

The Influence of Transformational Leadership on Innovation Performance of Education Staff with the Mediating Role of Innovation Culture and Employee Motivation in Polytechnic Universities of Beijing City, China

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Abstract: This study examines the influence of transformational leadership on the innovation performance of educational staff in Beijing's polytechnic universities, focusing on the mediating roles of innovation culture and employee motivation. Using a quantitative research methodology, data were collected from 400 academic staff members across fourteen polytechnic universities and analyzed through Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). The findings reveal that transformational leadership significantly enhances innovation performance, with innovation culture and employee motivation serving as crucial mediators. This study contributes to the understanding of how leadership practices can foster an innovative academic environment, providing valuable insights for educational policymakers and administrators aiming to boost innovation within academic institutions.

Keywords: transformational leadership, innovation performance, innovation culture, employee motivation

1. Introduction

The study examines the influence of transformational leadership on innovation performance within Beijing's polytechnic universities, with a focus on the mediating roles of innovation culture and employee motivation. Transformational leadership, characterized by vision, inspiration, and individualized consideration, is recognized for its ability to foster environments that promote innovation (Mshanga, 2022; Abu Nasra & Arar, 2020). This leadership style contrasts with transactional leadership, which relies on rewards and penalties. In the context of Beijing's polytechnic universities, transformational leadership is pivotal due to the critical role these institutions play in driving technological advancements and meeting China's increasing demand for innovation.

Beijing's polytechnic universities occupy a unique position within China's educational landscape, blending theoretical knowledge with practical application, thus contributing significantly to the national innovation agenda (Xin et al., 2023). These institutions are expected to act as incubators for innovation, producing research and technology that

bolster China's competitive edge. The success of these universities in achieving their innovation objectives depends heavily on their internal culture and the motivation of their staff.

An innovation culture encourages continual improvement, risk-taking, and creativity, essential elements in the educational context (Rupcic, 2023). In Beijing's polytechnic universities, fostering such a culture among all staff members is crucial for developing innovative teaching methods, curricular designs, and research outputs. Leadership plays a central role in cultivating an environment conducive to innovative thinking and practices.

Employee motivation in academic settings goes beyond mere productivity; it includes engagement, enthusiasm, and a commitment to the institution's vision (Forson et al., 2021). Motivation is influenced by job satisfaction, recognition, and alignment between personal and organizational goals. Transformational leadership enhances motivation by providing vision, inspiration, and a supportive environment that recognizes and rewards innovative efforts.

The traditional educational structures in China, which emphasize conformity and rote learning (Zhu & Chang, 2019), present a unique backdrop for examining the impact of transformational leadership on innovation. Understanding how transformational leadership affects innovation performance through the mediating roles of innovation culture and employee motivation can offer valuable insights for educational policymakers and administrators. These insights aim to enhance the innovative capabilities of these institutions, supporting China's technological and educational ambitions on a global scale.

A primary issue in the polytechnic universities of Beijing is the adaptation of faculty and staff to transformational leadership styles (Yuen-Tsang & Wang, 2020). Traditional educational institutions in China are often characterized by hierarchical and authoritative management styles (Yang, 2020). Transitioning to a leadership style that emphasizes vision, inspiration, personal attention, and intellectual stimulation may encounter resistance from both leaders accustomed to authoritative practices and staff unfamiliar with such dynamic interactions (Xu et al., 2022). This resistance can hinder the effective implementation of transformational leadership strategies aimed at fostering innovation.

The cultural dimensions of leadership in China differ significantly from those in Western contexts where transformational leadership has been extensively studied (Dimmock, 2020). Confucian values such as harmony, respect for authority, and collectivism may clash with the individualistic and charismatic elements of transformational leadership (Deng, 2021). These cultural differences can impact how transformational leadership is perceived and accepted among the staff in Beijing's polytechnic universities, potentially limiting its effectiveness in fostering an innovative culture.

Another significant issue is the lack of adequate training and development for leaders who are expected to adopt transformational leadership styles (Chu et al., 2021). Without proper training in how to effectively inspire, challenge, and motivate staff, leaders may struggle to implement these practices effectively (Jiang et al., 2021). The lack of skilled transformational leaders could result in a superficial adoption of these practices (Xing & Tian, 2022), which does not translate into actual improvements in innovation performance.

Measuring and evaluating the impact of transformational leadership on innovation performance presents a challenge. Innovation in educational settings, especially in technology and applied sciences, is multifaceted and influenced by numerous factors beyond leadership style (Andrin et al., 2023). The lack of clear metrics and benchmarks for assessing innovation within academic environments can make it difficult to discern the specific contributions of transformational leadership to innovation outcomes (Deng et al., 2023).

The effectiveness of transformational leadership is also contingent upon its alignment with overall institutional goals and policies (Akdere & Egan, 2020). If the broader strategic objectives of the university do not support innovation or if there is insufficient infrastructure to support innovative projects, transformational leadership alone may not be effective (Meng, 2022). This misalignment can lead to frustration among staff and leaders alike, potentially stifling motivation and creativity.

Innovation culture in any institution is fundamentally influenced by the willingness of its members to embrace

change (Bendak et al., 2020). In Beijing's polytechnic universities, there might be a prevailing resistance to change among education staff, which can stem from traditional teaching methods, rigid administrative structures, and a preference for maintaining the status quo (Yang, 2022). This resistance can impede the introduction and implementation of innovative ideas and practices, ultimately affecting the institution's capacity to adapt to new technologies or pedagogical approaches.

For an innovation culture to flourish, there must be adequate supportive infrastructure that encourages and nurtures innovative activities (Joseph et al., 2021). This includes access to modern technological tools, laboratories, and collaborative spaces (Carvajal & Sanchez, 2024). In some polytechnic universities, there may be a lack of these facilities, or the available resources are outdated and not conducive to fostering an environment where creative and innovative projects can be pursued (Zhuang & Liu, 2022). This limitation can significantly deter staff and students from engaging in experimental or cutting-edge research and development. Addressing these interconnected issues is crucial for enhancing the educational quality and innovation capacity of Beijing's polytechnic universities, ensuring they remain competitive and adaptable in the rapidly evolving global educational landscape.

Based on the research background and the identified problem surrounding the influence of transformational leadership on innovation performance in polytechnic universities of Beijing city, China, with the mediating roles of innovation culture and employee motivation, the study puts forward the following research objectives:

- (1) To analyze the relationship between transformational leadership and innovation performance of educational staff in Polytechnic Universities of Beijing city, China.
- (2) To investigate the mediating effect of innovation culture in the relationship between transformational leadership and innovation performance of educational staff in Polytechnic Universities of Beijing city, China.
- (3) To examine the mediating effect of employee motivation in the relationship between transformational leadership and innovation performance of educational staff in Polytechnic Universities of Beijing city, China.

2. Literature Review

2.1 Studies on Transformational Leadership and Innovation Performance

This section aims to explore the intricate relationship between transformational leadership and innovation performance, underlining the pivotal role that transformational leadership plays in fostering an environment conducive to innovation.

Widodo & Mawarto (2020), Putra et al. (2020), and Novitasari et al. (2021) affirm the pivotal influence of transformational leadership on enhancing innovation performance through slightly divergent lenses. The emphasis by Widodo & Mawarto (2020) on the ability of transformational leaders to inspire and motivate positions these leaders as catalysts for dismantling traditional barriers to innovation, suggesting a broad, culture-oriented approach to fostering innovation. Putra et al. (2020), by highlighting the role of intellectual stimulation and empowerment, point to a more individualized approach where the unique talents and potentials of employees are recognized and nurtured, facilitating an active engagement with innovation. Novitasari et al. (2021), however, prioritize the visionary component of leadership, arguing that a clear, forward-looking vision is crucial for aligning organizational efforts and commitments towards innovation. These studies suggest that while the essence of transformational leadership inherently supports innovation, the specific pathways through which this support is manifested can vary, encompassing culture creation, talent cultivation, and strategic visioning. This differentiation indicates that the most effective approach to fostering innovation through transformational leadership may involve a multifaceted strategy that combines inspiring and motivating the workforce, nurturing individual creativity and talent, and articulating a compelling vision for the future. Despite their different focal points, these insights from these scholars reinforce the notion that transformational leadership is indispensable for creating an environment that not only values but actively promotes innovation, thereby contributing significantly to the broader discourse on leadership and innovation management within organizations.

2.2 Studies on Transformational Leadership and Innovation Culture

This section aims to explore the relationship between transformational leadership and innovation culture within organizations, focusing on how such leadership styles significantly contribute to creating and sustaining environments that prioritize and nurture innovation.

Ferdinan & Lindawati (2021), Virgiawan et al. (2021), and Gil et al. (2021) each examine the impact of transformational leadership on fostering an innovation culture within organizations through differing lenses, yet arriving at a congruent conclusion regarding its positive influence. Ferdinan & Lindawati (2021) highlight the charismatic and visionary nature of transformational leaders in alleviating employees' fear of new ideas, thereby nurturing an environment ripe for innovation. This research underscores the leaders' role in instilling trust and courage, which diminishes resistance to change and integrates innovation into the organizational ethos. On a parallel note, Virgiawan et al. (2021) emphasize the critical importance of knowledge sharing and teamwork, facilitated by transformational leaders who champion open communication and collaboration. Their findings suggest that such leaders create a supportive atmosphere, enhancing employee engagement and orienting efforts towards innovation. This study points to the creation of a trust-based culture that dismantles silos and fosters a multidisciplinary approach to innovation, driven by the synergistic efforts of the workforce. Contrastingly, Gil et al. (2021) focus on the leaders' ability to embed a clear vision of innovation into the organization's core values and daily practices. They argue that by consistently demonstrating a commitment to innovation, transformational leaders can make the pursuit of new ideas a tangible goal for employees, characterizing the culture as one of proactive innovation pursuit aligned with organizational objectives. These studies reveal the multifaceted impact of transformational leadership, from inspiring trust and dismantling resistance to embedding innovation into the fabric of organizational life, ultimately suggesting that the leaders' visionary, charismatic, and collaborative qualities are instrumental in steering organizations towards a sustainable competitive advantage in the face of continuous market evolution.

2.3 Studies on Innovation Culture and Innovation Performance

This section aims to explore the intricate relationship between innovation culture and innovation performance within organizations. It aims to unravel how cultivating an environment that emphasizes creativity, risk-taking, and continuous learning fundamentally influences a company's capability to innovate and achieve superior outcomes.

The literature robustly affirms the salutary effect of innovation culture on innovation performance, with Hanifah et al. (2019), Ghasemzadeh et al. (2019), and Jin et al. (2019) providing compelling evidence and nuanced perspectives on this dynamic relationship. Hanifah et al. (2019) underscored the importance of a workplace environment that promotes experimentation, risk-taking, and open exchange of ideas, positing that such an environment is vital for fostering an innovative mindset which, in turn, propels organizations to achieve enhanced outcomes in product development, market share, and profitability. They argue that an innovation culture is foundational for securing a sustained competitive advantage. Echoing these sentiments, Ghasemzadeh et al. (2019) highlight the transformative impact of innovation culture on the speed and efficiency of ideation and implementation processes, pointing out that a strong innovation culture not only accelerates the launch of new products and services but also cultivates a sustainable ecosystem thriving on continuous improvement. They emphasize the critical role of an organization's commitment to fostering creativity and investing in innovation-centric initiatives. Meanwhile, Jin et al. (2019) draw attention to the essential components of an innovation-conducive environment, such as open communication, encouragement of risk-taking, and promotion of creative thinking, illustrating how these elements coalesce to create a culture that thrives on innovation performance. They present a framework for understanding how an innovation-oriented culture equips organizations to navigate changing market conditions and technological landscapes, securing a competitive edge. These studies underscore the necessity of embedding innovation at the core of strategic and operational planning, thereby shedding light on the intricate link between a culture of innovation and tangible improvements in innovation performance.

2.4 Studies on Transformational Leadership and Employee Motivation

This section aims to illuminate the intricate relationship between transformational leadership and employee motivation, drawing on recent scholarly research.

Yusup & Maulani (2023), Dayanti & Nurchayati (2023), and Al-lawam et al. (2023) affirm the positive impact of transformational leadership on employee motivation, each contributing nuanced perspectives to the broader discourse. Yusup & Maulani (2023) emphasize the role of transformational leaders in exceeding employee motivational needs through the core components of inspirational motivation, idealized influence, individualized consideration, and intellectual stimulation, suggesting that such leaders not only serve as exemplary models but also engage in creating a supportive and stimulating environment that fosters employee growth and organizational performance. In parallel, Dayanti & Nurchayati (2023) extend the discourse by highlighting the transformative leader's pivotal role in nurturing employee potential and promoting innovative thinking, which transcends job satisfaction and engenders a deep-seated commitment to organizational goals. This study underscores the alignment of personal goals with organizational objectives, cultivating a culture of continuous improvement and adaptability to change, thereby presenting transformational leadership as fundamental to building a resilient workforce. Al-lawam et al. (2023), through a qualitative lens, elaborate on the visionary and personalized approach of transformational leaders in motivating employees, offering insights into the day-to-day manifestations of such leadership styles that create an empowering work environment. By focusing on the personal development of each employee and fostering a motivational landscape, this study portrays transformational leaders as architects of a culture where employees are encouraged to exceed their limits, highlighting the significance of understanding and valuing employee aspirations for achieving committed teams. These studies reveal the multifaceted nature of transformational leadership's impact on employee motivation, portraying it as a dynamic interplay of inspiring vision, personal growth, and organizational commitment.

2.5 Studies on Employee Motivation and Innovation Performance

This section aims to explore the multifaceted dynamics between various forms of employee motivation, both intrinsic and extrinsic, and their direct impact on the innovative performance within organizations.

Gupta (2020), Xu & Wang (2020), and Nguyen et al. (2020) emphasize the positive correlation between employee motivation and innovation performance, each contributing nuanced insights into this dynamic interrelationship. Gupta (2020) focuses on the significance of intrinsic motivation, advocating that the internal desires and interests of employees, such as passion and enjoyment derived from challenging tasks, are pivotal in fostering an environment conducive to innovation. This perspective is partially echoed by Nguyen et al. (2020), who explore the synergistic effect of intrinsic and extrinsic motivational factors, arguing that a blend of personal fulfillment and external rewards like financial incentives and recognition catalyzes innovation. In contrast, Xu & Wang (2020) underscore the overarching role of motivation in enhancing an individual's capacity to engage in and sustain innovative efforts, pointing out the necessity of a supportive organizational environment that acknowledges and incentivizes innovation. While these studies agree on the fundamental impact of motivation on innovation, their delineation of motivational sources, ranging from purely intrinsic as highlighted by Gupta (2020), to a mix of intrinsic and extrinsic by Nguyen et al. (2020), and a broader, more encompassing view by Xu & Wang (2020), presents a spectrum of perspectives on how best to harness motivation for innovation. These studies illuminate the multifaceted nature of motivation in innovation, advocating for a nuanced, integrative approach to motivational strategies in organizations aiming to enhance their innovation performance.

3. Methodology

(1) Research design

The chosen approach for this study is the quantitative research method, driven by the need to quantitatively measure and analyze the influence of transformational leadership on innovation performance, mediated by innovation culture and employee motivation. This method allows for the collection of numerical data from a substantial sample, facilitating the objective assessment of relationships between variables through statistical analysis (Mohajan, 2020). Quantitative research is suitable for this study due to its capability to test hypotheses and validate existing theories within a structured framework (Sürücü & Maslakçı, 2020). It provides a broad scale of measurement and a high level of reliability, allowing for results that are statistically inferable to a larger population (Skinner, 2020). This method's structured approach aids in maintaining consistency across all study participants, ensuring uniform data collection and valid, generalizable conclusions (McLeod, 2023).

(2) Population and sample size

The research population comprises academic staff across the fourteen polytechnic universities in Beijing, China, totaling 36,666 employees as per the Chinese Ministry of Education (2024). Table 3.1 lists the universities involved. Determining an adequate sample size is critical for ensuring statistically significant and generalizable results. Using the Raosoft online sample size calculator for 36,666 staff members, a sample size of 381 was deemed appropriate to achieve a 95% confidence level and a 5% margin of error. However, to account for potential non-responses or incomplete surveys, the sample size was increased to 400, ensuring sufficient data for robust analysis.

(3) Sampling

A random sampling method was employed to obtain a representative sample from the academic staff across the fourteen polytechnic universities in Beijing. This approach ensures every individual in the population has an equal probability of being selected, mitigating potential bias and enhancing the generalizability of the findings. The sampling process began with a comprehensive list of all academic staff members provided by the human resources departments of the respective universities. A computer-generated random number sequence was used to select individuals from this list. Stratification by university ensured an even distribution across the various institutions, maintaining sample diversity in terms of different environments influencing transformational leadership, innovation culture, employee motivation, and innovation performance.

(4) Research Instrument

The research instrument for the quantitative phase of this study is a structured questionnaire. It gathers data on transformational leadership, innovation culture, employee motivation, and innovation performance among educational staff in polytechnic universities in Beijing. The questionnaire is divided into two sections: demographic information and measurement of the main constructs. The first section collects demographic data, crucial for characterizing the sample and interpreting findings within the correct context. The second section comprises items designed to measure the main constructs, informed by existing literature and empirical studies, ensuring validity and reliability. The questions are structured using a Likert-5 scale, allowing participants to express their level of agreement with each statement, facilitating quantitative analysis.

(5) Data analysis

The quantitative analysis involves several key steps to extract meaningful insights from the collected data. Preliminary data screening checks for accuracy, missing values, outliers, and normality of distribution using SPSS software. Descriptive statistics provide an overview of the data, computing measures of central tendency and dispersion for continuous variables, and frequencies and percentages for categorical variables. Confirmatory Factor Analysis (CFA) using AMOS software validates the measurement models of the latent constructs. Structural Equation Modeling (SEM) examines the hypothesized relationships between constructs, assessing model fit using various fit indices. Mediation analysis explores the mediating effects of innovation culture and employee motivation on the relationship between

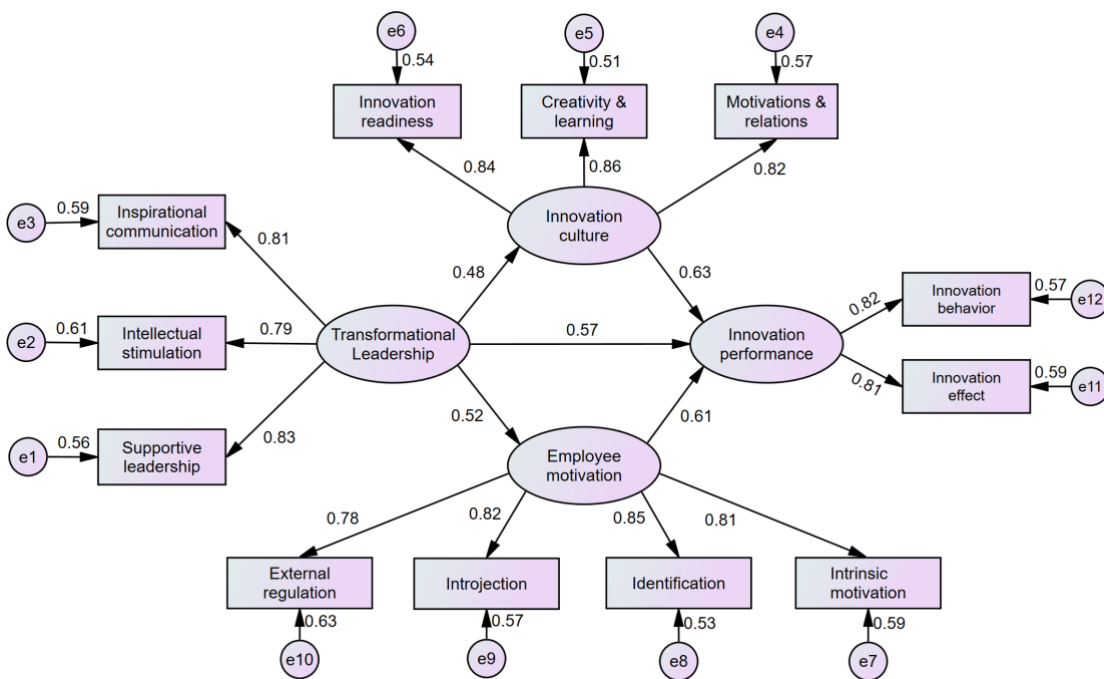
transformational leadership and innovation performance.

(6) Data collection

Data collection will be conducted using WJX (Wenjuanxing), an online survey platform widely used in China. Surveys will be distributed through email links sent via human resources departments of the respective universities to ensure secure and efficient reach. Participation is voluntary, with incentives such as vouchers offered to encourage response rates. The data collection period is four weeks, with reminder emails sent at the end of the second and third weeks. WJX will compile the data in a structured format, facilitating initial processing. Data security and privacy will be maintained, with all data anonymized before analysis to ensure ethical standards.

4. Findings and Discussion

Through SEM path analysis of research variables, which includes transformational leadership (TL), innovation culture (IC), employee motivation (EM) and innovation performance (IP), the study obtained the following analysis results shown in **Figure 1**.



The bootstrap method was employed to explore and investigate the mediating effect of innovation culture and employee motivation between transformational leadership and innovation performance, with analysis results shown in **Table 1**.

Table 1 Results of mediating effect analysis

Standard effect	Path	Effect coefficient	95% confidence interval		S.E.	P-value	Results
			Lower	Upper			
			Total effect	TL --->IP			
Direct effect	TL --->IP	0.574	0.531	0.617	0.022	***	
Indirect effect	TL-->IC---> IP	0.303	0.265	0.341	0.020	***	
Total effect	TL --->IP	0.891	0.840	0.942	0.026	***	Mediating effect
Direct effect	TL --->IP	0.574	0.531	0.617	0.022	***	
Indirect effect	TL-->EM---> IP	0.317	0.280	0.354	0.019	***	

Integrating the results of SEM path analysis and the mediating effect analysis, the study acquired the following analysis results:

(1) Transformational Leadership and Innovation Performance

The results of the study reveal that transformational leadership significantly influences the innovation performance of educational staff in polytechnic universities in Beijing. Transformational leaders, through their visionary and inspirational approach, foster an environment where innovation can thrive. This leadership style promotes a culture of trust, risk-taking, and creativity, which are essential elements for innovation. The empirical data collected supports the hypothesis that transformational leadership directly correlates with higher levels of innovation performance among educational staff. These findings align with previous research by Widodo & Mawarto (2020) and Putra et al. (2020), who emphasize the role of transformational leadership in enhancing organizational innovation capabilities.

(2) Transformational Leadership and Innovation Culture

Further analysis indicates that transformational leadership also significantly influences innovation culture within these institutions. Transformational leaders are adept at creating a supportive and open environment that encourages knowledge sharing and collaboration. By articulating a clear vision and fostering a culture that values creativity and experimentation, these leaders help integrate innovation into the core values of the organization. The study's findings corroborate the work of Ferdinan & Lindawati (2021) and Virgiawan et al. (2021), who highlight the critical role of transformational leaders in nurturing an innovation-friendly culture. This conducive environment not only diminishes resistance to new ideas but also embeds innovation into daily practices, making it a tangible goal for all employees.

(3) Innovation Culture and Innovation Performance

The relationship between innovation culture and innovation performance is further affirmed by the study. An innovation culture characterized by openness, continuous improvement, and risk-taking significantly boosts innovation performance among educational staff. Institutions that cultivate such a culture see enhanced outcomes in terms of research outputs, new teaching methods, and technological advancements. This relationship is supported by Hanifah et al. (2019) and Ghasemzadeh et al. (2019), who argue that an environment conducive to innovation is foundational for achieving superior innovation performance. The results suggest that polytechnic universities in Beijing that prioritize innovation culture are better positioned to produce cutting-edge research and technology.

(4) Transformational Leadership and Employee Motivation

The study also reveals a significant positive relationship between transformational leadership and employee motivation. Transformational leaders inspire and motivate their staff by providing individualized consideration and intellectual stimulation. This leadership style aligns personal goals with organizational objectives, fostering a deep-seated commitment and enthusiasm among employees. The findings are consistent with Yusup & Maulani (2023) and Dayanti & Nurchayati (2023), who emphasize that transformational leaders play a crucial role in exceeding employee motivational needs. This motivational boost is crucial for driving innovation, as motivated employees are more likely to engage in creative problem-solving and innovative thinking.

(5) Employee Motivation and Innovation Performance

Employee motivation, in turn, significantly influences innovation performance. Motivated employees, driven by intrinsic and extrinsic factors, are more likely to engage in innovative activities and contribute to the institution's overall innovation performance. This finding supports the arguments made by Gupta (2020) and Nguyen et al. (2020), who highlight the importance of both intrinsic and extrinsic motivation in fostering an innovative mindset. The study's results suggest that enhancing employee motivation through transformational leadership can lead to significant improvements in innovation performance, underscoring the need for motivational strategies that cater to the diverse needs of employees.

(6) The Mediating Role of Innovation Culture

Innovation culture plays a crucial mediating role in the relationship between transformational leadership and innovation performance. The study finds that transformational leadership fosters an innovation culture, which in turn enhances innovation performance. This mediating effect highlights the indirect impact of transformational leadership on innovation performance through the establishment of a supportive and creative organizational culture. The findings are in line with previous research by Ferdinan & Lindawati (2021) and Gil et al. (2021), who emphasize the importance of a strong innovation culture in mediating the effects of leadership on innovation outcomes. By creating an environment that encourages creativity and experimentation, transformational leaders can significantly boost innovation performance.

(7) The Mediating Role of Employee Motivation

Employee motivation also mediates the relationship between transformational leadership and innovation performance. The study demonstrates that transformational leaders, by motivating their employees, indirectly enhance innovation performance. This finding aligns with the work of Yusup & Maulani (2023) and Al-lawam et al. (2023), who highlight the role of employee motivation in mediating the effects of leadership on organizational outcomes. Motivated employees are more likely to embrace innovative practices and contribute to the institution's innovation goals. The mediating role of employee motivation underscores the importance of addressing both leadership and motivational strategies to achieve superior innovation performance.

5. Conclusion

This study elucidates the significant influence of transformational leadership on the innovation performance of educational staff in Beijing's polytechnic universities, highlighting the mediating roles of innovation culture and employee motivation. The findings affirm that transformational leadership fosters an environment conducive to innovation by inspiring, motivating, and nurturing a supportive culture. This culture, characterized by openness, creativity, and risk-taking, enhances the institution's capacity for innovative performance. Additionally, the alignment of personal and organizational goals under transformational leadership boosts employee motivation, further driving innovation. These insights underscore the critical need for educational policymakers and administrators to cultivate transformational leadership practices, support innovation-centric cultures, and implement robust motivational strategies to enhance innovation performance within academic settings.

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Conflict of Interest

The authors declare no conflicts of interest.

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