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Literature Review: Accidents in the Material and Construction Industry

*Nurhana Abd Wahab, Nik Hasnaa Nik Mahmood, Asnul Dahar Minghat**

Universiti Teknologi Malaysia, Malaysia
*Correspondence: E-mail: asnul@utm.my

ABSTRACTS

The material and construction industry plays a big role to contribute to the country's development and indirectly contributes to improving the quality of life for locals. Here, the focus of this paper is on the literature review on accidents in the material and construction industry, problems causing the accident, the safety training impact and influences, issues related to the method of training, the model of learning and training for Occupational Safety and Health, and the effectiveness of training method. This paper can become the references for practitioners and industrial sectors as well as stakeholders and government.

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1. INTRODUCTION

The material and construction industry plays a big role to contribute to the country's development and indirectly contributes to improving the quality of life for locals (Stephen & Festus, 2022). This material and construction industry can consume and connect with local raw materials (Patil *et al*., 2022; Irawan *et al*., 2021). This construction can be also encouraged in the educational field (Babalola & Omolafe, 2022a; Babalola & Omolafe, 2022b).

The industry provides job opportunities for approximately 800,000 people in this country. It requires high numbers of manpower from locals and foreigners together to keep the industry moving as required by the Malaysian government. Undoubtedly, the construction site is one of the most dangerous workplaces in Malaysia. The construction workers deal with hazardous sources, situations, and activities most of the time. Perilous activities such as scaffolding, excavation, working with machines, and electrical-related equipment have become common for construction workers. Based on the SOCSO report, within these five years, the number of major accidents that occurred in Malaysia has slightly increased. Most of the report concludes that the root cause of the accidents was due to human error for example slips, trips and falls from height, being struck by an object, electrocution, and being caught in machinery. To increase awareness of safety and health among the workers of the industry, laws, and regulations have been set up not only to minimize these accidents but also to reduce the severity. One of the laws and regulations provided by the national agency is the safety training program. It is considered a preventive program that functions to protect the construction workers. Safety Training is a paramount preventive program where it provides awareness of safety to the local and foreign workers. At the same time, its objective aims to reduce the number of accidents in the workplace. From the safety training program, the workers will be able to understand the impact of conducting safety habits and safety acts at the construction site.

The focus on the literature includes accidents in the material and construction industry, causes of the accident, the safety training impact and influences, issues related to the method of training, the model of learning and training for Occupational Safety and Health, and the effectiveness of training method.

2. METHODS

We used a literature review for obtaining the data. The data were then summarized to get an explanation. Several references were used, including Anger *et al*. (2009), Endroyoa, *et al*. (2012), Gervais (2003), Jafari *et al*. (2014), Juárez-Carrillo *et al*. (2017), Huber (2016), Pinto *et al*. (2011), Crosby and Lester (2007), Tam and Fung (2012), Tovar-Aguilar *et al*. (2014). We also used some literature on websites, such as http://www.dosh.gov.my/index.php/en/occupational-accident-static, Retrieved on 1 January 2018.

3. RESULTS

3.1. Accidents in the Material and Construction Industry

Material and construction can be hazardous businesses in Malaysia. This is widely recognized by DOSH and everyone in the material and construction industry. Safety in construction projects still needs attention. The result from DOSH 2017 showed that the level of fatal accidents in construction is higher than in all other industries.

Occupational accidents are unplanned, unpredictable, or unintentional events that can cause some damage or harm to the equipment or cause injury, or even death to the workers.

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These accidents may bring about many impacts such as financial losses, social nuisances, human suffering as well as humanitarian issues.

3.2. Causes of Accidents in Construction

Occupational injury is contributed by inherent hazards and the nature of job performance. Chemical, physical and biological hazards are three types of hazards recognized and controlled in all industries, especially construction.

Physical hazards can cause direct injury or internal bleeding to the worker on site. Due to the negative attitude and behavior of the general workers, their inconvenience to wear PPE is one of the reasons which causes accidents. In addition, this occurs due to the poor communication between the site- management and general workers. Language barrier causes communication breakdown among general workers from various countries as some of them do not understand the local language. As a result, it is difficult for the safety committee to communicate to inform these workers about the hazardous areas that may occur at the site.

The complexity of building designs is one of the causes of the accident. More complex designs tend to involve a greater likelihood of accidents in the workplace. The workers tend to apply the same knowledge and skill in the event though the nature of the project is different. The worker who is trained in a specialized area cannot adapt to the new equipment as they may not be familiar with it.

Research results showed that 85% of accidents are caused by unsafe acts in construction industries. Fatal accident investigation report in the safety culture plays an important role in the occurrence of an accident.

3.3. Safety Training Impact and Influences

According to OSHA, the purpose of training is to ensure the workers can perform their job safely by establishing expectations for workers on how to perform the task. Safety training could help to reduce accidents, injuries, and compensation costs, and it increases workers' safety awareness in the workplace, therefore the workers must be well trained, so they could be able to react to and identify the hazard. The induction is conducted in a training classroom and the number of participants is limited to 40. The participants need to attend the entire complete module to obtain Green Card. Failure to attend the entire course requires them to attend completely new training from the beginning. The attendance of the participants will be recorded with signature during the 6-hour sessions as proof of their presence in class.

Safety training is one of the factors to improve safety climate level and safety culture at the construction site. The improvement of the safety climate factor can promote the level of safety climate at the site. Safety cultures have an impact on the workers' performance and derive their beliefs and behavior in their workplace.

The inadequate knowledge among senior and project managers may cause poor safety culture and will be reflected in their safety performance. High performance of the project can be achieved by good and intense safety training. This is supported by the fact that to convey the safety knowledge, the safety induction, orientation, toolbox talks, communication among workers, and formal presentation by safety managers should be conducted effectively.

3.4. Issues Related to Method of Training

Safety training contents should involve material analysis of workers' level of knowledge, analysis of workers' needs and interests is perceived as very important to get a good impact

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during a training session. Visual aid for training 4D or 5 D will help to increase knowledge during training sessions and after a training session. Observations are made to see how much they have learned during the training sessions. Workers can be motivated by training. Frequent training will encourage workers' awareness, and motivation and promotes pride in work completed with no accidents.

The idea of a good safety report can be achieved by motivated workers influenced by the training program. Focusing in 3D safety training materials, 3D training materials are effective to enhance the understanding of foreign workers during training sessions for those who have very minimal English proficiency.

The employer may have the best intention in training but the objective to improve safety training to make sure the effectiveness in the target may not be achieved unless they pay special attention during a training session. Foreign workers encounter a language barrier, use a visual aid, and provide translator and safety guidelines written in their language.

3.5. Model of Learning and Training of Occupational Safety and Health

Safety education and training as one element that must be included in the curriculum because students will be working with equipment, machinery, and material during personnel practical training. The study emphasizes that education and training are very crucial to obtaining a construction safety culture.

3.6. Effectiveness of Training Method

There is a combination of different training methodologies, flipcharts, visual materials, and bilingual handouts, handout learning highly increases Safety Knowledge among highly educated participants. Peer-to-peer education shows a good sign in terms of behavior. This is because, at the end of the program, the safety awareness in the use of PPE compared with the control group increases. The sessions need to be recorded and collected as proof of their presence in class.

Discussion demonstration, video materials, printed material (brochures), and training conducted by the peer-to-peer results in safety knowledge and safety behavior and becomes more effective in their native language. Training assessments and material during class sessions should be provided in multiple languages so they can understand the information.

3.7. Kirkpatrick Model /Training Evaluation Model

Kirkpatrick's Four-level training evaluation model is used to analyze the effective training program and the impact of the training so that it can be improved in the future. There are four levels of Kirkpatrick's Model that applies in this research, the four-level are reaction, learning, behavior, and result:

(i) **Level 1: Reaction.** Measure the workers' reaction to the training, the value of the training session (pertaining to the topic being discussed), materials, presentation of the trainer, and the venue.

(ii) **Level 2: Learning.** Measure what the workers have learned in the class and the knowledge they have gained during the class session which will be transferred to paper. Pre and Post exams will be conducted to test the participants' understanding before and after the session.

(iii) **Level 3: Behaviour.** Measure the behavior of the participants before and after a training session. This will be done based on the training they have received perhaps they can apply their new knowledge to their routine work. Site management personnel can evaluate their

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behavior at the site during the working hour to see their development in terms of behaviour.

(iv) **Level 4: Reaction.** The results of the training will be analyzed. This includes the outcome to the company and workers themselves whether it gives a positive impact on the workers and provides a good return to the company.

4. CONCLUSION

To improve learning outcomes, the implementation of industry-based OSH learning is more effective compared to the existing learning model. The learning model (industry-based OSH) can enhance the OSH knowledge, skills, and attitude of the participant and should be adapted to be the implementation of OSH in all the projects. The Industry-Based OSH learning model consists of a) material, (b) Learning /training (c) Tool /equipment – media (d) learning/training evaluation. All these processes require to be taught by certified trainers.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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