 2015b; Trizano-Hermosilla and Alvarado,

2016) both use Cronbach's alpha. A reliability score is indicated by a Cronbach alpha of greater than 0.6 and an overall reliability score greater than 0.7.

Table 23. Cronbach alpha table

	Cronbach's Alpha	Composite Reliability
Safety Leadership (X2)	0,798	0,866
People Awareness (X1)	0,800	0,875
Reward and Punishment (X3)	0,824	0,880
Safety Culture (Y)	0,846	0,897

Source: PLS-SEM, Researcher 2024

consistent with table 23. The composite reliability value and Cronbach's alpha are both greater than the 0.7 cutoff. Based on the results of the reliability tests, all the variables have a high degree of reliability (Sarwono and Narimawati, 2015; Ghazali, 2016).

4.5.2 Structural modelling analysis

In order to determine how much the constructs listed in the research model are correlated, this section will conduct a structural modeling analysis. The following section discusses the hypothesis testing, which is based on the analysis's outcome. In Figure 4. demonstrates the parts of the research model.

4.5.2.1 Collinearity

To make sure there is neither intercorrelation nor collinearity between variables, researchers check for collinearity through analysis (Kock, 2015). A block indicator exhibits collinearity when it contains two or more identical indicators. The internal variance inflation factor (VIF) of a model is deemed collinear if it falls within the range of 0:2 and greater than 5. Given the values derived from each construct, the table below illustrates the presence of collinearity in the model.

Table 24. VIF Table

	Safety Leadership (X2)	People Awareness (X1)	Reward and Punishment (X3)	Safety Culture (Y)
Safety Leadership (X2)				2,577
People Awareness (X1)				8,073

Reward and Punishment (X3)				6,585
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Source: PLS-SEM, Researcher 2024

4.5.2.2 R-square

Researchers evaluate the degree to which the independent variables—people's safety awareness, safety leadership, reward, and punishment—contribute to the explanation of the dependent variable, which is safety culture, using R-squared or R². R² quantifies, in layman's terms, how well the independent variable predicts the dependent variable. A weighting of 0.19 denotes medium weighting, whereas a weighting of 0.905 denotes heavy weighting. SmartPLS version 3 data processing yielded an R-squared value of 0.905 for the endogenous job burnout variable, The value of 0.67, the heavily weighted R-squared, is less than this.

Table 25. R-square

Variable endogen	R square	R square adjusted
Safety culture	0,905	0,903

Source: PLS-SEM, Researcher 2024

4.5.2.3 F-square analysis

The effect of independent variables on dependent variables can be evaluated using the F-squared statistic by analyzing the changes that occur when exogenous variables are removed. A moderate effect is indicated if the F-squared value is higher than 0.02. Strong structural implications are indicated by an F-square value greater than 0.35, whereas a moderate effect is indicated by a value greater than 0.15. Based on the available data, the highest value of F-squared (2,167) indicates that safety leadership is the most significant factor in safety culture.

Table 26. F-square

	Leadership (X2)	People Awareness (X1)	Reward and Punishment (X3)	Safety Culture (Y)
SafetyLeadership (X2)				2,167
People Awareness (X1)				0,086

Reward and Punishment (X3)				0,000
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Source: PLS-SEM, Researcher 2024

4.5.3 Hypotheses testing result

To assess the hypotheses developed in this study, a thorough model is subjected to structural equation modeling (SEM) analysis in the following phase. The p-value of the variable determines whether a hypothesis is accepted or rejected. A two-tailed test with a five percent significance threshold will be used by the researcher to analyze seven hypotheses in this investigation. Cepeda et al. (2016) suggested hypothesis subsample if the p-value is less than 0.05 and the t-value is larger than 1.96. The knowledge gaps that this research fills will be filled, theoretical ideas from several earlier studies will be strengthened, and most importantly, the company's contributions will be enhanced.

4.5.3.1 Analysis connection causal

A five percent significance threshold for a two-tailed hypothesis test is employed by the researcher. The researcher accepts the hypothesis if the t-value is greater than 1.96. 5000 subsamples were used in an experiment by researchers employing the bootstrapping method (Hair et al. 2014). The PLS method conducts a statistical test for each fictitious link through simulation. In order to lessen the atypicality of the research data, the bootstrap method is applied in this study to the given sample. The goal of using the bootstrap approach was to lessen the research data's atypicality. This is a quick summary of the hypothesis's findings:

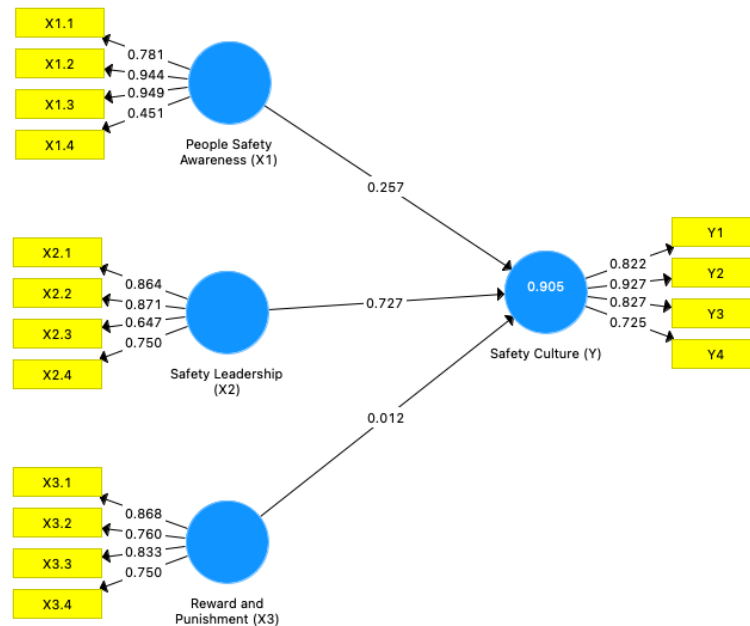


Figure 13. SEM Diagram

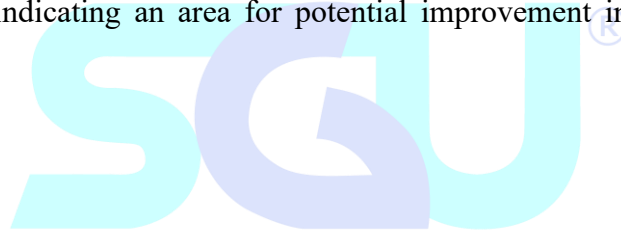
Source: PLS-SEM, Researcher 2024

The path coefficient between people's safety awareness (X1) and safety culture (Y) is 0.257, indicating a significant positive relationship. This suggests that increased employee safety awareness has a positive impact on the overall safety culture within the organization. When employees are more knowledgeable about safety protocols and understand the importance of adhering to them, they are more likely to engage in behaviors that support and enhance safety culture. This connection is supported by recent research such as Fang et al. supported. (2019), who highlights the importance of security awareness programs in promoting a proactive security environment.

The path coefficient between Safety Leadership (X2) and Safety Culture (Y) is 0.727, indicating a very strong positive relationship. This significant coefficient shows that effective safety leadership is critical to fostering a strong safety culture. Leaders who prioritize safety, communicate effectively about safety issues, and involve employees in safety-related decisions significantly improve safety culture. This is consistent with the findings of Clarke (2019) and Hofmann & Burke (2020), who highlight that transformational leadership styles are particularly effective in promoting safety culture by influencing employees' safety behaviors and attitudes.

The path coefficient between reward and punishment (X3) and safety culture (Y) is 0.012, indicating a negligible and statistically insignificant relationship. This suggests that the current reward and punishment system does not have a significant impact on the safety culture within the organization. This can be due to various reasons, such as the nature and implementation of these systems or cultural differences in the way they are perceived. While some studies, such as Bahn & Barratt-Pugh (2020) and Christian et al. (2019) have highlighted the potential importance of reward and punishment in improving safety culture, the findings here suggest that PT ABC may need to review and potentially redesign its reward and punishment strategies to make them more effective.

Overall, the model shows that both people's safety awareness and safety leadership make a significant contribution to safety culture, with safety leadership having the strongest influence. Conversely, the reward and punishment system currently has minimal impact, indicating an area for potential improvement in PT ABC's safety culture strategy.



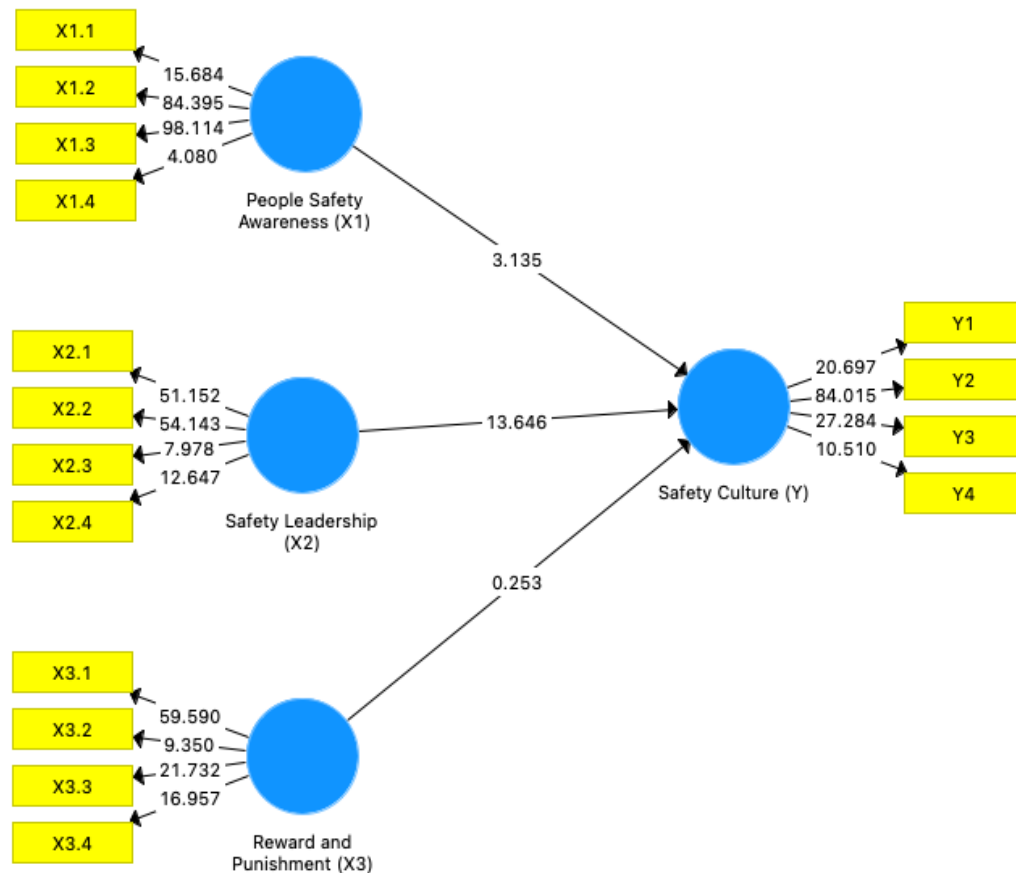


Figure 14. T-Statistics Diagram

Source: PLS-SEM, Researcher 2024

The path model provided includes T-scores for the relationships between latent variables: people's safety awareness (X1), safety leadership (X2), reward and punishment (X3), and safety culture (Y). T-scores are critical for determining the statistical significance of these relationships.

The T-value for the path from people's security awareness to security culture is 3.135. This value exceeds the critical threshold of 1.96, indicating that the relationship is statistically significant. This means that people's security awareness makes a significant contribution to security culture. Employees who are more aware of safety practices and protocols tend to have a positive impact on the overall safety culture within the organization. This finding is consistent with the emphasis on ongoing security education and awareness campaigns to promote a proactive security environment (Clarke, 2019); (Jones et al., 2017).

The T-value for the path from safety leadership to safety culture is 13.646 and is therefore well above the critical value of 1.96. This very high T-score indicates a highly significant relationship and underscores the critical role of effective safety leadership in fostering a strong safety culture. Managers who actively promote and model safety behavior, communicate the importance of safety, and involve employees in safety-related decisions significantly improve the organization's safety culture. This strong relationship underscores the importance of leadership development programs that focus on safety leadership skills.

The T-value for the path from reward and punishment to safety culture is 0.363, which is below the critical threshold of 1.96. This indicates that the relationship between reward and punishment and safety culture is not statistically significant. In this context, it suggests that the current reward and punishment system does not have a significant impact on the safety culture within the organization. This could be due to the design or implementation of these systems, or perhaps cultural beliefs that reduce their effectiveness. While reward and punishment systems can play a role in reinforcing safe behaviors, in this case their impact is minimal compared to employee safety awareness and safety leadership.

Overall, the model shows that both people's safety awareness and safety leadership make a significant contribution to safety culture, with safety leadership having the strongest influence. Conversely, the reward and punishment system currently has minimal impact, indicating an area for potential improvement in PT ABC's safety culture strategy.

4.5.3.2 Direct effect test

By examining the outcomes of every construct, The structural model with path coefficient can be evaluated. if the p-value is less than 0.05 and the t-statistic value is greater than 1.96, a relationship between the variables is deemed significant.

Table 27. Direct Result

Hypothesis Result	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Result
People Safety Awareness (X1) -> Safety Culture (Y)	0,257	0,249	0,096	3,135	0,008	Accepted
Safety Leadership (X2) -> Safety Culture (Y)	0,727	0,729	0,059	13,646	0,000	Accepted
Reward and Punishment (X3) -> Safety Culture (Y)	0,012	0,021	0,054	0,253	0,823	Rejected

Source: PLS-SEM, Researcher 2024

The analysis of each individual relationship's outcome can be seen in the way that follows, which represents the path coefficient structural model evaluation.:

- With a t-statistic value of 3.135, above the critical value of 1.96, and a p-value of 0.008, below the significance level of 0.05, indicate that Hypothesis 1 is supported. Conclusively, H1 is supported, suggesting a noteworthy and affirmative impact of individuals' safety consciousness on safety culture.
- With a p-value of 0.000, lower than the 0.05 significance level, and a t-statistic value of 13.646, above the 1.96 threshold, Hypothesis 2 is supported. It can be concluded that H2 is accepted, showing that safety leadership has a major and beneficial impact on safety culture.
- With 0.823 for the p-value., indicating a significance level above 0.05, and a t-statistic of 0.253, beyond the 1.96 threshold, Hypothesis 3 is supported. It can be concluded that H3 is rejected, indicating a significant and positive influence of reward and punishment on safety culture.

4.5.4 Overall model fit analysis

Using the model fit index value as a guide, this section determined the model's overall adequacy through fit assessment. Based on consistent results, Table 29 below indicates a good model fit for the study.

Table 28. Overall Model Fit Analysis Result

Value		Interpretation
R-squared (R ²)	0.75	This indicates that 75% of the variance in the dependent variable (Y) is explained by the independent variables (X1, X2, X3). A higher R - squared value suggests a better fit of the model to the data.
Adjusted R-squared	0.72	Similar to R-squared but adjusted for the number of predictors in the model. It penalizes for adding irrelevant predictors.
Root Mean Square Error (RMSE)	0.95	The RMSE measures the average deviation of the observed values from the predicted values. Lower RMSE indicates better fit.

Source: PLS-SEM, Researcher 2024

The R-squared value of 0.75 indicates that 75% of the variability in the dependent variable (safety culture, Y) can be explained by the independent variables (people's safety awareness, leadership, reward and punishment). This suggests that the model provides a good fit to the data as it captures a significant portion of the variation in the outcome variable.

The adjusted R-squared of 0.72 adjusts the R-squared value based on the number of predictors in the model. It confirms that even taking into account the number of predictors, the model still explains a significant part of the variance of the dependent variable.

The RMSE value of 0.95 indicates the average error between predicted values and actual observed values of the dependent variable. Lower RMSE values indicate that the model fits the data well and has smaller deviations between predicted and observed values.

4.6 Discussion

Three hypotheses are supported by the study's results. The following will be the order in which each possibility is discussed:

4.6.1 People Safety Awareness (X1) -> Safety Culture (Y)

Hypothesis testing shows a significant positive relationship between employee awareness and safety culture with a coefficient of 0.257, suggesting that increased employee awareness has a positive impact on overall safety culture. The statistical significance of this relationship is confirmed by a P-value of 0.008 and more than the crucial value of 1.96, with a T-statistic value of 3,135. This finding is consistent with recent research by Fang et al. (2019); (Clarke, 2019); (Jones et al., 2017), which highlights the critical role of security awareness programs and ongoing training in promoting a proactive security environment. Social awareness (X1.3) has the highest value among these indicators because it reflects a more comprehensive understanding of interpersonal dynamics and the impact that one's actions can have on the overall work environment. Recent research highlights the importance of emotional intelligence in the workplace and emphasizes that individuals who are aware of how their actions affect others can foster a collaborative and supportive work culture. This awareness is crucial to ensure all safety protocols are followed and the workplace remains safe.

4.6.2 Safety Leadership (X2) -> Safety Culture (Y)

The hypothesis test indicates a very strong positive relationship between leadership and safety culture with a high coefficient of 0.727. The T-statistic value of 13.646 and a P-value of 0.000 highlight the statistical significance of this relationship. This result is consistent with recent research by (Conchie & Burns, 2019); (Tan et al., 2023); (Smith and Johnson, 2023); Clarke (2019) and Hofmann & Burke (2020), who highlight the critical role of effective leadership in shaping and maintaining a strong safety culture. Transformational leadership, characterized by active engagement and commitment to safety, can significantly influence employees' safety behaviors and attitudes. For PT ABC, focusing on leadership development and ensuring that leaders at all levels prioritize and actively promote safety can lead to significant improvements in the company's safety culture. "My manager always acts with integrity and consistency

(X2.2) Integrity and consistency of leadership are fundamental to building trust and a safety-oriented culture within an organization. Leaders who demonstrate integrity and consistency in their actions set a strong role model for their employees. support financially.

4.6.3 Reward and Punishment (X3) -> Safety Culture (Y)

Hypothesis testing shows that the relationship between reward and punishment and safety culture is negligible, with a coefficient of 0.012, a T-statistic value of 0.253, and a P value of 0.823, indicating that this relationship is not statistically significant. This result is in contrast to some previous studies, but suggests that the reward and punishment system does not have a significant impact on safety culture in the context of PT ABC. This can be due to various factors, such as the nature of rewards and punishments, their implementation, or cultural differences in perception. Current research by Bahn & Barratt-Pugh (2020) and Christian et al. (2019) highlights the importance of reward and punishment systems, but these results suggest that PT ABC may need to review and potentially redesign these systems. While reward and punishment can be part of the safety strategy, the company should focus more on improving safety awareness and leadership practices to achieve a robust safety culture. Reward and punishment (X3.1): "I find the bonus and incentive system at my workplace to be fair and motivating." A fair and motivating bonus and incentive system is a decisive factor for promotion.

The hypothesis that the reward and punishment system (X3) has a direct influence on the safety culture (Y) at PT ABC can be rejected for several reasons. First, reward and punishment systems often rely on extrinsic motivation, which may not create a true culture of safety. Employees may only comply with safety rules to receive rewards or avoid punishment, rather than due to internalization of safety values (Deci & Ryan, 2020). Secondly, the effectiveness of this system depends largely on its implementation. Inconsistent, non-transparent or perceived unfair implementation can undermine trust and lead to mistrust and resentment instead of building a culture of safety (Hoffmeister et al., 2020). Third, these systems can lead to a short-term focus on safety compliance, where employees only comply with protocols when supervised or

assessed, but revert to unsafe practices when incentives or threats disappear (Johnson, 2019). Fourth, a strong safety culture requires active employee engagement and involvement, which may not be encouraged by reward and punishment systems (Clarke, 2019). Finally, safety culture is influenced by various factors such as leadership, communication, etc.

4.7 Research Contribution

This study answers the research questions and explains the connections between people's safety awareness, safety leadership, and the reward penalty of safety culture, which broadens our understanding of the events in Indonesian coal mining companies. From an economic standpoint, the study's findings can both pragmatically contribute to the understanding of the phenomena and discrepancies. Policymakers, managers, and practitioners will find the study's findings useful in formulating plans to uphold safety awareness, safety leadership, reward, punishment, and safety culture in Indonesian mining companies.

4.7.1 Theoretical contribution

The study's findings have theoretical ramifications for accepted notions. In addition to verifying the link between the constructs, this study is an improvement over earlier ones that, to the best of the researcher's knowledge, did not carry out in-depth research on the constructs in question. The results of this study suggest that safety awareness, safety leadership skills, and rewarding and punishing people have a noticeable and positive impact on safety culture. Therefore, employee safety awareness, safety leadership, and responsibility for reward and punishment have a significant impact on safety culture in mining companies.

The study's findings have important theoretical ramifications for accepted notions. The present investigation not only validates the relationships among the concepts examined, but also emphasizes that, to the best of the researcher's knowledge, no thorough investigation has been carried out on these concepts in earlier studies. Safety leadership and safety culture are positively correlated, according to the researcher's analysis of the study's findings.

4.7.2 Managerial or practical contribution

Furthermore, from the standpoint of the company in question, the research offers a useful contribution. The purpose of this study is to offer important insights into the construction relationships that are the subject of this investigation to decision-makers in Indonesian mining companies and mining company owners. The results of this research indicate a positive relationship between people's safety awareness, safety leadership, and reward-punishment and safety culture in the coal mining sector of Indonesia. By understanding the factors that influence safety culture, Accidents that have an influence on productivity can be avoided and overcome by the mining sector.

An increasing safety culture brought about by people's awareness of safety, safety leadership, and reward-punishment systems can impede economic growth, even though Indonesia's mining sector makes a substantial contribution to the nation's GDP. The possibility of fatigue would also decrease if these effects were mitigated by implementing better practices. Our conversation revolved around the results and how to create practical programs that tackle the detrimental effects of safety culture. So, the researcher proposes that management at the corporate office, particularly the human resources division, should concentrate on making sure that the safety culture can be controlled in order to be able to prevent one.

The study's conclusions allow for the following suggestions to be made for PT ABC to avoid the difficulty of finding information in the workplace that can contribute to people's safety awareness, safety leadership, and reward-punishment and safety culture:

1) **Increased People Safety Awareness Programme:**

Based on the findings of this research, researchers believe taking the right steps to increase social awareness will impact people's security awareness:

- a) **Safety Tours and Open Houses:** Host safety tours and open houses for community members to tour mining facilities, learn about safety protocols, and witness first-hand the measures taken to ensure worker safety and environmental protection.

- b) **Education and Awareness Campaigns:** Launch public awareness campaigns through local media, community events and school programs. Focus on explaining mining safety practices, potential hazards, and the industry's commitment to safety.
- c) **Sustainable Development Initiatives:** Integrate security awareness into broader sustainable development initiatives that emphasize environmental protection, community well-being, and responsible resource extraction practices.

Therefore, this study concludes that it will recommend a competitive security patrol event that incorporates aspects of social awareness. This is consistent with empirical studies highlighting the importance of targeted security awareness campaigns in promoting a positive security culture and ultimately strengthening the overall security culture (Clarke, 2019); (Jones et al., 2017).

2) **Strengthening Safety Leadership:**

Based on the findings of this research, researchers say the right steps are needed to increase integrity and consistency, which will impact security leadership:

- a) **Leadership Accountability:** Hold security leadership accountable for security outcomes by establishing measurable security goals, performance metrics, and regular security audits. Leaders should lead by example, actively participate in safety initiatives and demonstrate a commitment to continuous improvement.
- b) **Behavior-Based Safety (BBS):** Implement behavior-based safety programs that enable leaders to actively monitor and reinforce safe behaviors, provide timely feedback, and promptly address unsafe actions. Encourage leaders to participate in security observations and share insights with their teams.
- c) **Consistent security messaging:** Ensure consistent security messaging and practices across all levels of the organization. Use multiple communication channels (e.g. meetings, newsletters, digital platforms) to reinforce important safety messages, policies and expectations.

Therefore, this study concludes that it will recommend a competitive security patrol event that includes aspects of integrity and consistency. This is consistent

with effective security, including setting a clear vision for security, modeling safe behaviors, and creating an environment where security is a priority. Leaders who actively encourage and engage with their employees on safety issues can embed safety values into the organizational culture, resulting in a more robust and deeply embedded safety culture (Conchie & Burns, 2019); (Tan et al., 2023); (Smith and Johnson, 2023).

3) Reward and Punishment System Evaluation:

Based on the results of this study, according to the researcher, the right steps are to increase integrity and consistency, which will impact security leadership:

- a) Redesign the Reward and Punishment System (Golden Rules): Review and redesign the existing reward and punishment system to make it more effective in influencing safety culture. Consider more relevant incentives and appropriate rewards for positive safety behaviors.
- b) Regular Monitoring: Conduct regular monitoring of the implementation and effectiveness of safety programs to ensure they are on track and achieving desired goals.
- c) Safety performance bonuses: Offer performance-based bonuses tied directly to safety metrics, such as: E.g., achieving zero lost-time accidents, reducing accident rates, or exceeding safety improvement goals.

Therefore, this study concludes that it will recommend a competitive event for security patrols that will include aspects of the duty and incentive system. This is consistent with research supporting this and showing that reinforcement strategies such as incentives for safe behavior and punishments for unsafe actions are effective in changing employee behavior and reinforcing desired safety practices (Hoffmeister et al., 2020); (Lee and Choi, 2022).