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Can Employee Training Stabilise the Workforce of Frontline Workers in Construction Firms? An Empirical Analysis of Turnover Intentions

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Abstract: The construction industry is a critical pillar of China's economy, providing substantial employment opportunities for society. However, the high turnover rate among frontline construction workers has become a significant challenge to the development of the industry. This high mobility not only increases recruitment and training costs for companies but also seriously affects the quality, safety, and productivity of construction projects. This study aims to investigate the impact of employee training on the turnover intention of frontline employees in the construction industry, as well as to analyze the role of organizational identification and perceived supervisor support. Data were analyzed through a structured questionnaire survey of 533 frontline construction employees using the study's Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that training is effective in reducing turnover intention among frontline employees and that this effect is partly achieved by increasing employees' organizational identification. In addition, perceived supervisor support moderates the relationship between employee training and turnover intention, and the effect of employee training on reducing turnover intention is more significant when perceived supervisor support is high. This study further validates the applicability of social exchange theory in the context of China's construction industry, reveals the key roles of employee training and organizational identification in reducing turnover intention, and highlights the important influence of perceived supervisor support as a means of enhancing the effectiveness of employee training, which provides a rationale for Chinese construction firms to optimize the training system and enhance supervisor support in order to improve employee retention intention.

Keywords: employee training; organizational identity; perceived supervisor support; turnover intention

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1. Introduction

As an important cornerstone of China's national economy, the construction industry not only creates a lot of economic value, but also provides a large number of jobs to society [1,2]. The rapid growth of China's economy has led to a dramatic increase in construction activity and the creation of the world's largest construction market. However, the Chinese construction industry is currently facing a significant challenge: the problem of frontline employee turnover [3].

Employee turnover is a theoretical and practical problem faced by the construction industry and a major concern for industrial psychologists. Frequent turnover among

construction workers makes it difficult for construction firms to attract workers and costs construction firms huge amounts of money in recruiting, hiring, and training new staff [4,5]. As a result, there is a consensus that frequent worker turnover is one of the main causes of poor performance, low quality, and accidents in the construction industry [6]. Statistics show that between 2019 and 2023, China will have an average of about 670 accidents per year in the construction sector, resulting in more than 760 deaths per year. Among these accidents, 583 accidents due to construction production safety problems in 2023 resulted in 635 deaths, confirming that the high mobility of workers is one of the main reasons [7]. Even globally, the construction industry has more fatalities than any other industry [8]. This is because high mobility prevents workers from gaining experience and expertise on the job [9]. Therefore, construction firms need to be cautious about the turnover of frontline workers and strive to reduce the turnover rate of frontline workers in construction firms to ensure their safe production and competitive advantage.

Many studies have examined the factors that influence turnover among frontline workers in the construction industry. These factors include job characteristics [10], pay [11,12], the employment relationship [11], and employee satisfaction [12]. However, few studies have examined the impact of employee training on the turnover intention of frontline workers.

Most of the frontline construction workers in China have received less education and have a lower cultural level, resulting in an obvious lack of construction production skills and work safety knowledge. It has been confirmed that employee training can effectively improve worker safety awareness and reduce the risk of accidents [13]. Meanwhile, the American General Contractors (AGC) 'CARE culture' training has shown that employee training can not only increase employees' sense of psychological safety but also ensure that employees feel valued and respected [14]. However, whether employee training also has a significant impact on the turnover intentions of frontline employees in the construction industry is still a question worth exploring.

Based on this, the present study proposes to use employee training (ET) as the independent variable to explore its impact on the turnover intention (TI) of frontline employees in the construction industry. Drawing on previous research findings, organizational identification (OI) is introduced as a mediating variable and perceived supervisor support (PSS) as a moderating variable, aiming to construct a research framework and conduct an in-depth analysis of the mechanisms through which employee training influences turnover intention.

2. Literature Review and Hypothesis

Employee training (ET) is a set of efforts undertaken by organizations to help employees acquire the knowledge and skills needed for their current or future jobs [15]. It contributes positively to the development of the organization by providing new knowledge, skills, and competencies that help employees perform better [16]. According to social exchange theory, employees perceive training as an investment in them by the organization and, therefore, respond with reciprocal actions that increase their commitment to the organization [17]. Organizations that provide training and development tend to have lower turnover rates than those that do not provide training and development opportunities for employees [18]. Previous research has shown that ET increases job satisfaction and, therefore, reduces turnover [19]. In addition, for the construction industry, which is a high-risk industry, effective training can also improve employees' job skills and safety awareness as a way of reducing risky behaviors in construction production [20,21]. Accordingly, this study proposes the following hypotheses:

H1. *There is a negative relationship between ET and TI.*

From the employee's perspective, training is a symbol of the employer's commitment to the employee [22]. Through induction training, employees are provided with basic information about the company's basic management system, safety, and personal protection [23]. Through training, it makes employees feel that they are part of the company, thus developing a sense of belonging and involvement within the organization [24]. In addition, ET improves employee efficiency, enhances employee skills, promotes alignment between personal growth and organizational goals, and ensures employee career adaptability, thus helping employees enhance their professional competence and achieve long-term career development [25]. Past studies have shown that ET positively affects employees' OI [26]. Therefore, the following can be hypothesized based on the previous literature:

H2. *There is a positive relationship between ET and OI.*

OI is the feeling of being psychologically aligned with an organization [27]. When people identify strongly with an organization, it creates a strong sense of 'being with the organization' [28], which prevents individuals from leaving or having the intention to leave the organization. Because employees identify more positively and see themselves as one with the organization, they are motivated to stay with the organization. They are then motivated to stay connected to the organization and aligned with its goals. Because strong identification with the organization means that employees feel that the organization is a part of them and that they are psychologically connected to the organization, employees who have a strong sense of belonging to the organization are less likely to be interested in leaving their current position [29]. Previous studies have also shown that OI is negatively related to TI [30–32]. Therefore, based on the previous literature, the following can be hypothesized:

H3. *There is a negative relationship between OI and TI.*

ET is defined as the process of changing the skills, knowledge, attitudes, and behaviors of employees, which not only helps them to improve the skills required for their current position but also prepares them for their long-term future career development [17,33]. ET can promote employee identification with the organization by providing a deeper understanding of the organization's culture and feeling the organization's recognition of the employee's work [34]. When employees strongly identify with the organization, they feel more responsible and involved with the organization. The more employees identify with the organization, the more likely they are to adopt the organizational practices as their own, to follow the organization's 'prototype', and to be closely connected to the organization [35]. That is, when subordinates identify with the organization, they are more likely to stay [29]. Therefore, the following can be surmised based on the previous literature:

H4. *OI mediates the relationship between ET and TI.*

PSS is the extent to which employees perceive that their supervisors value their contributions, care about their well-being, and meet their socio-emotional needs [36]. The supervisor–employee relationship is critical in minimizing employees' uncertainty at work, as supervisors can support their subordinates by using information to reduce their distress over uncertainty [37]. According to Eisenberg et al. [38], employees who receive high levels of support respond positively to organizations that care about and support them. When employees perceive support from their supervisors, they will perceive the organization as providing them with ongoing professional recognition, which will lead them to have more positive intentions toward the organization. As a result, employees who perceive support will trust the organization more, which will ultimately have a positive outcome by reducing TI [39]. Accordingly, the following can be hypothesized:

H5. *PSS moderates the relationship between ET and TI, which becomes weaker when PSS is high.*

A conceptual framework for this study was developed based on the previous literature. This framework is shown in Figure 1.

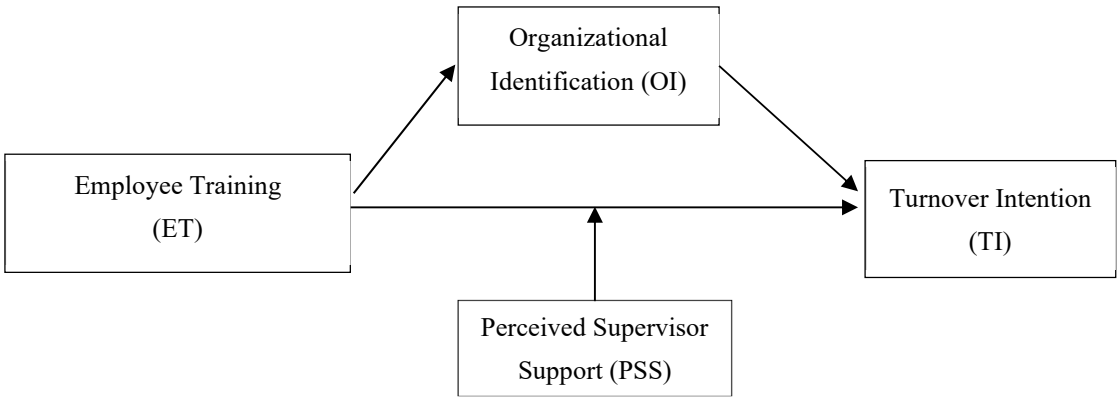

Figure 1. Research framework.

3. Materials and Method

3.1. Questionnaire Design

The questionnaire consisted of two main parts, the first part was to collect detailed demographic information, gender, age, marital status, education level, monthly income, and work experience. This information facilitates the understanding of the characteristics of the respondents. Part 2 developed several constructs to measure ET, OI, PSS, and TI. The constructs used in this study have been validated and adapted to the Chinese context and are supported by the existing literature. These constructs are drawn from the fields of organizational behavior and social psychology and have been adapted to suit the uniqueness of the construction industry.

Employee Training Scale (ET): A scale developed by Marwat, Qureshi, and Ramay [40] was used to measure respondents' overall perceptions of ET practices in construction companies. The scale has six items.

Organizational Identification Scale (OI): The scale developed by Mael and Ashforth [41] was used to measure respondents' perceptions of their identification with the construction company they work for. The scale has 6 items.

Perceived Supervisory Support Scale (PSS): a scale adapted from Eisenberger et al. [36] was used to measure respondents' perceived support from their direct supervisors. The scale has 9 items.

Turnover Intention Scale (TI): a scale developed by Wayne et al. (1997) [42] was used to measure respondents' thoughts about leaving their current organization. The scale has 5 items.

3.2. Participants and Procedure

The questionnaire survey used a purposive sampling technique to select participants from construction companies. Inclusion criteria were frontline workers in the construction industry in China and full-time employees with at least one year of work experience. Exclusion criteria included not being a frontline worker in a construction company, having less than one year of work experience, or not being a full-time employee.

To ensure the quality of questionnaire completion and response rate, the researcher first contacted the human resource department of the interviewed construction companies and went into the construction site after obtaining permission. The respondents were gathered in a meeting room at the construction site with the help of the project site managers. Before

the questionnaires were distributed, the researcher would briefly introduce the purpose of the study and the content of the questionnaires to ensure that the respondents were fully aware of the content of the survey. To ensure confidentiality, all questionnaires were collected anonymously.

The criteria used to select the sample size was at least five times the number of observations as recommended by Hair [43]. The questionnaire for this study had 26 questions, and the minimum sample size calculated was 130. Referring to similar studies where the questionnaire return rate was about 60%, the required sample size was 217. China State Construction Engineering Corporation (CSCEC), one of China's largest state-owned enterprises and the most representative construction company in the country, was chosen as the target for this study. The investigation focused on ongoing construction projects within its subsidiaries. The survey was conducted in May–July 2024 in the North, East, Southwest, and Southeast regions of China. The study investigated 40 construction projects under construction, with a total of 571 frontline workers participating, and 533 valid questionnaires were recovered, with a validity rate of 93.3%. The demographic and occupational characteristics of the respondents are shown in Table 1.

Table 1. Profile of respondents (N = 533).

Project	Option	Frequency	Percentage
Gender	Male	463	86.9
	Female	70	13.1
Age	Below 20 years	35	6.6
	Between 21 and 30 years	158	29.6
	Between 31 and 40 years	224	42.0
	Between 41 and 50 years	82	15.8
	Above 51 years	32	6.0
Marital Status	Single	167	31.3
	Married	343	64.4
	Divorced	23	4.3
Education Level	High school certificate	78	14.6
	Technical certificate	223	41.8
	Diploma	175	32.8
	Degree	53	9.9
	Others	4	0.8
Monthly income	3000 yuan and below	84	15.8
	3001–4000 yuan	190	35.6
	4001–5000 yuan	125	23.5
	5001–6000 yuan	63	11.89
	6001–7000 yuan	41	7.7
	Above 7000 yuan	30	5.6
Years workingin the currentcompany	Below 1 year	33	6.2
	Between 1 year and 3 years	91	17.1
	Between 3 years and 5 years	41	7.7
	More than 5 years	368	69.0

3.3. Partial Least Squares Structural Equation Modeling

This study uses the Partial Least Squares Structural Equation Modeling (PLS-SEM) statistical technique. Compared to CB-SEM, the PLS-SEM method assesses partial model structure by correlating principal component analysis with ordinary least squares regression to understand multiple relationships in a study. Thus, PLS-SEM is more effective when dealing with data that do not obey a normal distribution or when the sample size is relatively small [44]. This statistical technique was carried out using Smart PLS 4.1 software, which is very capable of handling non-normal data processing and smaller sample sizes to effectively achieve the objectives of this study [45].

PLS-SEM consists of two components: a measurement model for observing the relationships between variables and their underlying constructs and a structural model for describing the relationships between constructs. Both models are operated using Smart PLS, which is used to calculate path coefficients and to validate the measurement and structural models.

3.3.1. Evaluation Criteria for Measurement Models

Common Method Bise: When a single method or source is used to collect data in a study, it may be vulnerable to common method bias [46]. This is because data are obtained from a single respondent using the same variables. To address this one issue, this study conducted a one-way Harman test for CMB to test for common method bias through exploratory factor analysis. The critical issue of common method bias arises if a single factor is present or if one factor accounts for more than 50% of all variances shown in the factor analysis (i.e., unrotated matrix) [47].

Assessing measurement models requires reliability and validity tests. In reliability testing, four main metrics are assessed: external loadings (OL), Cronbach's alpha (CA), composite reliability (CR), and average variance extracted (AVE). According to the requirements of the test, the values of CA [48], CR [49], and OL [50] must be greater than 0.70 and the value of AVE must be greater than 0.5 [51,52].

Discriminant validity is the degree to which a particular structure on a surface is different from other structures [53]. It is used to assess whether a measure measures what it was designed to measure and nothing else [54], so discriminant validity is an important component of any measurement model. Discriminant validity can be assessed using a variety of methods [55], such as the heterotrait/monotrait ratio (HTMT), the Fornell–Larcker criterion, and cross-loading. Of these, the HTMT is a widely recognized method for assessing discriminant validity in research [56]. Unlike the Fornell–Larcker criterion and (partial) cross-loading, the HTMT correlation test is generally considered to provide a higher-quality assessment of discriminant validity. To determine discriminant validity, we applied a threshold of 0.9 as a criterion for this investigation, as suggested by previous studies [57–59].

3.3.2. Evaluation Criteria for Structural Models

Structural model assessment mainly consists of measuring statistical significance and path coefficients. In addition, R^2 values are used to assess the proportion of variance in the endogenous variables that can be explained by the predictor variables, and these values indicate the strength of the model in explaining the observed outcomes [60]. It can take any value between 0 and 1, with higher values indicating greater explanatory power [61]. According to the rule of thumb proposed by Cohen [62], significant, moderate, and weak R^2 values for endogenous latent variables correspond to 0.26, 0.13, and 0.02, respectively.

The f^2 indicates the size of the effect, i.e., the magnitude of the impact that each independent variable has on the outcome of the study, and it provides valid insights into

the magnitude of the relationships or differences observed in the study [63]. The rules of thumb for small, medium, and large effect sizes for f^2 values are 0.02, 0.15, and 0.35, respectively, as suggested by Cohen [62]. Q^2 is used to assess the predictive power of a model [64]. A predictive relevance Q^2 greater than 0 indicates that the model has predictive relevance for a particular endogenous structure, and a Q^2 less than 0 indicates a lack of predictive relevance [65]. The above criteria can comprehensively assess the quality and validity of the model and ensure the reliability of the results [44].

4. Results

4.1. Common Method Variance

In this study, a one-way Harman test was conducted on CMB and the results of the test showed that these variables accounted for 37.596% of the total variance, a percentage that is lower than the commonly accepted 50%. This result suggests that common method bias is unlikely to have a significant impact on the results of this study.

4.2. Measurement Model Assessment

4.2.1. Convergent Validity

The factor loadings and reliability indices for each construct were examined to assess internal consistency and convergent validity according to the criteria in the previous Section 3.3.1. Table 2 summarizes the indicator loadings for each construct. Overall, the indicator loadings for both the ET and OI constructs were greater than 0.7, reflecting a high degree of internal consistency and convergent validity. However, PSS1 and PSS7 in PSS and TI5 in TI were below 0.7, indicating a lack of construct consistency, and these three measures were excluded from subsequent analyses. The excluded measurement model is shown in Figure 2.

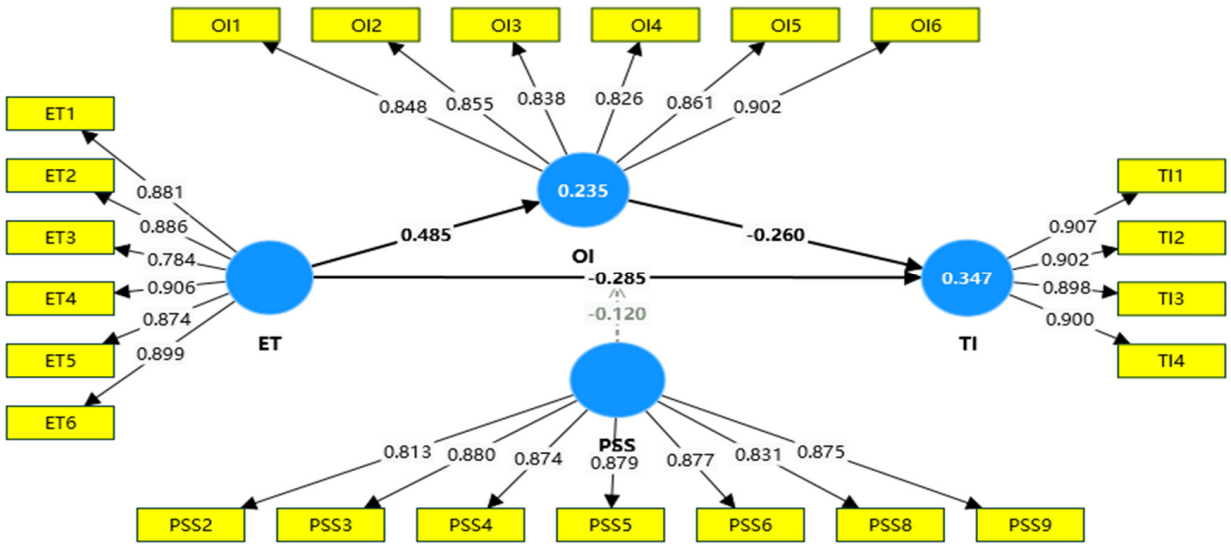

Figure 2. Measurement model.

Table 3 shows the results of the reliability tests of the structural models, including Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) values. According to the criteria mentioned earlier in Section 3.3.1, the values of Cronbach's alpha for the four constructs were in the range of 0.923–0.942, which are all greater than 0.7, indicating high internal consistency.

Table 2. Factor loading.

Constructs	Indicator	Abbreviation Indicator	Loading
Employee Training	My organization conducts extensive training programs for its employees in all aspects.	ET1	0.881
	I normally go through training programs every year.	ET2	0.886
	In my organization, training needs are identified through a formal performance appraisal mechanism.	ET3	0.784
	In my organization, there are formal training programs to teach new colleagues the skills they need to perform their jobs.	ET4	0.906
	In my organization, there are formal training programs to teach new colleagues the skills they need to perform their jobs.	ET5	0.874
	Training needs identified are realistic, useful and based on the business strategy of the organization.	ET6	0.899
Organizational Identification	When someone criticizes the organization I work for, it feels like a personal insult.	OI1	0.848
	I am very interested in what others think about the organization I work for.	OI2	0.855
	When I talk about the organization I work for, I usually say 'we' rather than 'they'.	OI3	0.838
	The successes of the organization I work for are my successes.	OI4	0.826
	When someone praises the organization I work for, it feels like a personal compliment.	OI5	0.861
	If a story in the media criticized the organization I work for, I would feel embarrassed.	OI6	0.902
Perceived Supervisor Support	My immediate superior shows very little concern for me. (R)	PSS1	0.442
	My immediate superior strongly considers my goals and values.	PSS2	0.813
	My immediate superior cares about my opinion.	PSS3	0.880
	My immediate superior is willing to extend himself/herself to help me perform my job to the best of my ability.	PSS4	0.874
	My immediate superior really cares about my well-being.	PSS5	0.879
	My immediate superior cares about my general satisfaction at work.	PSS6	0.877
	Even if I did the best job possible, my immediate superior would fail to notice. (R)	PSS7	0.479
	Help is available from my immediate superior when I have a problem.	PSS8	0.813
	My immediate superior takes pride in my accomplishments at work.	PSS9	0.875
Turnover Intention	I often think of quitting my job at this company.	TI1	0.907
	I am seriously thinking about quitting my job at this company.	TI2	0.902
	I am actively looking for a job outside this company.	TI3	0.898
	As soon as I can find a new job, I will leave this company.	TI4	0.900
	I think I will be working at this company for 5 years from now.	TI5	0.388

Table 3. Cronbach's alpha, composite reliability, and convergent validity of the constructs.

Constructs	Cronbach's Alpha	CR	AVE
Employee Training	0.937	0.943	0.761
Organizational Identification	0.926	0.929	0.731
Perceived Supervisor Support	0.942	0.943	0.742
Turnover Intention	0.923	0.924	0.813

For composite reliability (CR), the values in this study ranged from 0.924 to 0.943, which were all greater than 0.7, indicating sufficient composite reliability. For the average variance extracted (AVE), the values in this study were between 0.731 and 0.813, all of which satisfy the criterion of greater than 0.5, showing robust consistency and validity.

4.2.2. Discriminant Validity

In this study, the heterotrait/monotrait ratio (HTMT) of correlation was used to test discriminant validity, as shown in Table 4. A threshold value of 0.9 was used in this study as a criterion for this investigation. The results of the study showed that all values were less than 0.9, confirming the discriminant validity of the model and ensuring that each construct was sufficiently different from the other.

Table 4. Heterotrait/monotrait ratio (HTMT) matrix.

Constructs	Organizational Identification	Perceived Supervisor Support	Employee Training
Organizational Identification			
Perceived Supervisor Support	0.405		
Employee Training	0.516	0.256	
Turnover Intention	0.481	0.432	0.489

Specifically, the value of TI and OI is 0.481, which indicates that TI is significantly conceptually different from OI. Similarly, the value of 0.405 for PSS and OI shows that there is a clear difference between PSS and OI. Moreover, the value of 0.489 for TI and ET also clearly highlights the difference between TI and ET. These values are all much less than 0.9, which together validate that the model has robust discriminant validity across all dimensions.

4.3. Final Path Coefficients

In the process of testing the hypotheses, a total of five hypotheses were tested, of which three were examined for direct correlation, one for moderating role and one for mediating role. The structural modeling framework has ET as the independent variable, TI as the dependent variable, OI as the mediating variable, and PSS as the moderating variable. The significance test was set at 0.05 probability level using Smart PLS bootstrap operation. The results are shown in Figure 3 and Table 5.

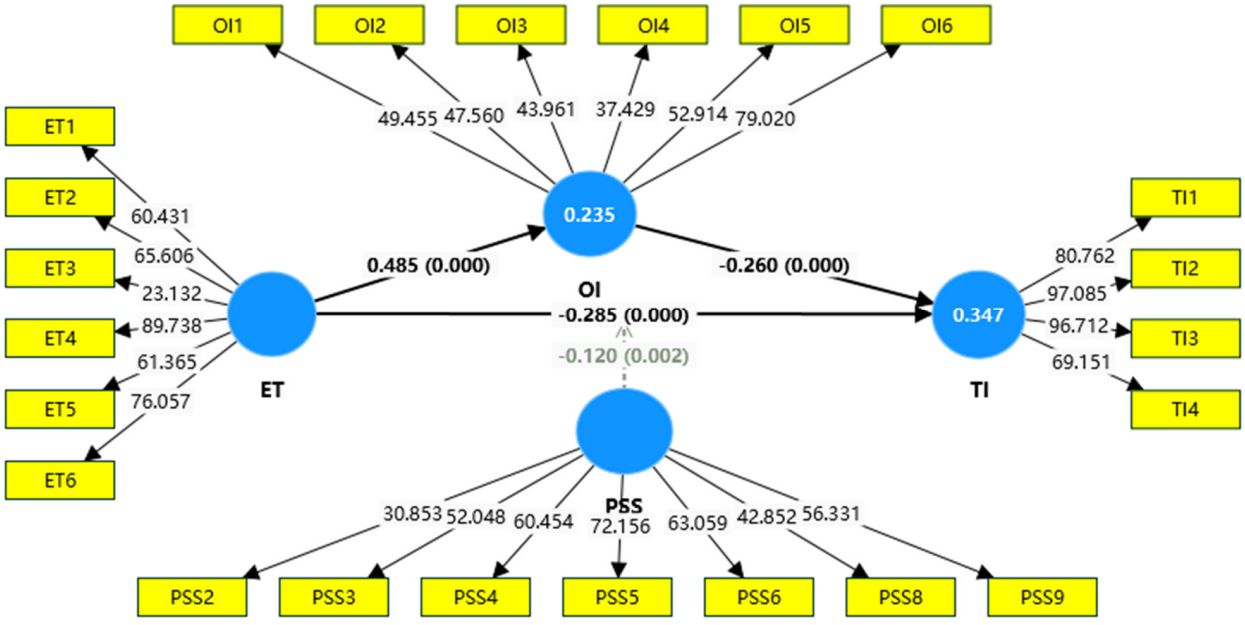

Figure 3. Structure model test.

Table 5. Final path coefficients.

Hypotheses	Path	Path Coefficient (β)	Std. Dev. (STDEV)	T Values	*p* Values	Result
H1	ET -> TI	−0.285	0.049	5.763	0.000	Supported
H2	ET -> OI	0.485	0.043	11.320	0.000	Supported
H3	OI -> TI	−0.260	0.054	4.792	0.000	Supported
H4	ET -> TI	−0.126	0.032	3.991	0.000	Supported
H5	PSS × ET -> TI	−0.120	0.038	3.140	0.002	Supported

Table 5 shows that ET is significantly and negatively related to TI (β = −0.285, T = 5.736, $p < 0.05$), which supports Hypothesis H1. This result suggests that ET has a positive effect on reducing the TI of frontline employees in the construction industry. In addition, there is a significant positive relationship between ET and OI (β = 0.485, T = 11.320, $p < 0.05$), which supports Hypothesis H2. This means that ET has a significant effect on increasing the OI of frontline employees in the construction industry. There is a significant negative relationship between OI and TI (β = −0.260, T = 4.792, $p < 0.05$), which suggests that OI has a positive effect on lowering the TI of frontline employees in the construction industry, and hypothesis H3 was also supported.

H4 showed a significant indirect effect of ET on TI (β = −126, T = 3.991, $p < 0.05$), which indicated that the hypothesis was supported, and these findings implied that OI played a mediating role between ET and TI. Finally, in the test of moderating effect, the moderating effect of PSS was shown to be significant (β = −0.120, T = 3.140, $p < 0.05$), and Hypothesis H5 was supported, indicating that PSS can act as a moderating effect of the relationship between ET and TI of frontline employees in the construction industry.

4.4. Effect Size and Predictive Power of the Model

The magnitude of the effect of exogenous constructs on model prediction accuracy and relevance is presented in Table 6. This analysis assessed the relative magnitude of each construct's contribution in predicting TI and the magnitude of ET's power to contribute to the prediction of OI. The results showed that the effect size of ET on TI was $f^2 = 0.094$, which ranged from 0.02 to 0.15, indicating a moderate to low effect. Both OI and PSS exhibited small effect sizes of 0.063 and 0.067, respectively. Conversely, the effect size of ET on OI was $f^2 = 0.307$, which ranged from 0.15 to 0.35, indicating a moderate to high effect. The overall effect sizes ranged from 0.063 to 0.307, and these values imply that the relationships identified in this study are not only statistically significant but also practically relevant in the context of this study.

Table 6. Explanatory power.

Predictor	Outcomes	R^2	f^2	Q^2	Fitness of Model
ET	-> OI	0.235	0.307	0.168	SRMR = 0.085 NFI = 0.927
ET	-> TI	0.347	0.094	0.277	
OI	-> TI		0.063		
PSS	-> TI		0.067		

The overall predictive relevance of the model, $Q^2 = 0.277$, and the predictive relevance of ET for OI was $Q^2 = 0.168$, indicating that the model was predictively relevant for all endogenous constructs.

R^2 values were used to assess the proportion of variance in the endogenous variables that could be explained by the predictor variables, and the results showed that the R^2 value

was 0.347 for TI and the R^2 value was 0.235 for OI. This indicated that the research model effectively explained the variations in the endogenous variables.

In addition, SRMR was used to assess the fitness of the structural equation model (SEM). The SRMR value of the research model was 0.085, which is acceptable with SRMR < 0.1 according to Hu and Bentler (1998) criteria [66]. Meanwhile, the NFI value was 0.927, and according to the criteria of Bentler and Bonett (1980), the NFI value > 0.9 indicates that the model fits well and reaches the acceptable range. The explanatory power of the structural model consists of R^2, f^2, Q^2 and fitness parameters are shown in Table 6.

5. Discussion

The purpose of this study was to assess the impact of employee training in construction firms on the turnover intention of frontline employees, as well as to examine the role of organizational identification and perceived supervisor support. The study tested five hypotheses, and all five hypotheses were valid. In the forthcoming discussion, this study refers to the previous literature and examines the findings through a different lens to understand the relationship between employee training, organizational identification, perceived supervisor support, and frontline employees' turnover intention in construction firms by exploring the relationship between these variables in order to provide practical recommendations for organizational development in the construction industry.

Hypothesis H1 proposed that there is a negative relationship between employee training and the turnover intention of frontline employees in the construction industry. The results ($\beta = -0.285$, T = 5.736, $p < 0.05$) confirmed that effective employee training plays an important role in reducing the turnover intention of frontline employees in the construction industry. This result is consistent with previous research [67]. This study showed that when construction companies are interested in conducting employee training, employees perceive it as an investment in them by the organization, especially for the construction industry where the job risks are high, conducting training for employees is perceived as a sign of importance to the safety of employees' lives and as a result, they tend to increase their satisfaction, which in turn reduces the turnover intention [20]. The positive impact of employee training on turnover intention can be attributed to the social exchange theory. This theory suggests that when an organization provides something of value to its employees, based on the norm of reciprocity, the employees also exchange support and recognition from the organization through positive attitudes and behaviors towards the organization [68]. These findings suggest that employee training in construction companies can not only improve employees' knowledge and skills but also effectively reduce employee turnover intention, which provides a new basis for construction companies to conduct employee training.

In H2, it is proposed that there is a positive relationship between employee training and organizational identification of frontline employees in the construction industry. The results ($\beta = 0.485$, T = 11.320, $p < 0.05$) indicate that employee training can significantly improve the organizational identification of frontline employees in the construction industry. This finding also confirms previous research [69]. This study found that when organizations conduct training for employees, their organizational identification increases due to the social exchange theory [34]. In the construction industry, where job risks are high, active training programs for employees, especially safety training, will make employees feel valued, and their sense of belonging will improve. In addition, it has also been noted that innovative techniques for training development, enhanced pre-training surveys, and support for learners will further enhance the positive effects of training when conducting employee training efforts [69].

Hypothesis H3 explored the relationship between organizational identification and employees' turnover intention, and the results ($\beta = -0.260$, T = 4.792, $p < 0.05$) confirmed that organizational identification positively affects the reduction in turnover intention among frontline employees in the construction industry. This finding is consistent with previous research [29] that organizational identification is the feeling of being psychologically aligned with the organization, which makes employees feel very strongly connected to the organization's values, goals, and job support by enhancing their emotional engagement and sense of belonging. When employees strongly identify with their organization, they perceive it as a loss when they leave the organization [32]. In addition, frontline employees in the construction industry often migrate with construction projects, and when they enter a project, they are motivated to believe in the organization and align with its goals, which increases the sense of belonging and reduces the likelihood of leaving the organization.

At H4, this study used bootstrapping to validate the mediating influence, hoping to verify the mediating role of OI in the relationship between ET and TI. The results ($\beta = -126$, T = 3.991, $p < 0.05$) indicated that the mediating role was supported. These findings suggest that organizational identification can indirectly affect turnover intention through its relationship between employee training and employee turnover intention. In the construction industry, as a high-risk industry, when an organization conducts training for frontline employees, it will be viewed by the employees as a sign of concern for the employees and the importance of their lives and safety, which will make the employees believe that the organization has regarded them as part of the organization [41]. Based on the social exchange principle, this tends to enhance employees' sense of organizational identification, which in turn enhances their connection with the organization, thus reducing turnover intention. Combined with H2, we may learn that organizational identification does not only have a direct effect on the turnover intention of frontline employees in the construction industry but also has an indirect effect.

Finally, Hypothesis H5 confirms the moderating role of perceived supervisor support in the relationship between employee training and turnover intention among frontline employees in the construction industry ($\beta = -0.120$, T = 3.140, $p < 0.05$). This finding is reasonable based on the past literature that perceived supervisor support can help frontline employees identify and refine more useful knowledge and skills from the training they receive, which helps employees to be more receptive to company-arranged training and better absorb the knowledge from the training, which in turn enhances the effectiveness of the training. Strong supervisor support can reduce job insecurity [70]. Thus, when employees feel supervisor support, they perceive it as the organization's concern for the long-term development of their careers, which leads to more positive intentions towards the organization and ultimately reduces turnover intentions.

Based on the above discussion, this study provides important insights into the impact of employee training in construction firms on the organizational identification and turnover intention of employees within the organization. The overall findings highlight the following important messages: first, employee training in construction firms reduces the turnover intention of frontline employees; second, employee training in construction firms enhances the organizational identification of frontline employees; and third, perceived supervisory support positively moderates the relationship between employee training and turnover intention, i.e., when employees feel supported by their supervisors, the effect of employee training will be more pronounced, and frontline employees' turnover intention and frontline employees' propensity to leave will be lower.

6. Conclusions

Employees are an important asset to an organization, especially in the labor-intensive construction industry. This study aims to evaluate the impact of employee training on the turnover intention of frontline workers in construction firms while examining the roles of organizational identification and perceived supervisor support. The results indicate that training effectively reduces the turnover intention of frontline employees, partially mediated by an increase in their organizational identification. Furthermore, perceived supervisor support moderates the relationship between employee training and turnover intention. Specifically, when perceived supervisor support is high, the effect of employee training on reducing turnover intention is more pronounced.

This study enriches the research on employee training within the construction industry. Previous studies on employee training have primarily focused on knowledge-based workers, such as public university lecturers [71], civil servants [22], and bank management personnel [72], with limited attention to frontline workers in the construction sector. Moreover, the findings validate the applicability of social exchange theory in the context of employee training and turnover intention among frontline workers in construction firms, thereby extending the theoretical framework to a new domain and enhancing the integration of academic insights with practical applications. Overall, this study advances the understanding of the role of employee training in Chinese construction firms.

As an empirical study, this research provides evidence-based insights for optimizing human resource management practices in construction firms. It highlights the critical role of employee training in enhancing organizational identification and reducing turnover intention, offering valuable references for managerial decision-making. Additionally, the study identifies the moderating effect of perceived supervisor support, further emphasizing and clarifying the role of managers in construction firms. Overall, this research offers practical guidance for Chinese construction firms to reduce turnover intention by optimizing training systems and strengthening supervisor support, contributing to the stability and sustainable development of the industry.

Despite its significant contributions, this study has certain limitations. The research design employed is cross-sectional, which means that data were collected at a single point in time. This design may limit the ability to capture the relationships between variables as they evolve over time. Furthermore, this study primarily relies on survey data and quantitative analysis, lacking supplementary in-depth qualitative research to comprehensively uncover the complex mechanisms underlying individual perceptions and behaviors.

Future research could address these limitations by adopting longitudinal data collection and analysis to explore the dynamic relationships between human resource management practices and employee behaviors in the construction industry. In large-scale construction projects, such a time-sensitive approach would hold greater practical significance. Additionally, future studies could integrate quantitative and qualitative methods through a mixed-methods research design. Quantitative data could be gathered through surveys to provide broad insights, while small-scale qualitative interviews could offer a deeper understanding of the mechanisms driving employee perceptions and behaviors. This approach would provide more comprehensive and multi-dimensional insights, enhancing both the explanatory power and theoretical contributions of the research. The proposed research directions could help address the limitations of existing studies, deepen understanding of the relationships between human resource management practices and employee behaviors in the construction industry, and offer forward-looking, practical recommendations for management practices in construction firms.

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