



Literature Review: Relating Factors to the Effectiveness of Occupational Health and Safety Program Performance

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Abstract

Edited by: Eli Djulejic
Citation: Mappangile AS, Ramdhan DH. Literature Review: Relating Factors to the Effectiveness of Occupational Health and Safety Program Performance. Open-Access Maced J Med Sci. 2022 May 26; 10(F):420-426. <https://doi.org/10.3889/oamjms.2022.9127>
Keywords: OHS performance; OHS management system; Workers
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Received: 26-Feb-2022
Revised: 13-May-2022
Accepted: 16-May-2022
Copyright: © 2022 Andi Surayya Mappangile, Doni Hikmat Ramdhan
Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests
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INTRODUCTION: Work safety performance assessment is one part of the Occupational Health and Safety Management System activities that aim to ensure workers' right to safety and health in the workplace and increase productivity. Further identification of factors related to safety performance needs to be done to ensure the quality of the assessment results is accurate, effective, and efficient.

METHODS: This study is a literature review conducted to explore factors related to the performance of occupational safety and health programs. We carried out the literature search in September 2021. The research sources were taken from several databases, namely, Science Direct, ProQuest, and Google Scholar. The Science Direct database found 823 articles, 8802 ProQuest, and 3200 Google Scholars. From the entire database, only 22 articles met the inclusion criteria. The variables in this study are OHS performance, OHS management system, and work.

RESULTS: This literature review shows that there are 19 personal factors, 19 work environment factors, 13 technical factors, and 37 organizational factors related to the effectiveness of occupational safety and health program performance.

CONCLUSION: Factors related to occupational safety and health program performance are grouped into four. Primary factors, namely, personal factors, work environment factors, technical factors, and organizational factors.

Introduction

Occupational safety and health have long been discussed globally; global occupational safety and health issues have become influential in various policies, regulations, standards, and business strategies [1], [2].

Various steps and strategies are implemented by companies in implementing an occupational safety and health system as an effort to minimize the impacts caused by running industrial processes [3], at least there is something that underlies the application of occupational safety and health, namely, the OHS Management System that needs to be implemented in any workplaces [4].

However, the implementation of the OHS management system until now remains a question regarding its effectiveness, considering the work accident data are still increasing from year to year. Statistics shows that there were 2.3 million deaths due to work accidents, of which 2 million were due to occupational diseases, and 0.3 million were due to injuries, which cost about US\$2.8 trillion. The costs incurred due to occupational accident losses

reached 4% of GDP. This cost is a waste that directly reduces existing productivity, affecting a country's competitiveness [5], possibly means that accidents and occupational diseases are still a severe problem in the industry [6]. Likewise, in Indonesia, although from year to year, there has been an increase in receipt of OHS management system certificates, from 2017, around 5119 companies increased to 8050 in 2019, but this number is still minimal compared to the number of companies that are required to report based on research conducted by Triyatmo, 2013 [7]. However, on the other hand, statistics shows that the number of work accidents in Indonesia is recorded based on the Ministry of Manpower and Transmigration Report and *BPJS Ketenagakerjaan* records. The number of work-related accidents in 2014–20,220 shows that the number of accidents from year to year has increased the highest in 2018, namely, 173,105 or 40,273 cases per day compared to last year. The previous year, namely, 2017, which was 123,000 cases of work accidents (2014 = 105,383; 2015 = 110,285) had decreased in 2016 = 105,182 cases but increased again in 2019 (114,000 cases) and in 2020 despite the COVID-19 pandemic conditions also increased (177,000 cases) [8] Occupational accidents not only have an impact on employers but also on the future of

Table 1: Synthesis of research results related to factors relating to occupational health and safety performance

Number	Researcher/year	Factors related to occupational safety and health performance
1	Botti <i>et al.</i> (2021)	Lack of training, non-standard work equipment, weak maintenance of work equipment/machinery, haste in work, and inadequate availability of personal protective equipment
2	Adeyemo and Smallwood (2017)	Limited applicable OSH laws (regulations do not match current conditions), forms of corruption and bribery, weak OSH culture, high level of discomfort, level of punishment for OSH violators, inadequate funding of equipment facilities, political influence, government commitment inadequate, lack of skills of the workers, inadequate coordination and integration in the inspectorate division
3	Mohammadfam <i>et al.</i> (2017)	OHSAS certification 18001
4	Eskandari <i>et al.</i> (2021)	Organizational factors consist of nine sub-factors, namely, management commitment to safety, worker participation, safety communication, blame culture, safety training, interpersonal relationships, safety supervision, reward system, and continuous improvement Meanwhile, individual or personal factors consist of nine sub-factors, namely, perceptions of safety rules and regulations, risk taking, emotional instability, safety awareness, job satisfaction, fatigue, work competence, workload, and work stress The third factor is the work environment consisting of five sub-factors, namely, chemical agents, physics, biology, ergonomic factors, and mechanical factors
5	McCabe <i>et al.</i> (2017)	Worker's perceptions of safety programs, occupational safety, and health management, supervision related to OSH aspects, labor safety, and work pressure. Workforce involvement and worker awareness of OSH and organizational commitment
6	Chu <i>et al.</i> (2020)	Group openness, group consistency, group extraversion, group agreement, and neuroticism have a significant relationship to participation and safety compliance which leads to an increase in occupational safety and health performance in high-speed rail operators
7	Zhang and Zhu (2021)	Acclimatization training
8	Gopang <i>et al.</i> (2017)	Implementation and evaluation of occupational safety and health management systems on a regular basis
9	Tremblay and Badri (2018)	Organizational dimensions, namely, upper management commitment, risk identification and control, prevention programs, training, and subcontractor management. Technical dimensions, namely, LOTO, personal protective equipment, working in confined spaces, working at heights, working in high temperatures, rescue procedures, and manual work procedures The behavioral dimension consists of four themes, namely, supervision, discipline measurement, communication, and worker representation. The dimensions of continuous improvement in question include audits, documentation, and policies The level of organizational support felt by workers
10	Liu <i>et al.</i> (2019)	Accompaniment
11	Liu <i>et al.</i> (2021)	Management's commitment to safety aspects, safety training, and worker involvement has a direct influence on work safety performance, level of knowledge, and motivation of workers
12	Lu <i>et al.</i> (2020)	Personal factors include stress levels, fatigue, social support, job stress, and self-esteem
13	Baby <i>et al.</i> (2021)	OHS regulations and commitments, planning, implementation, evaluation, and review by management
14	Lestari <i>et al.</i> (2019)	OHS policy, legal compliance related to OSH aspects, the dedication of workers related to OSH, number of hours of OSH training, and number of visits to external consulting services
15	Rodrigues <i>et al.</i> (2020)	Project management, OHS management, management commitment, safety climate, training, HR management, risk management, and management
16	Winge <i>et al.</i> (2019)	Application of safety culture
17	Khawam and Bostain (2019)	Implementation of work safety management system and safety responsibility
18	Tong <i>et al.</i> (2020)	Reward policy, management norms, and culture
19	Machfudiyanto <i>et al.</i> (2021)	The technical factors are the number of safety levels, the number of technical errors in the safety management system, the number of work accidents, the frequency of repairs, and the repair costs incurred
20	Janačković <i>et al.</i> (2017)	Human or worker factors consist of indicators of injury level, worker ability index, degree of conformity with SOP, employee satisfaction index, number of errors, and omissions committed. Organizational factors consist of indicators of efficiency in managing safety resources, division of work with high risk, number of safety control programs in the workplace, the average number of hours of employee training each year, and number of guidelines related to occupational safety and health The fourth factor is external factors, which consist of indicators of the level of safety technology, the level of implementation of laws and regulations, the number of standards, the number of available work accident databases, and the number of available funds
21	Qayoom and Hadikusumo (2019)	Safety culture
22	Ifelebuegu <i>et al.</i> (2019)	Emotional intelligence

OHS: Occupational health and safety, OHSAS: Occupational health and safety assessment series, OSH: Occupational safety and health, HR: Human resource, SOP: Standard operating procedure, LOTO: Lock out/tag out.

the entire family and become one of the leading causes of company losses [9].

The data show that the actions or behavior of workers causes 80% of work accidents, and at least 70% of the behavior or actions of workers are caused by errors, not in humans but the management system and working conditions. Engineering techniques (eliminating unsafe conditions) toward management so that significant losses do not occur, then a new prevention strategy is formulated to reduce accidents and adverse impacts and make OHS a top priority; the method focuses on the more complex aspects of OHS in the form of an OHS management system [10].

To make the OHS management system more effective to prevent work accidents and occupational diseases is to improve the performance of OHS [10], [11] and assess the achievement of OHS performance, performance measurement is needed. Performance is not an end in itself but a tool for more effective management. Performance measurement results show what happened, did they do things that prevented accidents and illness, and whether those actions were practical in terms of the actual injury and illness, not why it happened, or what interventions should be implemented/developed to overcome them [12],

[13], [14], which ultimately the numbers will tell the organization whether they are effective as a team [15]. Measuring OHS performance helps ensure that organizations meet their OHS policy goals and targets. OHS performance measurement provides information on how the organization (or organizational sub-units) is performing concerning OSH and enables the organization to identify problem areas where improvement can be made [16]. OSH performance must be evaluated based on realistic and appropriate indicators. Possibly because each problem or failure in OHS has its characteristics, and the success of the OHS management system cannot be judged solely by counting the number of accidents [17].

In measuring the performance of the OHS management system as a form to evaluate the effectiveness of the entire system, measurement indicators are needed [18]. Clear indicators are needed to measure the effectiveness of the OHS management system. The effectiveness of the OHS management system, in general, has been evaluated through compliance audits and performance evaluations based on the standards and audit methods of the OHS management system [19], [20], and evaluation of the implementation of the OHS management system [21].

Based on this, the researchers conducted further studies to identify indicators or factors that influence the assessment of occupational safety and health performance so that the assessment results become more accurate, effective, and efficient [18].

Methods

This literature review was conducted to explore the factors that influence the effectiveness of implementing occupational safety and health performance. The literature search was carried out in November 2021. Researchers searched for data sources using several databases, namely, Google Scholar, Science Direct, and ProQuest, by connecting the main topic terms, namely, OSH Performance “AND” OSH Management System “AND” Occupational. There are limitations in the search for related journals carried out by researchers, namely, based on the year of publication of the literature used between 2016 and 2021 to find valuable data sources following the times.

Inclusion criteria included in selecting this literature review research include journals that must relate to factors that affect the effectiveness of occupational safety and health performance and full journal texts available in English or Indonesian. The exclusion criteria included in selecting this literature review study were literature review articles. The variables in this study are factors that affect the effectiveness of implementing occupational safety and health performance.

Data extraction

Data selection and analysis

The journals were selected by the researcher independently. The Science Direct and ProQuest databases were searched using the exact keywords, “OSH Performance, OSH Management System, Occupational.” “While the Google Scholar database was searched using the keywords “*Kinerja K3, Sistem Manajemen K3, dan Pekerjaan.*” Twelve thousand eight hundred and twenty-five articles were searched through Google Scholar, Science Direct, and ProQuest databases during data synthesis. Seven thousand three hundred and sixty-six articles were issued after reviewing the year the article was published, namely, 2016–2021. Five thousand two hundred and sixty-one articles were removed by reviewing the title, and 111 articles were removed by reviewing the abstract. Thirty-four studies were relevant because they discussed factors related to the effectiveness of occupational safety and health program performance. During the full-text analysis of 34 studies, another 12 articles were excluded because the

data did not match the inclusion criteria; this systematic review finally selected 22 relevant studies that met the research inclusion criteria.

Figure 1 describes selecting articles according to the guidelines of the Preferred Reporting Literature Reviews and Meta-analysis. The initial search yielded 12,825 articles showing high relevance to the topic under review. After duplicating articles and filtering the year of publication, title, and abstract, 34 articles entered the next stage, namely, full-text review and eligibility based on the inclusion and exclusion criteria determined by the researcher. Twenty-two research articles that met the requirements were reviewed for quality and synthesized in this final literature review report.

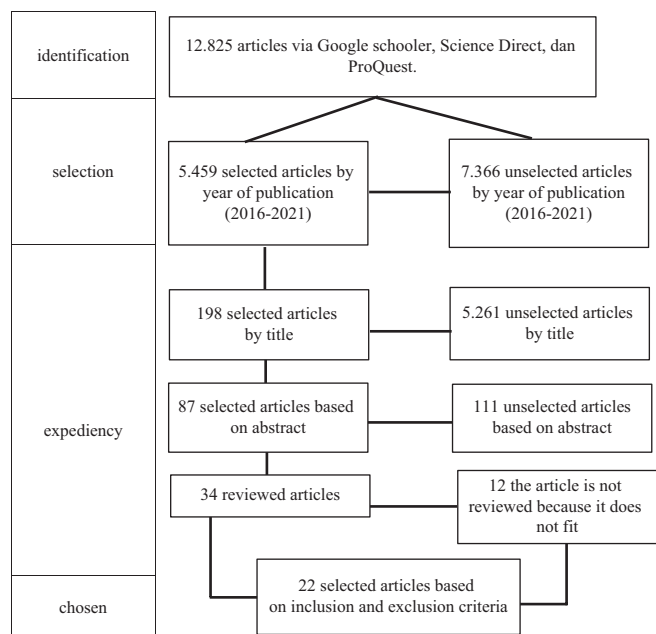


Figure 1: PRISMA Flowchart For Research Literature Review

Results and Discussion

The results of the research in this literature review indicate that there are several factors that can be used as indicators in measuring the performance of occupational safety and health programs because of the discovery of a relationship based on the results of various analyses that have been carried out. In general, factors related to the performance of occupational safety and health programs can be classified based on individual factors, environmental factors, technical factors, and organizational factors as used in Table 1.

Individual factors in workers related to the effectiveness of occupational safety and health program performance are safety awareness, job satisfaction, fatigue, work competence, workload, and work stress [35], workers' emotional state [43], worker feedback on work safety, and participation in safety development [44], [45], [46].

Other individual factors related to occupational safety and health performance are knowledge [34], motivation, dedication [36], personality neuroticism, physical condition, mental condition, psychomotor condition, worker ability, degree of conformity with SOP, ability to regulate one's own emotions when decision-making, the ability to handle other people's emotions, the ability to discuss emotions accurately, impulsive behavior, perception of safety rules and regulations [27], risk taking, social support, self-esteem [35], employee satisfaction index, number of mistakes, and negligence committed [23], [26].

Personal factors are the primary cause of work accidents [47]. Research conducted on the construction industry in Iran states that the personal factors of workers are the factors that directly influence the performance of occupational safety and health [48].

Knowledge is one of the personal factors related to unsafe work behavior that can lead to the risk of work accidents and reduce work safety performance [49], [50]. Because knowledge plays a crucial role in shaping behavior, and someone with a high level of knowledge related to OHS aspects tends to have a positive attitude in responding to hazards or hazards in the work environment [51], meaning that person can identify what type of hazard is. Only those in the workplace can determine control measures to minimize the risk of him having an accident at work.

Environmental factors related to the effectiveness of the performance of occupational safety and health programs are the presence of chemical hazards, physical hazards, biological hazards, ergonomic hazards, mechanical hazards, environmental health and hygiene conditions, project hazard level, high work climate [29], lighting in the work area, ventilation, availability of safety manuals, emergency exits, direction markers, availability of toilets, working floor conditions, drinking water conditions, toilet cleanliness, and WWTP system [26], [30], [46].

Unsafe working environment conditions include non-fulfillment of requirements and inadequate conditions of materials, tools, machines, and workplace spaces, giving rise to potential hazards in the work area, which will impact the incidence of work accidents [52], [53]. A good work environment and workers' perceptions of their work environment have a significant relationship to implementing occupational safety and health management practices and compliance [54].

Technical factors that are known to have a significant relationship with the effectiveness of the performance of occupational safety and health programs in an organization are the implementation of the lockout/tag-out program, personal protective equipment, working in closed spaces, working at heights, working in high temperatures, rescue procedures, manual work procedures [31], the number of safety levels, the number of technical errors in the safety management

system, the number of work accidents, the frequency of repairs, maintenance of work equipment/machines [55], performance measurement, and supervision [22], [23].

Technical factors are relevant to technology that can influence or assist in increasing productivity and work safety performance, including the availability of personal protective equipment, repair of work equipment, and supervision or supervision [56]. There is a significant relationship between supervision (supervision) and the incidence of work accidents [57]. Routine work monitoring activities are proven to reduce the risk of irregularities in work which will lead to increased employee performance and decreased risk of work accidents [58].

Supervision is defined as ensuring that organizational and management objectives are achieved. It deals with ways of making activities as planned [59]. Weak management supervision will result in a gap or gap due to the absence of a system that can guarantee the implementation of safe working behavior and conditions that can impact work accidents. [60]. According to Government Regulation of the Republic of Indonesia No. 50 of 2012 concerning the Implementation of the Occupational Health and Safety Management System, the contribution and commitment of management such as carrying out supervisory activities carried out on the workforce can create a culture of occupational health and safety. The incidence of work accidents can be reduced.

Organizational factors are the application of the OHS management system [22], [30], [49], organizational/management commitment [31], [27], [38], worker participation [27], safety communication, continuous improvement, rules, and regulations, work accident investigation, the number of errors and omissions, number of training hours [49], [55], safety program, employee health check program, risk management (HIRADC), internal audit, safety promotion, resource procurement, safety responsibility [49], accountability and authority, and frequency and severity of work accidents [25], [32], [44], [61].

Other organizational factors related to competency improvement, training, documentation and document control, management review, number of visits to external consulting services [36], safety culture [42], [48], workforce certification, reward policy [40], group openness, group consistency, group extraversion, group agreement [28], efficiency of safety resource management, division of high-risk work, safety control program, and guidelines related to OSH [26], [62].

Management commitment has an effect of 35% on the safe behavior of workers [63]. Strong management commitment and worker involvement related to occupational safety and health aspects [34] have been shown to significantly improve an organization's safety and health climate and culture because these two factors can positively influence safe work behavior so that safety-related compliance can

be met. Moreover, Management commitment improve occupational safety and health performance [64].

To ensure that the OHS Management System has been built according to the characteristics of each organization, Makin Wander suggests the main control strategies for dealing with hazards in the workplace, namely, safe places, safe people, and safe systems [65].

In addition to factors related to the effectiveness of the performance of occupational safety and health programs in an organization, some factors can hinder and disrupt the performance of occupational safety and health, namely, the limited applicable OHS law, forms of corruption and bribery, weak OHS culture, level of high discomfort, level of punishment for OSH violators [43], inadequate funding of equipment facilities [55], OSH law which has not been updated and does not reflect current conditions, weak judicial system, and structure related to OSH violations, influence politics, inadequate government commitment, lack of skills of workers, inadequate coordination, and integration [24].

Conclusion

Performance appraisal of occupational safety and health programs can be carried out accurately, effectively, and efficiently if an assessment is carried out using indicators proven to have a relationship with work safety performance. Factors related to occupational safety and health performance are grouped into four main categories: Personal, work environment, technical, and organizational.

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