Humanities and Social Sciences Letters
2025 Vol. 13, No. 1, pp. 379-395
ISSN(e): 2312-4318
ISSN(p): 2312-5659
DOI: 10.18488/73.v13i1.4111

Exploring the moderating influence of sustainable creativity strategies on the relationship between a green innovation atmosphere and employee green creativity

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Article History
Received: 25 October 2024
Revised: 29 January 2025
Accepted: 14 February 2025
Published: 27 February 2025

Keywords
Employee green creativity
Green innovation atmosphere
Process innovation
Product innovation
Sustainable creativity strategies.

ABSTRACT

This paper explores the interaction of organisational atmosphere, sustainable creativity strategies, and employee green creativity within the framework of a green innovative technology development industry in Shenzhen. It seeks to clarify how organised sustainability interventions and a favourable environment for green innovation affect workers' creative contributions to environmental sustainability initiatives. A total of 247 individuals employed by the research and development division participated in the survey. The variable relationship was assessed using previously developed scales modified for this study and Stata-SEM was used to examine the data. The findings show the following significant positive relationships: Employee green creativity is positively influenced by a green innovation atmosphere ($\beta = 0.588$ and $p < 0.001$), employee green creativity is enhanced by sustainable creativity strategies ($\beta = 0.519$ and $p < 0.001$), and the relationship between green innovation atmosphere, employee green creativity is moderated by sustainable creativity strategies ($\beta = 0.492$ and $p < 0.001$). This study advances theory by illustrating how organisational cultures and strategic interventions foster sustainability-focused employee creativity. It stresses the significance of combining enabling climates with focused sustainability policies for competitive advantage and environmental stewardship and offers ways for businesses to promote innovation and sustainability.

Contribution/Originality: This study uniquely investigates the interplay between green innovation atmosphere, sustainable creativity strategies and employee green creativity within organizational settings. Using a quantitative approach (Stata-SEM), it highlights the novel moderating role of sustainable creativity strategies, offering new insights into fostering employee-driven sustainability-focused innovation.

1. INTRODUCTION

Green innovation and employee creativity have gained prominence since sustainable development and environmental stewardship are becoming more important. Green innovation which develops and implements environmentally friendly goods, processes and practices is a strategic need for organisations globally (Rana & Arya, 2024). Innovation that prioritizes sustainability is essential as regulators, consumers and stakeholders pressure organisations to go green (Chen, 2011). Employee creativity the creation of new and beneficial ideas at work is vital for innovation and competitive advantage (Baah, Agyabeng-Mensah, Afum, & Lascano Armas, 2024). Green innovation and employee creativity are important areas of research that examine how organisational practices and cultures might inspire employees to produce creative sustainability solutions (Le, Tran, Lam, Tra, & Uyen, 2024).

Growing corporate sustainability literature emphasises the significance of integrating environmental factors into strategic planning and daily business operations (Tran, 2024). This comprehensive approach reduces organizations' environmental impact and boosts their commercial position.

Green innovation and employee creativity studies have shown that a supportive workplace is an important aspect of their literature (Şengüllendi, Bilgetürk, & Afacan Fındıklı, 2024). According to Srivastava, Pathak, Soni, and Dixit (2024), a strong organisational commitment to environmental sustainability improves employees' environmental behaviours and green innovation performance. Anwar's (2024) research showed that top management sets the tone for sustainability and fosters an environmentally responsible culture. Ejibe, Nwankwo, Nwankwo, Okoye, and Scholastica (2024) found that businesses with comprehensive environmental management systems encourage employee green activities. They give staff the structure and resources to solve sustainability problems creatively. Wang's (2024) study on sustainability-oriented creative tactics and employee innovation. Ur Rehman et al. (2024) found that sustainability training and collaborative problem-solving sessions encourage staff to create new environmental solutions. The literature on creativity implies that giving employees autonomy and diverse challenging jobs boosts creativity (Choudhary & Datta, 2024). According to Farrukh, Rafiq, Raza, and Iqbal (2024), empowering leadership, a key component of sustainable creativity techniques boosts intrinsic motivation and creative self-efficacy, increasing creativity. Green human resource techniques have also been studied for boosting employee creativity. According to Soomro, Moawad, Saraih, Abedelwahed, and Shah (2024), green training and development programmes improve employees' environmental performance. These programmes teach staff green innovation skills and demonstrate the company's commitment to sustainability motivating them to innovate. Bhat et al. (2024) found that transformational leadership improves employees' pro-environmental behaviour showing that green leaders can encourage creative sustainability thinking.

Some gaps exist (You & Kee, 2024) despite the extensive literature on green innovation and employee creativity. Understanding how sustainable creativity initiatives affect employee green creativity is lacking. Research rarely explains how supportive organizational circumstances foster employee creativity (Liu et al., 2024). For instance, more research is needed on how green training programmes and leadership styles affect employees' abilities to innovate environmental solutions (Tuan, 2023). There is little empirical information on how sustainable creativity initiatives moderate the association between green innovation atmosphere and employee green creativity (Adomako & Nguyen, 2023). Some studies suggest that supportive practices can improve the impact of environmental management systems on employee behaviours (Fazal-E-Hasan et al., 2023) but there is little research on how these strategies interact with the green innovation atmosphere to influence creativity. This gap is particularly crucial given the complexity of green innovation and employee creativity which are influenced by many human, organisational, and external factors (Kiranantawat & Ahmad, 2023). Existing study has focused on large, international firms, neglecting innovative technology development companies. Innovative technology development company are vital to the global economy and drive innovation but their approaches to green innovation and employee creativity may differ from larger enterprises (Setyaningrum & Muafi, 2023). SMEs' (small and medium enterprises) specific challenges and opportunities must be understood to build tailored strategies that encourage sustainability and innovation across organisational settings (Li, Li, Sarfarz, & Ozturk, 2023). Therefore, more studies are needed to evaluate the impact of sustainable creative initiatives over time.

Several reliable frameworks assist the study of sustainable creative techniques, green innovation atmosphere, and employee green creativity. The componential theory of creativity (Nasir, 2023) helps explain how individual and contextual factors affect creative performance. This idea says domain-relevant abilities, creativity-relevant processes, and intrinsic motivation drive creativity. Creating a supportive atmosphere, and increasing intrinsic desire, green training and empowered leadership can improve these elements by giving employees the skills (Song, Ma, Fan, & Peng, 2023). According to the Resource- Based View (RBV) of the company, distinctive organisational skills like a green innovation climate can sustain a competitive advantage. Successfully integrating sustainability

into core operations and strategy can provide valuable, uncommon and inimitable resources that boost performance. Organisations may maximise employee green creativity and generate sustainable innovation through a green innovation culture and sustainable creativity methods (Begum, Xia, Ali, Awan, & Ashfaq, 2022). This research will help organisations use sustainable creativity practices to boost employee green creativity and generate sustainable innovation.

2. LITERATURE REVIEW

Green innovation is one of the most prominent elements of sustainable development and is presently being emphasized by academia and industries. It considers the formation and implementation of eco-friendly products, processes and practices (Arici & Uysal, 2022). The motivation to create ecologically friendly products, political pressure from governments and a sense of corporate social responsibility are significant drivers behind this practice (Begum, Ashfaq, Xia, & Awan, 2022). A study shows that green innovation allows firms to meet environmental requirements and has been found to differentiate and improve the firm's propositions and its operational performance (Maitlo et al., 2022). Firm investment in green technologies saves resources and waste and saves money while improving profitability (Luu, 2022). Green innovation improves the brand image of an organization and attracts green-conscious customers and investors. Organisational green innovation relies on the creativity of employees (Hu et al., 2022). Employee creativity yields novel ideas and solutions that are needed to design green products and processes. An organisational culture that encourages risk-taking, cooperation, and continuous learning is considered to foster creativity (Jamshed, Shah, Majeed, Al-Ghazali, & Jamshaid, 2022). Leadership's commitment to achieving sustainability goals may also motivate the employees to channel their creativity toward meeting the company's green goals (Malik, Ali, Kausar, & Chaudhry, 2021). A number of studies have found intrinsic motivation to be an enabler for creativity and engagement with an organization when employees feel the organization values their contribution to innovation of green products and services (Ogbeibu, Jabbour, Gaskin, Senadjki, & Hughes, 2021). Green innovation requires investment into an environment that promotes imagination and taps creativity at the employee level. The organisational climate and environment that fosters eco-friendly and sustainable ideas is called the green innovation atmosphere (Muñoz-Pascual, Galende, & Curado, 2021). This environment includes managerial support for green initiatives, resources for sustainable projects and policies and practices that promote environmental responsibility (Arslan et al., 2021). However, employee green creativity is the ability and willingness of employees to produce unique and effective ideas that promote environmental sustainability (Mansoor, Farrukh, Lee, & Jahan, 2021). Employees actively develop solutions to reduce environmental impact, enhance resource efficiency, and promote sustainable practices in their organization (Sharma et al., 2021). Previous studies have shown that encouraging organisational climates boosts employee creativity. Studies have indicated that an innovative organisational culture that celebrates and rewards creativity can boost employees' creativity (Shahzad, Qu, Zafar, & Appolloni, 2021). According to Muisyo and Qin (2021) strong corporate dedication to environmental sustainability enhances employees' environmental habits and green innovation performance. Furthermore, companies with thorough environmental management systems inspire staff green initiatives (Anwar, 2024). These results highlight the need for a green innovation-friendly workplace in motivating staff creativity towards sustainability targets (Baah et al., 2024). These empirical results allow one to enlarge the idea that a green innovation environment significantly influences employee green creativity (Tran, 2024). Organisations that support green innovation help to create environmental sustainability and provide individuals with the means of creativity. According to Srivastava et al. (2024) environmentally friendly organisational policies and practices equip staff members with information, tools, and motivation to produce creative environmental ideas. Green leaders can motivate employees to think imaginatively about sustainability. According to Wang (2024) transformational leadership supports pro-environmental behaviour. Research has established that a green innovation climate influences employees in delivering green creativity. Green innovation

climate is a direct and indirect influence of green transformational leadership which positively influences green creativity (Maitlo et al., 2022). Green innovation strategy increases green organizational identity and green creativity, and they further influence green innovation positively (Mansoor et al., 2021). Proactive green innovation, unlike reactive green innovation, positively influences performance in green creativity and green product development but is partially mediated by green creativity (Nasir, 2023). Furthermore, green human resource management and green process engagement are mediators link between green transformational leadership and employee green creativity (Qamar, Afshan, & Rana, 2023). This indicates that organizations should cultivate a green innovation environment where proactive green innovation strategies are emphasized and, in turn, the evolution of green transformational leadership to boost employee green creativity and overall green innovation performance. The notion is supported by a large body of empirical data showing a green innovation environment boosts employee green creativity and drives sustainable innovation in organisations (Farrukh et al., 2024).

H_1: A green innovation atmosphere significantly influences the employee's green creativity.

Numerous studies have studied how creativity tactics affect employee innovation and creativity (Bhat et al., 2024). Liu et al. (2024) found that autonomy, diverse and hard activities and a supportive work environment promote creativity. Adomako and Nguyen (2023) found that sustainability-oriented creativity initiatives boost employees' innovative environmental conservation behaviours.

Sustainability in the organisational vision, green skill training and development, and collaborative environmental problem-solving are some of these initiatives. Kiranantawat and Ahmad (2023) found that empowering leadership, a key component of sustainable creativity techniques boosts intrinsic motivation and creative self-efficacy and increasing creativity (Li et al., 2023). From these empirical findings, the hypothesis that sustainable creativity practices greatly influence employee green creativity can be developed. Sustainable creative strategies that incorporate environmental aims and sustainability principles shape employee green creativity (Nasir, 2023). Green training programmes give employees the tools to solve environmental issues creatively. Begum, Xia, et al. (2022) found that green human resource (HR) approaches including training and development improve employees' environmental performance. Organisations that foster sustainability collaboration allow staff to share varied viewpoints and ideas resulting in more innovative and effective green solutions (Begum, Ashfaq, et al., 2022). Luu (2022) found that team-based problem-solving and information sharing improve green innovation outcomes.

Positive outcomes from sustained creative initiatives in diverse organisational contexts support the hypothesis (Luu, 2022). When firms integrate their creativity strategy with sustainability goals, they encourage innovation and employee participation in environmental goals (Ogbeibu et al., 2021). This alignment gives employees purpose and motivates them to solve sustainability problems creatively. Nasir (2023) found that employees are more likely to be pro-environmental and give new ideas when they believe their company is sustainable. Sustainable creativity strategies significantly influence employee green creativity through various mechanisms. Green transformational leadership positively affects employee green creativity with green human resource management and green process engagement mediating this relationship (Soomro et al., 2024).

Sustainability control systems drive employee green creativity by fostering psychological empowerment and sustainability learning capabilities (Maitlo et al., 2022). Green creativity develops differently based on job positions with leaders' green creativity influenced by subordinates' green self-efficacy and personal identification while subordinates' green creativity is affected by their green passion, green self-efficacy and leaders' green creativity (Setyaningrum & Muafi, 2023). The adoption of environmental sustainability strategies and green human resource management practices increases both employee green creativity and general creativity leading to improved organizational innovation and performance (Arici & Uysal, 2022). These findings highlight the importance of sustainable strategies in fostering employee green creativity and driving organizational success. Thus, a strong body of empirical evidence supports the idea that sustainable creativity initiatives boost employee green creativity resulting in more sustainable and innovative organisational practices.

H_5: Sustainable creativity strategies significantly influence employee green creativity.

It has been demonstrated that organisational initiatives mitigate the relationship between employee outcomes and workplace climates (Rana & Arya, 2024). According to Le et al. (2024) innovation-supportive HR strategies boost employee creativity in creative work environments. Sustainability studies demonstrate that various techniques might increase the link between environmental initiatives and employee behaviour. Şengüllendi et al. (2024) found that sustainable training programmes and eco-friendly performance appraisals improve environmental management systems' green behaviour engagement.

Ejibe et al. (2024) revealed that integrating environmental strategy into organisational frameworks considerably increases corporate environmental policies' impact on employees' pro-environmental actions. From these empirical findings, the hypothesis that sustainable creativity strategies considerably regulate the association between green innovation atmosphere and employee green creativity can be developed (Choudhary & Datta, 2024). Sustainable creativity strategies, green skills training, sustainable leadership, and collaborative problem-solving can boost employee creativity in a green innovation environment (Soomro et al., 2024).

Structured sustainability training helps employees understand and interact with green innovation efforts improving their creativity. This supports Renwick, Redman, and Maguire (2013) who found that green HR practices alter employee behaviour and boost the organization's environmental strategies (You & Kee, 2024). Sustainable creativity practices foster green creativity and support the concept. Organisations that promote sustainable innovation give staff the tools and information they need and create a culture that rewards green creativity (Tuan, 2023).

Employee creativity increases when a green innovation atmosphere and sustainable creativity initiatives work together. For instance, Fazal-E-Hasan et al. (2023) discovered that empowered leadership, a major component of sustainable creative initiatives greatly enhances the positive benefits of a sustainability-focused organisational climate on staff innovation (Setyaningrum & Muafi, 2023).

Recent research has focused on the role of green innovation strategies that shape the creative outcome of employees and organizational performance. The influence of such strategies is reportedly done to green organizational identity facilitating a positive impact on green creativity (Baah et al., 2024). Green transformational leadership might therefore mediate employee green creativity through green human resource management and green process engagement (Qamar et al., 2023). Adoption of environmental sustainability strategies and green human resource practices can boost both green and general employee creativity to provide organizational innovation and performance improvement (Nasir, 2023).

Green abilities and motivational strategies moderate the effectiveness of green innovation practices. According to the study by Şengüllendi et al. (2024) innovation climate mediates the connection between green innovation and environmental sustainability. Such findings emphasize the integration of sustainability issues into the operations of an organization to enhance an innovation climate and green innovation initiatives which always result in a sustainable development as well as a competitive advantage (Choudhary & Datta, 2024). Thus, a large body of empirical evidence supports the hypothesis that sustainable creativity strategies moderate the relationship between green innovation atmosphere and employee green creativity resulting in more effective and sustainable innovation in organisations (see Figure 1).

H_6: Sustainable creativity strategies significantly moderate the relationship of green innovation atmosphere and employee green creativity.

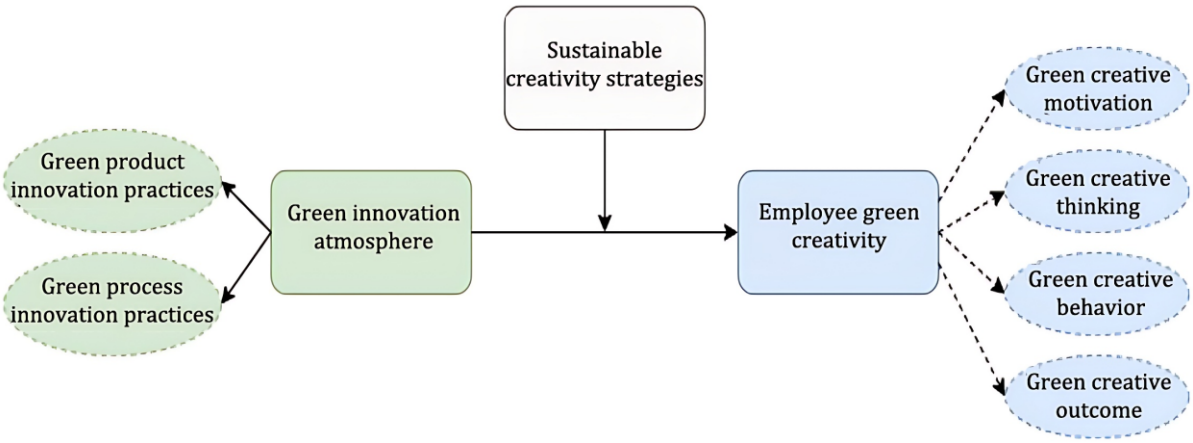

Figure 1. Theoretical model.

3. METHODOLOGY

This study analyzed the data gathered from 247 employees of the research and development (R&D) department of a green innovative technology development company in Shenzhen, China. Shenzhen was a smart choice with its technological innovation and focus on green technology. Participants were selected based on their involvement in green innovation R&D directly and ensuring relevance and knowledge of the core area of this study. The study used scales from earlier studies for measuring the essential constructs. We have applied sustainable creativity strategies, green innovation atmosphere, and employee green creativity scales in this study. The main reason for applying these scales is that they are reliable and valid scales to test organizational constructs that have previously been tested through some prior publications. A set of structured questionnaires related to sustainable creativity techniques, organisational green innovation atmosphere and green creative behaviors were presented to participants (see Table 1). Such a survey had to be submitted over email or as a paper copy according to the subject's preference and the logistical facilities of the concerned organisation.

Table 1. Questionnaire profile.

Variables	Number	References
Sustainable creativity strategies	05	Zahrani (2022)
Green innovation atmosphere	12	Weng, Chen, and Chen (2015)
Employee green creativity	16	Jiang et al. (2020)

Stata-SEM, a powerful statistical tool for analyzing complex latent variable associations was used for statistical analysis. Initial validation of the measurement model and scale reliability and validity was done using confirmatory factor analysis (CFA). The hypothesised correlations between sustainable creativity strategies, green innovation atmosphere, and employee green creativity were tested using structural equation modelling (SEM). The research followed a methodical data gathering, cleaning, and processing process. Missing data were handled properly and SEM assumptions like normality and multicollinearity were reviewed and addressed. Chi-square, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) were used to assess structural model goodness-of-fit. The study checked for validity and reliability. This included using psychometrically sound scales, rigorous statistical methods, and SEM analysis best practices. Sensitivity and robustness analyses verified results stability and consistency across model parameters.

Institutional Review Board Statement: The Ethical Committee of XingTai University, China, approved this study (Approval No: XY 20241111) with an approval date of November 11, 2024, and expiration on November 11, 2025.

4. RESULTS

The study focuses on the following three main factors: sustainable creativity strategies, green innovation atmosphere, and employee green creativity. Table 2 indicates their respective reliability and validity measures. These measures are required to develop uniformity and accuracy. Sustainable creativity strategies have a Cronbach's alpha of 0.897. Internally, it is highly robust since its items possess a very high correlation as well as reliability. It has a CR of 0.931 that develops reliability for the measurement model for this variable. Composite dependability values of 0.70 or higher are broadly acceptable and above 0.90 are very high. Sustainable creativity strategies have an AVE of 0.521. For a latent concept, if it captures more than half of the variance of observable variables then its AVE value will be above 0.50 to show convergent validity.

Table 2. Variables reliability and validity.

Variables	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Sustainable creativity strategies	0.897	0.931	0.521
Green innovation atmosphere	0.929	0.867	0.546
Employee green creativity	0.858	0.932	0.528

The Cronbach's alpha of the green innovation atmosphere variable is 0.929 meaning that this has a very high internal consistency. A high alpha value indicates the strength of the items' reliability and consistency in measuring the construct across contexts. The composite reliability for the variable is 0.867. Although this is slightly lower than composite reliability (CR) for sustainable creativity strategies, it comfortably exceeds 0.70, therefore guaranteeing the trustworthiness of the construct. AVE for green innovation atmosphere 0.546; AVE > 0.50; The construct thus has strong convergent validity: Most of the variances of the items are captured. Cronbach's alpha = 0.858. Strong internal consistency and reliability on this build indicator items were indicated. Composite reliability indicates a very trustworthy measurement model for this variable, it is 0.932. All variables are above the 0.50 criterion meaning that the AVE is 0.528. Since the latent variable explains more than half of the variance in the observed measurements, the construct has strong convergent validity (see Figure 2).

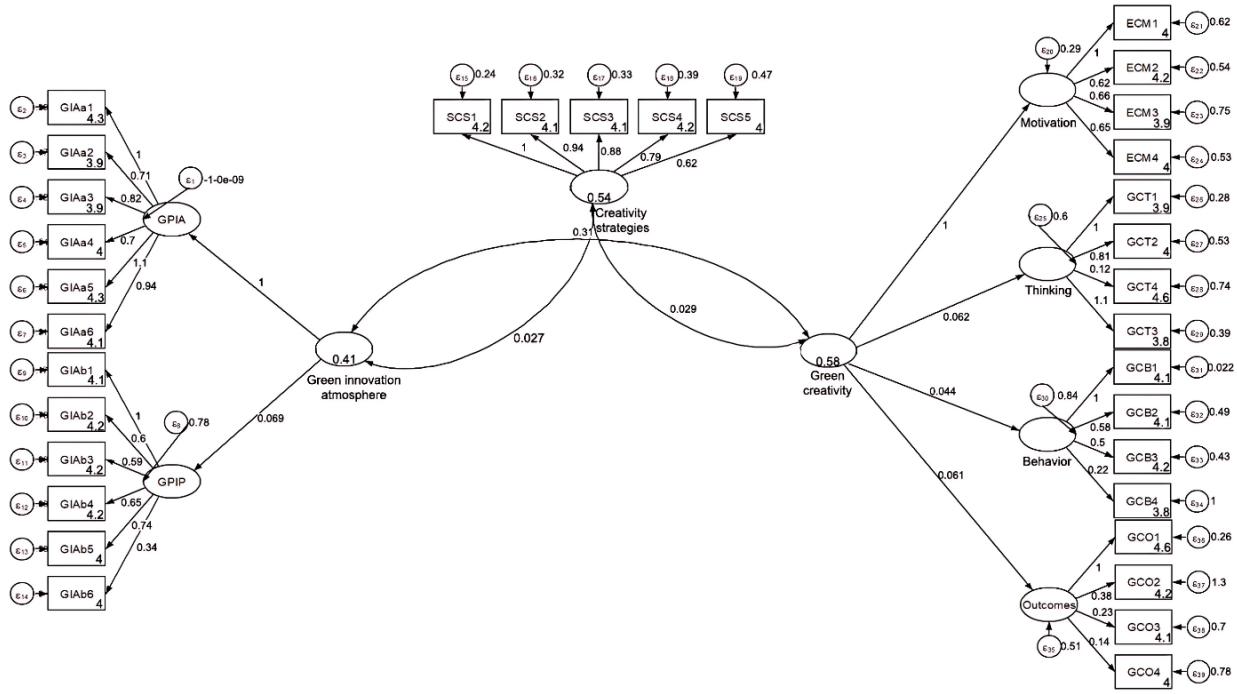

Figure 2. Estimated model.

The Confirmatory factor analysis (CFA) tests the measurement model's fit for the latent components Sustainable creativity strategies (SCS), green innovation atmosphere (GIA), and employee green creativity green creativity motivation (GCM), green creativity thinking (GCT), green creativity behavior (GCB) and green creativity outcome (GCO) in Table 3. Standardized observed information matrix (OIM Coef.) indicates that each measurement item's latent construct representation is strong. The coefficients, standard errors, z-values, significance levels (P > |z|), and 95% confidence intervals reveal the measurement model's reliability and validity. The restricted coefficients of 1.000 for each first item in the construction serve as reference points for comparing the following items' strengths and contributions.

Table 3. Confirmatory factor analysis.

Measurements	OIM coef.	Std. err.	z	P>|z|	[95% conf. interval]	
SCS1	1.000	Constrained				
SCS2	0.568	0.044	10.985	0.000	0.385	0.550
SCS3	0.595	0.047	10.648	0.000	0.150	0.573
SCS4	0.171	0.085	8.955	0.000	0.258	0.838
SCS5	0.218	0.039	75.157	0.000	0.254	0.784
GIAa1	1.000	Constrained				
GIAa2	0.518	0.082	8.542	0.000	0.167	0.762
GIAa3	0.712	0.082	8.912	0.000	0.207	0.802
GIAa4	0.589	0.081	8.466	0.000	0.155	0.751
GIAa5	0.616	0.050	9.425	0.000	0.517	0.714
GIAa6	0.589	0.079	9.081	0.000	0.275	0.751
GIAb1	1.000	Constrained				
GIAb2	0.546	0.083	8.466	0.000	0.170	0.761
GIAb3	0.465	0.095	7.666	0.000	0.232	0.769
GIAb4	0.680	0.057	9.236	0.000	0.568	0.631
GIAb5	0.530	0.075	10.555	0.000	0.283	0.906
GIAb6	0.562	0.087	8.331	0.000	0.218	0.788
GCM1	1.000	Constrained				
GCM2	0.085	0.088	9.367	0.000	0.351	0.918
GCM3	0.674	0.053	9.825	0.000	0.569	0.617
GCM4	0.407	0.079	9.949	0.000	0.275	0.883
GCT1	1.000	Constrained				
GCT2	0.677	0.039	72.782	0.000	0.114	0.350
GCT3	0.675	0.036	78.257	0.000	0.105	0.383
GCT4	0.591	0.074	9.376	0.000	0.140	0.560
GCB1	1.000	Constrained				
GCB2	0.737	0.037	78.510	0.000	0.184	0.422
GCB3	0.688	0.063	9.982	0.000	0.217	0.712
GCB4	0.591	0.038	77.154	0.000	0.207	0.371
GCO1	1.000	Constrained				
GCO2	0.434	0.037	79.100	0.000	0.232	0.653
GCO3	0.292	0.038	79.420	0.000	0.316	0.462
GCO4	0.512	0.039	76.632	0.000	0.313	0.720

Table 4 shows the fitness data for sustainable creativity strategies, green innovation atmosphere, and employee green creativity. The standardized factor loadings from the original sample show how well each indicator item connects with its latent construct. Higher factor loadings indicate stronger correlations between measuring items and constructs. Sustainable creativity strategies metrics like SCS3 (0.739) and SCS2 (0.718) have strong correlations with the entire construct showing they accurately capture sustainable creative behaviours. For Green Innovation Atmosphere, (GIAa4) (0.797) and GIAb3 (0.720) have high loadings showing their efficacy in measuring the organisational climate for green innovation. Indicators like GCM2 (0.837) and GCO3 (0.779) strongly correlate with their characteristics of creativity proving their relevance in assessing employees' green creativity. The study's

measuring model is reliable and valid laying the groundwork for subsequent studies and interpretations of these constructs' linkages.

Table 4. Measurement items fitness statistics.

Variables	Indicators	Original samples
Sustainable creativity strategies	SCS1	0.667
	SCS2	0.718
	SCS3	0.739
	SCS4	0.670
	SCS5	0.573
Green innovation atmosphere	GIAa1	0.566
	GIAa2	0.606
	GIAa3	0.617
	GIAa4	0.797
	GIAa5	0.585
	GIAa6	0.534
	GIAb1	0.637
	GIAb2	0.684
	GIAb3	0.720
	GIAb4	0.610
	GIAb5	0.635
	GIAb6	0.649
Employee green creativity	GCM1	0.798
	GCM2	0.837
	GCM3	0.672
	GCM4	0.708
	GCT1	0.595
	GCT2	0.520
	GCT3	0.763
	GCT4	0.668
	GCB1	0.695
	GCB2	0.710
	GCB3	0.562
	GCB4	0.555
	GCO1	0.688
	GCO2	0.678
	GCO3	0.779
	GCO4	0.737

Table 5 chi-square fit statistics comparing the structural equation model to the saturated and baseline models likelihood ratio chi-square 7827.455 p-value 0.000 The likelihood ratio chi-square value of 7827.455 with a p-value of 0.000 indicates that the proposed model and the saturated model fit differently. The baseline chi-square value is 3236.769 similarly with a p-value of 0.000 indicating a big difference from the saturated model showing that the model can well capture variable associations. Fit statistics from here indicate how good the SEM fit is; thus, it allows us to assess whether the SEM is able to explain the relationships between sustainable creativity strategies, green innovation atmosphere, Employee green creativity and other study constructs.

Table 5. Chi-square fit statistics.

Fit statistic	Value	Description
Likelihood ratio	7827.455	Model vs. saturated
p > chi2	0.000	
chi2_bs(2728)	3236.769	Baseline vs. saturated
p > chi2	0.000	

Table 6 shows R-square statistics comparing the saturated model to the estimated model showing how much variance each variable explains. The saturated model has a decent match with Standardized Root Mean Square Residual (SRMR) of 0.040 while the estimated model has 0.069, a little higher residual error but still within acceptable standards. Job security (0.253) and job autonomy (0.554) R-square values in the estimated model indicate how much variance the model explains. These statistics help determine the structural equation model's (SEM) goodness-of-fit and explanatory power revealing how well the data supports the proposed relationships between sustainable creativity strategies, green innovation atmosphere, employee green creativity and other variables.

Table 6. R-square statistics model goodness of fit statistics.

Description	Saturated model	Estimated model	R square
SRMR	0.040	0.069	
Job security			0.253
Job autonomy			0.554
Employee engagement			0.575

Table 7 presents route analysis for green innovation atmosphere, sustainable creativity strategies, and employee green creativity. The intensity and direction of associations among the variables along with their standard errors, z-values, and significance levels at the 95% confidence interval are reported. With a path coefficient of 0.588 (z = 4.005 and p < 0.001) a green innovation atmosphere influences employee green creativity to a considerable extent with a confidence interval of 0.349 to 0.466. This further suggests that a workplace supportive of the development of green innovation augments employees' sustainability creativity. This suggests that the more organizations engage in green innovation, the more employees will participate in innovative behavior for environmental sustainability consistent with previous research on organizational climate and creativity (see Figure 3).

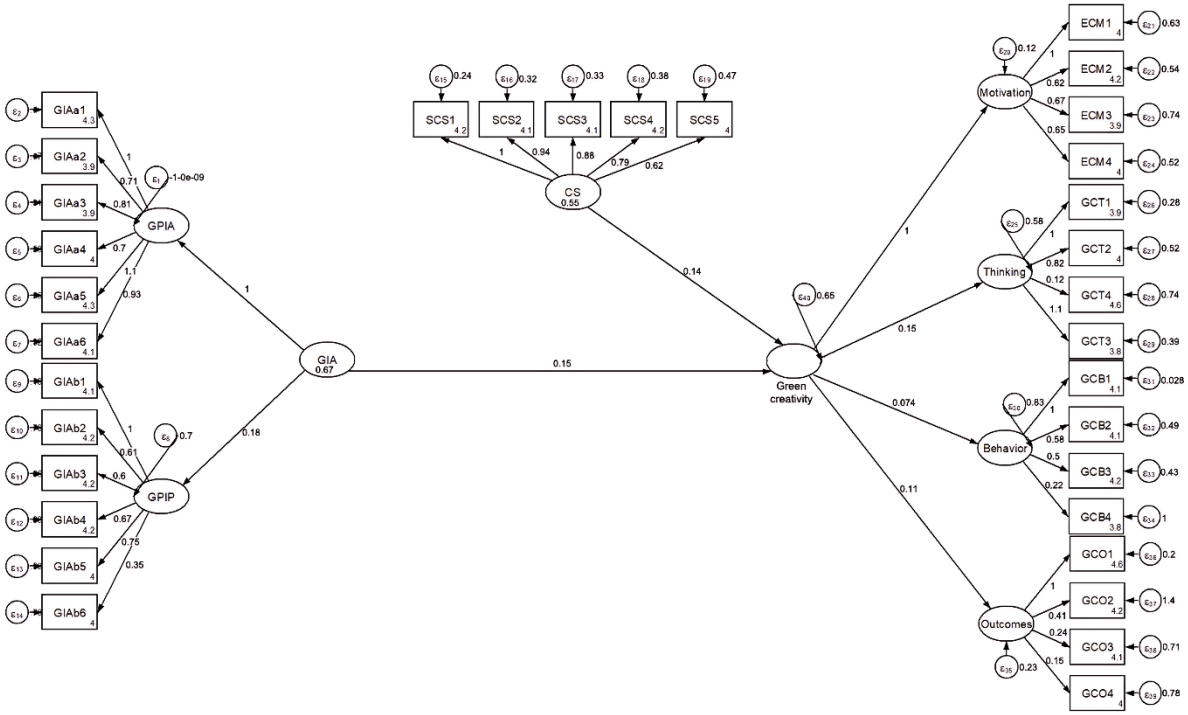

Figure 3. Structural model for path analysis.

Similarly, sustainable creativity strategies strongly impact employee green creativity (p < 0.001, path coefficient 0.519, z = 3.548 and confidence interval 0.269-0.769). This shows the necessity of structured strategies to encourage sustainable creative behaviour among employees (see Figure 3). The positive relationship shows that

organisations that promote sustainable innovation with resources, training and support drive employee creativity towards environmental goals. According to theoretical perspectives, organisational interventions influence employee sustainability behaviours and outcomes (Renwick et al., 2013; Zhang & Bartol, 2010). Additionally, sustainable creativity strategies moderate the link between green innovation atmosphere and employee green creativity with a path coefficient of 0.492 ($z = 3.360$ and $p < 0.001$) and a confidence interval of 0.255 to 0.728. This moderating impact shows that focused sustainability measures enhance employee green creativity in a supportive green innovation environment. Combining a green innovation environment with well-organized interventions to foster sustainable creativity can have combined effects that result in more creative output in environmental projects. This emphasises the requirement of a whole strategy combining strategic support with environmental dedication to boost staff innovation in favour of organisational sustainability.

Table 7. Path analysis.

Hypotheses	OIM coef.	Std. err.	z	P>|z|	95% conf. interval	
A green innovation atmosphere significantly influences the employee's green creativity.	0.588	0.208	4.005	0.000	0.349	0.466
Sustainable creativity strategies significantly influence the employee's green creativity.	0.519	0.128	3.548	0.000	0.269	0.769
Sustainable creativity strategies significantly moderate the relationship of green innovation atmosphere and employee's green creativity.	0.492	0.121	3.360	0.000	0.255	0.728

5. DISCUSSION

Sustainable development depends on employee creativity and organisational innovation. Businesses are adopting environmentally friendly solutions to lessen their ecological effect and increase resilience in light of the growing severity of environmental challenges worldwide. To understand how employee green creativity, sustainable creativity methodologies, and the atmosphere of green innovation interact to support sustainable invention, this study looks at the intricate relationships between these factors. The report clarifies how businesses could successfully integrate sustainability. It demonstrates how businesses may harness the inventiveness of their staff to solve environmental problems by assessing the connections between these elements.

An atmosphere conducive to green innovation plays a crucial role in employee green creativity, and an organisational climate supports environmentally focused innovation. According to Arici and Uysal (2022) a supportive workplace fosters employee innovation. This conclusion emphasises the need for such a scenario and encourages research. A culture that prioritizes sustainability, resources for eco-friendly projects and environmental goals spurs green innovation. This environment inspires employees to find creative and achievable solutions to reduce their environmental impact. The organization's commitment to environmental sustainability and green innovation in structure and motivation is shown. Thus, employee creativity supports business goals. This study supports Mansoor et al.'s (2021) claims that green innovation boosts employee green creativity. Organisational support strongly influences environmentally conscious behaviour and creativity, according to the study. This shows that management and leadership are essential to environmentally responsible firm innovation. Leaders may inspire people to be environmentally conscious and work towards a common goal by modelling sustainability. Transformational leadership boosts green creativity by fostering creative sustainability thinking, according to Malik et al. (2021). The study found that workers who believe their bosses share their environmental ideals are more inventive in addressing environmental issues. Leaders must foster green innovation and empower people to approach sustainability issues imaginatively. A workplace that encourages green innovation boosts employee creativity, which benefits sustainable firms. Companies that wish to unleash worker creativity and create long-term solutions should promote green innovation. Rules are needed for green projects. These policies and practices

include eco-friendly skill development and training, cooperative idea-generation platforms and staff sustainability recognition. The research shows that these programmes help workers address environmental issues and use eco-friendly goods. Companies that invest heavily in green innovation frameworks may see increased staff creativity and sustainability.

Validating the second hypothesis which states that sustainable creativity practices strongly influence employee green creativity emphasises the need for planned organisational interventions in supporting environmentally conscious innovative behaviour among workers. Hu et al. (2022) found that tailored strategies boost creativity. The conclusion supports previous research. Worker knowledge, skills, and drive enable environmentally conscious innovation and sustainable solutions. Cooperative problem-solving, sustainable labour and green training are examples. These strategies were strongly correlated with employees' innovative environmental efforts, according to the study. Sustainability-focused employers can inspire employee creativity to achieve environmental goals. According to creativity and sustainability theories, organisational support and resources help employees create innovative environmental solutions (Maitlo et al., 2022). The third hypothesis states that sustainable creativity methods attenuate the relationship between an atmosphere of green innovation and employee green creativity. This helps us understand how organisational climates and structured interventions affect creative behaviour. The third hypothesis is that sustainable creativity techniques moderate the relationship. The findings show that sustainable creative methods boost green innovation by promoting green creativity. The moderating influence suggests that explicit measures to support and encourage sustainable innovation are more effective in boosting employee creativity when joined with a green innovation climate. However, this effectiveness is dramatically boosted. This study confirms previous research on organisational behaviour and innovation that revealed structured interventions and supportive environments encourage creativity (Arici & Uysal, 2022). According to statistics, companies that implement sustainable creativity initiatives into their operational frameworks encourage environmentally friendly innovation and a creative workplace. These findings are significant for firms seeking to improve sustainability through staff innovation and creativity. Recognizing the complimentary impacts of sustainable creativity and green innovation may help organisations establish more complete green creativity initiatives. This requires creating a sustainable workplace and implementing focused methods to give employees the tools, supplies and rewards they need to produce sustainably. Comprehensive green training programmes may raise employees' environmental knowledge and skills while collaborative platforms can boost innovation. Recognizing and praising sustainability accomplishments can boost employee commitment to environmental goals. This study stresses the necessity for a robust green innovation and sustainable creativity environment to boost employees' green creativity and encourage sustainable innovation in organisations.

The necessity of promoting green creativity among staff members by establishing an environment that is conducive to sustainable creativity and green innovation is highlighted by the validation of all three hypotheses. Employee creativity contributes more to sustainability in an environment that encourages green innovation, and sustainable creativity techniques offer the framework and resources to amplify this impact. A green innovation environment and employee green creativity can interact in ways that are controlled by sustainable creativity methodologies, demonstrating the potential for synergy between customized interventions and the right climate. For businesses that prioritize sustainability, these insights are crucial. They contend that employees' creative potential can be unlocked by integrating strategic assistance with environmental dedication leading to noteworthy and inventive environmental solutions.

6. CONCLUSION

This study found several ways organisational cultures and strategic actions might boost employee creativity and environmental sustainability. The findings underline the importance of an organization's commitment to sustainability and the importance of a conducive environment for eco-friendly innovation in encouraging employee

environmental innovation. The research also implies that sustainable creative tactics boost employees' environmental stewardship concepts. This study shows that supportive surroundings and specialized interventions can synergize. These tactics boost organisational atmosphere and staff green creativity. Practically, these findings suggest that businesses can improve their sustainability by promoting green innovation and implementing systematic techniques that empower individuals to creatively solve sustainability problems. This method improves organizations' resilience and competitiveness and supports environmental and sustainable development goals. To better understand these processes, we must identify and address the limitations and aggressively pursue future studies. This will provide insights for organisational leaders and governments trying to manage sustainability in a changing world.

6.1. Implications of the Study

This study will impact research fields of organisational theory and sustainability. The research precisely explains how the environment surrounding green innovation in firms contributes to the green creativity of employees. It reveals that green innovation encourages creative performance for the sake of ecological sustainability, thus creating and extending concepts of organizational climate and creativity. Sustainability is affected by strategic objectives and organizational leadership. Research further underpins the ways of sustainable creativity in the green innovation of employees for developing theories. Interventions structured into training, environmentally friendly practices, and cooperative platforms nurture sustainable invention; hence the theoretical frameworks that connect organizational practices to creativity are further expanded. This theory contribution brings out the reality that there is a necessity for organizations to invest in focused efforts that enable people to creatively solve environmental issues. This study also enriches the theoretical moderation effects of sustainability-oriented innovation. Sustainable creative strategies are found to reverse the causal relationship between a green innovation climate and worker green creativity, thus exemplifying the effect of supportive organizational climates plus personalized interventions. The resulting theoretical insight reflects that optimized employee creativity must be derived through the integration of environmental commitment and strategic aid for the sustainable achievement of creative goals.

This research is highly helpful for firms looking to implement sustainability through the creativity and innovation of employees. The results highlighted organisational green innovation support. Ensuring environmental sustainability is the priority and merging it with the culture of business will have people working on green projects. Feasible building targets for sustainability, green initiative support, and encouragement and idea sharing of innovation. The study advocates for sustainable creative solutions to increase staff members' sustainable innovation. Such learning of friendly policies and methods in the teaching of the practice can be taken by an organization to ensure it increases its venues for the solving of group problems in sustainability. Improvement of the staff's capacity lines up to the corporate objectives in sustainability as they encourage innovation and responsibility over the long-term towards the environment. This study also highlights the need for a facilitating organizational environment and specific projects to take advantage of sustainability efforts. The symbiotic result of this research will assist business enterprises using holistic practices that align effective facilitation for creative innovation with top management commitment toward sustainability. This approach combines the goals of sustainability with strategic planning, acknowledges the initiatives of employees for the environment, and periodically changes sustainability policy according to environmental concerns and employee feedback.

6.2. Limitations and Future Research Directions

This research carries some limitations even if it has made some worthwhile contributions. The study could have limited generalizability by concentrating on sectors or businesses with varying sustainability strategies and organisational environments. Comparative studies across sectors or worldwide areas could test the robustness of

found links in future studies. Self-reported data for factors like green innovation atmosphere and staff green creativity may introduce common method bias, exaggerating construct connections. Mixed-method or longitudinal designs can capture quantitative and qualitative data to better understand how organisational environments affect sustainability-oriented creativity over time.

This analysis suggests several intriguing research options. One avenue could be to study how sustainable creativity practices affect employee green creativity. Examine how training, incentives, and organisational rules affect employees' abilities to create and implement sustainable ideas. Additionally, studying how leadership styles and organisational culture support green innovation may provide ways to promote sustainability-oriented creativity at different organisational levels. Future research should also examine the border circumstances that affect sustainable creativity techniques' ability to moderate the relationship between green innovation atmosphere and employee green creativity. Organisational size, industry features, and geographic location may help explain when and how these tactics work best. Longitudinal studies could also examine the dynamic nature of organisational environment, sustainable creativity practices, and employee green creativity and their long-term effects on organisational sustainability. Addressing these limitations and following these potential research directions might improve our understanding of how organisations can use innovation and creativity to achieve sustainability goals. Researchers can inform organisational practices and policies that promote environmental stewardship and sustainable development in varied organisational contexts by examining these avenues.

Funding: This study received no specific financial support.
Institutional Review Board Statement: The Ethical Committee of the XingTai University, China has granted approval for this study (Ref. No. XY 20241111).
Transparency: The authors declare that the manuscript is honest, truthful and transparent, that no important aspects of the study have been omitted and that all deviations from the planned study have been made clear. This study followed all rules of writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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