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**The Effect Mechanism of Virtual Team Leadership on Employees’
Intrapreneurial Behavior in Southwest Border Areas of China**
**กลไกผลกระทบของการนำทีมเสมือนจริงที่มีต่อพฤติกรรมการเป็น
ผู้ประกอบการภายในองค์กรของพนักงานในพื้นที่ชายแดนภาคตะวันตก
เฉียงใต้ของประเทศไทย**

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ABSTRACT

The southwestern border areas are among the poorest regions in China, where poverty remains difficult to overcome. Activities such as employee-led intrapreneurship can accelerate organizational innovation and transformation, serving as an important driving force for economic development in these regions and as a key approach to improving local economic conditions. Leadership has been found to be closely related to employees' intrapreneurial behavior. Therefore, based on Social Information Processing Theory, this study examines the relationship between virtual team leadership and employees' intrapreneurial behavior, while also exploring the mediating role of passion for inventing and the moderating effect of organizational embeddedness in the southwestern border areas of China. Data were collected in September 2025 through purposive sampling using online questionnaires distributed to employees from 65 enterprises in the region, resulting in 589 valid responses, representing an 89.24% response rate. This quantitative study utilized SPSSAU^{*} to test the hypotheses through correlation analysis, path analysis, as well as mediation and moderation analyses.

The findings revealed that virtual team leadership was positively associated with employees' intrapreneurial behavior. In addition, passion for inventing played a mediating role in this relationship, while organizational embeddedness moderated both the direct effect of virtual team leadership on passion for inventing and the indirect effect of virtual team leadership on employees' intrapreneurial behavior through passion for inventing in the southwestern border areas of China. Finally, the study recommends that poverty alleviation agencies and related organizations prioritize support for the composite leadership characteristics required in virtual environments, as well as employees' perceptions of organizational attachment, within local poverty reduction strategies. Such an approach can foster proactive innovation mechanisms and encourage employee-initiated intrapreneurial activities, thereby contributing to poverty alleviation and economic development in the southwestern border areas of China.

Keywords: Southwest Border Areas of China, Virtual Team Leadership, Employees Intrapreneurial Behavior, Passion for inventing, Organizational embeddedness

* Intelligent web analytics software, including SEM

บทคัดย่อ

พื้นที่ชายแดนตะวันตกเฉียงใต้ของประเทศไทยเป็นหนึ่งในภูมิภาคที่มีความยากจนสูง และยังเผชิญความท้าทายในการพัฒนาเศรษฐกิจอย่างต่อเนื่อง การส่งเสริมการเป็นผู้ประกอบการภายในองค์กรของพนักงานเป็นกลไกสำคัญที่ช่วยขับเคลื่อนนวัตกรรม การเปลี่ยนแปลงองค์กร และการพัฒนาเศรษฐกิจในพื้นที่ดังกล่าว โดยภาวะผู้นำถือเป็นปัจจัยสำคัญที่มีความสัมพันธ์กับพฤติกรรมการเป็นผู้ประกอบการภายในองค์กรของพนักงาน การศึกษานี้อาศัยกรอบแนวคิดทฤษฎีการประมวลผลข้อมูลทางสังคม เพื่อศึกษาความสัมพันธ์ระหว่างภาวะผู้นำที่เหมือนจริงกับพฤติกรรมการเป็นผู้ประกอบการภายในองค์กรของพนักงาน โดยศึกษาบทบาทของความหลงใหลในการสร้างสรรค์สิ่งประดิษฐ์ ในฐานะตัวแปรสื่อกลาง และการฝังรากลึกในองค์กร ในฐานะตัวแปรกำกับ ในพื้นที่ชายแดนตะวันตกเฉียงใต้ของประเทศไทย

การวิจัยนี้เป็นการวิจัยเชิงปริมาณ เก็บรวบรวมข้อมูลในเดือนกันยายน ค.ศ. 2025 โดยใช้การสุ่มตัวอย่างแบบเฉพาะเจาะจง (Purposive Sampling) และแบบสอบถามออนไลน์จากพนักงานใน 65 องค์กร ได้รับแบบสอบถามที่สมบูรณ์จำนวน 589 ชุด คิดเป็นอัตราการตอบกลับร้อยละ 89.24 วิเคราะห์ข้อมูลด้วย SPSSAU ผ่านการวิเคราะห์สหสัมพันธ์ การวิเคราะห์เส้นทาง และการวิเคราะห์ตัวแปรสื่อกลางและตัวแปรกำกับ ผลการวิจัยพบว่า ภาวะผู้นำที่เหมือนจริงมีความสัมพันธ์เชิงบวกต่อพฤติกรรมการเป็นผู้ประกอบการภายในองค์กรของพนักงาน โดยความหลงใหลในการสร้างสรรค์สิ่งประดิษฐ์ทำหน้าที่เป็นตัวแปรสื่อกลาง ขณะที่การยึดโยงกับองค์กรมีบทบาทเป็นตัวแปรกำกับ ทั้งในความสัมพันธ์ทางตรงระหว่างภาวะผู้นำที่เหมือนจริงกับความหลงใหลในการสร้างสรรค์สิ่งประดิษฐ์ และความสัมพันธ์ทางอ้อมระหว่างภาวะผู้นำที่เหมือนจริงกับพฤติกรรมการเป็นผู้ประกอบการภายในองค์กรของพนักงาน ผลการศึกษาเสนอแนะว่า หน่วยงานที่เกี่ยวข้องกับการพัฒนาเศรษฐกิจและการลดความยากจน ควรส่งเสริมภาวะผู้นำที่เหมาะสมกับการทำงานในสภาพแวดล้อมเหมือนจริง ควบคู่กับการเสริมสร้างความผูกพันของพนักงานต่อองค์กร เพื่อกระตุ้นนวัตกรรมและการเป็นผู้ประกอบการภายในองค์กร อันจะนำไปสู่การพัฒนาเศรษฐกิจและการลดความยากจนในพื้นที่ชายแดนตะวันตกเฉียงใต้ของประเทศไทยอย่างยั่งยืน

คำสำคัญ: พื้นที่ชายแดนตะวันตกเฉียงใต้ของจีน การเป็นผู้นำที่เหมือนจริง พฤติกรรมการเป็นผู้ประกอบการภายในองค์กรของพนักงาน ความมุ่งมั่นในการคิดค้นสิ่งใหม่ ๆ การฝังรากลึกในองค์กร

Introduction

Intrapreneurship has emerged as an effective pathway for enterprises to shape new competitive advantages and pursue fresh growth momentum through its commitment to identifying and developing novel business opportunities (Fang *et al.*, 2025; Klein and Ben-

Hador, 2025; Ruili *et al.*, 2025). In this context, employees with an entrepreneurial mindset are of great significance as they have high sensitivity to new demands appearing in the market, dare to initiate entrepreneurially, and can apply thinking in terms of intrapreneurship (Yan *et al.*, 2025). However, even if such activities can push the organization forward in terms of innovation and transformation, they are not easy to accomplish, and an employee's intrapreneurial behavior alone cannot do so. They require favorable managerial support (Zhu and Guo, 2021), such as virtual team leadership, and positive experiences (Cardon *et al.*, 2013), such as a passion for inventing. Furthermore, a sense of organizational attachment (Crossley *et al.*, 2007), such as organizational embeddedness, is necessary to fully enhance employees intrapreneurial behavior. Therefore, the issue of how to achieve in-depth cognition and develop an effective organization mechanism to promote employees intrapreneurial behavior under a new perspective has attracted wide attention both in theoretical and practical terms (Yan *et al.*, 2025; Zhu and Guo, 2021).

Leadership is considered an important organizational determinant that can influence employees intrapreneurial behavior, yet paradoxical leadership and platform leadership in particular have been widely explored in the literature (Hu *et al.*, 2025). Different from these leadership styles, which are based on satisfying different needs of employee, providing employees with better physical or psychological resources, and creating more positive interactions, virtual team leadership is a combination of technology-based leadership and traditional leadership theories, which focuses on utilizing high technology to stimulate employees' creativity and organizational agility (Qu and Xi, 2022). Clearly, virtual team leadership can play a more immediate and effective driving role in activities entailed by recognizing and exploiting new opportunities, strategic renewal, and new venture formation. Nevertheless, the prevailing scholarly discussions have scarcely extended to embrace the effect of virtual team leadership (Batırlık *et al.*, 2022), specifically in the milieu of China's Southwest Border Areas, the non-consideration of said effect curtails rich revelations concerning the underpinnings of employees intrapreneurial behavior, and further hampers the credibility and persuasiveness of the empirical results. Indeed, employees intrapreneurial is more than individual innovation (Lajçi *et al.*, 2025), it is an entrepreneurial-oriented behavioral pattern and is one of the important manifestations of virtual team leadership that is effectively implemented and transformed in the organization. As a result, the understanding of the function and effectiveness of virtual team leadership has not been fully formed; thus, how virtual team leadership influences its subordinates to perform in the employee entrepreneurial activities has not been extensively explored in the Southwest Border Areas of China (Qu and

Xi, 2022). In addition, based on social information processing theory, employee attitudes and behaviors are subject to change with their leaders during the process of social interaction (Hu *et al.*, 2025). This is because virtual team leadership is focused on discovering and acknowledging possibilities, is good at creating a positive and creative environment, and leads team members in transforming opportunities into value creation. These qualities can be detected and interpreted in employees' experiences (Qu and Xi, 2022), and can impact their mindsets and actions towards entrepreneurial endeavors. Therefore, it is both logical and significant for us to study the effect of virtual team leadership on employees' intrapreneurial behavior under the social information processing approach in the Southwest Border Areas of China.

At the same time, work) The social information processing theory suggests that emotions are an important reaction and expression of an individual when his/her behavior is swayed by external information (Salancik and Pfeffer, 1978). Virtual team leadership tends to materialize in unprecedented and future-oriented behaviors. Such positive information during the interaction is triggered by the employees and eventually leads to emotional changes that alter the ownership status and dependence on entrepreneurial activities (Bravo-Duarte *et al.*, 2025). As such, employee-related entrepreneurial emotions are the essential vehicle through which perceiving entrepreneurial cues can lead to entrepreneurial actions (Hu *et al.*, 2025). At the same time, it is suggested that employees' passion for inventing – or the experienced strong, positive affect in work associated with finding and developing new product/market opportunities (Cardon *et al.*, 2013) – is a central emotional mediator linking leadership and employees' intrapreneurial activities. These novel actions are very much related to proposing innovations and implementing innovativeness within employees intrapreneurial behaviour (Hu *et al.*, 2025). Thus, investigating the mediating role of the employee passion for inventing may reveal additional means to strengthen the relationship between virtual team leadership and employee intrapreneurship in the Southwest Border Areas of China.

In addition, since intrapreneurship is employee — rather than entrepreneur-led—led activity within existing organizations, the bond between employees and their current organization has become a focal point of interest. In particular, leadership can affect employee emotions and behaviors, but there is no guarantee that a leader's priority for searching for and seizing development opportunities will be shared by subordinates (Santana *et al.*, 2025). As an essential antecedent to evaluating employees' perception of their perceived organizational attachment, organizational embeddedness represents employees' feeling of being an integral part of the organization (Crossley *et al.*, 2007). Individuals who are more deeply embedded in an institution are more likely to want to stay in that institution and to seek advancement within

it (Sinha *et al.*, 2025). Being active in Intrapreneurship is a crucial road for employee career development. People who scored higher on organizational embeddedness are more likely to positively respond to leader expectations than others, and consequently, they are more likely to translate their passion into intrapreneurial behavioral activities (Yan *et al.*, 2025). As a result, in order to fully capture employees intrapreneurial behavior, this study should embed an employee's organizational embeddedness as a variable in the theoretical framework, and investigate in depth how organizational embeddedness facilitates employees intrapreneurial behavior in the Southwest Border Areas of China.

On the other hand, the areas along the Southwest Border are the core poverty-stricken regions of China, with a 2023 average income per capita of only ¥14,250. As a result, restoring the local impoverished economy is a matter of urgency (Liao *et al.*, 2024). In China's southwestern border regions, where geography is remote, transportation is inconvenient, and businesses are scattered, virtual collaboration has become a structural feature of organizational operations. In this context, virtual team leadership is not merely a matter of technical adaptation, but rather a key organizational mechanism for overcoming geographical isolation and resource constraints. Compared to more developed regions, virtual teams in China's south-western border areas face more pronounced challenges, such as the digital divide, cultural diversity (due to multi-ethnic communities), and the need for cross-border collaboration. This lends virtual team leadership unique research value, as leaders must establish trust, align objectives, and motivate member engagement through digital media within a 'weak-ties' environment. At the same time, given the lagging economic development, small-scale enterprises, and limited external resource inflows in China's southwestern border regions, employees' intrapreneurial behavior has become a core pathway for organizations to break through resource bottlenecks and achieve endogenous growth. Local employees possess a 'situational knowledge' advantage regarding local market demands, ethnic cultural resources, and cross-border trade opportunities; their intrapreneurial behavior serves not only as a source of organizational innovation but also as the micro-foundation for regional poverty alleviation and industrial revitalization. Compared to developed regions, intrapreneurship in the south-western border regions exhibits more 'constraint-driven' characteristics, where resource scarcity may conversely stimulate employees' creative resource integration behavior. On the other hand, passion for inventing refers to an individual's intense emotional investment and sustained motivation in creative problem-solving activities. In the south-western border regions, this passion exhibits a distinct contextual embeddedness: Whilst resource constraints and survival pressures may suppress it, a sense of mission to resolve local practical problems, the

creative traditions within ethnic cultures, and an emotional commitment to transforming the poverty-stricken conditions of one's hometown may conversely stimulate a high intensity of passion for inventing. This passion-driven 'frugal innovation' is particularly crucial for the south-western border regions. Furthermore, these regions exhibit the typical characteristics of an 'acquaintance-based society', with tight social networks and strong interpersonal bonds; organizational embeddedness here displays the dual characteristics of high 'relational embeddedness' and 'structural embeddedness'. The deep embeddedness of employees within the organisation, the community, and local society may facilitate knowledge flow through trust and information sharing, but may also lead to cognitive lock-in and path dependence due to excessive embeddedness. In the context of the south-western border regions, organizational embeddedness is often intertwined with local and ethnic identities, forming a unique embeddedness mechanism. Therefore, examining virtual team leadership, employees intrapreneurial behavior, passion for inventing, and organizational embeddedness within the context of China's south-western border regions not only deepens the theoretical understanding of the mechanisms of 'innovation under adversity', but also provides academic support for regional poverty alleviation and China-ASEAN prosperity. Enterprises are essential dense economic vehicles of angular, not only for the impact of employment development and the national industrial prosperity, but also a critical endogenous force in the Southwest Border Areas of China (Liao and Chen, 2024; Xu, 2025). Therefore, an investigation of employees' intrapreneurial behavior in these sectors may promote innovation and reform at the organizational level, raise the overall economic performance of the region, and be meaningful for local economic development.

In summary, this study aims to investigate employees' perceptions of virtual team leadership and employees intrapreneurial behavior, alongside examining the mediating and facilitating effects of passion for inventing and organizational embeddedness in Southwest Border Areas of China. Clarifying these relationships will identify the antecedents and facilitating mechanisms of employees intrapreneurial behavior in Southwest Border Areas of China, thereby powerfully driving organizational transformation and innovation to reverse local poverty.

Research Questions

Research into organizations' intrapreneurial in China is still in its infancy, standing in stark contrast to advanced nations. Over the past decade, theoretical exploration and practical

validation of employees intrapreneurial behavior abroad have largely defined the state of research in this field. Despite cultural differences stemming from institutional histories and knowledge contexts, studies on employees intrapreneurial behavior in China—particularly those exploring specific regional contexts—remain markedly underdeveloped. Given this, the following research questions are proposed:

(1) Does the virtual team leadership related to employees intrapreneurial behavior in Southwest Border Areas of China?

(2) Does passion for inventing mediating between virtual team leadership and employees intrapreneurial behavior in Southwest Border Areas of China?

(3) Does organizational embeddedness moderating between passion for inventing and employees intrapreneurial behavior in Southwest Border Areas of China?

(4) Does organizational embeddedness moderates the indirect effect of passion for inventing on employees intrapreneurial behavior in Southwest Border Areas of China? i.e., the higher the level of organizational embeddedness, the higher the indirect effect of virtual team leadership on employees intrapreneurial behavior through passion for inventing.

Research Objectives

(1) To exploring the relationship between virtual team leadership and employees intrapreneurial behavior in Southwest Border Areas of China.

(2) To analyze the mediating effect of passion for inventing between virtual team leadership and employees intrapreneurial behavior in Southwest Border Areas of China.

(3) To analyze the moderating effect of organizational embeddedness between passion for inventing and employees intrapreneurial behavior in Southwest Border Areas of China.

(4) To analyze the moderating effect of organizational embeddedness moderates the indirect effect of virtual team leadership on employees intrapreneurial behavior, i.e., the higher the level of organizational embeddedness, the higher the indirect effect of virtual team leadership on employees intrapreneurial behavior through passion for inventing.

Literature Review and Hypothesis

Employees Intrapreneurial Behavior

Employee intrapreneurial behavior refers to the conscious process whereby individual members within an organization, whilst remaining within their existing employment relationship

and organizational boundaries, proactively identify and capitalize on market or technological opportunities. By reorganizing and allocating the organization's existing resources (or leveraging external resources), they develop new products, services, processes, or business models to create economic and social value, whilst simultaneously assuming the associated uncertainties (Neessen *et al.*, 2019). In contrast, some researchers, such as Gawke *et al.* (2019), define it as a bottom-up intrapreneurial activity initiated and championed by employees.

This behavior possesses the dual attributes of 'employee status' and 'entrepreneurial spirit': whilst the individual remains within a formal employment relationship, they demonstrate characteristics typical of independent entrepreneurs—such as opportunity orientation, resource integration and risk-taking—in the performance of their role (Escribá-Carda *et al.*, 2020; Farrukh *et al.*, 2022; Li *et al.*, 2026).

In short, employees' intrapreneurial behavior is an entrepreneurial process at the individual level within an organizational context; its essence lies in achieving the co-evolution of individual and organizational value through the dynamic coupling of opportunity, resources and action, amidst the tension between structural constraints' and 'autonomous creation.

Virtual team leadership and Employees intrapreneurial behavior

Virtual team leadership is described as the composite characteristics of leaders in virtual environments, enabling the achievement of organizational objectives by influencing and guiding team members (Batırlık *et al.*, 2022). Virtual team leadership excels at fostering positive atmospheres and improving interpersonal relationships, which helps motivate employees to propose innovative ideas and enhance their creativity (Qu and Xi, 2022). According to social information processing theory, individual activities are profoundly influenced by complex external information. Individuals determine appropriate attitudes and behaviors by processing and interpreting specific social information (Salancik and Pfeffer, 1978). At the same time, studies have shown that leadership styles may shape employee thoughts and behaviors (Hu *et al.*, 2025; Zhu and Guo, 2021). In this context, virtual team leadership is the change agent and the change practitioner at the same time, as it has a pivotal role in the prediction of employees intrapreneurial behavior. In particular, virtual team leadership tries to encourage employee creativity and flexibility by creating a beneficial environment (Qu and Xi, 2022). In addition, it is the source, or at least reinforces, tacit entrepreneurial norms in the firm. For employees, this is a powerful positive signal: that entrepreneurial behavior is welcome and supported in the organizational context (Bravo-Duarte *et al.*, 2025), and thus employees develop desire and pursue intrapreneurial behavior in line with what leaders expect and

organizational services. Therefore, virtual team leadership encourages its employees, who are the ones to perform and take actions in intrapreneurial behavior. Hence the hypothesis:

H1: Virtual team leadership and employees intrapreneurial behavior are positively correlated.

The Mediator Role Played by Passion for inventing

Passion for inventing is defined as the positive and intense feelings entrepreneurs experience through the processes of recognizing new market needs, applying new technologies, or making other useful changes in products or services (Cardon *et al.*, 2013). At the same time, studies reveal that employees' passion for inventing may serve as a mediator in the relationship between entrepreneurial leadership and intrapreneurial behavior (Hu *et al.*, 2025). In addition, passion for inventing indicates active connection and engagement with the inventor role, where such individuals internalize the identity of the inventor as who they are and relate to the inventor identity as an important part of their self-concept, and they consider designing new products or services as an essential part of the job (Cardon *et al.*, 2013). Several value-ridden belief systems related to virtual team leadership are established within organizations, influencing collective mental models and emotional responses of members positively (Bravo-Duarte *et al.*, 2025). Therefore, virtual team leadership can predict and prevent resistance to fulfilling entrepreneurial goals in the midst of change and organizational innovation. It enhances employees' trust in exploration activities, which allows employees to directly feel emotional support from the superintendent, dispels fears, and fosters positive feelings about exploring new business opportunities (Qu and Xi, 2022). Therefore, the more inventors' identities are active in opportunity identification and development activities and shaped by support from the top level of leadership within an organization, the more they are likely to exhibit intrapreneurial behaviors (Qu and Xi, 2022). Hence the hypothesis:

H2: Passion for inventing has a mediator effect between virtual team leadership and employees intrapreneurial behavior.

The Moderator Role Played by Organizational embeddedness

Organizational embeddedness refers to employees' perceptions of being intertwined with the work organization (Crossley *et al.*, 2007). Highly embedded employees are more likely to stay and work efficiently in an organization. They feel they can progress in their career in the same organization and/or get more professional and/or psychological satisfaction in the same organization (Santana *et al.*, 2025). As a result, employees who are highly

embedded in their organization are more driven to align their personal advancement with organizational development. They can also motivate employees with higher inventive passion to realize their desires and engage actively in intrapreneurial behavior (Hu *et al.*, 2025). In addition, when highly inventive, passionate employees are willing to take even more initiative in risk, they are prone to get involved as intrapreneurs in more risky activities in the company (Yan *et al.*, 2025). Concurrent with this, studies have shown that organizational embeddedness positively mediates the relationship between employees' inventive passion and their performance in intrapreneurial activities (Hu *et al.*, 2025). Therefore, strong organizational embeddedness could turn employees' passion for inventing into something beyond an emotional state and encourage inventors with a high passion for inventing to participate in intrapreneurial activity that involves some risk of failure and career jeopardy (Hu *et al.*, 2025). Hence the hypothesis:

H3: Organizational embeddedness has a positive moderating effect between passion for inventing and employees intrapreneurial behavior.

On further analysis, organizational embeddedness moderated the relationship between virtual team leadership and passion for inventing, as well as the relationship between virtual team leadership and employees intrapreneurial behavior, and the present study hypothesized that the mediating role of passion for inventing between virtual team leadership and employees intrapreneurial behavior was also moderated by organizational embeddedness. Hence the hypothesis:

H4: Organizational embeddedness moderates the indirect effect of virtual team leadership on employees intrapreneurial behavior, i.e., the higher the level of organizational embeddedness, the higher the indirect effect of virtual team leadership on employees intrapreneurial behavior through passion for inventing.

Research Framework

The research framework was constructed according to the research objectives and hypotheses (Figure 1).

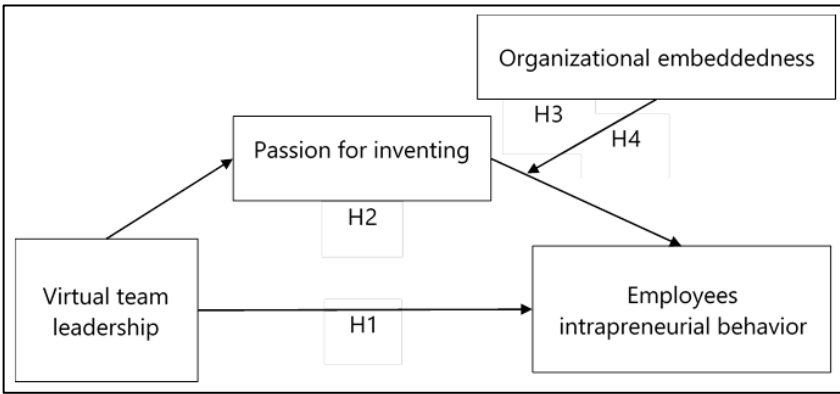


Figure 1: Research Conceptual Framework

Source: Auhtor (2025)

Methodology

Sample and Data Collection Procedure

The measurement items in this study comprise 54 items; consequently, the sample size should not be less than 540 responses, representing 10 times the sample size (Videla *et al.*, 2021).

The survey was conducted in September 2025 using purposive sampling, and virtual questionnaires were distributed with the assistance of managers from 65 enterprises to investigate employees' perceptions of virtual team leadership, employees intrapreneurial behavior, passion for inventing, and organizational embeddedness in the Border Areas of China, a total of 589 valid responses were obtained (response rate: 89.24%).

Measures

Virtual team leadership scale: Drawing by Batırlık *et al.* (2022), the scale is divided into 6 factors, managerial qualities, interactivity, human relations, personal traits, rewards and flexibility, comprising 29 items (The α of the scale = 0.913). It is described as a composite trait of leaders in virtual environments (Batırlık *et al.*, 2022).

Organizational embeddedness scale: Designed by Crossley *et al.* (2007), single-factor, comprising 6 items (The α of the scale $\alpha=0.82$). It is defined as employees' perception of their attachment to the organization (Crossley *et al.*, 2007).

Passion for inventing scale: Hu *et al.* (2025) adapted the measurement instrument from Cardon *et al.* (2013), single-factor, comprising 4 items (The α of the scale $\alpha = 0.942$). It is

defined as the positive emotions experienced by individuals through processes such as seeking new market opportunities, creating new products or services, and adopting new ways of working (Cardon *et al.*, 2013).

Employees intrapreneurial behavior scale: Drawing by Gawke *et al.* (2019), the scale is divided into 2 factors, Strategic Renewal Behavior (The α of the scale $\alpha=0.93$) and Venture behavior ($\alpha=0.87$), comprising 29 items. It refers to bottom-up intrapreneurial activities initiated and championed by employees (Gawke *et al.*, 2019).

Gender, educational attainment, and professional qualification certificate as demographic variables (Hu *et al.*, 2025; Qu and Xi, 2022), whilst other variables are measured using a 5-point scale in a self-reported format.

Results

Distribution of Population Characteristics

As shown in Table 1, the sample comprised predominantly males (456 individuals, 77.42%), with the largest proportion holding a specialized (associate degree) (485 individuals, 82.34%). Furthermore, the majority of respondents had not obtained a professional qualification certificate (462 individuals, 78.44%). Analysis indicates that the sample aligns with the target group of this study.

Table 1: Distribution of population characteristics

Background variables	Category	N	%
Gender	Male	456	77.42
	Female	133	22.58
	Total	589	100
Educational attainment	High school and below	52	8.83
	Specialized	485	82.34
	Undergraduate	58	9.85
	Graduate student	3	0.51
	Total	589	100
Professional qualification certificate	Have	127	21.56
	Not have	462	78.44
	Total	589	100

Note: n=589.

Model Fit

As shown in Table 2, the overall model had an SRMR = 0.05, a good match.

Table 2: Model fit

	O	M	95%	99%
Models of saturation	0.05	0.034	0.036	0.039
Estimated model	0.05	0.034	0.036	0.039

Note: * $p < 0.05$.

Correlation Analysis

The correlation matrix shows that virtual team leadership was significantly correlated with employees intrapreneurial behavior ($r=0.234^{***}$, $p<0.001$), and H1 holds. Moreover, the relationship between the virtual team leadership, passion for inventing, and organizational embeddedness is entirely significant ($r=0.506^{***}$, 0.241^{***} , $p<0.001$), indicating that all variables are interrelated.

Table 3: Correlation analysis

Variable	M	SD	1	2	3	4
1. Virtual team leadership	3.70	0.92	0.768			
2. Passion for inventing	3.64	0.96	0.506**	0.808		
3. Organizational embeddedness	3.75	1.02	0.241**	0.232**	0.788	
4. Intrapreneurial behavior	3.76	0.95	0.234**	0.169**	0.253**	0.746
α			0.907	0.896	0.832	0.904
CR			0.732	0.793	0.835	0.879
AVE			0.575	0.654	0.621	0.558

Note: * $p < 0.05$; the value in the diagonal is the AVE open root value.

Mediating and Moderating Effect Analysis

As shown in Table 4, passion for inventing had a mediating effect (3.675^{***} , $p<0.001$) on the path of virtual team leadership to employees intrapreneurial behavior, and H2 holds (virtual team leadership $\rightarrow$ passion for inventing $\rightarrow$ employees intrapreneurial behavior). Therefore, passion for inventing effectively mediates the relationship between virtual team leadership and employees intrapreneurial behavior. Moreover, organizational embeddedness has a significant positive moderating effect in the pathway passion for inventing to the employees intrapreneurial behavior ($\beta = 0.124^{***}$, $p<0.001$), and H3 holds (passion for inventing $\times$ organizational embeddedness $\rightarrow$ employees intrapreneurial behavior). Therefore,

organizational embeddedness effectively moderates the relationship between passion for inventing and employees intrapreneurial behavior.

Table 4: Mediating and moderating effect analysis

Effect	Path	Coefficients
Mediating	Virtual team leadership → passion for inventing → employees intrapreneurial behavior	3.675*** (Sobel Z)
Moderating	Passion for inventing × organizational embeddedness → employees intrapreneurial behavior	0.124***

Note: * $p < 0.05$.

Moderated Mediation Effect

As shown in Table 5, the indirect effect of virtual team leadership through passion for inventing on employees intrapreneurial behavior is significant (0.1212***, 0.1516***, 0.1662***, $p < 0.001$) at different levels of organizational embeddedness, and H4 holds. Therefore, the indirect effects of organizational embeddedness on employees intrapreneurial behavior through passion for inventing.

Table 5: Test results of moderated mediation effect

Effect	Sobel test		95% IC
	Indirect effect	SE	
Organizational embeddedness(low)	0.1212	0.0407	0.1348, 0.3032
Organizational embeddedness(medium)	0.1516	0.0461	0.1715, 0.3559
Organizational embeddedness(high)	0.1662	0.0604	0.1874, 0.4315

Note: * $p < 0.05$.

Discussion

1) Virtual team leadership exhibits a positive correlation with employees intrapreneurial behavior. This indicates that, as a key factor influencing intrapreneurial behavior, the conduct and characteristics of virtual team leadership can elicit emulation and adherence from subordinates. Consequently, enterprises may proactively cultivate managers possessing virtual team leadership competencies to foster employees intrapreneurial behavior, serving as an effective pathway for corporate innovation and reform in the Southwest Border Areas of China.

2) Employee passion for inventing mediates the relationship between virtual team leadership and intrapreneurial behavior. It can be inferred that if virtual team leadership emphasizes the exploration and development of opportunities during subordinate management, employees will be more inclined to propose new ideas for product and service innovation. Consequently, their inventive passion will increase, leading to higher levels of intrapreneurial behavior. Therefore, organizations should implement broad job designs, granting employees greater autonomy to further stimulate their passion for inventing in the Southwest Border Areas of China.

3) The moderating role of organizational embeddedness in the relationship between passion for inventing and employee intrapreneurship within organizations is validated in the Southwest Border Areas of China. This study found that employees with higher organizational embeddedness achieve greater levels of intrapreneurship when translating passion into concrete intrapreneurial behavior. This indicates that employees possessing a passion for inventing require stronger organizational embeddedness to be more likely to remain within the organization and engage in intrapreneurial behavior. Consequently, organizations need to cultivate a sense of belonging conducive to employees intrapreneurial behavior, while providing both moral and material support for internal entrepreneurial activities to further enhance the role of virtual team leadership in Southwest Border Areas of China.

4) Organizational embeddedness mediates the indirect effect of virtual team leadership on intrapreneurial behavior via employees' inventive passion in the Southwest Border Areas of China. Higher levels of organizational embeddedness amplify the indirect effect of virtual team leadership on intrapreneurial behavior through employees' passion for inventing. This occurs because employees with high organizational embeddedness actively transform creative ideas into valuable intrapreneurial behavior for the organization to gain recognition from virtual team leadership.

Implications

1) It is an analysis of for-profit organizations within Southwest Border Areas in China, examining the selection and management of leaders internal to the combined intrapreneurial level and dealing with hierarchical responses. Enterprises can also try to develop corresponding management measures to tap employees' intrapreneurial potential to the greatest extent and promote organizational innovation. Such as hiring, training, and rewarding leaders with certain technical expertise (Qu and Xi, 2022). Leaders from anywhere in the

hierarchy, as well as all leaders incumbent and future, must pay greater attention to recognizing and developing their employees intrapreneurial talents, and they must adapt their leadership styles to how they want their employees to behave. These include: building virtual team leadership prominence, developing positive organizational climate and interpersonal relations in a virtual context, and enabling employees to identify and exploit opportunities in their work.

2) The findings of this research provide important implications for other regions or organizations that intend to unleash and nurture employees' passion for inventing to promote regional intrapreneur activities. Since employees' passion for inventing is an important mediating variable of intrapreneurial behavior, the managers need to focus on firing up this passion to help foster more individual activities within intrapreneurial activities. This may be done by actively promoting and steering entrepreneurial behavior inside the company and by creating a climate that energizes and strengthens the use of the creative power of the employees. Such methods can also stimulate positive inventive passion, contributing to a more active participation of employees in intrapreneurship engagement (Sinha *et al.*, 2025). In China's south-western border regions, where employees face limited external opportunities and scarce resources, traditional rational decision-making models struggle to explain their motivation for intrapreneurship. Here, a passion for inventing is not merely an emotional response, but rather a process of 'cognitive restructuring' in the face of resource constraints; passion-driven employees tend to redefine these constraints as opportunities for innovation, thereby stimulating their intrapreneurial behavior. This mechanism resonates with the core logic of the Theory of Effectuation: In environments of uncertainty, emotionally driven action precedes precise calculation. Furthermore, the multi-ethnic culture, cross-border trade opportunities, and historical memory of poverty alleviation in China's south-western border regions provide employees with a unique 'source of meaning'. Here, the passion for invention is not merely a personal emotion, but is linked to collective narratives such as the mission of local development and the preservation of ethnic cultural heritage, forming a resonant structure of individual passion–collective meaning. This resonance results in the driving effect of this passion on intrapreneurial behavior being stronger than in developed regions.

3) This research provides a practical human resource management approach for organizations to develop an exceptional breed of intrapreneurs in the Southwest Border Areas of China. In the case of employees intrapreneurial behavior and passion, even passion is not sufficient for understanding intrapreneurial behavior, and the focus on the relationship of attachment between employees and the organization should be prioritized (Hu *et al.*, 2025). In addition, passionate inventing employees are very motivated to engage in entrepreneurial

activities outside the organization. Hence, HRM practices need to be tailored towards reinforcing employees' commitment to the organization and supporting corporate entrepreneurship. For example, organizations may seek to build organizational ties by encouraging employees to participate in longer-term projects, whereby those with a high passion for inventing may be encouraged to do so. Furthermore, a particular challenge facing enterprises in China's south-western border regions lies in the limited opportunities for external entrepreneurship locally; for highly motivated employees, 'external entrepreneurship' often results in a brain drain to more developed regions or across national borders. Consequently, enterprises need to establish a robust, embedded 'constraining function' to fully foster the development of employees intrapreneurial behavior. Working in tandem with the 'empowering function'—which interacts with virtual team leadership and passion for inventing—this enables enterprises to avoid the dilemma of 'retaining staff whilst extinguishing their motivation'.

On the other hand, it is worth noting that the context-specific nature of China's south-western border regions requires researchers to move beyond the simple transplantation of universal theories when understanding passion for inventing and organizational embeddedness, and instead construct a 'context-embedded' theoretical framework. The mediating role of passion for inventing reveals the micro-mechanisms of 'how emotions are translated into action', whilst the moderating role of organizational embeddedness reveals the structural conditions of 'how organizations retain and activate passion'. The synergistic management of these two factors is the key pathway for enterprises in China's south-western border regions to achieve endogenous entrepreneurship and drive regional economic development under resource constraints.

Limitations and Future Research Directions

This study also has some limitations.

1) Owing to the limitations of the survey, the final data for this study are only based on employees' self-reports, which may have some potential impact on the validity of the research findings. By using leader-subordinate matching data, the subsequent research can further validate these results, thus uncovering more complex cross-level relations and improving the precision and the interpretation of the analysis.

2) The effect of virtual team leadership on employees' intrapreneurial performance through several different routes. Only one mediating route (i.e., employee passion for

inventing) was considered in the current study. Additional research is needed to investigate other influence paths and clarify their mediating effects.

3) The present study focused solely on the moderating effect of organizational embeddedness. Future research may consider incorporating various moderating variables — such as future scenario thinking, AI literacy, Confucian culture, and learning agility (Liu and Bunnag, 2025; Li *et al.*, 2025; Li and Zhang, 2026) — to further elucidate the relationship between virtual team leadership and employees intrapreneurial behavior.

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