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THE INFLUENCE OF FACTORS AFFECTING SAFETY PERFORMANCE AMONG OIL AND GAS OFFSHORE WORKERS WITH ROSTERS SCHEDULE: THE MEDIATION ROLE OF SAFETY CLIMATE

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Abstract

Oil and gas industry is an industry that has activities with a high level of risk both related to personal safety and process safety. Failure to maintain the safety aspect of the company can have a negative impact on financial, reputation and even a negative consequences from government. In maintaining company performance related to safety, each oil and gas company sets safety performance standards which are included in the company's performance targets. There are several factors that influence safety performance. Therefore this study aims to examine the factors that influence safety performance by mediating safety climate in the Indonesian oil and gas industry. Data was collected using a questionnaire which was distributed to 420 oil and gas field workers and analyzed using Structural Equation Modeling using Smart PLS 4 with 13 hypotheses. The results showed that the factors that had a significant direct effect on safety performance were safety climate and safety culture, while those that had an indirect effect were safety climate, mental health and safety culture. companies can improve safety performance by strengthening the factors that are significantly influential: safety climate, safety culture, mental health and safety behavior.

Keywords: Safety Performance; Safety Climate; Safety Behavior; Safety Culture; Mental Health; Work Fatigue; Structural Equation Modelling.

INTRODUCTION

Activities in the oil and gas industry are the most dangerous and have a high risk of the entire process of exploration and exploitation of oil and gas (Septalita, 2018) Based on SKK Migas (Special Task Force for Upstream Oil and Gas Business Activities in Indonesia) data, incident rate data obtained in the range of 0.68 to 0.88 between 2011-2016. Incident rate (IR) is the number of mining accident victims of Cooperation Contract Contractor (KKKS) employees and work partners (fatal, serious, moderate and light) multiplied by 1000,000 compared to the total working hours of KKKS employees and Business Partners for one year, this figure become one of the benchmarks for the success

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of work safety management performance in upstream oil and gas operations (Operational Support Di-vision SKK Migas, 2017), converted to the number of work accident victims in the up-stream oil and gas industry as shown in Figure 1.2 for both employees and work partners, then overall it shows an average number of 320.5 per year with the highest score being 388 in 2013 and the lowest score being 247 in 2016.

According to (ILO, 2013), it is estimated that the annual loss due to work-related accidents and diseases in some countries reaches 4% of the gross national product. This cost does not include the cost of restoring facilities, environmental restoration in the event of pollution, losses due to loss of production, and intangible costs due to a bad corporate image. In order to prevent work accidents, both process and personal safety, the company sets performance targets related to safety, which we usually know as safety performance. There are several factors that affect safety performance including safety behavior, safety culture, safety climate, work fatigue and mental health. This study aims to find a cor-relation between these factors, both directly and indirectly by mediating safety climate.

One indicator that is often used to measure how companies run work safety programs and evaluate work safety management is safety performance (Wijaya, 2019). Safety Performance is the level of success in achieving safety in a certain period of time that is produced by a certain function, and regular monitoring is needed to find out how com-pliance and implementation of applicable safety regulations is (Dorji et al, 2006). Ac-cording to Pradita (Pradita & Sentoso, 2022) safety performance is employee behavior consisting of work safety components such as the use of safety protective equipment and participating in activities related to maintaining work safety.

According to (Gao et al., 2016) safety performance is an individual safety behavior that is closely related to compliance and participation. Safety performance component which consists of safety compliance, namely the behavior of workers to carry out and comply with safety regu-lations that apply in the workplace, such as obeying the use of personal protective equipment and complying with safety regulations that apply in the workplace, and safety participation, namely the contribution of employee behavior in realizing work safety in the work environment, such as participating in work safety training, participating in work safety programs and caring for the safety of co-workers.

Safety Climate

The term safety climate was first popularized by Zohar in 1980 with a unified definition of cognition regarding aspects of organizational safety based on the experience of social relations and the organizational environment which reflects the shared percep-tion of workers about the importance of safety actions in work behavior. According to (Setiono & Andjarwati, 2019a), safety climate is defined as a temporary state of safety culture, which describes an individual's perception of an organization that occurs situationally, referring to the perceived safety in a place, at a certain time dimension, relatively un-stable and can change depending on conditions and environmental conditions.

There are 8 factors in SC identified by (Berek, 2023) as follows: recognize the importance of safety training programs, management's perceived attitude to safety, the

perceived impact of safe behavior on promotion, the level of perceived risk in the workplace, the perceived effect of the workplace on safety, status perceived by safety officers, the perceived impact of safe behavior on social status, perceived status of the safety committee.

Safety Culture

The terminology regarding safety culture first appeared in the Chernobyl nuclear disaster report in 1886 published by the International Nuclear Safety Advisory Group (INSAG). -nuclear plant safety issues to warrant significant warranted attention (INSAG, 1991). If an individual does not understand work safety culture, the worker will potentially encounter various problems in the work process (Mairing et al, 2021). Of course, companies also play an important role in implementing a safe culture to empower workers to get to know more about the science and culture of work safety (Setiono & Andjarwati, 2019b). Companies must build and disseminate the importance of empowering culture and work safety culture such as management systems, determining policies, giving rewards and consequences, providing and controlling OHS facilities such as completeness of PPE according to applicable standards, providing competency training consistently effectively and efficiently, apart from the operational sector or this production as a first step to build a safety culture (Rahmawati, 2017).

Mental Health

Since the 19th century in Germany, namely in 1875 AD, the study of mental health has been known. In the mid-20th century the study of mental health developed more along with advances in modern science and technology. Mental health problems are also one of the focuses of the work program of the World Health Organization (WHO), ac-cording to WHO (2022), mental health is a state of mental well-being that enables people to overcome life's pressures, realize their abilities, study well and work. well, and con-tribute to their community. A study was conducted in a manufacturing industry in South Korea with shift work hours, and found that workers with night shifts tended to have worse mental health, especially in terms of insomnia, depression and suicidal tendencies (Wahyono et al., 2019)

Work fatigue

Work Fatigue is one of the factors that influence safety performance. This is proven empirically through research conducted by the National Safety Council (NSC) that 13% of work accidents are the result of work fatigue. In addition, the report shows that 97% of workers have at least one risk factor for burnout at work and more than 80% have two or more factors.

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condition in which the body's strength to carry out the same activity is reduced and the efficiency of work performance decreases (Roshadi, 2014).

Safety behavior

The definition of safety behavior according to the APA dictionary of Psychology (2007) is a behavior that is carried out with the involvement of individuals in an effort to minimize or prevent a disaster from being carried out. According to (Fadillah, 2022), safety behavior is behavior that supports safety practices and activities at work, both of which must be accepted by employees as work requirements to avoid accidents at work. To generate safety behavior, according to Sirait (Sirait & Paskarini, 2016), there are 5 things that can be developed, namely: knowledge of work safety, awareness, the state when the individual clearly understands what is on his mind, perception, motivation, and needs for survival.

Structural Equation Modeling (SEM)

Structural equation modeling (SEM) is a widespread approach to test substantive hypoth-eses in psychology and other social sciences (Jobst et al., 2023). This methodology makes it possi-ble to analyze a network of theoretical relationships between variables, some of which may be la-tent, i.e., not observable. According to (Sarstedt et al., 2014) PLS is a prediction-oriented approach to SEM, mainly used for exploratory research but also suitable for confirmatory research. The analysis carried out in SEM-PLS consists of evaluating the measurement model (outer model) and evaluating the structural model (inner model).

Outer model analysis aims to determine the validity and feasibility of a measurement. There are several indicators used in the evaluation of measurement models: convergent validity, discriminant validity, Cronbach's alpha and composite reliability test. Inner model is a model used to predict causal relationships between variables that cannot be measured. There are 4 tests in the model structure evaluation: collinearity, path coefficient, coefficient of determination and predictive relevance test.

RESEARCH METHODS

This research will be carried out at five oil and gas company located from west to east offshore Indonesia area. This company is considered to have represented Indonesia's offshore conditions in terms of location, water depth, share ownership, work schedule and worker status. The total number of workers working in the 5 oil and gas companies working in the offshore fields is 7360 workers. Calculation of the sample using the slovin formula in equation 1, the number of samples obtained is 380.

$$n = \frac{7360}{(1 + (7360\ x\ 0{,}05^2)\ )} = 380 \qquad (1)$$

Research Flow

See Figure 1 for the Research flow:

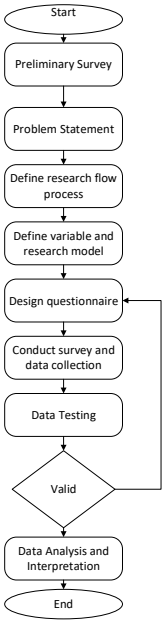

Fig 1. Research Flow

Research Model

See Figure figure 2 for research model. This modeling is done using smart pls software version 4. This research model will examine the direct effect of the variables safety climate, safety culture, mental health, work fatigue and safety behavior on safety performance, as well as testing the indirect effect by mediating safety climate.

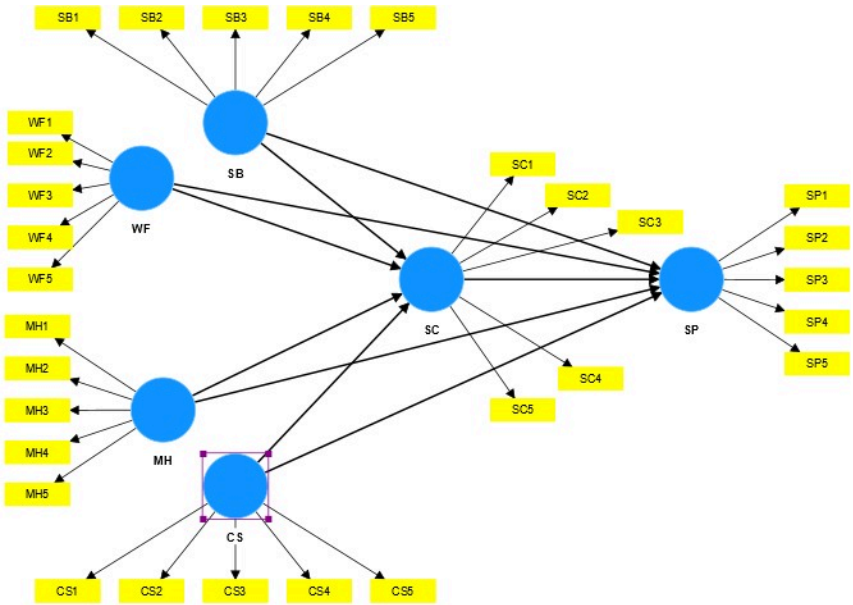

Fig 2. Research Model

Quesionnaire design

The questionnaire given to respondents consisted of 30 questions representing 6 variables, namely work fatigue (WF), mental health (MH), safety behavior (SB), safety climate (SC), safety culture (CS) and safety performance (SP). Each variable is represented by 5 questions, each taken from the literature and represented by an index of 1-5. The answer to the question consists of 5 choices ranging from strongly disagree to strongly agree, each of which can be converted to a Likert scale of 1-5.

Data Collection

Data collection was carried out using a questionnaire distributed to 5 oil and gas companies. In total, 420 data were obtained, but there were 17 invalid data so that only 403 data could be used for further analysis. Data details are shown in table 1, yellow highlight describe data with invalid criteria.

Table 1. Demography data of respondent. Yellow highlights are invalid data.

Count of Usia Saat Ini	Column Labels			
Row Labels	Lainnya	Maintenance	Production	Grand Total
< 25 tahun		2	3	5
2 tahun atau lebih		2	3	5
> 45 tahun	3	58	41	102
2 tahun atau lebih	3	58	41	102
25 - 45 tahun	8	145	160	313
2 tahun atau lebih	8	145	159	312
Kurang dari 2 tahun			1	1
Grand Total	11	205	204	420

RESULTS AND DISCUSSION

This test serves to determine how far a variable is positively correlated with other variables. This test consists of two parameters, namely loading factor and average variance (AVE). This test is said to be valid if the loading factor value is > 0.7 and the AVE value is more than 0.5. Table 2 show the results of the calculation of the loading factor indicate that 6 of 30 indicator of the questionnaire is invalid.

Table 2 Invalid data based on loading factor

No	Variable	Indicator	Loading Factor	Ave
1	Work Fatigue	WF5	0,169	0,597

2	Mentall Health	MH2	0,607	0,469
3		MH4	0,399	
4	Safety Climate	SC1	0,644	0,492
5		SC5	0,66	
6	Safety Performance	SP5	0,163	0,626

Next step is to determine reliability testing through Cronbach's alpha and composite reliability with the value of each variable between 0.6 - 0.9. Composite reliability aims to determine the reliability and consistency of a data that is measured repeatedly and gets the same results. While Cronbach's is to revalidate composite reliability. Dakduk et al (2019) divided the Cronbach's alpha measurement into 4 criteria, namely below 0.60 is not accepted, 0.60 - 0.70 is minimal, 0.70 - 0.80 is in the good category, and 0.80-0.90 is in the very good category. In table 4.9 all indicators have a Cronbach's alpha value above 0.6 so that all data is declared reliable. Meanwhile, the Composite Reliability value is declared reliable if it is more than 0.7 (Dakduk et al, 2019). All indicators have a value of more than 0.7 so that all data on the CS, MH, SB, SC, SP, and WF indicators are declared reliable.

Table 3 Reliability Test Data. CS=safety culture, MH=mental health, SB=safety behavior, SC=safety climate, SP=safety performance, WF=work fatigue

Indikator	Cronbach's alpha	Composite reliability	Keterangan
CS	0.855	0.897	Reliable
MH	0.720	0.840	Reliable
SB	0.886	0.917	Reliable
SC	0.661	0.813	Reliable
SP	0.855	0.902	Reliable
WF	0.884	0.920	Reliable

Structural Model Test

After testing the validity and reliability, the next step is to test the structural model. The structural model test is a model used to predict causal relationships between variables that cannot be measured. There are three stages carried out, namely the collinearity test, hypothesis testing, testing the value of f square. The evaluation of the structural model is related to testing the hypothesis of the influence between research variables.

The collinearity test is carried out by ensuring that the inner VIF (Variance Inflated Factor) value is less than 5, this number indicates that there is no multicollinearity between variables (Hair et al., 2021). From table 4 can be seen that there is no VIF between variables whose value is greater than equal to 5, meaning that the level of multicollinearity between variables is low. These results corroborate the parameter

estimation results in the PLS SEM which are unbiased (robust).

Table 4 VIF Data

	SC	SP
CS	1.488	1.983
MH	1.627	1.687
SB	1.159	1.270
SC		2.066
SP		
WF	1.225	1.225

The next stage is testing the hypothesis between variables, this is done by looking at the t statistic or p value. The limitation is that the t statistic value is greater than 1.96 (t table) or the p value of the test results is less than 0.05, so there is a significant influence between the variables. In addition, it is necessary to convey the results and the 95% confidence interval for the estimated path coefficient parameter. After testing the p value, the third is to determine the value of f square, namely the influence of direct variables at the structural level with the criteria according to Hair (Hair et al., 2021) is low if the f square is 0.02, moderate if the f square is 0.15, and high if the f square is above 0.35.

Table 5 Hypothesis Testing Data (Direct)

Hipotesis	Path Coefficient	p-value	95% Interval Kepercayaan Path Coefficient		f square	Result
			Batas Atas	Batas Bawah		
CS -> SC	0.490	0.000	0.356	0.592	0.333	**Accepted**
CS -> SP	0.622	0.000	0.551	0.687	0.545	**Accepted**
MH -> SC	0.171	0.000	0.073	0.251	0.037	**Accepted**
MH -> SP	-0.008	0.856	-0.092	0.074	0.000	**Rejected**
SB -> SC	0.232	0.001	0.142	0.428	0.096	**Accepted**
SB -> SP	-0.031	0.190	-0.075	0.019	0.002	**Rejected**
SC -> SP	0.251	0.000	0.168	0.328	0.085	**Accepted**
WF -> SC	-0.004	0.907	-0.073	0.073	0.000	**Rejected**
WF -> SP	-0.025	0.512	-0.100	0.050	0.001	**Rejected**

Table 5 shown 4 of 9 hypothesis (direct) are rejected, and table 6 shown 1 of 4 hypothesis (indirect) is rejected.

Table 6 Hypothesis Testing Data (Indirect)

Hipotesis	Path Coefficient	p-value	95% Interval Kepercayaan Path Coefficient		Upsilon (V)	Result
			Batas Atas	Batas Bawah		
CS -> SP	0.123	0.000	0.076	0.169	0,01513	**Accepted**
MH -> SP	0.043	0.002	0.016	0.070	0,00184	**Accepted**
SB -> SP	0.058	0.004	0.031	0.109	0,00339	**Accepted**
WF -> SP	-0.001	0.908	-0.017	0.020	1E-06	**Rejected**

5. Results

From the results of the validity test and the structural model test, the results obtained from 9 direct hypotheses, there are 5 hypotheses accepted and 4 hypotheses rejected. The most significant variable on safety performance is safety culture with a path coefficient of 0.622, followed by safety climate. From the results of the validity test and the structural model test, the results obtained from 9 direct hypotheses, there are 5 hypotheses accepted and 4 hypotheses rejected. The most significant variable on safety performance is safety culture with a path coefficient of 0.622, followed by safety climate.

This study also analyzes the influence of the variables of safety culture, mental health, work fatigue and safety behavior on safety performance mediated by safety climate. From the results of the validity test and the structure of the model, there is 1 of the 4 variables whose hypothesis is rejected, namely work fatigue. Of the three variables whose hypotheses were accepted, safety culture had the most significant effect with a path coefficient of 0.123, followed by safety behavior and mental health.

CONCLUSION

This study aims to determine the factors that influence safety performance in oil and gas companies in the working area of Indonesia with a roster work system. Furthermore, this research is expected to be a reference for companies in efforts to prevent work accidents that can result in losses for both workers and for the company. The factors studied included work fatigue, safety behavior, mental health, safety culture and safety climate.

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As for the mental health, safety behavior and work fatigue factors with p-values exceeding 0.05, they do not have a significant effect on the achievement of safety performance in oil and gas companies, so to directly improve safety performance it would be inappropriate to focus on the 3 factors above.

In addition to the direct influence, this research also studied the indirect influence of the factors of safety climate, safety behavior, work fatigue and mental health through the mediation of safety climate. With p-values less than 0.05, these factors have a significant influence on safety performance by mediating safety climate. These factors are safety culture, mental health, and safety behavior, while work fatigue does not have a strong relationship with safety performance with p-values less than 0.05. To improve safety performance by using mediation factors, the priority is to create programs related to factors with a priority scale of safety culture, safety behavior, and mental health.

BLIBLIOGRAPHY

Berek, N. C. (2023). *Tindakan Tidak Aman pada Pekerja Konstruksi Gedung: Telaah Berdasarkan Model Tanggap Hambatan*. Penerbit NEM.

Fadillah, A. (2022). *Hubungan Antara Pengetahuan Dan Keterampilan Keselamatan Dan Kesehatan Kerja Dengan Perilaku Selamat Pada Pekerja Konstruksi Di Proyek Jalan Tol Cinere Tahun 2021 (Doctoral dissertation, Universitas Binawan).*

Gao, R., Chan, A. P. C., Utama, W. P., & Zahoor, H. (2016). Multilevel safety climate and safety performance in the construction industry: Development and validation of a top-down mechanism. *International Journal of Environmental Research and Public Health*, *13*(11), 1100.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2021). *Multivariate data analysis 6th Edition*. Pearson Prentice Hall. New Jersey. humans: Critique and reformulation.

Jobst, L. J., Bader, M., & Moshagen, M. (2023). A tutorial on assessing statistical power and determining sample size for structural equation models. *Psychological Methods*, *28*(1), 207.

Pradita, S., & Sentoso, A. (2022). Analisis Pengaruh Praktek Keselamatan dan Kesehatan Kerja terhadap Kinerja Karyawan dimediasi oleh Komitmen Organisasi. *Jesya (Jurnal Ekonomi Dan Ekonomi Syariah)*, *5*(1), 128–146.

Rahmawati, R. , & N. D. (2017). *Gambaran Pelaksanaan Kesehatan dan Keselamatan Kerja Rumah Sakit (K3RS) pada Perawat di RSUD Tugurejo Semarang (Doctoral dissertation, Faculty of Medicine).*

Roshadi, I. (2014). *Hubungan Kelelahan Kerja dengan Produktivitas Kerja Karyawan di Fakultas Dakwah dan Komunikasi UIN Sunan Kalijaga Yogyakarta (Doctoral dissertation, Universitas Islam Negeri Sunan Kalijaga).*

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair Jr, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy*, *5*(1), 105–115.

Septalita, E. D. (2018). Kecelakaan Kerja Di Area Pengeboran Minyak Dan Gas Tahun 2012-2016. *The Indonesian Journal of Occupational Safety and Health*, *7*(1), 52.

Setiono, B. A., & Andjarwati, T. (2019a). *Budaya keselamatan, kepemimpinan keselamatan, pelatihan keselamatan, iklim keselamatan dan kinerja*. Zifatama Jawara.

Setiono, B. A., & Andjarwati, T. (2019b). *Budaya keselamatan, kepemimpinan keselamatan, pelatihan keselamatan, iklim keselamatan dan kinerja*. Zifatama Jawara.

Sirait, F. A., & Paskarini, I. (2016). Analisis perilaku aman pada pekerja konstruksi dengan pendekatan behavior-based safety (studi di workshop PT. X Jawa Barat). *The Indonesian Journal of Occupational Safety and Health*, *5*(1), 91–100.

Wahyono, S., Widowati, L., Handayani, L., Sampurno, O. D., Haryanti, S., Fauzi, F., Ratnawati, G., & Budiarti, M. (2019). *Kratom: Prospek Kesehatan dan Sosial Ekonomi*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan.

Wijaya, H. (2019). *Analisis Data Kualitatif: sebuah tinjauan teori & praktik*. Sekolah Tinggi Theologia Jaffray.