

A MAPPING REVIEW ON SAFETY CULTURE IN MALAYSIAN INDUSTRIES: A RESEARCH REPORT FROM 2007 TO 2022

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Abstract: Optimising a company's safety culture is a tool for reducing and preventing workplace accidents. However, the variables that affect safety culture across industries have not been thoroughly studied and are rarely discussed in previous research. The objective of this study is to identify the factors that affect a company's safety culture across industries in Malaysia over the past decade. In this systematic review study, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method was used. The Scopus and Web of Science databases were used for these qualitative studies, which identified seven industries engaged in safety culture research between 2007 and 2022. The research found that behavioural factors were the most important aspect of safety culture, followed by situational and psychological factors. Nineteen elements of safety culture and three main research objectives of safety culture in different industries were identified within the study period. In addition, a different preference for the elements of safety culture was found in different industries in Malaysia. In conclusion, a systematic review study provides researchers, companies, practitioners, and policy makers with a snapshot of the Malaysian safety culture landscape and the elements preferred by different industries to reduce occupational accidents in the future.

Keywords: Safety culture, gaps analysis, Malaysia, systematic review, safety culture elements.

Introduction

Safety culture is considered a key element that confirms the context for an organisation's awareness of the importance of safety (Schulman, 2020). Furthermore, safety culture reflects and constructs organisational psychological and behavioural characteristics that can influence the success or failure of occupational safety and health programmes (OHS) (Tear *et al.*, 2020). With the growing awareness of safety culture as a key indicator of organisational safety outcomes, regulators in various industries have begun to emphasise safety elements in their business requirements and audits (Naevestad *et al.*, 2019). With this in mind, it is not surprising that significant efforts are being made to develop an evidence-based OHS strategy to address a variety of safety issues across numerous industries (Cunningham *et al.*, 2020).

The rapid growth of industrialisation has had a significant impact on income inequality and quality of life, but it has also contributed to an increase in occupational accidents. Each organisation has different elements of adaptive safety culture that help to improve safety performance (Beus *et al.*, 2010). Accident reports in Malaysia are compiled and managed by the Department of Occupational Safety and Health (DOSH) Malaysia, allowing for continuous assessment of safety performance in all industrial sectors. The number of injury cases is increasing in all industries. Malaysia's national occupational injury statistics recorded 21,534 cases for all industries in 2021, with an injury rate of 1.43 per 1,000 workers (DOSM, 2022). However, the literature on safety culture rarely discusses beyond the variables of safety

culture in different industries. It is important to examine the research conducted, especially from a Malaysian perspective, as the Malaysian Occupational Safety and Health Master Plan 2021-2025 (OSHMP25) emphasises the need for a preventive culture in all industries to promote a healthy work culture that benefits employees, organisations and the nation. There is a need for a baseline study and discussion on how the predictive factors of safety culture research from different industries can be applied to create a better understanding of safety culture and as an additional means to manage safety in the workplace. Therefore, the objective of this systematic review was to explore the area of safety culture research that has been conducted in Malaysia over the past decade. The findings of this study can be used to deepen and make practical the topic of safety culture by improving the understanding of the interactions between industries and contextual variables in a particular workplace.

Materials and Methods

The aim of the systematic literature review (SLR) is to discover and summarise literature that is systematically related to previous studies or research. The process is well organised and transparent, and each phase is conducted using sequential techniques (Wong *et al.*, 2013). PRISMA is a widely accepted technique for conducting SLR in a variety of study areas, including safety research (Nyoni *et al.*, 2018 & Adaku *et al.*, 2021).

Study Design

This systematic review covered studies on safety culture conducted in Malaysia and published between 2007 and June 2022. The year 2007 was chosen for this review since it was the first year that safety culture publications were made available in SCOPUS and the Web of Sciences (WOS) database.

Systematic Review Protocol

In this study, a standard protocol of Preferred Reporting Items for Systematic Reviews and

Meta-Analyses (PRISMA) was used to optimise the research quality of article reviews (Page *et al.*, 2021). The author combined an intensive manual search with an iterative systematic search to identify research papers published on safety culture in Malaysia. Identification, screening and data abstraction are the three key PRISMA phases (Figure 1). Identification is the first step in the systematic review and this process was conducted in June 2022. To ensure the quality of the papers reviewed in this study, the Scopus and WOS databases were selected because they have well-established citation indexing systems. By using keywords and search terms such as “*safety culture*” and “*Malaysia*”, this process yielded 48 articles from Scopus and 38 articles from WOS. The second stage is screening, where articles are included or excluded based on standards set by the authors using specific databases. During the screening process, eligibility, and inclusion and exclusion criteria were established to obtain relevant articles for the systematic review process. The following criteria had to be met for an article to be accepted for review: (a) It had to address the topic of safety culture, (b) it had to be an article, (c) it had to be written in English, and (d) it had to have been published between 2007 and June 2022. These criteria aim to focus on primary research on safety culture in Malaysia. A total of 86 publications were found in the online databases Scopus and Web of Science (WOS). After filtering out duplicate articles ($n = 20$), 66 articles were subjected to manual screening of title and abstract. All 51 of these articles were rejected because they did not meet the inclusion criteria. The final step was data abstraction and analysis. The remaining publications were evaluated, reviewed, and analysed. In this review, 13 selected papers (studies) are described in detail. Table 2 summarises the results.

Quality Assessment of Extracted Data

The reliability of the descriptive cross-sectional research was then assessed using the Joanna Briggs Institute (JBI) assessment, which consists of eight questions, for all 13 papers selected using the PRISMA selection methodology. The

reviewers independently assessed the collected data against the evaluation criteria. The articles' focus on safety culture was the primary criterion for inclusion in this study. Studies that did not address safety culture as a main variable or only alluded to it in discussion as a potential area for further study were excluded.

Results and Discussion

This systematic review provides new empirical evidence on safety culture studies across all industries in Malaysia. The authors prepared, analysed and reported the scoping review in accordance with the Preferred Reporting Items

for Systematic Reviews and Meta-Analyses (PRISMA). The comprehensive reporting guide, illustrative examples and best practices for large scoping studies provided by PRISMA were ideal for this review, although there are other published standards for conducting systematic scoping reviews (Peter *et al.*, 2015, Xiao & Watson, 2019, Prill *et al.*, 2021). A total of 86 articles were found during the search. We found 66 studies after eliminating duplicates and then selected 13 studies from 25 different safety culture topics (Figure 1). In the course of the quality assessment, the 13 articles that were identified and considered for analysis are shown in Table 1.

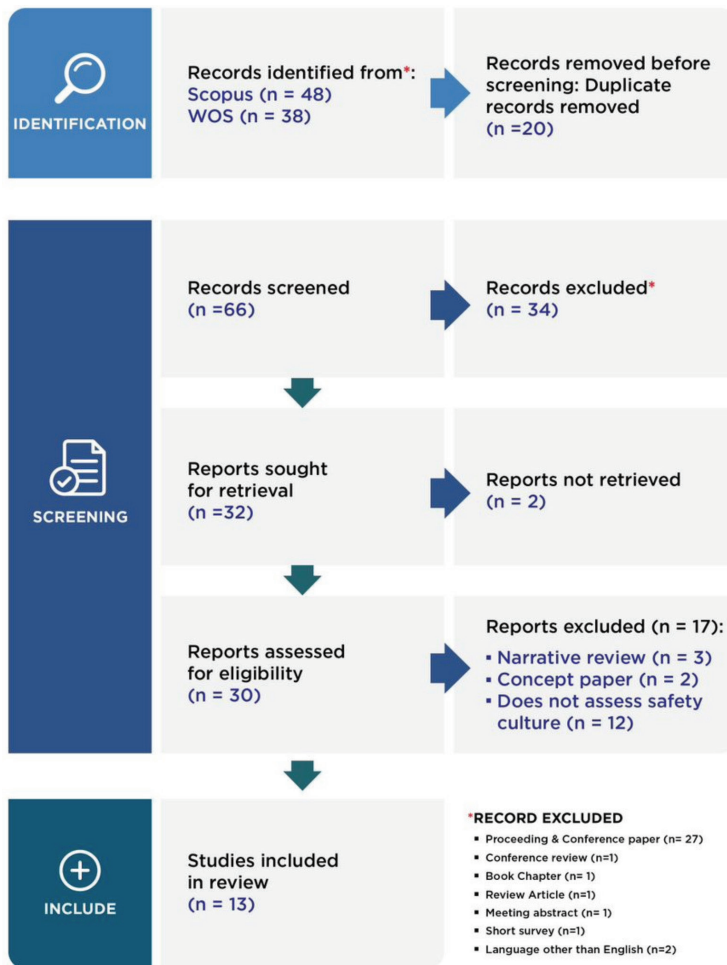


Figure 1: The flow diagram of the systematic review protocol

Table 1: Assessment summary of reviewed article for cross-sectional research design

Assessment Questions	Number of Articles			
	Yes	No	U	N/A
1. Were the criteria for inclusion in clearly defined?	13	0	0	0
2. Were the study participants and the setting described in detail?	13	0	0	0
3. Was the exposure measured in valid and reliable method?	13	0	0	0
4. Were objective criteria used for condition measurement?	11	0	2	0
5. Were confounding factors identified?	13	0	0	0
6. Were confounding factor controls mentioned?	13	0	0	0
7. Were the outcomes measured in a valid and reliable way?	10	0	3	0
8. Was the suitable statistical analysis performed?	10	0	3	0

U: unclear; N/A: Not applicable

Characteristics of Study Design

Table 2 provides an overview of the characteristics of safety culture research. The studies examined were published between 2006 and 2021 and are organised by journal category in Scopus and Web of Sciences (WOS). Cross-sectional research appeared to be the predominant methodological design applied to all articles reviewed to determine the state of safety culture research in Malaysia. In line with the reviews, all studies used questionnaires as a measurement tool to assess safety culture in Malaysian organisations. Previous research on safety culture in organisations has used surveys, qualitative and anthropological techniques, accident investigations and more (Hopkins, 2006). Various safety culture questionnaires have been used in research and organisational development up to this point (Choudhry *et al.*, 2007).

Major Finding Concerning Safety Culture Research

A total of seven different types of industries were found in this review. Most of the research on safety culture in Malaysia since 2007 has mainly focused on the health sector (30%), the oil and gas industry (23%) and the manufacturing sector (15%) (Table 3). This result is congruent with bibliometric studies on safety culture, in which

the topic category “health sciences & services” is listed in five of the top ten most active journals (Van Nunen *et al.*, 2018). In Malaysia, the oil and gas industry is the backbone and main growth sector of the country’s economy, as well as the riskiest industry in the global economy (Foo *et al.*, 2015). Therefore, the number of studies on safety culture in the oil and gas industry should increase and diversify as the research findings can help reduce risk and improve the safety performance of the industry. This upward trend also applies to the manufacturing sector, which had the highest number of occupational injuries (7,994) and fatalities (65) in 2021 compared with the nine other industries (DOSM, 2022). As not all industries on the first list of the Occupational Safety and Health Act of 1994 are considered in the study of safety culture, it is difficult to infer the level of safety culture in Malaysia. For example, industries not included in this survey include mining, agriculture and transportation.

The allocation of safety culture research to each industry, the aspects of safety culture, the objectives and the results of the corresponding studies are summarised in Figure 2. In Malaysia, healthcare, oil and gas and manufacturing have been the leading industries in safety culture research over the past 15 years. To gain a better understanding of the target characteristics and importance of safety culture, this review paper

Table 2: Characteristics of safety culture research in Malaysia from 2007 until 2022

References, [ID]	Year	Study Design	Industry	Participant	Instrument	Safety Culture Predictors	Safety Culture Aspect	Research Focus
Naji <i>et al.</i> , [1]	2022	Cross-sectional	Petrochemical	All employees	Questionnaire	Positive relationship between safety culture and safety communication ($p < 0.001$).	Behavioural	Relationship between safety factors and safety culture
Mohamad <i>et al.</i> , [2]	2022	Cross-sectional	Oil and Gas	Managers & Engineers (Interview) All employees (Questionnaire)	Interview questionnaire	Safety culture, supportive environment, social media perceived usefulness, management commitment, perceived organizational support, employee crisis perception and employee affective commitment are positively associated with communication (ICC) in oil and gas ($p < 0.001$).	Behavioural	Factor associated with safety culture
Al-Mekhlafi <i>et al.</i> , [3]	2021	Cross-sectional	Oil and Gas	Tanker driver	Questionnaire	Safety culture had a positive and significant impact on driving performance ($p < 0.000$).	Situational	Prediction of safety culture model framework
Naji <i>et al.</i> , [4]	2021	Cross-sectional	Oil and Gas	Upstream production and operational	Questionnaire	Psychosocial hazard has a significant effect on safety performance ($p < 0.000$)	Psychological	Relationship between safety factors and safety culture
Nadarajan <i>et al.</i> , [5]	2020	Cross-sectional	Healthcare	Medical student	Questionnaire	There was significant difference between senior and junior medical students on APRR rate ($p < 0.001$).	Behavioural	Factor associated with safety culture

References, Year [ID]	Year	Study Design	Industry	Participant	Instrument	Safety Culture Predictors	Safety Culture Aspect	Research Focus
Musa & Isha [6]	2020	Cross-sectional	Aviation	Airport ground handler	Questionnaire	Employees' perception of management commitment and reporting, training and competency, work environment, pressure for job completion and voluntary policy intervention has predictive significance toward accidents and near misses	Situational, Psychological & Behavioural	Relationship between safety factors and safety culture
RJ <i>et al.</i> , [7]	2019	Cross-sectional	Healthcare	Doctor Nurse Pharmacist Clinical and non-clinical staff	Questionnaire	Not applicable	Behavioural	Factor associated with safety culture
Sivanandy <i>et al.</i> , [8]	2016	Cross-sectional	Healthcare	Pharmacist	Questionnaire	There was a significant difference in patient safety attitude according to seniority and gender of pharmacists ($p < 0.05$).	Behavioural	Factor associated with safety culture
Samsuri <i>et al.</i> , [9]	2015	Cross-sectional	Healthcare	Pharmacist	Questionnaire	Significant correlation for overall safety culture and number of medication errors reported for pharmacists working in the hospital ($p < 0.05$).	Behavioural	Relationship between safety factors and safety culture

References, [ID]	Year	Study Design	Industry	Participant	Instrument	Safety Culture Predictors	Safety Culture Aspect	Research Focus
Yulia et al., [10]	2015	Cross-sectional	Manufacturing	Production line	Questionnaire	PPE and training were significant predictors for safety culture ($p < 0.05$)	Situational	Factor associated with safety culture
Ali et al., [11]	2009	Cross-sectional	Manufacturing	Food and beverage Tobacco, Electrical and Electronics, Chemical, Metal and non-metal sectors.	Questionnaire	Significant relationship between management practices and injury rates ($p < 0.04$)	Behavioural	Factor associated with safety culture
Makhtar et al., [12]	2019	Cross-sectional	Education	Vocational college Instructor	Questionnaire	Influence of peers, safety knowledge, safety communication, safety rules, personnel protective equipment and safety training had a significant positive relationship with safety culture ($p < 0.01$)	Psychological, Behavioural, Situational	Relationship between safety factors and safety culture
Hassan et al., [13]	2007	Cross-sectional	Construction	Large & Small projects	Questionnaire	Not applicable	Psychological	Factor associated with safety culture

Table 3: Characteristic of safety culture research in Malaysia

Characteristics	(n)	(%)
Industries		
- Aviation	1	8
- Construction	1	8
- Education	1	8
- Healthcare	4	30
- Manufacturing	2	15
- Oil and gas	3	23
- Petrochemical	1	8
Safety culture aspects		
- Situational	6	33.3
- Behavioral	7	38.9
- Psychological	5	27.8
Research objectives		
- Factors associated with safety culture	7	53.8
- Prediction of safety culture model framework	1	7.7
- Relationship between safety factors and safety culture	5	38.5
Research outputs		
- Management commitment, management practices, organizational support, recruitment	3	6.8
- Training and competency	6	13.6
- Communication	5	11.4
- Work performance	2	4.5
- Psychosocial	1	2.3
- Employee perception	3	6.8
- Policy	1	2.3
- Attitude and behaviour	3	6.8
- Influence of peer	1	2.3
- Safety rules and procedures	1	2.3
- Personal protective equipment (PPE)	2	4.5
- Work environment	4	9.1
- Seniority	2	4.5
- Gender	1	2.3
- Reporting	2	4.5
- Knowledge	1	2.3
- Work pressure, Stress	2	4.5
- Rewards and recognition	1	2.3
- Employee participation	3	7.0

classified the articles dealing with the aspect of safety culture based on Cooper's reciprocal safety culture model. The model includes three aspects of safety culture, namely behavioural, psychological and situational context, which is supported by most academics and researchers involved in process improvement and accident prevention (Lund & Aarø, 2004). The analysis revealed that over the past decade, behavioural and situational aspects have been the most frequently studied characteristics of safety culture in Malaysia. This finding is in line with Cooper's (2018) comprehensive research, which suggests that organisations should focus at least 80% of their efforts on improving and maturing situational and behavioural safety culture. The approach was also supported by Ismail (2021), who found that the behavioural aspect has the greatest impact on building a positive safety culture, followed by the situational and psychological aspects. The results of this study also allow for triangulation of perspectives related to safety culture within an organisation and across industries.

In recent decades, research on safe work behaviour has become increasingly important in the field of occupational health and safety (Zaira & Hadikusumo, 2017). In a variety of industrial settings, several studies have attempted to determine the impact of workers' safety behaviour on occupational injuries (Varonen & Mattila, 2000; Neal & Gryphon 2006). Numerous research findings have shown that unsafe work behaviours increase the risk of accidents and fatal injuries in workplaces (Choudhry, 2014). Research has shown that unsafe behaviour is responsible for approximately 80% of workplace incidents (Shin, 2014). According to Pareto's Law, only 20% of causes lead to 80% of outcomes. Applying this principle to accidents means that 20% of behaviours cause 80% of accidents. As of 2022, oil and gas, aviation, education and healthcare are the four industries that include situational, behavioural and psychological aspects when examining safety culture. It is imperative that the organisation considers all

three aspects of safety culture, as the principle of the reciprocal model is to optimise the situation in order to optimise the behaviour. Furthermore, as the desired behaviours emerge, the various psychological elements will adapt and evolve towards a positive safety culture (Cooper, 2016).

Since the publication of the Institute of Medicine (IOM) report, awareness of patient safety within healthcare organisations has increased and is receiving more attention (Donaldson, 2000). This report has created the paradigm for a culture of safety where harmful incidents can be reported without blaming specific individuals and where lessons are learned from mistakes. One of the most important components in improving patient safety is safety culture research, which is often conducted in the form of sampling in patient safety settings (Flin, 2007). Therefore, the number of safety culture research studies in healthcare settings is very high so that the organisation can gain an understanding of the staff to improve safety culture and prevent incidents. The target population of this research includes doctors, nurses, pharmacists, clinical and non-clinical staff, and medical students working in the healthcare setting.

The Malaysian National OGSE Industry Blueprint (2021-2030) aims to create a "robust, resilient and globally competitive" Malaysian oil and gas, services and equipment sector that can improve national GDP growth, sector employment, export development and fiscal contribution. However, these workers operate in high-risk environments where the likelihood of accidents or injuries is significant (Bevilacqua *et al.* 2020). Given the complexity and hazardous environment of oil and gas operations, minimising risks and preventing occupational accidents are important safety objectives (Berg *et al.*, 2014; Ajmal *et al.*, 2022).. Studies have been conducted on health and safety in the oil and gas industry. However, despite the many fatalities, severe damages and significant efforts made to prevent such accidents, egregious disasters still occur in the industry, causing the loss of lives and resources (Hassan *et al.*, 2020).

Industry	Safety Culture Aspect			Aim		Output																				
	A	B	C	X	Y	Z	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12	O13	O14	O15	O16	O17	O18	O19	
Aviation	✓					✓	✓	✓	✓			✓						✓			✓					
Construction			✓	✓								✓														
Education	✓	✓	✓			✓	✓	✓				✓			✓							✓				
Healthcare	✓	✓	✓	✓		✓	✓	✓	✓									✓	✓	✓	✓			✓		✓
Manufacturing	✓			✓			✓									✓									✓	✓
Oil & Gas	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓						✓								✓
Petrochemical	✓					✓																				

Legends

Aim

- X = Factor associated with safety culture
- Y = Prediction of safety culture model framework
- Z = Relationship between safety factors and safety culture

Output

- O1 = Management Commitment, Management Practice, Organizational Support, Recruitment
- O2 = Training, Competency
- O3 = Communication
- O4 = Work performance
- O5 = Psychosocial
- O6 = Employee Perception
- O7 = Policy
- O8 = Attitude, Behaviour
- O9 = Influence of peer
- O10 = Safety rule, Safety procedure
- O11 = PPE
- O12 = Work environment
- O13 = Seniority
- O14 = Gender
- O15 = Reporting
- O16 = Knowledge
- O17 = Work pressure, Stress
- O18 = Rewards, Recognition
- O19 = Employee participation

Safety Culture Aspect

- A = Situational
- B = Behavioural
- C = Psychological

Figure 2: Mapping of safety culture research between industry, safety culture aspects, objectives and outputs of corresponding studies in Malaysia

Several of the scientific studies on occupational accidents have focused on the manufacturing industry in Malaysia, as the work there is very dangerous, e.g., operating heavy machinery or coming into contact with chemicals (Saad *et al.*, 2012, Rahman *et al.* 2014, Hee, 2014; Hui-Nee, 2014). According to the Department of Occupational Safety and Health in Malaysia, the number of accidents by sector is still dominated by manufacturing. A lack of safety culture is one of the reasons for the high number of accidents in the Malaysian manufacturing industry (Amirah *et al.*, 2013). These findings are also confirmed by Ali *et al.* (2017), who suggest that many accidents in the manufacturing industry are due to violations of OSHA regulations and a failure to emphasise the importance of maintaining a safe work culture.

In this review, 19 elements of safety culture were identified from the positive predictive factors that practitioners and researchers can examine and apply to improve safety culture in the organisation. Training and competence (14%), communication (11.6%) and work environment (9.3%) were the most important predictive elements influencing organisational safety culture across all seven sectors. Effective training is key to changing a company's safety culture (Harvey *et al.*, 2001; Marquardt *et al.*, 2021). Increased communication at all levels of the organisation can improve safety culture and reduce incidents (Lyndon *et al.*, 2015; Shuen & Wahab, 2016; Alsabri *et al.*, 2021)

The research objectives of the articles studied are addressed in the three key contexts. The data show that the researchers' preferred and predominant study objective were the factors associated with a safety culture. The researchers specified variables as factors for the study, assuming that they would have a significant impact on the results. In examining indicators of safety culture, a wide range of factors have been discovered that can influence a safety culture (Flin *et al.*, 2000; Guldenmund, 2000). However, there is still little consensus on what the core factors of a safety culture are. Most studies focus on identifying the core factors as well as the structure of these factors

that make up a safety culture and which factors are related to the safety culture of organisations. The relationships between safety variables and safety culture are also highlighted in safety culture studies, but very few studies have examined prediction as a research topic. The oil and gas industry seems to be the only industry that has made prediction a major target of safety culture research in Malaysia.

The results of this research also show that the elements of safety culture vary across industries. For example, management practices, communication, job performance, employee perception and psychosocial aspects were the most important elements in the oil and gas industry, while in the health sector, work environment, seniority, gender, reporting, work stress, employee involvement, attitude, training and competence were the most important. Consequently, this result clearly shows that each industry prefers different elements of safety culture to strengthen the culture of the organisation. This is due to the fact that different industries pose different industrial hazards and risks. Safety cultures in organisations encompass both general and company-specific values and attitudes in managing the organisation's safety (Harvey *et al.*, 2004). Consequently, this report clearly shows that different industries prefer different elements of safety culture to strengthen the culture of the organisation.

Conclusion

It is challenging to standardise the essence and elements of safety culture in different industries, as safety culture paradigms and organisational practices vary widely across companies. Future research should include a wide range of other industries or organisations in order to find a workable indicator for each of their different industries' processes. In Malaysia, additional research is needed to understand the interrelationships between the components assessed across a range of different Malaysian industries in order to achieve OSHMP25's goal of establishing a preventive culture in all work environments.

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References

- Adaku, E., Ankrah, N. A., & Ndekugri, I. E. (2021). Design for occupational safety and health: A theoretical framework for organisational capability. *Safety Science*, *133*, 105005.
- Ajmal, M., Isha, A. S. N., Nordin, S. M., Rasheed, S., Al-Mekhlafi, A. B. A., & Najj, G. M. A. (2022). Safety management and safety outcomes in oil and gas industry in Malaysia: Safety compliance as a mediator. *Process Safety Progress*, *41*, S10-S16.
- Al-Mekhlafi, A. B. A., Isha, A. S. N., Chileshe, N., Abdulrab, M., Kineber, A. F., & Ajmal, M. (2021). Impact of safety culture implementation on driving performance among oil and gas tanker drivers: A partial least squares structural equation modelling (PLS-SEM) approach. *Sustainability*, *13*(16), 8886.
- Ali, D., Yusof, Y., & Adam, A. (2017). Safety culture and issue in the Malaysian manufacturing sector. In *MATEC web of conferences* (Vol. 135). EDP Sciences. <http://dx.doi.org/10.1051/mateconf/201713500031>
- Ali, H., Abdullah, N. A. C., & Subramaniam, C. (2009). Management practice in safety culture and its influence on workplace injury: An industrial study in Malaysia. *Disaster Prevention and Management: An International Journal*, *18*(5), 470-477.
- Amirah, N. A., Asma, W. I., Muda, M. S., & Amin, W. A. A. W. M. (2013). Safety culture in combating occupational safety and health problems in the Malaysian manufacturing sectors. *Asian Social Science*, *9*(3), 182.
- Alsabri, M., Boudi, Z., Lauque, D., Dias, R. D., Whelan, J. S., Östlundh, L., & Bellou, A. (2022). Impact of teamwork and communication training interventions on safety culture and patient safety in emergency departments: A systematic review. *Journal of Patient Safety*, *18*(1), e351-e361.
- Bergh, L. I. V., Hinna, S., Leka, S., & Jain, A. (2014). Developing a performance indicator for psychosocial risk in the oil and gas industry. *Safety science*, *62*, 98-106.
- Bevilacqua, M., Bottani, E., Ciarapica, F. E., Costantino, F., Di Donato, L., Ferraro, A., ... & Vignali, G. (2020). Digital twin reference model development to prevent operators' risk in process plants. *Sustainability*, *12*(3), 1088.
- Choudhry, R. M., Fang, D., & Mohamed, S. (2007). The nature of safety culture: A survey of the state-of-the-art. *Safety science*, *45*(10), 993-1012.
- Choudhry, R. M. (2014). Behavior-based safety on construction sites: A case study. *Accident Analysis & Prevention*, *70*, 14-23. <https://doi.org/10.1016/j.aap.2014.03.007>
- Cooper, M. D. (2000). Towards a model of safety culture. *Safety Science*, *36*(2), 111-136.
- Cooper, M. D. (2018). The safety culture construct: Theory and practice. In *Safety cultures, safety models* (pp. 47-61). Springer, Cham.
- Cunningham, T. R., Tinc, P. J., Guerin, R. J., & Schulte, P. A. (2020). Translation research in occupational health and safety settings: Common ground and future directions. *Journal of Safety Research*, *74*, 161-167.
- The Office of Chief Statistician Malaysia. (2022). *Big data analytics: National occupational accident and disease statistic 2021*. Department of Statistic Malaysia Official Portal. https://v1.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=492&bul_id=MkRo

- Crisis Communication (ICC) in Malaysia oil and gas high risk industry. *SAGE Open*, 12(1), 21582440221079887.
- Musa, M., & Isha, A. S. N. (2020). Substantial effect of voluntary policy interventions on aircraft ground handling safety. *Journal of Air Transport Management*, 89, 101895.
- Nadarajan, S. P., Karuthan, S. R., Rajasingam, J., & Chinna, K. (2020). Attitudes toward patient safety among medical students in Malaysia. *International Journal of Environmental Research and Public Health*, 17(21), 7721.
- Naevestad, T. O., Hesjevoll, I. S., Ranestad, K., & Antonsen, S. (2019). Strategies regulatory authorities can use to influence safety culture in organizations: Lessons based on experiences from three sectors. *Safety Science*, 118, 409-423.
- Naji, G. M. A., Isha, A. S. N., Mohyaldinn, M. E., Leka, S., Saleem, M. S., Rahman, S. M. N. B. S. A., & Alzoraiki, M. (2021). Impact of safety culture on safety performance; mediating role of psychosocial hazard: An integrated modelling approach. *International Journal of Environmental Research and Public Health*, 18(16), 8568.
- Naji, G. M. A., Isha, A. S. N., Alazzani, A., Saleem, M. S., & Alzoraiki, M. (2022). Assessing the mediating role of safety communication between safety culture and employees safety performance. *Frontiers in Public Health*, 10, 840281. <https://doi.org/10.3389/fpubh.2022.840281>
- Neal, A., & Griffin, M. A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. *Journal of Applied Psychology*, 91(4), 946.
- Nyoni, W., Pillay, M., Rubin, M., & Jefferies, M. (2018). Organizational factors, residual risk management and accident causation in the mining industry: A systematic literature review. *International Conference on Applied Human Factors and Ergonomics* (pp. 14-23). Springer, Cham.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E. & Chou, R., & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic Reviews*, 10(1), 1-11.
- Peters, M. D., Godfrey, C. M., Khalil, H., McInerney, P., Parker, D., & Soares, C. B. (2015). Guidance for conducting systematic scoping reviews. *JBIM Evidence Implementation*, 13(3), 141-146.
- Prill, R., Karlsson, J., Ayeni, O. R., & Becker, R. (2021). Author guidelines for conducting systematic reviews and meta-analyses. *Knee Surgery, Sports Traumatology, Arthroscopy*, 29(9), 2739-2744.
- Rahman, N. A. A., Rasdan, I. A., & Arifpin, M. M. (2014). Analysis of the perception of occupational accident in mining and quarry sector towards safe and healthy working environment. *International Journal of Current Research and Academic Review, Special Issue-1*, 95-02.
- RJ, A. K., Chin, Z. H., Sharlyn, P., Priscilla, B., & Josephine, S. (2019). Hospital survey on patient safety culture in Sarawak General Hospital: A cross sectional study. *The Medical Journal of Malaysia*, 74(5), 385-388.
- Saad, M. S., Fatimah, S., & Zairihan, A. H. (2012). The determinants of industrial accidents in the Malaysian manufacturing sector. *African Journal of Business Management*, 6(5), 1999-2006.
- Samsuri, S. E., Lin, L. P., & Fahrni, M. L. (2015). Safety culture perceptions of pharmacists in Malaysian hospitals and health clinics: A multicentre assessment using the safety attitudes questionnaire. *BMJ Open*, 5(11), e008889.

- Schulman, P. R. (2020). Organizational structure and safety culture: Conceptual and practical challenges. *Safety Science*, 126, 104669.
- Shin, D. P., Gwak, H. S., & Lee, D. E. (2015). Modeling the predictors of safety behavior in construction workers. *International Journal of Occupational Safety and Ergonomics*, 21(3), 298-311.
- Shuen, Y. S., & Wahab, S. R. A. (2016). The mediating effect of safety culture on safety communication and human factor accident at the workplace. *Asian Social Science*, 12(12), 127-141.
- Sivanandy, P., Maharajan, M. K., Rajiah, K., Wei, T. T., Loon, T. W., & Yee, L. C. (2016). Evaluation of patient safety culture among Malaysian retail pharmacists: Results of a self-reported survey. *Patient Preference & Adherence*, 10, 1317.
- Van Nunen, K., Li, J., Reniers, G., & Ponnet, K. (2018). Bibliometric analysis of safety culture research. *Safety Science*, 108, 248-258.
- Varonen, U., & Mattila, M. (2000). The safety climate and its relationship to safety practices, safety of the work environment and occupational accidents in eight wood-processing companies. *Accident Analysis & Prevention*, 32(6), 761-769.
- Wong, G., Greenhalgh, T., Westhorp, G., Buckingham, J., & Pawson, R. (2013). RAMESES publication standards: Meta-narrative reviews. *Journal of Advanced Nursing*, 69(5), 987-1004.
- Xiao, Y., & Watson, M. (2019). Guidance on conducting a systematic literature review. *Journal of Planning Education & Research*, 39(1), 93-112.
- Yulia, A., Salleh, M. F. M., Noorazman, M. A., & Roslan, U. A. A. (2015). Safety culture and its contributing factors in manufacturing workplace in Malaysia. *IJABER*, 13(7), 5819-5827.
- Zaira, M. M., & Hadikusumo, B. H. (2017). Structural equation model of integrated safety intervention practices affecting the safety behaviour of workers in the construction industry. *Safety Science*, 98, 124-135.