Original Article

OSHCIM Implementation Readiness from the Perspective of Designers and Contractors in Malaysia Construction Industry

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ABSTRACT: *DOSH Malaysia has developed Guidelines on Occupational Safety and Health in Construction Industry (Management) 2017 (OSHCIM) based on "Prevention through Design" concept, where clients, designers, contractors, competent persons, and other stakeholders shall work together. This study aims to determine the readiness of designers and contractors on OSHCIM implementation. Questionnaires and interviews were adopted to collect individual's perception and to measure on both the designers and contractors' adherence to OSHCIM practices. The results shown that there is a statistically significant difference between the designers and contractors' views on "Prevention through Design". In general, the designers exhibited a lower mean score compared to the contractors, especially in areas related to safety, cost, damages, and flawed design. This evinced that designers seem reluctant to synthesize the OSHCIM concept in their designs. Likewise, the contractor scored 3.45 out of 4, manifested the receptiveness of OSHCIM implementation could improve the coordination between the client and other parties. In contrast, the designers could barely obtained a lower of 3.03. Designers seem to be less convinced compared to the contractor on OSHCIM implementation which could improve the coordination between client, designer, and contractor.*

Keywords: *Contractors, Construction Industry, Designers, OSHCIM, Prevention through Design, Survey*

1.0 INTRODUCTION

The construction industry is considered as one of the most dangerous occupations alarming a high casualty rates in many countries, including Malaysia. The construction industry accounts for 8 per cent of the total workforce in the United States has led to 20% of fatalities. Roughly, it is estimated that there are about 1,100 deaths annually and 170,000 serious injuries annually (CPWR, 2007). Fall is the top leading cause of fatality in construction. The most common situation leads to falls include the process of making connections, walking on beams, and walking close to openings such as floors or windows. Fall protection is required at height of 6 feet above a surface (Lingard, Harley, Pirzadeh, & Wakefield, 2014). The risk factors for falls are slippery surfaces, unexpected vibrations, misalignment, and unexpected loads.

Behm, (2005) reported in Oregon, Washington, and California, claiming on 22% of the 226 injuries occurred from 2000 to 2002 were partly due to construction design. Pretty close to the reported rate in the U.S., 42% of 224 fatalities happened in the construction site between 1990 and 2003 were relate to construction designs. European Foundation reported that 60% of fatal accidents resulted in part from decisions made before site work began. NSW WorkCover (2001) reported that 63% of all fatalities and injuries could be attributed to design decisions or lack of planning (NOHSC, 2001).

According to Driscoll et al (2008), design contributes significantly to work-related serious injury where 37% of workplace fatalities are due to design-related issues (Hale, Walker, Walters, & Bolt, 2012). This proves that design is a risk factor that contributes to fatalities in the construction site. Therefore, the introduction of the concept of prevention through design (PtD) can be beneficial to the construction industry (Torghabeh & Hosseinian, 2012). The terminology used for prevention through design in the US is known as "safe design" in Australia and "design for safety" in the UK. While in Malaysia, it is versed as Occupational Safety and Health in Construction Industry (Management) or OSHCIM. The UK, Australia and Singapore have mandated the practices of PtD through the regulations, however in Malaysia, the Ptd practices or OSHCIM 2017 is yet to be enacted as regulation.

Prevention through Design (PtD) was developed as a proactive method in design processes furthermore to eliminate or to reduce work-related hazards or illness thence to minimize risks associated with construction, manufacturing, maintenance, use, reuse, and disposal of facilities, materials, and equipment (Lingard et al., 2014). PtD in construction is explicitly considering construction and maintenance safety in the design of a project. The PtD concerns about workers' safety and values safe construction and maintenance especially to workers performing tasks at the construction sites.

Design has major leverage where ability to influence key project goals is greatest early in the project schedule during planning and design stage (López, Carlos, Romero, & Gibb, 2012). In situations when safety issues are not discussed during the design phase, building occupants might expose to the risk of injury and when designs are 'unconstructive', it is more dangerous to build as well as to maintain. Therefore, safe design should be integrated with the construction processes at the earliest stages of the project's life cycle. There are countless advantages if safe design is integrated in construction for instance cost-saving, shorter schedule, improves quality, sustainability and certainly create a greater control over safety. The core component of the PtD is similar to the hierarchy of control system which aimed to minimize occupational hazards at the early stages of the design process. PtD concept emphasizes on addressing hazards at the top of the hierarchy of controls (mainly through elimination and substitution) at the early stages of project development (Lu, Li, Zhou, & Deng, 2015). PtD addresses public safety and ethical issues and mainly to forecast safety risks in construction activities or any other design-related matters. The advantages of PtD concept includes reducing site hazards with fewer injuries, aid on workers' compensation and insurance, increases productivity with fewer delays, strengthens designer-contractors' cooperation, reduce absenteeism, improves morale as well as to reduced employee turnover (Gambatese, Behm, & Rajendran, 2008).

The success of a construction project is highly dependent on design inputs provided by the stakeholders such as users, owner, facility management personnel and contractors. Constructability review and feedback should be consolidated and start from the design phase. In short, PtD is an emerging trend in construction safety whereby the application could save life, reduce duration and cost, last but not least protecting the workers. It is the designer's ethical duty to create drawings with good constructability. The objective of this paper is to identify the OSHCIM implementation readiness from perspective of designers and constructors through survey. Although Malaysia has yet to enact OSHCIM 2017 Guideline as a regulation, it is necessary for us to rectify issues promptly ensuring OSHCIM can be implemented in the construction industry.

2.0 METHOD

2.1 Research Objective

The aim of the study is to discover the readiness and tendency from both designers and contractors to implement OSHCIM for the construction industry. The variables of interest were measured using a questionnaire survey and interviews with participants from JKR, inclusive government and special projects in Johor, Penang, Selangor, Terengganu, Sabah, Sarawak, Putrajaya, and Kuala Lumpur. Besides, the research study also provides an analysis of the current industry practices among designers and contractors and recommends OSHCIM implementation enforced by the Department of Occupational Safety and Health.

2.2 Instrument

The study was conducted in Malaysia involving contractors and designers. The research study includes 600 respondents whereby both the designers and the contractors received 300 surveys each. However, 100 surveys are returned by the designers and 106 surveys returned by the contractors for further analysis.

This research mainly adopted both the research tools, the questionnaire-based survey and interviews. There are five sections in the questionnaire. Section A refers to the respondent's demographic profile and background while Section B refers to the respondent's general statements related to' safety and health knowledge. A 4-point Likert scale used 1- Strongly Disagree, 2- Disagree, 3- Agree and 4- Strongly Agree is applied for both Section A and B. Section C refers to Designers and Contractors' Roles and responsibilities on OSHCIM requirements, Section D refers to Management Practices and Section E refers to Training Practices. For Section D and E, the Likert scale measures the frequency of current practices, 1- Never, 2- Seldom, 3- Often and 4- Always practice. During the interview session, selected contractors and designers required to reveal an individual's data from the perspective of safety and health opinions, knowledge, skills and experience related to the implementation of OSHCIM.

The purpose of this interview is to reach a consensus on issues arises as well as implementation efforts for OSHCIM. The survey data collected were analyzed using the Statistical Package for the Social Science (SPSS) software where means and t-test analyses were obtained.

3.0 RESULTS AND DISCUSSION

In total, 100 designers and 106 entrepreneurs from 15 companies returned the surveys for further analysis. The designers and contractors' demographic profile are shown in Table 1. Approximately 30% of designers and 33% of contractors have less than five years of construction experience. However, most designers (34%) and contractors (39%) from these organizations are having more than 25 years of experience in the construction industry. In terms of the work location, majority of the designers work in Sarawak and most of the contractors work in Johor. The highest percentage of the designers are working as an architect (56.7%) and as engineers (18.6%) and none of them working as safety and health officers. Whilst for contractors, 39% of them are working as engineers, 28% are working as project managers and 24.8% are safety and health officers. Most of the designers (56%) and contractors (41%) has a bachelor's degree as their highest academic qualification.

Table 1 Demographic Profile of Respondents

Variable		Designer		Contractor	
		Total (n=99) (%)		Total (n=106) (%)	
Personal Experience	<5 years	30	(30.30)	35	(33.02)
	5-10 years	27	(27.27)	31	(29.25)
	10-15 years	14	(14.14)	18	(16.98)
	15-20 years	6	(6.06)	8	(7.55)
	20-25 years	9	(9.09)	6	(5.66)
	>25 years	13	(13.13)	8	(7.55)
Variable		Designer		Contractor	
		Total (n=100) (%)		Total (n=103) (%)	
Organization Involvement	<5 years	15	(15.00)	16	(15.53)
	5-10 years	12	(12.00)	19	(18.45)
	10-15 years	14	(14.00)	10	(9.71)
	15-20 years	11	(11.00)	6	(5.83)
	20-25 years	14	(14.00)	13	(12.62)

	>25 years	34 (34.00)	39 (37.86)

Variable		Designer	Contractor
		Total (n=90) (%)	Total (n=100) (%)
Location	Johor	15 (16.67)	53 (53.00)
	Melaka	0 (0)	1 (1.00)
	Pulau Pinang	11 (12.22)	14 (14.00)
	Sabah	3 (3.33)	5 (5.00)
	Sarawak	49 (54.44)	14 (14.00)
	Selangor	4 (4.44)	5 (5.00)
	Terengganu	3 (3.33)	5 (5.00)
	W. P. Kuala Lumpur	5 (5.56)	3 (3.00)

Variable		Designer	Contractor
		Total (n=97) (%)	Total (n=105) (%)
Designation	SHO	0 (0)	26 (24.76)
	Engineer	18 (18.56)	41 (39.05)
	Project Manager	2 (2.06)	30 (28.57)
	Architect	55 (56.70)	0 (0.00)
	Director	6 (6.19)	0 (0.00)
	Other	16 (16.49)	8 (7.62)

Variable		Designer	Contractor
		Total (n=99) (%)	Total (n=105) (%)
Highest Academic Qualification	Diploma	7 (7.07)	37 (35.24)
	Bachelor's Degree	56 (56.57)	43 (40.95)
	Master	17 (17.17)	6 (5.71)
	PhD	3 (3.03)	2 (1.90)
	Professional Competency	14 (14.14)	12 (11.43)
	Other	2 (2.02)	5 (4.76)

Variable		Designer	Contractor
		Total (n=89) (%)	Total (n=105) (%)
Social Amenities (Public)	None	25 (28.09)	61 (58.10)
	1-25	53 (59.55)	38 (36.19)
	26-50	8 (8.99)	3 (2.86)
	>50	3 (3.37)	3 (2.86)

Variable		Designer	Contractor
		Total (n=79) (%)	Total (n=105) (%)
Social Amenities (Private)	None	30 (37.97)	69 (65.71)
	1-25	43 (54.43)	29 (27.62)
	26-50	6 (7.59)	6 (5.71)
	>50	0 (0.00)	1 (0.95)

Variable		Designer	Contractor
		Total (n=81) (%)	Total (n=105) (%)
Infrastructure (Public)	None	35 (43.21)	51 (48.57)
	1-25	35 (43.21)	40 (38.10)

	26-50	4 (4.94)	10 (9.52)
	>50	7 (8.64)	4 (3.81)

Variable		Designer	Contractor
		Total (n=77) (%)	Total (n=105) (%)
Infrastructure (Private)	None	44 (57.14)	67 (63.81)
	1-25	26 (33.77)	27 (25.71)
	26-50	2 (2.60)	10 (9.52)
	>50	5 (6.49)	1 (0.95)

Variable		Designer	Contractor
		Total (n=73) (%)	Total (n=105) (%)
Residential (Public)	None	28 (38.36)	61 (58.10)
	1-25	32 (43.84)	32 (30.48)
	26-50	4 (5.48)	8 (7.62)
	>50	9 (12.33)	4 (3.81)

Variable		Designer	Contractor
		Total (n=91) (%)	Total (n=105) (%)
Residential (Private)	None	11 (12.09)	34 (32.28)
	1-25	54 (59.34)	54 (51.43)
	26-50	7 (7.69)	11 (10.48)
	>50	19 (20.88)	6 (5.71)

Variable		Designer	Contractor
		Total (n=73) (%)	Total (n=105) (%)
Non-residential (Public)	None	25 (34.25)	62 (59.05)
	1-25	37 (50.68)	34 (32.28)
	26-50	3 (4.11)	5 (4.76)
	>50	8 (10.96)	4 (3.81)

Variable		Designer	Contractor
		Total (n=89) (%)	Total (n=105) (%)
Non-residential (Private)	None	13 (14.61)	43 (40.95)
	1-25	56 (62.92)	48 (45.71)
	26-50	8 (8.99)	10 (9.52)
	>50	12 (13.48)	4 (3.81)

3.1 General Statements Related to Respondents' Safety and Health Knowledge

Table 2 shows the mean result according to the Likert scale as mentioned, 1 indicate as (Strongly disagree) and 4 indicate as (Strongly agree) to measure on designers and contractors' knowledge of safety and health. There were 8 out of 11 questions that showed a statistically significant difference with a p-value less than 0.05 between designers and contractors. This mean result exhibit on contractor's tendency to agree upon the distributed questionnaires compared to designers. Based on the survey result, we can vouch on that contractors are fully aware that safety and health is a critical criterion in construction. Referring to question number 7, the contractors achieved a mean score of (3.48) much higher than designers (3.05). There is a statistical difference between the two. Significantly, contractors stance with a positive assurance and firmly believes the OSHIM implementation could bring advantages for the project compared to the designers.

As for question one, three and five, both the designer and contractors achieved a mean score without reflecting any significant difference ($p < 0.05$). By all means, both the designer and contractor assured that zero accident is achievable. Proper planning on safety and health should start early in order to avoid non-compliance to safety and health regulation. Violators will be subject to legal action.

3.2 Management practices of respondents toward OSHCIM 2017 Guideline

Contractors acceded that they are responsible for protecting employees' safety and health, the mean score achieved (3.3905) compared with the mean score attained from the designers (2.8586) steering significant difference of ($p < 0.05$). In confronting the inference, it is clear that the designers had a variance of opinions from the contractors to hold accountable for workers' safety and health. However, the safety and health of workers should be one of the factors that the designers should take into consideration. Designers should understand that design could influence or even cause an impact on workers' safety. Thus, the designer should realize the accountability held during the design phase and gain a better understanding of the importance of workers' safety and health.

3.3 Training Practices of Respondents toward OSHCIM 2017 Guideline

Contractor and designer shown a significant differences in mean scoring ($p < 0.05$) for question number two and three. As reported, (3.217) contractors had attended construction safety training while (2.8774) attended a specific course of updating client's record on safety and health. Similarly for designers scores at (2.83 and 2.1224) respectively. Based on the result, it explicates that the designers were inadequately trained on safety and health discipline to compare to contractors. Therefore, designers should elevate trainings or join specific courses related to safety and health in construction. As for question number one, there are no statistically significant differences in the mean score of ($p < 0.05$) among the designers (3.2) and contractor (3.16). This result indicated that both have adequate knowledge of legal requirements, theories, technical and practical discipline of construction projects.

This study revealed on the readiness and adherence to OSHCIM implementation differ between designers and contractors. In the implementation of OSHCIM, designers and architects are less preferred than contractors. Contractors believes that the OSHCIM implementation can benefit the construction project by outweigh the project costs. The researcher may conclude that the contractor has gained a deeper understanding from the architect in construction processes and operation, worker safety, handling constructability issues and in identifying hazards and safety risks at construction sites. The study also found that designers had limited knowledge of construction safety compared to the contractors. DOSH should therefore be attentive to raise awareness of the implementation of OSHCIM through seminars or professional short courses to designers.

Table 2 OSCHIM Readiness between Designers and Contractors

Questions	Mean		T-test	p-value
	Designer	Contractor		
General Statements				
I agree that: (1 = Strongly Disagree and 4 = Strongly Agree**)**				
1. ..zero accident is achievable.	3.16	3.2642	1.046	0.297
2. ..accident/incident would damage my company reputation…	3.53	3.7358	2.646	0.009
3. ..proper planning on safety and health should start early…	3.55	3.6509	1.372	0.172
4. my company become a preferred designer/contractor…	3.14	3.4811	3.715	0
5. non-compliance to safety and health regulation will be subjected to legal action…	3.43	3.4528	0.274	0.784
6. a bigger penalty will encourage to design-out the hazard…	2.8	3.3774	6.072	0
7. safety and health is a critical criterion…	3.05	3.4762	4.83	0

8. I aware that OSHCIM requirement will improve the coordination…	3.03	3.4528	5.729	0
9. OSHCIM will not increase the operational cost…	2.43	2.8491	3.854	0
10. the implementation of OSHCIM can be applied by using the existing manpower.	2.68	3.0571	4.113	0
11. OSHCIM should be implemented in all size of construction projects.	3	3.3238	3.5	0.001
Management Practices (1 = Never and 4 =Always**)**				
1. I design code of conduct, ethics and policy to address the requirement on safety and health.	2.899	3.1143	1.546	0.124
2. I know that I am responsible towards workers safety and health…	2.8586	3.3905	4.544	0
Training Practices (1 = Never and 4 =Always**)**				
1. I have adequate knowledge on legal requirements...	3.2	3.1604	0.383	0.702
2. I attend a formal construction safety and training…	2.83	3.217	3.258	0.001
3. I attend specific course to enable me to update SHF for Client…	2.1224	2.8774	5.839	0

4.0 CONCLUSIONS AND RECOMMENDATION

This study revealed that readiness and adherence to OSHCIM implementation differ between designers and contractors. In the implementation of OSHCIM, designers and architects are less preferred than contractors. Contractors believes that the OSHCIM implementation can benefit the construction project by outweigh the project costs. The researcher may conclude that the contractor has gained a deeper understanding from the architect in the discipline of construction processes and operation, worker safety, handling constructability issues and in identifying hazards and safety risks at construction sites. The study also found that designers had limited knowledge of construction safety compared to contractors. DOSH should therefore be attentive to raise awareness of the implementation of OSHCIM through seminars or professional short courses to designers.

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