

## Examining the Effect of Green Inclusive Leadership on Green Creativity: A Mediating Effect of Green Thinking and Green Innovative Climate in Manufacturing Industries

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### Abstract

This study investigates the effect of Green Inclusive Leadership (GIL) on Green Creativity (GC) through the mediating roles of Green Innovative Climate (GIC) and Green Thinking (GT) within manufacturing industries. The research aims to understand how leadership behaviors that emphasize inclusiveness and environmental responsibility foster creativity among employees to achieve sustainable organizational outcomes. The study collected data through a quantitative survey design which included 335 participants who worked in manufacturing industries. The researchers used structured questionnaires to assess GIL and GC and GIC and GT. The study confirmed reliability and validity through testing with Cronbach's alpha and KMO/BTS assessments. This research conducted hypothesis testing through SPSS with Hayes' PROCESS Macro Model 4 which used regression and mediation analyses together with bootstrapping methods. The results show that GIL positively influences green creativity. The relationship between GIC and GT shows partial mediation because inclusive leadership directly boosts creativity while creating organizational support systems that develop sustainability-based thinking processes. The study provides actionable insights for manufacturing managers, who need to develop inclusive leadership skills and create a sustainable green business environment while teaching employees sustainable business practices. The practices enable organizations to integrate sustainability into their daily operations while satisfying both regulatory requirements and stakeholder expectations. This research extends existing literature by simultaneously examining two mediators' organizational climate and cognitive orientation in the leadership-creativity relationship within manufacturing industries. The study presents new empirical data together with a dual mediation framework which enhances both theoretical knowledge and practical uses of sustainability leadership.

**Keywords:** Green Inclusive Leadership, Green Creativity, Green Innovative Climate, Green Thinking, Manufacturing Industries

## Introduction

Organizations need to develop green creativity as their main organizational capability to address increasing environmental problems. Green creativity refers to the generation of novel and useful ideas, processes, or products that minimize ecological harm while enhancing efficiency and competitiveness ((Ahmad et al., 2022; Chen & Chang, 2013; Zhang et al., 2023). Manufacturing industries face high resource consumption and emissions, but GC helps companies achieve waste reduction, energy efficiency improvements, and development of sustainable products (Ma et al., 2023). Recent evidence shows that GC functions as both a mechanism for developing sustainable competitive advantages and an essential element for achieving enduring success in industries that depend on resources ((Manzoor et al., 2023; Begum et al., 2022; Wang & Liu, 2024). Manufacturing companies must implement sustainability practices together with creative processes according to scholars, which enable them to meet both regulatory standards and stakeholder demands (Saleem et al., 2023). The development of green creativity requires essential GC elements which depend on leadership practices. Green Inclusive Leadership (GIL) has emerged as a leadership style that integrates inclusiveness, participatory decision-making and environmental responsibility (Ghani et al., 2022). GIL creates work environments which enable employees to participate in sustainability initiatives because it requires organizations to accept staff suggestions and acknowledge their environmental practices and work together to find solutions to problems ((Khan et al., 2022; Bhutto et al., 2021; Abdou et al., 2023). The manufacturing studies demonstrate that GIL enables GC through three ways which include giving workers power and providing psychological safety and supporting green innovation (Asghar et al., 2023; Ren et al., 2024). Leadership influence extends beyond their immediate impact on followers. The leadership process creates two pathways which enable leaders to drive results through their impact on employee behavior and workplace perceptions. One such mechanism is the Green Innovative Climate (GIC), which reflects employees' shared belief that their organization supports and rewards environmentally oriented innovation (Zada et al., 2024). The GIC provides employees with resources and recognition and psychological safety which allow them to develop green concepts while turning organizational leadership strategies into innovative results (Chen et al., 2022; Song et al., 2023). The recent research conducted within manufacturing environments demonstrates that GIC functions as an essential environmental factor which enhances GIL effects on GC for sustainable innovation development (Amjad et al., 2024). Green thinking operates as a psychological mediator between organizational climate and its effects. Green thinking demonstrates how employees think about sustainability because it includes their understanding of environmental issues and their ability to assess practices according to environmental regulations and their dedication to protecting the environment ((Manzoor et al., 2024; Ahmeda et al., 2020; Li et al., 2023). Leaders who create an environment of open communication while they offer intellectual challenges and they acknowledge environmentally friendly achievements establish conditions which help employees develop green thinking their capacity to create innovative solutions which solve waste problems and increase energy efficiency and create sustainable product designs (Singh et al., 2020; Murad & Li, 2025). Leadership behaviors become internalized through green thinking because it serves as the cognitive track which leads to the establishment of environmentally innovative practices. The study of green inclusive leadership has grown, yet the combined GIC and GT mediation roles between GIL and GC relationship remain unexamined, especially in manufacturing sectors which face the toughest sustainability challenges. Previous studies have examined single mediators such as self-efficacy or absorptive capacity (Saleem et al., 2023; Amjad et al., 2024), but few have simultaneously addressed both organizational and cognitive mechanisms. Manufacturing firms need researchers to develop and test a dual mediation model which this study accomplishes. Manufacturing industries must implement leadership styles

that promote sustainable innovation, which drives this research need. The research established GIL as a positive factor for GC through its new empirical findings, while GIC and GT serve as mediating factors in this relationship, which creates a complete framework to understand how leadership drives sustainability in resource-dependent sectors.

## **Review of Literature**

### **Green inclusive leadership**

Green inclusive leadership is a modern-day leadership style that melds environmental responsibility with inclusiveness, transparency, and employee participation in sustainability-related projects. It advocates for leaders' visibility, openness to various eco-friendly ideas, and support for staff taking part in solving environmental problems (Bhutto et al., 2021; Abdou et al., 2023). In contrast to conventional leadership styles, green inclusive leadership does not only aim at attaining business objectives but also at building a common trust in environmental care and sustainable development through collective decision-making. By green inclusive leadership, research has shown that it not only creates an atmosphere of support and trust in the workplace but also encourages employees to think of themselves as important contributors to the green initiatives (Aboramadan et al., 2022; Thabet et al., 2023). Green inclusive leaders who acknowledge employees' eco-friendly efforts and promote open communication about environmental concerns will be able to develop and strengthen pro-environmental attitudes and actions. Hence, this leadership style has increasingly become a subject of research as an important factor that attracts sustainability-oriented results in the organizations.

### **Green creativity**

Green creativity is the terms that is used to represent new and useful ideas, practices, or solutions that will not only help but also the environment and cause no or very little damage to the ecosystem (Chen & Chang, 2013; Al-Hawari et al., 2021). It includes the capacity of employees to come up with creative ways of solving environmental issues, to suggest not only environmentally friendly but also better products and processes, and to find the sustainable ways of working that are much less harmful to the environment as compared to the traditional practices used. More and more, green creativity is viewed as an essential organizational competence in the vertical and incoming environmental issues and stakeholder demands. The recent studies point out that green creativity is the starting point for the firm's sustainable competitive advantage and the ultimate performance of the organization in the long run (Begum et al., 2022; Zhang et al., 2023). By considering in green creativity, employees create a good environment for the company while, at the same time, the company would meet its goals of being innovative and efficient. As a result, the spotlight has shifted more towards the encouraging of green creativity in the sectors of sustainability and innovation research.

### **Green innovative climate**

Green innovative climate refers to the employees' common understanding that their organization is the one which encourages, supports, and rewards innovations having environmental orientation (Chen et al., 2022). This climate is a reflection of the organization's values, norms, and practices that recognize and support experimentation with green ideas and, consequently, the development of innovations driven by sustainability. A robust green innovative climate indicates that the organization's environmental initiatives are among its strategic priorities. Supportive empirical findings show that a green innovative climate will positively increase employees' willingness to participate in the creative solution finding for the problems related to environment (Ren et al., 2023; Song et al., 2023). Of course, when a company offers the resources, recognition, and

psychological safety to green innovation, its employees are more likely to expend their energy in creating and executing environmentally friendly ideas. Hence, a green innovative climate acts as an important uprising condition which turns environmental values into innovative outcomes.

### **Green thinking**

Green thinking describes the mental processes through which people think about environmental matters, which includes their capacity to recognize ecological problems and their desire to safeguard nature and their practice of assessing everything through sustainable standards (Ahmeda et al., 2020; Begum et al., 2022). The approach shows a mental framework which values ecological responsibility and promotes people to think about the environmental effects which arise from their daily activities. Current studies demonstrate that green thinking acts as a psychological force which drives people to engage in environmental protection activities and develop innovative eco-friendly solutions (Singh et al., 2020; Li et al., 2023). People who hold strong green thinking beliefs tend to challenge practices that damage the environment while they develop innovative methods to achieve sustainable outcomes. The cognitive basis of green thinking enables people to develop green creativity together with all of their sustainability-related results.

### **Hypothesized literature**

#### **Green inclusive leadership and green creativity**

It is commonly acknowledged that the manufacturing sector is one of the main causes of the environmental problem mainly because of its heavy reliance on the natural resources, enormous energy use, and substantial waste and emissions (Zhang et al., 2023; Wang & Liu, 2024). The alone manufacturing operations like mining, product making, and disposal of the goods impose irreversible damage on the biosphere, thus, making sustainability in the production sector a very difficult issue (Chen et al., 2022). As a result, manufacturing companies are always under the pressure of meeting the requirements imposed by regulators, customers, and the entire world regarding the way they treat the environment and hence adopting environmental friendly practices backed up by responsible management (Ren et al., 2023). In this context, environmentally conscious and socially responsible leadership has become the primary leadership style that can help the factory industry get rid of environmental difficulties. Green inclusive leadership is still a new and unexplored term in literature which is identified by openness of the leader to employees' proposals about the environment, willingness to communicate about the issues concerning the environment, and holding the process of making decisions regarding the environment to be the most encompassing one (Bhutto et al., 2021; Abdou et al., 2023). On the contrary to the conventional methods of leadership, the green inclusive leadership is characterized by an all-around and problem-solving method that brings in the sensitivity towards the environment as well as the participation of the employees and the diversity of opinions which is very relevant in the complicated manufacturing settings (Thabet et al., 2023). The role of green inclusive leadership in stimulating green creativity among employees has been highlighted as one of the main points by earlier research. The term 'green creativity' refers to those employees who are capable of innovating and providing ways in which the company can lessen its environmental impacts and simultaneously improve its eco-friendliness (Al-Hawari et al., 2021). Green creativity is a must in industries such as manufacturing if they are to come up with eco-friendly processes, minimize waste, and design products that are both attractive and sustainable (Tuan, 2020; Li et al., 2024). The situation created by the environmental issues in manufacturing is such that organizations cannot do without the creative contributions of their employees in order to reach the goal of sustainable manufacturing (Song et al., 2023). For the manufacturing sector, green creativity will be the result and will be facilitated by green inclusive leadership, which is characterized by a supportive and psychologically safe environment in which the employees feel that they are

permitted to take risks and communicate their ideas (Shakil et al., 2023). Leaders of this type are proactive and offer support in the form of resources, guidance, and the granting of autonomy that makes it possible for the employees to come up with ideas for the problems caused by the environment that are typical of manufacturing (Aboramadan et al., 2022). Further, the act of permitting employees to partake in environmental decision-making and the appreciating of the diverse viewpoints by the green inclusive leader, the latter management strengthens the employees' allegiance with the sustainability initiatives and thus improves their promptness to perform the green creative behaviors (Ren et al., 2023). The connection between green inclusive leadership and employee green creativity can also be interpreted using social exchange theory (SET). According to SET, the leaders' encouraging and just deeds lead to the development of a sense of duty among the workers to respond with good behaviors (Blau, 1964). If the manufacturing leaders show their concern for the environment and inclusiveness by not only encouraging but also providing resources for the employees' green initiatives, then it is very likely that the employees will respond by showing higher green creativity (Karatepe et al., 2022; Zhang et al., 2023). It can, therefore, be said that workers pay back the green leadership with the green ideas and solutions which might be the company's contribution towards environmental sustainability. From the above-mentioned theoretical argument and fresh empirical validation, it is concluded that green inclusive leadership has a positive effect on the employees' green creativity in the manufacturing sector. By combining the aspect of inclusiveness with that of environmental responsibility, green inclusive leadership could be a major way through which manufacturing companies could get to the point of being more innovative in the green aspect, being more environmentally friendly, and achieving long-term sustainable development.

**H1:** *Green inclusive leadership has positively related to green creativity.*

### **Mediating effect of green innovative climate**

In the manufacturing sector, one of the main factors that support achieving environmental sustainability is the creativity and eco-friendly solutions of the workers. Green inclusive leadership (GIL) is considered to be an important facilitator of the aforementioned outcomes but its contribution to green creativity is usually indirect and takes place through the presence of supportive organizational contexts. One of the most important organizational contexts that GIL activates indirectly regarding green creativity is the green innovative climate that reflects the workers' common view that their organization is one that encourages, supports, and rewards eco-friendly innovation (Chen et al., 2022; Thabet et al., 2023). The perception of a green innovative climate is vital in manufacturing where the production process is not only complex but also requires huge amounts of resources and is environmentally sensitive. With this perception, the employees are given the psychological safety, the resources, and the organizational encouragement to experiment with their green ideas, redesign the production process, minimize waste, and maximize energy efficiency (Song et al., 2023; Ren et al., 2024). Employees in organization coinciding green innovation with the necessity and legitimacy are more inclined to engage in creative behaviors that would lead to realization of better environmental performance. Green inclusive leaders are the ones who mainly create such a climate. By being very open, having an easily accessed way of communication, and allowing employees to participate deeply in the decision-making connected to the environment, the green inclusive leaders indicate that sustainability and innovation are both important (Bhutto et al., 2021; Abdou et al., 2023). They have also recognized the importance of different green initiatives to make collaboration among different departments easier and result in green innovations with mistakes and risks being tolerated, thus staff feeling empowered to come up with creative environmental solutions. This point is more significant for a manufacturing market, where the employees working at the frontline have hidden knowledge of the processes and are in the best place to spot practical improvements

regarding greenness. The role of green innovative climate is even more confirmed by the social exchange theory (SET) underlining that employees give back the supportive behaviors of their leaders by performing positive discretionary actions (Blau, 1964). When green inclusive leaders set forth a climate that is conducive to green innovation, then employees will feel organizational support for their environmental efforts and will, in turn, be engaged in green creativity (Karatepe et al., 2022; Zhang et al., 2023). Lacking such a climate, even the most devoted a to green value leaders may find it hard to convert their vision into creative outcomes, and thus, employees may be the ones that lack confidence or institutional support to go ahead with green ideas. The empirical investigation brought out in sustainability and innovation literature reveals that a supportive green innovative climate amplifies the power of green leadership in manufacturing contexts that require continuous improvement and technological innovation to be green creative, especially so when it comes to promoting green leadership (Chen & Chang, 2013; Begum et al., 2022; Ren et al., 2024). This is the reason why it is maintained that a green inclusive leadership promotes indirectly a green creativity by tolerating, supporting and legitimating an environmentally-orientated creative behavior among employees of manufacturing plant through establishing a green innovative climate.

**H2:** *Green innovative climate mediates the relationship between green inclusive leadership and green creativity.*

### **Mediating effect of green thinking**

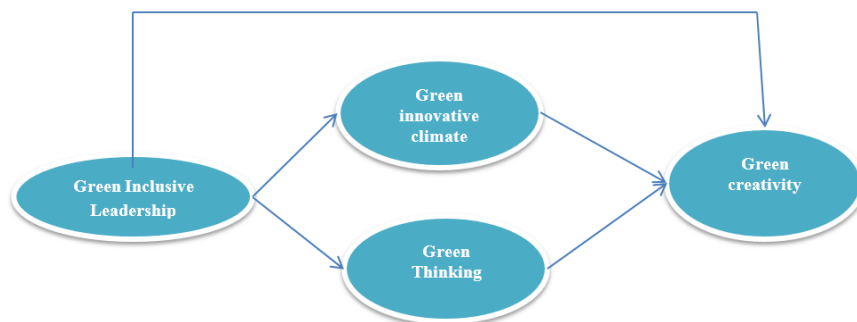
Green leadership is important for organizations to create, follow and finally realize a green vision, especially when it comes to nature-heavy industries like manufacturing (Lusiani et al., 2020). Now, manufacturers are getting more pressure from customers, regulations, and society as a whole to control the carbon footprint, use the minimum amount of resources, and even modify the production processes to be more sustainable. Under these conditions, the green inclusive leadership (GIL) has been recognized as the leading leadership style that harmonizes environmental awareness with openness, participation, and the overall support of the employees throughout the life of green initiatives (Bhutto et al., 2021; Abdou et al., 2023). GIL places the issue of sustainability in the center of the organization's concern while nurturing a conducive environment for the employees to come up with ideas, draw in and even make decisions on the green activities and together tackle environmental problems. GIL, in contrast to the traditional leadership styles, accentuates the easy approach, the being-open and tolerating of the different opinions regarding the solving of environmental issues, which is very important in the factory situations where the employees at the cutting edge have the know-how related to the process (Aboramadan et al., 2022). The green inclusive leaders will not only bring together individuals from different functions but also will help and provide resources to the employees to gradually move their efforts to the organization's eco-friendly goals and this will be done through the setting of green teams, supporting the cross-functional cooperation and providing guidance and assets (Wang et al., 2018; Thabet et al., 2023). Green thinking is a key psychological factor that mediates the relationship between green inclusive leadership and employee outcomes. Green thinking represents the environmentally sensitive cognitive frameworks of employees, which consist of their awareness of ecological problems, their concern for the environment, and their inclination to assess work practices from the sustainability perspective (Ahmeda et al., 2020; Begum et al., 2022). Leaders with strong environmental ethics and who are supportive of the employees' needs are in a position to change the employees' values, norms, and viewpoints, thus, creating a scenario where environmental responsibility comes first in the daily manufacturing processes. The green inclusive leaders provide intellectual stimulation, support, and feedback that are necessary for employees to come up with greener alternatives as opposed to the traditional production methods (Li et al., 2020). In the manufacturing sector, where innovation is often gradual and through

process improvements, green thinking thus plays the role of a crucial mediator. Employees who think green are the ones that are most likely to come up with ideas for waste reduction, energy-saving, recycling, and using eco-friendly materials. Previous studies have pointed out that even though a leader may promote green practices, the employees' internalization of environmental values and the development of green cognitive orientation would be the steps that lead to green creativity (Ahmeda et al., 2020; Singh et al., 2020). Therefore, it can be concluded that green thinking is a dynamic link between leadership behavior and creative environmental outcomes.

Green creativity, which is described as the development of new and valuable ideas for green products, processes, and practices, is one of the main factors that promote sustainable manufacturing performance (Chen & Chang, 2013; Ali et al., 2020). Workers who are good at green thinking have the skills to come up with products that are less harmful to the environment, suggest ways of production that are less polluting, and create processes that are less damaging to nature. Studies indicate that workers' eco-awareness has a strong positive effect on their participation in green creativity and their contribution towards the company's sustainability goals (Begum et al., 2022; Zhang et al., 2023). Based on social exchange theory, when green open-minded leaders provide backing to their staff, appreciate their contributions, and show commitment to ecological sustainability, then the staff would feel obliged to return the favor by adopting green thinking and participating in green creative activities (Blau, 1964; Karatepe et al., 2022). Thus, the idea is that green inclusive leadership indirectly develops green creativity by nurturing green thinking among manufacturing workers.

**H4:** *Green thinking mediates the relationship between green inclusive leadership and green creativity.*

## Framework



## Methodology

### Population, sample and technique

The researchers used a structured questionnaire survey to collect data for testing their proposed hypotheses in the tourism industry. The researchers chose the tourism sector because of two main reasons. First, the tourism industry creates environmental impacts through its various activities which include accommodation and transportation and recreational services because these activities result in high energy usage and waste production and create demands on natural resources. The increasing environmental regulations together with stakeholder requirements push tourism organizations to implement sustainable operational methods. Second, tourism activities create environmental problems which require researchers to study leadership and human resource methods that help employees develop green creativity for sustainable tourism growth. The researchers used a survey method to gather primary data which they used to study how leadership and organizational methods affected employees' ability to create environmentally friendly

innovations. The study allowed participants to choose whether to take part while the researchers guaranteed both identity protection and study results security to minimize incorrect answers from participants. The researchers distributed questionnaires to employees in tourism organizations through human resource departments which used electronic methods and sealed return systems to collect data with both methods providing convenience and maintaining data security. This research distributed 335 questionnaires to employees at tourism organizations to conduct their study. The study selected valid responses for statistical analysis after they screened the data and removed incomplete responses which resulted in an acceptable response rate that matched the requirements of survey-based research methods. The final sample size satisfied the minimum requirements for data analysis and was deemed adequate based on established sampling guidelines. The researchers used Table 2 to display descriptive statistics of the respondent's demographic characteristics, which included their gender and age and work experience, to show the sample profile.

**Table 2: Profile of Respondents (N = 335)**

Variable	Category	Frequency	(%)
<b>Gender</b>	Male	214	63.9
	Female	121	36.1
<b>Age</b>	<30	82	24.5
	31–40	154	46.0
	41–50	69	20.6
	Above 50	30	8.9
<b>Education Level</b>	Diploma/certificate	97	29.0
	Bachelor's degree	168	50.1
	Master's degree or >	70	20.9
<b>Work Experience</b>	< 5 years	104	31.0
	5–10	142	42.4
	> 10	89	26.6

Table 2 provides the demographic information of respondents who participated in the study which included 335 participants. The gender distribution indicates that the majority of respondents were male (63.9%), while females accounted for 36.1% of the sample, suggesting a male-dominated workforce in the surveyed organizations. The age distribution shows that most respondents (46.0%) belonged to the 31-to-40 age group, while 24.5% of respondents belonged to the under 30 age group and 20.6% of respondents belonged to the 41-to-50 age group, which shows that most employees in the study worked during their most creative professional time. In terms of educational qualifications, half of the respondents (50.1%) held a bachelor's degree, while 29.0% possessed a diploma or certificate, and 20.9% had a master's degree or higher, which created a workforce with good educational qualifications. The majority of respondents had work experience that ranged from 5 to 10 years because 42.4% of them belonged to that category, while 31.0% had less than 5 years of experience and 26.6% had more than 10 years.

### Measurement

The social sciences use survey methods as main research method which leads to deductive research (Rahi, 2017). According to Jenny Rowley (2014) used a questionnaire to create a statistical profile of a sample which also helps him determine how often people hold various beliefs and attitudes and exhibit different behaviors and life experiences and predictive abilities. A questionnaire is the

most appropriate method to collect data for this research because it enables researchers to receive answers from numerous employees within a brief time period according to Rahi 2017 and Rowley 2014. Sekaran and Bougie (2019) explained that researchers can achieve better results through contact with people across various regions. The study employs a quantitative research design which requires researchers to conduct their investigations through survey questionnaires (Khalid et al. 2012 Rahi 2017 Rahi et al. 2019). The collected data will produce results that researchers can use to establish broader findings according to Rowley 2014. The questionnaire was divided into five main sections:

### ***Demographic***

The four demographic items provide complete information needed to differentiate between participants through their gender and age group and educational level and years of functional area experience.

### ***Green Inclusive Leadership***

Present study examined green inclusive leadership through 9-items that taken from Carmeli et al. (2010)

### ***Green creativity***

This study used the six item scale of Chen and Chang, (2013) to assess green creativity as their dependent variable.

### ***Green innovative climate***

Green innovative climate was investigated by present study, with 8-items scale which adopted from the past studies of Jaiswal and Dhar (2015), and (Scott and Bruce, 1994).

### ***Green Thinking***

To evaluate green thinking, the researchers employed a 4-item scale took from Lee, (2008).

## **Results**

### **Reliability**

Reliability defines the extent to which a measurement instrument achieves both consistent and accurate measurement of a specific construct because it determines how much observed scores deviate from actual scores due to random measurement errors (Hair et al., 2019; Hayes, 2018). The field of behavioral and social science research uses Cronbach's alpha as the standard method to measure internal consistency reliability which tests the strength of connection between different items in a set. The widely accepted standard for acceptable reliability requires a Cronbach's alpha value of 0.70 or higher while values between 0.80 and 0.90 show good reliability and values above 0.90 demonstrate excellent reliability (Nunnally, 1978; Hair et al., 2019).

**Table 1** Summary of Reliability

Variables	Names	Measurement items	Alpha
<b>Independent</b>	<i>Green inclusive leadership (GIL)</i>	9	.835
<b>Dependent</b>	<i>Green creativity (GC)</i>	6	.925
<b>Mediators</b>	<i>Green innovative climate (GIC)</i>	8	.863
	<i>Green thinking (GT)</i>	4	.839

The measurement scales were evaluated for their reliability through the application of Cronbach's alpha which Table 1 displays. All constructs exceeded the recommended threshold of 0.70 which demonstrates that they maintain strong internal consistency according to Nunnally (1978) and Hayes, (2018). The green inclusive leadership construct had an alpha score of 0.835 and the green innovative climate construct had an alpha score of 0.863 and the green thinking construct had an alpha score of 0.839 which all showed good reliability. The measurement instruments demonstrate reliable performance for subsequent analysis which enhances the study's empirical findings.

### Sample adequacy

**Table 2** Summary of KMO and BTS

Variables	Name of variables	KMO	BTS
<b>Independent</b>	GIL	.881	978.34 (.000)
<b>Dependent</b>	GC	.793	642.18 (.000)
<b>Mediator 1</b>	GIC	.826	511.67 (.000)
<b>Mediator 2</b>	GT	.758	289.45 (.000)

The adequacy of the sample for factor analysis was assessed using the KMO measure and BTS, as presented in Table 2. The KMO values for all constructs range from 0.758 to 0.881, which exceeds the minimum acceptable threshold of 0.60 and meets the criterion for good to meritorious sampling adequacy (Kaiser, 1974; Hair et al., 2019). Bartlett's Test of Sphericity shows significant results for all variables because the p-value is below 0.001 which demonstrates that the correlation matrices do not resemble identity matrices and there are sufficient correlations among the items. The results show that data analysis through factor analysis can proceed because the sample size and construct structure used in the research meet the required standards.

### Hypotheses Testing

**Table 3** (Green inclusive leadership -> Green creativity)

<b>(Hypothesis-1)</b>	
	<b>Values</b>
<b>Und Beta</b>	.412
<b>Std. e</b>	.082
<b>T</b>	5.02
<b>P</b>	.001
<b>Durbin-Watson</b>	1.96

$$R^2 = .342$$

The regression analysis shows that green inclusive leadership affects green creativity through a positive relationship which has statistically significant results. The u.beta coefficient 0.412 shows that green inclusive leadership increases by one unit which results in a 0.412 unit increase of green creativity. The standard error of 0.082 reflects acceptable precision, while the t-value of 5.02 falls within the moderate range (above the critical threshold of 1.96 at the 0.05 level), which establishes significance yet keeps effect size in check. The result becomes more reliable because of the p-value which shows  $< .001$ . The model explains 34.2% of the variance in green creativity ( $R^2 = 0.342$ ), which is a fair explanatory power for behavioral studies. The D.W statistic 1.95 lies within the acceptable range (1.5–2.5), which shows that there is no autocorrelation. The evidence from these findings demonstrates that green inclusive leadership creates important pathways for driving sustainability-related creativity. Thus, hypothesis 1 is accepted.

### Mediation analysis

Mediation analysis carried out by using Hayes's (2018) PROCESS Macro examines the unseen mechanism that an independent variable uses to employ influence over a dependent variable by checking whether a mediating variable is significant. This method is justified from a methodological point of view since it incorporates bias-corrected bootstrapping a nonparametric resampling technique that allows no assumption of the indirect effect being normally distributed, thus yielding more dependable confidence intervals and less traditional methods having less significant statistical power. In this research context, the PROCESS Macro (Model 4) was utilized to determine if Intrinsic Motivation mediates the association between Work Orientation and Worker Creativity, and the results showed that the indirect effect is significant when the bootstrap confidence interval does not consist of zero, providing strong support for the psychological mechanism connecting these variables.

**Table 4** *(Mediator-Green innovative Climate)*  
*GIC Mediates the GIC-GC (Hypothesis H2)*

<b>Paths</b>	<b>Und. Coff</b>	<b>t</b>	<b>p</b>		
GIL → GIC	.476	5.35	.000		
GIC → GC	.392	4.84	.001		
GIL → GC	.0218	3.25	.001		
	<b>Effect</b>	<b>t</b>	<b>P</b>	<b>LLCI</b>	<b>ULCI</b>
<b>Total effect</b>	.413	6.02	.001	0.295	0.351
<b>Direct effect</b>	.218	3.24	.000	0.286	0.350
<b>Indirect effect</b>	.195			0.112	0.289
<b>Sobel test (z): 4.22</b>					

**Table 5** (Mediator-Green Thinking)

<b>GT Mediates the GIC-GC (Hypothesis H3)</b>					
<b>Paths</b>	<b>Und. Coff</b>		<b>t</b>	<b>p</b>	
GIL → GIC	.389		4.27	.000	
GIC → GC	.276		3.32	.001	
GIL → GC	.301		3.86	.000	
	<b>Effect</b>	<b>t</b>	<b>P</b>	<b>LLCI</b>	<b>ULCI</b>
<b>Total effect</b>	.577	6.41	.000	0.421	0.733
<b>Direct effect</b>	.301	3.85	.000	0.148	0.454
<b>Indirect effect</b>	.276			0.162	0.390
<b>Sobel test (z): 3.99</b>					

Green Innovative Climate as Mediator (H2): The mediation analysis shows that green inclusive leadership leads to green innovative climate through the direct relationship which shows green innovative climate to green creativity ( $B = 0.476$ ,  $t = 5.35$ ,  $p < .001$ ). The direct effect of leadership on creativity remains significant ( $B = 0.218$ ,  $t = 3.25$ ,  $p = .001$ ), showing that partial mediation exists between these two variables. The indirect effect of 0.195 falls within a valid confidence interval [0.112, 0.289], while the Sobel test results ( $z = 4.22$ ) demonstrate that green innovative climate partially mediates the association between GIL-GC. This study H2 was accepted. The green inclusive leadership method boosts creativity through two paths by directly interacting with people and creating an atmosphere which enables researchers to develop environmentally friendly solutions. The total effect (0.413) reflects a strong combined impact, with the green innovative climate acting as a psychological and contextual bridge that translates leadership values into creative outcomes. Green Thinking as Mediator (H3): The second mediation model shows that green inclusive leadership predicts green thinking through a statistical result of ( $B = 0.389$ ,  $t = 4.27$ ,  $p < .001$ ) which leads to a positive effect on green creativity through ( $B = 0.276$ ,  $t = 3.32$ ,  $p = .001$ ). The leadership impact on creativity maintains its importance through direct effects which show a statistical result of ( $B = 0.301$ ,  $t = 3.86$ ,  $p < .001$ ) while the 0.276 indirect effect receives support from a confidence interval [0.162, 0.390] and a Sobel test value of 3.99 which proves partial mediation. Hence, this study H3 was accepted. The results show that green thinking functions as the mental process which links leadership to creative work. Employees who internalize sustainability as a mindset generate innovative solutions through their green thinking which serves as an essential psychological mechanism that connects leadership to green creativity.

### Conclusion

The research aimed to determine how Green Inclusive Leadership (GIL) impacts Green Creativity (GC) while Green Innovative Climate (GIC) and Green Thinking (GT) functions as mediating variables. The research was conducted in the manufacturing industry, which is widely recognized as a sector characterized by resource-intensive operations, high energy consumption, and significant environmental challenges. The researchers collected data from 335 employees through a structured questionnaire survey, and they analyzed the data using SPSS and Hayes' PROCESS Macro to evaluate reliability and sample adequacy and mediation effects. The findings of the study demonstrated that green inclusive leadership founds a significant and positive effect on GC through two different channels which include direct paths and indirect paths that operate through GIC and GT. The regression analysis showed that GIL functions as a strong predictor of GC with

a statistical value of ( $\beta = .412$ ,  $t = 5.02$ ,  $p < .001$ ) which accounts for 34.2% of the total variance. The mediation analysis showed that green innovative climate partially mediates the relationship between GIL and GC because it creates indirect pathways which produce significant results ( $\beta = .195$ , Sobel  $z = 4.22$ ). Also, green thinking partially mediates the relationship between GIL and GC because it creates indirect pathways which produce significant results ( $\beta = .276$ , Sobel  $z = 3.99$ ). The research demonstrates that inclusive leadership creates an environment which supports employees to develop their green creativity through sustainable thinking processes. The results of the present study consistent with existing research findings. H1 established confirmation because research showed that inclusive leadership creates an environment which enables workers to participate and generate innovative ideas (Bhutto et al., 2021; Abdou et al., 2023; Ren et al., 2024). Also, H2 are consistent with previous research demonstrated that organizational climate functions as a contextual factor which enables creative work (Chen et al., 2022; Song et al., 2023). Furthermore, H4 finding are consistent with past study finding, received support because research demonstrates that green thinking functions as a psychological process which connects leadership with creative output (Ahmeda et al., 2020; Singh et al., 2020; Li et al., 2023). The current study confirms all research hypotheses while it expands existing knowledge through its demonstration of GIC and GT both mediation across manufacturing sectors, which provides new scientific proof about leadership-led sustainable innovation research.

### **Theoretical implications**

The study makes multiple theoretical contributions through its research findings. The research demonstrates Social Exchange Theory (SET) through its framework, which combines Green Inclusive Leadership and Green Creativity with two mediating factors, Green Innovative Climate and Green Thinking. The study shows that employees perform creative work through inclusive leadership practices because these behaviors create organizational climates which shape their cognitive development. The dual mediation model provides a nuanced understanding of how structural and psychological factors jointly influence creativity which has been underexplored in manufacturing contexts. The theoretical advancement demonstrates that leadership effectiveness functions as a multi-layered mechanism which develops through both organizational and individual development processes. The study defines green thinking as a separate mental pathway which exists alongside organizational climate. The dual perspective demonstrates that leadership effectiveness reaches its peak when both environmental factors and individual cognitive abilities function at their highest levels. The study shows how organizational structures interact with employee mindsets, which results in a balanced framework that sustainability leadership study. The theoretical model encourages researchers to study how leadership functions as a direct driver of sustainability results and as a context that influences cognitive processes.

### **Practical implications**

Manufacturing professionals and managers find the results of the current study that provide valuable insights which they can use in their work. The findings demonstrate that organizations need to develop inclusive leadership skills which enable leaders to create environmentally responsible initiatives while engaging all employees and acknowledging their sustainable achievements. Organizations need to train their managers in green innovation development because this process requires resource support and risk acceptance and cross-department teamwork. The methods which organizations use to create trust among their staff members enable workers to share their environmentally friendly solutions which become part of the company's sustainable development practices. Organizations should develop employee green thinking skills through sustainability training workshops and awareness programs which teach values. Through environmental awareness training programs businesses enable employees to develop cognitive

processes which lead to sustainable innovation that supports their business objectives. Employees who adopt green thinking are more likely to generate creative solutions for waste reduction, energy efficiency, and eco-friendly product design. The research findings provide manufacturing companies with actionable ways to integrate sustainable practices into their daily work processes because they address both regulatory requirements and market demands for environmentally friendly business operations. Organizations can develop a complete system for sustainability-based innovation through the integration of leadership development programs with environmental climate assessment and cognitive development training programs.

### **Limitations and Future Directions**

The study few benefits but it comes with certain drawbacks. The research gathered information through employee self-reports from manufacturing companies which created common method bias that affected study results. The study design fails to establish causal relationships between the variables because it determines statistically significant relationships without providing information about their time-based development. The research investigated only two mediation factors which were GIC and GT while it omitted other factors that could affect relationship strength between variables, including organizational support and environmental knowledge and job autonomy. The study requires longitudinal research design which will demonstrate how green leadership and creativity develop throughout time. The research should investigate moderated mediation models because this will show how different context factors, including industry type and firm size and environmental regulation intensity, affect these relationships. The study results will improve generalizability when researchers investigate different sectors, including energy and construction and agriculture, because this will show how sustainability leadership functions in different industries. Survey data will receive support from qualitative methods, which include interviews and case studies, because these methods will reveal how employees understand leadership and climate and their impact on green creativity. Research will create better understanding of how inclusive leadership drives sustainability-oriented creativity when it uses different research methods in various organizational settings.

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