



Research article

The relationship between servant leadership and team innovation performance: Mediating effect of self-efficacy

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ABSTRACT

This study delves into the effects of servant leadership on team innovation performance by examining innovation self-efficacy as a mediating factor and team innovation atmosphere as a moderating factor. Utilizing a questionnaire survey of 311 hotel employees, we employed a structural equation model for rigorous data analysis. Our key findings are summarized as follows: (1) Servant leadership positively influences team innovation performance. Specifically, the dimensions of persuasion and guidance within servant leadership emerge as significant predictors of enhanced team innovation. (2) Servant leadership significantly boosts innovation self-efficacy, highlighting its crucial role in fostering a culture of innovation. (3) Innovation self-efficacy emerges as a pivotal mediator between servant leadership and team innovation performance, underscoring its importance in translating leadership behaviours into tangible innovation outcomes. (4) The team innovation atmosphere positively moderates the relationship between innovation self-efficacy and team innovation performance, indicating that a supportive environment can amplify the impact of individuals' self-beliefs on collective innovation. This research offers valuable theoretical and practical insights into harnessing the power of servant leadership to enhance innovation self-efficacy and, ultimately, team innovation performance. Our findings contribute to a richer understanding of how these variables interact and can inform the development of more effective leadership strategies in organizations seeking to foster a culture of innovation.

1. Introduction

Due to rapid changes and the emergence of new technologies, the ability of enterprises to create accurate market forecasts is declining, and risks in the global business environment are increasing [1]. Today's business environment has become more complex and is experiencing rapid changes, posing significant challenges for operating organizations [2]. Organizations should focus on identifying potential improvement opportunities to strengthen and sustain their market position [3].

To continuously improve performance and remain competitive in such a harsh environment, organizations must innovate and change their routines [4]. The survival and success of different enterprises depend largely on their innovative capabilities [5], allowing them to quickly and effectively respond to increasing changes in the regulatory role of the business environment [6].

Scientists are also working hard to find factors that lead to better performance [7]. Leadership type was found to play an important

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role in this process, as it determines the effectiveness of employees' work [8] and plays a key role in the extent to which the organization supports innovation [9].

Servant leadership involves providing guidance to others, making sacrifices for others, and valuing the efforts of followers, ultimately creating a sense of respect and loyalty [10]. It is considered to be a particularly effective form of leadership [11] that emphasizes key "service" factors and prioritizes meeting the needs of company employees [12].

This leadership style has the potential to improve employees' work performance and attitudes through recognition and respect, fostering trust and high-quality interpersonal relationships [13]. When led with a servant leadership approach, employees tend to perform well [14,15] and exhibit positive behaviour [16], thereby positively influencing organizational performance [17]. In the modern world, servant leadership is considered the most effective means of solving workplace problems [18] and has the potential for a successful impact on organizations [19].

Notably, servant leadership promotes the well-being of all organizational stakeholders and the larger community [20]. It has been empirically proven that servant leadership has a significant impact on performance [21], affecting both individual and team performance significantly [2].

The hotel industry is a multibillion-dollar sector that feeds millions of people globally [22]. In China, the hotel industry has emerged as a significant economic force, generating income and employment opportunities [23]. According to the Junting Hotel Group's report [24], the comprehensive contribution of tourism to GDP in China is 10.94 trillion yuan, constituting 11.05% of the total GDP. The hotel industry plays a vital role within the broader tourism sector.

As of the Fourth Economic Census in China in 2018, the hotel industry employed 2,744,773 individuals nationwide, making a substantial contribution to employment [25]. Additionally, the industry contributed 8.56 billion yuan in taxes and surcharges, emphasizing its role as a significant taxpayer [25].

However, the rise of the sharing economy has brought about increased competition [26]. The rapidly expanding hotel industry is now confronted with numerous challenges [27].

Leaders play a crucial role as valuable resources in the hospitality industry [28]. Servant leadership, identified as compatible with the hospitality industry, is recognized as a source of customer satisfaction [11]. Hence, we chose to conduct a study on servant leadership in the hospitality industry, particularly considering the current challenging environment and heightened emotional tension faced by hotel officials [29].

In the context of the hospitality industry, where leadership skills are in high demand, most studies assume that hotel managers can influence service quality through effective management practices [30]. However, various forms of leadership may differ in their effectiveness in helping employees feel appreciated and recognized [31]. Consequently, there is an ongoing debate about which type of leadership is more suitable for hotel businesses [32], and leadership strength has become a prominent research area in the hotel industry [33].

In addition to the influencing factors of leadership style, employees' personal behaviours also impact productivity. Another significant aspect of interest is the study of creative self-efficacy, particularly concerning frontline waiter workers in hospitality companies [34]. Employees with high innovation self-efficacy exhibit a strong desire to meet customer needs and are highly productive, creating innovative services and actively developing new and effective problem-solving methods [35,36]. It is considered a key factor influencing employee productivity, and servant leadership is recognized for its positive influence on employees' self-efficacy [14].

Upon reviewing the literature, several gaps and challenges in previous studies were identified. While numerous studies cover different conditions, there is still a need to explore the impact of servant leadership on job performance [37]. Two key issues warrant attention. First, the mechanism of servant leadership has not been thoroughly examined in previous research [20], and the various dimensions of servant leadership require testing to understand their respective roles. Second, the use of servant leadership in different cultural contexts remains an understudied area, leading to limited consensus on the behaviour of servant leaders and presenting a potential avenue for further research [38].

In the context of hospitality leadership, there is limited understanding of whether and how servant leadership creates unique value and functionality in the hospitality industry [28]. Notably, the Chinese Research University Library database search revealed a scarcity of research on servant leadership in the Chinese hotel industry, indicating a need for more focused investigations [39].

Concerning the relationship between servant leadership and performance, previous research has focused predominantly on employee outcomes, neglecting team performance aspects [40–44]. Moreover, research on servant leadership at the team and organizational levels remains limited [20].

Therefore, this study, which is conducted in mainland China, aims to address these gaps by exploring the mediating role of innovation self-efficacy in predicting how servant leadership influences team performance. Additionally, the study seeks to investigate whether team innovation climate moderates the relationship between servant leadership and team innovation performance. Given that the team atmosphere is part of the company culture and can enhance the quality of employees' work performance [45], this study aimed to answer the following questions: 1. Examine the role of each dimension of servant leadership. 2. Investigate the role of servant leadership in the Chinese hotel industry. 3. Research servant leadership from the perspective of team and innovation performance. The goal is to enrich the research field and address the identified gaps in the literature.

2. Theory and hypothesis

2.1. Servant leadership and innovation self-efficacy

The concept of servant leadership was originally introduced by Greenleaf [46], who highlights leaders' motivation to serve [47].

Spears [48] distilled ten key characteristics of servant leadership from Greenleaf's perspective. These encompass traits such as listening, empathy, solace, vigilance, persuasion, foresight, vision, stewardship, commitment to others' growth, and community development. Subsequent research has reinforced prominent features of servant leadership, including ethical behaviour, nurturing followers' development and empowerment, and contributing to community well-being [20,40,47].

Eva et al. [20] further refined the concept, defining servant leadership as a form of other-oriented leadership enacted through individual interactions with followers with the intention of shifting the focus from self to others, which will have a significant positive impact on employees' innovative and productive behaviours [49]. Leaders have a significant impact on subordinates' work-related behaviours and attitudes in the work atmosphere [50]. It has a crucial impact on self-efficacy and creativity [51,52]. In the context of servant leadership, employees without innovation and creativity cannot develop [53]. This study follows the definition and measurement method proposed by Sun and Wang [54]. They focus on five dimensions, namely, emotional comfort, persuasion and guidance, altruism, wisdom, and social responsibility.

The mutual respect and service embodied by servant leadership awareness help to improve innovation self-efficacy, thereby helping to improve innovation efficiency [49]. Leadership has a crucial impact on self-efficacy and creativity [51,52]. Recent research has suggested that servant leadership has incremental value over other leadership approaches [55,56] and can increase employee creativity [57,58]. This approach can improve employees' innovation self-efficacy [59].

Building upon this foundation, we formulate Hypothesis 1.

H1. Servant leadership positively influences employees' innovation self-efficacy.

2.2. Innovation self-efficacy and team innovation performance

Originally introduced as a psychological concept, innovation self-efficacy was pioneered by the American psychologist Bandura [60]. Over time, this concept has extended into the realm of management research. Innovation self-efficacy refers to individuals' beliefs about their capacity to successfully execute a specific task [61]. Building on this concept, Tierney and Farmer [51] proposed that self-efficacy encompasses employees' confidence in their ability to demonstrate creativity within their job roles. In contrast to general self-efficacy, innovation self-efficacy is considered a sense-making framework [62] and is generally used to explain the meaning of situational and personal cues in the creative process [63].

An individual believes in his or her ability to complete the tasks required for innovation [49], focusing on innovation self-efficacy, persuasive self-efficacy, and change self-efficacy. When employees have innovation self-efficacy, employee productivity increases when there is greater confidence in the three areas [36]. Positive innovation self-efficacy is related not only to persistence but also to increased employee productivity through influencing innovation [49]. Employees with high innovation self-efficacy are more likely to engage in creative pursuits and exhibit innovation-oriented behaviours [62,63].

Innovation self-efficacy is believed to play a motivating and driving role in the creativity and innovation process of organizations and has a considerable influence on determining this process [64]. Research by Wihuda et al. [65] showed that self-efficacy plays an important role in a company's success in improving employee performance and productivity, and innovation self-efficacy has a significant impact on innovation performance [66]. Innovation self-efficacy improves innovation performance by motivating and helping employees to be highly involved [67] and has a positive relationship with innovation, playing a mediating role in transferring the influence of innovation antecedents [68].

Given these insights, Hypothesis 2 is formulated as follows.

H2. Innovation self-efficacy positively influences team innovation performance.

2.3. The mediating role of innovation self-efficacy

Servant leadership aims to foster an environment that embraces novel ideas and innovations. Innovation extends beyond generating new concepts; it also involves their dissemination and integration within the organization [69,70]. This process relies on employees' belief in their ability to perform challenging tasks, emphasizing the significance of innovation for self-efficacy [71]. Enhancing employees' self-efficacy is crucial for achieving performance aligned with predetermined visions and effectively competing with rivals [72].

Employees with a high sense of self-efficacy are more likely to take risks, face resistance calmly and are thus more likely to initiate and support innovative decisions and activities within the organization. This results in higher innovation performance at both the individual and organizational levels [73] and has a positive impact on company performance [74]. The mutual respect and service orientation inherent in servant leadership contribute to boosting innovation self-efficacy. Consequently, improved innovation self-efficacy enhances innovation efficiency and employee productivity [36]. High-quality servant leadership significantly enhances both organizational performance and individual outcomes [28,75].

In addition to servant leadership, collective organizational attitudes in the workplace contribute to the "organizational atmosphere" [76,77]. Shaped by social interactions within the organization, social interaction profoundly influences employee behaviour [78]. Guided by these premises, Hypothesis 3 is articulated as follows.

H3. Innovation self-efficacy mediates the relationship between servant leadership and team innovation performance.

2.4. The Team’s innovative atmosphere boosts servant leadership and performance

The team innovation atmosphere is the shared cognition of team members about the work environment that affects the performance of their innovative capabilities. It is an important situational variable that can affect employee attitudes and behaviours [79] and can encourage team members to frequently, timely, and effectively communicate new ideas and provide support for their implementation [80]. A relaxed and cooperative working environment enhances the frequency of interaction among team members, thereby enhancing mutual trust and resource sharing. This interaction and sense of security help team members share new knowledge, inspire new ideas, and solve new problems [81].

West [80] proposed four dimensions of the team innovation atmosphere—vision and goal, sense of security in participation, task orientation, and innovation support—completing the initial scale of the team innovation atmosphere inventory (TCI). This study adopts the measurement scale of team innovation atmosphere suitable for mainland China, compiled by the Chinese scholar Ling [82] based on West’s framework [80]. It includes four dimensions: vision and goal, task orientation, innovation support, and interaction frequency. These dimensions better illustrate the concept of the team innovation atmosphere.

An atmosphere of team innovation creates an environment of open communication, allowing employees to generate and experiment with new ideas and reward creativity [83]. It is perceived as encouraging employees’ innovative abilities, tolerance for risks, and support for individual development [84]. The atmosphere for people’s development is a type of work culture that helps employees understand values and expected behaviours [85,86]. When employees perceive a conducive work climate, they tend to become more loyal, leading to improved business performance and success [87].

A team innovation atmosphere creates a work environment that satisfies employees and helps them feel comfortable at work, addressing one of the management challenges [88–90]. The “support” dimension strengthens leader identification and employee identification at the individual level, with the expectation that it will enhance creativity [58] and contribute to more productive employees, ultimately improving overall company performance, welfare, and productivity [91,92]. An innovation atmosphere directly and indirectly promotes organizational performance through employees’ innovative work behaviours [93].

Guided by these premises, Hypothesis 4 is articulated as follows.

H4. The team innovation atmosphere plays a positive regulating role in servant leadership and team innovation performance.

2.5. The Team’s innovation atmosphere boosts self-efficacy and performance

Team innovation performance refers to the introduction of new concepts, processes, and product categories that enhance the team’s operations [94]. It is the team members’ perception of innovation results [95]. Lovelace et al. [96] developed a team innovation performance scale. Zhang [97] reorganized the measurement of team innovation performance from the perspective of innovation results. The table includes 7 items, such as “the team often developing products or services that are accepted by the market and having a large number of R&D innovation results”.

The team atmosphere is closely related to the innovation process [98], as it can regulate employees’ behaviours related to the innovation process [99]. An innovation atmosphere that is conducive to autonomy and freedom makes employees feel safe when taking risks [87]. Kmiecik et al. [100] found that an innovation atmosphere promotes innovative activities. In a highly creative climate, employees are more likely to express their interest in potential improvements, suggest adjustments and ideas, select ideal technologies for implementing such changes, and eliminate ineffective ideas [101].

A positive organizational culture can have a significant impact on employee performance [102]. In addition to having a high-level work culture, employees with a high sense of self-efficacy can improve their productivity [65], promote creativity and change, and encourage employees to seek independence in new ideas. This fosters collaboration and personal development [98]. In an atmosphere that provides employees with time and resources to test innovative ideas, they are likely to feel accepted and welcomed in the workplace, enabling them to suggest improvements and challenge the status quo, contributing to the organization’s success in its efforts [103].

Drawing on these premises, Hypothesis 5 is postulated as follows.

H5. A climate of team innovation has a positive moderating effect on innovation self-efficacy and team innovation performance.

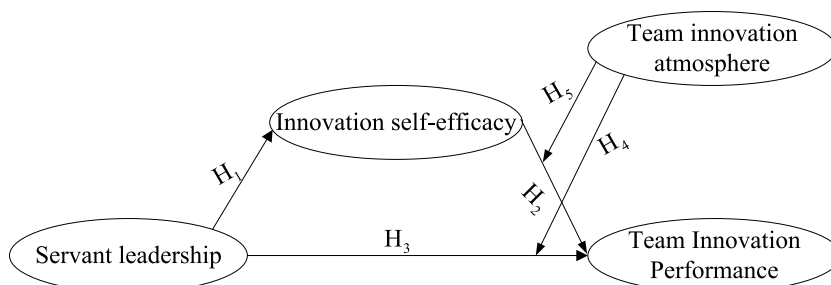


Fig. 1. Diagram of the research hypotheses.

Hence, this study develops a model in line with the research objectives and assumptions, taking into account Process Model 14. The specific model is illustrated in Fig. 1.

3. Research methods

3.1. Design and procedure

3.1.1. Sample and data collection

This study employed a questionnaire-based approach to gather, distribute and collect data online using Questionnaire Star software. The focus of this research is a hotel chain group in Chengdu. We selected five hotels from this group in Chengdu, comprising a total of 1231 employees. These five hotels have been in operation for more than five years, and their products and services exhibit relative stability. The sample size for the survey was calculated to be 302 copies using the Taro Yamane formula: $n = N/(1+N(e^{-2}))$.

To ensure the accuracy and efficiency of the data collection, a pre-polling questionnaire was administered in June 2023. There are two steps to pre-commission: first, the participants are sent to the WeChat group questions from the key management personnel, and the participants are asked to review the questionnaire; Second, explain and improve the feedback problems. A total of 210 questionnaires were collected in this survey, the data were analysed via principal component analysis, and some items with poor factor loading were deleted. According to the results of the pre-tuning data, the final service-oriented leadership consists of four dimensions. The final questionnaire consisted of 31 items.

A formal investigation will be conducted in August 2023. Supervisors ask employees to volunteer and use the blank data to fill out questionnaires. The researchers assured the participants that their individual responses were anonymous and that the data collection was limited to academic research. A total of 311 questionnaires were collected, for which the minimum number of participants was reached.

3.1.2. Measurement

This study employed a cross-sectional descriptive research design and collected data using a Likert scale (1, strongly disagree; 2, disagree; 3, somewhat disagree; 4, unsure; 5, somewhat agree; 6, agree; and 7, strongly agree). The scale was fine-tuned based on the mature scale.

Servant leadership was defined and measured according to Sun and Wang's framework [54], consisting of 9 questions with a reliability ranging from 0.66 to 0.87. The reliability analysis confirmed the structural validity and validity of the servant leadership questionnaire.

Innovation self-efficacy was assessed with the scale revised by Carmeli and Schaubroeck [104], which comprises 8 questions widely recognized by both domestic and foreign scholars.

The team innovation atmosphere was measured using the TCI scale revised by Ling [82], which includes 7 items. The reliability coefficients for half-half reliability and consistency reliability are 0.8355 and 0.9406, respectively.

Team innovation performance was assessed using Zhang's scale [105], which consists of seven questions and has an overall reliability of 0.904.

3.2. Demographic information

In relation to the gender distribution, the majority of participants were identified as "male", constituting 62.70% of the sample, while female participants composed 37.30%. In terms of educational attainment, more than half of the respondents held a "college or undergraduate" degree. Notably, 34.41% of participants possessed a master's degree or higher.

Regarding age demographics, a significant portion of the sample falls within the "31–50 years old" bracket, totalling 252 individuals and representing 81.03% of the sample. For details, see Appendix Table 1.

3.3. Data testing

Prior to embarking on the results analysis, this study diligently involved a series of data testing procedures aimed at assuring the quality and reliability of the gathered data. The following methodologies were rigorously employed.

3.3.1. Reliability analysis

The assessment of scale reliability hinged upon the utilization of Cronbach's α coefficient, a well-recognized measure of internal consistency. A decrease in Cronbach's α value between 0 and 1 yields higher scores for greater scale reliability. As advised by scholar Devellis and Thorpe [106], a Cronbach's α surpassing 0.70 signifies robust index consistency and high reliability. Conversely, coefficients below 0.60 suggest suboptimal reliability, prompting consideration of the scale's appropriateness or the selection of survey participants.

This test showed that the Cronbach's α coefficients for each variable and its dimensions substantially exceeded 0.80. This outcome solidifies the high reliability of the findings and substantiates the need for further analysis. For details, see Appendix Table 2.

3.3.2. Validity analysis

To thoroughly assess construct validity, an exploratory factor analysis (EFA) was performed. The Kaiser–Meyer–Olkin (KMO)

measure was judiciously applied to gauge the adequacy of sampling. KMO values above 0.8 are indicative of exceptional validity, signifying that the data are well suited for information extraction. Impressively, the KMO values for all four variables—namely, servant leadership, team innovation atmosphere, innovation self-efficacy, and team innovation performance—exceeded the threshold of 0.8, further underscoring the data's appropriateness for analysis. The specific results can be found in [Appendix Tables 3, 4, 5 and 6](#).

Convergent validity was meticulously assessed using the average variance extraction (AVE) method, a well-established benchmark in the academic community for evaluating convergent validity [107]. AVE values exceeding 0.50 indicate strong convergence of the latent variables.

The assessment revealed AVE values for servant leadership ranging between 0.60 and 0.80, accompanied by composite reliability (CR) values ranging from 0.75 to 0.89. The team innovation atmosphere exhibited AVE values between 0.64 and 0.90, coupled with CR values ranging from 0.78 to 0.96. The AVE value of team innovation performance is 0.5, with a combined reliability (CR) value of 0.85. Moreover, innovation self-efficacy had an AVE of 0.48, accompanied by a CR of 0.85, both surpassing the acceptable thresholds. Notably, the AVE exceeded 0.4, and all CR values soared beyond 0.7, confirming the acceptable convergent validity of the data [108]. The specific results can be found in [Appendix Tables 7, 8, 9 and 10](#).

In summary, these meticulous reliability and validity analyses unequivocally affirm the sufficiency and excellence of the gathered data. This collective validation empowers subsequent phases of data analysis.

3.3.3. Data descriptive statistics

The mean is employed to quickly capture a general overview of a dataset and is the most commonly used measure of central tendency. The standard deviation is used to gauge the consistency or dispersion of the data. There are no outliers in this test. For detailed values, see [Appendix Table 11](#).

3.3.4. Related analysis

This method is employed to examine the relationship between quantitative data and strength. The procedure involves:

Initial Assessment: Determine if there is a significant relationship between Y and X.

Correlation analysis: Subsequently, we analysed whether the correlation was positive or negative. Alternatively, the closeness of the relationship can be described by considering the size of the correlation coefficient.

Correlation analysis was also conducted to explore the relationships between servant leadership and innovation self-efficacy, team innovation atmosphere, and team innovation performance. The Pearson correlation coefficient was used to quantify the strength of these correlations. The specific analysis revealed the following:

There is a significant positive correlation between servant leadership and innovation self-efficacy, with a correlation coefficient of 0.786.

A significant positive correlation exists between servant leadership and team innovation atmosphere, with a correlation coefficient of 0.619.

There is a significant positive correlation between servant leadership and team innovation performance, with a correlation coefficient of 0.850. For detailed values, see [Appendix Table 12](#).

All correlation coefficient values surpass 0, indicating a positive correlation between servant leadership and innovation self-efficacy, team innovation atmosphere, and team innovation performance.

3.3.5. Normality test

The normality test assesses whether quantitative data follow a normal distribution. It is advisable to employ the Shapiro–Wilk (SW) test when the sample size is small (less than 50) and the Kolmogorov–Smirnov (KS) test when the sample size is large (more than 50). The inspection method involved the following steps.

- (1) Significance was determined by checking whether the difference was significant (p value less than 0.05 or 0.01).
- (2) Interpretation of Significance: A significant result indicates that the item does not exhibit a normal distribution. In such cases, if you need to compare differences in data between different groups, nonparametric tests can be considered.
- (3) Nonsignificant Interpretation: A nonsignificant difference ($P > 0.05$) suggested that the item demonstrated a normal distribution.
- (4) Strict requirements: Normality test requirements are stringent and challenging to meet. If the absolute value of kurtosis is less than 10 and the absolute value of skewness is less than 3, this implies that although the data are not perfectly normal, they are generally considered to be normally distributed.

This test revealed that the sample size for the research data exceeded 50, indicating that the Kolmogorov–Smirnov (KS) test was appropriate. Specifically, servant leadership, innovation self-efficacy, team innovation atmosphere, and team innovation performance are significant ($p < 0.05$). This implies rejection of the null hypothesis (null hypothesis: data are normally distributed), indicating that servant leadership, innovation self-efficacy, team innovation atmosphere, and team innovation performance do not adhere to normal distribution characteristics. For detailed values, see [Appendix Table 13](#).

In conclusion, servant leadership, innovation self-efficacy, team innovation atmosphere, and team innovation performance do not demonstrate normal characteristics. Given that the strictness of normality tests is often challenging to meet, if the absolute value of kurtosis is less than 10 and the absolute value of skewness is less than 3, this suggests that although the data are not perfectly normal, they are generally normally distributed. Therefore, despite not strictly adhering to normality, the deviation in the variable distribution

within this study is deemed acceptable.

3.3.6. Common method bias

Harman's single-factor test was employed to examine common method deviation. The variables underwent exploratory factor analysis to assess the factor analysis results. The findings indicated that the variance explained by the first factor without rotation and with rotation was 43.99% and 28.37%, respectively. Both percentages are less than the critical value of 50%, suggesting that there is no significant common method bias in this study.

3.3.7. Collinearity test

There are four criteria for testing for multicollinearity:

VIF value: If the variance inflation factor (VIF) of a specific variable exceeds 10 (strictly speaking, $VIF > 5$), it indicates an issue of multicollinearity. In such cases, one may consider removing the variable from the model and reanalysing it.

Tolerance Value: Tolerance was calculated as $1/VIF$. A tolerance less than 0.1 (in strict cases, less than 0.2) suggests a problem of collinearity.

Null Value in VIF: If a null value appears in the VIF calculation, it indicates an issue with the variable. It is recommended that the variable be removed during the analysis.

High correlation coefficient: If the VIF or correlation coefficient is notably high, it is advisable to remove such variables from the analysis and conduct a reanalysis.

If a VIF greater than 10 is used as the criterion for collinearity, it is evident that no variable with a VIF greater than 10 has been identified. This finding provides evidence that there is no significant multicollinearity issue among the variables in this study. The detailed values can be found in [Appendix Table 14](#).

4. Results

This study utilized AMOS 23.0 software to construct a structural equation model (SEM) and examine the mediating effect of coping strategies between self-care and body image. All variables in the model successfully passed the normal distribution test, and the model parameters were estimated using the maximum likelihood (ML) method. The initial fit of the model is illustrated in [Fig. 2](#), where the path coefficients are standardized. Model fit was assessed using various indices, including the chi-square test for degrees of freedom ratio (χ^2/df), goodness-of-fit index (GFI), standardized root means square residual (SRMR), root mean square error of approximation (RMSEA), normed fit index (NFI), incremental fit index (IFI), Tucker-Lewis Index (TLI), comparative fit index (CFI), parsimony goodness-of-fit index (PGFI), and parsimony-adjusted NFI (PNFI).¹

4.1. Overall hypothesis testing

[Table 1](#) shows that each fitting index in this model is good, and the next step of analysis can be carried out.

The path analysis conducted in this study revealed significant and noteworthy findings pertaining to the interrelationships among the variables under investigation. Specifically:

Servant leadership has a significant and positive influence on team innovation performance.

Servant leadership also has a significant and positive impact on innovation self-efficacy.

Innovation self-efficacy has a significant and positive effect on team innovation performance.

[Table 2](#) shows that innovation self-efficacy serves as a pivotal mediator in the intricate connection that links servant leadership with team innovation performance. These findings provide invaluable insights into the intricate mechanisms through which servant leadership exerts its influence on team innovation performance, underscoring the critical role of innovation self-efficacy within this intricate relationship.

4.2. Subdimension hypothesis testing

[Fig. 3](#) shows the results of subdimension hypothesis testing model, including subdimensions of persuasion guide, altruism, wisdom, and social responsibility.

[Table 3](#) shows that each of the fit indices in the model has reached a satisfactory level. These favourable results indicate that the model aligns well with the collected data, establishing a solid basis for progressing to the subsequent phases of analysis. This favourable model fit enhances the credibility and robustness of the findings, consequently facilitating continued exploration and interpretation of the research outcomes.

[Table 4](#) outcomes derived from the path analysis revealed several noteworthy relationships embedded within the model:

The servant leadership dimensions, such as social responsibility, altruism, wisdom, and persuasive guidance, all demonstrate substantial and positive impacts on innovation self-efficacy.

¹ NFI (Normed Fit Index) is a fit index in structural equation models with values typically ranging between zero and one. PNFI (Parsimonious Normed Fit Index) is a fit index in structural equation models with values typically ranging between 0 and 1 PNFI is a fit index that takes into account the complexity of the model. A higher PNFI value usually indicates that the model is both a good fit and relatively more concise.

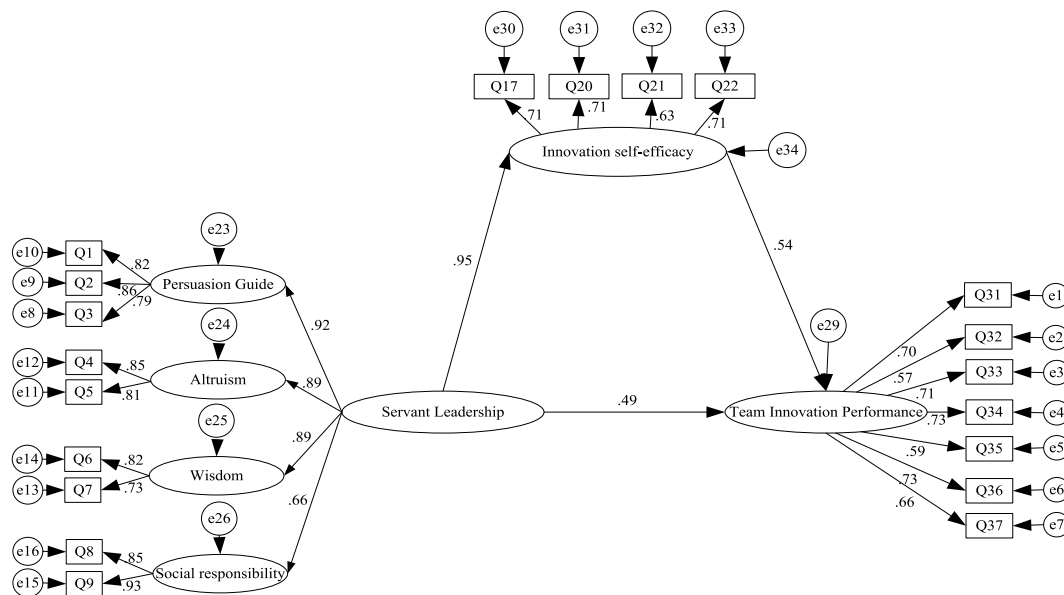


Fig. 2. Graphic hypothesis test model.

Table 1
Model fitting indices and reference values.

index	test result	Guideline
χ^2	203.354	–
df	163	–
χ^2/df	1.248	<5
CFI	0.988	>0.9
NFI	0.945	>0.9
TLI	0.987	>0.9
NFI	0.945	>0.9
RMSEA	0.028 (0.013–0.040)	<0.8

Table 2
Normalized path coefficients.

Paths	Estimate	SE	CR	P
Innovation self-efficacy ← Servant leadership	0.947	0.076	11.683	***
Team Innovation Performance ← Servant leadership	0.487	0.214	2.255	*
Team Innovation Performance ← Innovation self-efficacy	0.536	0.233	2.431	*

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Innovation self-efficacy is revealed to exert a significant and positive influence on team innovation performance.

Notably, among the dimensions of servant leadership, persuasive guidance is the only significant and positively predictive factor for team innovation performance.

In summary, it is evident that innovation self-efficacy plays a crucial role as a mediating factor that intricately bridges the connections across all dimensions of servant leadership and team innovation performance. This comprehensive comprehension underscores the pivotal function of innovation self-efficacy in transmuting distinct facets of servant leadership into tangible outcomes, particularly within the context of team innovation performance.

4.3. The moderating effect of team innovation atmosphere on the relationship between servant leadership and team innovation performance

As shown in Table 5, the moderating effect is divided into three models, and Model 1 includes the independent variable (servant leadership). Model 2 adds the moderating variable (team innovation atmosphere) to Model 1, and Model 3 adds the interaction term (the product term of the independent variable and the moderating variable) to Model 2.

For Model 1, the purpose is to study the impact of the independent variable (servant leadership) on the dependent variable (team innovation performance) without considering the interference of the moderator variable (team innovation atmosphere). Table 5 shows

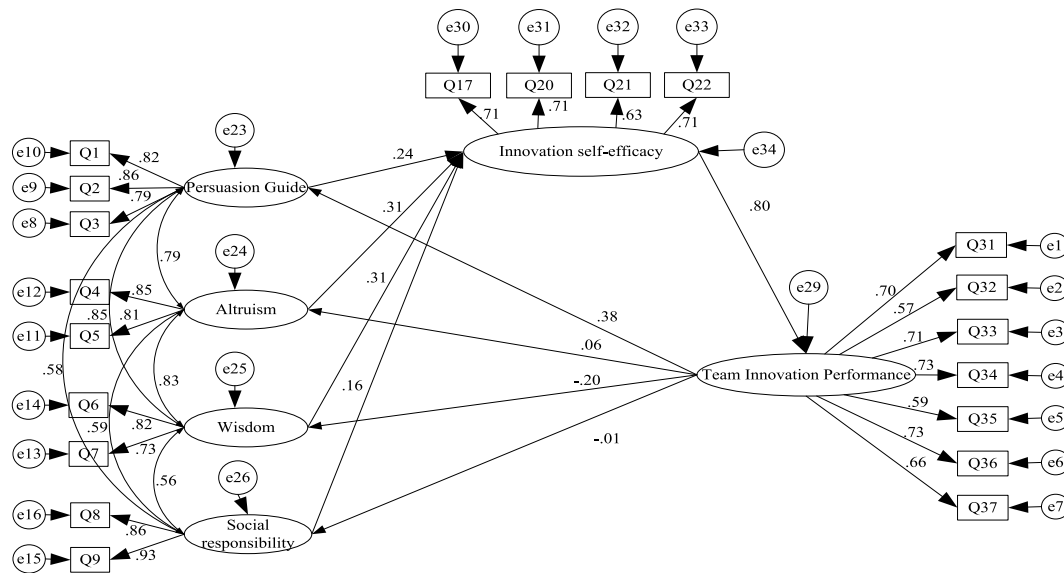


Fig. 3. Graph subdimension hypothesis testing model.

Table 3
Model fitting indices and reference values.

index	test result	Guideline
χ^2	158.692	-
df	155	-
χ^2/df	1.198	<5
CFI	0.991	>0.9
NFI	0.950	>0.9
TLI	0.989	>0.9
NFI	0.950	>0.9
RMSEA	0.025(0.002-0.038)	<0.8

Table 4
Normalized path coefficients.

Paths	Estimate	SE	CR	P
Innovation self-efficacy ← Persuasion guide	0.242	0.102	2.043	*
Innovation self-efficacy ← Altruism	0.312	0.102	2.689	**
Innovation self-efficacy ← Wisdom	0.305	0.152	2.036	**
Innovation self-efficacy ← Social responsibility	0.164	0.043	2.847	**
Team Innovation Performance ← Innovation self-efficacy	0.802	0.199	4.296	***
Team Innovation Performance ← Social responsibility	-0.012	0.044	-0.210	0.834
Team Innovation Performance ← Persuasion guide	0.385	0.097	3.653	***
Team Innovation Performance ← Altruism	0.059	0.101	0.548	0.584
Team Innovation Performance ← Wisdom	-0.198	0.156	-1.375	0.169

Note: SE: standard error; CR: critical ratio* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

that the independent variable (servant leadership) is significant ($t = 28.335, p = 0.00000.05$). This means that servant leadership will have a significant impact on team innovation.

The moderating effect can be viewed in two ways. The first objective is to view the significance of the change in the *F* value from Model 2 to Model 3; the second is to view the significance of the interaction term in Model 3. The moderation effects were analysed in this way.

As shown in Table 5, the interaction term between servant leadership and team innovation atmosphere is significant ($t = 2.379, p = 0.01800.05$). This means that when servant leadership affects team innovation performance, the moderator variable (team innovation atmosphere) has significant differences in the magnitude of the impact at different levels. The details can be viewed through the following simple slope chart:

The simple slope deeply studies the difference in the impact of the independent variable X on the dependent variable Y when the adjusting variable is at different levels. Simple slope analysis refers to the influence of the independent variable on the dependent

Table 5

Analysis results of the moderating effect of team innovation atmosphere on the relationship between servant leadership and innovation performance.

Variable	Model 1					Model 2					Model 3				
	B	standard error	t	p	β	B	standard error	t	p	β	B	standard error	t	p	β
constant	21.87	0.28	78.79	0.00***	–	21.87	0.27	81.83	0.00***	–	21.43	0.32	66.08	0.00***	–
servant leadership	0.65	0.02	28.33	0.00***	0.85	0.56	0.03	20.00	0.00***	0.74	0.54	0.03	18.13	0.00***	0.70
Team innovation atmosphere						0.19	0.04	5.03	0.00***	0.18	0.17	0.04	4.38	0.00***	0.16
Servant leadership*Team innovation atmosphere											0.01	0.00	2.38	0.02*	0.08
R^2	0.72					0.74					0.75				
Adjust R^2	0.72					0.74					0.75				
F value	$F(1,309) = 802.86, p = 0.00$					$F(2,308) = 445.64, p = 0.00$					$F(3,307) = 303.48, p = 0.00$				
ΔR^2	0.72					0.02					0.00				
ΔF value	$F(1,309) = 802.86, p = 0.00$					$F(1,308) = 25.29, p = 0.00$					$F(1,307) = 5.66, p = 0.02$				

Dependent variable: team innovation performance.

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

variable Y (that is, the significance of the regression coefficient, etc.) when the adjusting variable is at three different levels; the three levels of the adjusting variable are the average level, the high level (average value plus 1 standard deviation), and the low level (mean minus 1 standard deviation). As shown in Table 6, when the innovation atmosphere is high, servant leadership has a stronger positive predictive effect on team innovation performance. When the innovation climate is low, the positive predictive effect of servant leadership on team innovation performance is weak. Therefore, team innovation atmosphere plays a positive moderating role between servant leadership and innovation performance.

4.4. The moderating effect of team innovation atmosphere on the relationship between innovation self-efficacy and innovation performance

By employing hierarchical regression analysis, the obtained cross-product coefficient of service leadership and team innovation atmosphere is represented as $B = 0.01$, with a p value of less than 0.01, which signifies statistical significance. The detailed values can be found in Table 7. This outcome suggests that the team innovation atmosphere plays a role in the relationship between innovation self-efficacy and innovation performance.

Table 8, which is presented above, displays the outcomes of the Index of Moderated Mediation (Regulating Mediation Index), encompassing both the index value and the corresponding boot sampling results. Several key observations can be drawn from these results:

- (1) **Mediating Effect Assessment:** In mediating effect evaluation, two common approaches are typically employed. The first approach involves comparing the significance of effect values at different levels, while the second approach examines the significance of the index value. It is important to note that the SPSSAU² provides both of these assessment methods, which share similar underlying principles. However, in cases where the mediating effect of adjustment is not pronounced, the conclusions drawn from these two methods might not align entirely.
- (2) **Significance Determination:** If both the boot LLCI (lower limit confidence interval) and the boot ULCI (upper limit confidence interval) exclude the value 0, the result is deemed significant. Consequently, a mediating effect is inferred. In the present analysis, the Boot LLCI and Boot ULCI both exclude the value 0, indicating the existence of a significant moderating effect of team innovation atmosphere on the relationship between innovation self-efficacy and innovation performance.
- (3) In essence, the findings consistently indicate that the moderating effect of team innovation atmosphere on the relationship between innovation self-efficacy and innovation performance is substantial and statistically significant.

The analysis conducted using Model 14, with a focus on the mediating effect, has yielded profound insights into the intricate relationships among innovation self-efficacy, team innovation atmosphere, and innovation performance. The detailed values can be found in Table 9. Through meticulous examination, it becomes distinctly apparent that the team innovation atmosphere operates as a positive moderator within the interplay between innovation self-efficacy and innovation performance.

This conclusion is derived from observing distinct levels of innovation self-efficacy, each exhibiting varying degrees of mediating effects contingent on the team's innovation atmosphere. At a low level of innovation self-efficacy, the bootstrapped 95% confidence interval (CI) excludes the value 0, thus signalling a significant mediating effect (effect value = 0.152). As innovation self-efficacy reaches an average level, the bootstrapped 95% CI once again excludes 0, confirming a mediating effect (effect value = 0.208). Similarly, at a high level of innovation self-efficacy, the bootstrapped 95% CI also excludes 0, reinforcing a mediating effect (effect value = 0.263). This finding underscores that as the team innovation atmosphere becomes increasingly supportive of innovation, the predictive influence of innovation self-efficacy on innovation performance strengthens.

In essence, team innovation plays a role as an enhancer, magnifying the impact of innovation self-efficacy on innovation performance. This finding underscores the pivotal importance of cultivating an environment that not only fosters innovation but also empowers individuals to effectively leverage their innovative capacities. By augmenting the team innovation atmosphere, organizations can elevate their overall innovation outcomes by facilitating the translation of innovation self-efficacy into tangible enhancements in performance.

In summary, this study illuminates the intricate dynamics that interconnect innovation self-efficacy, team innovation atmosphere, and innovation performance, revealing the positive moderating function of the team innovation atmosphere. These findings offer invaluable insights for organizations aspiring to optimize their innovation progress and performance achievements by strategically aligning innovation self-efficacy with the team's innovation atmosphere.

4.5. Summary of results

This study aimed to construct and verify a moderated mediation model, primarily focusing on investigating the correlation between servant leadership and team innovation performance. The findings indicate that servant leadership has a substantial positive influence on both innovation self-efficacy and team innovation performance. Innovation self-efficacy was identified as a mediating factor in the association between servant leadership and team innovation performance. In addition, the team innovation atmosphere. Plays a moderating role between servant leadership and team innovation performance, as well as between innovation self-efficacy and team

² SPSSAU is an online statistical tool.

Table 6
Simple slope analysis.

moderator variable level	Regression coefficients	standard error	t	p	95% CI	
average value	0.54	0.03	18.13	0.00	0.48	0.60
High level (+1SD)	0.60	0.03	18.92	0.00	0.54	0.66
Low level (-1SD)	0.48	0.05	10.68	0.00	0.39	0.57

Note. A confidence interval (CI) is a range that we can claim with a certain level of confidence (e.g., 95%) that this interval includes an unknown parameter (e.g., the population mean).

Table 7
Moderated mediation model (the moderating effect of climate between innovation self-efficacy and innovation performance).

Variable	Team Innovation Performance				Innovation self-efficacy			
	beta	SE	t -value	p -value	beta	SE	t -value	p -value
constant	4.63	2.70	1.71	0.09	7.15	2.02	3.54	0.00***
gender	-0.23	0.50	-0.46	0.65	-0.47	0.58	-0.81	0.42
age	0.62	0.61	1.02	0.31	0.12	0.72	0.16	0.87
education level	0.53	0.36	1.45	0.15	-0.54	0.43	-1.26	0.21
servant leadership	0.38	0.03	10.96	0.00***	0.55	0.02	23.79	0.00***
Team innovation atmosphere	-0.16	0.09	-1.82	0.07				
Innovation self-efficacy	0.11	0.11	0.97	0.34				
Innovation self-efficacy * team innovation atmosphere	0.01	0.00	3.25	0.00**				
sample size					311			
R ²		0.80				0.65		
Adjust R ²		0.80				0.65		
F value		F (7,303) = 173.93, p = 0.00				F (4,306) = 143.90, p = 0.00		

Note: SE: Standard error * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Table 8
Mediation indices.

Moderator	Mediator variable	Index	BootSE	BootLLCI	BootULCI
Team innovation atmosphere	Innovation self-efficacy	0.01	0.00	0.00	0.01

Table 9
Conditional indirect effect results.

Mediator variable	level	level value	Effect	BootSE	BootLLCI	BootULCI
Innovation self-efficacy	low level (-1SD)	15.11	0.15	0.04	0.07	0.24
	average value	24.27	0.21	0.03	0.14	0.28
	High level (+1SD)	33.44	0.26	0.04	0.20	0.33

Note: The bootstrap lower-level confidence interval (BootLLCI) indicates the lower limit of the 95% interval of bootstrap sampling; the bootstrap upper-level confidence interval (BootULCI) indicates the upper limit of the 95% interval of bootstrap sampling; bootstrap type: percentile bootstrap method. SD: standard deviation.

innovation performance. According to our sub-dimensional analysis, the dimensions of social responsibility, altruism, wisdom, persuasion and guidance all exhibited significant positive impacts on innovation self-efficacy. Additionally, innovation self-efficacy has a notable positive effect on team innovation performance. Notably, among the four dimensions of servant leadership, only the persuasion and guidance dimension exhibited a significant positive predictive impact on team innovation performance.

5. Conclusions

5.1. Theoretical significance

The research findings yield valuable insights into leveraging servant leadership behaviors to enhance employee innovation self-efficacy and team innovation performance, contributing to three theoretical implications.

First, the study affirms that servant leadership significantly and positively impacts employees' innovation self-efficacy and team innovation performance, aligning with prior research [20,59]. This not only supports existing findings but also provides a fresh perspective on the adoption of the servant leadership style within the mainland Chinese context, shedding light on the driving factors of innovation [49].

Second, the research reveals that innovation self-efficacy serves as a mediating factor between servant leadership and team

innovation performance. This finding aligns with previous research [109] and enriches the theoretical understanding of how servant leadership influences team innovation performance through the lens of employee innovation self-efficacy. These results open avenues for future researchers to explore additional variables linking leadership styles to individual productivity outcomes [49].

Third, the study demonstrates that the team innovation atmosphere can moderate the relationship between servant leadership, innovation self-efficacy, and team innovation performance. This finding is consistent with the idea that work culture can impact the relationship between self-efficacy, employee performance, and productivity, aligning with the principles of social cognitive theory [110]. The exploration of how servant leadership influences innovation self-efficacy and, consequently, team innovation performance addresses a critical need for sustainable competitive advantage, particularly in the context of small and medium-sized enterprises within the hotel industry [111]. This study establishes and tests the relationships between servant leadership, innovation self-efficacy, team innovation atmosphere, and team innovation performance in the hotel industry.

5.2. Practical significance

Based on the results of this study, some practical suggestions are also provided for the hotel industry.

5.2.1. Strategic implementation of servant leadership

Given the substantial impact of servant leadership, a strong recommendation is made for managers within the hotel industry to proactively identify, train, and cultivate servant leadership leaders. Drawing insights from Hofstede's [112] research, which highlights the influential characteristics of Confucian culture, such as group harmony, trust, high power distance, and loyalty, it becomes evident that these values significantly shape the interactions between service leaders and employees [113,114]. Therefore, hotel managers are advised to employ targeted selection procedures and regular training initiatives to foster a culture of servant leadership. By doing so, they can effectively steer the organizational culture toward a service-centric approach. Since servant leadership notably contributes to nurturing employees' innovation self-efficacy, it consequently leads to enhanced employee productivity, thereby optimizing overall operational efficiency [115,116].

5.2.2. Integration of innovation self-efficacy

In view of the undeniable influence of innovation self-efficacy, it is recommended that organizations incorporate assessments of this trait into their recruitment processes. By prioritizing the selection of candidates with a strong inclination toward innovation self-efficacy, organizations can bolster their talent pool with individuals intrinsically motivated to make positive contributions to innovation [117]. Moreover, organizational leaders should emphasize the development of employees' innovation capabilities. To achieve this, creating a work environment that actively encourages and supports innovative behaviours, both on a spiritual and operational level, is paramount. The integration of personalized care and recognition of innovative behaviours should be integral aspects of this environment. Initiatives such as innovative competitions, advancements in job titles, salary incentives, and honorary awards for winners can serve as effective mechanisms for fostering a culture of innovation.

These recommendations hold the potential to bring about significant positive transformations within organizations, enhancing their capacity for innovation and promoting a culture that values both servant leadership leadership and innovation self-efficacy. By aligning these practices with the findings of this study, organizations can achieve a competitive edge by optimizing their innovation capabilities and overall performance outcomes.

5.2.3. Fostering a team innovation environment

A pivotal recommendation is to strengthen the creation of an environment that actively promotes team innovation. Recognizing that employees are more likely to engage in creative actions within a work setting characterized by freedom, flexibility, and open information sharing is of utmost importance. Additionally, demonstrating recognition and appreciation for their efforts through rewards and acknowledgements becomes essential in further enhancing their motivation for innovation [118,119]. By cultivating an atmosphere where innovation is valued, organizations can stimulate a culture of continuous creativity and idea generation.

5.2.4. Increasing the persuasion and guidance dimension

Given the notable influence of the persuasion and guidance dimensions, organizational leaders are advised to consistently enhance their personal knowledge and skills. The effective guidance and advice offered by leaders not only foster a sense of trust among subordinates but also reflect genuine concern for their well-being, both professionally and personally. This approach nurtures strong rapport and cultivates an atmosphere of mutual trust. Furthermore, leaders should intensify their sense of social responsibility, positioning themselves as positive role models for subordinates. This, in turn, instills a culture of shared responsibility and commitment within the organization, fostering an environment where all members contribute to its collective success.

Implementing these recommendations collectively contributes to the cultivation of an environment that thrives on the principles of servant leadership, innovation self-efficacy, and team innovation. Ultimately, this concerted effort leads to elevated team performance and overall organizational success. By aligning these strategies with the findings of the study, organizations can create a synergistic approach that optimizes their leadership practices, fosters innovation, and propels the organization toward sustained growth and excellence.

5.3. Research limitations

This study recognizes and acknowledges several limitations that should be taken into consideration when interpreting and generalizing the findings.

5.3.1. Limited context

The research is confined to a specific context within the hotel industry in Chengdu, China. Consequently, the results may not be readily transferable to other cultural contexts, geographical regions, or industries. To enhance the reliability and applicability of the conclusions, future research should aim to replicate this study in a range of settings that encompass diverse cultural backgrounds, geographical locations, and industries. Such an approach will allow for a more comprehensive understanding of the phenomenon and facilitate a broader generalization of the findings. It is recommended that future studies encompass not only commercial environments but also governmental and nongovernmental organizations to ensure a well-rounded understanding.

5.3.2. Mediating factors

While this study primarily examines the mediating role of innovation self-efficacy between servant leadership and team innovation performance, the possibility of other mediating factors remains unexplored. Future research should consider investigating additional mediating variables that might contribute to the relationship's complexity. For example, the impact of the innovation atmosphere within an organization could be a relevant mediating factor. Exploring multiple mediators can offer a more comprehensive and nuanced understanding of the intricate mechanisms underlying the observed relationships, providing a more holistic perspective.

5.3.3. Data collection methodology

The data collection for this study relied solely on online surveys, which can introduce potential biases and limitations. The use of a single data collection method may limit the depth of insights gained from participants. In future research, it is advisable to employ mixed-method approaches or gather data from various sources to ensure the validity, reliability, and richness of the findings. Combining quantitative data with qualitative insights can lead to a more comprehensive and multidimensional understanding of the phenomenon.

5.3.4. Data analysis methods

The data adopted a cross-sectional design and analysis method. The cross-sectional design may limit the generalizability of the results. Therefore, longitudinal research is recommended [120].

Given these acknowledged limitations, it is recommended that researchers build upon the foundation of this study. Conducting studies across diverse cultures and industries, exploring alternative mediating variables, and employing various data collection methods will contribute to a more robust body of knowledge in the fields of servant leadership, innovation self-efficacy, and team performance. Such endeavors will lead to a more comprehensive and nuanced understanding of the complex relationships under investigation, ultimately advancing organizational practices and leadership strategies.

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Data availability statement

Please contact the authors when data is requested.

CRediT authorship contribution statement

Luxi Ren: Software, Formal analysis, Data curation. **Huayu Shen:** Writing – review & editing, Writing – original draft, Software, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix U. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e27723>.

Appendix. Table**Appendix Table 1**

Basic information of the subjects

Name	Options	Frequency	Percentage (%)	Cumulative percentage (%)
gender	male	195	62.70	62.70
	female	116	37.30	100.00
education level	high school and below	42	13.50	13.50
	College or undergraduate	162	52.09	65.59
	Master degree and above	107	34.41	100.00
age	18~30 years old	59	18.97	18.97
	31~50 years old	252	81.03	100.00
total		311	100.0	100.0

Appendix Table 2

Table Reliability Table for Each Variable and Dimension

Variable	Number of items	Cronbach alpha coefficient
Persuasion and guidance	3	0.862
Altruism	2	0.816
wisdom	2	0.748
Social responsibility	2	0.886
Servant leadership total score variable	9	0.912
Innovation support	3	0.965
task oriented	2	0.895
Interaction frequency	2	0.779
Overall score of team innovation atmosphere variable	7	0.916
Overall team innovation performance score variable	7	0.852
Innovation self-efficacy total score	7	0.810

Appendix Table 3

Servant Leadership KMO and Bartlett's Tests

KMO value		0.88
Bartlett's test of sphericity	Approximate chi-square	1642.93
	df	36
	p value	0.00

Appendix Table 4

Inspection of team innovation atmosphere by KMO and Bartlett

KMO value		0.86
Bartlett's test of sphericity	Approximate chi-square	1976.30
	df	21
	p value	0.00

Appendix Table 5

KMO and Bartlett's test results for innovation self-efficacy

KMO value		0.87
Bartlett's test of sphericity	Approximate chi-square	566.83
	df	21
	p value	0.00

Appendix Table 6

Table of team innovation performance KMO and Bartlett's test results

KMO value		0.88
Bartlett's test of sphericity	Approximate chi-square	753.43
	df	21
	p value	0.00

Appendix Table 7
Servant leadership AVE and CR indicator results

Factor	value	CR value
Persuasion and guidance	0.68	0.86
Altruism	0.69	0.82
wisdom	0.60	0.75
Social responsibility	0.80	0.89

Appendix Table 8
Team innovation atmosphere AVE and CR index results

Factor	AVE value	CR value
Innovation support	0.90	0.96
task oriented	0.82	0.90
Interaction frequency	0.64	0.78

Appendix Table 9
Team innovation performance AVE and CR indicator results

Factor	AVE value	CR value
Team innovation performance	0.50	0.85

Appendix Table 10
Results of employee innovation self-efficacy AVE and CR indicators

Factor	AVE value	CR value
Employee innovation self-efficacy	0.48	0.85

Appendix Table 11
Descriptive statistics

Variable	minimum value	maximum value	average value	standard deviation	median
Team innovation atmosphere	7.00	49.00	24.27	9.17	24.00
Team innovation performance	9.00	47.00	21.87	9.27	18.00
Innovation self-efficacy	5.00	28.00	11.79	5.61	10.00
Servant leadership	13.00	61.00	27.97	12.07	22.00

Appendix Table 12
Pearson correlation analysis table

Variable	Average Value	Atandard Deviation	Servant Leadership	Innovation Self-efficacy	Team Innovation Atmosphere	Team Innovation performance
Servant leadership	27.97	12.07	1			
Innovation self-efficacy	11.79	5.61	0.79***	1		
Team innovation atmosphere	24.27	9.17	0.62***	0.62***	1	
Team innovation performance	21.87	9.27	0.85***	0.81***	0.64***	1

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Appendix Table 13
Normality test results

Variable	Average Value	Standard Deviation	Skewness	Kurtosis	Kolmogorov–Smirnov test		Shapiro–Wilk test	
					Statistics <i>D</i> value	<i>p</i>	Statistics <i>W</i> value	<i>p</i>
Servant leadership	27.968	12.067	0.994	−0.400	0.234	0.000**	0.832	0.000**
Innovation self-efficacy	11.794	5.612	1.019	−0.144	0.206	0.000**	0.857	0.000**
Team innovation atmosphere	24.270	9.165	0.424	0.067	0.133	0.000**	0.970	0.000**
Team innovation performance	21.871	9.271	0.878	−0.592	0.226	0.000**	0.858	0.000**

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Appendix Table 14
Table of Collinearity Diagnostic Table

Variable	VIF value	Tolerance
servant leadership	4.041	0.247

(continued on next page)

Appendix Table 14 (continued)

Variable	VIF value	Tolerance
Team innovation atmosphere	1.806	0.554
Innovation self-efficacy	3.362	0.297
Team innovation performance	4.649	0.215

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