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REDUCING ON CONSTRUCTION ACCIDENTS IN KLANG VALLEY: CAUSES. CHALLENGES AND PREVENTIVE APPROACHES

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ABSTRACT
The dataset on accidents in the construction sector portrays the Malaysian construction industry as the crucial sector which requires a significant reformation on the present site safety measures. Given the rising rates of accidents, ill-health, and safety concerns associated at construction sites, this sector is deemed as the most hazardous among other industries nevertheless, leading to become a matter of concern especially for the stakeholders in this industry. This study aims to investigate the various causes and effects of accidents and suggest effective preventive measures to curb accidents from occurring at the site. Identified the important elements that contribute to accidents in the region's construction industry and investigate viable accident-reduction strategies.The method used in this research is a questionnaire survey which is distributed online to construction professionals within the Klang Valley area. 50 sets of online questionnaires were returned back and the responses were using the Likert scale to scale the answer. Analysis was using frequency distribution and mean score. Findings of this study reveals that accidents are mostly caused by insufficient training and orientation delivered to the workers before the project starts. Meanwhile, the most prominent effect of accidents is that it leads to bad reputation of the company and a major number of respondents agreed that implementing a risk assessment plan to identify the possible risks is the best solution to mitigate high accident rate.

Keywords:
Construction, Accidents, Causes, Effect, Preventive measures, Questionnaire, Construction Parties

INTRODUCTION

Construction industry undoubtedly plays a major role in encouraging growth in the country's economy nevertheless, it is also vulnerable to accidents which can happen at any moment during the building phase placing workers' life in jeopardy as it involves several parties performing dangerous activities in a single environment (Ayob et al., 2018). The rate and statistics of accidents that occur in the construction industry for the country are still high based on a study conducted by Hamid et al, (2018). Latiffi et al. (2017) claim that this is because different construction parties have varying degrees of capacity to embrace and grasp the concept. (Haslina Mohamed et al., 2023).

Accidents occurring at the workplace on a daily basis are quite common in the construction sector culminating in workplace fatalities and also substantial implications for construction firms. The percentage of fatalities at Malaysian construction sites has skyrocketed over the years despite numerous efforts that have been taken to avoid them. Thus, respective authorities and construction companies need to be strict in enforcing safety guidelines at the workplace as an approach to reduce the likelihood of accidents at the construction site. The research's objectives in addressing this issue are to identify the major causes and effects of accidents and to propose proper mitigation measures to minimise accident rates.

LITERATURE REVIEW

Natural occurrences and human errors are the two main factors why construction accidents happen. Construction site mishaps are prompted through the reckless behaviour on the behalf of construction companies or employees of the company. Accidents at the workplace, according to Arachchige and Ranasinghe (2015), not only lead to delays but impact the development's time duration as well as raising expenses, and they also destroy the reputation of the construction companies involved.

Since human production activities are changing so quickly, it is essential to continuously enhance and add to all facets of development, starting with the development of infrastructure. (Freelove et al., 2022; Chen Youle, & Haslina Mohamed., 2024). However, as can be interpreted by looking at construction accident figures, there has been little significant reduction in accident numbers. DOSH (Department of Occupational Safety and Health) The construction industry continues to have the maximum mortality rate, in 2023, accounting for 45 fatalities (DOSH, 2024). Selangor have higher reported cases on construction accident compared to other industries on January to May 2023 (DOSH, 2024)

The safety efficiency of the Malaysian construction industry is subpar, as showcased by the large number of incidents and their increasing frequency. Despite the fact that the accident and death rates have been down in recent years, it is nevertheless unsatisfactory to declare that construction sites are now safer than they were previously. However, problems may arise in building projects that are created by the design because of the inexperience of some construction partners, their unfamiliarity with building materials and construction procedures, the lack of depth in the design, their incapacity to guide construction, or their ineffective guidance (Yu Chunchun & Zulhazmee Bakri., (2024)

Accidents do not happen on its own; they are frequently triggered by a set of conditions or by an individual's behaviour as they are practically unavoidable in every construction project. The preponderance of the accidents that occurred was caused by reckless behaviour as well as acts or through hazardous working conditions at the worksite. According to Ridley (1986), 99 of the accidents are driven by either unsafe behaviour or unsafe condition or by a combination of both. In other terms, accident causal factors can be divided into two categories known as human errors and non-human errors. The Table 1 below shows six main categories of accident causes and their respective sub-causes.

Table 1: Causes of accidents in the construction industry based on reports from DOSH (Hamid et al., 2008; 2019; Halim et al., 2020).

Causes of Accidents	Breakdown Aspects of Causes
Unsafe equipment	• Unavailability of safety equipment • Failure in equipment • Not ergonomics
Worksite conditions	• Poor site management in terms of arrangement of construction materials, equipment and waste materials. • Worksite is slippery and muddy • Excessive noise • Poor illumination • Poor ventilation
Distinctive nature of industry	• Work operation as in rough work, mental and physical requirements, high level of energy required. • Variable hazard • Working at high elevation • Limitation of working area

	• Transient workforce
Unsafe method	• Incorrect procedure of work • Level of knowledge • Inability to abide by the work procedure
Human element	• Negligence • Experience (total working hours and training undertaken) • Body effort (tiredness, pain, drug addiction, intake of alcohol) • Personal Protective Equipment (PPE) • Self-emotion • Attitude
Management	• Education (safety training and orientation) • Poor safety policies • Poor inspection program • Inadequate warning system • Safety not regarded as important criteria • No compliance with safety regulation • Insensitive • Motivation program

Accidents can generate delays in construction, lead to huge costs, and, most importantly, harm the company's public image, including losing employees' faith or being barred from negotiating on government projects (Arachchige and Ranasinghe, 2015). Construction accident repercussions are classified into three categories: humanitarian, economic, and legal. Some of the most major consequences include scheduling time wasted, corporate reputation harm, psychological repercussions on personnel, and medical expense expenditures (Ahmed, 2019).

The construction field has a high-risk potential, with a high likelihood of serious accidents occurring on the jobsite. Since there are various inherent dangers at construction sites, all reasonable precautions should be taken to prevent them. Workers will be more efficient and motivated to work if they are given the idea that they are safe. If the company maintains a high standard of health and safety, its professional image will improve, making it more appealing to potential stakeholders. Some of the safety measures that may be implemented are performing routine inspections of the equipment, using the appropriate protective gear, executing risk assessment before the project is started, and providing sufficient training to workers.

Based on the research from the previous study, thirty (30) causes were classified into 6 main categories, 9 effects and 7 mitigation approaches were determined and tabulated in the Table 2 below.

Table 2: Causes, effects and mitigation approaches.

Causes (Hamid et al., 2008; 2019; Halim et al., 2020)	**Effects** (Ahmed. S., 2019)	**Mitigation Approaches** (Toole, T. M., 2002; MacDonald et al., 2009; Krasno, 2021)
Unsafe equipment	Human suffering exposing workers to injuries, disability and fatalities	Performing routine inspections of the equipment
Worksite conditions	Affect productivity and safety of workers	Using appropriate protective gear
Distinctive nature of industry	Loss of income or decline in wages	Conducting safety meetings on a daily basis
Unsafe method	Increase the risk of mental disorders	Executing risk assessment

Human element	Cause project delay	Providing sufficient training to the workers
Management	Increase in project cost	Comply with OSHA guideline and report unsafe working condition
	Project abandonment by involved parties	Engage in communications
	Reputation of the organization is tarnished	
	Employers is held account for the negligence of workers during work and injuries faced by their workers	

METHODOLOGY

The quantitative method was implemented in this study and the questionnaire survey which was distributed using Google Form tool on the targeted construction professionals in the Klang Valley region. The questionnaire survey contains four sections for the respondent to answer consisting of Section A for the demographic information, Section B for the causes of accidents at construction sites, Section C for the effect of accidents at construction sites and finally Section D for preventive measures to reduce accidents in the construction industry. The collected data was tabulated and analysed in the Microsoft Excel. Data analysis is used Frequency distribution using Percentage formula (Triola, M. F., 2018) and Mean Score formula (Triola, M. F., 2018). The result was later presented in the form of a table and chart. For the objective 1 until 3, the mean score was computed and the ranking was given based on the mean score value. The formula shown below is used to calculate the percentage frequency and mean score.

$$Percentage\ (\%) = \frac{Frequency\ of\ selected\ answer}{Total\ frequency}\ x\ 100\%$$

$$Mean\ Score = \frac{(\Sigma\ f \times s)}{5N}\ \ (1 \leq MS \leq 5)$$

ANALYSIS AND DISCUSSION

For methods of verifying the results, activities such as assuring methodological coherence, sample sufficiency, creating a dynamic link between sampling, data collecting, and analysis, thinking theoretically, and theory creation are examples of verification techniques that assure data dependability and validity (Morse et al. 2002; Hanah Zakaria et al., 2023).

Through the online questionnaire, fifty (50) respondents out of 200 targeted respondents have responded within the duration of 1 month and 18 days. Based on the analysis conducted for Section A, the highest number of responses was obtained with a percentage of 3% (3 of 50) from JA Consult which is a traffic consultancy firm meanwhile certain companies have 2 respondents (2%) and the rest only one respondent (1%) from each company.

From Figure 1, 54% (27 of 50) of the respondents are working with companies that handle infrastructure projects and 4% (2 of 50) of the respondents are companies involved with industrial projects. In Figure 2, it can be seen that 42% (21 of 50) of respondents come from the contractor background while 12% (6 of 50) are working in fields apart from those mentioned in the questionnaire.

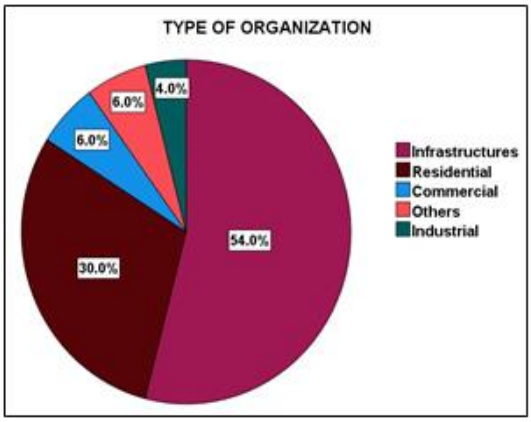

Figure 1: Type of respondent's organization.

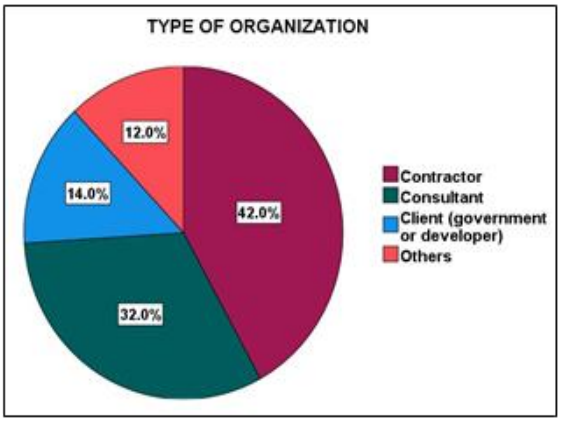

Figure 2: Category of the respondent's organization.

Based on Figure 3, Engineers possesses the highest percentage of responses received with a percentage of 32% (16 of 50) as they are more exposed to hazards due to working at the project sites as per compared to others while the lowest responses with 4% (2 of 50) comes from the Quantity Surveyor. The majority, 44% (22 of 50) of the respondents have less than 5 years working experience while 10% (5 of 50) of the respondents have more than 20 years of experience. This indicates that respondents having 5 years' experience or less have a lack of interest towards safety practices and are highly likely to be exposed to danger at sites.

According to the pie chart in Figure 5, 54% (27 of 50) respondents answered "Yes' ' indicating their experience of encountering workplace accidents while 46% (23 of 50) had not experienced any occurrence of accidents at the workplace. Accident incidents may occur due to few factors such as the availability of a safety plan, worksite conditions, and level of knowledge of workers. Figure 6 implies that 88% (44 of 50) respondents have been exposed to safety programs focusing on training for employees while 6% (3 of 50) have not joined any safety programs implying that they lack knowledge on safety practices for site works. Therefore, this individual must not be given any critical roles as it may affect the employee and also the public.

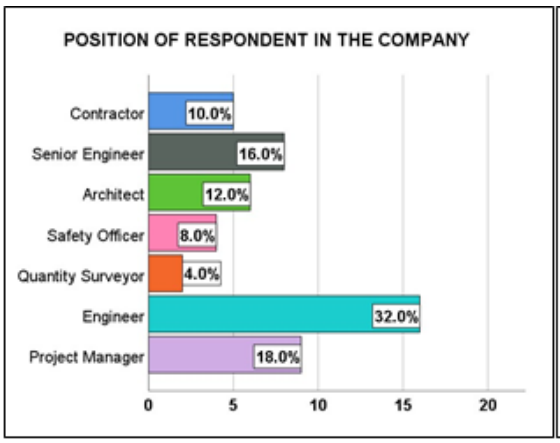

Figure 3: Position of the respondent in the company.

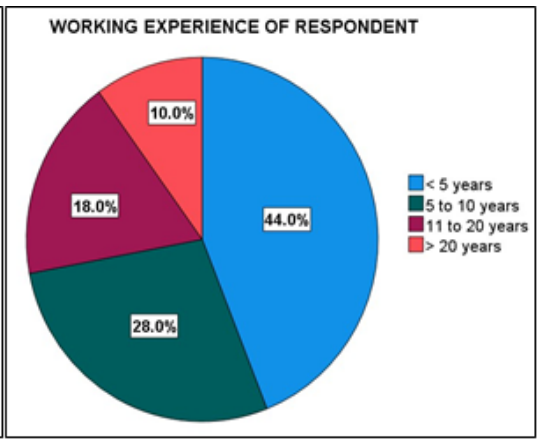

Figure 4: Working experience of respondent.

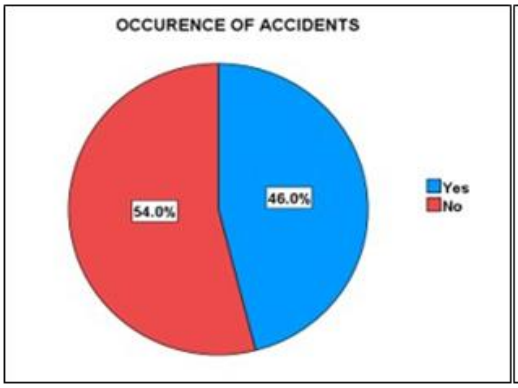

Figure 5: Occurrence of accidents.

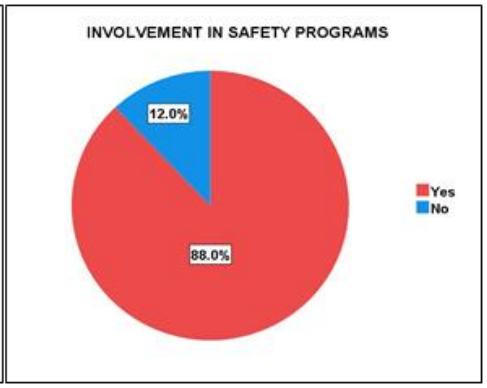

Figure 6: Respondent's involvement in safety programs.

The questions in Section B aids in determining the causes of accidents at the construction site which is also the research's first objective. Based on Figure 7, Education (insufficient safety training and orientation before the project is started) has the highest mean score of 4.18 out of 5.00 and falls under the category of management meanwhile the lowest mean score of 3.06 out of 5.00 is the self-emotion of workers falling under the human element category for the causes of accidents at site. According to Lai et al., (2011), the most effective method to prevent hazards is by providing safety training to employees which is essential because it prohibits them from committing mistakes which might cause accidents, and also to permit employees to execute their particular job obligations with proper safety skills. This is also in line with Birhane et al;(2020): Dorji et al;(2006) and Phawchamnan et al; (2018) on health and safety training and its correct application can reduce the occurrence of accidents on construction projects.

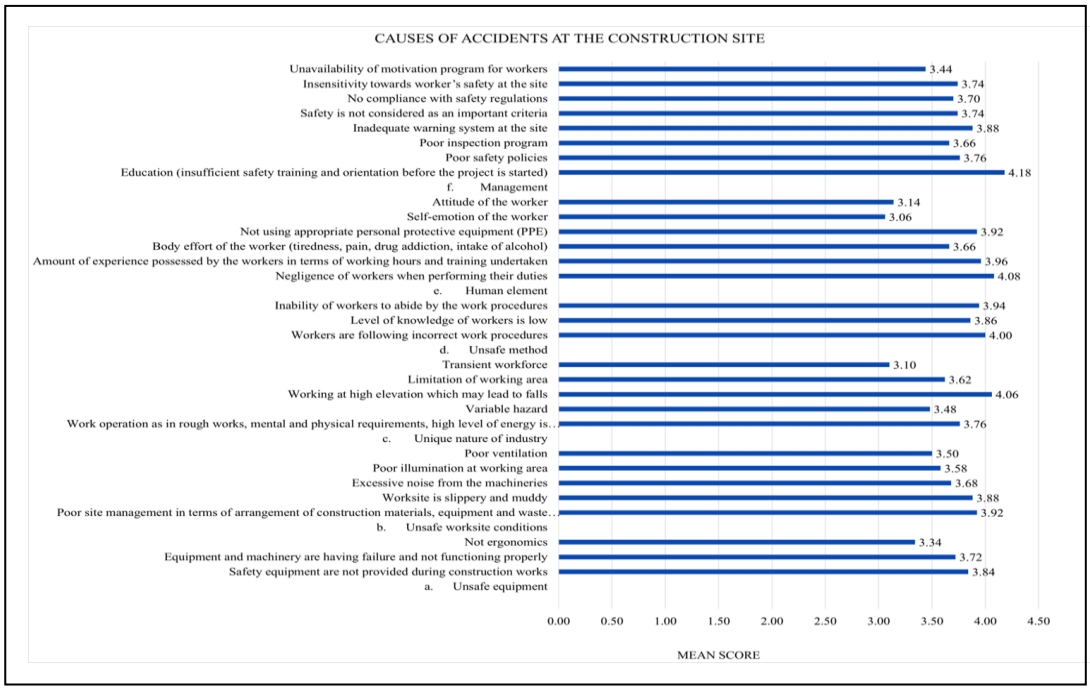

Figure 7: Mean score for causes of accidents at the construction site.

As referred to the designed questions in Section C to achieve the second objective of the study which is to study the effects of accidents at the construction site, leading to a bad reputation. The company is ranked the highest as it has a mean score of 4.34 out of 5.00. while the lowest ranking increases the risk of mental illness in workers by possessing a mean score of 3.44 out of 5.00 as portrayed in Figure 8. Occurrence of accidents can lead to a company's image being tarnished as clients may not be able to build trust on the company and this will highly affect the company since in the long run, the company's production and output will be hindered. Mental illness of workers is not specifically caused by work pressure but can also be caused by various other factors such as genetics, personal financial problems or through ongoing medical conditions.

Economic perspective and condition are the underlying causes of fatal accidents in the construction industry (Hale et al, 2012; Jaafar et al, 2017). This is because aspects of financial and project development are deemed to be more important than OSH management (Jaafar et al, 2017). The social element covers the impact originating from the community and clients in particular. There is a lack of awareness and emphasis by the community on OSH issues in the construction industry (Hale et al, 2012; Jaafar et al, 2017). This is aligned with the finding in Section C.

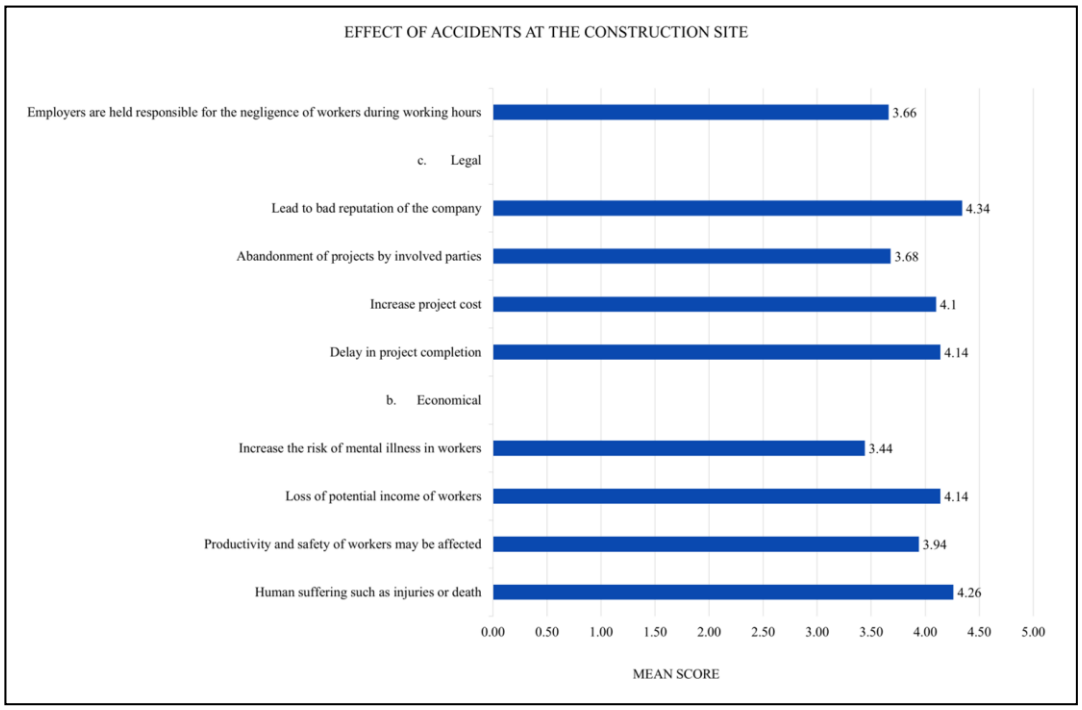

Figure 8: Mean score for effect of accidents at the construction site.

The questions in Section D are designed to achieve the third objective of the study which is to propose suitable preventive measures to reduce accidents rate in the construction site. According to Figure 9, 82% (41 of 50) respondents are satisfied with the safety measures that are implemented in the company where they are working at while 18% (9 of 50) respondents are dissatisfied with the safety measure implemented in the company. The findings signify that worker's safety is not a main priority for certain companies, thus could contribute to a rise of accidents at building sites.

Based on the listed preventive measures to reduce accidents in Figure 10, the highest mean score of 4.38 out of 5.00 lies in implementing a risk assessment plan to identify the possible risks while the lowest mean score of 3.48 out of 5.00 is determined as engaging in communication. The highest ranking

indicates that a risk assessment is very crucial to be carried out as it helps to determine the presence of potential dangers that may arise throughout the project completion in order for the respective authorities to mitigate the hazards. Slightly mean score value is 4.32 which is performing routine inspections of equipment used at the sites. The finding is similar to Xu et al, (2021), in which to prevent the unsafe statuses of objects, the status of safety protection equipment can be regularly checked. Engaging in communication is less effective as difficulties may occur in terms of language barrier between the employer and the employees especially when employing international workers.

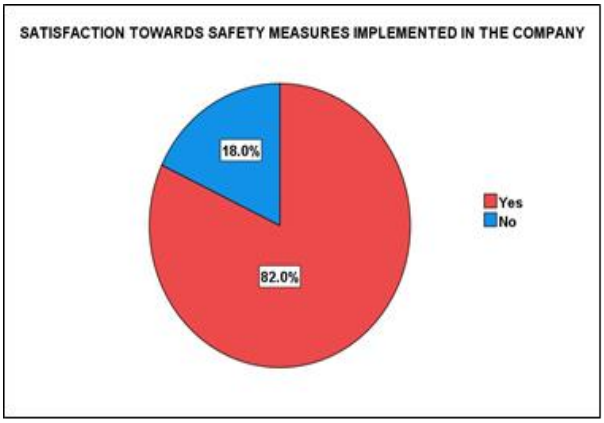

Figure 9: Respondent's satisfaction towards safety measures implemented in the company.

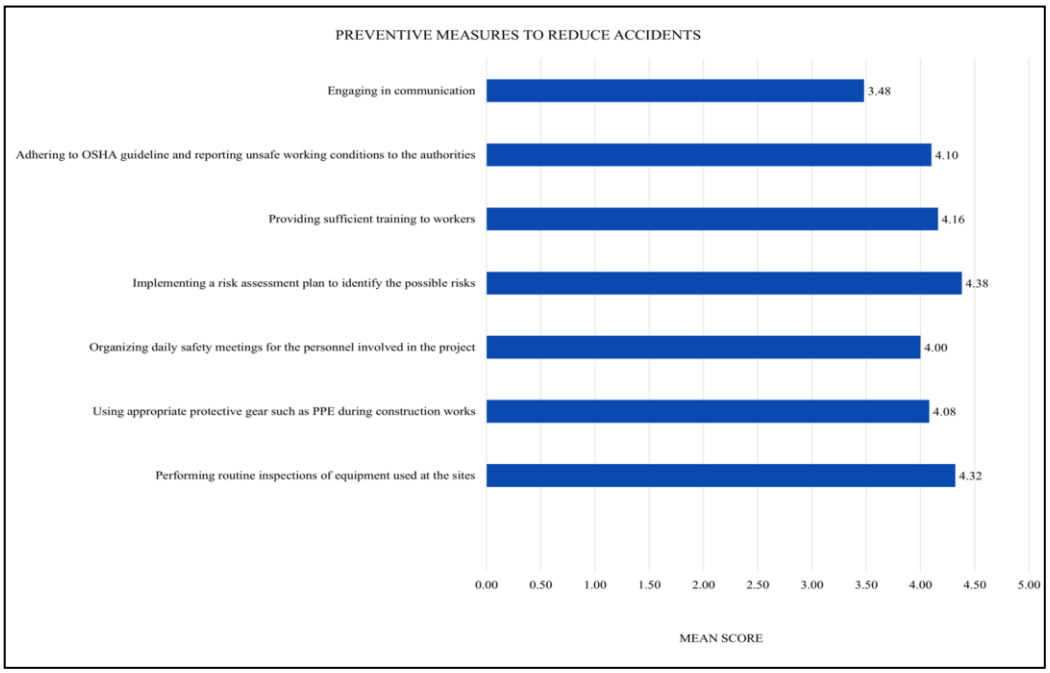

Figure 10: Mean score for preventive measures to reduce construction accidents.

Having two-way communication is also important as miscommunication can lead to major work-related accidents, project rework, and employee concerns in the long period of time.To prevent the unsafe statuses of objects, the following measures can be adopted. For example, safety protection equipment can be used based on operational requirements. The status of safety protection equipment can be regularly checked.

CONCLUSION

When contrasted towards the other causes outlined in the questionnaire survey, a large percentage of the targeted respondents concede with an overall mean of 4.18 out of 5.00 on the statement that education, which is insufficient safety training and orientation programs for employees before the project is started, is the leading cause of accidents. Managers and supervisors should invest time and commitment in delivering effective and beneficial safety training. Employee safety must be optimised by engaging every employee with safety training at varying periods, as well as can be conducted via regular interactions with supervisors, managers, and employees.

Accidents at construction sites lead to bad reputation, according to the large percentage of the respondents, with a mean score of 4.34 out of 5.00 as the main effect of accidents at construction sites. Workers who speak details regarding the inadequate safety management at their workplace may jeopardize a company's image. Having a bad reputation for a firm is correlated with greater hiring and selection costs, worse operating margins, and lower returns. As an outcome of reputational damage, client and stakeholder trust is harmed, and initiatives are impeded. Damage to a company's reputation raises the potential of liquidity, which has an impact on stock prices and, eventually, market capitalization.

Implementing a risk assessment plan is the best preventive measure that can be carried out to reduce the rate of accidents in the construction industry as agreed by the majority of respondents. A firm can use a risk assessment plan to prioritise hazards and formulate a framework to reduce the chances of the hazard to occur. Such an approach not only cuts the organisation time, money, and physical assets, but it also allows employees to focus on business-related activities over extended periods of time.

RECOMMENDATION OF STUDY

Based on data of the research in analysis and discussion, the research is mainly attentive on the way of determining the causes of accidents, how it affects in terms of humanitarian, economical and legal as well as the proposed preventive measures to reduce the accidents at construction sites. The International Labour Organization (ILO) also recommends that organizations must manage occupational safety and health to provide a safe and healthy workplace (Park et al., 2016; Rahman, N.H., & Mohd Kamil, N.L., 2022). Hence, listed below are the recommendations that can be proposed for the usage of future research. Future researchers may conduct detailed research to identify the possible causes of construction accidents as in the current modern world, hazards can be present everywhere. There should be more study on the effects of construction accidents as there is limited research carried out regarding this issue. The importance of identifying and proposing better preventive measures which are more efficient in mitigating the high accidents rate in the construction field. Attempting to increase the number of targeted respondents in order to acquire adequate data for comparable purposes.

AUTHORS BIOGRAPHY

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