Effect of Accident Due to Fall From Height at Construction Sites in Malaysia

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Abstract. Nationally, falls from height (FFH) are a significant threat to the construction fields and are one of the leading causes of a fatal accident to construction workers. Since the construction industry is carried out in hazardous environments, accidents occurring at various severity rates, leading to minor, severe and fatal injuries. Meanwhile, the majority of accidents are caused by a variety of significant causes and uncertain actions or unsafe conditions. The recognition effect of falls from height accidents at construction sites is the focus of this research. Therefore, this paper revealed the major effect of an accident due to a fall from height from past researchers. The reported cases of accidents were investigated by the Malaysian Department for Occupational Safety and Health (DOSH) were reviewed. The finding of this paper indicates a time loss of project execution due to accident investigation was the major effect of the accident due to fall from height at construction sites and cost implication for hiring a new worker, training for a new employee and compensation for injury or settlement of death claims. Discoveries of this paper will enhance the construction industry to improve the performance and regulation of all construction projects in terms of safety.

1. Introduction

Accidents are unpredictable events that involuntarily and unexpectedly cause damage or injury. In the construction sector, accidents are inevitable and have a higher risk than other professions. Rising death rates have been recorded for the construction industry around the world, illustrating the industrial crisis as a result of accidents. Furthermore, the construction sector has expand over the last decades, resulting in improved company profits, economic accessibility, and enhanced demand for commodities. While it is significant, it has long been recognised as one of the riskiest sectors in many regions of the world. Tang et al., [1] have mentioned that the construction industry has unsatisfactory working conditions, a complicated situation, a high rate of workforce turnover, a weak of safety management, feeble educational performance and poorly trained employees compared to other industries. Occupational accidents in the construction sector are prevalent cases, leading to physical and mental disabilities and a high fatality rate. Forteza et al., [2] highlighted that fatal accident causes heavy casualties and also enormous personal, social and financial costs. According to information from the Social Security Organization [3], the number of accidents and casualties in the construction industry increasing in 2018 compared to 2017. Since January to November 2018, there have been 143 fatalities and 8,191 injuries in the construction sector.

Moreover, the multi-story or high-rise structures continue to dominate in construction projects and there are a number of risks associated with work in heights, heavy machinery and vertical
In the construction industry, falls from height are among the most common causes of serious work-related accidents and deaths. While working four feet or higher off the ground, possibility of workers at a risk for falling is higher and anything that can trigger you to lose balance and fall is a hazard. Most falls occur from a working platform, frameworks, ladders, or scaffolding. Zhang et al. concluded that the significant threats to the safety and impact of the construction workers contribute to the socio-economic losses have made the accident prevention a priority for enhancing construction management practices. Hence, falls from height (FFH) still significantly higher in construction accidents than other types of accidents. The causes of accidents in the construction industry in Malaysia were reviewed, and evidence shown that the administrative weakness in the organisation in maintaining a good safety management system and workers incorrect work practises are the two main causes of accidents. In fact, safety commitment is reflected by good management in the workplace, in which the workers sense of safety responsibility is an important factor influencing injuries at workplace.

Therefore, the study intended to review the effect of an accident due to falling from height at construction sites.

1.1. Issues of Fall from Height (FFH)

Construction industry has a unique, complex, and temporary nature making it one of the most dangerous industries. Statistics from the Department of Safety & Health has demonstrated that in the construction industry, fatality was 5 times greater than other industries. Master Builders Association Malaysia (MBAM) identified there has been a concerning rise in fatality rate in the construction industry per 100,000 workers. In 2014, 7.26 of every 100,000 jobs are deaths. It increased from 10.74 in 2015, to 12.78 in 2016 and gone up to 14.94 out of 100,000 in 2017. Furthermore, a total of 187 out of the 650 fatalities occurred in the construction industry among all industries, meaning that within one year, and excluding day off from Sunday, there are 1.2 fatalities every two days in the construction industry. The statistics revealed by the Department of Occupational Safety and Health (DOSH) about the number of fatalities by the sector in Malaysia. Compared to other sectors, the statistics highlight that the construction sector is the highest number of fatalities that are 81 people in 2018. The findings revealed, work at height are one of the main contributors to the high construction accident rate. Inappropriate company policies, weak management dedication, unsafe practices, inappropriate attitudes of construction workers and inadequate safety and workers training can result in a fall from height accident.

Meanwhile, Aminbaksh et al. stated that inadequate safety measures go beyond the safety concerns, since construction accident rates can have a significant impact on the financial success of construction companies and raise construction costs by up to 15%. If all parties do not work together to reduce the number of cases, this problem will always increase.

The statistics revealed by the Department of Occupational Safety and Health (DOSH) about the accident caused by falling from a height in the construction industry are shown in figure 1. Referring to the statistics published by the Department of Safety and Health in 2015-2019 falls from height reported the highest rate of fatalities in the years 2015 and 2018 compared to any other years of accidents. Moreover, it is found that maximum fatality is caused due to a fall from height.

Hence, to address this critical issue this paper will focus on the effect of the accident due to falls from height in the construction site.
Figure 1. Fall from Height cases of Accident in Construction Site (DOSH Fatal Accident Case Statistics 2015-2019)

2. Effect of Accident Due to Falls from Height at Construction Sites

According to Kadiri et al., [15] workers are the main victim of these accidents and the loss of project time is the main effect in project execution triggered by this accident. From the Table 1, it demonstrates that the serious effect of accidents on construction sites is on-time loss of project execution, 48.57% of construction firm's views.

Table 1. Effect of Accident at Construction Sites

| Effect of Accident             | Frequency | % Valid |
|--------------------------------|-----------|---------|
| Time Loss Of Project Execution | 17        | 48.57   |
| Reputation Of Firm             | 8         | 22.86   |
| Psychology Of Workers          | 5         | 14.29   |
| Cost Of Medical Expenses       | 4         | 11.43   |
| Others                         | 1         | 2.85    |
| **Total**                      | **35**    | **100** |

Labourers are the main group of workers exposed to construction site accidents and also the primary victims of construction accidents. In order to reduce the risk of injuries on-site, construction firms should establish safety measures from this study. In project management, the time frame and duration of the project seem to be critically important. The primary consequence of construction site accidents is the loss of time in project accomplishment. Furthermore, to ensure a safe construction site, management has to recognise, adopt and execute all or certain of the following steps such as effective supervision and evaluation by safety officials and on-site leaders [15]. During the construction period, projects are not finished as per contract, which results in numerous negative effects, due to failure to reach the specified time, estimated costs and specified quality. According to Salunkhe [16], cost overruns and project delays decrease the productivity in the economic resources available, restrict the potential for growth and reduce economic profitability. Moreover, cost overruns lead to a capital-output ratio increase for the entire economy in the projects.

According to Asanka and Ranasinghe [17], accidents lead in construction delays, costs are exceeded and sometimes affect the organization's image, and losing the confidence among workers or prohibition from tendering by government authorities. This can contribute to stakeholder dissatisfaction uncompetitiveness during tenders, financial losses related to property damages and restrictions from the authorities. Furthermore, accidents can change the corporate objectives or even
make the business uncompetitive. Human factors are the primary reasons for accidents but this is not the only cause for all accidents. While considering the human factor, negligence has a significant impact on construction-relevant accidents and is one of the vital causes reported by several researchers [17].

Arunkumar and Gunasekaran [18] mentioned that in the workplace, anything which can contribute to your loss of balance or body support, resulting in a falling risk is a fall. Moreover, construction accidents might have a negative effect, such as loss of time, the credibility of the company, worker's mental illness, increases of medical costs, recruitment costs, training costs, reimbursement costs, loss of productivity and accident investigation time cost.

According to Oladipupo [19] accidents have considerable negative effects on project execution; some of these effects are damages to materials and equipment, injuries to labour, delay of works, reduced productivity, resource wastage and increased construction cost. In addition, the effects of construction accidents cause the employer huge cost for the reorganization of jobs, substitutes or reimbursements for equipment, workers, facilities and legal fees. From the Table 2, the researcher assessed the effects of accidents on construction sites that contribute to a production delay, operational delay while the causes of accidents are determined and productivity loss affects the delivery of construction projects.

Table 2. Effect of Accidents at Construction Sites.

| Categories     | Effect of Accidents Due to Fall from Height                           |
|----------------|-----------------------------------------------------------------------|
| Humanitarian   | • Suffering to individual                                               |
|                | • Hardship to the individual                                           |
|                | • Fatality                                                            |
|                | • Minor injury                                                        |
|                | • Disabling injury                                                     |
|                | • Possible loss of earning the ability                                 |
| Economic       | • Production delay                                                     |
|                | • Increment in insurance premium.                                      |
|                | • Legal expenses                                                       |
|                | • Time lost by the employee                                            |
|                | • Reduced quality                                                      |
|                | • Time spent in training a temporary or permanent replacement          |
| Legal          | • Legal liability                                                      |
|                | • Failure to safeguard employee being a criminal offense leading to prosecution |

The researcher revealed that increment in insurance premiums, expenses of rescue activities and equipment, medical payments, payments for injury or death claims settlements, legal fees for protection against claims, worker's compensation insurance costs and enhanced insurance expenses are cost consequences of accidents on construction projects.
Table 3. Combination effect of accident due to fall from height at construction sites among the previous researcher.

| Categories | Effect of Accident Due to Fall from Height at Construction Sites | References | Freq. |
|------------|---------------------------------------------------------------|------------|-------|
|            |                                                               | [1]       | [14]  | [21]  | [2]  | [7]  | [8]  | [3]  | [12] |
| Humanitarian | Suffering to individual                                      | √          |       |       |       |       |       |       | 1    |
|             | The reputation of a firm                                     |           | √     | √     |       | √     |       |       | 6    |
|             | Mental illness of workers                                    |           | √     | √     |       |       | √     |       | 5    |
|             | Injuries of workers                                          |           | √     |       |       |       | √     |       | 3    |
|             | Possible loss of earning the ability                        |           | √     |       |       |       | √     |       | 5    |
|             | Fatality                                                     |           | √     |       |       |       |       |       | 2    |
| Economic    | Time loss of project execution                               | √          |       |       |       |       |       |       | 8    |
|             | Cost of recruiting a new worker                              | √          |       | √     | √     | √     |       |       | 7    |
|             | Cost of training given to a new worker                       | √          |       | √     | √     | √     |       |       | 7    |
|             | Compensation Cost                                            | √          |       | √     | √     | √     |       |       | 7    |
|             | Repairs or substitute damaged equipment cost                 |           | √     | √     |       |       |       |       | 7    |
|             | Additional Supervision cost                                 |           | √     | √     | √     |       |       |       | 7    |
|             | Productivity loss                                            |           | √     | √     |       |       |       |       | 4    |
|             | Cost of medical expenses                                     | √          |       | √     | √     |       |       |       | 6    |
|             | Damages of materials and equipment                            | √          |       |       |       |       | √     |       | 6    |
|             | Penalties from authorities                                   |           | √     | √     |       |       |       |       | 3    |
| Legal       | Legal liability                                              | √          |       |       |       |       |       |       | 1    |
|             | Failure to safeguard employee being a criminal offense leading to prosecution |           |       |       |       |       |       |       | 1    |

According to Table 3, it indicates a plethora of research that has been conducted by selected previous researcher. There are 18 major effects as being exhumed by the researchers through a detailed and comprehensive literature review. Without any iota of uncertainty, eight various authors have classified different effect of accident due to fall from height at construction sites and segregate the factor into three categories. There are certain factors that are listed eight times while others are stated only once. Nevertheless, the latter being stated only once does not indicate that this aspect does not affect the safety of the worker [20]. Therefore, as shown in the table 3, the economic element would severely affect when the accident due to fall from height occur at construction sites. The most frequent accident result on economic categories such as time loss of project execution, cost of recruiting a new worker, cost of training given to a new worker, compensation cost and repairs or substitute damaged equipment cost. The results demonstrated that the scale of accident costs that would have to be absorbed in the cost of construction projects, potentially making them less profitable than originally planned. A plethora of reasons can be given for the high frequencies of economic categories are referred to client aspect. In respect of the client, he is the project initiator and wants to deliver the project on time, cost-saving, and good project performance but importance should be given to the safety of employees [21]. Nonetheless, the previous study indicating that employees have experienced injuries in construction through rapid operations highlighted by Irumba [22], this might be attributed client's mandate to the company to complete the project quickly. In addition, this is in agreement with Udo et al., [23] who stated that construction today is defined by speedy project completion. While the client wants to execute the project quickly, the contractor takes the same path,
encouraging the employees to carry out projects as soon as possible at the detriment of safety. Hasty construction contributes to poor workmanship, which can lead to workers’ negligence which mainly contributed fall from height accidents at the construction sites [24].

Furthermore, humanitarian elements are the second highest frequent effect of accident due to fall from height mentioned by previous researcher. There are certain effect listed by researcher such as suffering to individual, bad reputation to construction firm, mental illness of workers, injuries of workers, possible loss of earning ability and fatalities. Therefore, accident costs and health hazards cannot be reflected in financial terms only. The occurrence of a construction accident had probably affected all elements of society like employees, families, employers and resources [25]. It has a very devastating social aspect because an injury may have an emotional burden on independence in the household, and this has an adverse impact on the family's social relations [26].

Lastly, the legal categories are the least effect of accident was mentioned by researcher such as legal liability and failure to safeguard employee being a criminal offense leading to prosecution. This situation happened due to most of the companies are refuse to report the accident to the government authorities due to control reputation of the companies and disallow being investigated by the authorities. According to section 15, 16 and 17 of the OSHA 1994 by DOSH [27], it is a duty of the employer (or a self-employed person) to prepare a safety and health policy. Employers who did not comply with the provisions shall be guilty of an offence and on conviction, be liable to a fine not exceeding fifty thousand ringgit or to imprisonment for a term not exceeding two years or to both.

3. Conclusion
Commonly, the construction projects are produced in a dangerous, complicated and lengthy process. In every project, costs, time, reliability and safety are essential features. This paper reveals the effect of an accident due to a fall from height from various researchers. All of the organisations and individuals participating in construction projects should be specifically concerned with the safety of employees involved in construction projects on-sites. Ultimately, recognizing the effect of accidents fall from a height will help prevent certain accidents from occurring and improve the overall level of safety on construction sites.

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