MPPKI (October, 2024) Vol. 7 No. 10

ISSN 2597– 6052

DOI: https://doi.org/10.56338/mppki.v7i10.5991

MPPKI

Media Publikasi Promosi Kesehatan Indonesia

The Indonesian Journal of Health Promotion

Research Article *Open Access*

Qualitative Analysis using HFACS Model on Factors Causing Risk-taking Behavior at Workplace

Rizky Yuli Ikhwanuddin[1]*, Zulkifli Djunaidi[2]

[1]Fakultas Kesehatan Masyarakat, Universitas Indonesia | email: ryikhwanuddin@gmail.com

[2]Fakultas Kesehatan Masyarakat, Universitas Indonesia | email: zul@ui.ac.id

* Corresponding Author: ryikhwanuddin@gmail.com

ABSTRACT

Introduction: The risk of workplace accidents, according to the 2022 Indonesian National Occupational Health and Safety (OHS) Profile, is mainly influenced by human factor in safety. This factor includes risk-taking behavior at workplace. One of the industrial sectors that needs a highlight in investigating risk-taking behavior is mining industry, which has 100% increase of workplace accidents in 2022.

Objective: This paper explores several results from research which aims to identify factors causing risk-taking behavior at workplace.

Method: Qualitative approach of a research is explored in this paper. The participants of this study were 283 employees of PT. XYZ Site A, a mining contractor company in Indonesia, ranging from managers, supervisors, and workers. The primary data of this paper was collected from the answers and reasons that the participants wrote in a questionnaire with open-ended questions, while the secondary data of this paper was taken from SMKP implementation documents and records obtained from PT. XYZ Site A. These data were then analyzed qualitatively using HFACS (The Human Factors Analysis and Classification System) Model.

Result: As per HFACS analysis, risk-taking behavior at workplace is caused by individuals' internal factors that are mainly due to self errors and complacency, as well as external factors, which are predominantly coming from operational targets to achieve, given by both supervisory and managerial levels.

Conclusion: All levels of HFACS contribute risk-taking behavior at workplace, in which organizational influences level is the one whose all sublevels play roles in triggering such behavior. Organization needs to improve its resource management, organizational climate, as well as safe organizational processes to minimize risk-taking behavior at workplace.

Keywords: Human Factors in Safety; Risk-Taking Behavior; HFACS Model

INTRODUCTION

In Indonesia, the risk of workplace accidents is influenced by human factor in safety (1). This factor includes risk-taking behavior at workplace. Among all industrial sectors, mining industry has issues with risk-taking behavior that needs to be examined because this industry has 100% increase of workplace accidents in 2022 (2,3). This paper aims to explore several results from research identifying factors causing risk-taking behavior at workplace.

Literature Review on Risk-taking Behavior

Risk-taking behavior has been previously studied in several research on various contexts. The findings of these studies provide an insight to this paper in investigating the factors causing risk-taking behavior at workplace. In a bigger picture, these studies conclusively find two main factors that contribute risk-taking behavior, i.e., internal factors and external factors.

The first internal factor is employees' perceptions, as indicated in studies by Safe Work Australia (4) in the context of many industries in a national scale, and Cruwys et al. (5) in psychological context, in which individuals will tend to take risk if they perceive that a risk is deemed low by them, even though that risk may be regarded higher by the organization. In hospitality industry, self-interest comes as the next internal factor causing risk-taking behavior (6). This factor is similar with the findings from other researchers (7), that in military context, risk-taking behavior is internally triggered by sensation seeking, safety skepticism, as well as difference in gender and age. Another internal factor is also defined in other research in psychology that there is a continuous cognitive conflict experienced by individuals exactly before the rule-breaking act [8]. Therefore, individuals conduct a risk calculation processing to weigh the potential result of their rule-breaking behavior. This notion is supported by other study in construction context by Low et al. [9] that defines risk-taking behavior as a result of individuals' risk understanding. When risk calculation has been made by individuals, they will have the nerve to take risk. Risk understanding, furthermore, also activates a complacency mindset for individuals to take risk. Finally, in road traffic context, individuals' inner motivation to look cool and impress their client also trigger risk-taking behavior [10]. Those individuals regard risk-taking as a status, without realizing that such behavior can put themselves and other people in danger.

Meanwhile, external factors also cause risk-taking behavior in various contexts. According to Ghosh and Shum [6], accidental situation, helping colleague, improving efficiency, and promoting client services have motivated employees in hospitality organizations to take risk. They also indicate that an individual can be influenced by other individuals to break the workplace rules. In addition, there is an ethical sacrifice and calculation to break rule due to unintended obligation to be accepted in a certain community or group, called Pro-social Rule Breaking theory. This is in line with the findings from other studies that risk-taking behavior is externally influenced by team or organization, particularly leadership that promotes risk-taking, team cohesion, as well as strategic and situational factors [7], and team trust [11], which indicates that risk-taking, in psychological context, is performed by individuals because they trust the team for the benefit of the team. A specific focus on other external factors causing risk-taking behavior is empowering leadership [12]. In this case, organizational leaders can have a negative potential to give power to individuals for taking risk without any fear towards negative consequences. Similar to this, other research in psychology [13] finds that rule-breaking behavior has an indirect relationship with organizational leadership's expectation. Targets from the leaders given to workers are rationally hard to achieve so they make workers break the rules to achieve the target. In line with that research, Wang et al. [14] find out that direct supervisors' high-performance expectation to their workers can motivate them to break rules. From those studies, risk-taking behavior can be activated by both internal and external factors that lead to rule-breaking act.

The studies above provide an overview on factors causing risk-taking behavior in several contexts. This trigger a research question for this paper that seeks to investigate whether there are similar factors causing risk-taking behavior in the context of one organization in mining industry in Indonesia. An appropriate analysis tool is needed to provide a comprehensive understanding on this issue. This paper, therefore, chooses HFACS (The Human Factors Analysis and Classification System) model as the proper tool to seek the answers to the research question.

HFACS Model

HFACS has been utilized as a tool in several recent research in various fields, such as aviation [15,16,17], maritime [18], and medical services [19] to analyze incidents and unsafe acts that potentially lead to incidents. This model is developed by Shappell and Wiegmann [20] to identify four levels of failure, which refer to Reason's concept of latent and active failures. The model is very adaptable to various contexts in a sense that the sublevels in each context may slightly be different. However, the basic four levels of the model are unsafe acts, preconditions of unsafe acts, unsafe supervision, and organizational influences [20], as shown in the following figure.

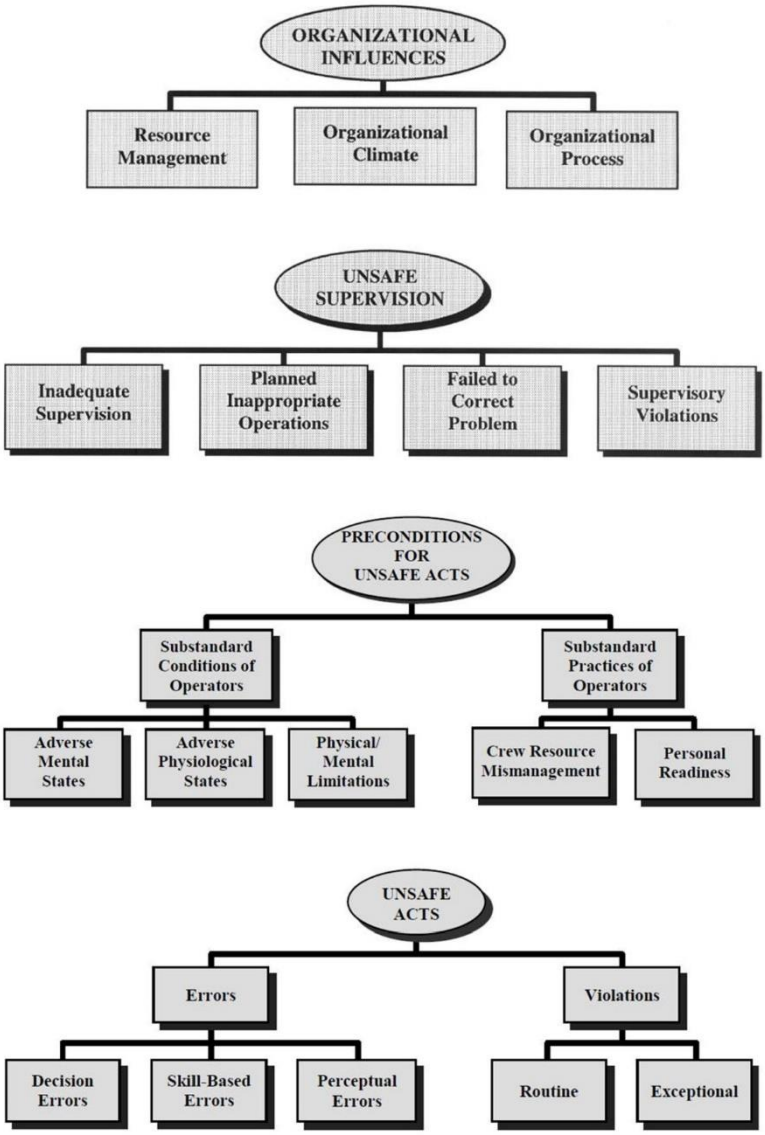

Figure 1. HFACS Model [20]

Unsafe acts consist of errors, which often cause accidents due to its nature to human, and violations that refer to safety rule ignorance [20]. Preconditions of unsafe acts consist of phisical and mental conditions, as well as substandard operator practice (mismanagement and readiness). Meanwhile, unsafe supervision consists inadequate supervision, planned inappropriate operations, failure to correct problem, and supervisory violations. Organizational influences, as the top level of the model, consist of resource management, organizational climate, and organizational process.

METHOD

This paper examines a partial scope of research that was conducted on July to December 2023 at PT. XYZ Site A (a mining contractor company in Indonesia). The primary data of this paper was collected from the answers and reasons that the participants write in a questionnaire with open-ended questions. Meanwhile, the secondary data of this paper was taken from SMKP implementation documents and records obtained from PT. XYZ Site A, such as the reports of inspections, hazard reports, observations, and incidents. These data were then analyzed qualitatively using HFACS model. The steps in analyzing the data include identifying: 1) similarities that are found from the collected data; 2) data that prominently illustrate risk-taking behavior; 3) disparities found between what is written in the documents and what is actually performed on the field; and 4) similarities and differences between the respondents' subgroups and their hierarchical levels.

Referring to Slovin's sampling formula [21,22] and utilizing stratified random sampling technique, a sample of 283 employees of PT. XYZ Site A participated in this study, ranging from managers (6.0%), supervisors (16.6%), and workers (77.4%). This percentage distribution is equal with the percentage of the population in the organization.

RESULTS

Factors that cause risk-taking behavior at PT. XYZ Site are illustrated in each level of HFACS analysis, starting from Unsafe Acts as the first level.

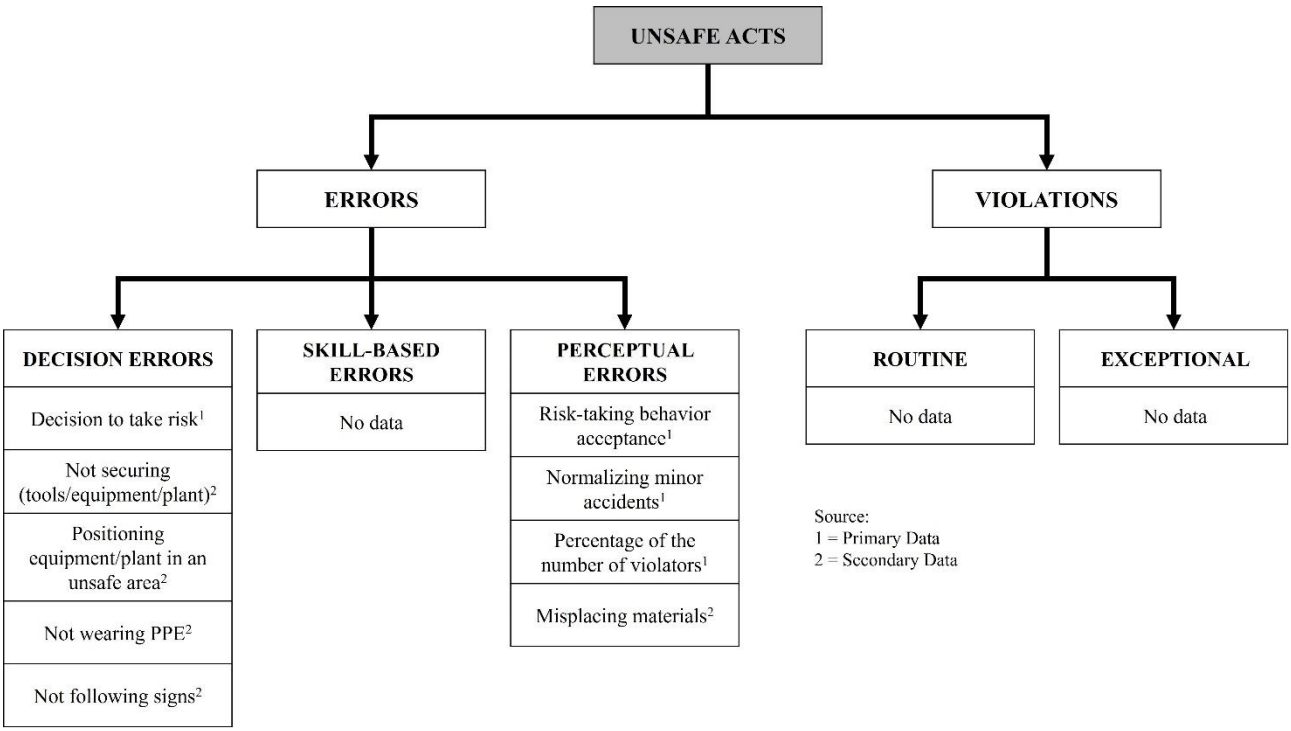

Figure 2. HFACS Analysis on Unsafe Acts Level

For Unsafe Acts level, it can be seen from the figure above that decision errors and perceptual errors cause the employees to take risks. The decision errors are mostly found in the top hazards reported at PT. XYZ Site A throughout the time period under study, while the perceptual errors are concluded from the participants' answers to the questionnaire given in this research. Meanwhile, no data available to identify whether there are skill-based errors occur at the organization. This gap of data occurs because currently there is no available tool to assess whether risk-taking behavior performed by employees is caused by their skills. Meanwhile, violations happen at workplace but it cannot be determined if they are routine or exceptional because there are no summary data or records on the nature of the violations happening at the workplace. Thus, it is hard to analyze the violation patterns in HFACS analysis.

In the level of Preconditions for Unsafe Acts, particularly the category of Substandard Conditions of Operators, there are adverse mental states in the forms of complacency and misplaced motivation. Based on the questionnaire answers given by the participants in this research, when they have a feeling of seniority and more experienced among others, they start to underestimate safety rules. In addition, the misplaced motivation occurs when the employees start to feel bored at work and they start to lose their focus and lead to risk-taking behavior. No data available in this research to determine whether there are adverse physiological states and physical/mental limitations in the organization because these data are administered by other teams, normally medical and human resource teams, and are not covered in the organization's SMKP documents. For the substandard Practices of Operators, lack of communication appears as a manifestation of crew resource mismanagement. The ideal communication should be a two-way positive communication among supervisors and workers. Furthermore, no data in this research regarding personal readiness at PT. XYZ Site A as these data are also administered by other departments and are not disclosed in SMKP documents. The details of analysis on this level can be explained in the following figure.

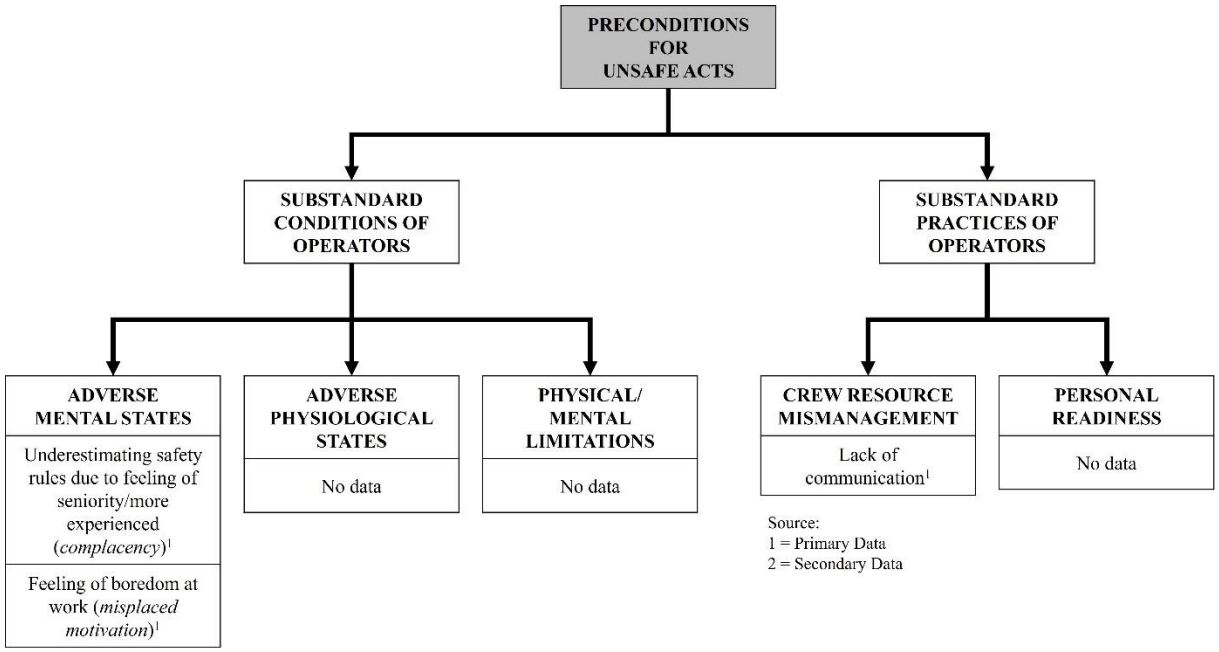

Figure 3. HFACS Analysis on Preconditions for Unsafe Acts Level

In the next level of HFACS Analysis, i.e., Unsafe Supervision, the following figure can give a detail illustration.

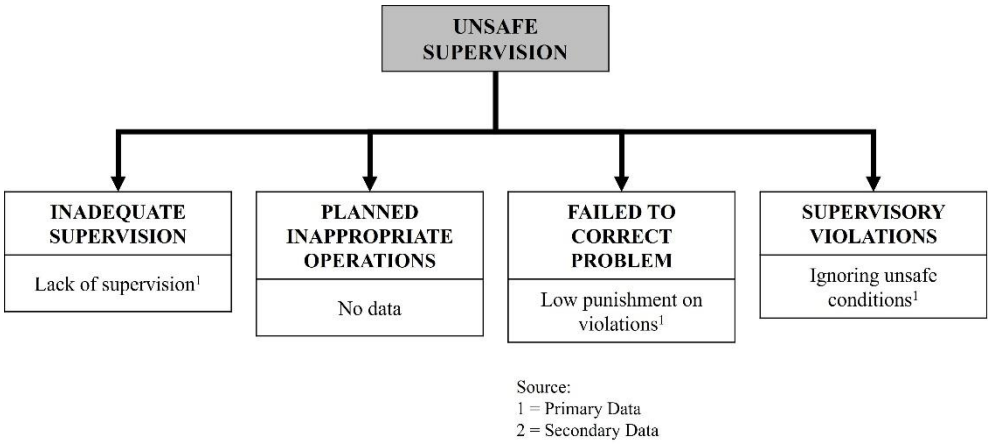

Figure 4. HFACS Analysis on Unsafe Supervision Level

In this level, lack of supervision is perceived to be a cause for risk-taking behavior by the employees. Worker participants consider this factor as a missing key in implementing risk controls. They have several occasions where there is no supervisor around or, in other cases, there is only one supervisor that has to oversee several locations. Meanwhile, managers and supervisors admit that there is still low punishment on violations. This low punishment does not give deterrent effect to the violators so they do not repeat it in the future. Furthermore, workers state that many unsafe conditions that they found and reported are ignored or slowly followed up by supervisors or managers. This makes the workers have to take risk working in an unsafe condition. No data available regarding whether planned inappropriate operations have occurred in the organization as they are not covered in SMKP documents.

The highest level of HFACS Analysis, i.e., Organizational Influences, also has factors causing risk-behavior at workplace. The resource management factor mostly addresses the issues regarding what the employees need to be safe at work. Both manager and supervisor participant groups state that the trainings for employees are still inadequate to achieve their safety objectives. Workers, on the other hand, highlight the need to establish safe place of work and to improve employees' financial welfare in order to minimize risk-taking behavior at workplace. Although the latter factor is closely related employment issues, this factor can indirectly impact employees' focus at work. In addition, workers' concerns on the need to improve safety facilities also raise an illustration on how the organization is leaning to reactive rather than proactive safety approach.

Regarding organizational climate at PT. XYZ Site A, based on recent safety maturity level measurement conducted by them internally, the organization is in the calculative level [23], which indicates that the focus of the organization is still quantitative compliance on safety performances while there are still many unsafe conditions and actions found at the workplace. Regarding organizational processes, the factors causing risk-taking behavior are related with contractual aspects that have to be performed by PT. XYZ Site A as a mining contractor company. The majority of the three group participants (managers, supervisors, and workers) are in agreement that they take risk because they have to achieve their work target as there is time schedule that has to be followed. This indicates that whenever these contractual targets are not achieved, there is a possibility that safety aspects will be left out. Another issue that is raised by workers is, in what they perceive, as an unequal distribution of organizational program. Fatigue check program is the one that they highlight on this distributional issue because the program is only given to the production team. Thus, there is a sense of feeling left out faced by non-production workers. Overall, the details of the causal factors in this organizational level are explained in the following figure.

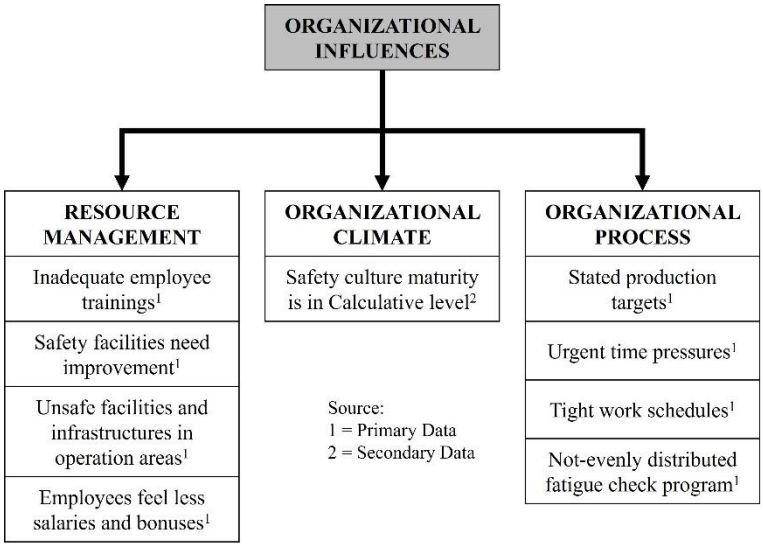

Figure 5. HFACS Analysis on Organizational Influences Level

Lastly, the results of the HFACS analysis above still leave some gaps because of the unavailability of several data that are not covered in SMKP documents, such as skill-based errors, routine violations, exceptional violations, adverse physiological states, physical/mental limitations, personal readiness, and planned inappropriate operations. Therefore, any risk-taking behavior as result of these gaps of data may not be well captured by the organization. Thus, preventive and corrective actions towards the risk-taking behavior may not be as effective as expected.

DISCUSSION

Based on the result of HFACS analysis, it can be seen that the causes of risk-taking behavior are found in every level. The level whose all elements have the causal factors is the Organizational Influences. In the context of Indonesian mining industry, the level of organizational influences has a connection with Mining Safety Management System (SMKP). SMKP as the organization's main drive to prevent workplace accidents is indirectly becoming the root cause of all variables that triggers risk-taking behavior. From policy element, employees will have perceptions that safe behavior is not a priority in organization if the management does not formulate operational policy or business purposes that have orientation on safe behavior at workplace. Another reference for determining the organization's business purposes and contractual aspects in delivering works for the client (such as production targets, time targets, operation schedules) is the SMKP element of management review and performance improvement. A less comprehensive retrospective review on employees' behavior can make organization's safety policy and business purposes vulnerable to risk-taking behavior.

The findings of this research have similarities in comparison with the results of previous research on risk-taking behavior. Risk-taking behavior at workplace is caused by individuals' internal factors that are mainly due to self errors and complacency, as well as external factors, which are predominantly coming from operational targets to achieve, given by both supervisory and managerial levels. On the other hand, there is one finding that makes this research differs from other studies, i.e. there is no finding that risk-taking behavior performed by employees at PT. XYZ Site A is caused by individuals' sensation seeking, safety skepticism, motivation to look cool and to impress

clients. This is an indication of employees' awareness that they cannot perform these unprofessional and unsafe behaviors at workplace.

This research also provides several implications on the mining practices in the organization. While the organization has established a safety management system, the focus of the system approach is still directed towards unsafe acts from workers and unsafe conditions on the jobsite. Organization still ignores that managers and supervisors also play important roles in creating these unsafe acts and conditions. The HFACS analysis in this study, in addition, still has some limitations as it only analyzes based on the primary data and the secondary data from SMKP documents. There are gaps of data needed to conduct the analysis more comprehensively because further secondary data from other departments in the organization, due to the research time constraint, are not investigated.

CONCLUSION

The factors that trigger risk-taking behavior investigated in this research are mainly because of individuals' self errors and complacency, and predominantly due to operational targets to be achieved by the organization, given by both supervisory and managerial levels. The factors that have been determined and analyzed can be an important contribution to prevent incidents and, at the same time, to improve safe behavior at workplace in mining industry. By understanding those causal factors, mining organizations can formulate action plans to prevent or minimize risk-taking behavior. Thus, workplace incidents can be prevented through proactive approach, instead of reactive approach.

For future research, qualitative research can be conducted on employees through interviews or focus group discussion to investigate more comprehensively regarding factors causing risk-taking behavior. In addition, another qualitative research can include analyzing and investigating the data that have been some gaps in this research. Furthermore, quantitative research can also be conducted to see whether the efforts to address the findings in this research have been effective and significant to decrease the number of risk-taking behaviors at workplace.

SUGGESTION

Organization needs to increase influence towards its employees to not take risks that endanger themselves, other people, and environment. This can be delivered by improving resource management, organizational climate, and organizational process that support a better safety management system. Furthermore, safety leadership trainings for supervisors and managers especially on risk management and safe behavior at workplace need to be conducted. Organization also needs to sharpen its monitoring and evaluation on risk management regarding risk-taking behavior prevention not only towards workers but also to the organization, which is represented by supervisors and managers, who are also potential to perform risk-taking behavior. Therefore, organization should have a broader perspective in safety management system.

REFERENCES

1. Direktorat Jenderal Pembinaan Pengawasan Ketenagakerjaan dan Keselamatan dan Kesehatan Kerja. Profil Keselamatan dan Kesehatan Kerja Nasional Indonesia Tahun 2022. 2022.
2. Direktorat Jenderal Mineral dan Batu Bara. Analisis Statistik Kecelakaan Tambang Berakibat Mati Tahun 2022. 2022.
3. Direktorat Jenderal Mineral dan Batu Bara. Minerba One Data Indonesia. 2024 [cited 2024 Jun 20]. Kecelakaan Tambang. Available from: https://modi.esdm.go.id/kecelakaantambang
4. Safe Work Australia. Attitudes towards risk taking and rule breaking in Australian workplaces. 2014.
5. Cruwys T, Ferris LJ, Rathbone JA, Greenaway KH, Saeri AK. When Trust Goes Wrong: A Social Identity Model of Risk Taking. J Pers Soc Psychol. 2021;
6. Ghosh A, Shum C. Why do employees break rules? Understanding organizational rule-breaking behaviors in hospitality. Int J Hosp Manag. 2019 Aug 1;81:1–10.
7. Breivik G, Sand TS, Sookermany AMD. Risk-Taking and Sensation Seeking in Military Contexts: A Literature Review. Sage Open. 2019 Jan 1;9(1).
8. Pfister R, Wirth R, Weller L, Foerster A, Schwarz KA. Taking shortcuts: Cognitive conflict during motivated rule-breaking. J Econ Psychol. 2019 Mar 1;71:138–47.
9. Low BKL, Man SS, Chan AHS, Alabdulkarim S. Construction worker risk-taking behavior model with individual and organizational factors. Int J Environ Res Public Health. 2019 Apr 2;16(8).
10. Rowe R, Stride CB, Day MR, Thompson AR, McKenna FP, Poulter DR. Why are newly qualified motorists at high crash risk? Modelling driving behaviours across the first six months of driving. Accid Anal Prev. 2022 Nov 1;177.

11. Breuer C, Hüffmeier J, Hibben F, Hertel G. Trust in Teams: A Taxonomy of Perceived Trustworthiness Factors and Risk-taking Behaviors in Face-to-face and Virtual Teams. Human Relations. 2020 Jan 1;73(1):3–34.
12. Jung KB, Kang SW, Choi SB. Empowering leadership, risk-taking behavior, and employees' commitment to organizational change: The mediated moderating role of task complexity. Sustainability (Switzerland). 2020 Mar 1;12(6).
13. Qureshi TM, Saleem I, Ahmed S. Breaking Organizational Rules for a Reason: A Framework to deal with Prosocial Rule Breaking. Psychol Educ [Internet]. 2021;58(4). Available from: www.psychologyandeducation.net
14. Wang F, Zhang M, Das AK, Weng H, Yang P. Aiming at the organizational sustainable development: Employees' pro-social rule breaking as response to high performance expectations. Sustainability (Switzerland). 2021 Jan 1;13(1):1–17.
15. Xu R, Luo F, Chen G, Zhou F, Abdulahi EW. Application of HFACS and grounded theory for identifying risk factors of air traffic controllers' unsafe acts. Int J Ind Ergon. 2021 Nov 1;86.
16. Kilic B, Gundogdu S. Human Factors in Air Cargo Operations: An Analysis Using HFACS. Journal of Aviation Research [Internet]. 2020;2(2):101–14. Available from: https://dergipark.org.tr/jar
17. Small A. Human Factors Analysis and Classification System (HFACS): As Applied to Asiana Airlines Flight 214. The Journal of Purdue Undergraduate Research. 2020 Aug 28;10(1).
18. Zhang X, Chen W, Xi Y, Hu S, Tang L. Dynamics simulation of the risk coupling effect between maritime pilotage human factors under the hfacs framework. J Mar Sci Eng. 2020 Feb 1;8(2).
19. Jalali M, Dehghan H, Habibi E, Khakzad N. Application of "Human Factor Analysis and Classification System" (HFACS) Model to the Prevention of Medical Errors and Adverse Events: A Systematic Review. Vol. 14, International Journal of Preventive Medicine. Wolters Kluwer Medknow Publications; 2023.
20. Wiegmann SA. The Human Factors Analysis and Classification System--HFACS. 2000.
21. Susanti A, Asih R, Soemitro A, Suprayitno H, Ratnasari V. Searching the Appropriate Minimum Sample Size Calculation Method for Commuter Train Passenger Travel Behavior Survey. Journal of Infrastructure & Facility Asset Management. 2019;1(1).
22. Zach. Statology. 2023. Slovin's Formula Calculator. Available from: https://www.statology.org/slovins-formula-calculator/
23. Canada Energy Regulator. Advancing Safety in the Oil and Gas Industry: Statement on Safety Culture (2021). 2021.