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SAFETY CLIMATE ON SMALL AND MEDIUM ENTERPRISES IN BATIK PRODUCTION BASED ON FACTOR ANALYSIS

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ABSTRACT

Safety climate is an instrument to determine workers' perceptions of occupational safety and health. To find out workers' perceptions about the importance of safety climate factors in the batik industry, it is necessary to do a factor analysis. Factor analysis was carried out using Exploratory Factor Analysis to reduce variables to form new factors with a minimum of lost information. Furthermore, the Kruskal-Wallis test was conducted to determine the differences in the perception of respondents' criteria regarding the previously formed safety climate factors. This study reduces the 8-variable questionnaire with 36 statement items into seven new factors, namely management commitment and worker actions toward safety, management procedures regarding safety, management support for safety, management and worker's efforts to create safety, worker's attitudes regarding work and safety, workers rewards for reporting a hazard, and workers knowledge of safety.

Keywords: Safety climate, exploratory factor analysis, Kruskal-Wallis test.

INTRODUCTION

OHSAS 18001:2007 describes Occupational Health and Safety as K3 as all conditions and factors that impact the safety and health of workers and other people in the workplace. Work accidents and occupational diseases that occur in Indonesia and even the world are caused by low awareness of the importance of K3 in an organization. In response to this, many companies have now tried to increase OSH awareness among all members of their company by making OSH a safe workplace culture. The Advisory Committee on Safety in Nuclear Installations (ACSNI) defines safety culture as a product of individual and group values, attitudes, perceptions, competencies, and behavioral patterns that will determine commitment and the style and skills of the organization's health and safety management (Smith & Wadsworth, 2009). Safety culture includes employees' assumptions, values, norms, and beliefs (Hall, 2006). Safety climate also reflects employees' perceptions of the importance of relatively safe behavior at work (Zohar, 1980). Evaluation of an organization's safety culture is considered very complex and requires several assessment methods with a long period to complete. Meanwhile, assessing the safety climate is relatively more straightforward (Akyuz, Yildirim, & Gungor, 2018). The ease in this assessment is because the safety climate itself is a reflection of the safety culture. Professionals, in this case, use the safety climate to assess safety culture and measure employee attitudes during the implementation of safety programs (Hall, 2006). In their opinion, Griffin and Neal (2000) said that the safety climate was assessed through a survey using a questionnaire distributed to employees. The survey can further identify the perception of specific safety dimensions (Griffin & Neal, 2000). The survey using the questionnaire will provide a good understanding of the current atmosphere in the organization (Hall, 2006; Akyuz, Yildirim, & Gungor, 2018).

Solo is one of Indonesia's cities known for its batik as its icon. Many batik industrial centers are located in the city of Solo, one of which is the Kampung Batik Laweyan area (Setyanto, Samodra, & Pratama, 2015). Various types of batik are produced in Kampung Batik Laweyan, such as written batik, stamped batik, and printed batik. The level of difficulty of making batik with one another has a difference. Written batik is a type of batik done manually by individuals using canting. Canting is a tool that accommodates hot wax for later use as a batik drawing tool where the cloth or fabric is the base for the drawn motif. Drawing with canting is followed by a coloring process where the fabric is dyed several times. The last stage is dipping the dyed batik cloth into chemicals to dissolve the wax or wax. Meanwhile, stamped batik is made manually using a stamp (a tool shaped according to the desired motif) where the motif is made on the cloth. This cloth is placed on a long table and then stamped with a stamp dipped in wax or batik wax. This stamping process is done repeatedly. Meanwhile, the process of making batik printing is produced using a printing machine (Lestari S. D., 2010; Nurainun, Heriyana, & Rasyimah, 2008). During the process of batik, some work accidents sometimes occur. Examples of work accidents in this process are burns that can occur during the canting process due to hot molten wax. Burns may also occur while pulling batik cloth since this process is associated with boiling water and coals of fire. The canting process also produces smoke which, if inhaled continuously, will cause shortness of breath.

Also, the skin of the hands of batik craftsmen sometimes experiences irritation such as redness, itching, and pain due to direct contact with batik dyes containing chemicals (Anis, Wijaya, & Muslimah, 2015; Lestari & Warseno, 2018). Many workers are less concerned with K3, where they work without personal protective equipment. While making a batik is directly related to chemicals and heat, not all workers wear gloves, masks, or other protective equipment. The workers feel they are used to doing work without personal protective equipment. Work accidents in the batik production process are caused by many factors, including the workers' activity, the work environment, and other factors (Rachmawati, 2017). The application of K3 must be carried out by all industries, including the batik industry. Joanda, Suhardi, & Rohani (2018) conducted an analysis of safety climate factors for occupational safety and health in Small and Medium Enterprises (SMEs) furniture in Central Java Province based on Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) approaches (Joanda, Suhardi, & Rohani, 2018). The questionnaire used in their research consisted of 8 factors with 36 statement items. The eight factors are management commitment and action for safety, worker knowledge and compliance with safety, knowledge of worker attitudes towards safety, worker participation and commitment to safety, safe working environment, organizational readiness in an emergency, safety priority in production, and risk justification. Another study by Wirawati et al. (2020) analyzed the safety climate in the textile industry in Bandung using the NOSACQ50 questionnaire. This questionnaire consists of 7 factors with 50 statement items. The seven factors are management safety priorities and commitments, management safety empowerment, safety management fairness, worker safety commitments, worker safety priorities without tolerance for hazardous risks, safety in learning, communication, and innovation, as well as worker confidence in the success of the safety system (Wirawati et al., 2020). Safety climate analysis has been carried out in several small and medium industries. This analysis is intended to measure perceptions of the safety factors that exist in the industry. The safety climate is considered the best instrument for estimating the work safety environment in manufacturing facilities (Seddik, 2019). The perception of employees working in the industry regarding increasing the level of safety climate is essential for employers and government agencies to take further initiatives (Kaium, 2020). Safety climate analysis is one way that can be done to determine the factors that affect K3 in the batik industry in Kampung Batik Laweyan. Thus, business owners and the government can make decisions in applying K3.

This study analyzes the safety climate factors in the batik industry in Kampung Batik Laweyan Solo by adopting the Joanda et al. questionnaire (2018). This questionnaire includes eight factors with a total of 36 statement items. The method used is Exploratory Factor Analysis (EFA) or exploratory factor analysis, which aims to reduce climate safety data by initially forming new variables that can absorb information from the original data (Supranto, 2010). Since there are 36 safety climate variables to be analyzed, a technique is needed to simplify these variables without losing much information about the data obtained. Through Exploratory Factor Analysis, new safety climate factors will be found in SMEs that produce batik in Kampung Batik Laweyan, where the factors found will then be analyzed. The Kruskal Wallis test was also conducted to determine whether significant differences in perceptions of the respondent's characteristics regarding the safety climate factors formed.

METHODOLOGY

The population needed in this study are owners and workers in the batik industry, an unknown population. The sample is the owners and workers in SMEs that produce batik in Kampung Batik Laweyan, Surakarta. After getting 75 respondents, the data was tested. Data testing aims to determine whether the data obtained is sufficient to describe the actual situation. Testing the data is calculated by equation 1.

$$N' = \left[\frac{\frac{k}{s}\sqrt{N \sum X^2 - (\sum x)^2}}{\sum x} \right]^2 \qquad (1)$$

Where :
N' = the amount of data that should be;
N = number of actual data;
s = level of accuracy;
k = confidence level

The data is considered sufficient if the value of N'>N. The following is the respondents' demographic data, which can be seen in table 1.

Table 1

Demographic Profile

Demographics	Frequency N	Percent %
Gender		
Female	30	40%
Male	45	60%
Age		
15 - 30	17	22,67%
31 - 45	37	49,33%
46 - 64	19	25,33%
> 64	2	2,67%
Educational level		
Primary School	12	16%
Junior High School	26	34,67%
Senior High School	32	42,67%
Associate's degree	1	1,33%
Bachelor's degree	4	5,33%

After the data from respondents who filled out the climate safety questionnaire were collected, the next step was data processing with Exploratory Factor Analysis using SPSS software. The Exploratory Factor Analysis stage using SPSS software is as follows: entering the data from the questionnaire; click Analyze, select Dimension Reduction, then click Factor.; select the variable to be processed, then click the arrow to the right that points to Variables, select Descriptives then put a checkmark as shown in the picture, and click Continue; click Extractions, select the Principal Components method as shown, then click Continue; click Rotations, select the Varimax method as shown in the image, then click Continue; and click OK. In this step, the output will appear in the form of KMO and Bartlett Test's tables, Anti-image matrices, Communalities, and Component Matrix containing the rotated factor loading values. Communalities are the magnitude of the variance of a variable that can be explained by the factors that have been formed. One approach that can be used to determine the number of factors to be maintained is the Eigenvalue. Eigenvalue with a value of more than 1 indicates that the Factor is worth maintaining. The correlation value between the original variable and the Factor is called factor loading, which helps determine an original variable that will be included in one of the factors. The factor loading value is considered high if it is more than 0.4. After all the required values are known, the next step is to discuss and interpret the results of the research that has been done.

The Kruskal-Wallis test in this study was carried out using SPSS software. The function of the Kruskal-Wallis test is to determine whether there is a significant difference between the respondent's criteria groups concerning the safety climate factor, which is the result of Exploratory Factor Analysis. Hypothesis 0 in the Kruskal-Wallis test states that three or more independent samples come from populations with no significant mean difference. On the other hand, hypothesis one indicates a significant mean difference. If the H value of the Kruskal-Wallis test is the critical value of chi-squares, then the null hypothesis is accepted, and the first hypothesis is rejected. However, if the H value of the Kruskal-Wallis test > the critical value of chi-square, then the hypothesis is rejected, and hypothesis one is accepted (Suyanto & Gio, 2017). In addition to looking at the H value of the Kruskal-Wallis test, the conclusion of the Kruskal-Wallis test is also determined based on the significance value. Suppose the probability value (Asymp . Sig) > alpha value. In that case, the null hypothesis is accepted, the first hypothesis is rejected, and vice versa, where the probability value (Asymp . Sig) < alpha value indicates that the hypothesis is rejected and the first hypothesis is accepted. The alpha value used in this study was 0.05. Thus, a significance value less than 0.05 indicates a significant difference between the variables tested. A significance value greater than 0.05 indicates no significant difference between the variables tested. At this stage, the Ranks and Test Statistics table will appear. The Test Statistics table contains Kruskal Wallis H, df, and AsympSig values. The AsympSig value smaller than 0.05 indicates a significant difference in each group of respondents' criteria related to the safety climate factor. On the other hand, there is no significant difference in each group of respondents' criteria regarding the safety climate factor, which is indicated by the AsympSig value greater than 0.05. The following is the Kruskal Wallis H test formula.

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{{R_j}^2}{N_j} - 3(N+1) \quad (2)$$

Where:
H = Kruskal-Wallis test value;
N = number of sample elements;
R = number of sample rankings

FINDINGS AND DISCUSSION

The factors were analyzed using SPSS software. Only 25 of the 36 statement items covering 8 factors were eligible for factor analysis. Based on the Exploratory Factor Analysis, of the 36 statement items on the safety climate questionnaire filled out by the respondents of batik production SMEs in Kampung Batik Laweyan Surakarta, they were reduced to 7 new factors. Factor 1 includes management commitment and worker actions toward safety, where this is the first Factor considered by respondents in the safety climate in batik production SMEs in Batik Laweyan Village, Surakarta, with the most significant percentage of variance being 29.51%. Factor 2 includes management procedures regarding safety with a variance percentage of 11.22%. Factor 3 is a factor that includes management support for safety with a variance percentage of 8.37%. Factor 4 is management and workers' efforts to create safety with a variance percentage of 6.92%. Furthermore, workers' attitudes regarding work and safety are included in a factor of 5 and get a variance percentage of 5.53%. Factor 6 includes workers' rewards for reporting a hazard, while factor 7 includes workers' knowledge of safety, where each Factor has a variance percentage of 5.11% and 4.77%.

Table 2

Generated factors.

Factor 1	Management Commitment And Worker Actions Toward Safety	X1_1	Management gives high priority to safety
		X1_3	The management is always open to receiving opinions from workers before making decisions where the legal basis for work safety is also open
		X1_8	Corrective action is always taken when management is notified of unsafe practice, including when an accident is imminent
		X2_2	I do my job safely
		X4_1	I get work done by following safe work rules
Factor 2	Management Procedures Regarding Safety	X1_2	My company provides comprehensive training to employees on occupational safety and health
		X1_4	The work rules and procedures in my company are good enough to prevent accidents at work
		X1_5	The work rules and procedures are carried out with certainty by the management
		X1_9	Safety issues are prioritized in the training program

		X7_2	I feel that management is willing to compromise on safety to increase production
Factor 3	Management Support for Safety	X1_10	My supervisor and manager always try to enforce safe work procedures
		X1_11	Management promotes employee engagement in security-related matters
		X1_12	Management encourages workers to attend safety training programs
		X7_1	I believe that safety can be compromised to increase production
Factor 4	Management and Worker's Efforts to Create Safety	X1_13	In my company, safety week celebrations and other safety promotion activities are organized by management, so they are very effective in creating safety awareness among workers
		X1_16	Preventive maintenance work is carried out regularly in the workplace
		X1_17	My company provides adequate safety equipment for workers
		X4_2	I work hard to improve work safety
		X4_3	I voluntarily carry out tasks or activities that may help improve work safety
Factor 5	Worker's Attitudes Regarding Work and Safety	X5_1	Where I work, employees are exposed to risky situations
		X6_1	I am trained enough to act in an emergency at work
		X8_1	Sometimes I deviate from the correct and safe work procedures because I already feel used to my job
		X8_2	K3 is not always practical to follow safety rules and procedures while working
Factor 6	Worker's Rewards For Reporting a Hazard	X1_7	Workers will be rewarded for reporting potential sources of danger (thanks, money or other gifts, awards in newspapers, etc.)
Factor 7	Worker's Knowledge of Safety	X3_2	I know how to maintain or improve occupational health and safety

EQUATIONS

Based on the data processing of the Kruskal-Wallis test between the age group of respondents and the seven safety climate factors as a result of Exploratory Factor Analysis, the age group has significant differences in perceptions regarding factor 1 - management commitment and worker actions toward safety and factor 6 - workers rewards for reporting a hazard. However, the age group did not have a significant difference in perceptions regarding factor 2 - management procedures regarding safety, factor 3 - management support for safety, factor 4 - management and worker's efforts to create safety, factor 5 - worker's attitudes regarding work and safety, and factor 7 - workers knowledge of safety.
The gender of the respondents was divided into two groups, namely male and female. Based on the data processing of the Kruskal-Wallis test between the sexes of the respondents and the seven safety climate factors as the result of Exploratory Factor Analysis, gender was found to have significant differences in perceptions regarding factor 3 - management support for safety and factor 6 - workers rewards for reporting a hazard. On the other hand, gender does not have a significant difference in perceptions regarding factor 1 - management commitment and worker actions toward safety, factor 2 - management procedures regarding safety, factor 4 - management and worker's efforts to create safety, factor 5 - workers attitudes regarding work and safety, and factor 7 - workers knowledge of safety. The group based on the latest education of the respondents was divided into five groups consisting of those with the last education of elementary school, junior high school, high school, diploma, and bachelor's degree. The data processing of the Kruskal-Wallis test between the latest education group of respondents and the seven safety climate factors as the results of Exploratory Factor Analysis found that this group had

a significant difference in perception regarding factor 1 - management commitment and worker actions toward safety. In contrast to factor 1, this group did not have a significant difference in perceptions regarding factor 2 - management procedures regarding safety, factor 3 - management support for safety, factor 4 - management and worker's efforts to create safety, factor 5 – worker's attitudes regarding work and safety, factor 6 - workers rewards for reporting a hazard and factor 7 - workers knowledge of safety.

The respondent's position at work is divided into management (including owners) and employees (batik workers). The processing of the Kruskal-Wallis test data between the respondent's position group and the seven safety climate factors and the results of Exploratory Factor Analysis showed that this group had a significant difference in perception regarding factor 1 - management commitment and worker actions toward safety, factor 3 - management support for safety, and factor 4 - management and workers efforts to create safety. In addition, occupational groups were found to have no significant differences in perceptions regarding factor 2 - management procedures regarding safety, factor 5 - worker's attitudes regarding work and safety, factor 6 - worker's rewards for reporting a hazard, and factor 7 - worker's knowledge of safety. The group of respondents based on years of service was divided into four groups: tenure of fewer than 10 years, 10-20 years, 21-30 years, and more than 30 years. The data processing of the Kruskal-Wallis test between the respondent's tenure group and the seven safety climate factors as Exploratory Factor Analysis results found a significant difference in perception regarding factor 1 - management commitment and worker actions toward safety in this group. The working period group was found to have no significant difference in perceptions regarding factor 2 - management procedures regarding safety, factor 3 - management support for safety, factor 4 - management and worker's efforts to create safety, factor 5 - worker's attitudes regarding work and safety, factor 6 - workers rewards for reporting a hazard and factor 7 - workers knowledge of safety.

The group of respondents related to work accidents is divided into two groups, namely "yes" (have had a work accident) and "no" (never had a work accident). Based on the processing of the Kruskal-Wallis test data between the group of respondents who have experienced work accidents with the seven safety climate factors as a result of Exploratory Factor Analysis, it was found that the group of respondents who had experienced work accidents had a significant difference in perception regarding factor 1 - management commitment and worker actions toward safety. , factor 3 - management support for safety, factor 4 - management and workers efforts to create safety, and factor 5 - workers attitudes regarding work and safety. The group of respondents who had experienced a work accident did not have a significant difference in perception regarding factor 2 - management procedures regarding safety, factor 6 - worker's rewards for reporting a hazard, and factor 7 - worker's knowledge of safety. The group of respondents regarding their participation in K3 training is divided into two, namely "yes" (have attended K3 training) and "no" (never attended K3 training). Based on the processing of the Kruskal-Wallis test data between the group of respondents who had attended K3 training with the seven safety climate factors as a result of Exploratory Factor Analysis, it was found that the group of respondents who had attended K3 training had a significant difference in perception regarding factor 1 - management commitment and worker actions toward safety. , factor 3 - management support for safety, factor 4 - management and workers efforts to create safety, and factor 5 - workers attitudes regarding work and safety. In contrast to these results, the group of respondents who had attended OSH training did not have a significant difference in perceptions regarding factor 2 - management procedures regarding safety, factor 6 - worker's rewards for reporting a hazard, and factor 7 - worker's knowledge of safety.

CONCLUSION

Respondents were divided into five groups less than 15 years, 15-30 years, 31-45 years, 46-64 years, and more than 64 years. Based on the data processing of the Kruskal-Wallis test between the age group of respondents and the seven safety climate factors as a result of Exploratory Factor Analysis, the age group has significant differences in perceptions regarding factor 1 - management commitment and worker actions toward safety and factor 6 - workers rewards for reporting a hazard. However, the age group did not have a significant difference in perceptions regarding factor 2 - management procedures regarding safety, factor 3 - management support for safety, factor 4 - management and worker's efforts to create safety, factor 5 - worker's attitudes regarding work and safety, and factor 7 - workers knowledge of safety.

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