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Structural equation modeling innovative work behavior of teachers in southern border provinces

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ABSTRACT

This study aimed to develop a structural equation model of innovative work behavior among teachers in the three southern border provinces of Thailand. The study was grounded in the Job Demands Resources (JD–R) Theory and Self-Determination Theory (SDT). A quantitative research design was employed, targeting primary school teachers in the three southern border provinces. Data were collected using multi-stage random sampling through a questionnaire survey. Structural Equation Modeling (SEM) was utilized to examine both direct and indirect effects. The findings revealed that, regarding direct effects, teachers' job satisfaction had the strongest positive influence on innovative work behavior. Innovative human resource management (IHRM) also exerted a significant positive effect on innovative work behavior. Concerning indirect effects, the results indicated that the development of teachers' innovative work behavior requires support through innovative human resource management mediated by job satisfaction. Similarly, psychological empowerment influenced innovative work behavior indirectly through job satisfaction. These findings are consistent with the theoretical assumptions of JD–R and SDT. Practically, the results suggest that enhancing teachers' recognition, providing career development opportunities, and supporting professional advancement are essential to fostering work motivation and stimulating creative innovation. Furthermore, personnel development policies should emphasize the enhancement of innovation-related competencies and instructional skills adaptable to contemporary educational contexts.

Keywords: Structural equation modeling, innovative work behavior, southern border provinces.

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INTRODUCTION

The development strategy for Thailand's southern border provinces (2022 to 2024), encompassing Pattani, Yala and Narathiwat, places a strong emphasis on elevating educational quality to meet the demands of a rapidly changing global landscape. A synthesis of the official performance reports from the 2022–2024 fiscal action plans reveals that the Office of the Basic Education Commission (OBEC) has actively implemented professional development programs for teachers. These initiatives primarily focus on enhancing learning management techniques and advancing the production and application of instructional media. The overarching goal is to equip teachers with modern technological tools to optimize the teaching and learning process, ensuring it is both efficient and highly responsive to the needs of contemporary learners. Despite these capacity-building efforts, a critical gap remains: a subset of teachers still lacks the creative initiative and the necessary intrinsic motivation to develop their own educational innovations (National Security Council Office, 2022). Strengthening human capacity to produce innovation-oriented individuals is crucial, as such individuals serve as key driving forces in advancing the regional innovation system within the context of the Southern Border Provinces (OECD, 2024). However, the prolonged unrest in the area has continuously affected educational management. Education, as a subsystem within the broader socio-political context of the southern region, has been

significantly influenced by the ongoing situation. A deeper examination reveals other major issues: educational quality and access to educational opportunities (Chuchuen, 2012).

A review of the literature concerning primary schools under the office of the Basic Education Commission in the three southern border provinces highlights several key areas for development. Saengrawee and Chusuwan (2022) examined the components of continuous learning among primary school teachers in the Southern Border Provinces. Their findings indicate that teachers must be capable of designing educational innovations to creatively address school contexts and effectively solve student-related problems. Also, Aree and Niemted (2023) investigated the needs for developing creative leadership among school administrators in the Southern Border Provinces. The study revealed that many administrators lack modern management skills. Some also demonstrate insufficient transformational leadership skills, limited capacity to initiate educational innovation, and inadequate adaptability to global trends. Additionally, resistance to change and limited understanding of change management were identified as significant barriers to innovation development and organizational progress. These findings underscore the critical importance of transformational leadership in driving organizational development. (Education Driving Center in the Three Southern Border Provinces, 2024). Furthermore, Chaisawas, Chullasap and Waichompu (2024) studied the development of components and indicators of school administrator competencies in multicultural societies under primary educational service areas in the three Southern Border Provinces. Their findings highlight that one essential competency of school administrators in multicultural contexts is academic and innovation leadership, including the ability to foster innovative work behaviors among teachers.

A synthesis of the literature integrating JD-R and SDT frameworks reveals transformational leadership as a crucial variable. It acts simultaneously as a job resource (JD-R) and a facilitator of basic psychological needs (SDT). Both theories support the premise that transformational leaders create a work environment that nurtures employees' internal capabilities. This empowers personnel with the cognitive, emotional, and motivational readiness to innovate, forming the essential groundwork for innovative work behavior in the organization. (Breevaart and Bakker, 2018; Hoch et al., 2018; Wang et al., 2021). Furthermore, Innovative Human Resource Management (IHRM) emerges as a pivotal variable that harmonizes with both the JD-R Model and SDT. Within the JD-R framework, IHRM functions as a critical job resource that stimulates motivation and buffers the constraints associated with job demands. Concurrently, through the lens of SDT, it serves as a primary mechanism for cultivating a work environment that satisfies the basic psychological needs of personnel. Consequently, both theoretical paradigms converge on the premise that IHRM establishes an essential foundation for creating a work context conducive to psychological empowerment, job satisfaction, and the sustainable promotion of innovative work behavior. (Bos-Nehles et al., 2017; Harney and Collings, 2021) Psychological empowerment serves as a critical factor in elucidating the internal mechanisms through which personnel translate job resources into positive work outcomes. Under the JD-R framework, psychological empowerment functions as a personal resource that bolsters motivation, confidence, and the readiness to navigate challenges. Simultaneously, this concept is highly congruent with SDT, particularly concerning the dimensions of autonomy and relatedness within the work context. When employees perceive that they possess decision-making authority, find value in their work, and receive recognition from the organization, their intrinsic motivation is substantially amplified. This internal drive, in turn, fosters the proactive initiative to conceptualize, implement, and propose novel operational approaches. Furthermore, within the JD-R framework, job satisfaction reflects the positive yield of job resources that promote occupational well-being. Concurrently, SDT posits that job satisfaction manifests when an individual's basic psychological needs, namely autonomy, competence, and relatedness, are fulfilled. Consequently, when personnel experience high levels of job satisfaction, they inherently cultivate a positive attitude toward the organization and exhibit heightened motivation in their performance (Kim and Beehr, 2018). Moreover, Innovative Work Behavior (IWB) can be comprehensively elucidated through an integrated lens of both the JD-R and SDT frameworks. From the JD-R perspective, IWB is conceptualized as a performance outcome that emerges when personnel are equipped with sufficient job resources and can effectively translate these resources into creative execution. Concurrently, SDT postulates that IWB is fundamentally driven by intrinsic motivation, which arises when an individual's basic psychological needs, specifically autonomy, competence, and relatedness, are optimally fulfilled (Orth and Volmer, 2017; Montani et al., 2020).

Based on the aforementioned rationale and significance, the researcher recognizes a critical research gap in developing a structural equation model of teachers' innovative work behavior in the three Southern Border Provinces comprising the provinces of Pattani, Yala, and Narathiwat. The study aims to examine the effects of key variables, namely transformational leadership, innovative human resource management, psychological empowerment, and job satisfaction, which may demonstrate causal relationships with one another which fosters innovative work behavior among teachers. In this proposed model, transformational leadership is conceptualized as an exogenous latent variable that exerts influence on other variables, which in turn affect teachers' innovative work behavior. The findings are expected to

identify significant causal pathways that promote innovative work behavior among teachers and to contribute to a clearer understanding of mechanisms for fostering innovation within the educational context. Furthermore, this study elucidates the complex mechanisms governing teachers' Innovative Work Behavior (IWB) in the three southern border provinces by identifying the primary driving variables. The theoretical insights gained from this research will empower school administrators and educators to practically apply these findings to foster IWB. Specifically, they can leverage key factors, namely Transformational Leadership, Job Satisfaction, Psychological Empowerment, and Innovative Human Resource Management, to cultivate a highly innovative educational environment.

Research objective

Developing a structural equation model of innovative work behavior of teachers in southern border provinces.

Hypothesis of research

The developed structural equation model of teachers' innovative work behavior in the three southern border provinces is consistent with the empirical data.

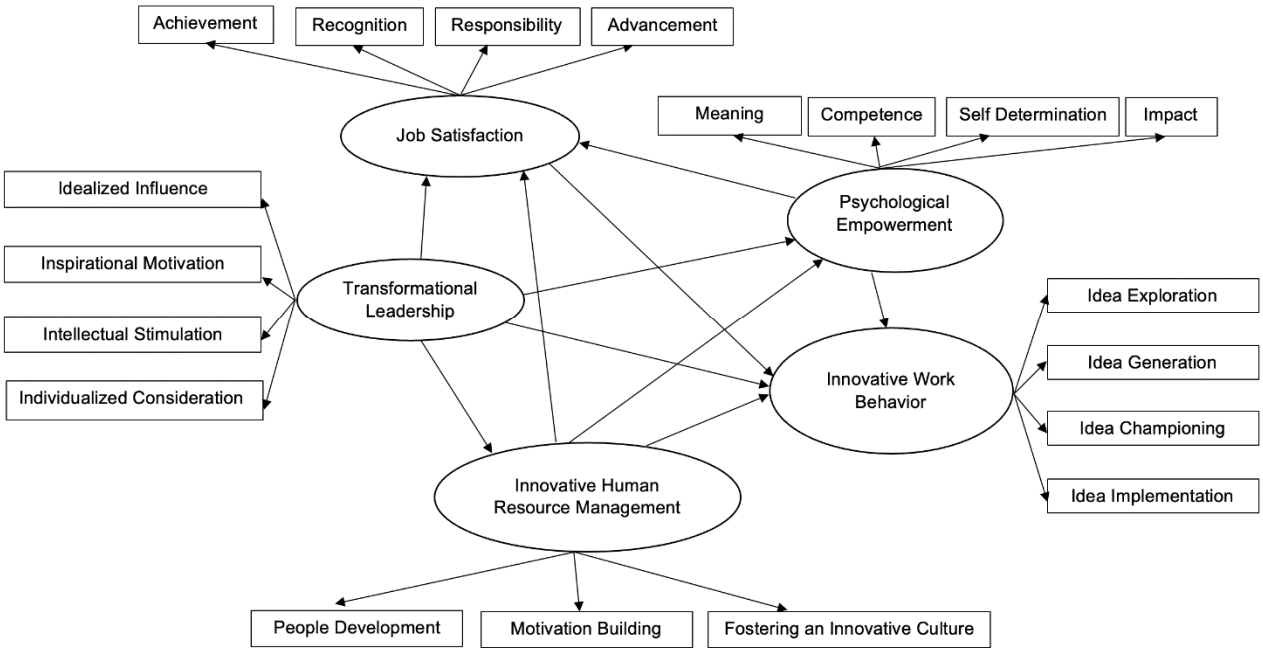

Figure 1. The conceptual framework.

METHODOLOGY

Participants and data collection

The population consisted of primary school teachers from a total of 868 schools under the Office of the Basic Education Commission in the three southern border provinces of Thailand (Pattani, Yala and Narathiwat). The sample consisted of 380 participants, including school administrators and teachers of primary schools under the Office of the Basic Education Commission in the three southern border provinces (Pattani, Yala and Narathiwat). The sample size was determined using a ratio of 20 participants per one observed variable (Kline, 2016). In these studies, there were 19 observed variables. The sample was obtained using a multi-stage random sampling technique. In the first stage, the population was stratified by province (Pattani, Yala, and Narathiwat). The second stage involved stratification by the Primary Educational Service Area Office within each province (Areas 1, 2 and 3). In the third stage, schools were stratified by size: small (1 to 120 students), medium (121 to 600 students), large (601 to 1,500 students), and extra-large (more than 1,500 students). To ensure a comprehensive and highly representative sample, proportionate allocation was utilized across all strata.

Furthermore, the selection of these variables primarily aims to test the Job Demands-Resources (JD-R) theory,

while also integrating Self-Determination Theory (SDT) to elucidate the concept of work engagement. This integration is essential because an individual's work engagement is fundamentally driven by the motivation to fulfill three basic psychological needs: autonomy, competence, and relatedness. Consequently, SDT serves as a crucial foundational framework in this study.

Specifically, this research seeks to examine how school administrators' Transformational Leadership (TL)—acting at the leader level as the sole exogenous variable—influences various mediating variables. These mediators include Psychological Empowerment (PE), Innovative Human Resource Management (IHRM), and Job Satisfaction (JS), which ultimately lead to the final positive outcome: teachers' Innovative Work Behavior (IWB).

Table 1. Common method bias assessment via Harman's single-factor test.

Component	SS loadings	% of variance	Cumulative %
Common latent factor	20.6	41.2	41.2

Table 1 presents the assessment of common method bias (CMB) utilizing Harman's single-factor test. The analysis demonstrated that a single common factor explained only 41.2% of the total variance, which is well below the established 50% criterion. These findings confirm that the dataset is not substantially affected by common method variance and is highly appropriate for further analytical procedures (Korsgaard and Roberso, 1995; Mossholder et al., 1998).

Measure

For this study, the researcher adapted and refined measurement items from various scholars to ensure their appropriateness and contextual relevance to the educational setting. The details are as follows:

Innovative work behavior (IWB)

The measurement instrument for innovative work behavior was adapted from Measuring Innovative Work Behavior, developed by De Jong and Den Hartog (2010). The scale consists of 12 items. Responses were recorded using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item is: "Teachers pay attention to problems that arise in the teaching and learning process." In the study, the scale demonstrated satisfactory internal consistency, with a Cronbach's alpha coefficient of 0.921 and AVE values were equal to or greater than 0.50.

Transformational leadership (TL)

The instrument used to measure transformational leadership was adapted from the Multifactor Leadership Questionnaire: Manual and Sample Set, developed by Bass and Avolio (2004). The scale comprises 16 items. Responses were recorded using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item is: "The school administrator demonstrates strong capability and energy in performing his or her duties." In the study, the scale demonstrated satisfactory internal consistency, with a Cronbach's alpha coefficient of 0.853 and AVE values were equal to or greater than 0.50.

Innovative human resource management (IHRM)

The instrument used to assess innovative human resource management was adapted from the Scale for Measuring HR Practices Aimed at Performance-Enhancement and Employee-Support, developed by Villajos et al. (2019). The scale consists of 6 items. Responses were recorded using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item is: "Teachers are provided with opportunities to participate in training and courses related to innovation." In the study, the scale demonstrated satisfactory internal consistency, with a Cronbach's alpha coefficient of 0.926 and AVE values were equal to or greater than 0.50.

Job satisfaction (JS)

The job satisfaction scale was adapted from the instrument developed by Herzberg (1987). The scale comprises 8 items. Responses were recorded using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item is: "Teachers carry out their assigned duties to achieve established goals and are able to resolve problems and obstacles encountered in their work successfully." In the study, the scale demonstrated satisfactory internal consistency, with a Cronbach's alpha coefficient of 0.926 and AVE values were equal to or greater than 0.50.

Psychological empowerment (PE)

The psychological empowerment scale was adapted from Dimensions, Measurement, and Validation of Psychological Empowerment in the Workplace, developed by Spreitzer (1995). The instrument consists of 12 items. A sample item is: “Teachers are confident in their own abilities.” In the present study, the scale demonstrated satisfactory internal consistency, with a Cronbach’s alpha coefficient of 0.906 and AVE values were equal to or greater than 0.50.

Data collection and analysis

Regarding the data collection procedure, formal letters along with 380 copies of the questionnaire were distributed to the selected schools. Upon retrieval, the returned questionnaires were carefully screened for completeness. The data from the fully completed responses were subsequently analyzed using the Jamovi statistical software.

Structural Equation Modeling (SEM) was employed to examine the relationships among the variables and to evaluate the validity of the proposed model. Specifically, Covariance-Based SEM (CB-SEM) was utilized to test the theoretical framework against the empirical data. This approach was deemed appropriate given that the sample size exceeded 200 participants and the data met the assumption of normal distribution. The goodness-of-fit for the model was evaluated using the following criteria: $\chi^2/df \leq 3$, SRMR ≤ 0.05, RMSEA ≤ 0.08, CFI ≤ 0.95, TLI ≤ 0.90 and GFI ≤ 0.95 (Hair, Hult, Ringle and Sarstedt, 2017).

RESULTS

As indicated in Table 2, the majority of the respondents were female (n = 310, 81.58%), while males accounted for 18.42% (n = 70). Regarding teaching experience, the largest proportion of the sample had over 10 years of experience (n = 191, 50.26%), whereas the smallest proportion possessed less than 5 years of experience (n = 74, 19.47%). In terms of educational attainment, the vast majority held a bachelor's degree (n = 331, 87.11%), followed by those with a master's degree (n = 47, 12.37%) and a doctoral degree (n = 2, 0.53%). Furthermore, concerning school size, most respondents were affiliated with medium-sized schools (n = 243, 63.95%), followed by small-sized schools (n = 120, 31.58%). A small minority were situated in large schools (n = 14, 3.68%) and extra-large schools (n = 3, 0.79%).

Table 2. Demographic characteristics of the respondents.

Demographic variables	Frequency	Percentage
Gender		
Male	70	18.42
Female	310	81.58
Work Experience		
Less than 5 years	74	19.47
5 – 10 years	115	30.26
More than 10 years	191	50.26
Educational Attainment		
Bachelor's degree	331	87.11
Master's degree	47	12.37
Doctoral degree	2	0.53
School Size		
Small	120	31.58
Medium	243	63.95
Large	14	3.68
Extra-large	3	0.79
Total	**380**	**100**

As indicated in Table 3, the overall mean levels of the variables were found to be at a very high level. Notably, psychological empowerment, followed by job satisfaction, and innovative human resource management, respectively, while transformational leadership demonstrated the lowest mean score among the variables.

Table 3. Descriptive statistics, Skewness Kurtosis and Heterotrait-monotrait (HTMT) ratio of correlations

Variables	M	SD	Sk	Ku	TL	IHRM	JS	PE	IWB
TL	4.050	0.686	-0.410	-0.019	1.000				
IHRM	4.223	0.636	-0.285	-0.738	0.413	1.000			
JS	4.415	0.602	-0.661	-0.430	0.406	0.719	1.000		
PE	4.418	0.595	-0.727	-0.219	0.311	0.691	0.652	1.000	
IWB	4.183	0.602	-0.280	-0.494	0.539	0.743	0.800	0.590	1.000

Regarding normality, consideration of skewness (Sk) values indicated that the overall data distribution was negatively skewed (Sk < 0), suggesting that most observed values were relatively higher than the mean. The skewness values ranged from –0.727 to –0.280. In terms of kurtosis (Ku), the overall distribution appeared slightly flatter than the normal distribution (Ku < 0), with all variables falling within the range of –0.738 to –0.019. Furthermore, the Heterotrait Monotrait ratio (HTMT) values were within acceptable thresholds, indicating good discriminant validity. Each latent construct was empirically distinct and adequately differentiated from the others. (Henseler, Ringle and Sarstedt, 2015; Hair, Hult, Ringle and Sarstedt, 2017).

Table 4. Model fit results of confirmatory factor analyses.

Latent variable	Cronbach's alpha	Observed variable	Factor loading	CR	AVE	Results
TL	0.853	TL1	0.884	0.865	0.684	Pass
		TL2	0.895			
		TL3	0.774			
		TL4	0.773			
IHRM	0.926	IHRM1	0.862	0.918	0.789	Pass
		IHRM2	0.883			
		IHRM3	0.916			
JS	0.926	JS1	0.829	0.915	0.771	Pass
		JS2	0.872			
		JS3	0.910			
		JS4	0.900			
PE	0.906	PE1	0.921	0.846	0.675	Pass
		PE2	0.761			
		PE3	0.709			
		PE4	0.859			
IWB	0.921	IWB1	0.863	0.889	0.724	Pass
		IWB2	0.769			
		IWB3	0.845			
		IWB4	0.899			

χ^2/df = 235/134 = 1.754, SRMR = 0.035, RMSEA = 0.045, CFI = 0.985, TLI = 0.981, GFI = 0.995

Table 4 Indicates that every construct achieved acceptable levels of reliability and convergent validity, as evidenced by Cronbach's alpha, composite reliability (CR > 0.70), and average variance extracted (AVE) values surpassing the recommended criteria (AVE > 0.50) The Average Variance Extracted (AVE) values for TL and PE, ranging from 0.675 to 0.684, successfully demonstrate convergent validity. That is, the observed indicators for both TL and PE converge on their intended underlying constructs at an acceptable level (Bagozzi and Yi, 1988).

Furthermore, the confirmatory factor analysis (CFA) of the structural equation model of teachers' innovative work

behavior in the three Southern Border Provinces revealed that 5 latent constructs: transformational leadership (TL), innovative human resource management (IHRM), job satisfaction (JS), psychological empowerment (PE), and innovative work behavior (IWB). The standardized factor loadings ranged from 0.709 to 0.921, indicating that all observed indicators significantly and adequately represented their respective latent constructs. Regarding construct reliability, the composite reliability (CR) values for all latent variables were equal to or greater than 0.70, demonstrating satisfactory internal consistency and supporting the adequacy of the measurement model. Furthermore, the average variance extracted (AVE) values were equal to or greater than 0.50. Considering the model fit indices, the results showed $\chi^2/df = 235/134 = 1.754$, SRMR = 0.035, RMSEA = 0.045, CFI = 0.985, TLI = 0.981, and GFI = 0.995. These values indicate that the measurement model demonstrated a good fit and was well aligned with the empirical data.

Table 5. Standardized direct effects with 95% confidence intervals.

Hypothesis	Path	β	SE	95% Confidence Intervals		p	Results
				Lower	Upper		
H1	TL →IWB	0.170	0.037	0.102	0.248	<.001	Supported
H2	IHRM →IWB	0.227	0.054	0.119	0.332	<.001	Supported
H3	JS →IWB	0.528	0.056	0.436	0.656	<.001	Supported
H4	PE →IWB	0.059	0.059	-0.052	0.179	0.283	Not Supported
H5	TL →JS	0.150	0.043	0.065	0.234	<.001	Supported
H6	IHRM →JS	0.381	0.062	0.244	0.487	<.001	Supported
H7	PE →JS	0.370	0.067	0.254	0.518	<.001	Supported
H8	TL →PE	0.094	0.044	0.003	0.176	0.043	Supported
H9	IHRM →PE	0.705	0.048	0.554	0.743	<.001	Supported
H10	TL →IHRM	0.420	0.057	0.323	0.549	<.001	Supported

As indicated in Table 5, the analysis of direct effects in the structural equation model of teachers' innovative work behavior in the three Southern Border Provinces indicated that the overall path coefficients ranged from 0.059 to 0.705. Notably, innovative human resource management (IHRM) exerted the strongest direct effect on psychological empowerment (PE), with a path coefficient of 0.705 ($p < .001$). This finding suggests that innovative human resource management practices substantially enhance teachers' psychological empowerment. The second strongest effect was observed from job satisfaction (JS) to psychological empowerment (PE), with a path coefficient of 0.528 ($p < .001$). In addition, transformational leadership (TL) significantly influenced innovative human resource management (IHRM), with a path coefficient of 0.420 ($p < .001$). Furthermore, psychological empowerment (PE) and innovative human resource management (IHRM) both had significant direct effects on job satisfaction (JS), with path coefficients of 0.381 and 0.370, respectively ($p < .001$). An additional noteworthy finding was that transformational leadership (TL) had a relatively small but statistically significant effect on psychological empowerment (PE), with a path coefficient of 0.094 ($p < .05$). However, psychological empowerment (PE) did not have a significant direct effect on innovative work behavior (IWB) ($p = 0.283$).

As indicated in Figure 2, Developing a Structural Equation Modeling Innovative Work Behavior of Teachers in Southern Border Provinces, these values indicated that the model demonstrated a good fit and was well aligned with the empirical data ($\chi^2/df = 188/129 = 1.457$, SRMR = 0.035, RMSEA = 0.045, CFI = 0.985, TLI = 0.981, GFI = 0.995).

Although the inherent structure of Structural Equation Modeling (SEM) naturally encompasses both direct and indirect relationships, thus primarily yielding a holistic overview of the model, the researcher determined that indirect effects should be reported separately to ensure methodological clarity and robust hypothesis testing. It is crucial to emphasize that merely specifying indirect paths within a model is not synonymous with explicitly testing their statistical significance. A rigorous evaluation of indirect effects necessitates examining the specific estimates (the product of path coefficients) and their corresponding confidence intervals. Therefore, to provide a more comprehensive interpretation and in alignment with established mediation literature, this study explicitly reports the indirect effect estimates alongside their bootstrapped confidence intervals to draw accurate inferences.

As indicated in Table 6, the analysis of indirect effects in the structural equation model of teachers' innovative work behavior in the three Southern Border Provinces revealed that the overall indirect path coefficients ranged from 0.041 to 0.201. Among the indirect paths, the strongest and most comparable effect was observed in the pathway whereby innovative human resource management (IHRM) positively influenced job satisfaction (JS), which in turn

enhanced teachers' innovative work behavior (IWB), with an indirect effect of 0.201. However, although innovative human resource management (IHRM) significantly influenced psychological empowerment (PE), psychological empowerment did not significantly predict innovative work behavior (IWB) (p = 0.283).

Table 6. Standardized indirect with 95% confidence intervals.

Pathway	β	SE	95% Confidence Intervals		p	Results
			Lower	Upper		
TL → IHRM → JS → IWB	0.084	0.020	0.048	0.126	<.001	Supported
TL →IHRM → PE → JS →IWB	0.058	0.015	0.031	0.088	<.001	Supported
TL → IHRM → PE → IWB	0.017	0.017	-0.015	0.051	0.288	Not Supported
TL → IHRM → IWB	0.095	0.027	0.046	0.151	<.001	Supported
TL → JS → IWB	0.079	0.025	0.033	0.130	<.001	Supported
TL → PE → JS → IWB	0.018	0.010	-0.001	0.039	0.060	Not Supported
TL → PE → IWB	0.006	0.006	-0.006	0.017	0.341	Not Supported
PE → JS → IWB	0.195	0.043	0.127	0.294	<.001	Supported
IHRM → JS → IWB	0.201	0.038	0.124	0.274	<.001	Supported
IHRM → PE → JS → IWB	0.138	0.029	0.080	0.193	<.001	Supported
IHRM → PE → IWB	0.041	0.038	-0.034	0.116	0.283	Not Supported

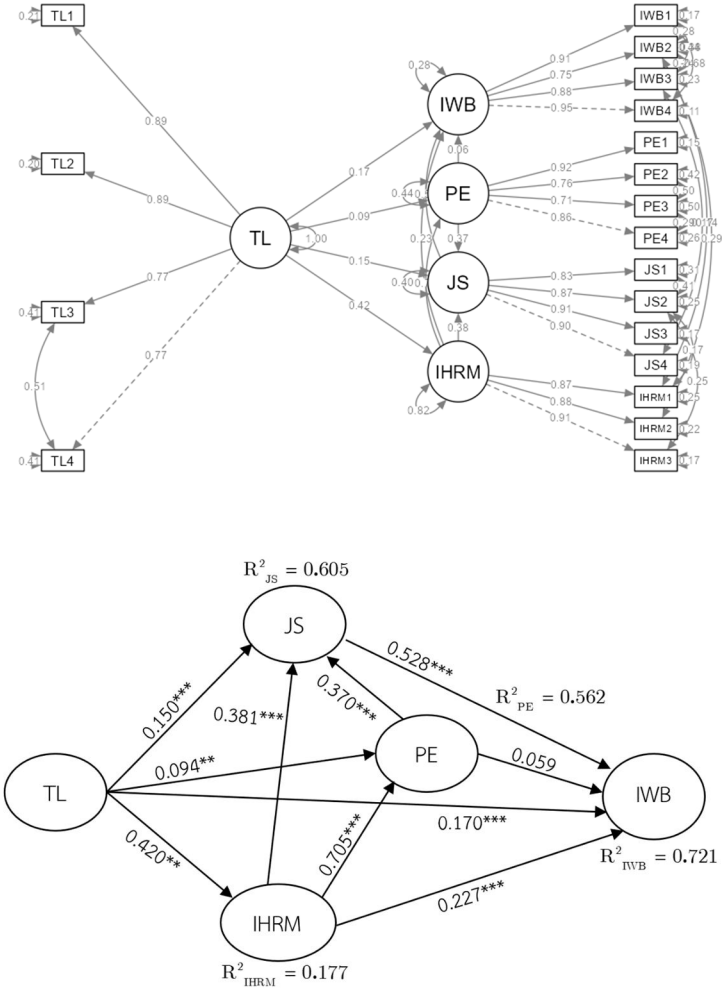

Figure 2. Developing a structural equation modeling innovative work behavior of teachers in southern border provinces.

When considering the exogenous latent variable, the overall indirect effects ranged from 0.006 to 0.095. Although these effects, particularly those associated with school administrators' roles, were relatively modest in magnitude, they remain important in promoting teachers' innovative work behavior, as they represent external driving forces that influence internal mechanisms. Specifically, transformational leadership (TL) positively affected innovative human resource management (IHRM), which subsequently enhanced innovative work behavior (IWB), yielding the largest indirect effect among the exogenous pathways (0.095).

An additional noteworthy finding was that the indirect pathway from transformational leadership (TL) to psychological empowerment (PE), and subsequently to job satisfaction (JS), did not significantly influence innovative work behavior (IWB) at the conventional statistical level ($p > .05$). Nevertheless, it demonstrated practical significance and may have meaningful implications for practice ($p < .08$) (Maxwell and Delaney, 2004; Field, 2013). Furthermore, although transformational leadership (TL) positively influenced innovative human resource management (IHRM), which in turn positively affected psychological empowerment (PE), this pathway did not result in a significant indirect effect on innovative work behavior (IWB) ($p = 0.288$).

DISCUSSION

Discussion of main findings

The development and evaluation of the structural equation model for teachers' innovative work behavior in the three southern border provinces revealed an excellent fit with the empirical data. The goodness-of-fit indices, specifically $\chi^2/df = 188/129 = 1.457$, SRMR = 0.032, RMSEA = 0.035, CFI = 0.991, TLI = 0.988, GFI = 0.996 all satisfied the recommended criteria. Within this validated model, the independent variables accounted for a highly substantial proportion of the variance in teachers' innovative work behavior. This robust explanatory power can be attributed to the rigorous literature review and the strong theoretical foundation, which successfully integrated the Job Demands-Resources (JD-R) theory with Self-Determination Theory (SDT) to elucidate the linkages between variables. Specifically, Transformational Leadership functions as a job resource (providing leadership and social support) that stimulates motivation and mitigates the negative impacts of job demands, while simultaneously supporting the basic needs of autonomy, competence, and relatedness through its transformational components. Similarly, Innovative Human Resource Management acts as an additional job resource; practices such as training, development, and cultivating an innovative climate serve to design work systems that fulfill these same psychological needs. Furthermore, Psychological Empowerment serves as a personal resource that strengthens the motivational cycle within the JD-R framework, aligning directly with the fulfillment of autonomy and relatedness. Job Satisfaction manifests as an outcome of intrinsic motivation, encompassing achievement, task interest, responsibility, and advancement, thereby promoting occupational well-being. Ultimately, Innovative Work Behavior emerges as the final performance outcome within the integrated JD-R framework (Deci and Ryan, 2000; Tummers and Bakker, 2017).

This study developed a structural equation model of teachers' innovative work behavior in the three Southern Border Provinces. The findings supported Hypotheses 1, 2 and 3, indicating that transformational leadership, innovative human resource management, and job satisfaction significantly influenced teachers' innovative work behavior. One possible explanation is that school administrators who demonstrate transformational leadership tend to foster supportive environments that encourage teachers to experiment with and develop new ideas, while effectively managing emerging challenges. Consistent with the JD-R framework, leadership is a pivotal variable influencing the utilization of job resources to manage workplace demands and challenges. When organizational leadership fosters a supportive environment where employees feel valued, it directly links to SDT by satisfying the needs for autonomy, competence, and relatedness through transformational leadership components. Moreover, the high expectations set by such leaders motivate teachers to exhibit creative behaviors and seek novel operational approaches, ultimately driving enhanced efficiency and innovation within the organization. (Tummers and Bakker, 2017) These findings are consistent with previous studies showing that transformational leadership has a positive and significant effect on employees' innovative work behavior (Li et al., 2019; Khan, Ismail, Hussain and Alghazali, 2020; Zainal and Matore, 2021; Rafique et al., 2022). According to hypothesis 2, innovative human resource management was found to have a statistically significant positive effect on innovative work behavior. This may be attributed to administrators' emphasis on developmental HR practices, including professional development, internal promotion, performance appraisal for growth, and the cultivation of an innovation-supportive climate. Such practices likely encourage teachers to generate novel ideas, implement them in practice, and promote acceptance of innovation among colleagues. Consistent with theoretical principles, Innovative Human Resource Management acts as a vital job resource. Initiatives such as professional training, development, and the fostering of an innovative atmosphere effectively stimulate workforce readiness. Consequently, employees are provided with the requisite ability, motivation, and opportunity to manifest concrete innovative work behaviors (Bos-Nehles et al., 2017; Harney and Collings, 2021). These findings align with prior

research demonstrating that developmental-oriented HRM practices positively influence employees' innovative work behavior (Chang, Zhang and Wu, 2021; Li, Zhang and Yan, 2022; Tajeddini et al., 2022; Kutieshat and Farmanesh, 2022; Al-Taie and Khattak, 2024). Subsequently, regarding hypothesis 3, job satisfaction also demonstrated a significant positive effect on innovative work behavior. Teachers who experience satisfaction, whether through achievement, external recognition, responsibility, or career advancement, are more likely to engage in creative thinking and innovation within their professional context. Consistent with the Job Demands-Resources (JD-R) framework, job satisfaction emerges as an outcome of intrinsic motivation—encompassing dimensions such as achievement, task interest, responsibility, and advancement, which in turn promotes comprehensive occupational well-being. This process is fundamentally supported by Self-Determination Theory (SDT), which asserts that such well-being manifests when an individual's three basic psychological needs (autonomy, competence, and relatedness) are fulfilled. Upon the satisfaction of these foundational needs, employees experience heightened autonomous and intrinsic motivation. This internal drive subsequently fosters a profound sense of meaningful work, enhanced job satisfaction, and positive well-being within the work environment (Bakker and Demerouti, 2017; Nazir et al., 2021). This result is consistent with earlier studies suggesting that individuals who feel satisfied with their roles and work environments are more inclined to display creative and innovative behaviors aimed at organizational improvement (Chung and Kim, 2017; Coetzer et al., 2018; Wei, Chen, Zhang and Zhang, 2020; Ahmad, Khan and Iqbal, 2021; Mustafa, Coetzer, Ramos and Fuhrer, 2021).

The findings did not support hypothesis 4, as psychological empowerment did not significantly affect innovative work behavior. This result may be explained by the unique contextual challenges of the three Southern Border Provinces, where ongoing instability and security concerns may influence teachers' psychological states. Even if teachers possess a certain level of psychological empowerment, external pressures and perceived threats may hinder their ability to translate that empowerment into innovative work behavior. This interpretation is consistent with Edmondson's (1999) Conservation of Resources Theory, which posits that when individuals face threats or resource loss, they tend to conserve existing resources rather than invest them in creating new ones. Furthermore, psychological safety is considered a fundamental prerequisite for innovation. When teachers feel insecure about their personal safety or property, their creative thinking and willingness to experiment may be naturally suppressed, as attention is redirected toward survival and security concerns. This perspective aligns with Edmondson (1999), who emphasized that psychological safety is a necessary condition for employees to engage in innovative behaviors.

Regarding hypotheses 5, 6 and 7, the findings indicated that transformational leadership, innovative human resource management, and psychological empowerment had significant effects on job satisfaction. One possible explanation is that school administrators who demonstrate transformational leadership emphasize visionary development and continuous organizational improvement. Such leadership fosters a supportive climate that sustains and enhances teachers' job satisfaction over time. This finding is consistent with previous studies showing that transformational leadership effectively improves both job satisfaction and life satisfaction among teachers, with significant relationships identified between transformational leadership and job satisfaction (Bernarto et al., 2020; Cahyono et al., 2020; Khan et al., 2020; Hilton et al., 2023; Jan and Manzoor, 2021). Similarly, innovative human resource management was found to have a statistically significant positive effect on job satisfaction. This may be because administrators who adopt innovative HRM practices tend to design professional development systems that provide teachers with opportunities to demonstrate their capabilities and achieve tangible success in their work. Such practices, including training, performance appraisal, rewards, and welfare support, enhance teachers' sense of value and satisfaction in their professional roles. These findings align with prior research demonstrating that high-quality HRM practices positively influence employees' job satisfaction (Suryani, Yoga and Sugianingrat, 2018; Khan, Yusoff, Hussain and Ismail, 2019; Uddin et al., 2019; Najam et al., 2020; Malik, Ali, Kausar and Chaudhry, 2022). In addition, psychological empowerment was found to exert a statistically significant positive effect on job satisfaction. This may be explained by teachers' perceptions that their work is meaningful, that they have autonomy in decision-making related to their responsibilities, and that they possess the competence to perform their duties effectively. Furthermore, when teachers perceive that they contribute positively to the reputation and success of their schools, they are more likely to experience higher levels of job satisfaction. These findings are consistent with previous research indicating that psychological empowerment positively influences job satisfaction, particularly when employees perceive their work as meaningful and believe they can make a meaningful impact on organizational outcomes (Aydogmus, Camgoz, Ergeneli and Ekmekci, 2017; Qing, Asif, Hussain and Jameel, 2019; Atik and Celik, 2020; Maan et al., 2020; Xiang et al., 2024).

Furthermore, hypotheses 8 and 9 were supported, indicating that transformational leadership and innovative human resource management had significant effects on psychological empowerment. One possible explanation is that school administrators actively foster teachers' psychological empowerment by promoting autonomy in decision-making, enhancing competence, emphasizing meaningfulness, and reinforcing teachers' perceived impact on the organization. Administrators who

consistently demonstrate confidence in teachers' potential through assigning challenging tasks and encouraging participation in policy-related decisions create conditions that strengthen teachers' internal sense of empowerment. These findings are consistent with prior research suggesting that leaders who inspire, intellectually stimulate, and provide individualized support enhance employees' perceptions of meaning, competence, and autonomy, thereby fostering positive psychological empowerment within organizations (Liu, Liu, Yang and Wu, 2019; Begum et al., 2020; Mufti et al., 2020; Prasetia, Melfayetty and Dewi, 2020; Palupi and Sunaryo, 2023). Finally, hypothesis 10 was also supported. Transformational leadership had a statistically significant positive effect on innovative human resource management. This may be explained by the tendency of transformational leaders to prioritize teacher development, motivation, and the cultivation of an innovation-oriented climate. By encouraging continuous professional development and creating an environment conducive to learning and experimentation, school administrators contribute to flexible and modernized systems of recruitment, development, and retention that align with changing contextual demands. These findings are consistent with previous studies demonstrating that transformational leadership positively influences the implementation of innovative HRM practices (Jia, Liu, Chin and Hu, 2018; Setiawan and Yohanes, 2020; Kazmi et al., 2021; Al-Jubouri, 2023; Wanuri, Budiyanto and Suhermin, 2023).

Practical implications

Teacher job satisfaction should be enhanced, as it exerts the strongest influence on teachers' innovative work behavior, particularly in terms of achievement, recognition, responsibility, and career advancement. Strengthening components that contribute to job satisfaction, such as publicly recognizing teachers' achievements during meetings, delegating pivotal roles in curriculum development, particularly for competency-based curricula, facilitating access to professional training and study visits, and actively supporting their career advancement trajectories, is highly recommended. These strategic approaches will significantly enhance occupational motivation and stimulate educators to cultivate creative thinking, ultimately culminating in the generation of innovative pedagogical practices.

Innovative human resource management practices should be strengthened, as they significantly influence teachers' innovative work behavior. In formulating personnel development policies, emphasis should be placed on organizing training for the integration of digital technology in pedagogy, supporting the design of context-responsive lesson plans, and encouraging teachers to develop customized, problem-based educational innovations tailored to their learners. Furthermore, schools must cultivate a climate conducive to experimentation. This can be achieved by providing platforms for knowledge exchange, effectively transforming the institution into a "School as Learning Community" (SLC) and by conducting collaborative workshops to pilot and refine innovations. Finally, it is crucial to recognize and reward innovative achievements, whether through formal commendation, opportunities for professional development, or support for career advancement. Collectively, these strategies will empower teachers to embrace change and sustain continuous innovative practices.

Limitations and future research

Based on the literature review, the researcher identified and addressed several research gaps as discussed above. However, the findings revealed that teachers' psychological empowerment did not significantly influence innovative work behavior. Therefore, future studies should further examine and develop strategies to enhance teachers' psychological empowerment in order to promote innovative work behavior more effectively.

CONCLUSIONS

This study developed a structural equation model of teachers' innovative work behavior in the three southern border provinces of Thailand, grounded in the Job Demands–Resources (JD–R) Theory and Self-Determination Theory (SDT). The proposed structural model demonstrated a good fit with the empirical data.

The findings revealed that teachers' job satisfaction exerted the strongest positive influence on innovative work behavior. Furthermore, the emergence of innovative work behavior requires support from Innovative Human Resource Management (IHRM), operating through job satisfaction as a mediating mechanism. Similarly, psychological empowerment contributes to innovative work behavior indirectly through job satisfaction.

Overall, this study provides both theoretical and practical contributions to understanding the drivers of teachers' innovative work behavior in the three southern border provinces. Specifically, job satisfaction and innovative human resource management serve as key mechanisms in fostering and sustaining innovative work behavior among teachers.

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