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Safety and Health Management at Highway Construction Site in Malaysia

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Abstract: The construction industry is one of the most dangerous and high-risk work industry in the world.Therefore, safety and health management at highway construction is not applied systematically, accidents will arise, its will literally affect to Malaysia's economic growth in future .Moreover, highway construction carry significant risks.The most common factors that contribute to these risks include inefficient planning, unexpected delays, poor quality equipment , and inadequate oversight.The focus of this research aims and objectives to identify the management of safety and health project in a highway construction.A questionnaire survey was conducted, targeting respondents who are highway projects under construction at Wilayah Persekutuan Kuala Lumpur.To determine respondent demographics, descriptive data were examined using a frequency and percent distribution. During this period, the mean score and Relative Importance Index were used to describe consensus on health and safety management in highway construction (RII). The findings of this study will assist practitioners in paying greater attention to health and safety management issues that will affect the success of security and health management for highway building projects.

Keywords: Safety and Health, Highway Construction, Safety Management at Highway Construction, RII

1. Introduction

The Construction sector in Malaysia has played a significant role in contributing to revenue generation in the construction sector as the central pillar of Malaysia's economic and social network. The construction industry currently requires extremely detailed planning and work schedules; excellent project management comes with good specifications, requirements, and inspections of the project, which can provide the entire efficiency of time, expense, and resources [1].

Health and safety in construction is a dangerous industry where multiple parties within the same environment face many different challenges. According to an analysis of data available from the Occupational Safety and Health Administration (DOSH), 1,116 occupational accidents occurred

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between 2011 and 2016 [2], with 37.85% to 37.85% reported at construction sites. 51.50% of permanent disabilities and deaths. This makes the construction industry one of the most dangerous jobs in the world. This is a dangerous industry, and many stakeholders face various challenges in the same environment.

As a result, increased security knowledge can effectively reduce security threats and enable highway projects to be carried out more efficiently in a safe environment. Road construction is also a traitor because it requires interaction with public transport, heavy equipment, and vehicles working at construction sites. According to a National Institute for Occupational Safety and Health (NIOSH) survey, more than 800 highway construction workers have died at work and 490 are currently working [3]. Most of these deaths are due to equipment or vehicle accidents. Studies show that construction vehicles can overtake pedestrians in the same way that accidents and injuries occur in normal road traffic. Worker safety training is essential to reduce workplace injuries to both field and mobile workers [5]. The objective of this research is to identify project management in the industry of highway construction health and safety. Highway construction focuses mostly on the cause, with the most important issue being a lack of awareness about worker safety, which leads to an increase in fatalities.[4].

The most important factors supporting building development and highway construction are major elements in management of safety and health at workplace. Besides that, safety and health issues that were highlighted and increased the construction site. However, safety level included providing safety guides, providing safety equipment, developing a safe workplace, and having a permanent on-site safety representative. The purpose of this study is to define project management in the field of health and safety in road construction. Highway construction mainly emphasizes the cause, the most important factor is the lack of knowledge about the safe production of workers, which leads to more deaths [4].

2. Safety and Health in Construction Site

Construction site safety is an aspect of infrastructure activities that aims to keep construction employees and others safe from death, injury, disease, or other health hazards. Construction sites also have challenging working environments due to their dynamic nature and diverse supply and resource factors [6]. At the same time, various protective and coordination procedures must be applied, such as plans for the installation of temporary barriers, barriers or safety nets, personal protective equipment and coordination of these measures. Obligations must apply. Thus, effective monitoring of health and safety risks has been demonstrated through knowledge and practice of a program approach in accordance with standard safe operating procedures. Less reliable, especially in many work situations [7].

Working at heights, transferring machinery, vehicles and large products, using power tools and electrical devices, harmful materials, loud noises, pollution, and vibration are all possible occupational risks [8]. The most common causes of death on site are falls, electric shock, crushing and injury. From a safety perspective, an innovative work environment is designed to act as a preventative measure against the risk of accidents occurring more frequently as work progresses due to the increasing interaction between resources, such as using more devices at the same time [7]. The big picture can highlight the main challenges of these systems related to easy integration into multiple stages of site progression while ensuring reliable information. The accuracy of tracking technologies, their flexibility and adaptability to work situations, and data transfer rates have a huge impact on the quality of real-time processing.

2.1 Project management in highway construction

Project management includes planning and scheduling from start to finish of project operations. In highway construction, the main goal of project management is to solve problems, protect structures and

maintain road surfaces. To develop an acceptable maintenance plan, you need to identify, understand, and communicate the problem. Maintenance schedules are a predictable performance issue. When planning planned maintenance, data-driven scientific strategies go beyond mechanics. Highway systems and their components can be kept in place with effective highway construction management and regular maintenance standards.

2.2 Project life cycle

In the construction industry, project success depends on whether the project is completed on time, on budget, meets quality standards, is running on schedule (safety), and ultimately customer satisfaction. Often evaluated. However, the industry suffers from low project productivity. One reason for this is that project work requires a complex combination of interest groups, interest groups, and sub-processes [8]. Therefore, the project life cycle can overlap with other strategic goals and is therefore considered the first safe phase of a construction project. It also affects the project life cycle. The four main phases of a typical project are the start, planning, execution, and completion of all phases. When executed correctly, these terms define the process from start to finish of a project and are often referred to as the project life cycle. Most accidents in the construction sector occur during the implementation phase, but previous studies have shown that the ability to compromise health and safety rapidly declines during the life cycle of a project. The decisions made during the design and definition stages have a significant impact on the site.

2.3 Safety and health at highway construction

In Malaysia, researchers investigated highway-related issues such as public-private partnerships, privatization assessments, knowledge management systems, and important outcome factors affecting project team members' attitudes to the environment [4]. As Malaysia's road network grows, there is a need to focus on improving highway construction strategies to address environmental challenges by manipulating government policies, creating social value and revitalizing the economy. The road network is thus connected with all alternative modes of transport [5]. Recent research on green roads has focused on various green initiatives to improve our environment. Health and safety project management is an important process for minimizing the frequency and severity of road traffic accidents. The relationship between man and machine and traffic technology is unpredictable and poses challenges for road safety management. One way to improve road safety is to design, develop, and maintain highways that are much more resistant to average human-machine interaction with the highway. Over the years, technological advances in road construction have increased the number of design, construction and maintenance techniques used. These developments pave the way for new road safety innovations. By recognizing, analyzing and implementing each situation and opportunity as needed, it can be addressed at all stages of road planning, design, construction, maintenance and operation to maximize road safety optimization.

Improving Occupational safety and health (OSH) in the construction sector takes time but is achievable. Although different types of studies have suggested different workplace safety practices to identify safety improvements, an organization's human resources are critical to good safety performance and effective safety management.

2.4 Issues at highway construction sites

The causes of the accident were employee turnover, fraud, lack of workplace safety records, poor on-site maintenance, improper cleaning and use of unusable materials, poor maintenance of equipment, supervisors directing negligent employees, and unskilled workers. The individual approach explains the causes of accidents as personal weaknesses such as forgetfulness, lack of concentration, lack of work motivation, irresponsibility, and recklessness [9].

2.5 Factors to improving safety and health at highway construction

Increasing occupational safety and health in the construction industry takes time, but it is achievable. Despite the fact that several types of research have offered various workplace safety strategies for identifying safety improvements, an organization's human resources are vital to excellent safety performance and successful safety management [10-11].

3. Research Methodology

The focus of this research is to study at the health and safety management on Malaysian construction sites. The purpose of this study is to increase safety and health by using effective project management based on core principles. The scope of this research is equivalent to that of the worker safety study in that it aims to ensure the safety of highway construction workers. A questionnaire survey was used to obtain primary data. The questionnaire was capability is based a five-point Likert scale, with responses ranging from strongly disagree to strongly agree [12].

3.1 Development of survey form

A questionnaire was designed to determine the perception of several participants at highway construction Wilayah Perseketuan Kuala Lumpur, Peninsular Malaysia about issues that cause happen accidents at site. The survey form or the questionnaire was divided into three sections:

i. Section A: Respondent demographics -This part collected the information on the respondents' background such as gender, level of education, Professional in highway construction,and years' experience in construction [13].

ii. Section B: Issues at highway construction-This section was mainly safety and health issues at highway construction [14]. Respondents were Likert scale and mean of the scale range that goes from 1 (strongly disagree) to 5 (strongly agree)-a total of 12 questions.

iii. Section C: Highway Construction Target Safety and Health Factor for the construction of highways in this section [15]. As a significant factor for improving safety and health at highway construction sites, grades were rated from to Respondents were asked to rate a total of 12 questions from 1 (strongly disagree) to 5 (strongly agree).

The population size consisted of 50 respondents, including highway construction professionals such as contractors, safety officers, project managers, Engineers. The population size was limited to this amount to optimize the time and cost provided for the research effectively. The surveys contained specific questions and would be time demanding, perhaps discouraging some respondents from participation. Furthermore, the proper selection of target respondents with high experience and expertise [16].

4. Results and Discussion

4.1 Respondent demographics

From the demographic respondents, include respondent's profiles and organizations information, 50 survey respondents from Wilayah Persekutuan Kuala Lumpur. This site was chosen because it is a construction site with only known sites. For example, Damansara Shah Alam Expressway (DASH), East Klang Expressway and Sungai Besi, ulu Kelang (Suke) highway are under construction [18].

Table 1: Profile of Respondent (General Information)

Profile Description	Category	Number	Percentage (%)
Gender	Male	30	60
	Female	20	40
Level of education	Certificate	3	6.0
	Diploma	9	18.0
	Degree	22	44.0
	Master	11	22.0
	PhD	5	10.0
Professional in highway construction	Senior Engineer	10	20.0
	Engineer	16	32.0
	Safety officer	5	10.0
	Project Manager	8	16.0
	Construction site	6	12
	workers	5	10
	Others roles		
Years' experience in construction	Less than 5 years	17	34.0
	5-10 years	11	22.0
	10-15 years	17	34.0
	15 years above	2	4.0
	Others	3	6.0

4.2 Safety and health issues at highway construction and the factors to improve safety and health at highway construction.

The mean score and the relative important index (RII) according on the equation must be computed based on the questions [17].

$$RII = \sum W / A*N \quad Eq.\ 1$$

Where the weights ω and A are the basis of each element from 1 to 5 respondents, and A is the total number of samples. This equation normalizes all coefficient values between 0 and 1 to RII. A RII ratio or rating of 1 has the greatest impact on the safe performance of the and vice versa [19]. According to [18], there are five levels of RII values. Very important ($0.8RI \leq 1$), important ($0.6RI \leq 0.8$), neutral ($0.4 \leq RI \leq 0.6$), and almost important ($0.2 \leq RI\ 0.4$) is of little importance ($0RI \leq 0.2$). Tables 4.13 and 4.14 provide a comprehensive analysis of occupational health and safety management at construction sites.

Table 2: Relative important index for Safety and health issues at highway construction

Category	Questions	Level of Severity		
		RII	Level of Rank	Ranking
Section B: Safety and health issues at highway construction	Unstable of the equipment at construction site .	0.732	Significant	4
	Mostly management difficult to provide suitable Personal Protective Equipment (PPE) attire to employees.	0.7	Significant	10
	Employees failure to communicate or follow the instruction given by upper officers .	0.72	Significant	6
	Lack of project planning and does not follow the project schedule	0.748	Significant	1
	Lack of work experience employees in construction industry .	0.74	Significant	2
	Lack use of standard operation practices at construction site .	0.74	Significant	3
	The safety officer did not provide a daily routine briefing before work begin among employees .	0.644	Significant	12
	Unsafe behaviour at construction site .	0.72	Significant	7
	Improper maintenance requires frequent inspection of equipment used to work at height such as scaffolds ,platforms ,ladders and aerial lift .	0.716	Significant	8
	Lack of control of hazardous energy such as hydrocarbon release and chemicals substances.	0.7	Significant	11
	Mostly employees lack of skill but management still allow to work risk works such as work from height .	0.724	Significant	5
	Lack of a controlled working environment and the complexity and diversity of the size of organizations.	0.704	Significant	9

Table 3: Relative important index for factor to improve safety and health at highway construction

Category	Questions	Level of Severity		
		RII	Level of Rank	Rating
Section C: To improve safety and health at highway construction	Engineer and safety officer should conduct daily site inspection and safety meetings .	0.84	Very Significant	8
	Safety officer should briefing and inspect the equipment before start the work .	0.864	Very Significant	4
	Ensure safety and health plan prepared before construction phase starts .	0.88	Very Significant	2
	Provide enough safety and health education regarding the usage of machinery and to ensure that employees can identity the procedures at workplace .	0.884	Very Significant	1
	Proper training is the easy way to help improve safety culture among employees .	0.844	very Significant	6
	Display clear signboard at construction workplace it make warning to everyone nearby to take precautions sign are a cost - effective way of reducing accidents .	0.84	very Significant	9
	Appoint skilled employees .	0.816	Very Significant	10
	Developing the safety program and policies for contract document requirement should be a responsibility of the design team during the design phase .	0.816	Very Significant	11
	Have to control traffic with correct way and systematic to avoid from traffic jams and accidents by road users .	0.844	very Significant	7
	Highway safety Audit process for highway construction ,operation and maintenance safety make more safety at construction site	0.816	Very Significant	12
	Prevent traffic from entering work area ,such as excavation ,material storage area .	0.852	very Significant	5
	Make surrounding workplace are safe and clean after work finish .	0.872	Very Significant	3

Based on Table 2 and 3 safety and health issues in highway construction, were reorganized by ranking to improve safety and health in highway construction. The total rating of is shown in Figure 4.4. The health and safety committee reveals the most important factors influencing health and safety management in highway construction and safety in accidents worker’s habits construction workers of

field workers. This factor is a major challenge in highway construction to address major safety and health issues. On the other hand, the lack of work experience of construction workers, non-use of standard work methods at construction sites (RII = 0.74), lack of project planning and non-compliant project schedules (RII = 0.78) ranked second and third in out of this study important factors were evaluated .Priority safety and health management to achieve high safety levels productivity among highway construction projects.

Table 4: Top five highest relative importance index

No	Impacts	Relative Importance Index (RII)	Rank
1	Provide enough safety and health education regarding the usage of machinery and to ensure that employees can identity the procedures at workplace .	0.884	1
2	Lack of project planning and does not follow the project schedule	0.748	2
3	Lack of work experience employees in construction industry .	0.74	3
4	Lack use of standard operation practices at construction site .	0.74	4
5	The safety officer did not provide a daily routine briefing before work begin among employees .	0.644	5

5. Conclusion

Research of safety and health at highway construction site in Malaysia was shown that the twelve questions, from safety and health issues at highway construction, and another twelve questions are being to improve safety and health at highway construction were concluded high significance relative importance index (RII,0.800-0.821) to very significant to significance (RII, 0.740-0.799). As a result, these variables may be the primary causes of highway construction accidents, injuries, and fatalities. This study suggests additional research on these safety and health management at a highway construction site in Malaysia by analyzing the relationship between the most significant factors such as providing enough safety and health education regarding use of machinery and ensuring that employees can identify the practices at the workplace, as well as a lack of project planning and failure to the project schedule to improve safety performance at highway construction. Finally, frequent inspections are required to enhance highway safety and health care and to ensure effectiveness.

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