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The Influence of Work Safety Culture and Work Safety Monitoring System on Work Safety

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Abstract

In building construction, there are many things that must be considered, one of which is work safety due to construction industry is a highly hazardous environment. Early signs of an organization's commitment to safety policies are manifested in the safety culture of the organization. Improving contractor safety culture can reduce work accidents on construction industry projects. It is unclear how to improve safety culture among construction industries, practically. The purpose of this study was to analyze the influence of safety culture and its association with management commitment in monitoring system of work safety. Structural Equation Modeling (SEM) method was used by researchers in testing the relationship between the measured variables and the latent construct. According to the results of this study, it can be concluded that Work Safety Culture (X1) has an influence on Work Safety (Y) based on the t-value of 2.721 ≥ 1.64, Work Safety Culture (X1) has an influence on the Work Safety Monitoring System (X2) that verified with a t-value of 3.772, Work Safety Monitoring System (X2) has no effect on Work Safety (Y) based on a t-value of 1.195 < 1.64, and Work Safety Culture (X1) has no influence on Work Safety (Y) through the Work Safety Monitoring System (X2) with a t-value of 0,877. The results of this study can be used as the basis for implementing a safety culture in the company because it is proven to have an important role in work safety so that it is expected to reduce work accidents with the support of management who are committed to consistently carrying out work safety monitoring systems.

Keywords : construction; safety culture; work safety monitoring system; structural equation modeling

INTRODUCTION

The construction business is one of the most dangerous workplaces in the world, accounting for more than half of all industry-related accidents and deaths (Tadesse and Israel, 2016). As a result, construction companies are increasingly concerned about the rising likelihood of accidents and fatalities (Abdullah and Wern, 2011). According to Health and Safety Executive (HSE), 2017, despite a 30 percent decrease in construction industry mortality, this sector is still responsible for the highest number of deaths in the UK. 165 of every 1000 employees in India get wounded at work (Kanchana et al. 2015).

Over-reporting and a significant number of informal construction workers in Indonesia have led to inaccuracies in Indonesia's construction mortality and incidence rates. More than 50,000 workplace accidents were reported in Indonesian industry in 2015, with over a third of them occurring in the construction sector, according to official statistics (BPJS Ketenagakerjaan, 2016). In contrast, little research has been done on the Indonesian construction industry's safety culture. The lack of safety communication and a poor work environment were evaluated extremely poorly by respondents. Recently, the level of safety culture in Indonesian construction and infrastructure projects was evaluated; it found that the first example had greater levels than the second (4.51 against 4.38 vs. 6.00). (Loosemore et al, 2019). Workers' safety habits are strongly tied to their workplace's safety culture, which represents proactive indicators of safety performance.

Health and safety (H&S) can be enhanced with the goal of improving H&S performance; however, there is little information available on how H&S may be improved in practice. The challenge is worsened even further by the several theories of H&S culture and the continuous dispute over whether or not culture can be measured. Culture's

definition and assessment has been a contentious issue in recent years. Consequently, some people have resisted further research on the notion. This has a negative impact on the industry's ability to improve H&S performance.

Research on techniques to lower construction industry accident and death rates is critical. Creating and promoting a safety culture is one strategy to reduce the number of accidents and deaths (Kim et al. 2016). Workplace safety monitoring systems generally don't have a clear connection to culture. The majority of the time, current safety management systems fail to take behavioral aspects of safety into account (Talabi et al., 2015). However, managerial commitment (Zahoor, 2017) and safety behavior are two frequently described characteristics of safety culture and safety climate (Zahoor, 2017). (Zhang, 2017). In addition, it is not evident how construction companies may improve their safety culture realistically. Study's objective was to examine the impact of work-safety culture and managerial commitment on monitoring systems.

LITERATURE REVIEW

Safety Culture

Because of the wide range of possible interpretations of the term "culture," it has been made abundantly clear that it is a notoriously difficult one to define (Spencer-Oatey, 2012). In order to generate behavioral norms, an organization's structure and control systems interact with its safety culture, which is defined by the Institution of Occupational Safety and Health (IOSH) (2015). Safety culture, according to Nielsen (2014), is a point of view or part of the organization's culture that affects employees' attitudes and actions, which in turn affects the degree of safety in the workplace. In the context of workplace health and safety (H&S), safety culture refers to the fundamental or underlying values, assumptions, and beliefs of a company (or work site or work group) (Bluff, 2011).

According to Latief et al. (2017), the features of the project's safety culture, such as leadership, strategic plan, and employee behavior, have an effect on safety behavior, processes and systems, and performance. This demonstrates the importance of a safety culture. As Musonda et al. (2009) have shown, a good work environment leads to better health and safety outcomes for employees. In light of this, health and safety culture must be taken into account. As evidenced by research such as Chinda and Mohamed (2008), Baram & Schoebel (2007) and Fernandez-Muniz et al. (2006 and 2007), health and safety performance records have been linked to an increase in the culture of health and safety in the workplace. Organizations that have a positive health and safety culture have seen improved health and safety outcomes (Chinda and Mohamed, 2008).

Despite its many definitions, culture is largely accepted as a critical component of an organization's overall success. According to Chinda and Mohamed (2008), attempts to enhance an organization's health and safety record may not be achieved until the health and safety culture is addressed.

Measure Safety Culture

Using a variety of surveys, researchers were able to quantify safety culture. Safety culture is often reflected in the questions asked on questionnaires (Mohamed, 2002). In most cases, this poll results in an aggregate score that reflects employees' views on workplace safety. "Management commitment to safety," "safety training," "work risk level," "status as a security officer," "working speed," "safety status," "the influence of safe behavior on promotion, and [the] impact of safe conduct on social status" were all included in Zohar's original research (1980). Final result is a 40-item questionnaire with eight dimensions and a total of 40 items. Tested using samples from industry groups, it was shown to be a useful instrument for gauging workers' views of safety.

METHODS

This research was conducted at PT. X which is one of the largest construction companies in Indonesia with respondents of workers that exposed to significant safety problems. Data was collected using a questionnaire instrument that consists of 15 indicators based on previous researches with a Likert scale from 1-5 according to the opinion or statement of the respondent. To analyze the influence of safety culture and their association with management commitment in monitoring system of work safety, researchers use Structural Equation Modelling (SEM). This model has three main contents that are hypothesis testing, structural confirmation, and modeling analysis.

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RESULT AND DISCUSSION

PT X is a construction company that is often involved in several important government infrastructure projects spread across Indonesia and has many subsidiaries. Entering the 21st century, this company strives to advance its performance in every aspect, starting from the Management, Health and Safety, Human Resources, to more highly structured innovation and technology. One of these things can be started by analyzing the importance of safety culture and its association to management commitment.

Structural Equation Modelling (SEM) is a technique used by researchers in testing the relationship between the measured variables and the latent construct. Structural Equation Modeling (SEM) is grouped into two approaches, namely Covariance Based SEM (CBSEM) and Variance Based SEM or Partial Least Square (PLS). In this study, SEM PLS analysis was performed using the SmartPLS software.

Hypothesis

With Work Safety Culture as X1, Work Safety Monitoring System as X2 and Work Safety as Y, the hypothesis in this study is obtained as shown in Table 1.

Table 1. Hypothesis

Path	Hypothesis	
X1 → Y	H1.0	Work safety culture has a significant relationship to work safety
	H1.1	Work safety culture has no significant relationship to work safety
X1 → X2	H2.0	Work safety culture has a significant relationship to the work safety monitoring system
	H2.1	Work safety culture does not have a significant relationship with the work safety monitoring system
X2 → Y	H3.0	Work safety monitoring system has a significant relationship to work safety
	H3.1	Work safety monitoring system does not have a significant relationship to work safety
X1 → X2 → Y	H4.0	Work safety culture has a significant relationship to work safety through a work safety monitoring system
	H4.1	Work safety culture does not have a significant relationship with work safety through the work safety monitoring system

Outer Model

Figure 1 below is a picture of the structural model relationship that will be evaluated.

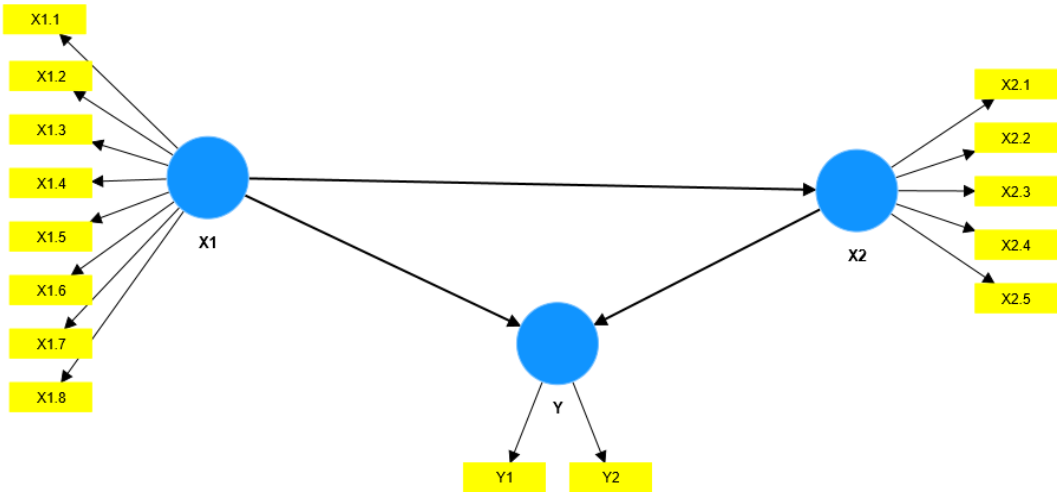

Figure 1. Outer Model

Convergent Validity

In the PLS SEM, validity and reliability tests were carried out using the PLS Algorithm. Convergent Validity must have a validity indicator as measured by the value of the Loading Factor, where if the Loading Factor is greater than 0.7 then the item is considered valid. The results of the Loading Factor values of this study are separated in each separate table. The Loading Factor values of all variables are shown in Table 2 below.

Table 2. Variable Validity Test

Variabel Latent	Indicator	Outer Loading	Conclusion
Work Safety Culture (X1)	X1.1	0.484	Not Valid
	X1.2	0.773	Valid
	X1.3	0.481	Not Valid
	X1.4	0.612	Not Valid
	X1.5	0.819	Valid
	X1.6	0.755	Valid
	X1.7	0.778	Valid
	X1.8	0.753	Valid
Work Safety Monitoring System (X2)	X2.1	0.884	Valid
	X2.2	0.854	Valid
	X2.3	0.752	Valid
	X2.4	0.906	Valid
	X2.5	-0.673	Not Valid
Work Safety (Y)	Y1	0.796	Valid
	Y2	0.928	Valid

Through Table 2 above, it is known that some variable items are declared invalid because the indicators X1.1, X1.3, X1.4, and X2.5 have an outer loading value < 0.70. Meanwhile, other indicators are declared valid because they have an outer loading value ≥ 0.70. Invalid indicators will be eliminated, thus forming a new outer loading value in Table 3 below.

Table 3. Variable Validity Test After Elimination

Variabel Latent	Indicator	Outer Loading	Conclusion
Work Safety Culture (X1)	X1.2	0.816	Valid
	X1.5	0.826	Valid
	X1.6	0.842	Valid
	X1.7	0.842	Valid
	X1.8	0.774	Valid
Work Safety Monitoring System (X2)	X2.1	0.909	Valid
	X2.2	0.892	Valid
	X2.3	0.844	Valid
	X2.4	0.894	Valid
Work Safety (Y)	Y1	0.781	Valid
	Y2	0.937	Valid

Discriminant Validity

The next stage is Discriminant Validity, which is carried out in testing the measurement model. Discriminant Validity is needed in measuring variables that are different from the items used in measuring other variables. The parameter used in Discriminant Validity is the AVE value, if the square root of the AVE of each variable is greater than the correlation between the two variables in the model.

Table 4. Correlation Value Between Variables

	X1	X2	Y
X1	0.820		
X2	-0.443	0.885	
Y	0.481	-0.343	0.862

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In addition to AVE, the value of Cross Loading is a necessary criterion in measuring Discriminant Validity which is used to determine how big the correlation between each variable and its indicators, as well as indicators of other block constructs.

Table 5. Cross Loading Correlation Value

	X1	X2	Y
X1.2	0.816	-0.317	0.325
X1.5	0.826	-0.471	0.585
X1.6	0.842	-0.302	0.391
X1.7	0.842	-0.286	0.273
X1.8	0.774	-0.368	0.256
X2.1	-0.367	0.909	-0.391
X2.2	-0.357	0.892	-0.194
X2.3	-0.332	0.844	-0.306
X2.4	-0.489	0.894	-0.300
Y1	0.291	-0.178	0.781
Y2	0.498	-0.372	0.937

Based on Table 5, it can be seen that the Cross Loading value in each indicator has a greater value with the variable, when compared to indicators from other block constructs, all items in this study have Discriminant Validity.

Reliability Test

Next is the stage of reliability testing which is a tool to measure the extent to which measurement results using the same object will produce the same data. Reliability test aims to measure the internal consistency of the measuring instrument. Cronbach's Alpha measures the lower limit of the reliability value in a construct, while Composite Reliability measures the actual value of reliability in a construct.

Table 6. Variable Reliability Test

Variabel Latent	Cronbach's Alpha	Composite Reliability
X1	0.882	0.911
X2	0.908	0.935
Y	0.678	0.852

Based on Table 6 above, it is known that all items in this study have met the reliability criteria because the Cronbach's Alpha and Composite Reliability values have values greater than 0.6. So it can be concluded that all variables and indicators in this study are valid and reliable.

Model Testing

Structural model testing (assessment of the structural model) or inner model testing aims to examine the effect of one variable with other variables. Structural model testing is done by looking at the path, whether the influence is significant or not by looking at the t value of the path obtained through the Bootstrapping process.

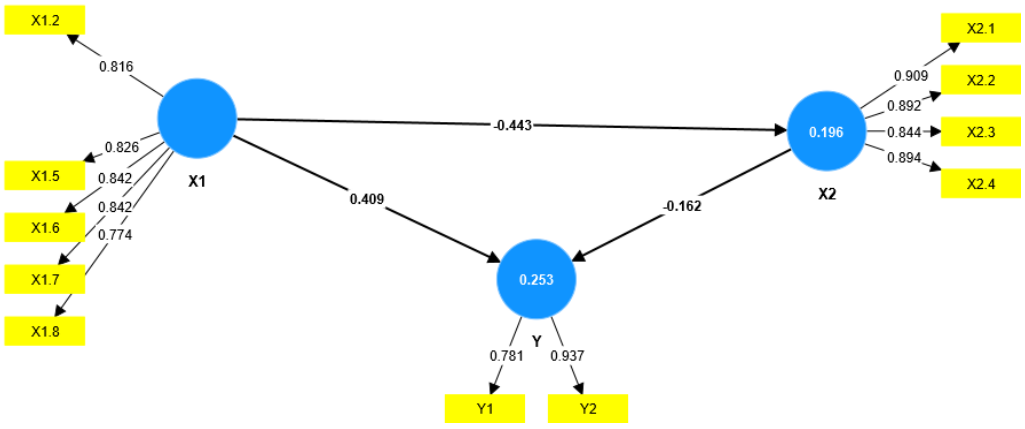

Figure 2. Inner Model

The results of testing the structural model, Path coefficient and t value are shown in Table 7 below.

Table 7. Path Coefficient and t Value

Path	Standard Deviation	T statistics	P values	Conclusion
X1 → Y	0.151	2.721	0.007	H1.0 accepted
X1 → X2	0.118	3.772	0.000	H2.0 accepted
X2 → Y	0.135	1.195	0.232	H3.0 rejected
X1 → X2 → Y	0.082	0.877	0.380	H4.0 rejected

In Table 7, the variables that influence significantly and positively are marked in black. While the red color means variables that are not significant. This study measures the significance at the 95% confidence level through the one-tailed test. If the study uses the one-tailed hypothesis (one-tailed test), then the t-value ≥ 1.64.

Hypothesis 1 was verified based on the t-value of 2.721 with a 95% confidence level. Considering the path coefficient value of 0.007, it can be concluded that X1 has a significant relationship to Y, meaning that Work Safety Culture has an influence on Work Safety. This finding correlates with the results of Guldenmund's research in Tehrani (2019) which believes that the establishment of an appropriate safety culture in individual organizations is an important strategy to reduce workplace accidents. In general, organizations with a strong culture of safety and continuous improvement perform better in preventing individual and organizational accidents (Martin, 2019).

Hypothesis 2 is verified with a t-value of 3.772 and shows that X1 has a significant relationship with X2, meaning that Work Safety Culture has an influence on the Work Safety Monitoring System. The monitoring system in this case is the leadership of contractors and other stakeholders having a significant impact on safety culture (Wu, 2016).

Based on t-value of 1.195 < 1.64, hypothesis 3 shows X2 does not have a significant relationship with Y, meaning that the Work Safety Monitoring System has no effect on Work Safety. And X1 does not have a significant relationship with Y through X2, meaning that Work Safety Culture has no influence on Work Safety through the Work Safety Monitoring System with t-value of 0.877.

CONCLUSION

In the present study, researchers tried to find out the influence of safety culture and its association with management commitment in construction projects. For this purpose, an approach based on structural equation modeling was used. There are eight indicators of Work Safety Culture (X1), five indicators of Work Safety Monitoring System (X2) and two indicators of Work Safety (Y). For Convergent Validity test, there are four indicators that not valid due to Loading Factor have values less than 0.7, and after being eliminated 11 indicators remain valid. For reliability test, resulted that all items have met the reliability criteria because the Cronbach's Alpha and Composite Reliability values have values greater than 0.6 so it can be said that all variables and indicators are valid and reliable. According to the results of this study, it can be concluded that Work Safety Culture (X1) has an influence on Work Safety (Y) based on the t-value of 2.721 have greater than 1.64 so Hypothesis 1 is accepted. Work Safety Culture (X1) has an influence on the Work Safety Monitoring System (X2) that verified with a t-value of 3.772. But, Hypothesis 3 is rejected, in other words Work Safety Monitoring System (X2) has no effect on Work Safety (Y) and Work Safety Culture (X1) has no influence on Work Safety (Y) through the Work Safety Monitoring System (X2) that means Hypothesis 4 is rejected as well. The results of this study can be used as the basis for implementing a safety culture in the company because it is proven to have an important role in work safety so that it is expected to reduce work accidents. In addition, management's commitment to continue to implement a work safety monitoring system has also been proven to have a significant impact on safety culture.

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