Original Article

Occupational Safety and Health Across Small and Medium Sized Enterprises: Investigation of Risk Management Practices in Malaysia

Marziana Madah Marzuki,[a,*] Wan Zurina Nik Abdul Majid,[a] Hatinah Abu Bakar,[b] Mohamad Rahimi Mohamad Rosman,[c] Khalid Abdul Wahid,[c] Mohd Zafian Mohd Zawawi[c]

[a] Faculty of Accountancy, Universiti Teknologi MARA, Cawangan Kelantan Kampus Machang, Malaysia.
[b] Faculty of Business Management, Universiti Teknologi MARA, Cawangan Kelantan Kampus Machang, Malaysia.
[c] Faculty of Information Management, Universiti Teknologi MARA, Cawangan Kelantan Kampus Machang, Malaysia.

*Corresponding author: marzianamadah@uitm.edu.my

Article history

Received 11/3/2022
Accepted (Panel 1) 21/3/2022
Accepted (Panel 2) 15/5/2023

ABSTRACT: *Using quantitative and qualitative methods, this study explored the implementation and effectiveness of the Occupational Safety and Health (OSH) risk management system and the effectiveness of the Malaysian OSH regulations in reducing occupational accidents and injuries. The participating Malaysian small and medium sized enterprises (SMEs) in this study reported that implementing OSH risk management systems have minimized occupational accidents and injuries. Nevertheless, several firms managed OSH using manual rather than electronic software or system. The existing OSH-related system was also perceived as less effective, unhelpful, and inconvenient. The obtained results also highlighted the need for subsequent improvement in the regulations of OSH concerning employee enforcement and discipline. This study further revealed new technology as an essential predictor of effective risk management system implementation. The obtained findings of this study may benefit regulators and SMEs in their efforts to improve OSH regulations and the risk management system enforcement.*

Keywords: *Awareness, Occupational Safety and Health, Regulations, Risk Management, Small and Medium Sized Enterprises*

1.0 INTRODUCTION

There has been a dramatic surge in research concerning the effectiveness of Occupational Safety and Health (OSH) risk management system implementation, regulations, and legislation. For example, the ineffectiveness of the risk management system was reflected in the 2008 financial crisis reports and the more recent coronavirus disease 2019 (COVID-19) pandemic in 2020 (Polinkevych et al., 2021). Specifically, it was reported that the weaknesses of practiced risk management were

attributed to technical issues and the lack of attention given to the critical situations that affected organizations. Furthermore, top management lacks decision-making involvement concerning risks was revealed (Settembre-Blundo et al., 2021). Thus, the lack of involvement illustrates a lack of convergence between the risk management system and corporate strategy. Top management delegated all risk assessment and mitigation strategies to area-specific technical experts. Ramos et al. (2020) emphasized that the knowledge and effectiveness of OSH standards among small and medium sized enterprises (SMEs) remains to be seen in a case study involving a solid waste treatment company in Portugal. It was subsequently found that although occupational accident records improved with the help of an integrated management system (IM), the organization still failed to encourage greater employee involvement in intended risk management activities. Thus, the organization failed to recognize its importance, although proper risk management systems were in place.

Furthermore, the risk management processes in the United Arab Emirates (UAE) and China revealed the centrality of organizational culture (Kim & Jung, 2019; Vijayan & Sharma, 2020). Specifically, organizational commitment to risk management processes influences the relationship between organizational culture and risk perception (Kim & Jung, 2019). An analysis of the relationship among international normative values, legal documents, and OSH risk management identified several shortcomings: (1) uncertainty regarding risk management goals, (2) complexity of appropriate procedural performance and inadequate substantiation, and (3) inadequate approaches to optimal risk management due to limited resource business capacities, particularly financial resources. Thus, the study recommended a direct optimization strategy that can minimize the risk event probability at the assigned constraint for the total costs of the OSH (Bochkovskyi & Gogunskii, 2018). Reverse problems focus on reducing the average costs of preventing and eliminating risks and consequences.

Despite the pervasiveness of these studies, OSH risk management system regulations and the implementation and effectiveness of OSH risk management systems among Malaysian SMEs are still not clear. Examining these issues remains prevalent, as Malaysian SMEs contribute 99% of business establishments and 36% of Malaysia's Gross Domestic Product (GDP). Malaysian SMEs face insurmountable challenges. One of the hurdles SMEs face is monitoring compliance with OSH requirements, given limited capital or financial support. Another difficulty is increased workplace accident rates, which may affect employee health, safety, and business goodwill. By mitigating OSH-related issues, employee involvement and appropriate penalties are critical predictors of low death rates, accidents, and lost workdays (Surienty, 2019).

The recorded Department of Occupational Safety and Health (DOSH) accident statistics demonstrated that occupational accidents and injuries in Malaysia soared over the years, a constant rise in cases from the rate of 2.81 per 1,000 employees in 2015 to 2.93 per 1,000 employees in 2017. Similarly, an increase in fatality rate was recorded, with a rate of 4.84 per 100,000 employees in 2015 to 4.90 per 100,000 employees in 2017. Referring to Table 1, the manufacturing sector in Malaysia recorded the highest occupational accident statistics. Even though the statistic specific to SME-related occupational safety and health is still unavailable, according to Hong et al. (2011), 80 percent of workplace accidents involved SMEs.

Table 1 Occupational Accident Statistics by Sector in Malaysia until April 2021

Sector	Non-Permanent Disability (NPD)	Permanent Disability (PD)	Deaths	Total
Hotels and restaurants	50	1	0	51
Utilities (electricity, gas, water, and sanitary services)	68	0	3	71
Finance, insurance, real estate, and business services	121	5	4	130
Construction	56	5	25	86
Transport, storage, and communication	106	0	3	109
Manufacturing	1604	77	20	1701
Wholesale and retail trades	81	1	0	82
Public services and statutory authorities	29	0	0	29
Mining and quarrying	15	1	2	18
Agriculture, forestry, and fishery	342	5	1	348

Therefore, the present study explored the implementation and effectiveness of the OSH risk management system and Malaysian OSH regulations in reducing occupational accidents and injuries in SMEs.

2.0 LITERATURE REVIEW

2.1 Malaysian OSH Risk Management Regulations and Enforcement

Malaysia has made progressive efforts to enforce laws and regulations for employers and employees. DOSH, regulated by the Malaysian Ministry of Human Resources, is responsible for OSH in Malaysia. DOSH is an OSH standard setter, legislation enforcer, and OSH-related promotional activity coordinator. DOSH ensures employees' safety, health, and welfare and protects individuals from safety and health hazards across various sectors: (1) manufacturing; (2) mining and quarrying; (3) construction; (4) hotels and restaurants; (5) agriculture, forestry, and fishing; (6) transport, storage, and communication; (7) public services and statutory authorities; (8) utilities (gas, electricity, water, and sanitary services); (9) finance, insurance, real estate, and business services; (10) wholesale and retail trades. By administering and enforcing OSH-related legislation, the DOSH creates a safe and healthy work culture that can enhance employees' workplace quality.

The DOSH enacted several acts, including the Factories and Machineries Act of 1967 (FMA 1967), the Occupational Safety and Health Act of 1994 (OSHA 1994), and the Petroleum Safety Measures Act of 1984. The FMA 1967 accords the privilege to factories to control individuals' safety, health, and welfare; therefore, the registration and inspection of machinery and matters connected in addition to that. The most comprehensive act, OSHA 1994, covers nearly all sectors, excluding employees working on board ships and the armed forces. The OSHA 1994 covers approximately 90% of the Malaysian workforce.

Malaysian statutory bodies or companies directly related to OSH, the National Institute of Occupational Safety and Health (NIOSH), and the Social Security Organization (SOCSO) are under the Ministry of Human Resources' purview. It should be noted that NIOSH and DOSH play different roles. Although the DOSH plays a more significant role in enforcement, it is instrumental in ministry-sanctioned training skills. The national workforce can obtain necessary skills training through the

NIOSH by focusing on the Ministry of Human Resources. Skilled workers comprised only 28% of the workforce as of 2019, and the government targeted at least 35% of the national skilled workforce by the end of 2021 (The Star, 2020).

The SOCSO was established to administer, implement, and enforce the Employees' Social Security Act of 1969 and the Employees' Social Security (General) Regulations of 1971. The SOCSO status was changed to a Statutory Body on July 1, 1985. SOCSO provides employees social security protection for their dependents through (1) the Employment Injury Scheme and (2) the Invalidity Scheme. The Employment Injury Scheme protects employees from occupational injuries, including occupational and commuting accidents. The Invalidity Scheme provides employees with 24-hour protection against (1) invalidity, (2) deaths due to any cause outside working hours, and (3) non-occupation-related incidents. Both schemes provide employees with medical treatment, physical rehabilitation, vocational training, and cash benefits in the event of unforeseen circumstances. SOCSO also conducts accident prevention activities by implementing OSH awareness programs for employers and employees. Fig. 1 summarizes the OSH-related laws and regulations in Malaysia.

Meanwhile, the Labor Department was established in 1912 and is one of the 12 departments and agencies under the jurisdiction of the Ministry of Human Resources. Before the 1960s, the department's objective was to protect the interests of workers in the plantation and mining sectors. In 1970, the Labor Department merged with the Department of Industrial Relations. The coalition focused on resolving disputes involving workers and unions. The restructuring of labor institutions continues to be made to realize their functions and responsibilities more effectively. Among the changes made was separating the Department of Labor from the Department of Industrial Relations (JPP) and further outlining their duties and functions. The Labor Department is responsible for preserving the welfare and interests of workers by creating harmony between employers and workers.

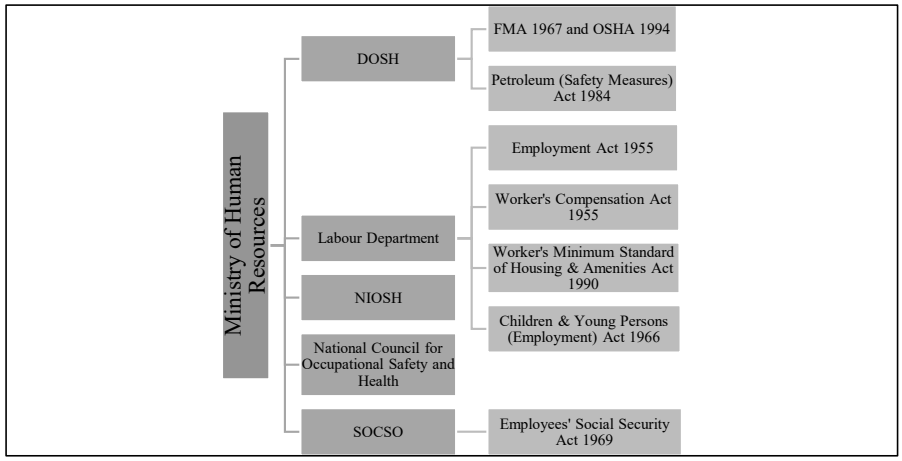

Figure 1 OSH-related Laws and Regulations in Malaysia (Source: Yusoff, 2014)

Malaysian Hazard Identification, Risk Assessment, and Risk Control (HIRARC) were introduced in 2008 as part of the OSH management system. HIRARC is generally known as a risk management system that prevents accidents. Implementing existing measures and methods can prevent or eliminate occupational injuries and accidents. In recent years, HIRARC has become central to essential planning, management, and business operation practices.

HIRARC is extremely important for identifying, analyzing, and assessing hazardous organizational risks. Once the hazards and risks are identified, analyzed, and evaluated, suitable control measures are proposed for implementation. Consequently, Malaysian organizations can proactively monitor, manage, and generate consciousness of the risks associated with organizational strategic objectives. Accordingly, risk monitoring indicates the importance of evolution and permanent

measurement of organizational risk severity. However, risk severity maintains an overall risk profile that aligns with organizational strategic objectives (Van Staveren, 2009). Meanwhile, risk management reveals the centrality of organizations, organizational processes, and the potential upsides and downsides of organizational risks. By focusing on risk management, the impact of alternatives on future organizational performance can be detected early (Hopkin, 2002).

2.2 Occupational Safety and Health Risk Management Practices

Accordingly, risk management is typically understood as the proactive means of contending potential risks rather than being responsive (Taofeeq & Adeleke, 2019). As Section 15 of the OSHA 1994 stipulated, the primary safety and health provision obligations are placed on the employers defined as the "principal employer" or "immediate employer" of an organization. Risk management and risk assessment plans are the cardinal principles of the self-regulatory philosophy in the context of management aspects (*Plan, Do, Check, and Act*) (Ab. Rahman, 2015). According to Wanberg et al. (2013), a project with poor-quality performance is usually linked to a higher likelihood of injury. Therefore, an increase in OSH practices is expected to improve safety performance in the workplace (Hinze, 2013). Thus, organizations must adopt a holistic strategy to improve the physical environment, conduct safety risk assessments, and elevate employees' knowledge.

Prior studies highlighted the contribution of adopting safety measures in the workplace, particularly in enhancing safety performance (Teo & Phang, 2005). The practical implementation of OSH practices can moderate accidents and decrease compensation costs (Surienty, 2019). Proper equipment handling, installation and dismantling of heavy devices, site inspection, and supervisory practices closely contribute to safety management factors, particularly in the construction sector (Kerry et al., 2021). Therefore, SMEs must acknowledge the centrality of OSHA 1994; they can generate higher returns by reducing the costs incurred as compensation (Laukkanen, 1999). Furthermore, safety problems severely affect workplace health and economic competitiveness (Surienty, 2019). Through occupational risk prediction and management, overall organizational safety and organizational occupational damage can be appropriately addressed. In addition, occupational risk prediction and management may be more effective in assessing, forecasting, and handling occupational risks across business organizations (Semeykin et al., 2020).

Different SMEs and large multinational organizations demonstrate varying organizational characteristics, which have raised several issues that may affect the implementation of OSH (Surienty, 2019). Extensive studies have also revealed a relationship between company size and the effectiveness of OSH implementation (Hong, 2011). Large multinational organizations have the financial strength and structure to implement an effective OSH system, unlike SMEs. A large organization with many employees leads OSH programs that benefit more stakeholders, resulting in lower costs per person. Conversely, the implementation of OSH in SMEs has been reported to be irrelevant due to the workforce size. Moreover, implementing OSH in SMEs cannot be directly explained regarding monetary gains, which may appear irrelevant or less significant for a company's sustainability. Among other challenges is the implementation of OSH that focuses more on adopting established safety practices than compliance with OSH regulations (Surienty, 2019). Its performance is evaluated based on the organizational ability to meet the minimum requirements outlined by the local OSH Act of 1994 and the International Labour Organization (ILO) Standards on OSH. The implementation of OSH does not rely on an individual basis but must be interdependent and coordinated across various capacities, departments, work shifts, and even locations.

The existing risk assessment guidelines centralized by the HIRARC (HIRARC, 2008) comprise general guidelines for implementing industrial risk assessment systems (Kadir et al., 2020). The framework generally involves a qualitative risk assessment table or matrix, a simple calculation of risk rating, and a three-level categorization of risks, excluding existing control measures. The current HIRARC framework has been widely used in studies on hotel services, hydroelectric power generation plants, schools or education, crane operations, road accidents, and manufacturing. Studies on risk management mainly consider the following four key steps that govern the processes related to HIRARC: (1) risk classification, (2) risk identification, (3) risk analysis and estimation, and (4) risk control. Nevertheless, the extent of these processes among Malaysian SMEs is still not clear.

3.0 METHOD

The present study focused on employees of SMEs registered under SOCSO. A stratified random sampling strategy was employed to generalize the findings to the entire population (Bryman & Bell, 2003). Owners, managers, or supervisors were specifically targeted based on the following justifications: (1) they are responsible for corporate and business-level strategic decisions, and (2) they are in the best position to describe various organizational characteristics of their companies. The search generated 1,060 companies with more than 75 employees across 14 districts in Malaysia. The list of companies was retrieved from the official website of SOCSO. Based on Krejcie and Morgan's (1970) guidelines for determining the sample size, the recommended sample size for a population of 1,060 companies was 285; owners, managers, or supervisors from 285 companies were targeted as respondents.

The multi-item questionnaire constructs were measured using a five-point Likert scale. All six constructs used in this study (context, ease of use, personal innovativeness, perceived usefulness, trust, and effectiveness of risk management system) were developed and researched by Gaoa, Krogstiea, and Siau (2011). Questionnaires were distributed using Google Forms; however, only 55 respondents responded. Notably, despite assuring anonymity and confidentiality, the approached respondents expressed fear that tax authorities may go after them, as most of them may not have fulfilled their tax obligations, resulting in difficulty in acquiring information related to SMEs (Ackah & Vuvor, 2011). The model was tested using SmartPLS software (version 3.3.6). This study simultaneously assessed the measurement and structural models by minimizing the error variance and analyzing the relationships among the variables. A bootstrapping function with 5,000 re-samples was employed to determine the statistical significance of the paths.

Moreover, this study employed the interview method to explore the involvement of related stakeholders in OSH risk management activities to gain in-depth views of OSH practitioners on the subject. This method allows the interviewer to deeply explore informants' feelings and perspectives on a specific subject (Guion, 2001). Consequently, it enriches background information that can stimulate relevant questions regarding the topic under study. Furthermore, the in-depth interview allowed informants to discuss their feelings, opinions, and experiences freely. Specifically, this method provides an opportunity to gain valuable insights into how specific individuals or groups interpret and view the world (Milena et al., 2008). The present study targeted individuals directly involved in OSH-related risk management activities. A list of relevant practitioners was generated. To meet the objectives of this study, informants were selected based on their experience in OSH or related risk management departments. Consequently, three OSH-related officers and one technical service division officer were invited to participate. As shown in Table 2, most participants had more than ten years of experience with OSH.

Table 2 Details of Participants

Identification Details	Positions	Years of Experience in OSH
Interviewee 1	Chairman of the Occupational Safety (OSH) Committee and Senior Manager	More than 30 years
Interviewee 2	Head of Health, Safety, Security, and Environment (HSSE) Department	15 years
Interviewee 3	Head of Technical Service Division	More than 20 years
Interviewee 4	Safety and Health Officer (SHO)	Seven years

However, due to the COVID-19 pandemic, this study conducted online semi-structured interviews using Google Meet. All interviews lasted between two and three hours. A list of questions aligned with the study's objectives guided the interviews. The questions were framed based on the following main issues: (1) OSH risk awareness at the workplace, (2) risk identification mechanisms, (3) risk evaluation processes, (4) risk prevention or control mechanisms, (5) risk monitoring, (6) risk management process mechanisms, (7) OSH regulation awareness, and (8) problems in OSH risk management processes. Subsequently, several probing questions were asked to ensure comprehensive discussion sessions on OSH-related topics. Information on anonymity and confidentiality was relayed to participants to ensure honest and autonomous responses. All participants were

informed that their identities would not be disclosed in any publication. Finally, all interview recordings were transcribed to generate general ideas, and the responses were coded into themes.

4.0 FINDING

4.1 Quantitative Results

4.1.1 Demographic Profile of Respondents

This study managed to gather completed questionnaires collected from 55 participants. The respondents were from two electrical and electronics companies (3.6%), one transportation company (1.8%), one investment company (1.8%), and 34 manufacturing companies (65.5%). Furthermore, most respondents were from companies with more than 50 employees (85.4%). Only three respondents reported working in a company with 20–50 employees (5.5%); the remaining four respondents were from companies with 6–19 employees (1.8%) and fewer than five employees (7.3%). Regarding the operation period, most respondents had worked for more than 20 years (83.6%). Approximately 5.5% of the respondents had 16–20 years of experience, while the other 7.3% had less than five years of experience. Only two respondents had 11–15 years of experience. Additionally, most respondents (25.5%) worked south of Peninsular Malaysia (Negeri Sembilan, Melaka, and Johor) and west coast of Peninsular Malaysia (Pulau Pinang, Perak, and Kedah) (25.5%). The remaining 10.9% worked on the east coast of Peninsular Malaysia (Pahang and Terengganu). Among the respondents, 16.3% worked on the eastern coast of Malaysia (Sabah and Sarawak). The remaining 18.2% worked in Selangor. The respondents' demographic profiles are presented in Table 3.

Table 3 Demographic Profile of Respondents

Demographic Characteristics	Frequency (n = 55)	Percentage (%)
Gender		
Men	27	49.1
Women	28	50.9
Designation		
Manager	27	49.1
Engineer	1	1.8
OSH staff	16	29.1
Head departments	5	9.1
Others	6	10.9
Company type		
Electrical and electronics	2	3.6
Transportation	1	1.8
Investment	1	1.8
Manufacturing	36	65.5
Others	15	27.3
Number of employees		
Less than five	4	7.3
6–19	1	1.8
20–50	3	5.5
More than 50	47	85.4
Operation period		
Less than five years	4	7.3

Demographic Characteristics	Frequency (n = 55)	Percentage (%)
11–15 years	2	3.6
16–20 years	3	5.5
More than 20 years	46	83.6
Company location		
Johor	3	5.5
Kedah	3	5.5
Kuala Lumpur	2	3.6
Melaka	1	1.8
Negeri Sembilan	10	18.2
Pahang	2	3.6
Perak	2	3.6
Pulau Pinang	9	16.4
Sabah	6	10.8
Sarawak	3	5.5
Selangor	10	18.2
	4	7.3

4.1.2 Safety and Health Risk Knowledge

Table 4 summarizes the respondents' safety and health risk knowledge. Almost all respondents (98.2%) knew of safety and health risks. Furthermore, all respondents reported implementing a workplace safety and health risk management system. In particular, all the respondents confirmed that their company relied on the manual implementation of a safety and health risk management system instead of an automated system.

Table 4 Health and Safety Knowledge

Knowledge of Safety and Health (OSH 1994)	Frequency	Percentage
No	1	1.8
Yes	54	98.2
Implementation of safety and health risk management system		
Yes	55	100.0
Mode of implementation of safety and health risk management system		
Manual	55	100.0
Electronic software	0	0.0

4.1.3 Effectiveness of Risk Management System

Respondents were required to rate the effectiveness of the existing risk management systems. This study used convergent validity, including loadings, Average Variance Extracted (AVE), Composite Reliability (CR), discriminant validity (Hair, Ringle, & Sarstedt, 2011), and the heterotrait–monotrait ratio of correlations (HTMT) (Henseler, Ringle, & Sarstedt, 2015). In Table 5, the indicator loadings for all items exceed the recommended value of 0.6 (Hair et al., 2010). Furthermore, the AVE

values were in the range of 0.708–0.972, exceeding the recommended value of 0.5. The recorded CR values ranged from 0.935 to 0.999, exceeding the recommended 0.7 (Hair et al., 2010).

Table 5 Model Results

Constructs		α	Loadings	Composite Reliability (CR)	Average Variance Extracted (AVE)
Context	CT1	0.916	0.744	0.935	0.708
	CT2		0.765		
	CT3		0.934		
	CT4		0.889		
	CT5		0.867		
	CT6		0.832		
Ease of Use	EOU3	0.985	0.989	0.99	0.972
	EOU4		0.989		
	EOU5		0.979		
Effectiveness of Risk Management System	ES1	0.768	0.911	0.896	0.811
	ES2		0.890		
Personal Innovativeness	PIC1	0.957	0.921	0.966	0.824
	PIC2		0.899		
	PIC3		0.863		
	PIC4		0.962		
	PIC6		0.899		
	PIC7		0.899		
Perceived usefulness	PU1	0.969	0.892	0.976	0.89
	PU2		0.947		
	PU3		0.972		
	PU4		0.971		
	PU5		0.931		
Trust	TU1	0.984	0.948	0.987	0.914
	TU2		0.954		
	TU3		0.936		
	TU4		0.970		
	TU5		0.970		
	TU6		0.951		
	TU7		0.965		

The discriminant validity of the measurement items was tested using Fornell and Larcker's (1981) criteria. Table 6 presents the results of discriminant validity, which demonstrated that all the square root values of AVE for the matrix diagonal elements were higher than all cases for the off-diagonal details in their corresponding rows and columns. In other words, appropriate discriminant validity was established in this study.

Table 6 Discriminant Validity

	CT	ES	EOU	PIC	PU	TU
CT	0.944					
ES	0.897	0.901				
EOU	0.786	0.720	0.986			
PIC	0.841	0.895	0.802	0.908		
PU	0.656	0.622	0.839	0.734	0.943	
TU	0.785	0.753	0.944	0.819	0.814	0.956

Notes: CT denotes context, ES denotes effectiveness of risk management system; EOU denotes ease of use; PIC denotes personal innovativeness; PU denotes perceived usefulness; TU denotes trust.

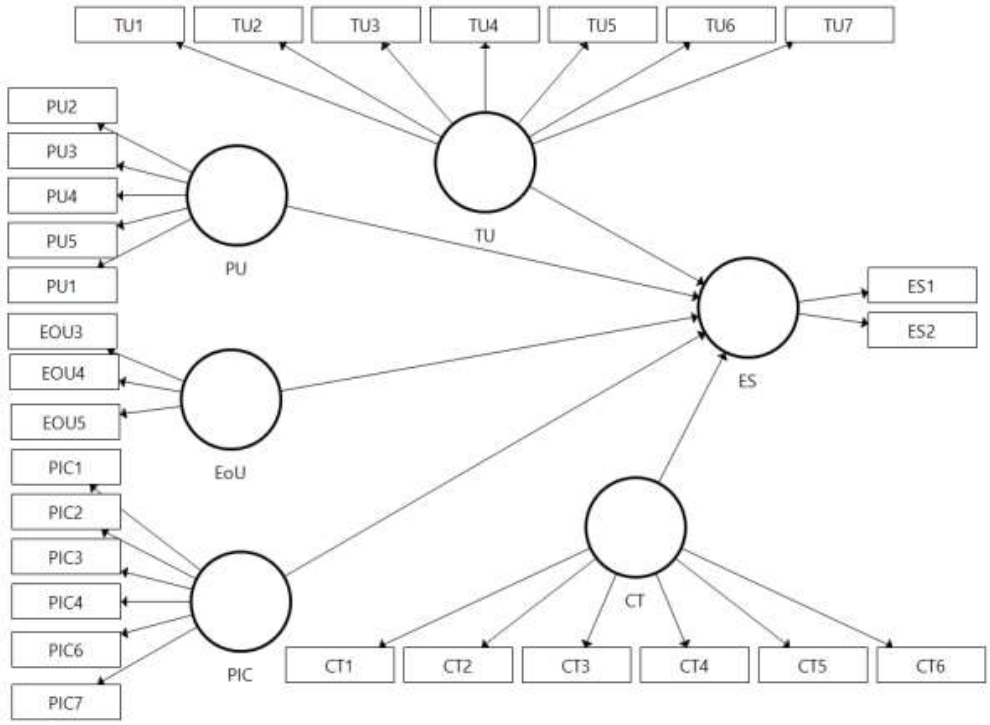

Figure 2. Structural Model

Table 7 shows that the recorded R^2 for the effectiveness of the risk management system was 0.743. Using the bootstrapping technique in the structural model (Fig. 2) with 500 resampling, the path coefficients and t-statistics were

determined for the hypothesized relationships. Referring to the tabulated results in Table 7, the path coefficient and t-value (0.036) show an insignificant influence of perceived usefulness on the effectiveness of the risk management system. In other words, H1 is not supported. Meanwhile, the results showed a negligible impact of ease of use on the effectiveness of the risk management system (t-value = 1.390). In other words, H2 is not supported. Similarly, the results demonstrate an insignificant relationship between trust and the effectiveness of the risk management system (t-value = 1.162). Thus, H3 was not supported. Furthermore, the results depicted another insignificant relationship between personal innovativeness and the effectiveness of the risk management system (t-value = 1.556). Thus, H4 is not supported. However, the relationship between context and effectiveness of the risk management system was found to be statistically significant (t-value = 5.106). Thus, H5 is supported.

Table 7 Direct Relationship Results

Hypotheses	Beta	R^2	t-value	p-value	Result
H1: PU → ES	-0.003		0.036	0.486	Not supported
H2: EOU → ES	-0.300		1.390	0.083	Not supported
H3: TU → ES	0.206	0.743	1.162	0.123	Not supported
H4: PIC → ES	0.279		1.556	0.060	Not supported
H5: CT → ES	0.769		5.106	0.000	Supported

Notes: Significance level was recorded at 1.645; PU denotes perceived usefulness; ES denotes effectiveness of risk management system; EOU denotes ease of use; TU denotes trust; PIC denotes personal innovativeness; CT denotes context.

The results demonstrate the ineffectiveness of these companies' current risk management systems. In particular, the current system lacks usefulness, ease of use, trust, and personal innovation. According to the technology acceptance model theory, perceived effectiveness and ease of use are central to an effective and efficient system. However, the findings of this study contradict those of previous studies (Lin, Juan, & Lin, 2020; Teo, 2011). The only significant criterion found in this study was context. Context provides an understanding of circumstances and activities (Basole, 2004). Therefore, an effective and efficient risk management system must be established.

4.2 Qualitative Findings

In addition to the presented quantitative results, this study conducted interviews to obtain in-depth insights into the implementation and other related issues of risk-management processes and OSH regulations in SMEs. The following subsections present the findings of the interviews.

4.2.1 Occupational Safety and Health Risk Awareness at The Workplace

Workplace OSH risk awareness ensures managers can cope with significant threats from increased organizational volatility and competition, mainly through newly developed technologies. New technologies have exposed organizations to new forms of risk and a greater risk frequency. Thus, effective and holistic risk management approaches require organizations to be aware of the importance of risk mitigation, for example, by developing risk management policies (Smith, 2001). This led to the first

interview question on how subordinates and employees create OSH risk awareness. The mechanisms employed by the interview participants included providing training and safety briefings on the importance of OSH risk mitigation to avoid accidents and injuries in the workplace. Apart from delivering materials such as brochures and fliers concerning workplace risks and ways to mitigate them, other interview participants highlighted the following points:

Concerning awareness, we have a patrol team. Every day, we appoint one department representative to make an observation. If we find something that affects the safety, we file a report. Patrols are carried out between 3 p.m. to 4.30 p.m. on Fridays…. We know the DOSH-sanctioned OSH guidelines. But frankly speaking, we comply with the guidelines prescribed by our parent company. We adopt Japanese Industrial Standards (JIS) and follow all Japanese-related regulations.

(Interviewee 1)

We have established the Safety & Health (S&H) committee, which comprises representatives from management and employees as committee members. The S&H committee is the primary platform for consultation and participation among the organizational staff of various levels. Staff participated in consultations concerning policymaking, objectives, and target settings.

(Interviewee 2)

4.2.2 Occupational Safety and Health Risk Identification Mechanisms

Organizations can mitigate OSH risks by highlighting critical tasks that pose significant risks to employees' health and safety. These include hazards involving specific equipment due to energy sources, working conditions, or activities performed. This step is critical because unidentified risks may have severe and immediate (acute) implications or cause long-term (chronic) health issues. This led to a second interview question on how SMEs identify OSH risks.

Accordingly, Interviewee 4 listed how the company identifies OSH risks: (1) conducts safety inspections, (2) examines the work processes, (3) reads machine manuals, and (4) scrutinizes related studies. Some OSH-related risks were identified in previous accidents. Implemented measures are essential for preventing future recurring accidents. The following interview participants highlighted other valuable points.

To us, risks do not mean they must involve complicated things. Even small actions can involve risks. For example, both handling machines and pressing machine switches may generate risks. Thus, whatever we do, we need to think of risks. In our company, we have warning signs in all risky spots. These warning signs indicate that we have the Standard Operating Procedure (SOP) and work instructions (WI) in place. Even WI are provided by the machines. So, everybody must understand the WI.

(Interviewee 1)

Multiple risk assessment tools have been used in our risk management processes. Generally, we use HIRARC guidelines by DOSH, Job Hazard Analysis, and Noise Risk Assessment for noise. Chemical Health Risk Assessment was employed for chemicals, and Ergonomics Risk Assessment (ERA) was referred to for ergonomic hazards.

(Interviewee 2)

OSH risks are identified from SOP or work procedures. The operator or person in charge must understand the SOP or work procedures.

(Interviewee 3)

Nevertheless, as highlighted by Interviewee 1, accidents are generally inevitable due to human error, which can be minimized by being vigilant at all times. Additionally, reminders were placed at high-risk locations in the workplace for all employees to exercise safety precautions for their families.

5.2.3 Occupational Safety and Health Risk Evaluation Processes

Regarding the OSH risk management system, the identified potential hazards must be analyzed to estimate hazard or risk severity levels. Such identification is instrumental for organizations to determine and prioritize different types of hazards in the workplace. For example, high-risk threats may require immediate action. Based on the OSH risk management system, the levels of risk priority were determined based on the relative risk involved by multiplying the risk likelihood (likelihood of risk occurring) by risk severity. This led to the next interview question on how the SMEs classified their levels of risk priority. One interview participant responded as follows:

The level of risks differs from one type of assessment to another. Generally, a risk matrix table was used in quantitative or semi-quantitative assessments to classify high, medium, or low risks.

(Interviewee 2)

Interviewee 4 responded favorably in determining the levels of risk priority using the HIRARC table issued by the DOSH. Meanwhile, Interviewee 3 provided a standard response: the DOSH matrix table was employed to prioritize risk. Interviewee 3 specifically explained that the levels of risk priority are based on a risk matrix that is based on the multiplication of risk likelihood and risk severity: a risk matrix of four and below are categorized as low, a risk matrix of five and 12 is classified as medium, and a risk matrix of 13 and above is considered high.

Conversely, Interviewee 1 highlighted the use of subjective evaluation to determine specific risk levels and explained that they did not rely on any particular rubric for that purpose:

The injury severity determines the level of risk. The level of risk is high if it is possible to lose an arm or if it is possible to break a leg. However, if it concerns a slight injury, the risk is low. Therefore, we look at the potential level of harm that is expected to occur.

4.2.4 Occupational Safety and Health Risk Preventive or Control Mechanisms

In the OSH risk-management system, control mechanisms for all hazards were identified, particularly for high-priority risks. Organizations should determine short- and long-term control mechanisms for the identified threats to control risks. Short-term control mechanisms are employed until permanent control mechanisms are implemented. In contrast, long-term control mechanisms are implemented based on practicality. Hazardous risks can be controlled at the source level through engineering, administrative control, or PPE use (DOSH, 2008). At the source level, hazardous risks can be eliminated (e.g., stopping buying

and cutting up scrapped bulk fuel tanks owing to explosion hazards) or substituted (e.g., a hazardous chemical is substituted by a less hazardous one). Interviewee 2 stressed the importance of prevention:

Prevention is a must. Prevention is always better than cure. Identified hazards are assessed and prioritized based on risk rating. The preventive actions are implemented based on the magnitude of the effects.

Interviewee 1 also highlighted the following points:

The OSH risk control mechanisms are generally determined in a meeting and decided by the Managing Director. So, our Managing Director has the final say. Our Managing Director changes once in five years. He must take precautions against OSH risks. He usually asks us to give opinions and suggestions on OSH risk controls. After that, he will decide. If the risk is high, he will instruct and ask us to take more risk precautions.

Interviewees 3 and 4 shared similar risk control mechanisms. Interviewee 3 expressed the following:

After identifying hazards, we will review the control measures and decide whether to eliminate, substitute, isolate, engineer, administer, or use PPE.

Interviewee 4 highlighted the implementation of hierarchical control mechanisms for OSH risk prevention. Hierarchy control mechanisms typically rank risk prevention according to effectiveness (most effective to least adequate). The risk prevention controls using hierarchical controls are presented in Fig. 3. Elimination and substitution are the most effective control mechanisms (NIOSH, 2015). However, elimination and substitution methods are challenging, particularly in well-established processes. Implementing elimination and substitution requires significant organizational changes involving various procedures and equipment. However, depending on engineering controls to remove hazards is more effective because this control mechanism examines and removes threats at the source before employees are involved. This control mechanism is considerably more expensive for short-term plans than administrative control or PPE. However, in the long term, the implementation of engineering controls reduces operating costs. Administrative controls and PPE are the least effective and expensive mechanisms; however, maintaining both is costly.

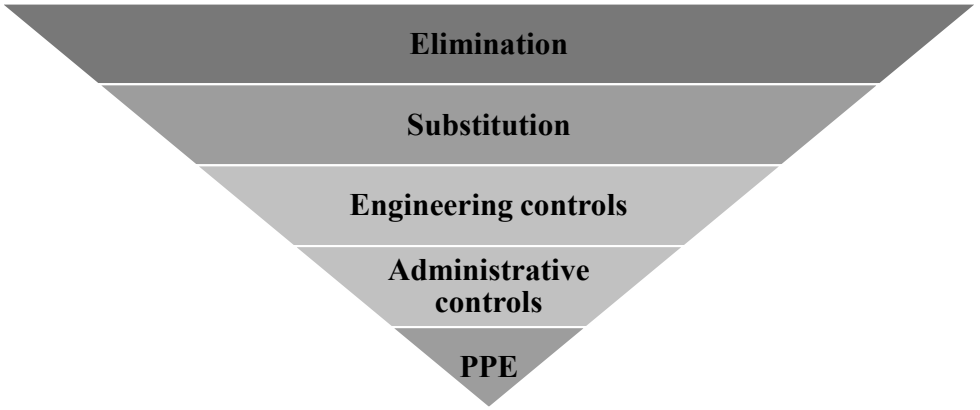

Figure 3. Hierarchy Control Mechanisms (NIOSH, 2015)

4.2.5 Occupational Safety and Health Risk Monitoring

Although organizations refer to and comply with OSH risk-monitoring guidelines, hazardous risks are not mitigated or prevented earlier if the effectiveness of controls is not regularly determined, monitored, checked, and evaluated. Therefore, the last step in a risk management system is essential. The determined control mechanisms require regular checks to assess (1) whether the controls have successfully solved hazardous risks and (2) whether other control measures are required. Evaluating the effectiveness of control mechanisms and identifying hazardous risks can help prevent hazards.

Organizations may practice various methods for monitoring risk-preventive control. This leads to the next question regarding how SMEs monitor the implementation of the proposed control mechanisms. Interviewee 2 highlighted the culture of regular meetings to ensure the performance of agreed-upon preventive control mechanisms. Interviewee 2 explained the following:

Yes, it was monitored by the department heads. Monitoring done by the department heads is essential. Sometimes we will have meetings with the manager, but I am sorry to say that we have many meetings. There are many kinds, but our forum is not long, capped at one hour.

Interviewee 3 provided a standard response to implementing safety meetings and walks to ensure well-implemented preventive control mechanisms. Interviewee 4 expressed the creation of deadlines for implementing all agreed-upon control mechanisms. Interviewee 1 explained the use of the different methods as follows:

Yes, we have a monitoring system in places such as S&H Committee Inspection and Audit. Staff is authorized to issue a Non-Conformance Report for non-conformance prevention controls. Employees also conduct Unsafe Conditions Unsafe Act (UCUA) programs.

4.2.6 Occupational Safety and Health Risk Management Process Mechanisms

The advancement of technology today due to the advancement of Industrial Revolution 4.0 led to the next interview question in this study on using any new technology or software to manage OSH risk-management processes. All interviewees provided standard responses, and no software was used to manage the risks. Instead, risks were managed manually, for example, using spreadsheets (Microsoft Excel) to control and record the identified risks. The monitoring processes were also performed manually by tracking the spreadsheet risks. Interviewee 4 highlighted the following points.

Our risk management process is implemented by documenting it as part of SOP. All departments have their own HIRARC.

Interviewee 2 provided the following standard response:

Risk management was integrated into the processes and activities. All staff need to understand the risk of activities and the adoption of mitigation measures.

Interviewee 3 highlighted the manual implementation of risk management processes, such as conducting safety walks before safety meetings and random checks on factories and employees. The interview participants did not note using any software to monitor the risk management processes in the organization.

4.2.7 Occupational Safety and Health Regulation Awareness

Malaysia has made progressive efforts to enforce laws and regulations for employers and employees. However, little is known about how employers and employees perceive enforcement. This led to the next interview question on the perceptions of the adequacy of Malaysia's current enforcement (e.g., OSHA, 1994) in OSH risk prevention. Most interview participants responded as follows:

Yes, we refer to OSHA, FMA, and DOSH regulations. (Interviewee 3).

It is adequate, but it still needs improvement in the future. (Interviewee 4)

Interviewee 2 agreed on the need to improve related regulations:

We always believe in continual improvements, as the improvement processes should not be halted at any point.

Conversely, Interviewee 1 noted the adequacy of the existing regulations. Current regulations were not the main issue:

To me, this is how we work. The regulations are more than enough. It's just that the enforcement is lacking.

Interviewee 1 subsequently described the following points:

The enforcement is less, and the understanding given to the employees is also less. There will be no problem if we comply with the existing regulations. It is just that sometimes there is a discipline problem among our people.

5.0 DISCUSSION OF RESULTS AND FINDING

Overall, most survey respondents in this study demonstrated knowledge of OSHA 1994. All survey respondents confirmed implementing the OSH risk management system. However, the risk management system was implemented manually without electronic software. Based on the results, this study did not provide adequate evidence to determine the convenience, trustworthiness, effectiveness, usefulness, or personal innovativeness of the manual system implemented in these SMEs. Although the results revealed that the existing system fulfilled the requirements of a risk management system, the implemented system was reported to be less effective.

The ineffectiveness of the risk management system may be due to its manual implementation of the risk management system without any electronic software. Some of the challenges in risk management performance are that all risk data are scattered across organizations, and the data may not be shared across business units and departments (Patterson & Executive, 2015). Therefore, organizations require tools to capture adequate risk information and evolution in computing and risk technology, and the development of new technologies can help them implement effective risk management (Patterson & Executive, 2015). Big data analytics and cloud computing can capture, extract, transform, and use legacy databases to conduct risk assessments, stress tests, and risk scenario analyses. Although it is costly to purchase systems, the costs of technological advancements can be reduced, and organizations may benefit from risk management process technologies.

Interviews were also conducted to explore how SMEs implement OSH risk management systems. First, the interview findings indicated the understanding of several SMEs on the importance of vigilance regarding OSH-related risks. Second, some SMEs in this study established S&H committees to help mitigate OSH-related risks. Third, SMEs implemented preventive organizational measures by mandating SOP, conducting audits, fixing deadlines, and showing warning signs to encourage OSH risk alertness. Furthermore, some SMEs highlighted their compliance with the DOSH guidelines using the HIRARC system in the context of risk evaluation and control. Non-conformance reports, auditing processes, and regular OSH meetings and inspections were identified as risk-monitoring mechanisms for SMEs to effectively and efficiently implement the OSH risk management system. The interview participants also emphasized the importance of top management's involvement in the OSH risk management system to ensure effective OSH risk mitigation.

Finally, interview participants reported the adequacy of existing OSH regulations and the need for practical improvements to mitigate OSH-related risks. One interview participant highlighted the need to improve employee awareness of OSH risk mitigation and enforcement. Specifically, employees' self-discipline was stressed as lacking in implementing the OSH risk-management system. Similarly, Sharma (2020) highlighted the need to implement a proper risk management system and initiatives to inculcate a robust organizational culture of risk management, which supports the present study's findings.

6.0 CONCLUSION

This study explored the implementation and effectiveness of an OSH risk management system and Malaysian OSH regulations for reducing occupational accidents and injuries. This study reveals that an OSH risk-management system has been implemented in SMEs to mitigate occupational accidents and injuries. However, OSH risk management was implemented manually without using electronic software to monitor risks effectively. Furthermore, this study revealed the adequacy of existing OSH regulations and the need for improvements in regulatory enforcement, employee discipline, and understanding of OSH from practitioners' viewpoint.

This study successfully expands the existing knowledge on implementing OSH risk management systems in Malaysian SMEs. SMEs play an essential role in the Malaysian economy, and knowledge of OSH-related performance is vital for regulators to formulate and design adequate risk management systems or processes. Organizations can mitigate occupational injuries and accidents that impede productivity. Based on the findings of this study, an effective technology-enhanced risk management process using electronic software or systems to capture, analyze, and predict existing prospective risk information is recommended. Better-informed management decisions may lead to actions that produce more reliable outcomes. Additionally, SMEs can connect and align organizational risks with appropriate resources to meet strategic objectives. Finally, this study provides valuable insights for OSH regulators to improve existing OSH regulations and develop better mechanisms to ensure compliance with OSH regulations.

However, the small sample size of survey respondents limited the study's findings' generalizability due to the lack of responses during the COVID-19 pandemic. Nevertheless, the data covered SMEs in all Malaysian states. Future research should increase the sample size to include more SMEs. Furthermore, insights or views from lower-level employees are essential to help SMEs improve their OSH risk management processes. Therefore, future studies should comprise employees at all levels.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to the National Institute of Occupational Safety and Health (NIOSH) Malaysia for funding this research project through a Grant Scheme (100-TNCPI/GOV 16/6/2 (013/2020)) and the University Teknologi MARA (UiTM) Cawangan Kelantan for their administrative support.

REFERENCES

Ab. Rahman, R. (2015). Managing Safety at Work Issues in Construction Works in Malaysia: A Proposal for Legislative Reform. Published by Canadian Center of Science and Education, Modern Applied Science, 9, 13.

Ackah, J., & Vuvor, S. (2011). The Challenges Faced by Small & Medium Enterprises (SMEs) in Obtaining Credit in Ghana.

Basole, R. C. (2004). The Value and Impact of Mobile Information and Communication Technologies. In *Proceedings of the IFAC Symposium on Analysis, Modeling & Evaluation of Human-Machine Systems,* 9, 1–7.

Bochkovskyi, A., & Gogunskii, V. (2018). Development of The Method for The Optimal Management of Occupational Risks. *Восточно-Европейский журнал передовых технологий*, 3(3), 6–13.

Bryman, A. & Bell, E. (2003). Business Research Methods. Oxford: Oxford University Press.

Gaoa, S., Krogstiea, J., & Siaub, K. (2011). Developing an Instrument to Measure the Adoption of Mobile Services. *Mobile Information Systems, 7*, 45–67.

Guion, L. A., Diehl, D. C. & McDonald. D. (2011). Conducting an In-depth Interview. Archival copy: for current recommendations, see http://edis.ifas.ufl.edu or your local extension office.

Hair, J. F. Ringle, C. M. & Sarstedt, M. (2011). PLS-SEM: Indeed, a Silver Bullet. *Journal of Marketing Theory and Practice, 19*(2), 139–151.

Hair, Joseph F., William C. Black, Barry J. Babin, & Rolph E. A. (2010). Multivariate Data Analysis. Upper Saddle River, NJ: Prentice Hall.

Henseler, J., Ringle, C. M. & Sarstedt, M. (2015). A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling. *Journal of the Academy of Marketing Science,* 43, 115–135.

Hinze, J., & Hallowell, M. (2013). Construction-Safety Best Practices and Relationships to Safety Performance. *Journal of Construction Engineering and Management*, 139, 1–8.

Hong, K.T., Surienty, L. & Mui Hung, D.K. (2011). Occupational Safety and Health (OSH) in Malaysian Small and Medium Enterprises (SME) and Effective Safety Management Practices. *International Journal of Business and Technopreneurship*, 1(2), 321–338.

International Labour Organization (ILO). (2021). Press Releases: WHO/ILO: Almost 2 Million People Die from Work-Related Causes Each Year. Retrieved on November 5, 2021, from https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_819705/lang--en/index.htm.

Kadir, Z. A., Siti Hawa Mohammad, R., Othman, N., Amrin A., Muhtazaruddin, M. N., Abu-Bakar, S. H., & Muhammad-Sukki, F. (2020). Risk Management Framework for Handling and Storage of Cargo at Major Ports in Malaysia towards Port Sustainability, *Sustainability, 12*, 516. doi:10.3390/su12020516.

Kerry, T. V., Abas, N. H., Mohd Affandi, H. & Md. Amin, S. (2021). Stakeholder's Perceptions on the Significant Factors Affecting Safety Management Implementation at Construction Sites. *MCRJ, 13*(2), 68–80.

Kim, S. & Jung, D. (2019). Analysis of Environmental Complaints for Receptor-oriented Risk Management: Busan as a Case Study. *Journal of Environmental Health Sciences*, *45*(6), 605–612.

Krejcie, R.V. and Morgan, D.W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607–610.

Laukkanen, T. (1999). Construction Work and Education: Occupational Health and Safety Reviewed. *Construction Management and Economics, 17*, 53–62.

Milena, Z. R., Dainora, G., & Alin, S. (2008). Qualitative Research Methods: A Comparison Between Focus-Group and In-Depth Interview. *Psychology, Annals of Faculty of Economics.*

National Institute of Occupational Safety and Health (NIOSH). (2015). Hierarchy Controls. Retrieved on November 1, 2021, from https://www.cdc.gov/niosh/topics/hierarchy/default.html

Patterson, T., & Executive, C. C. S. (2015). The Use of Information Technology in Risk Management. *Complex Solutions Executive IBM Corporation*. Retrieved on November 18, 2021, from https://us.aicpa.org/content/dam/aicpa/interestareas/frc/assuranceadvisoryservices/downloadabledocuments/asec-whitepapers/risk-technology.pdf

Polinkevych, O., Khovrak, I., Trynchuk, V., Klapkiv, Y., & Volynets, I. (2021). Business risk management in times of crises and pandemics. *Montenegrin Journal of Economics*, 17(3), 99–110.

Ramos, D., Afonso, P., & Rodrigues, M. A. (2020). Integrated Management Systems as A Key Facilitator of Occupational Health and Safety Risk Management: A Case Study in A Medium Sized Waste Management Firm. *Journal of Cleaner Production*, *262*, 121346.

Semeykin, A. Y., Klimova, E. V., Nosatova, E. A. & Khomchenko, Y. V. (2020). Using Automated Risk Assessment Systems to Ensure the Safety of Personnel at Construction Sites. IOP Conf. Series: Materials Science and Engineering 9450, 12022 IOP Publishing. doi:10.1088/1757-899X/945/1/012022

Settembre-Blundo, D., González-Sánchez, R., Medina-Salgado, S., & García-Muiña, F. E. (2021). Flexibility and Resilience in Corporate Decision Making: A New Sustainability-Based Risk Management System in Uncertain Times. *Global Journal of Flexible Systems Management*, 1–26.

Smith, K. (2001). Environmental Hazards. Assessing Risk and Reducing Disaster (3rd ed.). London: Routledge.

Surienty, L. (2019). OSH Implementation in SMEs in Malaysia: The Role of Management Practices and Legislation: Volume II: Safety and Health, Slips, Trips and Falls. Research Gate. https://www.researchgate.net/publication/326850505.

Taofeeq, D. M. and Adeleke, A. Q. (2019). Factor's Influencing Contractors Risk Attitude in the Malaysian Construction Industry. *Journal of Construction Business and Management*, *3*(2), 59–67.

Teo, E.A.L., Ling, F.Y.Y., & Ong, D.S.Y. (2005). Fostering Safe Work Behaviour in Workers at Construction Sites. *Engineering, Construction, and Architectural Management, 12*(4), 410–422.

The Star (2020). Towards a Skilled Workforce. The Star, Available at https://www.thestar.com.my/opinion/letters/2020/09/07/towards-a-skilled-workforce.

Vijayan, V. K. & Sharma, N. (2020). A Study on the Impact of Dimensions of Risk Management on Risk Management Practices in It Projects in the UAE. *International Journal of Management*, 11(9), 754–769.

Wanberg, J., Harper, C., Hallowell, M. R., & Rajendran, S. (2013). Relationship Between Construction Safety and Quality Performance. *Journal of Construction Engineering and Management, 139*, 1–10.

World Health Organization (WHO). (2021). WHO/ILO: Almost 2 million people die from work-related causes each year. Retrieved from https://www.who.int/news/item/16-09-2021-who-ilo-almost-2-million-people-die-from-work-related-causes-each-year, on November 12, 2022.