

e-Proceeding

V-GO GREEN 2020²⁹⁻³⁰ SEPT

VIRTUAL GO-GREEN: **CONFERENCE & PUBLICATION**

"SUSTAINABLE ENVIRONMENT, RESILIENCE AND SOCIAL WELL-BEING"

Organiser :
Research, Industrial Linkages, Community &
Alumni Network (PJIM&A)

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Faculty of Architecture, Planning and Surveying (FSPU)
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Publication Date : 22nd February 2021

Virtual Go-Green Conference and Publication 2020

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e ISBN 978-967-2920-06-9



9 7 8 9 6 7 2 9 2 0 0 6 9

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GAP ANALYSIS ON ACCIDENT CAUSATION AND IMPLEMENTATION OF INTEGRATED MANAGEMENT SYSTEM (IMS) AT CONSTRUCTION SITE

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Abstract

The current high fatality rate in construction accidents negatively reflects the nation's construction industry. This research aims to identify the main causes of accidents and the gap between the causes of the accident that would allow for solutions to minimise the fatality rate. Systematic Literature Review was conducted to review past studies on accident causation and the benefits of Integrated Management System (IMS) in managing the safety of construction workers. Scopus and Web of Science were referred to as the source database. 23 journal articles were indicating that human factors are the leading cause of accidents. 35 journal papers discussed on IMS which provides various benefits. Therefore, it is suggested that human factors should be incorporated with IMS knowledge towards minimising the fatality of the construction workers.

Keywords: *accident causation; integrated management system (ims); construction safety; human factors*

1.0 INTRODUCTION

A construction site is an unsafe and hazardous workplace to be in comparison to other sectors. The high accident rates at construction sites typically involved injuries, fatality, work-related illnesses as well as others indirect and direct heavy losses (Fang & Wu, 2013; Sherratt, Farrell, and Noble 2013). Chi, Han, and Kim (2013) revealed that the building construction site and its nature of work is the major contributor to the accidents. Durdyev et al. (2017) concurred that the construction site that engages a diverse workforce with the use of equipment and machinery as well as activities expose workers to accidents.

Malaysia's construction sector contributed the highest fatality rates compared to other sectors. Table 1 shows the fatality rates experienced by sectors between 2017 and 2019. Referring to the construction sector, there was an increment of the fatality rate from 63 deaths in the year 2017 to 81 deaths in the year 2018. Until June 2019, it indicates that the death rate was increasing from 81 deaths until October 2018 to 118 deaths until June 2019. If compared to other sectors, the construction sector was the first ranking of fatality in the year 2017, 2018, and 2019 as shown in Table 1.

Table 1: Statistic of fatalities by sectors

Sector	2017	2018	2019
Manufacturing	46	25	62
Mining & Quarrying	7	2	4
Construction	63	81	118
Agriculture, Forestry, Logging & Fishery	18	18	26
Utility (Electricity, Gas, Water & Sanitary Services)	8	1	5
Transport, Storage & Communication	9	9	12
Wholesale & Retail Trade	5	1	1
Hotel & restaurant	2	1	1
Financial, Insurance, Real Estate & Business Services	7	13	22
Public Services & Statutory Bodies	4	3	9

NPD: Non-Permanent Disability

PD: Permanent Disability

Source: Department of Occupational Safety and health (DOSH), 2019

The accident issue needs to be addressed immediately due to its devastating impact towards the contractor and construction sector. Construction accidents lead to project delay, increment in expenses and loss of contractor reputation (Williams, Adul Hamid, and Misnan 2018). Sakthi and Rajesh (2017) revealed that the top five effects of accidents to project are cost of medical expenditures, time loss of project execution, productivity loss, doubtfulness to the contractors and cost of training given to the new employees. The high fatality also will affect the country's name due to poor management of construction safety (Islam, Razwanul, and Mahmud 2017). Ultimately, it will also negatively affect the economy since the construction sector is one of the country's main Gross Domestic Product (GDP) contributors (Khan, Liew, and Ghazali 2014).

2.0 METHODOLOGY

A systematic literature review was utilised to identify the articles and journals related to the accident causation that occurred at the construction site as well as the implementation of the Integrated Management System (IMS) as a construction safety management. Mallett et al. (2012) noted that systematic literature review would assist researchers to find relevant sources related to the research from an academic database which is detailed and comprehensive. Thus, it gives clear advantage to the researcher in evaluating previous research as a data collection compared to traditional literature review. The database utilised in conducting the systematic literature review was from Scopus and Web of Science. Both databases, which are Scopus and Web of Science, are rigorous collections of information and contain more than 256 fields of studies (Mohamed Shaffril et al. 2019).

The data obtained from systematic literature review is used to identify the gap of this study by analysing the main cause of accidents and the benefits of Integrated Management System (IMS) implementation at construction site. The purpose of this paper is to fulfil the following research questions.

- RQ1. What are the main causes of accidents at the construction site?
- RQ2. What are the benefits of Integrated Management System (IMS) implementation?
- RQ3. Is there a gap between Integrated Management System (IMS) implementation and cause of accidents at construction sites?

The process of selecting the articles was through keywords related to the accident causation and Integrated Management System (IMS) through synonyms based on previous research keywords, dictionaries, and thesaurus. A total of 183 articles related to the accident causation and 220 articles were on Integrated Management System (IMS) implementation obtained from both databases.

At the screening stage, the entire duplicate articles were removed which is 173 articles for accident causation and 205 articles for Integrated Management System (IMS) implementation. This study is focusing on the articles in the field of construction industry and the Integrated

Management System (IMS) with a combination of ISO 9001, ISO 45001, and ISO 14001. The determination of the relevant articles are important in meeting the research needs. The unrelated articles were 133 articles on accident causation and 181 articles on Integrated Management System (IMS) implementation. Thus, the relevant articles to be analysed were 7 articles on accident causation and 16 articles on Integrated Management System (IMS) implementation in the construction sector.

3.0 FINDING

3.1 Accident causation at construction site

The model of Accident Causation Model by Haslam et al., 2005 was used in this study and it consists of four areas which are originating influences, shaping factors that covered workers factors, site factors, and material/equipment factors.

Table 2: Accident causation frequency

No	Authors	Worker Factors	Site Factors	Material/Equipment factors	Originating Influence
1.	Abdulhamid et al., (2000)	*			*
2.	Al-Tabtabai, (2002)				*
3.	Zhenghui et al., (2010)	*			*
4.	Manu et al., (2010)		*		*
5.	Bashir et al., (2011)	*			
6.	Lin et al., (2011)	*			
7.	Zou, (2011)				*
8.	Behm et al., (2012)	*			*
9.	Ismail et al., (2012)				*
10.	Chi et al., (2013)	*	*		
11.	Cokeham et al., (2013)				*
12.	Manu et al., 2014		*		*
13.	Chi et al., (2014)	*			*
14.	Shin et al., (2014)	*			
15.	Kadiri et al., (2014)	*			
16.	Yilmaz, (2015)	*			
17.	Asanka et al., (2015)	*			
18.	Shamsuddin et al., (2015)	*			
19.	Alomari et al., (2016)	*			
20.	Guo et al., (2017)	*			
21.	Ganesh et al., (2017)	*	*		
22.	Hola et al., (2017)	*			*
23.	Li et al., (2017)	*			*
24.	Williams et al, (2018)				*
25.	Arunkumar et al., (2018)	*	*		
26.	Hola et al., (2018)	*		*	*
27.	Laal et al., (2018)	*			
28.	Ayob et al., (2018)	*		*	
29.	Al-Khaburi et al., (2018)	*		*	
30.	Kim et al., (2018)	*			
31.	Othman et al., (2018)	*	*		*
32.	Ahmed, (2019)	*			*
33.	Betsis et al., (2019)	*			
34.	Hamid et al., (2019)		*		*
35.	Kang et al., (2019)	*			*
36.	Sanni-Anibire et al., (2019)	*	*		
37.	Williams et al., (2019)	*		*	*
	Frequencies	30	8	4	19

Table 2 shows the result of the most frequent cause of accidents at construction sites were due to worker factors which occurred 30 times while originating influences occurred 19

times. This shows that worker factors were the first contributor followed by originating influences. The factors related to worker factors are lack of communication, physical and mental inability, failure to use personal protective equipment, workers actions, attitudes, behaviours, capability, poor safety knowledge, lack of skills, workers failure to follow work procedures, carelessness, failure in using safety equipment, lack of supervision, lack of training, insufficient training, lack of awareness, and inexperienced personnel.

It is important for employers to provide safety training to construction workers before being assigned to the construction site to ensure the accident can be controlled (Haslam et al. 2005). Cokeham and Tutesigensi (2013) suggested that the incident rates can be minimised among workers by means of H&S training. The curriculum should however be tailored to suit the particular hazards of different areas of work. Furthermore, employees should not switch between areas of work unless they are adequately trained. Simukonda (2019) states that an adequate OSH training and induction is one of the solutions in preparing beginners to perform their tasks. Construction workers that did not have proper training on OSH issues, process, and reporting are unreliable. Ahmed (2019) highlights that training and workshop programs should be developed to provide the appropriate skills and techniques for stakeholders regarding scheduling, cost and time management, equipment technology, and risk analysis.

3.2 Integrated Management System (IMS)

Chountalas et al., (2019) noted that the separate systems are complex and bureaucratic where poor total management of HSE and quality issues from top-level can be a risk to strategic management practices. Tepaskoualos and Chountalas (2017) emphasized that Integrated Management System (IMS) helps in reducing the cost of operation and management, fully monitoring and solving the safety issues, significantly reducing bureaucracy thus, effectively meeting the stakeholders' needs. Laal et al. (2018) proves that, the implementation of safety programs especially Integrated Management System (IMS) and annual audits have had a significant impact on reducing accident indices and improving safety. Therefore, health and safety management systems are appropriate tools for reducing accident rates.

4.0 DISCUSSION

The results of this paper found that the implementation of the Integrated Management System (IMS) can solve issues that may arise during the implementation of a detached management system. Hamid et al. (2019) said that the incidence of accidents on construction sites are often caused by either lack of knowledge or training, lack of monitoring from the top, or from the negligence of the individuals themselves. Thus, training programs are prioritised to be the most effective measures in integrated risk management. Effective training helps personnel carry out various activities, establish a positive safety attitude, and integrate safety with environmental and quality goals. Sanni-Anibire et al. (2019) recommended that continuous training on safety laws and requirements should be provided to all workers on site according to their job task, provision and enforcement of PPE for various construction site activities can improve the safety performance.

5.0 CONCLUSION & RECOMMENDATION

In conclusion, an Integrated Management System (IMS) training to construction workers is necessary based on the system advantages. This is important as a pre-requisite for the construction organisation in implementing the Integrated Management System (IMS) on the construction site and to train new employees before they are assigned to their job site. Further studies are needed in developing an Integrated Management System (IMS) training model that can be used by the construction organisation to design the modules as well as training methods according to their own mould. At the same time, this training model can be used by any authority involved occupational safety and health at the workplace, as well as in the construction site as a regulation for contractors who will carry out construction work.

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