OSHCIM: A STUDY ON MALAYSIAN OSH REGULATORY CAPABILITIES READINESS IN THE DESIGN PHASE

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Continuous accidents and fatalities in construction projects have increased scholarly interest in addressing safety and health during the design phase. In Malaysia, the introduction of the Occupational Safety and Health in the Construction Industry (Management) (OSHCIM) in 2017 as a legislative framework to enhance Prevention through Design (PtD) practices has recently gained attention. This study aims to evaluate the regulatory capabilities of Malaysia concerning OSHCIM requirements and stakeholders' readiness. A mixed-method approach was employed, surveying 91 purposively sampled enforcers. The findings indicate that the regulator requires further clarification on OSHCIM requirements and additional information and guidance, particularly during the conceptual and design stage involving clients and designers. The Department of Occupational Safety and Health (DOSH) should organise seminars or short professional courses to support and raise awareness among enforcers. These study findings offer valuable insights for regulatory bodies, helping them understand the readiness of enforcers and address safety and health concerns throughout the project lifecycle.

Keywords: Prevention through Design, OSHCIM, enforcement, safety, Malaysia

INTRODUCTION

The construction industry in Malaysia is marked by hazardous work-related incidents and accidents, causing concern among all parties, particularly industrial players in a developing nation. Accidents and fatalities in the construction industry can be controlled or reduced through proactive measures taken by all stakeholders, especially clients, designers, and contractors within the construction supply chain. Government agencies such as the Department of Occupational Safety and Health (DOSH) and the Construction Industry Development Board (CIDB) have made significant efforts to ensure safety and health in this sector through enforcement, training, policy setting, and other initiatives. In addition to these efforts, introducing new regulations and guidelines is crucial to improving the construction industry's current safety and health practices and creating a safe and healthy environment. The willingness and

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collaboration of all stakeholders are necessary to effectively manage workplace risks and reduce the occurrence of accidents and fatalities in this sector.

The Role of Occupational Safety and Health (OSH) Legislation and Designers' Responsibilities

Governments worldwide have introduced OSH legislation, including requirements for designers to incorporate safety and health measures into construction projects (Behm 2005). The European Framework Directive 92/57/EEC, known as the EU Design for Safety law and similar regulations in Singapore, Australia and other countries have played a crucial role in promoting safety in the construction industry (Martínez-Aires, Rubio Gámez, and Gibb 2016). However, the capabilities of regulatory authorities in Malaysia and other Asian nations need to be assessed to ensure effective compliance (Sha 2004). Understanding the enforcement capabilities of these authorities is essential to promoting safety and health in the construction industry.

Regulatory bodies like the Department of Occupational Safety and Health (DOSH) and the Construction Industry Development Board (CIDB), play a crucial role in overseeing and enforcing safety and health regulations in the construction industry. In Malaysia, it is important to assess the capabilities of these authorities due to the unique challenges and characteristics of the construction industry. Enhancing their capabilities can strengthen the enforcement of safety and health regulations and foster a safer working environment for construction workers and the public (Suresh *et al.,* 2017). The capabilities of regulatory authorities are crucial in setting standards, monitoring compliance, providing guidance, and taking enforcement actions to prioritize safety and health measures. Further exploration is needed to understand their capabilities and ensure effective compliance.

Implementation of OSHCIM Guideline and Regulatory Capabilities

To enhance safety issues in the construction industry, DOSH introduced the Occupational Safety and Health in Construction in Management (OSHCIM) guideline in February 2017, which applies specifically to the construction industry (DOSH, 2017). These guidelines, adapted from the CDM 2015 Regulations, aim to promote shared responsibility among all stakeholders involved in construction projects. However, as OSHCIM is relatively new and considering the diverse regulatory landscape in Malaysia. DOSH with its multidisciplinary composition representation in all states of Malaysia, it becomes crucial to understand the capabilities of regulatory authorities to ensure the effective implementation of OSHCIM by all stakeholders. It is worth noting that the multidisciplinary composition of DOSH allows for a comprehensive evaluation of safety practices and compliance. By collaborating with professionals from other agencies or departments, DOSH can effectively address specific issues, leverage external expertise when necessary, and ensure consistent and proactive enforcement efforts.

Promoting Practical Implementation of Design for Safety (DfS)

Previous studies have focused on Design for Safety (DfS) and its incorporation into construction projects. While much of the literature has concentrated on the concept, techniques, and utilisation of DfS in construction, there is a significant body of research on how DfS can be practically implemented. Most of the past research has examined DfS knowledge, attitude, practices, and the capabilities of designers and organisations in the construction industry (Patrick Manu *et al.,* 2018). Despite the awareness of DfS, there is a need for its more practical implementation. All

stakeholders must work together to encourage design professionals to use DfS effectively, providing necessary support for its execution. While most engineers prefer Prevention through Design (PtD), the practical implementation of DfS is still evolving (Abueisheh *et al.*, 2020). Although design professionals generally have positive attitudes towards DfS and are familiar with its principles, they tend to apply it sparingly (Che *et al.*, 2020; Sharar *et al.*, 2022). Similar concerns regarding DfS implementation have been identified in Palestine (Abueisheh *et al.*, 2020). Even in developed countries like New Zealand, design professionals still need help in implementing DfS effectively (Guo *et al.*, 2021).

Various factors can influence the adoption of the DfS concept in the construction industry, as highlighted by Abueisheh *et al. (*2020) and Poghosyan *et al. (*2018). These factors include designer attitudes and acceptance of the concept, designer knowledge and education, DfS legislation, client influence, and the availability of DfS tools. The failure to prioritise safety and health has resulted in numerous incidents causing fatalities, severe injuries, and property damage. According to DOSH data (Official DOSH Website 2023) in 2021, the construction industry reported a fatality rate of approximately 6.3 per 100,000 workers, resulting in 73 deaths. These figures accounted for 24% of the total fatalities across all industries in Malaysia, which amounted to 301 fatalities.

The responsibility for managing safety and health in the construction industry extends beyond contractors and should involve clients, designers, and regulators. However, existing studies have primarily focused on the roles of clients, designers, and contractors, neglecting the critical role of regulators. The governments are responsible for implementing new rules and regulations, requiring significant effort in drafting, enacting, and enforcing them to meet evolving standards (Fungsi - CIDB HQ n.d.; Official DOSH Website 2023). Regulators in the construction industry play a crucial role in overseeing and enforcing legislation, conducting inspections and audits, addressing violations, providing guidance and education, and promoting safety. While various standards and codes of practice exist, it is essential to regularly assess the capabilities of regulatory authorities to ensure their effectiveness in promoting compliance and fostering a safe working environment. By addressing regulators' challenges, stakeholders can collaborate to enhance safety practices, achieve compliance, and establish a culture of safety and health.

The Critical Role of the Regulator

Regulatory bodies play a vital role in enforcing compliance in the construction industry, including prevention through design (PtD), in the construction industry. They conduct inspections, audits, and other enforcement activities to ensure adherence to safety regulations throughout the design and construction process (Che Ibrahim and Belayutham, 2020). This paper provides insights into the factors influencing construction site safety, although it does not directly focus on regulatory capabilities. The involvement of regulatory bodies contributes to the enforcement and promotion of safety in construction.

All stakeholders must effectively comply with safety requirements, and regulatory bodies must provide guidance, training, and support to designers, contractors, and other involved parties. Moreover, regulatory bodies may collaborate with industry groups, professional organisations, and other stakeholders to establish safety best practices and standards for construction design (Abueisheh *et al.*, 2020).

Further research is needed to understand the impact of regulatory bodies on the project life cycle, regarding PtD implementation. Regulatory bodies play a critical role in ensuring compliance with safety regulations, and their increased oversight and enforcement in PtD implementation is essential (Aksorn and Hadikusumo, 2008). Enforcers act as regulatory bodies, which are crucial in managing safety risks in construction projects and require the necessary resources and skills for effective compliance. This study highlights the role of enforcers possessing competency, a sound strategy, corporate experience, an intelligent and reliable system, suitable infrastructure and information structure, and fostering good collaboration with other agencies (Manu *et al.,* 2019). Law enforcement of safety regulations and promoting best practices in construction design by regulatory bodies can contribute to a safer working environment (Aksorn and Hadikusumo, 2008).

METHOD

This study employed a mixed-methods approach, combining quantitative data from questionnaires and qualitative data from semi-structured interviews to assess the readiness and capability of Malaysian enforcement officers in enforcing OSHCIM. Using mixed methods allows for a comprehensive understanding and enhances the credibility of the findings by incorporating multiple data sources (Jogulu and Pansiri 2011)

An analytical framework based on previous research, guidelines, and standards was employed to identify critical factors. The study incorporated the six categories identified by Patrick Manu *et al. (*2019), namely competence, strategy, corporate experience, systems, information and infrastructure, and collaboration. Additionally, factors from Aksorn and Hadikusumo (2008) study, such as worker involvement, safety prevention and control systems, safety arrangements, and management commitment, were considered. These factors align with the requirements of ISO 45001:2015, which emphasises continuous improvement through the Plan-Do-Check-Act cycle. The development of survey questions was guided by the OSHCIM guidelines to ensure their relevance to the local context. The study aims to identify areas for enhancing the implementation of OSHCIM in the construction industry by the regulatory body.

Instrument

This study utilised a combination of 91 questionnaires and in-depth interviews with participants selected through purposive sampling. The participants were required to have at least five years of experience with an engineering degree and be involved in either the design or construction phase.

Expert interviews were conducted to validate the constructed questionnaire for the Regulatory Capabilities Questionnaires. The researcher successfully interviewed five experts, each with over 20 years of experience in service. Four of them held the position of Deputy Director in charge of Construction Safety, while one was the Director of Construction Safety at DOSH Headquarters, responsible for formulating construction safety policies for the country. All the experts had extensive experience in enforcing construction safety regulations. The interviews lasted between 40 and 60 minutes, ensuring comprehensive insights.

Based on the feedback obtained from the expert interviews, the initial questionnaire was modified. Additional relevant elements were incorporated, such as the prosecution procedure, the issuance of fines, and other punitive actions. The

importance of collaboration with other agencies was also emphasised, focusing on addressing this issue at the highest management level. Elements that were not applicable to the context of the Malaysian construction industry, such as additional remuneration for high-risk activities, were eliminated. The objective was to ensure that respondents could easily comprehend the survey questions and provide valuable data.

The questionnaire included elements derived from the recommendations outlined in OSHCIM 2017, covering various aspects of the construction life cycle. It was divided into three sections. The first part (SECTION A) gathered background information about the participants' experience levels. The second part (SECTION B) assessed the attributes related to DfS for Regulatory Body Capability. The third section (SECTION C) allowed participants to provide comments and suggestions.

During the interviews, selected enforcement officers were expected to share their perspectives, knowledge, abilities, and practices related to safety and health, specifically in implementing OSHCIM throughout the construction project life cycle. The interviews aimed to evaluate the regulatory body's capabilities in implementing OSHCIM effectively.

The Relative Importance of Factors

Respondents were requested to express their opinions on the importance of a list consisting of 6 main attributes and 28 sub-attributes related to the regulatory body's capabilities. They assigned scores ranging from 1 to 5, with '1' indicating unimportance and '5' being very important. The importance of each factor was determined by applying a scoring formula (Kometa, Olomolaiye, and Harris 1994). Subsequently, Equation (1) converted the scores into importance indices.

$$\text{Relative importance index (RII)} = \frac{\sum W}{A \times N} \qquad \text{Eq (1)}$$

W is representing the weighting assigned to each factor by respondents, with weights ranging from 1 to 5. In this study, the highest weight (A) was assigned a value of 5. N represents the total number of samples. The resulting relative importance index (RII) is then calculated and normalised within the range of 0 to 1.

Table 1 displays the RII for each factor that affects regulatory body capabilities, as reported by the respondents.

The survey was distributed during the workshop held across Malaysia. None of the participants was incentivised to participate; everyone who participated did so voluntarily. The University’s ethical principles and standards assured that their response would be confidential.

FINDINGS

According to the survey, 91 out of 100 distributed forms were returned, representing personnel from 15 states of Malaysia. Around 61% of the regulators had between 5 and 10 years of experience in the construction industry, with all of them holding an engineering degree. Only 6% had a Masters degree, and 1% held a PhD. Most of the regulators were based in Central Malaysia.

Table 1 displays the mean results based on the Likert scale, where 1 indicates "not important", and 5 indicates "very important," measuring the regulatory body's capabilities in implementing OSHCIM. The sub-attributes are arranged in descending order according to the RII rank, as shown in Table 1.

Table 1: RII of factors affecting Regulatory Capabilities Body for the construction life cycle.

Ranking	Main Attributes	Sub Attributes	Existing Ranking	Very Important %	RII
1	Competency	Understanding the OSHCI(M) Knowledge requirement	1	75.82	0.94
2		…. identifying the critical elements for the roles of Stakeholders	2	70.33	0.92
3		OSHCI(M) continual improvement and training for the regulator	4	62.64	0.90
4		OSHCI(M) or similar experience of auditing, inspection on the stakeholders	3	61.54	0.89
5		Regulator reference and seeking advice from supervisor or an expert panel.	5	61.54	0.89
6		Selection and position of the appropriate personnel for enforcement.	6	57.14	0.87
7		Experience conducting any punitive action activities	7	51.65	0.85
8	**Corporate Experience**	Fund and allocation budget	9	61.54	0.90
9		System recognition from internal and external	8	57.14	0.89
10	SYSTEM	The procedure of enforcement (IP preparation, issuance of notices etc.)	24	64.84	0.93
11		Performance monitoring and measurement	26	61.54	0.90
12		Internal and external audit	25	60.44	0.89
13		Accident and incident investigation and reporting	28	61.54	0.88
14		Worker's participation.	27	53.85	0.87
15	Strategy	Top management commitment to OSHCI(M)	19	68.13	0.92
16		Safety at workplace	20	63.74	0.91
17		Organising, planning, managing, and monitoring	17	60.44	0.90
18		Understanding the requirement of the Regulator policy with OSHCI(M).	18	60.44	0.89
19		Public safety	21	63.74	0.89
20		Promoting and awareness program	22	54.95	0.88
21		Research and innovation	23	47.25	0.86
22	**Collaboration**	Intra-collaboration	10	56.04	0.87
23		Inter-collaboration	12	52.75	0.86
24	**Infra and Info**	ICT resources (software, gadgets (tablets, laptops, pc), etc.)	13	57.14	0.89
25		Workplace (workspace, workstation, telephone)	14	54.95	0.88
26		Accessing to any references, information and data related to OSHCI(M)	12	53.85	0.86
27		Technologies (BIM, drone, camera, smart tools, artificial intelligence etc.)	16	53.85	0.84
28		Official vehicle	15	46.15	0.81

The mean results align with the findings from the distributed surveys, indicating that the enforcers fully understand the importance of safety and health in the construction industry. This understanding demonstrates positive assurance that OSHCIM implementation can bring long-term advantages to construction projects, as supported by Hwang, Zhao, and Toh (2014).

The study's findings are consistent with the research conducted by Behm, Culvenor, and Dixon (2014), which emphasises the importance of competence as the most crucial attribute for regulatory capability, followed by corporate experience, system, and collaboration. Prioritising the prominent and sub-attributes according to the RII for enhancing regulatory capability in OSH enforcement aligns with previous research, apart from corporate experience and system. All the listed attributes received a score of over 50% in the "very important" category.

The finding that the sub-attribute of research and innovation received a score of only 47.25% for "very important" under the main attribute of strategy suggests that enforcers need to develop a greater appreciation for the value of research and its potential long-term benefits for their organisation (Tashakkori *et al.*, 1998; Jogulu and Pansiri, 2011). Regarding this sub-attribute, it is noteworthy that enforcers mentioned during the interviews that they work under a very tight budget, which significantly limits their ability to invest in research and innovation (Manu, Poghosyan, Mahamadu *et al.*, 2019). This financial constraint implies that their role primarily involves on-site physical activities, and they may not perceive the relevance of research as part of their day-to-day work culture. This finding shed light on the challenges enforcers face in prioritising research and appreciating its potential long-term benefits for their organisations.

Another good finding was that enforcers' preference for using their personal vehicles due to claim issues, additional allowances, and greater control, despite the provision of official vehicles with a score of 46.15%, along with limited availability and poor maintenance of such official vehicles, underscores their practical considerations and preferences in transportation during enforcement activities for the "Infrastructure and infostructure" attribute (Manu, Poghosyan, Mahamadu, *et al.*, 2019). This insight highlights enforcers' practical considerations and preferences regarding transportation during their enforcement activities.

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Based on extensive interviews, enforcers concur that accidents in construction projects often arise from a lack of safety considerations in the initial phases, supporting the findings of Mohd *et al. (*2020) and Behm and Culvenor (2011). However, there is a need to enhance the understanding of safe design concepts among supporting staff compared to the management level. Enforcers are still exploring the benefits of OSHCIM in monitoring, assessing, and enforcing safety regulations to improve overall performance. It is crucial to grasp the requirements of OSHCIM, particularly the client-designer-contractor relationship, for successful implementation in Malaysia. Additionally, enforcers need to learn from accidents and understand the impact of design on incidents. Supporting staff, who mainly interact with contractors, would benefit from more training on safe design in the pre-construction phase to broaden their applied knowledge beyond day-to-day construction activities.

These results highlight the significance of regulatory competence, corporate experience, effective systems, and collaboration in enhancing regulatory capability in OSH enforcement (Behm, Culvenor, and Dixon, 2014). Therefore, it is recommended that DOSH conduct a comprehensive education program to promote these ideas and improve the overall understanding and implementation of OSHCIM.
As for enforcers, they are more accustomed to enforcing during the construction phase, which means they usually only meet with the contractors. In OHSCIM, the most influential stage to reduce accidents is the design stage, suggesting they need to explore starting to meet and learn about the designer's roles and duties to clients and the new organisation that will focus on similar aspects as the designer. Most of them agreed that they also do not know how to enforce OSHCIM effectively since industry players mostly do not understand the PtD concept (Aksorn and Hadikusumo, 2008).

These results underscore the significance of regulatory competence, corporate experience, effective systems, and collaboration in enhancing regulatory capability in OSH enforcement (Manu, Poghosyan, Mahamadu *et al.*, 2019). Thus, DOSH should conduct a vast education program to promote these ideas (Aksorn and Hadikusumo, 2008).

CONCLUSIONS

The study findings suggest that enforcers understand construction processes and operations, worker safety, constructability issues, and hazard identification at construction sites, regardless of their engineering education level. However, the study also revealed that some enforcers needed knowledge of construction safety, particularly during the conceptual and design stage. Furthermore, clients and designers are new areas of enforcement that require attention, as they are still determining the OSHCIM requirements they must comply with. To address these issues, DOSH should focus on raising awareness of OSHCIM implementation among enforcers and provide them with seminars or short professional courses. Additionally, examining successful case studies from other countries can serve as a guide for achieving quick wins.

It is essential to acknowledge the need for specificity in addressing the unique characteristics of the Malaysian construction sector context. By delving into this

specificity, future research can further explore the country's effectiveness of regulatory measures and enforcement practices. Additionally, to enhance the understanding of regulatory capabilities and their impact on safety and health in the construction industry, it is recommended that comparative studies with different geographical locations, especially in Asian regions, should be conducted to capture the similarities and differences of the regulator's DfS capabilities. Such a comparative analysis would provide valuable insights into the similarities and differences in regulatory approaches and their outcomes, allowing for identifying best practices and areas for improvement. This would contribute to the advancement of regulatory frameworks and promote the adoption of effective strategies to ensure safety and health in construction projects across various contexts in the region.

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