



UTS  
ePRESS

Construction  
Economics and  
Building

Vol. 19, No. 1  
Jan-Jun 2019



© 2019 by the author(s). This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) License (<https://creativecommons.org/licenses/by/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

**Citation:** Belayutham, S. and Ibrahim, C.K.I.Z 2019. Barriers and Strategies for Better Safety Practices: The Case of Construction SMEs in Malaysia. *Construction Economics and Building*, 19:1, Article ID 6331. <https://doi.org/10.5130/AJCEB.v19i1.6331>

ISSN 2204-9029 | Published by UTS ePRESS | <https://ajceb.epress.lib.uts.edu.au>

RESEARCH ARTICLE (PEER-REVIEWED)

# Barriers and Strategies for Better Safety Practices: The Case of Construction SMEs in Malaysia

Sheila Belayutham<sup>1</sup> and Che Khairil Izam Che Ibrahim<sup>2\*</sup>

<sup>1</sup>Faculty of Civil Engineering, Universiti Teknologi MARA, 40450, Shah Alam, Selangor, Malaysia; sheila6913@uitm.edu.my

<sup>2</sup>Faculty of Civil Engineering, Universiti Teknologi MARA, 40450, Shah Alam, Selangor, Malaysia; chekhairil449@uitm.edu.my

\*Corresponding author: Che Khairil Izam Che Ibrahim. [chekhairil449@uitm.edu.my](mailto:chekhairil449@uitm.edu.my)

**DOI:** <https://doi.org/10.5130/AJCEB.v19i1.6331>

**Article history:** Received 22/10/2018; Revised 23/03/2019; Accepted 19/04/2019; Published 03/06/2019

## Abstract

Despite the various efforts that have been made by the government and construction authorities to strengthen safety practices among SMEs in Malaysia, the construction SMEs are still unable to demonstrate good safety practices. As part of a wider intervention study to improve the safety practices of the SMEs, this study has taken the first step in identifying the barriers and strategies to improve the safety practices at construction sites in Malaysia. The study has been conducted using various approaches (workshops, site observation and questionnaire survey) that have enabled the triangulation of information. The findings highlighted that the main barriers to good safety practices are the implementation costs, poor safety culture and lack of safety commitment from the client. The proposed solutions include introducing safety as one of the construction KPIs, creating more safety-conscious culture and establishing a funding mechanism to support the cost of safety training. Subsequently, several recommendations have been provided by collating inputs based on the barriers, strategies and drivers through three-party collaboration (authorities, industry and academia) in creating a collaborative movement towards enhancing safety practices among the SMEs. The fresh insights from this study would enable authorities and SMEs to be more proactive, rather than reactive in improving safety practices in the construction industry.

**DECLARATION OF CONFLICTING INTEREST** The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. **FUNDING** This work was supported by the Social Security Organisation (SOCSO), Malaysia (Ref. No. PKS/PBK(S)/208/24/2 Jld.5 (26)) with the collaboration of the Department of Occupational Safety and Health (DOSH) Malaysia and the Faculty of Civil Engineering, Universiti Teknologi MARA, Malaysia.

## Keywords

**Safety and hazards, Construction, Small and medium-sized enterprises (SMEs), Barriers and strategies, Malaysia.**

## Introduction

Occupational Health and Safety (OHS) is well acknowledged in the construction industry as one of the most important subjects by its very dynamic nature. The involvement of a wide range of construction stakeholders such as the Government, developers, main and subcontractors, consultants, construction related associations and unions, as well as skilled and general workers have resulted in the industry being seen as a test case of human rights within the context of workers' safety (Zou and Zhang, 2009; Gao, et al., 2017). The implementation of OHS measures in the industry is critical for the protection of all project stakeholders (Lingard, et al., 2015).

Over the years, the construction industry has recorded one of the poorest occupational safety and health records as compared to the other industries (Lingard, 2013; Sherratt, et al., 2015; Choe and Leite, 2017). The high number of accidents (i.e. death, permanent disability and non-permanent disability) reported has been explained by the natural characteristics of construction work environment (Choe and Leite, 2017). Despite the persistent endeavours that have been made to improve and promote construction safety (Sherratt, et al., 2015), those accidents still plague the industry (Zhou, et al., 2015). According to Arewa and Farrell (2012), Small and Medium-Sized Enterprises (SMEs) in construction accounts for 90% of the fatalities at work. Evidence has also shown that construction SMEs are the major contributor to the high incidence of serious injuries and fatalities (Mayhew, Quintan and Ferris, 1997). Furthermore, there is evidence that accident rate is higher in small construction businesses than in larger ones (Kheni, Gibb and Dainty, 2010). As most SMEs are ranked at the lower end of the inter-organisational hierarchy (e.g. sub-contractor) of a project, the ability for SMEs to exert influences on decision-making in the construction process is limited, despite their workers' day-to-day exposure to OHS risks (Lingard and Holmes, 2001). Moreover, construction SMEs are often unaware of their responsibilities for OHS, owing to less resources and awareness of the OHS risks at work, hence contributing to poor safety practices (Sunindijo, 2015). The consequences of poor safety practices could negatively influence the notion of safety management towards a safe work environment.

The diffused nature of OHS practices within the construction industry has long been recognised in developed countries and is no exception in developing countries such as Malaysia. Manu, et al. (2018) in their recent study on OHS practices in developing countries revealed that Malaysia is one of the countries, where the practice OHS management is not commonly implemented and could only worsen if no appropriate actions and preventive measures were taken. In Malaysia, construction is the third most dangerous industry, with the highest rate of fatalities compared to other industries. According to the Department of Occupational Safety and Health (2016), out of 237 occupational accidents reported in construction in the year 2015, 88 were fatal with a fatality rate of 4.84 per 100,000 workers. The number of fatalities increased about 3 per cent, equivalent to 91 fatalities in the following year. A total of 328 fatal occupational injuries that occurred in the construction sector were recorded in Malaysia from year 2013 to 2016. In recent statistics, 52 cases of deaths at construction sites have been reported within the first 6 months of year 2018, as compared

to a lower figure of 40 deaths for the similar time frame in year 2017 (DOSH, 2018). The figures might have looked even worse, considering the possibility of non-fatal accidents in the construction sector, which goes unreported (Colak, Etiler and Biser, 2004).

Despite the previous studies conducted in Malaysia (e.g. Ismail, et al., 2012; Subramaniam, et al., 2016), OHS has almost exclusively focused on safety practices in other industries, while little has been undertaken on examining the extent of construction SMEs' OSH practices. In Malaysia, supporting the SMEs in managing health and safety risk should be the priority, due to the significantly greater proportion of SMEs in the construction sector (Manu, et al., 2018). The performance of construction SMEs (in particular, SMEs owned by the *Bumiputera*, *Malaysian indigenous of Malay origin*) from every angle has often been the matter of concern by the Malaysian Government. The failure rate among construction SMEs in delivering projects according to requirements has become an issue to the government, which has established initiatives to elevate the economy of the *Bumiputera* through New Economy Policy that was introduced decades ago (Ayob, et al., 2018). In regard to OHS, the Social Security Organization (SOCSO) report (2010-2012) has stated that 80-90 percent of work-related accidents reported were from the SME businesses (Aziz, et al., 2015). Surienty (2012) further emphasised that OHS in SMEs is still lacking despite their substantial contribution to workplace accident statistics. The failures in OSH compliance were due to the inability to fully understand the construction process and requirements (as most of the owner were retired civil servants with no engineering and construction background), lack of financial capability, lack of OHS and risk management knowledge, as well as the lack of ownerships to deliver the project (e.g. subcontract the project to other parties) (Ayob, et al., 2018). Thus, more fine-grained knowledge is needed regarding to OSH practices as *Bumiputera* construction SMEs is vulnerable to adverse safety and health incidents as it can negatively affect the image and future job demands for the company. It is well acknowledged that the *Bumiputera* construction SMEs have different business approaches than non-*Bumiputera*, especially on the efforts to acquire new information and knowledge to improve their productivity (Kamal and Flanagan, 2014). Therefore, this study aims to explore the current OHS practices, as well as the barriers and strategies for better safety practices by construction SMEs. This aim will assist in providing answer to the research question: "How to improve the OHS practices among construction SMEs?". As mentioned by Alarcon, et al. (2016), detecting the best practices or strategies for different company sizes, with different needs will help reduce occupational accidents in the construction industry.

### THE CHARACTERISTICS OF CONSTRUCTION SMES IN RELATION TO OSH

In the Malaysian construction industry, more than 90% of the registered construction companies are SMEs (CIDB, 2018). This is in line with a recent study by Manu, et al. (2018), who found that there is a significant proportion of micro-business construction firms in Malaysia. The construction SMEs play an important role as general contractors on small and medium-sized projects and as sub-contractors to large construction companies. The Malaysian Construction Industry Development Board (CIDB) has categorized SME contractors using grades from G1 to G5 with two relevant variables which are tendering capacity (less than RM 5 million) and paid-up capital (up to RM 250,000). As for the *Bumiputera* status, the SMEs must fulfill the following criteria: 1) established under the Companies Act, 1965; 2) paid-up capital of at least RM25,000; 3) shareholders are 100% *Bumiputera*; 4) Board of Directors consist of at least 51% *Bumiputera*; and 5) Managerial, professional and supporting staff consist of at least 51% *Bumiputera*.

There has been considerable debate about the distinct features of SMEs compared to large organizations, particularly on the subject of safety management and practices. Large organizations usually are involved in large projects that contains a wider range of safety risks, which requires the implementation of more comprehensive safety measures (Sunindijo, 2015). In contrast, most SMEs are still operating at the lower end of inter-organisational hierarchy that tends to utilize less formal OHS approaches. This could be the resultant of the constant change in ownership due to the frequent changes in contractual relationships, which complicates the OHS operational and management activities (Loosemore and Andonakis, 2007). Hence, the implementation of safety management practices could be associated with the firm size (Manu, et al., 2018). Several construction literatures have emphasized that poor OHS practices (leads to high risk of accidents) at construction sites were dominated by the SMEs. One of the main differences between large organizations and SMEs is the financial resource capability and availability towards the implementation of OHS management practices (Kheni, Gibb and Dainty, 2010; Surienty, 2012). Large organizations often have strong financial capability that could ensure good implementation of safety management systems, while most SMEs have constrained financial capability that disables the commitment on planning and implementing safety management practices and programmes.

Apart from the economic distinction, SMEs could also be characterised by its nature (e.g. heterogeneous, geographical dispersion, lack of cohesive representation, etc.), organisational factor (e.g. non-formal ownership, being independent, simple lines of communication) and industry dynamism (e.g. a limited market share, high resource constraints, limited access to external sources for support) (Legg, et al., 2015). Hasle, et al. (2012) emphasised that it is difficult to separate between safety management practices and other aspects (management and operational activities) of running small businesses. For example, SMEs prefer to use verbal compared to written communication, causing the lack of formal documentation and system (e.g. in-house OHS policy and OHS system), limited knowledge of existing OHS Acts, Regulations and Codes of Practices and limited knowledge on hazards controls and health effects (e.g. evaluation of risks to avoid accidents) (Hasle, et al., 2012; Legg, et al., 2015; Manu, et al., 2018).

In addition, the nature of construction SMEs, being trade sub-contractors in projects also inhibit good OHS practices (Loosemore and Andonakis, 2007). There is evidence that subcontractors commonly hire unskilled workers who have difficulty to go through OHS learning and training due to linguistic and cognitive inability to understand good safety practices (Gao, et al., 2017). Moreover, SMEs are also characterized as having mostly migrant workers, whereby the OHS knowledge on practices and prevention measures among the workers are difficult to be maintained over time. The difficulties faced by SMEs due to payment issues from principal contractors also influence their ability to focus on OHS (Lingard, 2013). Several scholars (e.g. Loosemore and Andonakis, 2007; Sunindijo, 2015) have suggested that the lack of collective support (e.g. union representation) from the industry also weakens the effort to govern safety within the community. Overall, these characteristics could further exacerbate the ability of construction SMEs to deliver systematic safety management practices in the workplace.

## PREVIOUS STUDIES ON OHS PRACTICES AMONG SMES IN THE CONSTRUCTION DOMAIN

The subject of OHS in SMEs has received widespread attention in construction management research due to the nature of SMEs (e.g. firms and operational characteristics) towards the

implementation of OHS management practices. However, the intention here is not to review the broader literature of OHS on SMEs but to concentrate on past research that focused on OHS practices among SMEs in the construction domain. In order to trace the patterns and trends, we have split the time frame into four sub-periods and summarised each study based on the publication year.

The early literatures of OHS in SMEs were observed within the context of OHS implementation and performance among subcontractors. The research direction has then moved from the general context to more specific features (i.e. individual-level) of OHS (e.g. OHS risk and behaviour). For example, attention has been given by Lingard and Holmes (2001), who have made one of the initial attempts in understanding two specific OHS risk controls among small businesses engaged in the Australian construction industry. They emphasised that individuals, rather than technological controls need to be considered in minimizing the incidence of occupational injury or ill-health for the consideration of OHS risk in small firms. Studies within this time period were mostly from developed countries such as the United States of America, United Kingdom and Australia.

In the sub period of 2006 - 2010, the research has broadened its landscape to include more analytical-based studies that provided evidences on the attitudes and problems faced by small firms in implementing OHS regulations. Studies include Loosemore and Andonakis (2007) who focused on exploring the nature and extent of problems faced by subcontractors in implementing the OHS Regulation in Australia. They found that the main barriers to effective OHS compliance among small-contractors are the implementation costs, language and educational barriers and a fear of change. In contrast, Kheni, Gibb and Dainty (2010) examined the influence of contextual environment (Sub-Saharan Africa) towards Ghanaian construction SMEs in managing OHS. They have recommended several measures to overcome the challenges faced by in the country that includes cost, safety culture and commitment by providing education, funding for training and H&S cost being made part of the prime cost items in bills of quantities. On the other hand, studies at National-level (e.g. UK) have been initiated to investigate the wider engagement of SMEs in OHS implementation. The subject of safety behaviour continues to be the on-demand topic for the scholars. Several types of methodological frameworks were adopted to achieve the objectives. At later stage, the literatures have also included developing countries such as Ghana, Pakistan, Taiwan and South Africa, unlike in previous time frame where most studies focused only on developed countries.

In the third sub period 2011-2015, the research expands to consider the multiple context (e.g. comparative studies, role of owner-manager) in understanding OHS implementation in SMEs. For example, Holte, Kjestveit and Lipscomb (2015) studied on injury risks among apprentices in different small-size construction enterprises within different building and construction trades. More empirical studies to deepen the understanding of the OHS concept (e.g. identify motivation factors, leading indicators) has begun to develop. Articles also adopted different types of quantitative method (e.g. Delphi survey), from countries such as Denmark, India, Sri Lanka, and Nigeria as their research settings.

In the fourth sub period ( $\geq 2016$ ), new lines of research began to emerge, where scholars began to develop assessment tools to measure the performance of OHS in SMEs. In addition, different approaches to capture OHS practices began to be adopted. For instance, Lingard, et al. (2015) used participatory video to capture subcontracted construction workers' safety rule violations. Overall, it is widely acknowledged in the construction literature that SMEs are typically lagging in embracing effective OHS management practices. Several scholars have highlighted increasing research interest at various levels including individual, organisational,

project and national level. Although there is diversity in the current thinking on the aspect of OHS among SMEs, there is still a lack of effort to contextualise the SMEs for safety in local construction context (i.e. Malaysia). Several scholars (e.g. Subramaniam, et al., 2016) have suggested for more attention and studies to be done on OHS in SMEs within the specific context and sector. Consequently, this study has attempted to fill the gap by providing more practical views on the extent of OHS management practices among construction SMEs in Malaysia. Findings from two sessions of OHS workshops and site visits to several construction sites have been examined, where the barriers and strategies of OHS management practices have been discussed in detail.

## Research Methods

This study was performed in 2017, as part of an intervention programme for *Bumiputera* construction SMEs, conducted in collaboration with the Department of Occupational Safety and Health (DOSH), Malaysia. This study has adopted a pragmatic philosophical perspective of mixed-methods research design, that facilitates consistent conceptualisation and triangulation of findings. The adoption of pragmatic approach provides a workable solution to the multifaceted problem (e.g. current practices, barriers) through the mix of data collection methods within the research process (Creswell, 2003). In this study, adopting the pragmatic approach is seen to be most suitable as integrating more than one approaches could produce results that can be translated into practical ends (e.g. strategies to improve OHS practices among construction SMEs). Mixed methods in terms of conducting OHS workshops, a questionnaire survey and site observations were adopted with a cross-sectional sample of construction SMEs to identify the current OHS practices, barriers and strategies, subsequently addressing the research question.

Initially, past research regarding OHS practices among construction SMEs were reviewed. Based on the OHS studies in the local context and other countries, the OHS practices, barriers and strategies for continuous improvements were examined. A preliminary study was conducted to complement the literature research. The preliminary study consisted of several discussions and meetings with subject matter experts from the construction industry (i.e. project manager and safety manager) and OHS related government bodies in order to gather information related to OHS practices among construction SMEs. Site observations were also conducted at eight small construction sites with the use of Work Improvement in Small Construction Sites (WISCON) checklist developed by Kawakami (2016), in order to capture the insights on the current practices of OHS among construction SMEs.

In the next stage, two OHS workshops were conducted to increase the awareness on the OHS regulations and to highlight the important areas related to the enhancement of OHS for construction SMEs. During the workshops, a set of questionnaire survey, which have focused on capturing insights on barriers and strategies was distributed to each participant. Initially, pilot surveys with five construction practitioners were conducted prior to administering the survey to assure reliability, further improving the clarity of the instructions and assess the time needed for the survey. A one-hour session was allocated in the workshop for a direct face-to-face discussion and to assist the participants in filling up the survey. The survey data were analysed using descriptive statistics including frequencies and means to show the relative importance of variables. Inferential statistics (i.e. multivariate analysis of variance (MANOVA)) were then employed to examine whether the nature of organisations (i.e. main contractor and sub-contractor) have peculiar effect on the strategies.

## Results and Discussion

### 1) Site Observations

In total, eight small construction sites were visited in order to observe their level of OHS implementation. A WISCON checklist was adopted as part of the assessment tool. During the covert participant observation, the researchers were given permission by the site management to observe the participants (workers), as well as the site for safety practices, regarding the WISCON checklist. The data for this non-participatory approach was documented solely using the checklist (enables objective documentation of safety practices) and no elements of recording has been utilised. The workers were engaged as passive participants towards producing findings that provide accurate representation of a culture, particularly in safety, from the context of this study.

Findings from the observation is shown in Table 1. Each compliance to the WISCON criteria is given a YES, while a non-compliance is given a NO. From the observation, all the sites have fulfilled a minimum of one out of the 37 criteria, except for the variable 'remove all projecting nails in timber' (Material Handling and Storage). Based on the findings, the variables that have been complied most by the contractors were: 'use wheeled devices when moving materials' (Materials Handling and Storage) and 'ensure safe wiring connections for supplying' (Physical Environment). Meanwhile, the least complied upon variable is under the category of 'work at height'. This could be due to the reason that SMEs are less involved in high-rise projects, particularly so for the site visits conducted, where only one site (Site 6) has been identified as having work at height hazard.

A comparison between the eight sites showed that only two sites (Site 4 and 6) have compliance rate of more than 50%, while the other six sites (Site 1, 2, 3, 5, 7 and 8) have compliance rate below 50%. Site 6 showed the most compliance with 31 YES (83.78% compliance), while the least compliant site was Site 5 with only 6 YES (16.22% compliance). The difference could be drawn to the element of 'working at height', where Site 6 is the only high-rise project site and the adherence to most of the criteria showed that the site was performing well in terms of their OHS implementation.

In summary, the initial findings indicate that although OHS practices at some sites (site 4 and 6) complied to most of the WISCON variables, there are still SMEs that were unable to improve and enhance their OHS practices at the construction sites. This can be seen, for example, from the observations that some of the workers were not even equipped with basic personal protective equipment (PPE) such as safety helmets (Site 1 and 3) and safety boots (Site 1, 3 and 5). In summary, the revelation aligns with the initial findings and the disclosure leads to a dire need to improve the OHS performance of construction SMEs in the local context. The findings of the status-quo were later shared at the OHS workshop for further reference and discussion.

Table 1 Summary of findings (based on WISCON checklist) from eight small construction sites

WISCON Safety and Health 37 Variables	Evident (frequency of YES)							
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Materials Handling and Storage (7 Variables)	1	3	2	4	2	6	2	4
Work at Height (7 Variables)	1	NA	0	2	NA	6	NA	NA
Machine Safety (4 Variables)	NO	4	NA	4	0	NA	3	1
Physical Environment (6 Variables)	2	4	3	3	2	6	1	2
Welfare Facilities (5 Variables)	3	NO	4	1	NO	5	NO	NO
Emergency Preparedness (3 Variables)	1	1	2	1	1	3	1	1
Work Organization (2 Variables)	1	2	2	2	1	2	1	2
Safety and Health Organization (3 Variables)	NO	1	2	2	NO	3	NO	2
<b>Frequencies of YES</b>	<b>9</b>	<b>15</b>	<b>15</b>	<b>19</b>	<b>6</b>	<b>31</b>	<b>8</b>	<b>12</b>

Note: NA – Not applicable (i.e. the variables are not relevant to the site)

No – No practices were found in the site

## 2) OHS Workshop

Two OHS Workshops have been conducted to provide a platform for discussion on the importance and practices of OHS at small construction sites based on specific OHS modules. The modules included: 1) Elements of Work Improvement at small construction sites; 2) Safety and health policy; 3) Safety and health committee and safety and health meeting requirement; 4) Legal requirement, 5) Work safety; 6) Hazard identification, risk assessment and risk control (HIRARC); and Incident and accident investigation and reporting procedure. These two-series of workshops are part of a wider OHS project focusing on improving the *Bumiputera's* capability on safety and health management practices at construction sites. The Contractor Services Center (CSC) and the Department of Occupational Safety and Health (DOSH) Malaysia have helped in identifying construction SMEs, subsequently contacting the organisations to seek for their agreement to participate in the workshops. In this study,



only construction SMEs in Kuala Lumpur and Selangor were targeted as participants as the incidence of work-related fatal injuries occurred in these states were among the highest in Malaysia (Ayob, et al., 2018). In workshop 1, 18 SMEs have participated, while 21 SMEs participated in workshop 2. It is worth highlighting that despite the sampling covers only small fraction of the total population (there were approximately about 45000 registered construction SMEs (CIDB, 2018)), these SMEs are the ones who are continuously active in the industry and have been recommended by the authorities (due to their commitment and proactiveness towards OHS). In addition, Coviello and Jones (2004) emphasised that even if the survey response is not significant in number, but if the respondents were drawn from a high-quality group, significant findings can still be produced.

In both workshops, apart from the module presentation, a questionnaire survey was also administered to the participants in order to gauge their opinion on the barriers and strategies in the implementation of OHS among SMEs.

#### *Profile of respondents*

Overall, there were good mixtures of designations of respondents with almost 60 per cent of the respondents holding upper-level management positions in their organisations (see Table 2). It was clear that most respondents belonged to senior and top management decision makers, with the balance predominantly engineers and supervisors who were working in daily site operations. On average, respondents had about 12 years of experience in the construction industry. In terms of the nature or organisation, almost 80 percent of the participants indicated that their main business were main contractors. The remaining 20 per cent were mostly sub-contractors.

Table 2 Summary of respondents

	Respondents characteristics	No. of respondents (total = 39)
Designation	Project Director	11
	Project Manager	7
	Construction Manager	5
	Civil Engineer	2
	Site Supervisor	9
	Safety & Health Officer	2
	Safety Site Supervisor	1
	Others (Assistant director, Cost controller)	2
Years of Experience	0 - 5	14
	6 - 10	12
	11 - 15	6
	>15	7
Nature of construction SMEs	Main contractor	31
	Sub-contractor	8

### *Assessing the barriers to improve safety and health practices*

A questionnaire was designed to solicit the respondents' opinion on the degree of relevancy of the nine barriers in order to determine the current barriers in implementing OHS practices among the SMEs. A five-point Likert scale (1: least relevant to 5: extremely relevant) was used for this purpose.

Table 3 shows that the respondents have rated 'cost of OHS implementation' as the most relevant barrier for the implementation of OHS among SMEs with the highest mean value of 3.56. This is followed by 'poor safety culture' with a mean value of 3.31 and 'lack of safety commitment from client', with mean value of 3.27. Barriers such as 'lack of managerial commitment' and 'lack of strict enforcement of OHS regulations' received mean values of 3.23 and 3.19, respectively. The remaining choices among the nine barriers were 'OHS regulations are too prescriptive' with a mean of 3.16, 'Lack of health and safety training for workers' with a mean of 3.08 and 'Lack of resources to implement safety' with a mean of 3.04. The least relevant factor was 'Lack of point of reference for OHS improvements' with the lowest mean value of 2.96.

**Table 3** Key Barriers to Improve Safety Performance among SME Contractors

No.	Barriers to improve safety performance among SMEs in the construction industry	Mean	Std Deviation
1	Lack of safety commitment from Client	3.27	0.919
2	Cost of OHS implementation	3.56	0.917
3	Poor safety culture	3.31	0.970
4	Lack of Managerial Commitment	3.23	1.177
5	Lack of strict enforcement of OHS regulations	3.19	1.200
6	Lack of resources to implement safety	3.04	1.280
7	Lack of health and safety training for workers	3.08	1.164
8	OHS regulations are too prescriptive	3.16	0.850
9	Lack of point of reference for OHS improvements	2.96	1.060

### *Strategies to Improve Safety Performance among the Construction SMEs*

Table 4 shows the respondents' perception on the strategies that would be effective to enhance the H&S performance of SME contractors.

**Table 4:** Strategies to Improve Safety Performance among the SME Contractors

No.	Strategies to improve safety performance among SMEs in construction industry	Mean	Std Deviation
1	Safety as one of the Key Performance Indicators (KPI)	3.92	0.845
2	Safety is one of the criteria in tendering	3.77	0.815
3	Government Funding on OHS Training	3.84	0.800

Table 4 continued

No.	Strategies to improve safety performance among SMEs in construction industry	Mean	Std Deviation
4	Platform to share experience and promoting best practices	3.69	0.736
5	Linking OHS and insurance	3.62	0.804
6	Tougher renewing licenses	3.31	1.087
7	Strict enforcement on OHS regulations	3.64	0.952
8	More focus and tougher health and safety training programme	3.69	0.788
9	Forming "Safety Responsible Group"	3.46	0.761
10	Measuring tool for OHS practice	3.38	0.803
11	Less prescriptive on the OHS regulations	3.19	0.938
12	Creating more safety-conscious culture	3.85	0.785
13	Tougher penalties	3.33	1.129
14	Outreach efforts - Coordinated action among worker unions and related associations	3.46	0.706
15	More Communication Efforts	3.58	0.902

As shown in Table 5, the respondents have rated 'Safety as one of the Key Performance Indicators (KPI)' as the most important strategy for the implementation of OHS among SMEs with a mean value of 3.92. This is followed by 'Creating more safety-conscious culture' with mean value of 3.85 and 'Government funding on OHS Training' with mean value of 3.84. Next, the strategy of making 'Safety as one of the criteria in tendering', received the mean value of 3.77, while 'Platform to share experience and promoting best practices' and 'More focus and tougher health and safety training programme' received the same mean value of 3.69. Strategies such as 'Strict enforcement on OHS regulations' and 'Linking OHS and insurance' received the mean value of 3.64 and 3.62, respectively. The remaining choices among 15 strategies were 'More Communication Efforts' with a mean of 3.58, 'Outreach efforts' and 'Forming "Safety Responsible Group"' with the same mean value of 3.46, 'Measuring tool for OHS practice' with mean of 3.38, 'Tougher penalties' with mean of 3.33 and 'Tougher renewing licenses' with mean of 3.31. The least favourable strategy was 'less prescriptive on the OHS regulation' with the lowest mean value of 3.19. Overall, this result resonates with the earlier findings on the barriers of OHS implementation, whereby both findings pointed to 'organisational strategy', 'culture' and 'cost' as the main variables.

Table 5 shows the MANOVA results of the 15 strategies to improve OHS based on the nature of SMEs (i.e. main contractor and sub-contractor). As shown in Table 5, based upon the standard  $\alpha$  of 0.05, subjects in the 15 independent variables (the strategies) are not significantly different based on their nature of SMEs. This indicates that regardless of them being a main contractor or sub-contractor, their perception on these strategies are similar towards improving the OHS practices. One of the possible reasons is about the relationship between main and subcontractors. The mutual understanding on co-existence

and responsibility also creates a reciprocal notion towards embracing the importance of safety practices in construction.

Table 5 MANOVA results

Dependent Variable	Independent variables (Strategies)	Type III Sum of Squares	df	Mean Square	F	Sig.
Nature of Organisation	Safety as one of the Key Performance Indicators (KPI)	.709	1	.709	1.036	.316
	Safety is one of the criteria in tendering	1.368	1	1.368	1.541	.223
	Government Funding on OHS Training	.060	1	.060	.090	.765
	Platform to share experience and promoting best practices	.833	1	.833	1.404	.244
	Linking OHS and insurance	2.720	1	2.720	3.553	.068
	Tougher renewing licenses	.123	1	.123	.074	.788
	Strict enforcement on OHS regulations	1.970	1	1.970	1.594	.215
	More focus and tougher health and safety training programme	.168	1	.168	.218	.644
	Forming "Safety Responsible Group"	.001	1	.001	.002	.967
	Measuring tool for OHS practice	.509	1	.509	.568	.456
	Less prescriptive on the OHS regulations	.384	1	.384	.437	.513
	Creating more safety-conscious culture	.342	1	.342	.494	.487
	Tougher penalties	1.686	1	1.686	1.168	.287
	Outreach efforts - Coordinated action among worker unions and related associations	.140	1	.140	.209	.650
	More Communication Efforts	.833	1	.833	1.171	.287

*Respondents' Personal Opinion on the Drivers to Improve OHS Practices in Construction Projects*

An open-ended discussion during the workshop was conducted to seek the respondents' opinion on the question: What drives the SMEs to improve their Safety & Health practices in a construction project? The discussion was moderated by the researcher and assisted by the officer from DOSH. The quotes from the respondents have been analysed through converting raw narrative data (notes, audiotapes) into partially processed data (transcripts), which were then coded manually. The keywords most related to the quotes have been extracted and displayed in Table 6.

**Table 6** Keywords for the Drivers to Improve H&S in Construction Projects

Keywords	Example of quotes from the respondents
Top management support, commitment, monitor workers, outreach of effort	Higher commitment by top management by having monitored KPI, introduce simple safety management tool, SME's management shall be committed to comply on OSHA 1994 & FMA 1967
Safety awareness, safety culture, self-regulation, attitude change	Most of the safety officers do not feel the belonging because their job as per contract basis Groom safety officer with cultural diversity such as Indonesia, Bangladesh and Vietnam
H&S tender evaluation/ tender budget	Rate dictated by Public Work Department (PWD) not including safety features. Include the cost of S&H of project into the costing of the project Review previous project OHS recognition and performance evaluation during tendering stage Government agencies should impose relevant fix cost to SMEs during tender stage
Reward and Penalty system	Foster culture of incentives Provide healthier competition between SMEs at state level SMEs should impose a penalties system to workers
Training, sharing of best practices	Provide specific OHS training and continuous education Platform to share experience via local group engaged by regional CIDB Using social media to share and disseminate OHS information to workers and other firms
Funding from government/ client	Funding from government to give knowledge and training to SME
Social Networking	Social media as a tool and platform to deliver construction OHS messages and information Foreign workers are isolated from conventional communications networks by poor English and Malay language skills. The use of social media could connect them with more effective information.

Table 6 continued

Keywords	Example of quotes from the respondents
Regulations, Enforcement	Translate law statement into layman words. Prepare guidelines for each industry and not too general. (be specific) With a lot of regulation but without any enforcement and check and balance, it will become wasting of effort

Overall, it is evident that most of the discussion points in Table 6, regarding to the drivers to improve the implementation of OHS are almost like the strategies highlighted in the previous section. Most of the respondents have recognised ‘top management’ support, ‘safety culture’ and ‘H&S tender budget as the top drivers. These variables coincide well with the top three barriers identified earlier in the questionnaire (Refer to Table 3), although not in the same order. Nonetheless, the notion to tackle the current barriers are clear, as follows: 1) In terms of cost, the budget on H&S should be included in the tender; 2) Crucial support must be given by management; and 3) A need to instil safety culture across the organization.

## Recommendations for the enhancement of OHS practices among construction SMEs

Findings for the OHS workshop could be retrieved from the three major sections, which has been discussed as follows: 1) Barriers to Improve Safety Performance among the SME Contractors; 2) Strategies to Improve Safety Performance among the SME Contractors; and 3) Respondents’ Personal Opinion on the Drivers to Improve H&S Practices in Construction Projects. The triangulation of the data obtained from the questionnaire survey (barriers and strategies) and the open-ended question (top three strategies) has reached saturation, where the results have been conclusive with cost, management’s commitment and safety culture emerging as the three most prominent themes for enhancing safety practices among construction SMEs. Each of the variables were then formed into a structure for the enhancement of OHS practices among construction SMEs.

In relation to the findings (triangle of cost, safety culture and commitment) from this study, the following recommendations are made;

- Practical initiatives should be developed to provide a platform to improve the safety training for foreign workers in order to increase the safety awareness and culture. This is important as the Malaysian construction industry largely consist of multicultural environment due to limited local labour force, with total dependency on migrant workers. There is evidence that the migrant workers are embracing their home-grown culture (which is agriculturally based), for example, not used to wearing personal protective equipment (Mat Zin and Ismail, 2012). Ensuring the right safety culture for the intended audience (e.g. workers at site) is crucial for the advancement of OHS and for the well-being of the workers. One of the possible initiatives is to have more stringent in-house rules by incorporating the ‘carrot and stick’ approach, with a combination of reward and punishment to induce good behaviour. In addition, fees reduction or subsidising cost of safety training up to 40% (like the reduction of levy fees for foreign workers in the construction sector that has been introduced in 2019)

could also benefit the construction SMEs. This would give opportunities for the SMEs to continuously send their workers to safety training workshops to improve the OHS knowledge, attitude and practice.

- Social networking could also be adopted to increase safety awareness. For example, the formation of groups using social media (e.g. via WhatsApp, Telegram, online forum) for dissemination of ideas and information on safety and health, for both top management, as well as workers. There is evidence that there is a need for more means of communication and dissemination of OHS information among construction firms in Malaysia (Manu, et al., 2018). The authorities such as DOSH and CIDB could also work together by using their platforms (e.g. seminar, workshops, sharing sessions, award ceremony) to promote or engage SMEs to be part of the OHS activities. In addition, authorities such as DOSH and CIDB could also create *construction safety booklets* containing illustrations of basic rules and safe work practices specifically for SMEs.
- More specific OHS training programs should be introduced for *Bumiputera* construction SMEs to increase their knowledge on safety practices with regards to specific nature of works at construction sites. It is at the construction sites where these knowledge and practice have a significant impact on expenditure, efficiency and productivity (Wilkinson, Sherratt and Farrell, 2015). An example could be, training on road traffic safety for SMEs, who are involved in rural road maintenance works. Another example is to provide training related to new technologies in construction. This would further encourage the use of new technologies (e.g. BIM, drone etc) in improving OHS practices. In addition, training for managerial level on the management aspect of safety practices (e.g. developing in-house safety policy statement and safety file) could ease the planning and implementation of safety practices. Moreover, specific rules should be introduced that require employers (who employ in excess of a certain percentage of foreign workers) to provide free English or Malay language sessions to their workers. Ensuring that training is provided in the language(s) and at a literacy level that all workers can understand is vital to ensure effective OHS implementation. There is evidence that local construction SMEs have performed poorly in the planning and management aspect of safety practices (Manu, et al., 2018).
- Established *Bumiputera* construction SMEs should be encouraged to get involved in tertiary education (could start with relevant *Bumiputera* educational institutions), promoting their practices and disseminating their experience know-how. This could be done through a sharing session on OHS with undergraduate students as part of nurturing the safety culture and awareness in early education. In addition, collaboration on OHS activities (e.g. competition on OHS best practices or innovation) could also spur more industrial-academic collaboration and cooperation. This will eventually help the industry to produce more skilled *Bumiputera* workers (which is currently dominated by the others) equipped with OHS skills. The relevant authorities could also introduce Continuous Contractor Development (CCD) points as part of their involvement in tertiary education. This initiative could benefit not only the organisation (in terms of the CCD points) but also the students and academics with regards to teaching and learning.
- Consideration should also be given to implement a funding mechanism to assist in supporting the associated cost of implementing and educating the OHS practices. Apart from relying mostly on direct funding from the government, a mechanism such as tax incentives could also be introduced (i.e. any cost spent for OHS training could be given tax exemptions), linking cost of safety performance in the premium insurance (as a

driver to increase SMEs' motivation and awareness in construction site safety) and OHS workshops handled by local authorities/private clients could be initiated to help the construction SMEs. In addition, the introduction of OHS BQ in government projects (outlined in the Construction Industry Transformation Programme (CITP) 2016-2020) should help the contractors on the financial implication of OHS implementation. However, the inclusion of OHS BQ should not be introduced only to large scale projects, but also to smaller projects.

- As for management's commitment to OHS at construction sites, the idiom 'walk the talk' fits the situation well. Commitment from management should be demonstrated through actions such as proper funding allocated for PPE, safety audit, safety drill, etc., rather than just a safety policy in the form of words. The responsibility of ensuring OHS practices should not be placed solely on the contractors but should be shared by all actors involved in the project. Since stakeholders commonly do not recognise the impact, they can make on site safety (Spillane and Oyedele, 2013), a collective involvement through a legislative framework (e.g. Occupational Safety and Health in Construction Industry (Management) (OSHCI(M)) could govern the safety responsibilities and influence the safety decision making at the early phase of construction projects.
- Management should take 'ownership' of the project and workers (at all level of operations who are involved daily at site) should be treated as valuable project team members through collective responsibility (Durdyev, et al., 2017), rather than just a tool to complete a project. The establishment of a simple safety assessment and monitoring tool and including 'safety' as one of the company's KPIs could represent the top managements' commitment on safety. Measuring and reviewing OHS performance is critical for small contractors, such as *Bumiputera* SMEs in order to assess the extent the goals have been achieved (Manu, et al., 2018). Hence, management's commitment is very important to ensure proper understanding and appreciation of H&S across the organisation, especially workers who are physically facing the H&S risk in their daily life. Moreover, the continuous appreciation from management could influence the workers to reciprocate by expanding their formal role into voluntary behaviours of safety practices (Gao, et al., 2017).

## Comparison to Related OHS Studies on Construction SMEs

The results found in this study presents an opportunity for comparison with other related OHS studies on construction SMEs. For example, a study on barriers to implement OHS by Loosemore and Andonakis (2007) identified that implementation costs, language and educational barriers and fear of change were the barriers for effective OHS compliance among small subcontractors in Australia. In another study in New South Wales, Australia, Sunindijo (2015) found that subcontracting practices, especially the use of best price to win projects, clients' focus on other objectives (e.g., time and cost rather than safety) and fierce competition in the industry were the top barriers faced by the small construction organisations in the region. Kheni, Gibb and Dainty (2010) highlighted ineffective prevention services, low socio-economic status of workers, size related constraints and owner/managers' commitment to extended family goals were the key barriers to effective OHS management within Ghanaian SMEs. In contrast, this study identified cost of OHS implementation, lack of safety commitment from client and poor safety culture as the top three barriers faced by the construction SMEs in Malaysia.



In terms of the strategies to improve OHS, the findings of this study are in line with other related studies such as on having closer interaction and communication between authorities and SMEs, initiatives related to reducing or subsidising the training-related cost and formal health and safety compliance management systems. While advocating institutional pressures (e.g. new legislation framework) is preferable for immediate change, softer approach is needed to engage the construction SMEs, particularly the *Bumiputera* towards developing the OHS best practices. This study indicated that this could be done through a three-party collaboration (authorities, industry and academia) in order to enhance the collaborative movement towards improving the cost, safety culture and commitment, and hence achieving OHS knowledge, attitude and practice among the SMEs. This type of collaboration is regarded in the literature as effective and is a potential source of the gap in OHS among SMEs in developing countries.

Overall, although the subject of this study is like other related OHS studies, they are incomparable due to the differences in the context of the findings. The aforementioned studies were using different types of methodological framework (different methods, sampling etc) depending on several aspects (e.g. availability of data, geographical etc), and hence resulting in different arrangements of findings. All barriers and strategies have their own contexts that require certain levels of experience by practitioners in implementing OHS practices. This study provides a reflection from the local context in influencing an effective OHS practices, because the SMEs are dependent on the internal and external environment to drive the OHS. Consequently, it is believed that the findings from this study could provide a point of reference for construction SMEs, authorities and academia to further enable the strategies that would address the core barriers inhibiting the OHS implementation, particularly in developing countries.

## Conclusions

This study was initiated as part of a pilot programme by the Department of Occupational Safety and Health (DOSH) Malaysia and the Social Security Organisation (SOCSO) to better understand what it takes for the *Bumiputera* construction SMEs to continuously improve their OHS practices. The initial findings from the site observation have indicated that there is a need to improve the OHS practices of *Bumiputera* construction SMEs. The results from two OHS workshops indicate that the main barriers to better safety practices have been costs implications, poor safety culture and lack of safety commitment from the client. The proposed strategies include introducing safety as one of the construction KPIs, creating more safety-conscious culture and establishing a funding mechanism to support the cost of training. Based on the triangulation of our findings, a framework has been developed based on the triangle of cost, safety culture and commitment. Hence, the three elements are deemed necessary for the enhancement of OHS practices among *Bumiputera* construction SMEs.

There are several implications of this study. First, this study has provided some practical insights for construction organisations and authorities into the current safety practices among the *Bumiputera* construction SMEs and what it takes to improve the practices. Secondly, the findings from this study could act as a platform for further discussions in regard to the advancements of *Bumiputera* SMEs in terms of their capacity and capability building in the construction sector, as outlined in the Malaysia New Economic Policy and CITP 2016-2020 under strategic thrust: Quality, Safety and Professionalism.

This study has the following limitations. First, since the study is part of a project by DOSH, the current study is therefore based on a relatively small number of *Bumiputera* construction

SMEs, which in turn could limit the generalisation of the findings. Thus, as the project progresses positively, future studies could expand the current population to larger scales with diverse samples of construction SMEs. Second, this study has delimited the scope of research to skilled / professional workers and thus, did not collect data from unskilled workers for comparison purposes. It is recommended that future studies should include the participation of the unskilled / semi-skilled workers for better coverage of findings. Third, this study has focused on general group of SMEs and types of construction works. Considerations to further group the SMEs into medium-sized, small-sized and micro-sized enterprises along with the specific trading works, could lead to a better understanding on the implementation of OHS practices. Finally, the recommendations proposed in this study have not been validated and tested. It is suggested that future work should focus on a follow-up validation study through diverse research methods with relevant parties (e.g. focus group, case studies and industry forum) to facilitate the impact from the recommendations.

## References

- Alarcón, L.F., Acuna D., Diethelm S. and Pellicer E., 2016. Strategies for improving safety performance in construction firms. *Accident Analysis and Prevention*, 94, pp.107–18. <https://doi.org/10.1016/j.aap.2016.05.021>.
- Arewa, A.O. and Farrell P., 2012. A review of compliance with health and safety regulations and economic performance in small and medium construction enterprises In: *Smith, S.D. (Ed) Proceedings of 28th Annual ARCOM Conference*. 3-5 September 2012. Edinburgh, UK: Association of Researchers in Construction Management, pp.423-32.
- Aziz, A.A., Baruji, M.E., Abdullah, M.S., Nik Him, N.F. and Yusof, N.M., 2015. An Initial Study on Accident Rate in the Workplace through Occupational Safety and Health Management in Sewerage Services. *International Journal of Business and Social Science*, 6(2), pp.249-55.
- Ayob, A., Shaari, A.A., Zaki, M.F.M. and Munaaim, M.A.C., 2018. Fatal occupational injuries in the Malaysian construction sector—causes and accidental agents, *4th International Conference on Civil and Environmental Engineering for Sustainability (IConCEES 2017) 4–5 December 2017, Langkawi, Malaysia*.
- Choe, S. and Leite, F., 2017. Assessing Safety Risk among Different Construction Trades: Quantitative Approach. *Journal of Construction Engineering and Management*, 143(5), 04016133, [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001237](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001237).
- CIDB, 2018. *Construction Industry Review & Prospect 2016/2017: Chapter 2 – Construction Projects, Contractors and Personnel*. [online] Available at: <http://www.cidb.gov.my/images/content/pdf/bisnes/const-review-2016-2017/CIDB---Construction-Industries-Review---Chapter-2-Jan-15-2018.pdf> [Accessed 5 February 2019]
- Construction Industry Transformation Programme (CITP) 2016–2020. *Quality, Safety & Professionalism* Available at <http://www.citp.my/strategic-thrusts/quality-safety-professionalism/> [Accessed 20 January 2019].
- Colak, B., Etiler, N. and Bicer, U., 2004. Fatal occupational injuries in the construction sector in Kocaeli, Turkey, 1990–2001. *Industrial Health*, 42, pp.424-30.
- Coviello, N.E. and Jones, M.V. 2004. Methodological issues in international entrepreneurship research. *Journal of Business Venturing*, 19(4), pp.485-508. <https://doi.org/10.1016/j.jbusvent.2003.06.001>

- Creswell, J. 2003. *Research design: Qualitative, quantitative and mixed methods approaches*. Thousand Oaks, CA: Sage.
- Durdyev, S., Mohamed, S., Lay, M.L. and Ismail, S., 2017. Key Factors Affecting Construction Safety Performance in Developing Countries: Evidence from Cambodia, *Construction Economics and Building*, 17(4), <https://doi.org/10.5130/AJCEB.v17i4.5596>.
- Gao, R., Chan, A.P.C, Utama, W.P and Zahoor, H., 2017. Workers' Perceptions of Safety Climate in International Construction Projects: Effects of Nationality, Religious Belief, and Employment Mode. *Journal of Construction Engineering and Management*, 143(4), 04016117, [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001226](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001226).
- Hasle, P., Kvorning, L.V., Rasmussen, C.D.N., Smith, L.H. and Flyvholm, M. A., 2012. A model for design of tailored working environment intervention programmes for small enterprises. *Safety Health Work*, 3, pp. 181–191. <https://doi.org/10.5491/SHAW.2012.3.3.181>
- Holte, K.A., Kjestveit, K. and Lipscomb, H.J., 2015. Company size and differences in injury prevalence among apprentices in building and construction in Norway. *Safety Science* 71 (Part C), pp.205-12, <https://doi.org/10.1016/j.ssci.2014.01.007>.
- Ismail, F., Ahmada, N., Janipha, N.A.I. and Ismail, R., 2012. Assessing the Behavioural Factors' of Safety Culture for the Malaysian Construction Companies. *ASEAN Conference on Environment-Behaviour Studies*, Savoy Homann Bidakara Bandung Hotel, Bandung, Indonesia, 15-17 June 2011.
- Kamal, E.M. and Flanagan, R. 2014. Key Characteristics of Rural Construction SMEs, *Journal of Construction in Developing Countries*, 19(2), pp.1–13.
- Kawakami, T., 2016. Participatory training to improve safety and health in small construction sites in some countries in Asia: development and application of the WISCON training program. *Journal of Environmental and Occupational Health Policy*, 26(2) pp.208–19. <http://dx.doi.org/10.1177/1048291116652158>.
- Kheni, N., Gibb, A.G.F. and Dainty, A.R.J., 2010. Health and safety management within SMEs in developing countries: a study of contextual influences. *Journal of Construction Engineering and Management*, 136(10), pp.1104-15. [http://dx.doi.org/10.1061/\(ASCE\)CO.1943-7862.0000218](http://dx.doi.org/10.1061/(ASCE)CO.1943-7862.0000218).
- Legg, S., Olsen, K.B., Laird, I.S. and Hasle, P., 2015. Managing safety in small and medium enterprises, *Safety Science*, 71 (Part C), pp.189–96. <https://doi.org/10.1016/j.ssci.2014.11.007>.
- Lingard, H., 2013. Occupational health and safety in the construction industry, *Construction Management and Economics*, 31(6), pp.505-14, <https://doi.org/10.1080/01446193.2013.816435>.
- Lingard, H. and Holmes, N., 2001. Understandings of occupational health and safety risk control in small business construction firms: barriers to implementing technological controls. *Construction Management and Economics*, 19(2), pp.217-26. <https://doi.org/10.1080/01446190010002570>.
- Lingard, H., Pink, S., Harley, J. and Edirisinghe, R., 2015. Looking and learning: using participatory video to improve health and safety in the construction industry. *Construction Management and Economics*, 33(9), pp.740–51. <https://doi.org/10.1080/01446193.2015.1102301>.
- Loosemore, M. and Andonakis, N., 2007. Barriers to implementing OHS reforms – The experiences of small subcontractors in the Australian Construction Industry. *International Journal of Project Management*, 25, pp.579–88. <https://doi.org/10.1016/j.ijproman.2007.01.015>.

- Mat Zin, S. and Ismail, F., 2011. Employers' Behavioural Safety Compliance Factors toward Occupational, Safety and Health Improvement in the Construction Industry., *Procedia - Social and Behavioral Sciences*, 36, pp.742–51.
- Manu, P., Mahamadu, A-M., Phung, V.M., Nguyen, T.T., Ath, C., Heng, A.Y.T. and Kit, S.C., 2018. Health and safety management practices of contractors in South East Asia: A multi country study of Cambodia, Vietnam and Malaysia. *Safety Science*, 107, pp.188–201. <https://doi.org/10.1016/j.ssci.2017.07.007>.
- Mayhew, C., Quintan, M. and Ferris, R., 1997. The effects of subcontracting/outsourcing on occupational health and safety: Survey evidence from four Australian industries. *Safety Science*, 25(1–3), pp.163–78. [https://doi.org/10.1016/S0925-7535\(97\)00014-3](https://doi.org/10.1016/S0925-7535(97)00014-3).
- Sherratt, F., Crapper, M., Foster-Smith, L. and Walsh, S., 2015. Safety and volunteer construction workers. *Construction Management and Economics*, 33(5–6), pp.361–74. <https://doi.org/10.1080/01446193.2015.1024269>.
- Spillane, J. and Oyedele, L., 2013. Strategies for effective management of health and safety in confined site construction', *Australasian Journal of Construction Economics and Building*, 13(4), pp.50–64. <https://doi.org/10.5130/ajceb.v13i4.3619>.
- Subramaniam, C., Shamsudin, F.M., Zina, M.L.M., Ramalub, S.S. and Hassan, Z., 2016. Safety management practices and safety compliance in small medium enterprises: Mediating role of safety participation. *Asia-Pacific Journal of Business Administration*, 8(3), pp.226–44,
- Sunindijo, R.Y., 2015. Improving safety among small organisations in the construction industry: key barriers and improvement strategies. *Procedia Engineering*, 125, pp.109–16.
- Surienty, L., 2012. Management practices and OSH implementation in SME in Malaysia. In: *Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018)*, Florence, Italy, August 26–30, 2018. Wilkinson, R., Sherratt, F. and Farrell, P., 2015. Knowledge management on site: a case study project. In: *Proceedings of the Institution of Civil Engineers – Management, Procurement and Law*, 168(2), pp.99–109, <https://doi.org/10.1680/mpal.14.00022>.
- Zou, P.X.W. and Zhang, G., 2009. Comparative Study on the Perception of Construction Safety Risks in China and Australia. *Journal of Construction Engineering and Management*, 135(7), pp.620–27. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0000019](https://doi.org/10.1061/(ASCE)CO.1943-7862.0000019).
- Zhou, Z., Goh, Y.M. and Li, Q., 2015. Overview and analysis of safety management studies in the construction. *Safety Science*, 72, pp.337–50, <https://doi.org/10.1016/j.ssci.2014.10.006>.