# Unlocking the Keys to Safety: A Systematic Review of Safety Performance Metrics Across Industries

Bharto Ari Raharjo[1], Hamidah Nayati Utami[2], Tri Wulida Afrianty[3], Ika Ruhana[4]
{bhartoari.ub@gmail.com[1], hamidahn@ub.ac.id[2], twulidafia@ub.ac.id[3], ika_r_fia@ub.ac.id[4]}

Universitas Brawijaya, Indonesia[1,2,n]

**Abstract.** This systematic literature review aims to synthesize the key determinants of safety performance in the workplace. A total of 21 peer-reviewed studies published within the last decade were selected for analysis. The findings reveal that safety climate, safety culture, and safety management consistently show a significant positive impact on safety performance across various industries. Safety training, while beneficial, demonstrated varied significance in its direct influence on safety outcomes. This review emphasizes the multifaceted nature of safety performance and the critical role that these determinants play in fostering safer work environments. Additionally, the study highlights the importance of accurate and standardized measurement tools for assessing safety performance. Future research should aim to further refine these measurement methods and explore the causal relationships between safety determinants, considering different industry contexts and geographical variations. These insights provide valuable guidance for practitioners, policymakers, and researchers in developing effective strategies to enhance workplace safety.

**Keywords:** safety performance; systematic review; PRISMA; determinants factors

## 1 Introduction

Ensuring workplace safety is a critical concern for organizations across various industries. Safety performance, defined as the effectiveness of an organization in preventing workplace accidents and injuries [1], is influenced by a myriad of factors. Safety performance is a crucial aspect of any organization, particularly those operating in high-risk industries [2], [3], [4].

Measuring and understanding the key determinants of safety performance is essential for developing effective strategies to enhance safety and prevent accidents. The existing literature highlights several factors that can influence safety performance. Strong reporting culture, where employees proactively report safety-related events and concerns, has been identified as a key determinant of safety performance. Consistent execution of health, safety, and environment processes, timely closure of corrective and preventive actions, and the responsiveness and accountability of supervisors and line managers have also been found to be important in driving safety performance [5]. Additionally, individual-level factors such as safety motivation and collective safety behaviors that focus on changing the work environment have been shown to impact safety performance [6].

Safety performance encompasses various elements, including compliance with safety regulations, proactive risk management, and fostering a safety-oriented culture. Organizations in high-risk industries such as construction, manufacturing, and mining, where the potential for accidents is inherently higher, have been particularly vigilant in exploring and implementing strategies to improve safety performance [7], [8].

ICOPAG 2024, October 30, Malang, Indonesia

DOI 10.4108/eai.30-10-2024.2354738

Research has identified that organizational factors, including leadership commitment and safety climate, play a pivotal role in shaping safety performance. Leadership commitment to safety is reflected in the prioritization of safety over productivity, visible actions by leaders demonstrating a commitment to safety, and resource allocation for safety initiatives [9]. Safety climate, defined as shared perceptions among employees regarding the importance of safety within the organization, has been consistently linked to improved safety outcomes [10].

Moreover, the integration of advanced technologies and safety management systems (SMS) has shown promising results in enhancing safety performance. The adoption of digital tools such as real-time monitoring systems, predictive analytics, and automation can significantly reduce human error and ensure a safer working environment [11]. These technological advancements complement traditional safety practices and provide a holistic approach to managing workplace safety.

Employee engagement and participation in safety programs are also critical determinants of safety performance. Empowering employees to take an active role in safety processes, through training and involvement in safety committees, fosters a sense of ownership and accountability [12]. This participative approach not only enhances compliance with safety protocols but also encourages the identification and reporting of potential hazards.

Individual psychological factors such as safety knowledge, safety motivation, and risk perception are equally important. Employees with a high level of safety knowledge and motivation are more likely to engage in safe behaviors and comply with safety regulations [13]. Furthermore, the perception of risk influences how employees approach safety tasks and respond to safety interventions.

Industry-specific factors, such as the nature of work, regulatory environment, and the inherent risks associated with specific tasks, necessitate tailored safety strategies. For instance, the construction industry often deals with dynamic and unpredictable work environments, requiring adaptive safety measures and continuous monitoring [14]. Understanding these determinants and their impact on safety performance is essential for developing strategies that can enhance safety outcomes and promote a safe working environment.

Despite the wealth of research in this field, there remains a need for a comprehensive synthesis of findings that spans multiple industries and focuses on quantitative determinants and measures of safety performance. This systematic literature review aims to fill this gap by identifying and synthesizing the quantitative determinants of safety performance and the measures used to assess it across various industries. Based on this, the Research Questions (RQ) to be answered in this study are as follows:

**RQ: What are the determinants of safety performance and the quantitative measures used to assess safety performance across various industries?**

## 2 Literature Review

### 2.1. Systematic Literature Review (SLR)

A systematic literature review (SLR) represents a methodical approach to reviewing and synthesizing research on a particular topic [15]. It aims to collect, assess, and integrate findings from various studies, offering a thorough understanding of the current evidence. Using frameworks such as PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), SLRs prioritize transparency, thoroughness, and reproducibility throughout the review process [16]. This approach involves establishing specific inclusion and exclusion criteria, systematically searching relevant databases, and screening studies to gather pertinent data. The findings are then analyzed to uncover patterns, gaps, and discrepancies in the

literature. SLRs are commonly applied in disciplines like healthcare, business, and social sciences, where evidence-based insights are critical for guiding policy, practice, and future research directions.

The SLR process also helps reduce bias by using objective criteria to select studies and tools like risk of bias assessments to evaluate the quality of included research. Recent developments in SLR methodologies have emphasized the importance of refining search strategies and improving data extraction techniques to ensure the accuracy of the review. By synthesizing findings from a broad range of studies, SLRs not only offer a robust overview of the current state of knowledge but also highlight areas where further research is needed. This makes them a valuable tool for advancing research and practice in any field. Their ability to summarize and interpret large bodies of work provides researchers with a clear understanding of what is known, what remains unclear, and where future studies should focus [17].

### 2.2. Safety Performance

Safety performance is described as the "actions or behaviors demonstrated by individuals across various jobs to promote the health and safety of workers, clients, the public, and the environment" [18]. This concept encompasses a range of organizational practices such as safety climate, safety culture, leadership involvement, and safety management systems (SMS). The safety climate, referring to employees' perceptions of how safety is prioritized in the organization, has been found to significantly enhance safety behaviors, reduce accidents, and improve adherence to safety procedures. Safety performance focuses on creating a safe working environment, which can be achieved through fostering a strong safety culture and encouraging safety behaviors among workers, as well as minimizing accidents and occupational injuries at work sites [19]. According to [20] and [21], safety performance is also defined as an organization's ability to prevent workplace accidents and injuries. In recent years, safety culture and safety climate have played a critical role in influencing organizational safety performance.

## 3 Methodology

In this research, we utilized a systematic review methodology to identify and evaluate the determinants and quantitative measures of safety performance across different industries. This review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [22], [23], [24]. The review process was organized into several essential steps to ensure a thorough and methodical analysis.

### 3.1. Search Criteria and Strategy

We began by defining clear search criteria, selecting Scopus as the primary database due to its broad coverage of peer-reviewed literature. The keywords employed in the search included "Determinants," "Safety Performance," and "Safety Performance Measures." The inclusion criteria (IC) used to guide the systematic literature review were as follows:

1) IC1: Peer-reviewed articles
2) IC2: Quantitative studies
3) IC3: Studies published within the last 10 years
4) IC4: Studies focusing on the determinants and measures of safety performance across various industries.

Peer-reviewed articles were chosen to maintain the quality and credibility of the studies reviewed, while quantitative studies were prioritized to ensure the inclusion of measurable and statistically analyzable data on safety performance. The 10-year publication window was set to ensure the review included the most recent and relevant industry practices and challenges. This approach allowed us to capture a comprehensive range of factors influencing safety performance, as well as the various quantitative measures used to assess it. Articles excluded from the review included non-English language studies, qualitative research, and studies not directly relevant to safety performance.

### 3.2. Screen and Select Studies

The screening and selection of studies followed a two-phase process. First, we reviewed the titles and abstracts to identify potentially relevant quantitative studies. In the second phase, we conducted a full-text screening of these selected studies to ensure they met the established inclusion criteria. The data extraction process focused on identifying the determinants and measures of safety performance, with an emphasis on quantitative results.

The initial practical screening process yielded 340 papers. After applying IC1 (peer-reviewed articles) and IC2 (quantitative studies), the pool was narrowed down to 70 papers. At this stage, the titles, abstracts, and keywords of these 70 papers were evaluated for relevance to the research objectives, resulting in 52 studies selected based on IC3 (studies published in the last 10 years). A comprehensive full-text review of these 52 papers was then conducted to ensure adherence to the inclusion criteria. Finally, using IC4 (focus on determinants and measures of safety performance across industries), 21 papers were identified as key contributors. These 21 studies were further analyzed to consolidate findings on the subject, identify knowledge gaps, and propose future research directions.

### 3.3. Analyze and Synthesize Results

The findings from the selected studies were summarized to provide a comprehensive overview of the determinants and measures of safety performance. Figure 1 depicts the stages of our systematic literature review.

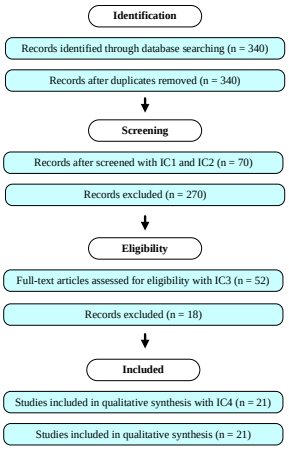


**Figure 1.** Flowchart of the Systematic Literature Review and Selection Process

Figure 1 illustrates the flowchart detailing the process of literature selection. Each study was assessed independently by four authors to ensure objectivity and reduce bias in the evaluation process. In cases of disagreement, the authors resolved differences through discussion and consensus.

## 4 Results

The search of the SCOPUS database using the keywords ('Determinants AND Safety Performance OR Safety Performance Measures') identified 340 papers published between 2014 and 2024 in English. These papers were screened and filtered using the IC2 (quantitative studies) and IC3 (published within the last 10 years) criteria, with a focus on titles, abstracts, and keywords. As a result, 52 articles were shortlisted. Following further analysis, 21 articles were selected for in-depth examination. Table 1 provides a list of the final selected articles.

Table 1. List of Selected Articles

| No | Author & Year | Country & Sample | Purpose |
|---|---|---|---|
| 1 | [25] | Panel data of European companies from different activity sectors from 2005 to 2019 | To explore how safety culture impacts financial performance through safety performance in European organizations |
| 2 | [26] | 374 managers and staff in the Iraqi electricity sector | To identify key determinants of workplace safety performance in the Iraqi electricity sector |
| 3 | [27] | 368 employee in the Ethiopian manufacturing sector | To examine the influence of safety culture and climate on safety performance, with employee engagement as a mediator, in Ethiopian manufacturing |
| 4 | [28] | Ghana; the oil, gas, and allied energy industry | To propose new metrics for improving safety performance in Ghana's oil, gas, and energy industries |
| 5 | [29] | Laborers and managers in small and medium-sized enterprises (SMEs) | To assess how leadership moderates the relationship between safety culture, climate, and performance in SMEs |
| 6 | [30] | Airport staff and as many as 60 officers at Wamena airport in eastern Indonesia | To evaluate the impact of safety risk management and airport personnel competence on flight safety at Wamena airport, Indonesia |
| 7 | [31] | Employees belonging to pharmaceutical firms located in different industrial zones of Lahore, Pakistan | Examines the relationship between safety management practices and safety performance in Lahore's pharmaceutical firms |

| No | Author & Year | Country & Sample | Purpose |
|---|---|---|---|
| 8 | [32] | 320 employees in the petrochemical industry of Iran | Investigates the link between safety attitudes and performance in Iran's petrochemical industry, with safety climate as a mediator |
| 9 | [33] | 380 production employees in three states of Malaysia from the upstream oil and gas sector | Evaluates how psychosocial hazards mediate the relationship between safety culture and performance in Malaysia's upstream oil and gas sector |
| 10 | [34] | 211 nurses at 2 large hospitals in the west of Iran | Explores how hospital and patient safety climates affect nurse safety performance in Iran |
| 11 | [35] | 78 completed building projects in Vietnam | Examines the interaction between safety culture and project complexity on construction safety performance in Vietnam |
| 12 | [36] | 146 nurses | Analyzes the relationship between safety climate, psychosocial hazards, and safe work behaviors in the nursing sector |
| 13 | [37] | 733 safety experts of aviation from safety experts of India, Taiwan, Thailand, Malaysia, Qatar, Indonesia, Japan, Singapore, UAE, USA, UK, France, Germany, Turkey, New Zealand, Switzerland, and Australia. | Assesses the moderating effects of multi-group factors on safety management systems, human factors, and civil aviation safety in various countries |
| 14 | [38] | 105 manufacturing sector of Malaysia | Explains the relationship between success factors, internal controls, and safety performance in Malaysia's manufacturing sector |
| 15 | [39] | 5162 truck drivers from a U.S. trucking company | Investigates the impact of supervisory safety communication and safety climate on safety outcomes in U.S. trucking companies |

| No | Author & Year | Country & Sample | Purpose |
|---|---|---|---|
| 16 | [2] | 103 process industry organisations located in Spain | Analyzes how safety leadership and working conditions affect safety behaviors in Spanish process industries |
| 17 | [40] | 230 responses from different types of construction projects across India | Identifies direct and indirect determinants of safety performance in India's construction project |
| 18 | [41] | 244 micro-firms (employing less than 10 employees) from several economic sectors with the help of the Department of Labour Inspection, Cyprus | Explores organizational determinants of safety performance in micro-firms across Cyprus |
| 19 | [42] | 354 employee in Sarcheshmeh copper complex in Rafsanjan | Examines the relationship between safety climate and performance in Iran's copper industry, with safety knowledge and motivation as mediators |
| 20 | [43] | 152 nurses in a large Belgian hospital | Identifies key psychological mechanisms influencing nurse safety performance in Belgian hospitals |
| 21 | [44] | 47 completed building projects in Singapore | Analyzes how safety investments, culture, and project hazards interact to impact construction safety performance in Singapore |

Building upon the analysis of the 21 selected articles, Table 2 presents the determinants that affect safety performance.

Table 2. Determinant Factors of Safety Performance

| No | Determining Factor | Results | | Prior Studies |
|---|---|---|---|---|
| 1 | Safety Climate | Significant | Positive | [27] |
| | | Significant | Positive | [29] |
| | | Significant | Positive | [31] |
| | | Significant | Positive | [32] |
| | | Significant | Positive | [34] |
| | | Significant | Positive | [36] |
| | | Significant | Positive | [39] |
| | | Significant | Positive | [40] |

| | | | | |
|---|---|---|---|---|
| | | Significant | Positive | [42] |
| 2 | Safety Culture | Significant | Positive | [27] |
| | | Significant | Positive | [25] |
| | | Significant | Positive | [28] |
| | | Significant | Positive | [29] |
| | | Significant | Positive | [33] |
| | | Significant | Positive | [44] |
| 3 | Safety Management | Significant | Positive | [26] |
| | | Significant | Positive | [30] |
| | | Significant | Positive | [37] |
| | | Significant | Positive | [40] |
| 4 | Safety Training | Not Significant | Positive | [26] |
| | | Significant | Positive | [28] |
| | | Not Significant | Positive | [41] |

The following table presents a qualitative synthesis of various studies that measure the safety performance variable. Each study included in the synthesis has explored different aspects of safety performance in various contexts. Similar or related measurements have been grouped together to provide a more comprehensive overview of how safety performance is assessed across different research.

Table 3. Synthesis of Safety Performance Measurements

| **No** | **Measurement** | **Source** |
|---|---|---|
| 1 | Total injury rate | [25] |
| 2 | Process safety information, operation procedure, employee participation, pre-start-up safety review, incident investigation, emergency planning | [27] |
| 3 | Safety participation, safety compliance, injuries and near misses | [29] |
| 4 | Safety participation and safety compliance | [2], [34], [36], [39], [43] |
| 5 | Airport operation procedure, airport operation equipment/facilities, airport personnel | [30] |
| 6 | Compliance with safety standards, belief in safety importance, use of PPE, participation in safety planning, risk evaluation, safety inspections, improvement suggestions, safety discussions | [31] |
| 7 | Leading, lagging | [33] |
| 8 | Incident rate / Accident rate | [35], [44] |
| 9 | Elements of safety, accidental rate, safety hazards, fatalities, emergency response | [37] |
| 10 | Workspaces, machinery, electrical equipment, ventilation, PPE, hazardous | [38] |

| | | |
|---|---|---|
| | areas, safety signs, self-inspections, inspection records | |
| 11 | Satisfaction with project safety, rating overall project safety, zero-incident goal | [40] |
| 12 | Compliance with health and safety law, health and safety initiatives, individual safety protection, general safety equipment, basic health and safety systems, employer's knowledge, employee use of safety measures | [41] |

Table 3 demonstrates that safety performance measurements are generally divided into several key groups, reflecting specific aspects of workplace safety. The first group, including studies by [25], [35], [44], focuses on direct measurements like injury rates and incident rates, which are outcome indicators of the effectiveness of safety measures implemented. The second group encompasses various measurements related to safety participation and compliance, assessed by several researchers such as [29], [34], [39], among others. These measurements emphasize the importance of active employee involvement in safety processes as well as their compliance with safety procedures.

The study by [31] offers a more comprehensive approach by covering various aspects such as compliance with safety standards, belief in the importance of safety, and the use of PPE, all of which contribute to enhanced workplace safety. Additionally, [40] focus on aspects of satisfaction with project safety performance and aspirations to achieve a zero-incident status, reflecting the organization's long-term safety targets.

# 5 Discussion

## 5.1. Safety Climate

Safety climate plays a crucial role in shaping safety performance across various organizations and industries. It represents the shared perceptions of employees regarding the significance of workplace safety, encompassing their attitudes, beliefs, and values about safety policies, procedures, and how management and leadership emphasize them.

Several studies, including [27], [29], [31], and [32], have consistently highlighted the positive influence of a strong safety climate on safety outcomes, such as lower incident rates and improved adherence to safety procedures. These studies indicate that when employees perceive safety as a key priority in their organization, they are more inclined to engage in safe behaviors, comply with safety rules, and actively participate in safety initiatives. The findings of [34] and [36] further support this relationship, showing that a positive safety climate enhances individual safety behaviors while also encouraging a collective commitment to workplace safety. This collective effort can lead to a culture where safety practices are deeply embedded within the organizational values.

Additionally, studies [39] and [40] emphasize the importance of a positive safety climate in fostering proactive safety management. They suggest that when the safety climate is strong, employees are more likely to take the initiative to identify hazards, report unsafe conditions, and contribute to continuous safety improvements. This proactive mindset is essential for preventing accidents and maintaining sustainable safety performance. Finally, the research by [42] underlines that safety climate is not solely driven by management but also requires active employee engagement. Their findings indicate that when employees feel that their safety

concerns are acknowledged and addressed by management, it strengthens the safety climate and, in turn, enhances overall safety performance in the organization.

### 5.2. Safety Culture

A company's total safety performance is heavily influenced by its culture. In contrast to safety environment, which reflects current perceptions and attitudes toward safety, safety culture is more deeply embedded and contains the enduring values, norms, and practices that determine how safety is viewed and managed across all levels of an organization.

The research consistently shows a significant positive relationship between safety culture and safety performance. For instance, [27] and [25] highlight that organizations with a strong safety culture tend to exhibit lower injury rates, fewer accidents, and greater adherence to safety protocols. These studies suggest that when safety is embedded in the organizational culture, it influences every aspect of operations, from decision-making to daily practices, leading to improved safety outcomes.

[28] and [29] further support this by demonstrating that a robust safety culture encourages continuous improvement in safety practices. Organizations with a positive safety culture not only comply with existing safety standards but also strive to go beyond mere compliance. They actively seek to identify and mitigate risks, engage employees in safety initiatives, and foster a shared sense of responsibility for maintaining a safe working environment.

The work of [33] underscores the importance of leadership in cultivating a strong safety culture. Their findings suggest that leadership commitment to safety is crucial for setting the tone and expectations regarding safety across the organization. When leaders prioritize safety and model safe behaviors, it reinforces the importance of safety culture and encourages employees to follow suit.

[44] add to this by showing that a positive safety culture not only impacts safety performance directly but also contributes to a more cohesive and resilient organizational structure. In organizations with a strong safety culture, employees are more likely to collaborate effectively, share information about potential hazards, and support each other in maintaining safety standards. This collaborative approach enhances the organization’s overall capacity to manage and respond to safety challenges.

### 5.3. Safety Management

Safety management is an essential component of the foundation for organizational safety performance. It includes the systems, policies, procedures, and practices put in place to maintain a safe working environment. Effective safety management entails not only implementing safety protocols, but also continuously monitoring, assessing, and improving these policies to avoid accidents and injuries.

Research has consistently shown a significant positive impact of safety management on safety performance. [26] and [30] highlight that robust safety management systems are essential for achieving and maintaining high safety standards. These studies suggest that when safety management is systematically and effectively implemented, it leads to a reduction in workplace accidents and enhances the overall safety performance of the organization. Key elements of successful safety management include clear communication of safety policies, regular training, and the active involvement of employees in safety initiatives.

[37] further emphasize the role of safety management in hazard identification and risk mitigation. Their findings indicate that organizations with strong safety management practices are better equipped to identify potential hazards before they result in incidents. This proactive

approach not only minimizes risks but also fosters a culture of safety awareness throughout the organization. Regular safety audits, risk assessments, and incident investigations are some of the tools that contribute to effective safety management, ensuring that potential safety issues are addressed promptly.

[40] add to this by illustrating the importance of leadership and management commitment in safety management. Their research shows that when organizational leaders are committed to safety management, it significantly boosts safety performance. This commitment is often reflected in the allocation of resources for safety, the establishment of clear safety goals, and the integration of safety management into the overall strategic planning of the organization. Effective leadership in safety management also involves setting clear expectations, providing necessary support, and fostering a safety-oriented culture.

### 5.4. Safety Training

Safety training is a critical component in promoting a safe work environment because it provides employees with the knowledge and skills they need to spot hazards, follow safety regulations, and respond effectively in crises. However, the impact of safety training on safety performance has yielded varying outcomes among research.

[28] found that safety training has a significant positive effect on safety performance. Their research emphasizes that well-structured and frequent safety training programs can lead to improved safety awareness and behavior among employees. When employees are regularly trained on safety procedures, they are more likely to adhere to safety protocols, recognize potential hazards, and take appropriate preventive measures. This finding underscores the importance of continuous and comprehensive safety training as a critical component of an organization's safety management strategy.

On the other hand, studies by [26] and [41] present a different perspective. While both studies acknowledge a positive relationship between safety training and safety performance, they did not find the relationship to be statistically significant. This suggests that while safety training is beneficial, its direct impact on improving safety performance might be influenced by other factors, such as the quality of the training, the level of employee engagement, or the integration of training into broader safety management practices.

The mixed findings in these studies highlight the complexity of safety training's role in enhancing safety performance. [26] and [41] suggest that the mere provision of safety training may not be sufficient to produce significant improvements in safety performance. It is crucial for organizations to ensure that safety training is not only comprehensive and relevant but also effectively integrated into the daily work practices of employees. This includes reinforcing training with practical applications, ongoing assessments, and continuous improvement based on feedback and changing safety requirements.

## 8 Conclusion

In summary, 21 studies were selected and analyzed to examine workplace safety performance. The analysis identified four major determinants of safety performance: safety climate, safety culture, safety management, and safety training. The findings emphasize the importance of understanding the complex nature of safety performance. By acknowledging the crucial roles played by safety climate, culture, management, and training, this research provides valuable insights for business practitioners, policymakers, and researchers aiming to create more effective safety strategies. These insights contribute to a broader understanding of the factors influencing safety and their impact on workplace conditions, ultimately promoting safer work environments.

Furthermore, the study highlights the significance of accurately measuring safety performance. Future research could focus on improving and standardizing the tools and methods used to evaluate safety performance across various industries and regions. This would enhance the precision and consistency of safety assessments, as well as provide deeper insights into the causal relationships between these key factors.

## References


[1] N. Venkataraman, "Safety Performance Factor," *International Journal of Occupational Safety and Ergonomics*, vol. 14, no. 3, pp. 327–331, Jan. 2008, doi: 10.1080/10803548.2008.11076772.

[2] B. Fernández-Muñiz, J. M. Montes-Peón, and C. J. Vázquez-Ordás, "The role of safety leadership and working conditions in safety performance in process industries," *J Loss Prev Process Ind*, vol. 50, pp. 403–415, Nov. 2017, doi: 10.1016/j.jlp.2017.11.001.

[3] G. Grote, "Safety management in different high-risk domains – All the same?," *Saf Sci*, vol. 50, no. 10, pp. 1983–1992, Dec. 2012, doi: 10.1016/j.ssci.2011.07.017.

[4] J. Zara, S. M. Nordin, and A. S. N. Isha, "Influence of communication determinants on safety commitment in a high-risk workplace: a systematic literature review of four communication dimensions," *Front Public Health*, vol. 11, Aug. 2023, doi: 10.3389/fpubh.2023.1225995.

[5] J. Stough, "Strong Reporting Culture as Stepping Stone to Continuously Drive Safety Performance Improvement," in *All Days*, SPE, Apr. 2012. doi: 10.2118/152566-MS.

[6] M. T. Ford and L. E. Tetrick, "Safety motivation and human resource management in North America," *The International Journal of Human Resource Management*, vol. 19, no. 8, pp. 1472–1485, Aug. 2008, doi: 10.1080/09585190802200231.

[7] Z. Zhou, Y. M. Goh, and Q. Li, "Overview and analysis of safety management studies in the construction industry," *Saf Sci*, vol. 72, pp. 337–350, Feb. 2015, doi: 10.1016/j.ssci.2014.10.006.

[8] K. Mearns, S. M. Whitaker, and R. Flin, "Safety climate, safety management practice and safety performance in offshore environments," *Saf Sci*, vol. 41, no. 8, pp. 641–680, Oct. 2003, doi: 10.1016/S0925-7535(02)00011-5.

[9] P. Kines *et al.*, "Nordic Safety Climate Questionnaire (NOSACQ-50): A new tool for diagnosing occupational safety climate," *Int J Ind Ergon*, vol. 41, no. 6, pp. 634–646, Nov. 2011, doi: 10.1016/j.ergon.2011.08.004.

[10] A. Neal and M. A. Griffin, “Safety climate and safety at work.,” in *The psychology of workplace safety.*, Washington: American Psychological Association, 2004, pp. 15–34. doi: 10.1037/10662-002.

[11] M. Robinson, P. L. Bigelow, and C. H. Langford, “Characterizing the effectiveness of occupational health and safety regulatory enforcement in British Columbia, Canada,” *Saf Sci*, vol. 79, pp. 56–73, 2015.

[12] D. A. Hofmann and F. P. Morgeson, “Safety-related behavior as a social exchange: The role of perceived organizational support and leader–member exchange.,” *Journal of Applied Psychology*, vol. 84, no. 2, pp. 286–296, Apr. 1999, doi: 10.1037/0021-9010.84.2.286.

[13] M. S. Christian, J. C. Bradley, J. C. Wallace, and M. J. Burke, “Workplace safety: A meta-analysis of the roles of person and situation factors.,” *Journal of Applied Psychology*, vol. 94, no. 5, pp. 1103–1127, 2009, doi: 10.1037/a0016172.

[14] H. Lingard and S. Rowlinson, *Occupational Health and Safety in Construction Project Management*. Routledge, 2004. doi: 10.4324/9780203507919.

[15] M. Pollock *et al.*, “Preferred Reporting Items for Overviews of Reviews (PRIOR): a protocol for development of a reporting guideline for overviews of reviews of healthcare interventions,” *Syst Rev*, vol. 8, no. 1, p. 335, Dec. 2019, doi: 10.1186/s13643-019-1252-9.

[16] A. C. Tricco *et al.*, “PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation,” *Ann Intern Med*, vol. 169, no. 7, pp. 467–473, Oct. 2018, doi: 10.7326/M18-0850.

[17] M. J. Page *et al.*, “The PRISMA 2020 statement: an updated guideline for reporting systematic reviews,” *BMJ*, p. n71, Mar. 2021, doi: 10.1136/bmj.n71.

[18] P. A. Cornelissen, J. J. Van Hoof, and M. D. T. De Jong, “Determinants of safety outcomes and performance: A systematic literature review of research in four high-risk industries,” *J Safety Res*, vol. 62, pp. 127–141, Sep. 2017, doi: 10.1016/j.jsr.2017.06.009.

[19] M. A. Al-Bsheish, “Enhancing Safety Performance by Recognizing the Role of Perceived Management Commitment to Safety in the Jordanian Healthcare Industry: Conceptual Framework,” *International Journal of Business and Social Research*, vol. 7, no. 01, p. 01, Jan. 2017, doi: 10.18533/ijbsr.v7i01.1023.

[20] R. B. M. de Koster, D. Stam, and B. M. Balk, “Accidents happen: The influence of safety-specific transformational leadership, safety consciousness, and hazard reducing systems on warehouse accidents,” *Journal of Operations Management*, vol. 29, no. 7–8, pp. 753–765, Nov. 2011, doi: 10.1016/j.jom.2011.06.005.

[21] Y.-J. Liu, J.-L. Chen, S.-Y. Cheng, M.-T. Hsu, and C.-H. Wang, “Evaluation of safety performance in process industries,” *Process Safety Progress*, p. n/a-n/a, Oct. 2013, doi: 10.1002/prs.11644.

[22] S. Farisyi, M. Al Musadieq, H. N. Utami, and C. R. Damayanti, “A Systematic Literature Review: Determinants of Sustainability Reporting in Developing Countries,” *Sustainability*, vol. 14, no. 16, p. 10222, Aug. 2022, doi: 10.3390/su141610222.

[23] A. Liberati, “The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration,” *Ann Intern Med*, vol. 151, no. 4, p. W, Aug. 2009, doi: 10.7326/0003-4819-151-4-200908180-00136.

[24] D. Moher *et al.*, “Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement,” *Syst Rev*, vol. 4, no. 1, p. 1, Dec. 2015, doi: 10.1186/2046-4053-4-1.

[25] I. Bautista-Bernal, C. Quintana-García, and M. Marchante-Lara, “Safety culture, safety performance and financial performance. A longitudinal study,” *Saf Sci*, vol. 172, p. 106409, Apr. 2024, doi: 10.1016/j.ssci.2023.106409.

[26] O. M. Tawfeeq, S. A. L. Thiruchelvam, and I. Bin Zainal Abidin, “Impact of Safety Management Practices on Safety Performance in Workplace Environment: A Case Study in Iraqi Electricity Production Industry,” *Engineering, Technology & Applied Science Research*, vol. 14, no. 2, pp. 13539–13546, Apr. 2024, doi: 10.48084/etasr.7006.

[27] M. Abeje and F. Luo, “The Influence of Safety Culture and Climate on Safety Performance: Mediating Role of Employee Engagement in Manufacturing Enterprises in Ethiopia,” *Sustainability*, vol. 15, no. 14, p. 11274, Jul. 2023, doi: 10.3390/su151411274.

[28] E. K. Ofori *et al.*, “Exploring new antecedent metrics for safety performance in Ghana’s oil and gas industry using partial least squares structural equation modelling (PLS-SEM),” *Resources Policy*, vol. 81, p. 103368, Mar. 2023, doi: 10.1016/j.resourpol.2023.103368.

[29] M. Asad, M. Kashif, U. A. Sheikh, M. U. Asif, S. George, and G. ul H. Khan, “Synergetic effect of safety culture and safety climate on safety performance in SMEs: does transformation leadership have a moderating role?,” *International Journal of Occupational Safety and Ergonomics*, vol. 28, no. 3, pp. 1858–1864, Jul. 2022, doi: 10.1080/10803548.2021.1942657.

[30] S. A. Majid *et al.*, “The effect of safety risk management and airport personnel competency on aviation safety performance,” *Uncertain Supply Chain Management*, vol. 10, no. 4, pp. 1509–1522, 2022, doi: 10.5267/j.uscm.2022.6.004.

[31] F. Saleem and M. I. Malik, “Safety Management and Safety Performance Nexus: Role of Safety Consciousness, Safety Climate, and Responsible Leadership,” *Int J Environ Res Public Health*, vol. 19, no. 20, p. 13686, Oct. 2022, doi: 10.3390/ijerph192013686.

[32] S. Karimpour, F. Jahani, and G. A. Shirali, “The relationship between safety attitude and safety performance in the petrochemical industry: The mediating role of safety climate,” *Work*, vol. 68, no. 2, pp. 507–517, Feb. 2021, doi: 10.3233/WOR-203353.

[33] G. M. A. Naji *et al.*, “Impact of Safety Culture on Safety Performance; Mediating Role of Psychosocial Hazard: An Integrated Modelling Approach,” *Int J Environ Res Public Health*, vol. 18, no. 16, p. 8568, Aug. 2021, doi: 10.3390/ijerph18168568.

[34] H. Aghaei, Z. Sadat Asadi, M. Mirzaei Aliabadi, and H. Ahmadinia, “The Relationships Among Occupational Safety Climate, Patient Safety Climate, and Safety Performance Based on Structural Equation Modeling,” *Journal of Preventive Medicine and Public Health*, vol. 53, no. 6, pp. 447–454, Nov. 2020, doi: 10.3961/jpmph.20.350.

[35] M. T. Trinh and Y. Feng, “Impact of Project Complexity on Construction Safety Performance: Moderating Role of Resilient Safety Culture,” *J Constr Eng Manag*, vol. 146, no. 2, Feb. 2020, doi: 10.1061/(ASCE)CO.1943-7862.0001758.

[36] A. Manapragada, V. Bruk-Lee, A. H. Thompson, and L. M. Heron, “When safety climate is not enough: Examining the moderating effects of psychosocial hazards on nurse safety performance,” *J Adv Nurs*, vol. 75, no. 6, pp. 1207–1218, Jun. 2019, doi: 10.1111/jan.13911.

[37] V. Singh, S. Kumar Sharma, I. Chadha, and T. Singh, “Investigating the moderating effects of multi group on safety performance: The case of civil aviation,” *Case Stud Transp Policy*, vol. 7, no. 2, pp. 477–488, Jun. 2019, doi: 10.1016/j.cstp.2019.01.002.

[38] C. C. Hong, T. Ramayah, and C. Subramaniam, “The relationship between critical success factors, internal control and safety performance in the Malaysian manufacturing sector,” *Saf Sci*, vol. 104, pp. 179–188, Apr. 2018, doi: 10.1016/j.ssci.2018.01.002.

[39] Y. Huang, R. R. Sinclair, J. Lee, A. C. McFadden, J. H. Cheung, and L. A. Murphy, “Does talking the talk matter? Effects of supervisor safety communication and safety climate on long-haul truckers’ safety performance,” *Accid Anal Prev*, vol. 117, pp. 357–367, Aug. 2018, doi: 10.1016/j.aap.2017.09.006.

[40] D. A. Patel and K. N. Jha, “Structural Equation Modeling for Relationship-Based Determinants of Safety Performance in Construction Projects,” *Journal of Management in Engineering*, vol. 32, no. 6, Nov. 2016, doi: 10.1061/(ASCE)ME.1943-5479.0000457.

[41] G. Boustras, A. Hadjimanolis, A. Economides, A. Yiannaki, and L. Nicolaides, “Management of health and safety in micro-firms in Cyprus – Results from a Nationwide Survey,” *Saf Sci*, vol. 79, pp. 305–313, Nov. 2015, doi: 10.1016/j.ssci.2015.06.014.

[42] A. Khaleghinejad and M. Ziaaldini, “Relationship between employees’ safety climate and safety performance with respect to mediating effect of safety knowledge and safety motivation in Sarcheshmeh copper complex,” *Journal of Health and Safety at Work*, vol. 5, no. 4, pp. 69–86, Dec. 2015, Accessed: Sep. 09, 2024. [Online]. Available: https://jhsw.tums.ac.ir/article-1-5332-en.html

[43] I. Lievens and P. Vlerick, “Transformational leadership and safety performance among nurses: the mediating role of knowledge-related job characteristics,” *J Adv Nurs*, vol. 70, no. 3, pp. 651–661, Mar. 2014, doi: 10.1111/jan.12229.

[44] Y. Feng, E. A. L. Teo, F. Y. Y. Ling, and S. P. Low, “Exploring the interactive effects of safety investments, safety culture and project hazard on safety performance: An empirical analysis,” *International Journal of Project Management*, vol. 32, no. 6, pp. 932–943, Aug. 2014, doi: 10.1016/j.ijproman.2013.10.016.