Research on Influencing Factors of Employee Safety Behavior — Data from Construction Enterprises in Hebei Province, China

Ang Zhao[1], Nutteera Phakdeephirot[2]

Graduate Department of Management
Master of Management, Program in Creative Industries Management (International Program)
Rattanakosin International College of Creative Entrepreneurship
Rajamangala University of Technology Rattanakosin, Nakhon Pathom, Thailand

[1]Email: Zhao.Ang@rmutr.ac.th
[2]Email: nutteera.pha@rmutr.ac.th

Abstract

This research aims to build a practical management framework to improve employees' safety behavior in construction enterprises. There were 412 employees randomly selected from 44 enterprises with AAA credit in the Hebei construction industry to conduct an online questionnaire. The results of this research are including organizational safety climate has a positive correlation with employees' safety behavior in construction enterprises; organizational safety climate has a positive correlation with employees' psychological capital in construction enterprises; employees' psychological capital has a positive correlation with their safety behavior in construction enterprises; and psychological capital plays a partial mediating role in the relationship between organizational safety climate and employees' safety behavior in construction enterprises. This research suggests that construction enterprises should create an excellent organizational safety climate to improve employees' psychological capital and promote safe behavior in production activities and improve the safety management ability of enterprise managers in engineering projects management.

Keywords: employee safety behavior, organizational safety climate, psychological capital, construction enterprises.

Introduction

The construction industry is a pillar of the national economy and plays an essential role in developing the country and improving people's lives (Zhang & Li, 2020). The National Bureau of Statistics of China (2021) points out that in the 13th Five-Year Plan period (2016-2020), the country promoted the accelerated development of the construction industry, and the added value of the construction industry accounts for more than 6.6% of the GDP. In 2019, it reached a 10-year high of 7.16 percent. Even under the influence of COVID-19, the GDP in 2020 exceeded 100 trillion yuan, increasing by 2.3% compared with the previous year. The total output value of the national construction industry also reached 26,394.7 billion yuan, with a year-on-year growth of 6.2% (Wen, 2021). When the construction industry has become an essential industry of national economic development, the government, enterprises, and people also pay particular attention to another aspect of safety production (Huang, 2018). Due to the objective conditions of construction projects, such as long construction time, large project scale, complex construction technology, a large amount of open-air work, etc. Production safety accidents frequently occur in the construction industry, which is considered one of the most severe safety problems (Zhang & Li, 2020).

The surge in occupational accidents in the construction industry has prompted researchers and academics to propose and evaluate new ideas, focusing on employee safety behavior (Yu et al., 2022). In addition to the work system, unsafe behavior is an indispensable factor leading to construction accidents (He et al., 2020). Controlling construction worker safety behavior can effectively prevent construction accidents and motivate researchers and practitioners to identify organizational and individual factors influencing safety behavior (Cui & Li, 2021). Therefore, it is necessary to research employee safety behavior and its predictive factors, which facilitates the development of interventions to improve safe employee behavior, thereby promoting workplace safety.

Employee safety behavior is a leading indicator of safety performance, as it has been found to minimize the risk of unsafe incidents, accidents, injuries, and other adverse safety outcomes (Yu et al., 2022). As front-line workers, construction workers face high-altitude work, construction equipment, physical labor, etc.; their attitude and behavior choices in complex environments are critical to reducing safety accidents (Xu, 2019). In addition to increasing the input of "hardware" facilities to ensure the safety of workers, such as safe construction facilities, safety guarantee equipment, safety supervision system, safety production technology, etc., in the aspect of "software," creating an excellent organizational safety atmosphere has also become one of the critical management means (Yang, 2018).

Organizational safety climate refers to employees' perception of the importance they attach to the safety and security of the enterprise working environment, formed when employees share and summarize their views on the working environment. These views are also the reference frame for safety behavior in the work process and psychologically affect employees (Hu & Xu, 2014). As the perceiver of the organizational safety environment, construction workers understand their surroundings. This understanding also constitutes the frame of reference for safety behavior, which psychologically affects construction workers and influences their behavior (Wen, 2021). The social exchange theory is the theoretical support of organizational safety climate. In an environment with a high organizational safety climate, the organization's managers will pay great attention to and attach importance to employee's mental health and safety, bringing a great sense of security and satisfaction. At the same time, the organization also provides many opportunities for employees to acquire knowledge and skills to improve their mental health. These are resources that are valuable to the individual employee (Wen, 2021). Therefore, in exchange, employees' organizational commitment, work motivation, and work performance will also be improved, and more emphasis will be placed on individual safety behavior at work.

Many studies have explored the relationship between organizational safety climate and employee safety behavior. For example, the survey data of He et al. (2020) came from 119 supervisors and 536 field workers of 22 construction projects in China. The research results show that organizational safety climate positively correlates with the safety behavior of supervisors and construction workers (He et al., 2020). Yu et al. (2022) took 1,600 miners from 35 coal mines enterprises in Shanxi Province as research objects to verify the influence of social psychological safety climate on mine workers' safety behaviors in China. The research results show that a social psychological safety climate positively impacts workers' safety behaviors (Yu et al., 2022).

Psychological capital is an individualistic state or tendency formed in development and growth (Saleem, 2022). While the construction industry is one of the unsafe industrial sectors that causes considerable harm to the workforce and organizations globally, psychological

capital can positively impact the mental health of construction workers and may bring about positive performance (Saleem et al., 2022). The social cognitive theory is the theoretical support of psychological capital. As an essential environmental factor, safety atmosphere refers to the cognition, belief, and attitude of enterprise employees towards the policies, procedures, and behavior adopted by the organization for safety, which belongs to the perceived safety environmental factors (Ye et al., 2020). Psychological capital reflects the individual's mental state in growth and development, which belongs to individual cognitive factors (Shen & Li, 2020). In the face of complex and challenging safety goals at work, employees with high self-efficacy may acquire knowledge and skills, integrate them confidently, and then complete the work with high standards, which all come from personal psychological capital (Wang et al., 2018).

In the previous researches, Guo et al. (2021) pointed out that coal mining enterprises attach importance to developing employee psychological capital to create an excellent organizational safety climate. Implementing employer commitments can improve employees' safety behavior and avoid accidents (Guo et al., 2021). He et al. (2019) took 655 construction workers in China as research objects to explore the impact of psychological capital on construction workers' safety behaviors. Furthermore, the research results confirmed that psychological capital directly correlates with construction workers' safety behaviors (He et al., 2019). Ye et al. (2014) investigated the impact of organizational safety climate on the safety behavior of 309 workers from coal mining enterprises in China. The research results showed that psychological capital plays a partial mediating role in organizational safety climate and coal mining workers' safety behavior (Ye et al., 2014). However, in the context of construction enterprises, it is still a gap in current research to explore the intermediary relationship between psychological capital in organizational safety climate and employee safety behavior.

Based on the above description, this research takes employees of construction enterprises as the research object. It examines the mediating relationship between organizational safety climate and employee safety behavior by constructing the research framework of organizational safety climate, psychological capital, and employee safety behavior. In this research framework, organizational safety climate is from the organization's perspective, and psychological capital is from the individual's perspective. It combines organizational and individual factors to explain the influencing factors of employee safety behavior and provide effectively feasible management suggestions for promoting employee safety behavior in construction enterprises. An empirical framework was constructed in this research, as shown in Figure 1.

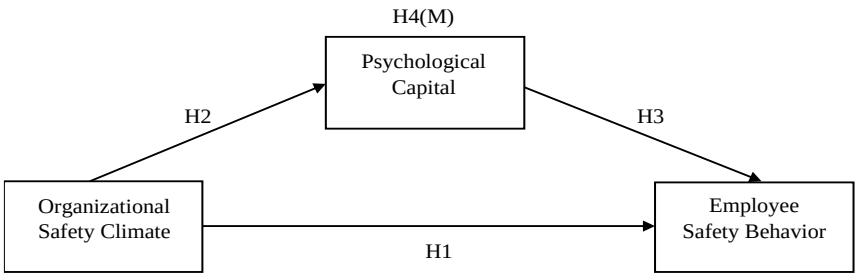

Figure 1 Empirical Framework of Research

(Source： by this Research)

Methodology

This research uses quantitative research methods, conduct empirical research through a questionnaire survey, and analyzes data with the help of SPSS 22.0 and AMOS 22.0. The sample data used in this empirical study were from the online questionnaire survey, and the respondents were all employees of AAA credit-level construction enterprises in Hebei Province. A total of sent out 450 questionnaires. After the questionnaires were collected, incomplete questionnaires or those whose contents were inconsistent with the actual situation were removed, and 412 valid questionnaires were obtained. The effective recovery rate was 91.6%.

The measurement of research variables directly adopts relatively mature scales widely used in existing studies. The organizational safety climate scale refers to the modified version of Zohar & Luria's (2005) organizational safety climate scale (Zohar & Luria, 2005). The psychological capital scale refers to Lorenz et al. (2016) 's revision of the composite psychological capital scale (Lorenz et al., 2016). The employee safety behavior scale refers to Fugas et al. (2012) 's revised general safety performance scale and the safety citizen role definition and behavior project to evaluate self-reported safety behaviors (Fugas et al., 2012). Based on those scales, an initial questionnaire was designed for this research. The questionnaire consists of two parts and a total of 30 questions. The first part is the descriptions of demographic information (including gender, age, occupation, marital status, work experience, and salary level). The second part is a description of the organizational safety climate, psychological capital, and employees' safety behavior.

Results

The demographic data statistics show that in this sample statistics concerning gender, 377 males, accounting for 91.5%. The number of females was 35, accounting for 8.50%. In terms of age, 394 people were less than 50 years old, accounting for 95.6% of the total. Among them, those aged between 30 and 50 accounted for 63.1%, more than half of the total sample. In terms of occupation, 89.1% are a worker. In terms of marital status, 74.0% were married. In terms of working experience, 93.9% of employees in construction companies have worked for 5 to 15 years. From the perspective of the salary level, 94.4% of employees in construction enterprises concentrated on an income of 5,000 to 10,000 yuan.

In confirmatory factor analysis, from the fitting index GFI, AGFI and NFI do not reach the standard of 0.9; and the convergence validity shows the AVE values of OSC and PC do not reach the standard of 0.5; it can be seen from the factor loading of the items (Estimate) that Q19, Q22, and Q27 do not reach 0.5. Therefore, these items are deleted, and the confirmatory factor analysis is performed again. Table 1 shows the results of aggregation validity test after deleting the items.

Table 1 The Convergence Validity Test (Delete Items)

Potential Variables	Items	Estimate	C.R.	AVE
OSC	Q7	0.688	0.884	0.559
	Q8	0.736		
	Q9	0.798		
	Q10	0.770		

	Q11	0.755		
	Q12	0.735		
PC	Q13	0.615	0.915	0.519
	Q14	0.696		
	Q15	0.699		
	Q16	0.737		
	Q17	0.743		
	Q18	0.775		
	Q20	0.764		
	Q21	0.766		
	Q23	0.703		
	Q24	0.690		
ESB	Q25	0.670	0.861	0.554
	Q26	0.780		
	Q28	0.780		
	Q29	0.770		
	Q30	0.715		
Above all the items P-value is *** indicate P < 0.001.				

(Source: Drawing in this study)

Table 2 shows the fitting indexes of the confirmatory factor model after deleting the item.

Table 2 The Fitting Indexes of the Confirmatory Factor Model (Delete Items)

Fitting index	CMIN/DF	RMSEA	GFI	AGFI	NFI	TLI	CFI
Reference standard	< 3	< 0.08	> 0.9	> 0.9	> 0.9	> 0.9	> 0.9
Result	2.327	0.057	0.910	0.918	0.910	0.939	0.946

(Source: Drawing in this study)

As can be seen from Table 1, in terms of convergent validity, the AVE value of the average variance extraction of each variable is between 0.519 and 0.559, all of which are greater than the standard of 0.5, and the combination reliability CR is between 0.861 and 0.915, all of which are greater than 0.7, indicating that the adjusted convergence validity is reliable. It can be seen from Table 2 that the fitting indexes of the deleted confirmatory factor model are all within the reference range, indicating that the adjusted model has a good fitting degree.

Then, in confirmatory factor analysis, the test discrimination validity is shown in Table 3.

Table 3 The Discriminative Validity Test			
Potential Variables	OSC	PC	ESB
OSC	**0.748**		
PC	0.641	**0.720**	
ESB	0.562	0.615	**0.744**
Note: The diagonal is the square root of the corresponding dimension AVE.			

(Source: Drawing in this study)

As can be seen from Table 3, the absolute value of the correlation coefficient between any two factors is less than the square root of the corresponding factor AVE, indicating a certain degree of discrimination between the three potential variables. Therefore, the discrimination validity of the scale after deleting questions is reliable.

AMOS 22.0 was used to construct a structural equation model to further verify the hypotheses in the study. The structural equation model is shown in Figure 2.

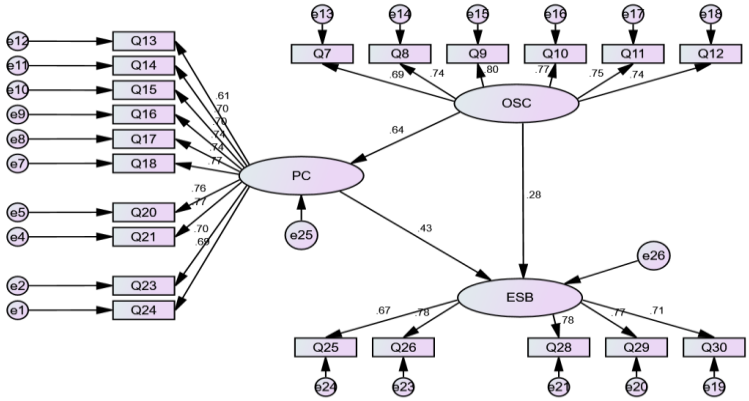

Figure 2 Structural Equation Model Diagram of Research

(Source: Drawing in this study)

The path test results are shown in Table 4.

Table 4 The Path Test							
Hypothesis	Path	Estimate	β	S.E.	C.R.	P	Result
H1	OSC→PC	0.670	0.641	0.068	9.815	***	Supported
H2	OSC→ESB	0.318	0.284	0.074	4.270	***	Supported
H3	PC→ESB	0.464	0.433	0.075	6.225	***	Supported
P-value is *** indicate P < 0.001.							

(Source: Drawing in this study)

As shown in Table 4, the test results show that OSC has a significant positive effect on P.C. (β=0.641, P<0.001); OSC had a significant positive effect on ESB (β=0.284, P<0.001);

P.C. has a significant positive impact on ESB (β=0.433, P<0.001). Therefore, it can be concluded that research hypotheses H1, H2, and H3 are all supported.

The test results of the mediation effect are shown in Table 5.

Table 5 The Indirect Effect Test

Effect	Path	Effect Value	Standard Error	Bootstrapping (N=2000)	
				95% CI	
Total effect	OSC→ESB	0.562	0.058	0.445	0.672
Direct effect		0.284	0.070	0.145	0.420
Indirect effect	OSC→PC→ESB	0.278	0.055	0.184	0.399

(Source: Drawing in this study)

According to the detection results in Table 5, the upper and lower 95% range of the total effect of the path "OSC→ESB" is [0.445,0.672], excluding 0, indicating that the total effect between OSC and ESB is significant, and the effect value is 0.562. The upper and lower 95% interval of the direct effect path of path "OSC→ESB" is [0.145,0.420], excluding 0, indicating that the direct effect between OSC and ESB is significant, and the effect value is 0.284. The upper and lower 95% interval of the mediation path "OSC→PC→ESB" is [0.184,0.399], excluding 0, indicating that PC plays a significant role in mediating between OSC and ESB, and the effect value is 0.278. Therefore, it can be confirmed that research hypothesis H4 is valid.

Discussion and Conclusion

According to the research results, we discuss that in the confirmatory factor analysis, after the aggregate validity detection of the original data, it was found that the AVE values of the potential variables OSC and PC did not reach the minimum standard reference value of 0.5. Moreover, the factor loading coefficients of items Q19, Q22, and Q27 did not reach the minimum standard reference value of 0.5. In addition, in the test of model fit, the fitting indexes GFI, AGFI, and NFI did not reach the minimum standard reference value of 0.9. Therefore, we deleted these questions and conducted confirmatory factor analysis again. The adjusted model test showed that the indexes of aggregate validity, discriminative validity, and model fit were all in line with the requirements of confirmatory factor analysis.

In the structural equation model, the fitting of the structural equation model is confirmed first, showing that the fitting degree of the model is suitable for further data analysis. The direct and indirect effect path in the model is tested, and the results support all the research hypotheses.

Based on the above analysis and discussion, this study draws the following conclusions: organizational safety climate has a positive correlation with employees' safety behavior in construction enterprises; organizational safety climate has a positive correlation with employees' psychological capital in construction enterprises; employees' psychological capital has a positive correlation with their safety behavior in construction enterprises; psychological capital plays a partial mediating role in the relationship between organizational safety climate and employees' safety behaviors in construction enterprises.

Therefore, this research builds an effective management framework and provides practical ideas for improving employees' safety behavior in construction enterprises. Construction enterprises should create an excellent organizational safety climate to improve employees' psychological capital to promote their safety behavior in production activities.

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