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ANALYSIS OF ENABLING FACTORS ON SAFETY AWARENESS AND COMPLIANCE OF THE USE OF PPE IN PLASTIC SACK INDUSTRY WORKERS USING THE PLS-SEM METHOD

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Abstract: A work accident is an unwanted and unanticipated event that can result in loss of life or property. The high incidence of work accidents can be caused by a lack of worker awareness of work safety. One of the elements in the PRECEDE-PROCEED behavior change theory, namely enabling factors, are factors that facilitate behavior or activities, such as providing facilities and infrastructure for workers to prevent work accidents. This study aims to ascertain the effect of enabling factors consisting of the availability of personal protective equipment (PPE) and training on safety awareness and adherence to the use of personal protective equipment (PPE) in plastic sack industry workers. This research is analytic using the PLS-SEM method. In this study, 81 participants were selected using a proportionate random sampling technique so that the number of samples used was comparable to the population in each sub-group using a questionnaire. Significant influences were observed in the results regarding the relationship between enabling factors and compliance with the utilization of personal protective equipment (PPE) (p-value = 0.000), as well as safety awareness (p-value = 0.000). Additionally, a significant influence was found between safety awareness and compliance with the use of personal protective equipment (PPE) (p-value = 0.019). Moreover, enabling factors were determined to influence compliance with PPE utilization through awareness (p-value = 0.035).

1. INTRODUCTION

The Minister of Manpower of the Republic of Indonesia's Regulation No. 03/MEN/1998 on Reporting and Examination Procedures defines a workplace accident as an unforeseen event that can result in human or property losses. Accidents have increased by 5% annually, as reported by the Director General of Labor Inspection and Occupational Safety and Health and the Ministry of Manpower. Accidents on the job frequently occur due to a lack of company participation to secure employees [1]. However, a lack of worker awareness of

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workplace safety can also lead to violations of established regulations, such as the improper use of PPE [2].

An individual's awareness of workplace safety when using personal protective equipment could be influenced by behavioral factors. The Precede-Proceed theory of behavior change, devised in 1980 by Lawrence W. Green, supports this notion. Enabling factors are one of the factors that influence a person's behavior. Enabling factors enable or facilitate behavior or activities, such as supplying facilities and infrastructure for workers to prevent workplace accidents [3].

Several complex factors can contribute to safety-related accidents, including a lack of safety awareness, which is identical to a lack of safety education. Understanding safety awareness can help improve safety behavior. Another study found a correlation between behavior and occupational safety and health consciousness [4]. The cultivation of self-awareness has the potential to enhance individuals' adherence to the utilization of personal protective equipment.

Regulation of the Minister of Manpower and Transmigration of the Republic of Indonesia No. PER.08/MEN/VII/2010 defines Personal Protective Equipment (PPE) as a specialized apparatus designed to effectively shield specific body parts or the entirety of an individual's physical being from the hazards of working environments. According to the Indonesian National Standard, employers are obligated to furnish personal protective equipment (PPE) to their employees or workplace standards applicable to all employees, as stated in the regulation. Utilizing PPE is one method for preventing workplace accidents. In actuality, however, numerous workers still ignore the importance of PPE and do not wear it. This is the reason why the number of accidents is rising [5].

Manufacturing companies use machinery, equipment, and labor to transform basic materials into marketable goods [6]. Mojokerto is the location of the enterprise that manufactures jumbo bags and woven bags. At various phases of every production process, the use of automatic and manual machines can cause workplace accidents. According to the company's 2018-2021 accident data, the extruder, printing, and needle-loom divisions have the highest accident rates compared to other divisions. According to the company's data on unsafe actions, the preponderance of accidents can be attributed to actions that were deemed unsafe. This is consistent with H.W. Heinrich's assertion that 80% of workplace incidents are the result of unsafe actions [7]. The primary factor contributing to unsafe action accidents in the plastic sack industry is the improper use of personal protective equipment (PPE).

Observations and interviews conducted by researchers with the company also revealed the same results. The data indicates that many employees still lack safety awareness due to their ignorance and sensitivity to potential hazards, so they violate work procedures, including personal protective equipment. In addition, it was discovered that employees involved in the production of plastic sacks did not use entire personal protective equipment.

This study uses SEM (Structural Equation Modeling), a second-generation multifaceted analysis of data approach, to investigate the relationship between latent variables [8]. CB-SEM (Covariance-Based SEM) and Variance-Based SEM, also referred to as PLS (Partial Least Squares), are two methods for evaluating associations between variables [9]. PLS is an efficient analytical technique because it is independent of the scale of measurement (e.g., interval or ratio scale), sample size, and residue distribution [10],[11]. The PLS algorithm modifies anomalous data using the central limit theorem, allowing PLS-SEM to be applied to such data.

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This literature review aims to analyze the enabling factors, such as the availability of personal protective equipment and training on safety awareness and compliance with the use of PPE among workers in the plastic sack industry using the PLS-SEM method.

2. LITERATURE REVIEW

2.1. Enabling Factor

Enabling factors are those that enable or facilitate behavior or activities, such as providing infrastructure and facilities for employees to prevent workplace accidents [3]. In Law no. 1 of 1970, article 14 point c states that administrators (employers) are required to provide free of charge, all necessary PPE for employees under their supervision and supply it to all visitors to the workplace along with appropriate instructions of supervisory officials or occupational safety experts. According to Azizah et al. [12], it will be difficult for employees to comply with the use of PPE if the organization does not provide the necessary facilities. This is supported by the findings of Rose and Rae [13], which indicate that some employees believe the lack of PPE availability is one reason they do not use it.

Training is an effort to broaden knowledge, modify behavior, and improve skills that must be supplemented with teaching aids/tools used in the educational process based on the concept that individuals learn and retain existing knowledge through their five senses [14]. In addition, it is one of the most effective methods for influencing human behavior to develop secure work practices. This is supported by the findings of Fassa and Rostiyanti [15], who discovered that OSH training can influence the safety awareness of project employees.

2.2. Compliance of The Use of PPE

According to the Big Indonesian Dictionary (KBBI), obedience is derived from the word "obey," which means to obey orders, to heed orders or rules, and to practice discipline. In the meantime, obedience implies obedience, compliance, and adherence to teachings and regulations. According to Kaplan and Sadock [16], compliance is the level to which an individual complies with existing regulations. Compliance with the use of PPE is the willingness of an individual to follow the rules that have been regulated and established by the organization when using a set of safety equipment for protecting part or all of the body from the risks of work-related accidents and diseases [17].

According to the Regulation of the Minister of Manpower and Transmigration of the Republic of Indonesia No. PER.08/MEN/VII.2010, personal protective equipment (PPE) is any item that can shield its wearer from harm by isolating one organ or the entire body. The Occupational Safety and Health Administration (OSHA) also defines Personal Protective Equipment (PPE) as a fundamental instrument to safeguard workers against potential harm or ailments from exposure to various workplace hazards. These hazards include biological, electrical, physical, radiation, mechanical, chemical, and other potential dangers. In accordance with company regulations, workers must use haircaps/safety helmets, sanitary masks/masks, earplugs, wearpacks, safety gloves, and shoes/safety shoes.

2.3. Safety Awareness

Safety awareness is the consciousness of employees who take action to maintain and enhance safety conditions in the workplace, as well as their responsibility for the risks of hazards in performing work and reducing losses caused by work. The issue of safety awareness

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has been considered crucial for all employees to implement within the organization. The socialization of the significance of work safety awareness is intended to eliminate accidents caused by using company equipment, negligence in safeguarding oneself from the risk of operating equipment, and dangers caused by reckless and lethal behavior. An employee's awareness of the necessity of using personal protective equipment, also known as PPE, is an example of safety consciousness [18].

3. METHODOLOGY

The method used in this research is a quantitative investigation using the Partial Least Squares-Structural Equation Modeling (PLS-SEM) method. This method is a technique for analyzing data that aids in studying the interrelationships between variables. Evaluation of the PLS-SEM model considers both the inner model (structural model) and outer model (measurement model) models. The outer model evaluation consists of convergent validity and discriminant validity. Convergent validity consists of testing individual item reliability which is considered to be a valid indicator if the loading factor value is ≥ 0.7, internal consistency reliability which has a limit value to be accepted by Cronbach's Alpha dan composite reliability ≥ 0.7, and average variance extracted (AVE) with minimun value of 0.5 to indicate a measure of good convergent validity [19].

The evaluation of an inner model shows how latent variables are related [20]. Inner model evaluation consists of three testing steps, the t-test with a t-statistics value ≥ 1.96 and a p-value ≤ 0.05 to indicate that the variables impact one another. Then, R-squared (R^2) is evaluated to identify the amount of variability of endogenous variables that can be explained by exogenous variables with criteria of 0.67 (substantial), 0.33 (moderate), and 0.19 (weak). The last one is the goodness of fit (GOF), the GOF value stretches between 0 and 1 with the interpretation of the values, namely 0.1 (small), 0.25 (moderate), and 0.36 (large) [19].

The objects of this study were 28 employees of the extruder division, 27 employees of the printing division, and 46 employees of the needle-loom division, for a total of 101 participants. In order to compare the number of samples proportionate to the population in each subgroup, the proportionate random sampling method for this study uses the Slovin formula to calculate the necessary sample size. Based on the calculation results, questionnaires were distributed to 81 respondents, with details of 22 respondents from the printing and extruder divisions and 37 respondents from the needle-loom division. The questionnaires used were the PPE availability questionnaire with 7 question items and the safety training questionnaire with 6 question items using a Likert scale [11], [21]. The safety awareness survey consists of 8 questions [22]. Assessment of compliance with the use of PPE is carried out through observation for four days during working hours using the PPE checklist.

The VAF (Variance Accounted for) formula can be utilized to calculate the extent to which safety awareness acts as an intervening variable and affects indirect outcomes [23]:

$$VAF = \frac{a \times b}{(a \times b) + c} \times 100\%$$

With :
a = the influence of independent variables on intervening variable
b = the influence of intervening variable on the dependent variable
c = the influence of the independent variables on the dependent variable

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When the calculated VAF value exceeds 80%, it signifies complete mediation by the intervening variable in the relationship. Conversely, if the Variable Attributable Fraction (VAF) falls between 20% and 80%, it indicates partial mediation by the intervening variable. On the other hand, a VAF value below 20% suggests the absence of any intervention or mediation effect from the intervening variable or simply no mediation [23].

4. RESULTS AND DISCUSSION

The research hypothesis was examined through the application of the PLS-SEM analysis method. This method consists of two phases, the evaluation of the measuring model and the assessment of the structural model [19]. This research framework is based on the work of Liswanti et al. [24], Priatna and Andika [4], Azizah et al. [12], and Dewi et al. [25]. Then, 81 employees from the extruder, printing, and needle-loom divisions were studied using the PLS-SEM method, including evaluating the outer and inner models. The outcomes of the two assessments are as follows:

4.1 Outer Model Evaluation Results

According to Haryono [19], the evaluation of the outer model includes convergent validity testing, which includes individual item reliability, composite reliability, and AVE (average variance extracted), as well as discriminant validity test. The evaluation of the outer model is shown in the following figure and table::

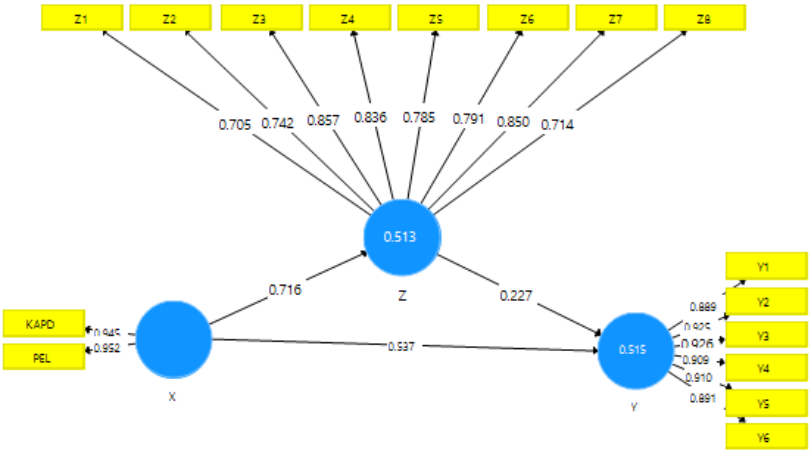

Fig 1. Loading Factor Results on Enabling Factor Variables, Safety Awareness, and Compliance with the Use of PPE

Table 1. Composite Reliability and AVE Results on Enabling Factor Variables, Safety Awareness, and Compliance with the Use of PPE

	Cronbach's Alpha	**rho_A**	***Composite Reliability***	**AVE**
Enabling Factor (X)	0.889	0.892	0.947	0.900
Compliance With The Use Of PPE (Y)	0.958	0.958	0.966	0.826
Safety Awareness (Z)	0.911	0.915	0.928	0.620

Figure 1 shows that the loading factor results for all indicators on enabling factor (X), safety awareness (Z), and compliance with the use of PPE (Y) passed the acceptability limit because the loading factor values obtained are greater than 0.5, indicating that they are valid and reliable. Furthermore, the values of Cronbach's alpha and composite reliability in Table 1

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are greater than 0.8, indicating that the construct has high reliability, and the AVE value exceeds 0.5, indicating that it has a high level of validity. According to the discriminant validity assessment outcomes, each indicator has a stronger correlation with the variable it measures than with other variables.

4.2 Inner Model Evaluation Results

The results of the inner model test between indicators and the variables they measure and their significance values associated with them can be observed in the table presented below:

Table 2. Effect Test Results between Indicators and Their Variables

Variables	Notation	Original Sample	T-Statistic	*P*-Value	Anotations
Enabling Factor (X)	KAPD	0,945	67,344	0,000	Significant
	PEL	0,952	82,124	0,000	Significant
Compliance With The Use Of PPE (Y)	Y1	0,889	22,951	0,000	Significant
	Y2	0,925	32,389	0,000	Significant
	Y3	0,926	36,040	0,000	Significant
	Y4	0,909	28,442	0,000	Significant
	Y5	0,910	28,849	0,000	Significant
	Y6	0,891	24,190	0,000	Significant
Safety Awareness (Z)	Z1	0,705	8,588	0,000	Significant
	Z2	0,742	13,030	0,000	Significant
	Z3	0,857	17,549	0,000	Significant
	Z4	0,836	15,631	0,000	Significant
	Z5	0,785	12,985	0,000	Significant
	Z6	0,791	10,154	0,000	Significant
	Z7	0,850	23,587	0,000	Significant
	Z8	0,714	10,512	0,000	Significant

Based on Table 2, it is known that the t-statistic value obtained is greater than 1.96 and the p-value is less than 0.05, which means that all indicators have a significant influence on the latent variable itself. The p-value results show the relationship of each latent variable to other latent variables as shown in Table 3 below:

Table 3. Results of Direct and Indirect Effect Tests between Variables

Variables	Original Sample	T-Statistic	P-Value	Anotations
Direct Effect				
Enabling Factor (X) -> Compliance With The Use Of PPE (Y)	0,537	5,544	0,000	Significant
Enabling Factor (X) -> Safety Awareness (Z)	0,716	11,585	0,000	Significant
Safety Awareness (Z) -> Compliance With The Use Of PPE (Y)	0,227	2,352	0,019	Significant
Indirect Effect				
Enabling Factor (X) -> Safety Awareness (Z) -> Compliance With The Use Of PPE (Y)	0,163	2,115	0,035	Significant

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According to Table 3, the t-statistic value is more than 1.96 and the p-value is less than 0.05, which means that enabling factor (X) has a positive and significant effect on PPE Compliance (Y) and Safety Awareness (Z). Then, in the table it is also known that safety awareness (Z) demonstrates a noteworthy and favorable impact on the adherence to the utilization of personal protective equipment PPE (Y). In addition, the results obtained were that the enabling factor (X) had a positive and significant effect on compliance with the use of PPE (Y) with the intervention of Safety Awareness (Z). After testing the inner model, it is continued in the analysis in the form of a diagram presented as follows:

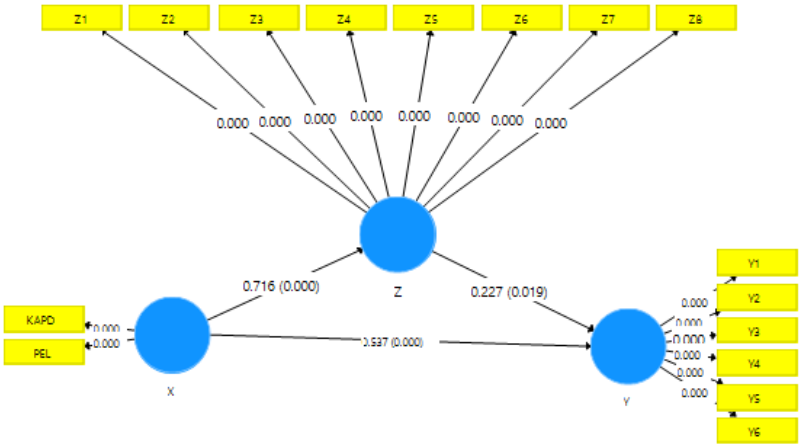

Fig 2. Inner Model Evaluation Results Diagram

The results of testing the model can be seen from the R-square value which describes the goodness of fit of a model which can be seen in the table below.

Table 4. R-square Results

Variables	***R-square***
Compliance With The Use Of PPE (Y)	0.515
Safety Awareness (Z)	0.513

The R-squared ($R^{2)}$ value criterion includes three classifications: R^2 0.67 (substantial), R^2 value 0.33 (moderate), and R^2 value 0.19 (weak) [19]. Table 4 displays the results of the R-square value, which indicates that all exogenous constructs or enabling factors (X) affect safety awareness (Z) simultaneously by 0.513 or 51.3% (moderate) and the remaining 48.7% is explained by factors outside the scope of this study. In addition, the findings that all exogenous constructs or enabling factors (X) and safety awareness (Z) simultaneously affect adherence to the use of PPE (Y) by 0.515 or 51.5% (moderate) and 48.5% are explained by extraneous variables.

The goodness of fit (GOF) is calculated using the Haryono [19] formula, where the root of the multiplication of the average AVE value with the average R-square value yields a GOF value of 0.634 for this research model. Where 0.1 (small GOF), 0.25 (moderate GOF), and 0.36 (large GOF) are the criteria for GOF values [19]. The model has a large GOF based on these results, and the greater the GOF value, the more accurately it describes the research sample.

The VAF calculated using safety awareness as an intervening variable is 23.23%. The VAF results indicate that the role of safety awareness as an intervening variable influencing enabling factor on PPE compliance is 23.23%. This condition is known as partial mediation,

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which is the relationship between the dependent and independent variables that still has a significant effect before or after the intervening variables.

After evaluating the structural model (inner model), the findings indicate that the enabling factor (X), which consists of the availability of PPE and training, has a significant impact on compliance with the use of PPE (Y). This result aligns with Dewi et al. [26] statement that providing factors, including the presence or accessibility of facilities and training, correlate with PPE compliance. These outcomes result from the provision of PPE facilities for all employees and the routine of PPE training, which together increase compliance with the use of PPE. According to several research [12], [27], and [28] there is a correlation between the availability of PPE and training on worker compliance with PPE use.

Furthermore, the outcomes of enabling factors (X), which include the availability of PPE and training, have a significant influence on safety awareness (Z). These outcomes align with the results obtained by El-Sallamy et al. [29], who found that safety training influences awareness of physical hazards. Ignorance of safety hazards is caused by a lack of training attended or given. According to Ernayasih et al. [30], training and the availability of PPE establish a substantial relationship with hazardous action behavior. Desmayanny et al. [31] describe if awareness influences the formulation of unsafe actions.

Then, the influence test results significantly increased compliance with the use of PPE (Y) in relation to safety awareness (Z). This result is consistent with Dewi et al. [25] finding that self-awareness is associated with compliance with the use of personal protective equipment. Self-awareness is associated with the discipline of using PPE, according to the findings of Djupri and Sulistia [32]. This was supported by Putra et al. [33], who stated that safety awareness is a component of comprehending safety management in terms of the significance of PPE. These outcomes result from the employees' behavior and habits, as they do not comply.

Notoadmojo explained that the availability of personal protective equipment is evidence of the supporting factors in the process of behavioral development [34]. According to the findings derived from the conducted interviews, it is established that a lack of safety awareness is one of the reasons employees do not use personal protective equipment. In addition, the company's personal protective equipment is inadequate or does not meet the requirements. The training was also inconsistent and irregular. It is hoped that by providing PPE in sufficient quantities and according to the job also providing OSH training to workers, safety awareness and compliance with the use of PPE can be increased.

5. CONCLUSION

The conclusions that can be obtained based on this research results are that there is a significant influence between enabling factors on safety awareness and compliance with the use of PPE in the extruder, printing, and needle-loom divisions in the plastic sack industry with a p-value of both are 0.000. It also found that safety awareness significantly influences compliance with the use of PPE with a p-value of 0.019. Besides that, enabling factors influence compliance with the use of PPE by intervening with safety awareness in plastic sack industry workers with a p-value of 0.057. The recommendations that can be given to increase safety awareness and compliance with the use of PPE for workers are providing sufficient PPE and providing a special cupboard for PPE storage. In addition, it can provide training to workers regularly.

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