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How Organizational Innovation Climate Affect Engineering Innovation Capability in Engineering Owner: Considering the Roles of Supervisory Support and Employees' Self-efficacy

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ABSTRACT

In today's rapidly evolving technological landscape, fostering innovation is essential for organizations, particularly in engineering sectors where complex problem-solving is vital for success. Understanding the dynamics between organizational climate and employee capabilities provides valuable insights for enhancing performance and maintaining a competitive advantage. This study examines the impact of organizational innovation climate (OIC) on engineering innovation capability (EIC), focusing on the mediating role of self-efficacy and the moderating effect of supervisory support. Data were collected from employees working in engineering project contexts, where innovation is critical due to the technical and complex nature of tasks. The results demonstrate that a supportive innovation climate directly enhances employees' innovation capabilities. Furthermore, self-efficacy acts as a partial mediator in this relationship, highlighting the role of individual confidence in driving innovation. Supervisory support positively moderates the relationship between innovation climate and self-efficacy, reinforcing the importance of leadership in fostering an environment conducive to innovation. This research offers theoretical insights into the interplay between organizational climate and individual performance, contributing to the literature on innovation management. Additionally, it holds practical value for organizations seeking to cultivate a robust innovation culture, ultimately driving enhanced performance and competitiveness in the engineering domain.

KEYWORDS

Innovation Climate; Engineering Innovation Capability; Self-Efficacy; Supervisory Support; Leadership; Organizational Innovation.

1. INTRODUCTION

The increasing complexity of engineering projects, driven by rapid technological advancements and growing societal needs, demands continuous innovation to remain competitive. Engineering innovation, a critical component of successfully managing and delivering complex projects, is often led by the engineering owner (EO), who acts as the main stakeholder guiding project strategy and execution. As engineering challenges become more intricate, fostering innovation within EO organizations is essential to solving problems efficiently and gaining a competitive edge in the industry. Enhancing the innovation capabilities of these organizations is crucial for addressing these challenges and leveraging opportunities for innovation [1, 2].

To achieve these innovation goals, organizational innovation climate (OIC) emerges as a pivotal factor. OIC refers to the shared perceptions of organizational policies, practices, and procedures that encourage creativity and innovation among employees[3]. Studies show that a positive OIC plays a

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crucial role in driving corporate innovation by fostering an environment that promotes new ideas and solutions. For instance, Patterson et al[4].demonstrated that a supportive innovation climate significantly enhances productivity and innovation outcomes. However, the mechanisms by which OIC influences the innovation capabilities of engineering owners, particularly in the engineering sector, remain underexplored [5]. Additionally, research focusing on the innovation climate within EO organizations, where project-based work and high levels of technical complexity are common, is limited. Understanding how OIC contributes to engineering innovation and its potential to transform EO organizations requires further investigation [6, 7].

This study aims to bridge these gaps by investigating the roles of employees' self-efficacy and supervisory support in mediating the relationship between OIC and engineering innovation capability. Self-efficacy, defined as an individual's belief in their ability to execute tasks successfully, is known to influence how employees engage with innovation processes. Higher self-efficacy enhances creativity and problem-solving, which are essential in innovation-focused environments[8, 9]. Moreover, supervisory support—managers' encouragement and assistance to employees—plays a critical role in shaping a positive innovation climate by providing resources and motivating employees to engage in innovative activities [10]. This study examines how these two variables interact with OIC and how they collectively impact innovation capability in engineering projects[11].

2. RESEARCH OBJECTIVES AND METHODOLOGY

The primary objective of this research is to examine how OIC influences the engineering innovation capabilities of EO organizations, with a particular focus on the mediating roles of employees' self-efficacy and supervisory support. To achieve this, the study adopts a conceptual model based on existing literature and theoretical frameworks. A structural equation modeling (SEM) approach will be used to test the hypothesized relationships between OIC, self-efficacy, supervisory support, and innovation capability. This approach allows for an analysis of the direct and indirect effects of these variables on innovation outcomes in EO organizations[12].

The theoretical contribution of this research lies in expanding the understanding of how organizational innovation climates and personal and managerial factors interact to influence innovation in complex engineering environments. From a practical standpoint, the findings will provide EO organizations with actionable insights into fostering an innovative climate that enhances their ability to tackle engineering challenges and stay competitive in a rapidly evolving market.

2.1. Organizational Innovation Climate

Organizational innovation climate (OIC) refers to the shared perceptions among employees regarding the extent to which their organization supports and encourages innovative behaviors. This concept has gained widespread acceptance in both academic and practitioner circles, with researchers defining it as the collective values, beliefs, and behaviors that shape the environment for innovation within an organization[13]. A positive OIC is essential for fostering creativity and enhancing overall organizational performance.

Several studies have explored the dimensions and implications of OIC, focusing on both antecedents and outcomes. For instance, prior research has identified factors such as leadership style, communication practices, and organizational culture as significant predictors of a positive OIC[14]. The work of Kahn (1990) highlights the importance of psychological safety as a precursor to fostering a supportive innovation environment, where employees feel safe to express their ideas without fear of reprisal[15].

In terms of outcomes, OIC has been linked to various positive organizational behaviors, including enhanced creativity, increased employee engagement, and improved innovation capabilities[16, 17]. Specifically, a robust OIC is crucial for developing engineering innovation capability, as it fosters an

environment conducive to generating and implementing innovative solutions to complex engineering problems[18]. Research indicates that organizations characterized by a strong innovation climate are better positioned to leverage their resources for innovative outcomes, thereby improving their overall performance[19].

Overall, the organizational innovation climate plays a vital role in shaping an organization's ability to innovate, making it essential to understand this relationship within engineering contexts to enhance innovation processes and outcomes in engineering firms.

2.2. Engineering Innovation Capability

Engineering innovation capability (EIC) is defined as an organization's ability to effectively develop and implement new technologies, processes, and services that enhance its competitiveness within the engineering sector[20]. EIC encompasses various components, including the integration of technical skills, organizational structures, and a culture that supports innovation. This capability is critical for organizations to adapt to rapidly changing market demands and technological advancements[21].

Research has shown that several factors contribute to the development of EIC, such as knowledge management practices, R&D investments, and employee engagement[22-24]. For instance, Cohen and Levinthal (1990) posited that organizations with high absorptive capacity, or the ability to recognize the value of new information, are better equipped to innovate[25]. Furthermore, firms with strong EIC have been found to achieve superior project outcomes, as they can better manage uncertainties and risks associated with complex engineering projects[26, 27].

In summary, EIC is a vital organizational capability that enables engineering firms to respond effectively to market challenges, underscoring the need for fostering a supportive innovation environment to enhance these capabilities.

2.3. Supervisory Support and Employees' Self-Efficacy

Supervisory support refers to the assistance, guidance, and encouragement provided by supervisors to their subordinates, significantly influencing employee performance and motivation[28, 29]. Employees'self-efficacy, on the other hand, is defined as an individual's belief in their ability to perform tasks successfully[9]. Both constructs are pivotal in understanding how employees navigate the complexities of innovation.

Research indicates that supervisory support enhances self-efficacy by creating an environment where employees feel valued and empowered. For example, studies by Gist and Mitchell (1992) demonstrate that supportive leadership practices positively influence employees' confidence in their abilities, leading to increased willingness to engage in innovative activities[30]. Additionally, the Leadership-Member Exchange (LMX) theory posits that high-quality exchanges between supervisors and subordinates foster trust and open communication, further enhancing employees' self-efficacy[31, 32].

The interplay between supervisory support and self-efficacy is crucial for fostering a positive organizational innovation climate, which in turn promotes innovation capability. When employees perceive strong support from their supervisors, they are more likely to believe in their abilities to contribute to innovation, thereby enhancing organizational performance[22, 33, 34].

2.4. Discussion of Innovation Climate and Innovation Capability

The relationship between organizational innovation climate and engineering innovation capability is well-documented in the literature. According to the Theory of Planned Behavior[35], a positive organizational climate can significantly influence employees' intentions to engage in innovative behaviors. A strong OIC not only encourages creativity but also facilitates the sharing of ideas and

collaboration among employees[36]. This is particularly important in the engineering field, where teamwork and collaboration are essential for overcoming complex challenges.

Moreover, the concept of psychological safety, as articulated by Kahn (1990), further supports this relationship. When employees feel psychologically safe within an innovative climate, they are more likely to take risks and experiment with new ideas, ultimately leading to enhanced innovation capabilities[17]. Thus, it can be hypothesized: Hypothesis 1: A positive organizational innovation climate significantly enhances engineering innovation capability.

2.5. Discussion of Self-Efficacy on the Relationship Between Innovation Climate and Innovation Capability

Self-efficacy serves as a critical mediator in the relationship between organizational innovation climate and engineering innovation capability. Drawing from Bandura's (1997) Social Cognitive Theory, individuals with high self-efficacy are more likely to embrace challenges and persist in the face of difficulties, making them more inclined to engage in innovative behaviors[9]. When employees perceive a supportive innovation climate, their self-efficacy is likely to increase, which in turn enhances their innovation capability.

Research by Wu et al. (2018) supports this assertion, demonstrating that a positive OIC contributes to higher self-efficacy among employees, which subsequently leads to increased innovative performance[37]. Furthermore, the interplay between self-efficacy and innovation capability aligns with the constructs of the Theory of Planned Behavior, where an individual's beliefs about their capabilities directly influence their behavioral intentions towards innovation[35, 38]. Therefore, the following hypothesis can be posited: Hypothesis 2: Employees'self-efficacy mediates the relationship between organizational innovation climate and engineering innovation capability.

2.6. Discussion of Supervisory Support on Innovation Climate, Self-Efficacy, and Innovation Capability

Supervisory support is hypothesized to moderate the relationship between organizational innovation climate and self-efficacy. According to the LMX theory, effective supervisory support creates high-quality relationships that foster trust and open communication[31]. This supportive relationship enhances the positive impact of a favorable OIC on employees' self-efficacy.

Furthermore, studies indicate that when supervisors actively promote an innovation-friendly environment, employees’confidence in their abilities to innovate is significantly strengthened[33, 39, 40]. The enhancement of self-efficacy through supervisory support ultimately leads to improved engineering innovation capability, as employees are more willing to engage in innovative tasks.

This leads to the following hypothesis: Hypothesis 3: Supervisory support positively moderates the relationship between organizational innovation climate and employees' self-efficacy.

Conceptual Model

The conceptual model derived from the above discussions illustrates the relationships among the organizational innovation climate, engineering innovation capability, employees' self-efficacy, and supervisory support.

3. METHOD

3.1. Procedure and Participants

The data for this study was collected through a questionnaire survey distributed to employees working in various engineering organizations. The survey was conducted over a period of three months, from

May to July 2023. A total of 600 questionnaires were distributed using a combination of random and convenience sampling methods, targeting employees who had been involved in engineering projects. Of the 600 distributed questionnaires, 480 were returned, yielding a response rate of 80%. After excluding incomplete responses, 450 valid questionnaires were used for data analysis.

The participants included employees with diverse roles and experience levels within engineering organizations, ensuring a broad representation of different perspectives on organizational innovation climate (OIC), engineering innovation capability (EIC), employees' self-efficacy, and supervisory support. This sample size is deemed adequate for structural equation modeling (SEM) analysis, as it exceeds the minimum recommended sample size for SEM, which is generally considered to be 200[41].

3.2. Questionnaire Design

The survey instrument was designed to measure four key constructs: organizational innovation climate (OIC), engineering innovation capability (EIC), employees' self-efficacy, and supervisory support. Established and validated scales from previous studies were used for each variable to ensure reliability and validity.

- Organizational Innovation Climate (OIC): OIC was measured using an 11-item scale that includes two dimensions: innovation support and resource supply. Items were adapted from Scott and Bruce (1994) and included statements such as "My organization provides sufficient resources for innovative projects." Responses were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree)[3].

- Engineering Innovation Capability (EIC): EIC was assessed using a 4-item scale focused on team innovation capability, based on Lovelace et al. (2001)[42]. Sample items included "The products developed by our team are highly innovative." Responses were rated on a 5-point Likert scale.

- Employees' Self-efficacy: 3item 4item 8item.To measure self-efficacy, a 3-item scale was employed. This scale assesses employees' confidence in their ability to contribute to innovative tasks. An example item is "I believe I can effectively contribute to innovative projects." Responses were rated on a 5-point Likert scale.

- Supervisory Support: Supervisory support was measured using a 9-item scale adapted from Greenhaus et al. (1990), which evaluates employees' perceptions of their supervisors' encouragement and guidance. Items such as "My supervisor provides support for my innovative ideas" were rated on a 5-point Likert scale[43].

3.3. Data Analysis Methods

The data analysis was conducted in three main stages, starting with the assessment of reliability and validity, followed by hypothesis testing through structural equation modeling (SEM) and regression analysis.

- Reliability and Validity Testing: To ensure the reliability of the scales, Cronbach's alpha coefficients were calculated for each construct. A Cronbach's alpha value of 0.70 or higher was considered acceptable[44]. Additionally, confirmatory factor analysis (CFA) was performed to assess the validity of the measurement model. Composite reliability (CR) and average variance extracted (AVE) were used to further verify construct validity, with AVE values greater than 0.50 indicating acceptable convergent validity[45].

- Main Effects and Mediation Testing: The primary relationships between OIC and EIC, as well as the mediating roles of employees' self-efficacy and supervisory support, were tested using SEM with the maximum likelihood estimation method. The hypothesized mediation effects were examined

using the bootstrapping method, with 5,000 bootstrap samples, as recommended by Preacher and Hayes[46]. This approach allows for the estimation of indirect effects and their statistical significance.

• Moderation Testing: To test the moderation effect of supervisory support on the relationship between OIC and employees' self-efficacy, hierarchical regression analysis was conducted. Interaction terms were created by multiplying the standardized scores of OIC and supervisory support, and these terms were entered into the regression model. The significance of the interaction term was used to determine whether supervisory support moderates the effect of OIC on employees' self-efficacy[47].

All analyses were performed using SPSS and AMOS software, with a focus on examining the direct and indirect effects of OIC on EIC, as well as the potential moderating role of supervisory support. The model fit was evaluated using common fit indices such as the chi-square test, comparative fit index (CFI), and root mean square error of approximation (RMSEA).

4. RESULTS

4.1. Descriptive Statistics, Correlations, and Demographic Factors

This section provides a descriptive statistical analysis of the sample's demographic characteristics, including age, gender, education level, and work experience. The correlation analysis encompasses the primary variables: Organizational Innovation Climate (OIC), Engineering Innovation Capability (EIC), Self-efficacy, and Supervisory Support.

Table 1 presents the means, standard deviations, and correlation coefficients for the demographic factors and the primary variables. The results indicate that the correlation coefficients among OIC, EIC, Self-efficacy, and Supervisory Support are statistically significant ($p < 0.01$ or $p < 0.05$), suggesting positive relationships among these constructs. Specifically, OIC demonstrates a strong positive correlation with EIC ($r = 0.50$, $p < 0.01$) and Self-efficacy ($r = 0.45$, $p < 0.01$), while Supervisory Support also correlates positively with all primary variables, including OIC ($r = 0.40$, $p < 0.01$) and EIC ($r = 0.42$, $p < 0.01$). These findings indicate that improvements in one construct are likely associated with enhancements in the others, thereby supporting the underlying hypotheses of this study.

Table 1. Descriptive Statistics and Correlation Analysis of Demographic Characteristics and Main Variables

Variable	Mean	Standard Deviation	Age	Gender	Education Level	Work Experience	OIC	EIC	Self-efficacy
Age (years)	35.6	9.2	-	-	-	-	0.30**	0.25*	0.15
Gender (Male=1/Female=0)	0.52	0.50	-	-	-	-	0.10	-0.05	0.05
Education Level (years)	15.4	2.4	-	-	-	-	0.15	0.30**	0.20*
Work Experience (years)	10.2	5.1	-	-	-	-	0.20*	0.22*	0.10
OIC	-	-	-	-	-	-	1	0.50**	0.45**
EIC	-	-	-	-	-	-	0.50**	1	0.38**
Self-efficacy	-	-	-	-	-	-	0.45**	0.38**	1
Supervisory Support	-	-	-	-	-	-	0.40**	0.42**	0.35*

Note: * $p < 0.05$, ** $p < 0.01$

4.2. Reliability and Validity Analysis

The reliability of the constructs was assessed using Cronbach's α coefficient, revealing that all constructs exceeded the acceptable threshold of 0.70, indicating satisfactory internal consistency across the measures. The Organizational Innovation Climate (OIC) construct comprises two dimensions: Innovation Support (7 items) and Resource Supply (4 items). The Engineering Innovation Capability (EIC) includes 4 items, Self-efficacy consists of 3 items, and Supervisory Support encompasses 9 items. The factor loadings for each item are presented in Table 2, demonstrating that all item loadings are above the recommended threshold of 0.60, affirming the construct validity of the scales used in this study.

Furthermore, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy yielded a value of 0.89, and Bartlett's test of sphericity was significant ($\chi^2 = 1120.54$, $p < 0.001$), confirming the appropriateness of the data for factor analysis.

Table 2. Item Factor Loadings, Reliability, and Validity Analysis

Construct	Item	Factor Loading	Composite Reliability	AVE
Organizational Innovation Climate (OIC)	OIC1	0.78	0.91	0.65
	OIC2	0.82		
	OIC3	0.75		
	OIC4	0.76		
	OIC5	0.80		
	OIC6	0.81		
	OIC7	0.74		
Resource Supply	RS1	0.79	0.85	0.61
	RS2	0.76		
	RS3	0.77		
	RS4	0.70		
Engineering Innovation Capability (EIC)	EIC1	0.84	0.87	0.61
	EIC2	0.80		
	EIC3	0.78		
	EIC4	0.76		
Self-efficacy	SE1	0.83	0.90	0.67
	SE2	0.81		
	SE3	0.75		
Supervisory Support	LS1	0.82	0.88	0.60
	LS2	0.80		
	LS3	0.79		
	LS4	0.81		
	LS5	0.76		
	LS6	0.78		
	LS7	0.73		
	LS8	0.75		
	LS9	0.74		

Table 3. Discriminant Validity Analysis

Construct	AVE	√ AVE	OIC	EIC	Self-efficacy	Supervisory Support
Organizational Innovation Climate (OIC)	0.65	0.81	1	0.50**	0.45**	0.40**
Engineering Innovation Capability (EIC)	0.61	0.78	0.50**	1	0.38**	0.42**
Self-efficacy	0.67	0.82	0.45**	0.38**	1	0.35*
Supervisory Support	0.60	0.77	0.40**	0.42**	0.35*	1

Note: √AVE indicates the square root of the average variance extracted.

Discriminant validity was evaluated by comparing the square roots of the average variance extracted (AVE) with the correlation coefficients among the constructs. The results presented in Table 3 demonstrate that the square roots of the AVE for all constructs are greater than their respective

correlation coefficients, confirming strong discriminant validity among OIC, EIC, Self-efficacy, and Supervisory Support. This indicates that the constructs are distinct from one another, thereby supporting the integrity of the measurement model used in this study.

4.3. Main Effects and Mediating Effects Analysis

The analysis of main effects and mediating effects was conducted using two models: the direct effects model and the mediating effects model. Both models were evaluated for goodness of fit using indices such as the Chi-square to degrees of freedom ratio (χ^2/df), Root Mean Square Error of Approximation (RMSEA), and Goodness of Fit Index (GFI). The results indicate that the direct effects model exhibits a satisfactory fit, with a χ^2/df of 2.85, an RMSEA of 0.07, and a GFI of 0.90. In contrast, the mediating effects model demonstrates an even better fit, with a χ^2/df of 2.30, an RMSEA of 0.06, and a GFI of 0.92. This suggests that including the mediating effects enhances the model's explanatory power.

The path coefficients from the mediating effects model indicate that all paths are statistically significant. For instance, the path from Organizational Innovation Climate (OIC) to Engineering Innovation Capability (EIC) had an estimate of 0.55 ($p < 0.001$), indicating a strong positive relationship. Similarly, the relationship between OIC and Self-efficacy was 0.45 ($p < 0.001$), and the path from Self-efficacy to EIC was 0.30 ($p < 0.01$).

Table 4. Main Effects and Mediating Effects Analysis Results

Path	Estimate	S.E.	C.R.	Bootstrap Bias-Corrected 95% CI	Bootstrap Percentile 95% CI	p-value
OIC → EIC	0.55	0.10	5.50	[0.39, 0.71]	[0.38, 0.70]	<0.001
OIC → Self-efficacy	0.45	0.08	5.62	[0.30, 0.59]	[0.29, 0.58]	<0.001
Self-efficacy → EIC	0.30	0.09	3.33	[0.13, 0.48]	[0.12, 0.47]	<0.01

The results of the bootstrap analysis confirmed a significant partial mediating effect of Self-efficacy in the relationship between OIC and EIC. This leads us to conclude that both Hypothesis 1 and Hypothesis 2 are supported:

- Hypothesis 1: A positive organizational innovation climate significantly enhances engineering innovation capability. (Supported)
- Hypothesis 2: Employees' self-efficacy mediates the relationship between organizational innovation climate and engineering innovation capability. (Supported)

4.4. Moderating Effects Analysis

The analysis of moderating effects was conducted to examine the impact of Supervisory Support on the relationship between OIC and Self-efficacy. Two regression models were analyzed: the initial model with Self-efficacy as the dependent variable and OIC and Supervisory Support as independent variables, and the interaction model, which included the product of OIC and Self-efficacy as an additional independent variable.

Table 5. Model Comparison for Moderating Effects Analysis

Model	R	R^2	Adjusted R^2	Standard Error of Estimate	R^2 Change	F Change	Significance
Initial Model	0.64	0.41	0.40	0.55	-	-	-
Interaction Model	0.73	0.53	0.52	0.48	0.12	12.32	<0.001

The results indicate that the interaction model significantly improves the predictive power of the relationship between OIC and Self-efficacy, confirming a positive moderating effect of Supervisory Support.

Table 6. Regression Coefficients for Moderating Effects Analysis

Path	Unstandardized Coefficient	S.E.	Standardized Coefficient	t	p-value
OIC → Self-efficacy (Initial Model)	0.48	0.08	0.39	6.00	<0.001
Supervisory Support → Self-efficacy	0.38	0.09	0.30	4.22	<0.001
OIC × Self-efficacy (Interaction Model)	0.25	0.07	0.20	3.57	<0.001

Thus, this leads to the conclusion that the hypothesis regarding the moderating effect is supported, as higher levels of Supervisory Support enhance the positive relationship between OIC and Self-efficacy.

- Hypothesis 3: Supervisory Support positively moderates the relationship between Organizational Innovation Climate and Employees' Self-efficacy. (Supported)

5. DISCUSSION AND MANAGEMENT IMPLICATIONS

5.1. Innovation Climate's Direct Impact on Innovation Capability

This study finds that an organization's innovation climate (OIC) has a direct, significant positive impact on employees' innovation capability (EIC), aligning with previous research showing that organizational environments fostering innovation encourage creative outputs[48]. However, in the context of engineering projects, the relationship between innovation climate and innovation capability has not been extensively explored. Our findings contribute to this field by verifying that OIC directly supports employees in leveraging their creativity and problem-solving abilities in highly technical environments, such as engineering projects. The unique demands of these projects—complexity, coordination, and a high degree of technical precision—mean that an organizational culture that prioritizes resource availability and innovation support can be a significant driver of innovation capability in this domain [49].

5.2. The Partial Mediating Role of Self-Efficacy

The study also reveals that self-efficacy acts as a partial mediator in the relationship between innovation climate and innovation capability. Self-efficacy, or an individual's belief in their capability to perform specific tasks, amplifies the effect of a positive innovation climate by empowering employees to take risks and engage in innovative behavior. This mediating role of self-efficacy in engineering projects provides a fresh perspective, as existing literature predominantly focuses on sectors like education or creative industries[50]. The engineering sector, with its focus on technical expertise and practical problem-solving, presents a unique context where the confidence to innovate can significantly enhance performance outcomes. These findings suggest that fostering self-efficacy within teams—through mentoring, skill-building, and confidence-enhancing initiatives—could further strengthen the impact of an innovation-friendly climate on project outcomes[51].

5.3. The Moderating Effect of Supervisory Support

The results also demonstrate that supervisory support moderates the relationship between innovation climate and self-efficacy positively. Although leadership support is known to influence innovative work behaviors[52], its role as a moderator between innovation climate and psychological states like self-efficacy in engineering project contexts has been underexplored. Supervisory support, which can

manifest in the form of constructive feedback, encouragement, and resource allocation, enhances the psychological safety employees feel in taking innovative risks, thereby reinforcing the positive effects of an innovation climate. This research contributes by showing that leadership plays a critical role in ensuring that the conditions of an innovation climate translate effectively into higher self-efficacy and innovation capability, particularly in complex, risk-averse environments such as engineering[53].

5.4. Management Implications

From a management perspective, these findings highlight several strategies to foster innovation in engineering projects:

1. Cultivating an Innovation-Supportive Climate: Organizations should create an environment where both innovation support and resource supply are prioritized. This includes providing necessary tools, flexible processes, and fostering a culture that encourages experimentation without fear of failure. Managers should actively promote innovation through team-based challenges, cross-functional collaboration, and transparent communication about innovation goals.

2. Building Employee Self-Efficacy: To enhance the effect of an innovation climate, organizations should focus on building self-efficacy among their workforce. This can be achieved through leadership development programs, mentorship, and creating opportunities for employees to gain mastery over new technologies and methodologies. This is particularly critical in engineering, where high self-efficacy can drive better engagement in innovative tasks and improve project outcomes.

3. Leveraging Supervisory Support: Supervisory support is a key factor in maximizing the potential of an innovation climate. Leaders should be trained to provide balanced support—offering guidance and resources while allowing employees autonomy to explore innovative solutions. This balance helps cultivate both self-efficacy and innovative capacity within teams, particularly in highly structured environments like engineering, where leadership support can help reduce the perceived risks associated with innovation.

6. CONCLUSION

This study has explored the dynamic relationships between organizational innovation climate (OIC), engineering innovation capability (EIC), self-efficacy, and supervisory support within the context of engineering projects. The results indicate that OIC plays a significant role in enhancing EIC, affirming the importance of fostering an environment that promotes creativity and innovation, especially in technically demanding fields like engineering. Furthermore, self-efficacy has been identified as a partial mediator in this relationship, suggesting that individuals' confidence in their abilities is crucial for translating an innovation-friendly climate into tangible innovation outcomes. Supervisory support has also been shown to positively moderate the link between OIC and self-efficacy, highlighting the critical role that leadership plays in enhancing employee innovation by fostering psychological safety and offering guidance.

These findings not only contribute to the existing body of literature by validating these pathways in the engineering context but also provide actionable insights for organizations seeking to enhance innovation capabilities. By fostering both a supportive innovation climate and strong supervisory support, organizations can empower employees to realize their full innovative potential.

7. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Despite its contributions, this study is not without limitations. First, the cross-sectional design limits the ability to draw causal inferences. Future studies could use longitudinal designs to better capture the temporal dynamics between OIC, EIC, self-efficacy, and supervisory support. Second, the study

relies on self-reported measures, which may introduce common method bias. Although efforts were made to mitigate this risk, future research could incorporate objective performance data to validate the findings. Third, the focus on engineering projects, while novel, may limit the generalizability of the results to other sectors. Replicating the study in different industries or with diverse employee groups could provide a broader understanding of these relationships. Finally, the study examines only one form of leadership—supervisory support. It would be beneficial to explore how other forms of leadership, such as transformational or servant leadership, interact with innovation climates and self-efficacy.

Given the limitations, there are several avenues for future research. First, longitudinal studies are needed to further investigate the causal relationships among the key variables. This could help in understanding how the effects of OIC and supervisory support evolve over time and how self-efficacy develops in response to these factors. Second, expanding the research to other industries could validate the generalizability of the findings. Studies focusing on sectors such as healthcare, education, or technology could uncover industry-specific dynamics. Third, future research should explore additional mediators and moderators, such as organizational commitment, intrinsic motivation, or team dynamics, to provide a more nuanced understanding of how innovation climates influence innovation outcomes. Lastly, investigating the role of different leadership styles in fostering innovation climates could provide valuable insights into how leaders can better support innovation, both at the individual and organizational levels.

This study has laid the groundwork for understanding how organizational innovation climate, self-efficacy, and supervisory support interact to enhance innovation capability in engineering contexts. However, there is much left to explore, and future research can build upon these findings to further elucidate the complexities of innovation in different organizational settings.

REFERENCES

[1] Dulaimi, M. F., Ling, F. Y., Ofori, G., et al. (2002). Enhancing integration and innovation in construction. Building Research & Information, 30(4), 237–247. https://doi.org/10.1080/09613210210134858.

[2] Cao, R., & Jiang, R. (2022). Resolving strategic dilemmas in ambidextrous organizations: An integrated second-order factor model perspective. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.924731.

[3] Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. Academy of Management Journal, 37(3), 580–607. https://doi.org/10.5465/256701.

[4] Patterson, M. G., West, M. A., Shackleton, V. J., et al. (2005). Validating the organizational climate measure: links to managerial practices, productivity and innovation. Journal of Organizational Behavior, 26(4), 379–408. https://doi.org/10.1002/job.312.

[5] Montani, F., Odoardi, C., & Battistelli, A. (2014). Individual and contextual determinants of innovative work behaviour: Proactive goal generation matters. Journal of Occupational and Organizational Psychology, 87(4), 645–670. https://doi.org/10.1111/joop.12066.

[6] Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: development and validation of the team climate inventory. Journal of Organizational Behavior, 19(3), 235–258.
https://doi.org/10.1002/(SICI)1099-1379(199805)19:3<235::AID-JOB837>3.0.CO;2-C

[7] Gumusluoglu, L., & Ilsev, A. (2019). Organizational innovation climate and individual innovative behavior: exploring the moderating effects of psychological ownership and psychological empowerment. Review of Managerial Science, 13(4), 771–789. https://doi.org/10.1007/s11846-018-0291-y.

[8] Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. Academy of Management Journal, 45(6), 1137–1148. https://doi.org/10.5465/3069429.

[9] Bandura, A. (1997). Self-efficacy: The exercise of control. W H Freeman/Times Books/ Henry Holt & Co.

[10] Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: Encouraging the expression of voice. Academy of Management Journal, 44(4), 682–696. https://doi.org/10.5465/3069410.

[11] Amabile, T. M., Conti, R., Coon, H., et al. (1996). Assessing the work environment for creativity. Academy of Management Journal, 39(5), 1154–1184. https://doi.org/10.5465/256995.

[12] Hair, J. F., Hult, G. T. M., Ringle, C. M., et al. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). SAGE Publications.

[13] Kivimaa, P., & Martiskainen, M. (2018). Innovation, low energy buildings and intermediaries in Europe: systematic case study review. Energy Efficiency, 11(1), 31–51. https://doi.org/10.1007/s12053-017-9547-y.

[14] Ekvall, G., & Arvonen, J. (1991). Change-centered leadership: An extension of the two-dimensional model. Scandinavian Journal of Management, 7(1), 17–26. https://doi.org/10.1016/0956-5221(91)90024-8.

[15] Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. Academy of Management Journal, 33(4), 692–724. https://doi.org/10.5465/256287.

[16] Choi, B. K., Moon, H. K., & Ko, W. (2013). An organization's ethical climate, innovation, and performance. Management Decision, 51(6), 1250–1275. https://doi.org/10.1108/MD-08-2012-0581.

[17] West, M. A., & Farr, J. L. (1990). Innovation at work. In M. A. West & J. L. Farr (Eds.), Innovation and creativity at work: Psychological and organizational strategies (pp. 3–13). John Wiley & Sons.

[18] Richard, B., & Kalle, L. (2025). Breakthrough teams in incumbent firms: how relational climate and boundary mechanisms affect radical innovations. European Journal of Innovation Management, 28(11), 77–111. https://doi.org/10.1108/EJIM-02-2024-0107.

[19] Alghamdi, F. (2018). Ambidextrous leadership, ambidextrous employee, and the interaction between ambidextrous leadership and employee innovative performance. Journal of Innovation and Entrepreneurship, 7(1), 1–14. https://doi.org/10.1186/s13731-018-0081-8.

[20] Chen, G., Farh, J.-L., Campbell-Bush, E. M., et al. (2013). Teams as innovative systems: Multilevel motivational antecedents of innovation in R&D teams. Journal of Applied Psychology, 98(6), 1018–1027. https://doi.org/10.1037/a0032668.

[21] Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319–1350. https://doi.org/10.1002/smj.640.

[22] Meng, B., & Qin, X. (2025). Organizational culture and innovation capability: Evaluating the impact of internal factors on corporate innovation. In Proceedings of the 2025 2nd International Conference on Big Data and Digital Management. Association for Computing Machinery. https://doi.org/10.1145/3768801.3768897.

[23] Mendoza-Silva, A. (2020). Innovation capability: a systematic literature review. European Journal of Innovation Management, 24(3), 707–734. https://doi.org/10.1108/EJIM-05-2020-0189.

[24] Wang, L., Li, S., & You, Z. (2020). The effects of knowledge transfer on innovation capability: A moderated mediation model of absorptive capability and network reliance. The Journal of High Technology Management Research, 31(1), 100372. https://doi.org/10.1016/j.hitech.2020.100372.

[25] Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly, 35(1), 128–152. https://doi.org/10.2307/2393553.

[26] Bresman, H., Birkinshaw, J., & Nobel, R. (1999). Knowledge transfer in international acquisitions. Journal of International Business Studies, 30(3), 439–462. https://doi.org/10.1057/palgrave.jibs.8490078.

[27] Gann, D. M., & Salter, A. J. (2000). Innovation in project-based, service-enhanced firms: the construction of complex products and systems. Research Policy, 29(7–8), 955–972. https://doi.org/10.1016/S0048-7333(00)00115-3.

[28] Eisenberger, R., Stinglhamber, F., Vandenberghe, C., et al. (2002). Perceived supervisor support: Contributions to perceived organizational support and employee retention. Journal of Applied Psychology, 87(3), 565–573. https://doi.org/10.1037/0021-9010.87.3.565.

[29] He, L., Yang, W., Miao, J., et al. (2024). The impact of supervisory career support on employees' well-being: A dual path model of opportunity and ability. International Journal of Mental Health Promotion, 26(11), 943–955. https://doi.org/10.32604/ijmhp.2024.052701.

[30] Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. Academy of Management Review, 17(2), 183–211. https://doi.org/10.5465/amr.1992.4279530.

[31] Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. The Leadership Quarterly, 6(2), 219–247. https://doi.org/10.1016/1048-9843(95)90027-2.

[32] Assefa, Y., Moges, B., Tilwani, S., et al. (2024). The mediating role of leader-member exchange (LMX) in the structural relationship between organizational justice and employee voice behaviour in higher education. Heliyon, 10(4), e26242. https://doi.org/10.1016/j.heliyon.2024.e26242.

[33] Moleka, P. (2024). The role of leadership in fostering innovation: A qualitative study in organizational settings. Advanced Research in Economics and Business Strategy Journal, 5, 48–53.

[34] Dayant, P., Eliyana, A., Emur, A., et al. (2022). Supportive leadership: A literature review. International Journal of Science and Management Studies (IJSMS), 74–80.

[35] Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T.

[36] Choi, W. S., Kang, S.-W., & Choi, S. (2021). Innovative behavior in the workplace: An empirical study of moderated mediation model of self-efficacy, perceived organizational support, and leader–member exchange. Behavioral Sciences, 11(7), 182. https://doi.org/10.3390/bs11070182.

[37] Wu, R., Feng, X., Zhai, Z., et al. (2026). Relationships between organizational innovation climate, creative self-efficacy, and innovation performance: A cross-sectional study in public hospitals. Inquiry: A Journal of Medical Care Organization, Provision and Financing, 63. https://doi.org/10.1177/00469580261132148.

[38] Mesterova, J., Prochazka, J., & Vaculik, M. (2015). Relationship between self-efficacy, transformational leadership and leader effectiveness. Journal of Advanced Management Science, 3(2), 109–122.

https://doi.org/10.12720/joams.3.2.109-122

[39] Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. Academy of Management Journal, 38(5), 1442–1465. https://doi.org/10.5465/256865.

[40] Schermuly, C. C., Meyer, B., & Dämmer, L. (2013). Leader-member exchange and innovative behavior: The mediating role of psychological empowerment. Journal of Personnel Psychology, 12(3), 132–142. https://doi.org/10.1027/1866-5888/a000098.

[41] Kline, R. B. (2016). Principles and practice of structural equation modeling (4th ed.). The Guilford Press.

[42] Lovelace, K., Shapiro, D. L., & Weingart, L. R. (2001). Maximizing cross-functional new product teams' innovativeness and constraint adherence: A conflict communications perspective. Academy of Management Journal, 44(4), 779–793. https://doi.org/10.5465/3069414.

[43] Greenhaus, J. H., Parasuraman, S., & Wormley, W. M. (1990). Effects of race on organizational experiences, job performance evaluations, and career outcomes. Academy of Management Journal, 33(1), 64–86.

https://doi.org/10.5465/256352

[44] Nunnally, J. C. (1967). Psychometric theory. McGraw-Hill.

[45] Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39–50. https://doi.org/10.1177/002224378101800104

[46] Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behavior Research Methods, 40(3), 879–891.

https://doi.org/10.3758/BRM.40.3.879

[47] Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173.

[48] Munir, R., & Beh, L.-S. (2019). Measuring and enhancing organisational creative climate, knowledge sharing, and innovative work behavior in startups development. The Bottom Line, 32(4), 269–289. https://doi.org/10.1108/TBL-05-2019-0064.

[49] Purnama, Y. H., Tjahjono, H. K., & Elqadri, Z. M. (2021). Innovative work behavior: The role of self-efficacy and organizational climates. In Complex, Intelligent and Software Intensive Systems (pp. 348–357). Springer International Publishing. https://doi.org/10.1007/978-3-030-70577-2_34.

[50] Premchandran, R., & Priydarshi, P. (2018). Do boundary preferences, work-family self-efficacy and proactive personality predict job satisfaction? The mediating role of work-family enrichment. Evidence-based HRM: a Global Forum for Empirical Scholarship, 7(2), 198–212. https://doi.org/10.1108/EBHRM-04-2018-0028.

[51] Sanz-Valle, R., & Jiménez, D. (2018). HRM and product innovation: does innovative work behaviour mediate that relationship? Management Decision, 56(6), 1417–1429. https://doi.org/10.1108/MD-06-2017-0570.

[52] Afsar, B., & Umrani, W. A. (2019). Transformational leadership and innovative work behavior: The role of motivation to learn, task complexity and innovation climate. European Journal of Innovation Management, 23(3), 402–428. https://doi.org/10.1108/EJIM-12-2018-0257.

[53] Nafees, M., Khan, S., & Imran, A. (2019). Influence of transformational leadership on innovative work behaviour, and mediating role of teachers self efficacy and innovative climate: insight from engineering institutions. Middle East Journal of Management, 6(4), 359. https://doi.org/10.1504/MEJM.2019.103302.