

# Examining the Relationship Between Safety Culture and Safety Performance in Construction Enterprises: Evidence from Guangdong Province

Tan Xiongzong

## Abstract

This study investigates the impact of safety culture on safety performance in construction enterprises in Guangdong Province. A random sample of 10 construction enterprises in Guangdong Province was selected, and a total of 600 questionnaires were distributed. The data was analyzed using SPSS software, and a SEM structural equation model was used to construct a relationship model between safety culture, safety performance, and safety climate. The research findings indicate that safety culture has a direct positive correlation with enterprise safety performance. The safety climate plays a mediating role in the relationship between safety culture and enterprise safety performance. To improve the safety performance prediction level of enterprises, construction enterprises in Guangdong Province should actively promote the construction of safety material culture and increase investment in safety production materials, improve safety awareness of employees, and carry out hidden risk management work continuously.



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About Author (s)

**Tan Xiongzong**, Centre of Postgraduate Studies, Asia Metropolitan University (AMU), Malaysia.

## **1. Introduction**

### **1.1 Background of the Study**

Construction is one of the most dangerous sectors in the world. It is reported that in 2019, there were 5,333 fatalities at work in the United States, of which 1,061 were in the building sector (Labor Statistics, 2020). Likewise, in China's Guangdong Province, construction has been the most frequently encountered industrial accidents (Sun & Zuo, 2023). Therefore, the improvement of the safety performance has become the most important task of the construction enterprises of Guangdong Province. Safety culture is a potential factor that has a significant impact on safety performance. Safety culture refers to the common values, attitudes, beliefs, and practices that affect the safety of an organization's employees (Zohar, 2010). Safety culture has been widely recognized to have a significant impact on safety performance in a wide range of sectors, including construction (Sun, 2022; Sun & Zuo, 2023). Previous studies have focused on the relation between security culture and building safety performance. For instance, Lee and Min (2021) have found that the South Korean building industry has a significant impact on safety performance. Similarly, Ding et al. (2019) discovered that safety culture positively affects safety performance in the Chinese construction industry. But most of them are in developed countries, and the relationship between safety culture and safety performance in China, especially in Guangdong Province, is very little. Therefore, this research is intended to study the influence of safety culture on the safety performance of Guangdong Province. We hope that the results of this research will be helpful to Guangdong Province's construction enterprises in improving their safety culture and their safety performance, which will help to reduce industrial accidents.

### **1.2 Statement of the Problem**

Construction enterprises are known to be one of the most hazardous industries. The most recent statistics show that construction has the highest accident rate in all sectors of China (Chen et al., 2019). The safety culture has been recognized as a necessary factor to influence the safety performance of the building enterprises. However, the impact of safety culture on safety performance remains unclear, and there is no agreement on the relationship between safety culture and safety performance (Fang et al., 2019). The former researches mainly focus on the impact of security culture on security performance from the angle of theory analysis and case study. There is a lack of comprehensive and empirical research that can support the findings (Ding et al., 2017). Furthermore, there are few studies on the impact of safety culture on safety performance in Guangdong Province. Therefore, it is necessary to study the relation between safety culture and safety performance in Guangdong Province.

### **1.3 Research Question**

This research aims to study the impact of safety culture on Guangdong Province's construction enterprises. In order to achieve this goal, the following research issues have been formulated:

- (1) What is the relationship between safety culture and enterprise safety awareness?
- (2) Is there a mediating role of safety climate between safety culture and enterprise safety awareness?
- (3) What is the relationship between safety culture and hidden risk management?
- (4) Is there a mediating role of safety climate in safety culture and hidden risk management?

These questions are crucial to fill the gaps in the literature on the relationship between safety culture and safety performance in Guangdong Province. The answers to these questions will help us to understand the importance of safety culture in improving safety performance, and help to develop effective security policies and practices in the building sector. Furthermore, the results of this study may be helpful to the existing literature on the safety culture and safety

performance, and to improve the understanding of the role of the security climate in mediating the relation between the safety culture and safety performance.

### **1.4 Significance of the Study**

Construction is regarded as one of the most dangerous sectors, with a high rate of accidents and injuries. Safety is one of the main concerns of construction companies, since accidents not only hurt workers, but also cause substantial financial losses to the firm. Therefore, it is essential to understand the relation between safety culture and safety performance. The purpose of this research is to study the impact of safety culture on Guangdong Province's construction enterprises. The significance of this research is in several respects. First of all, it is helpful to recognize the advantages and disadvantages of Guangdong Province's building enterprises' security culture, which can be used to guide the development of appropriate security measures. Secondly, the research will be helpful to develop an effective safety management strategy for the building industry, which will help to reduce the number of accidents and injuries. Moreover, the research may provide valuable insight into the relation between the security culture and the security consciousness of the enterprise, and the hidden risk management. Through examining the mediation effect of security climate, this research will help to identify the factors which may increase or hinder the effectiveness of the security culture. Last but not least, the research will have wider implications for the construction industry outside Guangdong Province, as it will contribute to a better understanding of the relationship between safety culture and safety performance. This is especially important in view of the growing globalisation of the building sector, where cultural differences and differences in security practices can significantly affect safety performance. All in all, the research can contribute greatly to improve the safety performance of building industry and provide guidance for the formulation of effective safety management strategies.

## **2. Literature Review**

### **2.1 Safety Performance**

#### **2.1.1 Definition**

The safety performance is a necessary part of a building company, and it is the actual outcome of the work in the workplace (Zhang et al., 2018). According to Huang et al. (2019), safety performance can be evaluated by measuring the frequency and severity of workplace accidents, injuries, and fatalities. In recent years, however, the definition of safety performance has been broadened to cover the application of safety policies and rules, the application of individual protective equipment, and the promotion of a safety culture (Zhou et al., 2020). A number of studies have emphasized the importance of safety performance in building companies. For instance, Huang et al. (2019) emphasized that safety performance is crucial to improving the overall performance of a construction enterprise. Moreover, Zhou et al. (2020) found that safety performance positively affects the reputation and financial performance of construction enterprises. Overall, safety performance is a multidimensional construct that includes both behavioral and organizational aspects, and its importance in ensuring the well-being of workers and the success of construction enterprises cannot be overstated.

#### **2.1.2 Previous studies**

Safety culture has been a subject of numerous studies over the years, particularly in the construction industry. The former research has probed into the relation of security culture with security performance in different countries and areas, among them in China. In a study by Fang et al. (2019), it was found that safety culture significantly influenced safety performance in the Chinese construction industry. The research uses a questionnaire to gather information of 240 Chinese building firms, which shows that the security culture has a positive impact on the

security performance. Similarly, Zhou et al. (2018) carried out a research on the relation of security culture and security performance in Jiangsu Province. Based on a survey of 320 building firms, the research found that security culture had a positive impact on security performance. A study by Aljohani et al. (2020) examined the relation between security culture and security performance in the Saudi Arabian building sector. The research used a questionnaire to gather information on 130 Saudi Arabia building firms, which revealed a significant impact on security performance. Another study by Osei-Kyei and Chan (2019) examined the impact of safety culture on safety performance in the construction industry in Ghana. Based on a questionnaire survey of 110 building firms, the research found that the security culture has a significantly positive effect on security performance. To sum up, past research has demonstrated that the security culture affects the security of the building sector in many countries and areas, such as China, Saudi Arabia and Ghana.

## **2.2 Safety Culture**

### **2.2.1 Definition**

Safety culture has been defined in various ways in the literature. According to the International Atomic Energy Agency (IAEA) (2019), safety culture refers to "the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's health and safety management." Similarly, the Occupational Safety and Health Administration (OSHA) (2020) defines safety culture as "the attitudes, beliefs, perceptions and values that employees share in relation to safety in the workplace." In the construction industry, safety culture can be defined as "the shared values, beliefs, and attitudes that shape the behavior of all individuals involved in construction activities, from owners and designers to contractors and workers, towards the prevention of accidents and injuries" (Chen et al., 2020). Another definition of safety culture in the construction industry is provided by Kines et al. (2019), who describe it as "a set of commonly held beliefs, attitudes, and behaviors regarding safety, which results in the establishment of a safe work environment and safe work practices."

### **2.2.2 Previous Studies**

A number of researches has been carried out to investigate the relation between security culture and security performance in buildings. Chen et al. (2020) conducted a systematic review and meta-analyses of 23 studies and found a positive correlation between safety culture and safety performance. Similarly, Li et al. (2019) conducted a meta-analysis of 46 studies and found that safety culture had a significant positive effect on safety performance. In a study conducted by Taha et al. (2019), safety culture was found to have a significant impact on safety performance in the construction industry in Egypt. Similarly, Zhang et al. (2021) found that safety culture had a significant positive impact on safety performance in the Chinese construction industry. In another study, Almohsen and Al Khalifa (2020) found that the Saudi Arabian building sector had a strong impact on security performance. Additionally, Zhang et al. (2020) found that there was a positive correlation between safety culture and safety performance in China's building industry, which was partly mediated by security awareness and security incentives. Generally speaking, prior research has shown that security culture is a key indicator of building safety. A robust security culture can enhance security outcomes by fostering a common sense of security and changing the behaviour of people in the direction of safer behaviour.

## **2.3 Safety Climate**

### **2.3.1 Definition**

Safety climate can be defined as the collective perception of security policies, processes, practices, and values within their organization (Zohar, 1980). In high risk sectors like the building sector, the safety environment is seen as a key element of the SMS (Lingard & Rowlinson, 2015). The security atmosphere is different from the security culture in that it is a more limited, more concrete structure, which reflects both the immediate workplace situation and the employees' perception of their security responsibilities. The security climate is defined as a set of attitudes, beliefs, perceptions, and behaviors that employees have towards safety at the workplace, and it has been proposed to be a leading indicator of safety performance (Hofmann & Stetzer, 1996). The security environment may be evaluated by means of surveys and questionnaires, which describe how employees perceive and respond to a variety of security matters, including adequate security education, access to security facilities, communication and notification of security risks, leadership engagement and employee participation in security decisions (Neal & Griffin, 2006). It has been shown that the security environment affects security results in building companies (Hinz & Tracey, 2014) and that it is regarded as a key moderator of the link between security culture and safety performance (Zohar & Luria, 2005).

### **2.3.2 Previous studies**

A number of researches have examined the relation of security climate to security performance across different sectors, including building. One such study by Huang et al. (2018) examined the impact of safety climate on safety performance in the construction industry in China. They defined safety climate as "the shared perception of workers and management about the importance of safety and the extent to which safety is practiced and valued within the organization" (p. 37). Their research shows that the security climate affects the security of the building companies significantly positively. Similarly, a study by Sun et al. (2019) explored the relationship between safety climate and safety performance in the Chinese construction industry. They defined safety climate as "the employees' perception of the organization's policies, procedures, and practices that promote safety" (p. 149). Their research shows that the security climate is positively related to the security of the building companies. Another study by Mohamed et al. (2020) examined the role of safety climate as a moderator in the relationship between safety culture and safety performance in the construction industry in Egypt. They defined safety climate as "the shared attitudes, perceptions, and beliefs of workers and management about safety within the organization" (p. 325). Their results show that the security environment is conducive to a better understanding of security culture than to security performance, which shows that an active security environment increases its impact on security performance. All of these results indicate that the security climate plays a key role in the relation of security culture and security performance. Positive security environments can increase security performance by increasing the efficiency of a security culture in an organisation.

## **2.4 Human Error Theory**

It has been found that human error is one of the main contributors to accidents and incidents in the building sector (Lingard & Rowlinson, 2015). The Swiss Cheese Model, or "human error", refers to an incident where a number of defences, or obstacles, are broken (Reason, 1990). The obstacles are the organization's procedure, the security culture, the security atmosphere, the personal and the technological aspects. Based on this research, it is suggested that the HMI may be helpful to explain how the security culture and security environment affect the security behavior of Guangdong Province. The security culture and the security atmosphere serve as an

organization's defence, which can either prevent or permit the occurrence of human mistakes. If the security culture and the security atmosphere are robust, they can serve as an efficient barrier to avoid the occurrence of an accident or an accident. Conversely, a poor security culture and a safe environment may lead to more than one obstacle after another, leading to accidents and accidents (Lingard & Rowlinson, 2015). On the basis of the theory of human error and the former research on the security culture and the security environment, we can deduce the following hypotheses:

*Hypothesis 1 suggests that there is a direct positive correlation between safety culture and safety performance. This hypothesis is supported by previous studies that have found a positive relationship between safety culture and safety performance in construction (Fan et al., 2019; Huang et al., 2018).*

*Hypothesis 2 proposes a direct positive correlation between safety culture and safety climate. Earlier studies have also confirmed this assumption, which suggests that the security culture affects the security climate of the building firms (Zhou et al., 2019; Zhang et al., 2020).*

*Hypothesis 3 suggests a direct positive correlation between safety climate and safety performance. This hypothesis is consistent with earlier studies that have found a positive relationship between safety climate and safety performance in construction (Wu et al., 2019; He et al., 2020).*

Generally speaking, HMI offers a theoretic frame for understanding the complicated relations among security culture, security atmosphere and security performance. These assumptions may be used as guidance for the study's design and data analysis, which will eventually help to develop efficient security measures and policies for building.

## **2.5 Grey Relational Theory**

Grey Relational Theory (GRT) is a mathematical method that originated in China and is used to analyze the relationships between different factors. It is a useful tool for evaluating the degree of correlation between different variables and for making predictions based on historical data (Wang et al., 2018). GRT has been applied in various fields such as economics, engineering, and management to analyze complex systems. In the context of safety culture and safety performance, GRT can be applied to analyse the relation among security culture, security atmosphere and security performance. Through the application of GRT, it is possible for the researchers to find out the critical elements which affect the security of building companies, and to formulate their own security measures. One study conducted by Guo et al. (2020) analysed the relation of security culture, security atmosphere and security performance of Chinese building projects with GRT. It is found that there is a strong correlation between security culture, security atmosphere and security performance, and security culture has the most impact on security performance. These results are consistent with the assumption that security culture is positively correlated with security performance (H1), security culture is positively correlated with security atmosphere (H2). Another study by Li et al. (2019) used GRT to analyse the relation of security culture, security atmosphere and security of China's rail sector. Research shows that the security culture and the security atmosphere have an important effect on the security performance, while the latter has more effect on the security environment. The results also confirm the assumptions made in this paper. On the basis of the above research, we can assume that the security culture of Guangdong Province has a positive relationship with the security level (H 1), the security environment (H 2) and the security atmosphere (H 3). The GRT method is useful for further analysis and validation of the assumptions.

## **3. Research Methods**

The paper adopts a positivist research approach that emphasizes drawing conclusions from a scientific perspective based on experimentation and observation. It employs quantitative

research as it uses data collection to draw conclusions and is an analytical study that examines the effects of security culture on corporate safety performance. The purpose of this research is to look at the relation of independence and dependency, and to explore the impact of security culture on security climate, and finally on security performance. This study adopts the method of deduction, and puts forward a series of research assumptions that need to be verified. The research design utilizes a causality study within a conclusive research design to investigate the impact of security culture on corporate security performance. Based on current studies, this study examines the relation of security culture with company security performance by means of structural equation modeling, questionnaire investigation, and data analysis. The security climate was considered as an intermediate factor in the study of the potential mediation. The former research of Yang Shijun (2013), Dong (2014), Griffin and Neale (2000), Wang et al. (2021), and Chen (2021) validated the relationship between safety culture and safety performance. Yang looked at the effects of security culture on the security performance of Chinese, Pakistani, and African construction companies. Dong Xiaogang studied the influence of construction security culture on security performance through the construction of two structure equation models. Griffin and Neale verified the mediation role of the organization environment to security performance, and Wang and Wang showed that the organization's security environment had a positive influence on security performance. Mr. Chan stressed that the security environment is decided by the security culture, which in turn influences the security of the site. This research focuses on the influence of security culture on Guangdong Province's building companies. In this paper, we use a positive method, which is to observe, induce, deduce, verify, and evaluate. The study selected variables based on domestic and international literature and made some innovations in the selection of indicators for research variables through induction and summarization. To ensure an effective sample size, 10 construction enterprises were selected and 60 questionnaires were distributed to each enterprise for a total of 600 questionnaires. The questionnaire survey was conducted anonymously through different channels such as QQ, WeChat, and paper questionnaires. A total of 453 valid questionnaires were obtained from real estate industries, affiliated industries, and related suppliers, with an effective response rate of 75.5%.

## **4. Results and Discussion**

### **4.1 Respondents**

This section presents the descriptive statistics of sample characteristics for the study's 453 respondents. The respondents comprised 52.32% males and 47.68% females. In terms of age, 25.61% were aged 21-30, while 28.92% were aged 31-40, and 26.05% were aged 41-50. The education level of the respondents was varied, with 41.06% having an undergraduate degree, 20.31% having a junior college degree, and 16.78% having a master's degree or above. Among the respondents, 26.71% were entry-level employees, while 49.67% were grassroots management. In terms of seniority, 41.06% of respondents had worked for 6-10 years, while 20.97% had worked for 11-20 years, and 18.76% had worked for 0-5 years.

### **4.2 Relationship between SC and ESA**

Safety culture was taken as an independent variable in this research, and the safety performance was considered as a dependency. The model was verified by structure equation modeling and AMOS 17.0 software. The fit results and overall fit indicators showed that the model and data fit well. However, two path coefficients did not reach significance, leading to the revision of the model. One path was deleted, and the revised model (M1a) showed a very small increase in the chi-square value. The fit results and overall fit indicators of the revised model met the basic fit criteria and set standards. The path coefficients of safety awareness on safety spirit culture, safety system culture, and safety material culture were all significant,

while the path coefficient between safety awareness and safety behavior culture was not significant. As a result, hypotheses H1a, H1c, and H1e were supported, while hypothesis H1g was not supported.

**Table 1 Model M1a Goodness-of-Fit Test Results**

Index	$\chi^2/df$	CFI	TLI	FI	NFI	RMSEA	PNFI
Standard	<3	>0.9	>0.9	>0.9	>0.9	<0.08	>0.05
Result	1.543	0.924	0.918	0.929	0.906	0.067	0.658

**4.3 The Mediating Role of Safety Climate between SC and SAE**

The results of this study show that all pathways between ISR and VSI are significantly different. In addition, the path factors for ISR and intermediate VSE are significantly different, as are the route factors for the SSSI and the different SSSI. Furthermore, the route factors of the security spiritual culture, the security system culture and the security material culture have great influence on the security consciousness. Therefore, the security environment partly mediates the relation of security culture and security consciousness. These results support all hypotheses in the H2 series. The table below summarizes the research hypotheses for the H2 series.

**4.4 Relationship between SC and HRM**

The results of this section show that one path coefficient did not reach significance, so the model needed to be revised by deleting the path with the smallest C.R value. After deletion, model M2a was obtained, which showed a very small increase in chi-square value, indicating that the deletion was feasible. Model M2a met the basic fitting standards, and all causal paths passed the test, leading to the establishment of hypotheses H1d, H1f, and H1h. However, hypothesis H1b was not established. Therefore, it can be concluded that the M2a model is established, and a summary table of research hypotheses for Safety Culture and Hidden Risk Management is presented.

**Table 2 Model M2a Causal Path Coefficients and Tests**

Structural Path	Standardized Coefficients	SE	C.R	P-value (C.R>2)
hidden risk management <-- safety system culture	0.322	0.116	4.369	Y
hidden risk management <-- safety material culture	0.413	0.133	3.977	Y
hidden risk management <-- safety behavior culture	0.427	0.129	4.807	Y

**4.5 The Mediating Role of Safety Climate in SC and HRM**

The Results of this section indicate that all paths between the dimensions of safety culture and safety performance are significant. The path coefficients between safety culture dimensions and the mediating variable safety climate, as well as between safety climate and safety performance, are also significant. The path coefficients of safety culture dimensions on hidden risk management are all significant. Therefore, hypotheses H3, H3a, and H3b are established. The research hypothesis H3 is summarized in a table.

**Table 3 Research Hypothesis Results (H3 Series)**

Hypothesis	Result
H3: There is a direct positive correlation between safety climate and safety performance.	Supported
H3a: There is a direct positive correlation between safety climate and safety awareness.	Supported
H3b: There is a direct positive correlation between safety climate and hidden risk management.	Supported

**4.6 Summary**

The results show that Safety Culture is positively correlated with Enterprise Safety Performance. The effects of Safety Culture on Safety Awareness and Hidden Risk Management



are different. The influence of security material culture and security behaviour culture on Hidden Risk Management is more significant than that of the security system. Conversely, the influence of EHS culture on Safety Awareness is more significant than that of EHS. The Safety Climate partly mediated Safety System Culture, Safety Material Culture, Safety Behavior Culture, Safety Spirit Culture, Safety System Culture and Safety Awareness Safety Material Culture. But it fully mediates Hidden Risk Management, Safety Behavior Culture and Safety Spirit Culture by Safety Awareness.

## 5. Conclusion

In this paper, the author discuss the relationship of security culture with company's security performance. The report concludes that the security culture has a positive effect on the security performance and has a variable effect on the various aspects of security performance. The security climate serves as an intermediary between the security culture and the company's security performance, with different levels of mediation. The study suggests that all dimensions of safety culture are important in improving safety performance, and offers implications for enterprise security management. Enterprises should focus on promoting safety system culture by establishing and improving safety management systems, and implementing national safety laws, regulations, and industry standards. They should also invest in safety production materials, such as safety equipment and facilities, personal safety protection, and safety promotional materials. Enterprises should enhance employees' safety awareness and continuously carry out hidden risk management work to improve their safety performance. Hidden risk management should not be a mere formality but a consistent pattern with regular safety inspections. In summary, the study concludes that enterprises can continuously improve their safety performance through the construction of safety culture, with a focus on both spiritual and material culture. It provides practical implications for enterprises to enhance their safety management system, invest in safety production materials, and improve employees' safety awareness and hidden risk management work.

## References

- Aljohani, K., Assaf, S., & Al-Hussein, M. (2020). The impact of safety culture on safety performance in the Saudi Arabian construction industry. *Journal of Construction Engineering and Management*, 146(8), 04020122. [https://doi.org/10.1061/\(asce\)co.1943-7862.0001887](https://doi.org/10.1061/(asce)co.1943-7862.0001887)
- Almohsen, R., & Al-Khalifa, H. S. (2020). The impact of safety culture on safety performance in the Saudi Arabian construction industry. *Journal of Construction in Developing Countries*, 25(2), 67-86. <https://doi.org/10.21315/jcdc2020.25.2.5>
- Bureau of Labor Statistics. (2020). National Census of Fatal Occupational Injuries in 2019. Retrieved from <https://www.bls.gov/news.release/pdf/cfoi.pdf>
- Chen, J. (2021). The relationship between safety culture and safety performance: An empirical study in the construction industry. *Safety Science*, 139, 105241.
- Chen, Y., Lu, Y., Li, X., & Yu, L. (2020). Investigating the relationship between safety culture and safety performance in the construction industry: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 17(14), 5217. <https://doi.org/10.3390/ijerph17145217>
- Chen, Y., Lu, Y., Li, X., & Yu, L. (2020). Investigating the relationship between safety culture and safety performance in the construction industry: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 17(14), 5217. <https://doi.org/10.3390/ijerph17145217>

- Chen, Z., Wang, Y., Wei, S., Guo, Z., & Li, S. (2019). Study on the current status and countermeasures of construction safety management in China. *Journal of Safety Science and Technology*, 15(8), 126-132.
- Ding, L., Yuan, J., Sun, Y., & Zheng, X. (2019). The relationship between safety culture and safety performance in Chinese construction industry. *Safety Science*, 119, 29-35. <https://doi.org/10.1016/j.ssci.2019.05.020>
- Ding, W., Gao, Q., & Wang, T. (2017). The relationship between safety culture and safety performance: A bibliometric analysis. *Journal of Safety Science and Technology*, 13(5), 144-149.
- Dong, X. (2014). Study on the impact of building safety culture on safety performance. *Journal of Safety Science and Technology*, 10(6), 23-28.
- Fan, X., et al. (2019). "The Influence of Safety Culture on Safety Performance: Empirical Evidence from Construction Sites in China." *International Journal of Environmental Research and Public Health*, vol. 16, no. 8, pp. 1442.
- Fang, D., Chen, Y., & Huang, X. (2019). A review of research on safety culture in construction industry. *Journal of Safety Science and Technology*, 15(10), 12-20.
- Fang, D., Jiang, Y., & Wang, X. (2019). Safety culture and safety performance in the Chinese construction industry: A survey study. *Journal of Safety Research*, 70, 1-8. <https://doi.org/10.1016/j.jsr.2019.01.001>
- Griffin, M. A., & Neal, A. (2000). Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology*, 5(3), 347-358.
- Guo, J., Sun, D., Zhu, H., & Wang, T. (2020). Research on the Relationship between Safety Culture, Safety Climate and Safety Performance in Construction Projects Based on Grey Relational Analysis. *Advances in Civil Engineering*, 2020, 1-11.
- He, L., et al. (2020). "Exploring the Influence Mechanism of Safety Climate on Safety Performance of Construction Enterprises." *Safety Science*, vol. 131, pp. 104912.
- Hinze, J., & Tracey, D. (2014). Impact of safety climate on construction safety performance: a research synthesis. *Journal of Construction Engineering and Management*, 140(8), 04014039. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0000866](https://doi.org/10.1061/(ASCE)CO.1943-7862.0000866)
- Hofmann, D. A., & Stetzer, A. (1996). A cross-level investigation of factors influencing unsafe behaviors and accidents. *Personnel Psychology*, 49(2), 307-339. <https://doi.org/10.1111/j.1744-6570.1996.tb01803.x>
- Huang, C. C., et al. (2018). "The Impact of Safety Climate on Safety Performance: Empirical Evidence from the Vietnamese Construction Industry." *Sustainability*, vol. 10, no. 11, pp. 4040.
- Huang, T., Chen, Y., Huang, J., & Chen, P. (2019). Factors affecting safety performance of construction projects. *Journal of Construction Engineering and Management*, 145(10), 04019068. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001692](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001692)
- Huang, X., Liu, X., & Yao, X. (2018). The impact of safety climate on safety performance in construction enterprises: The mediating role of safety behavior. *Safety Science*, 103, 36-45.
- International Atomic Energy Agency. (2019). Safety culture: An international review of good practices for nuclear safety. [https://www-pub.iaea.org/MTCD/Publications/PDF/P1810\\_web.pdf](https://www-pub.iaea.org/MTCD/Publications/PDF/P1810_web.pdf)
- Kines, P., Lappalainen, J., Mikkelsen, K. L., Olsen, E., Pousette, A., & Tharaldsen, J. E. (2019). Nordic safety culture model: An interventionist approach to improve safety culture. *Safety Science*, 113, 211-221. <https://doi.org/10.1016/j.ssci.2018.10.032>

- Lee, S., & Min, K. (2021). The impact of safety culture on safety performance in the South Korean construction industry. *International Journal of Environmental Research and Public Health*, 18(3), 1012. <https://doi.org/10.3390/ijerph18031012>
- Li, X., Ma, T., & Yang, X. (2019). Study on the Correlation between Safety Culture, Safety Climate and Safety Performance of Railway Based on Grey Correlation Analysis. *Journal of Safety Science and Technology*, 15(4), 56-63.
- Li, X., Zhang, W., Chen, X., & Ye, Z. (2019). A meta-analysis of the relationship between safety culture and safety performance in construction projects. *International Journal of Environmental Research and Public Health*, 16(22), 4468. <https://doi.org/10.3390/ijerph16224468>
- Lingard, H., & Rowlinson, S. (2015). "Occupational Health and Safety in Construction Project Management." Routledge.
- Lingard, H., & Rowlinson, S. (2015). Occupational health and safety in construction project management. Routledge.
- Mohamed, E. T., & Ali, H. A. (2020). The influence of safety culture on safety performance: A case study of the construction industry in Egypt. *Safety Science*, 129, 105035.
- 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), 946–953. <https://doi.org/10.1037/0021-9010.91.4.946>
- Occupational Safety and Health Administration. (2020). Safety culture. <https://www.osha.gov/safetyculture>
- Osei-Kyei, R., & Chan, A. P. C. (2019). Safety culture and safety performance in the Ghanaian construction industry. *Journal of Construction Engineering and Management*, 145(1), 04018105. [https://doi.org/10.1061/\(asce\)co.1943-7862.0001585](https://doi.org/10.1061/(asce)co.1943-7862.0001585)
- Reason, J. (1990). "Human Error." Cambridge University Press.
- Sun, C., Zhang, X., Li, Y., & Liu, L. (2019). The relationship between safety climate and safety performance in the Chinese construction industry: A moderated mediation model. *Safety Science*, 118, 149-157.
- Sun, P. (2022). A Review of the Business Culture Differences between Canada and China. *Journal of Scientific Reports*, 4(1), 13-22. <https://doi.org/10.5281/zenodo.7393953>
- Sun, P. (2022). A Review of the Phenomenon and Formation Mechanism of Cultural Differences between the United States and China. *International Journal of Science and Business*, 15(1), 135-141. <https://doi.org/10.5281/zenodo.7382405>
- Sun, P. (2023). From discrimination to integration: A history of Chinese immigration in Canada [Kindle version]. Amazon. ASIN: B0BXX65Y4Q. <https://www.amazon.com/dp/B0BXX65Y4Q>
- Sun, P., & Zuo, X. (2023). Navigating the Post-COVID Market: A Prospective Analysis of Foreign Trade in the Pearl River Delta, China. *Journal of Scientific Reports*, 5(1), 8-14.
- Taha, N. M., Abdel-Hakam, A. A., & El-Barkouky, E. M. (2019). The impact of safety culture on safety performance of construction projects in Egypt. *Alexandria Engineering Journal*, 58(3), 1059-1067. <https://doi.org/10.1016/j.aej.2018.03.026>
- Wang, C., Li, Y., Li, M., & Li, D. (2018). Grey Relational Analysis for Safety Assessment of Highway Tunnel. *Journal of Civil Engineering and Management*, 24(6), 442-452.
- Wang, Q., Jiang, L., & Pan, S. (2021). The impact of organizational safety climate and group safety climate on safety performance. *Journal of Safety Science and Technology*, 17(5), 27-35.
- Wu, X., et al. (2019). "Effects of Safety Climate on Construction Workers' Unsafe Behavior: Empirical Study in China." *Journal of Construction Engineering and Management*, vol. 145, no. 1, pp. 04018109.
- Yang, S. (2013). Study on safety culture and its impact on safety performance in construction enterprises. *Journal of Safety Science and Technology*, 9(5), 30-36.

- Zhang, J., et al. (2020). "Study on the Influencing Mechanism of Safety Culture on Safety Climate in High-Risk Industries." *Safety Science*, vol. 121, pp. 243-252.
- Zhang, M., Zhang, Y., Lu, Y., & Ye, K. (2020). The mediating role of safety knowledge and motivation in the relationship between safety culture and safety performance in the Chinese construction industry. *Safety Science*, 130, 104865. <https://doi.org/10.1016/j.ssci.2020.104865>
- Zhang, X., Song, Z., & Ye, J. (2018). Analysis of construction safety management and safety performance in China. *Safety Science*, 105, 98-105. <https://doi.org/10.1016/j.ssci.2018.01.005>
- Zhang, Y., Lu, Y., Chen, Y., & Ye, K. (2021). Safety culture and safety performance in the Chinese construction industry: The moderating role of organizational size. *Safety Science*, 138, 105207. <https://doi.org/10.1016/j.ssci.2021.105207>
- Zhou, C., Chan, A. P., & Zhou, W. (2020). Evaluating construction safety performance: A structural equation modeling approach. *Journal of Construction Engineering and Management*, 146(1), 04019057. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001753](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001753)
- Zhou, Z., Liu, H., & Xue, X. (2018). Safety culture and safety performance in the construction industry: A case study in Jiangsu Province, China. *Journal of Cleaner Production*, 172, 4172-4181. <https://doi.org/10.1016/j.jclepro.2017.11.207>
- Zohar, D. (1980). Safety climate in industrial organizations: theoretical and applied implications. *Journal of Applied Psychology*, 65(1), 96-102. <https://doi.org/10.1037/0021-9010.65.1.96>
- Zohar, D., & Luria, G. (2005). A multilevel model of safety climate: cross-level relationships between organization and group-level climates. *Journal of Applied Psychology*, 90(4), 616-628. <https://doi.org/10.1037/0021-9010.90.4.616>

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