



## Antecedents of Green Innovation among SMEs in Ghana: The Moderating Role of Organizational Green Core Competence

Lydia Asare Kyire<sup>1</sup>, Owusu Ackah<sup>2\*</sup>, Eugene Owusu Acheampong<sup>3</sup>, Mawutor Humphrey Ackumey Korda<sup>4</sup>

<sup>1</sup>Department of Entrepreneurship and Finance, Kumasi Technical University, Kumasi, Ghana.

<sup>2</sup>Department of Management and Administration, Accra Technical University, Accra, Ghana.

<sup>3</sup>Department of Management and Administration, Cape Coast Technical University, Cape Coast, Ghana.

<sup>4</sup>Department of Built Environment, University of Environmental and Sustainable Development Somanya, Somanya, Ghana.

### ABSTRACT

The drive toward sustainable production and consumption has gained momentum among academics, policymakers, and industry practitioners. A critical factor in this sustainability match is the recycling entrepreneur/firm. This study explores both internal and external factors that impact the green innovation performance of small and medium enterprises using a resource-based view as a theoretical lens. The study examines the relationship between stakeholder sustainability pressure, sustainability identity, green creativity, green core competence, and green innovation performance. Specifically, we examine the causal effects of stakeholder sustainability pressure and sustainability identity on green creativity and then the effect of green creativity on green product and process innovation performance. Furthermore, the moderation role of green core competence is assessed in the link between green creativity and green innovation performance. Data were collected from respondents in the landscape in Ghana. The result of the empirical analyses indicates that sustainability pressures have a significant impact on SMEs organizations' green creativity. Conversely, sustainability identity does not influence the green creativity of SMEs organizations. In furtherance, green creativity is found to influence green processes and product innovation of SMEs firms in the sustainability ecosystem. In addition, green core competence has a significant influence on the green process and product innovation performance of firms. However, the moderating effect of green core competence is weak and quite insignificant.

**Keywords:** Sustainability pressures, Sustainability identity, Green creativity, Green core competent, Green innovation performance

**Corresponding author:** Owusu Ackah

**e-mail** ✉ [ackahowusu@yahoo.com](mailto:ackahowusu@yahoo.com)

**Received:** 25 June 2023

**Accepted:** 14 September 2023

### INTRODUCTION

To thrive in the current competitive business environment, it is imperative organizations enact and maintain sustainability practices. Sustainability practices require auspicious use of resources without causing harm to future generations. The shift to a sustainability paradigm is influenced by diverse factors, including pressures from regulatory bodies, communities, and customer demand for environmentally friendly products and services (Singh *et al.*, 2020; Achi *et al.*, 2022). The quest for sustainability has birthed new avenues for enterprise development, such as green-oriented small and medium enterprises (SMEs) aimed at offering services and products by recollecting, rebuilding, and repurposing waste matter in communities. That is, these enterprises are mostly concerned with the successful SMEs and the reuse of waste products (Simpson & Radford, 2012).

Pressures on SMEs are nowadays influencing organizations' strategic and tactical approaches. Organizations

are under constant pressure to mitigate the extent to which their products and services negatively affect the environment and society. In addition, economic pressures serve as an underlying factor contributing to SMEs' sustainable behavior and practice. However, inasmuch as recycling enterprises have the potential to ensure industrial sectors achieve their sustainability goals, the activities of such enterprises are at a nascent stage (Fan *et al.*, 2023).

For instance, the recycling landscape involved in the championing of sustainable practices is dominated by a few large enterprises and, in recent times, some start-up entities. Surviving in the recycling sector requires the utilization of superior technology and innovation. Converting waste into usable products requires firms to shift from a conventional form of innovation to sustainable/green innovation. Green innovation is defined as a process where sustainability dimensions such as environmental, social, and financial aspects are integrated into an organization's system from idea generation through to research and development and commercialization (Awan *et al.*, 2023). Green innovation is categorized into two distinct forms – green product innovation and green process innovation.

Studies in the domain of sustainability have attempted to

establish a relationship between green innovation and the performance of firms, but limited attention has been paid to enterprises in the recycling sector (Baeshen *et al.*, 2021). The recycling sector plays a crucial role in the quest to achieve high sustainability standards and outcomes. However, there is a dearth of literature providing a nuanced understanding of the factors that influence green innovation in such a business landscape. The lack of consensus on the underlying factors that influence green product innovation and green process innovation limits insights into how recycling enterprises gain and maintain competitive advantage.

To address this gap in the literature, the study attempts to unearth the influencing factor that shapes green innovation (i.e., green product and process innovation) in the recycling sector. Relying on resource-based theory and social capital theory, the study explores both internal and external factors that impact the green innovation performance of enterprises. The study examines how recycling pressures from stakeholders and the sustainability identity of an organization affect green innovation. Corporate image contributes significantly to the reputation of a firm and further steers the activities of such an entity. Enterprises with green orientation happen to enact and institute measures that are fashioned towards the achievement of enterprise green goals (Nasrollahi *et al.*, 2020). Notwithstanding, these studies fail to elucidate how corporate green image impacts an organization's green creativity and furthers its green product and process innovation. External pressures and the sustainability identity of an organization shape its activities. However, these factors partially influence the success of green innovation (Cao & Chen, 2019). To derive superior benefits from these factors, firms should endeavor to integrate these sustainability factors into its corporate core values and beliefs. Hence, this would shape the orientation of the firm and further steer the creativity of teams into the design and production of environmentally friendly products and processes. The study conceptualizes that a high level of green innovation performance can only be achieved when entities cultivate and sustain a superior level of green creativity competence. Possessing superior green creativity competence would contribute significantly to the success of green product and process innovation (Khan *et al.*, 2022).

Conversely, green creativity does not impact the outcome of green processes and green product innovation under every circumstance (Yahya *et al.*, 2021). The limitation of previous studies is their inability to consider the green competence level of an organization and how it impacts the relationship between green creativity and green innovation performance. The study argues that organizations with superior green core competence stand the chance to enrich its green creativity and further impact dimensions of green innovation performance and vice versa. The remainder of the study is arranged as follows: section 2 focuses on the theoretical background and hypotheses development, section 3 presents the research method utilized for the study, and Section 4 elaborates on empirical findings and discussion of the study. The managerial implications are further discussed in section 4, while section 5 presents the conclusion of the study.

#### *Theoretical background and hypothesis*

##### *Sustainability pressure and green creativity*

In recent decades, there has been an increasing depletion of global resource stockpiles (Imran *et al.*, 2021). The decrease is mainly the result of hazardous business practices that affect both the natural and socio-cultural environment. For instance, the increase in the usage of fossil fuels in industries has contributed significantly to the unhealthy atmospheric environment of China in past decades. In most resource-rich developing countries, irresponsible mining activities have contributed to an increase in greenhouse gas emissions (Walker & Brammer, 2012). These activities have attracted the attention of governments, multilateral agencies, societies, and customers – demanding proper conduct of activities of enterprises in a manner that is friendly to the environment and society. Such demand from these stakeholders seeks to encourage organizations to move ahead of the financial bottom line to an inclusive approach that seeks to balance the economic, social, and environmental impact of business activities (Lee *et al.*, 2014).

Pressures from stakeholders' attempts to encourage organizations to design specific actions and policies to enhance the welfare of various groups by accounting for the triple bottom line of economic, social, and environmental performance have taken lives of their own, and firms have no option than to respond (Irani & Kilic, 2022). In most cases, the government's environmental regulations are designed to influence the green behavior of enterprises. To gain or increase access to government incentives, firms tend to re-position their activities to align with the broad sustainability demands of regulatory authorities (Eiadat *et al.*, 2008). These regulatory policies and incentives shape the sustainability behavior of enterprises – prompt organizations to acquire new skills and further enact deliberate strategies to gain the support of management. Gaining the support of management enables a firm to align its resources and human capital with the development of novel products and services that are environmentally friendly (Su *et al.*, 2020). In addition, firms can only achieve this feat by ensuring that team creativity is reconfigured to integrate green values and beliefs. By so doing, these value systems would enrich the firm's green creativity competence.

Moreover, stakeholder pressures provide a unique platform for organizations to reconfigure and align operations to fit into the sustainability agenda. Essentially, these pressures hold the power to alter the relationship between an organization and external stakeholders. Achieving a high level of sustainability performance requires impetus from both internal and external stakeholders. However, firms cannot gain a positive impact from the acquisition of this external knowledge unless it is able to strengthen its internal creative processes. Boosting internal absorptive capability and competence would positively impact the creativity of employees in a sustainable way (Rubashkina *et al.*, 2015). The study contends that there is a positive relationship between stakeholder sustainability pressures and firm green creativity performance. Based on this, hypothesis 1 is stated:

*H1: Stakeholder sustainability pressure has a positive association with an organization's green creativity.*

##### *Sustainability identity and green creativity*

Drawing lessons from the findings of studies in the scope of green innovation suggests that an individual's positive self-

concept is enriched when they feel membership with a specific group or organization. It further argues that positive self-identity is attained when employees' identity aligns with the group's core beliefs and values (Iqbal et al., 2021; Yahya et al., 2021). Placing significant emphasis on the core values and beliefs of an organization offers the leverage to attract and maintain superior human capital. Tyler and Blader (2001) documented that individuals prefer to be part of an organization that shares a high corporate reputation and vice versa.

To drive the sustainability agenda – organizations need to implement deliberate green strategies and policies that enhance the green image of the organization. Sustainability practices should be enshrined as core values and beliefs of such entities (Qu et al., 2022; Wang et al., 2022). The sustainability identity of an organization is central to its core beliefs and values. Placing emphasis on green beliefs and values would serve as a platform to enhance the sustainability identity of the organization (Carmeli & Dothan, 2017). Sustainability identity can be classified as an interpretive scheme of firm environmental protection that organizational members collectively possess to enhance its corporate green image and reputation (Chen, 2011). Implementing green strategies that influence the sustainability behavior and identity of employees happens to shape employees' cognitive and physiological model toward the greater efforts to bring forth novel ideals and approaches (Yousaf, 2021; Guo, 2022; Yu et al., 2022).

The sustainability identity of an organization positively influences the collective interpretation of issues and consequences. When organizational identity asserts itself as an environmentally friendly one, it shapes collective efforts to adopt and implement sustainability practices. In this atmosphere, the design and production of novel products are influenced by a shared sense of belief and value. Consequently, shared belief system and value influence employees' mental model towards the acquisition of new useful idea that seeks to mitigate the negative impact of organizational products on the environment and society. The continuous acquisition of green knowledge and skills enhances the green creativity of firms. In addition, the process of sustainability identity of firms makes employees share in the firm's successes and failures (Xing et al., 2019). Thus, the sustainability identity of an organization can aid in coordinating employee behavior toward the effort of cultivating new ideas, approaches, and actions that are sustainability-oriented. These efforts, we stand to argue, would enhance the green creativity of an organization. Based on this theory, the hypothesis 2 is formulated;

*H2: The sustainability identity of the organization is positively associated with green creativity.*

#### *Green creativity and green innovation performance*

The sustainability identity of a firm shapes the cognitive and behavioral attitudes of employees. Aligning employee behavior and attitude towards a firm's sustainability goals or agenda aids in shaping the green creativity of individuals. Collective efforts of employees to strengthen firms' green competitive advantage contribute to the green creativity of firms. An organization with a superior level of sustainability identity is argued to positively influence its green creativity (Song & Yu, 2018).

To curb the increasing demand and pressures from community and regulatory agencies, firms need to re-position its human capital and skills to offer novel and useful products and services

that are environmentally friendly (Shamsuzzoha et al., 2022). Re-positioning and reconfiguring organization resources and human capital can positively impact the green creativity of organizations. The Green creativity of organizations leads to superior innovation performance of firms. It does so by enabling firms to convert green human capital and green orientation into the generation and utilization of green ideas (Anik & Sulisty, 2021). The study conceptualizes that the green creativity of firms positively mediates the relationship between stakeholder pressure, sustainability identity, and green innovation performance.

Studies green creativity on green product innovation (Chen et al., 2016). However, there is limited insight into how green creativity affects the green process innovation of firms. This study seeks to resolve these inconsistencies by examining the mediating effect of these factors on green product innovation and green process innovation. In addition, the study seeks to empirically examine the mediating effect of green creativity on green product innovation and green process innovation. Previous studies consider green innovation as a one-off activity without placing emphasis on the dimensions of green innovation, such as process and product innovation. The study contributes to the existing literature by examining the mediating effect of green creativity on green processes and green product innovation performance. The hypotheses below are formulated to test these assumptions. The hypotheses below are formulated to test these assumptions.

*H3: Green creativity of the organization positively impacts the firm's green process innovation.*

*H4: Green creativity of the organization positively impacts the firm's green product innovation.*

#### *Moderating effect of green core competence on green creativity and green innovation performance*

The green creativity of an organization contributes to the superior innovation performance of firms. For firms to gain superior creativity requires the need for highly creative individuals coupled with prudent management practices (Ahmad et al., 2022). Green creativity of an organization enhances the innovation performance of a firm by influencing the creativity orientation of the firm (Anik & Sulisty, 2021). Although green creativity impacts green innovation performance, significant emphasis is placed on green product innovation as against green process innovation (Chen et al., 2008; 2016). Green core competence is acknowledged to have an impact on the green innovation performance of firms. However, some firms turn to gain superior outcomes as compared with their competitors (Chen et al., 2016). Investment in green creativity is highlighted to influence the outcome of green process innovation and green product innovation. In spite of this, there are limited studies providing insights into factors that influence the relationship between green creativity, green process, and green product innovation performance.

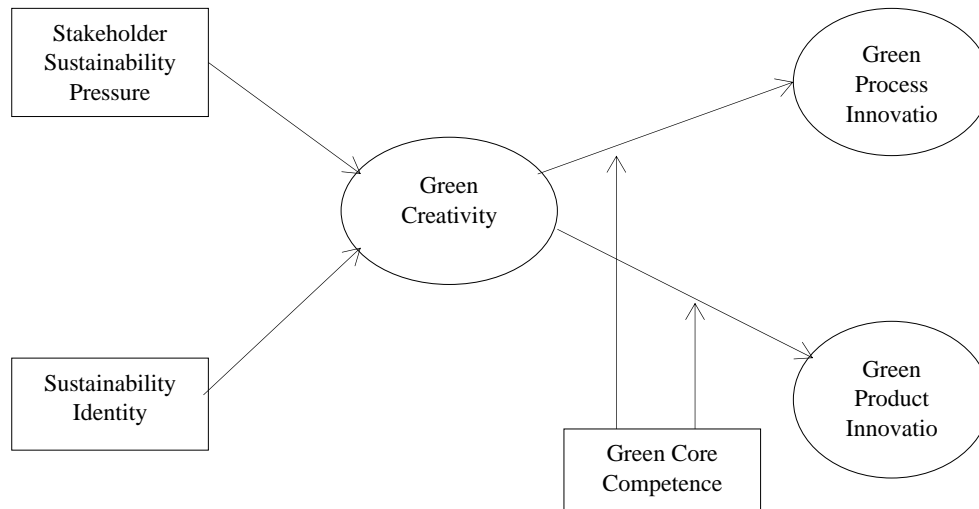
The green creativity of a firm results in the creation of competence in the design and deployment of environmentally friendly products and services. These green core competencies, in turn, provide a firm with the relevant leverage to outperform its competitors (Qu et al., 2022). To enrich the green innovation outcome of firms, this study attempts to examine how the green core competence of an entity moderates the relationship

between green creativity and green innovation performance. The study argues that organizations with high green core competencies have a high propensity to enrich the outcome between green creativity, green product innovation, and green process innovation. In furtherance, firms with green core competence are able to meet market demands – enterprises with core competence in green creativity (i.e., green manufacturing and production) are able to meet the green demand from customers and society holistically. As elaborated in the innovation literature, the core competence of an organization plays a crucial role in innovation performance and

competitive advantage development (Nasrollahi et al., 2020; Anik & Sulisty, 2021). Drawing lessons from innovation management literature, entities with superior green core competence possess the capabilities to integrate sustainability creativity practices into its organizational processes, product design, and commercialization phases. Based on the above, the hypotheses 5a and 5b are formulated:

*H5: Green core competence positively moderates the impact of green creativity on green process innovation.*

*H6: Green core competence positively moderates the impact of green creativity on green product innovation.*



**Figure 1.** Conceptual Model

## MATERIALS AND METHODS

The research method of the study is discussed in terms of data collection, variable measurement, and common method bias assessment.

### Data collection

The study utilizes correlational design to examine the relationship between stakeholder sustainability pressure, sustainability identity, green creativity, green core competence, and green innovation performance. It examines the causal effect of these variables on green processes and green product innovation performance.

To examine the conceptual model and the stated hypotheses, a survey instrument was designed, and synthesizing scales developed measurement scales from management and business literature. The draft questionnaire was constructed, and content validity was examined and improved with the aid of four (4) academics and four (4) industrial experts. The questionnaire was revised and used to test the stated hypotheses. The questionnaire elicits information on the informant's attitude and perception about the influencers of green creativity and its impact on the firm green process and green product innovation performance. It further ascertains the moderating effect of green core competencies of an organization.

To conduct the study, the target population was drawn to consist of employees and managers, both middle and senior

level, working in SMEs that are into recycling waste and sale of green products. These individuals, over the period, have adopted green innovation practices and strategies. The targeted population is considered knowledgeable about the processes and mechanisms involved in the adoption and utilization of green practices and strategies. A convenience sampling approach was utilized in sample identification and data collection. Most of the potential respondents were contacted personally to participate in the survey. Two hundred and fifty (250) questionnaires were distributed to potential respondents with cover letters guaranteeing the anonymity of answers and personality. The cover letter attached provided insights into the objectives of the study. Emphasizing the anonymity of respondents in the cover letter was to ensure social desirability bias is reduced to the barest minimum. This is an acceptable approach, especially in the area of sustainable development and green innovation performance (Roxas & Lindsay, 2012). Out of the 250 questionnaires, the study attained a response rate of 52%, translating into 130 answered questionnaires.

Non-response bias was examined by contacting most of the respondents to solicit reasons for not participating in the study. Reasons provided by respondents included lack of knowledge on the subject matter, disrupted and busy work schedule, and lastly, the issue of COVID-19 prevented most employees from gaining access to the workplace, preventing them from providing answers to questionnaire items. It became apparent that because most SMEs and green enterprises are small and

medium enterprises, they lacked the requisite technological infrastructure to support a remote work environment. The chi-square test was conducted to examine the non-response bias by comparing responses between early respondents and late respondents. The outcome was not significant, signifying and further providing evidence to support non-response bias.

#### Measures

In all, thirty-three questionnaire items, excluding the section on respondents' demographics. The questionnaire covered all the variables stated in the conceptual model of the study. The questionnaire items covered areas such as green creativity, green core competencies, stakeholder sustainability pressures, sustainability identity, green process, and green product innovation performance.

Green creativity is measured as the organizational ability and capabilities to develop and commercialize green and sustainable products. The measurement items for green creativity were adopted from studies conducted by Barczak *et al.* (2010) and Chen and Chang (2013). These measurement scales covered six items.

Green core competence measures the environmental and sustainability technical know-how of an organization. These comprised five items selected from a study conducted by Chen (2007). The capabilities and competence of a firm arguably have an impact on the innovation process and performance of firms. In addition, pressures from diverse stakeholders in both the micro and macro environment of firms contribute to their innovation process and performance. Stakeholder sustainability pressure examines how stakeholders influence organizations to adopt environmentally friendly practices. Measurement items for this construct were selected from studies conducted by Stevens *et al.* (2005) and Wuyts and Geyskens, (2005).

Sustainability identity measures an organization's social goals, objectives, and mission. It is argued that the identity of an organization, to some degree, aids in shaping the functional activities and processes of such an entity. Sustainability identity is measured using six (6) measurement items selected from Thong and Wong, (2018).

The dependent variables – green process innovation performance and green product innovation performance were measured using items from Chen *et al.* (2006). In addition, some items were selected from Chang (2011). It measured resource allocation and how organizations optimize processes to achieve sustainability objectives and goals.

#### Data analyses

The conceptual relationship elaborated in (Figure 1) is analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM) using the SmartPLS 3 software. The PLS-SEM method is used against the traditional covariance-based technique. The study utilized PLS-SEM techniques because the sample and data size followed the outline and procedure outlined by Kline (2012). The PLS-SEM approach is relevant in the estimating of a complex, hierarchical model representing the credibility and methodology of soft modeling assumptions (Fosso, Wambas, *et al.*, 2015; Dubey *et al.*, 2017). Initial descriptive statistics and profiles of respondents were provided. The sample comprises 72% male and 28% female, respectively. The average respondent had a bachelor's degree. A percentage of 21 had a master's degree. In addition,

organizations sampled, on average, employed over 100 employees.

The descriptive statistics consisted of the mean, standard deviation, excess kurtosis, and skewness (Table 1). Inference suggests the data distribution was normal and not entangled in excess outliers.

**Table 1.** Descriptive Statistics

Variables	Mean	Standard Deviation	Excess Kurtosis	Skewness
SSP1	5.010	1.556	0.179	-0.737
SSP2	4.514	1.633	0.232	-0.576
SSP3	4.495	1.451	-0.163	-0.421
SSP4	4.536	1.894	-0.743	-0.611
SSP5	5.247	1.277	1.153	-0.719
SSP6	5.330	1.137	0.150	-0.339
SSP7	5.549	1.037	-0.486	-0.212
SSP8	5.521	1.160	1.557	-0.516
SI1	5.031	1.453	1.412	-1.119
SI2	4.918	1.397	1.169	-0.910
SI3	5.268	1.328	1.299	-1.084
SI4	5.649	1.340	1.908	-0.934
SI5	5.588	1.191	1.041	-0.863
SI6	4.969	1.439	0.182	-0.598
GC1	5.010	1.550	0.179	-0.734
GC2	4.804	1.629	0.249	-0.565
GC3	4.505	1.451	-0.150	-0.442
GC4	5.649	1.046	0.633	-0.625
GC5	5.340	1.192	0.362	-0.392
GC6	5.474	1.066	-0.458	-0.269
GCC1	5.216	1.160	1.557	-0.596
GCC2	5.021	1.457	1.337	-1.092
GCC3	4.897	1.140	0.993	-0.867
GCC4	5.256	1.341	1.758	-0.927
GCC5	5.649	1.340	1.299	-1.089
GPI1	5.588	1.191	1.041	-0.803
GPI2	4.969	1.439	0.182	-0.898
GPI3	4.969	1.608	0.113	-0.749
GPI4	4.773	1.653	0.103	-0.535
GIP1	4.474	1.477	-0.262	-0.412
GIP2	5.670	1.073	0.685	-0.566
GIP3	5.38	1.113	0.436	-0.401
GIP4	5.093	1.119	-0.080	-0.589

In applying the PLS-SEM techniques, it is imperative to examine the validation of the outer model. Validating the outer model provided the basis for examining the inner model. Validating the outer model consists of determining the convergent and discriminant validity and reliability of constructs (Wetzels *et al.*,

2009). Once the model is validated, the inner model is fitted by calculating the path coefficients. In addition, the bootstrap test was conducted to examine the significance of conceptual relationships. The outcome of the outer model is presented in (Table 2). The outer model explored factor analyses of the indicators of the latent variables. Also, the average variance

extracted and the Cronbach reliability test are presented. The outcome indicates latent variables are reliable and valid. Judging by the factor loading, it can be seen that all the variables had an acceptable threshold, as proposed by Hair *et al.* (2014). The average variance extracted (AVE) values showed that the indicators can explain the variance of the construct above 50%.

**Table 2.** Measurement Model Evaluation

Variables	Loading	Alpha	Average Variance Extracted
<b>Stakeholder Sustainability Pressure</b>			
1. Media	0.769		
2. Civil Society Organizations	0.801		
3. Community demand and resident pressure	0.780		
4. Our organization works intensively with environmental advisors	0.667		
5. Our organization has a close relationship with one or more environmental organizations	0.628	0.825	0.548
6. Our organization has a collaborative relationship in the environment with third parties, like a real team	0.635		
7. Our supply chains collaborate with societal groups in the field of environment	0.641		
8. Our organization is involved in environmental projects in which several groups from society participate.	0.728		
<b>Sustainability Identify</b>			
1. The company's employees are proud of the company's history of social management and protection	0.872		
2. The company has a sense of pride about the company's social goals and missions	0.898		
3. The company has carved out a significant position concerning social management and protection	0.779	0.745	0.590
4. The company has formulated a well-defined set of social goals and missions	0.634		
5. The company's employees are knowledgeable about the company's social traditions and cultures	0.818		
6. The company pays very close attention to social management and protection	0.628		
<b>Green Creativity</b>			
1. Members of the green product development project propose new green ideas to improve environmental performance	0.796		
2. Members of the green product development project suggest new ways to achieve environmental goals	0.892		
3. Members of the green product development project promote and champion new green ideas to others	0.886	0.825	0.614
4. Members of the green product development project develop adequate plans for the implementation of new green ideas	0.726		
5. Members of the green product development project would rethink new green ideas	0.813		
6. Members of the green product development project would find creative solutions to environmental problems	0.639		
<b>Green Core Competence</b>			
1. The environmental capabilities, technologies, or know-how of the firm are rare in the marketplace	0.743		
2. The environmental capabilities, technologies, or know-how of the firm are less imitable by competitors	0.841	0.772	0.632
3. The environmental capabilities, technologies, or know-how of the firm are difficult to be substituted	0.876		
4. The environmental capabilities, technologies, or know-how of the firm provide potential access to meet a wide variety of environmental needs of markets	0.734		

5. The environmental capabilities, technologies, or know-how of the firm make environmental contributions to customer benefits	0.705		
<b>Green Process Innovation</b>			
1. The manufacturing process of the company effectively reduces the emission of hazardous substances or waste	0.629		
2. The manufacturing process of the company SMess waste and emission that allow them to be treated and reused	0.639	0.790	0.515
3. The manufacturing process of the company reduces the consumption of water, electricity, coal or oil			
4. The manufacturing process of the company reduces the use of raw materials	0.862		
<b>Green Product Innovation</b>			
1. The company chooses the materials of the product that produce the least amount of pollution for conducting the product development or design.	0.908		
2. The company chooses the materials of the product that consume the least amount of energy and resources for conducting the product development or design	0.772		
3. The company uses the fewest amount of materials to comprise the product for conducting the product development or design	0.617	0.741	0.729
4. The company would circumspectly deliberate whether the product is easy to SMEs, reuse, and decompose for conducting the product development or design	0.840		

Furthermore, a construct discriminant validity test was conducted using the Heterotrait Monotrait ratio approach. The outcome of the HTMT test is presented in (Table 3). The outcome indicated the outer model is valid. Therefore, further analysis can be conducted to ascertain the relationship between the variables under study. The outcome of the discriminant validity demonstrates that the average variance extracted from any construct and its indicator is greater than any of the shared variance with other constructs (Fornell & Larcker, 1981).

**Table 3.** Discriminant Validity – Heterotrait – Monotrait Ratio

Variables	1	2	3	4	5	6
1. Green Creativity						
2. Green Process Innovation	0.718					
3. Green Product Innovation	0.698	0.763				
4. Green Core Competence	0.687	0.761	0.783			
5. Stakeholder Sustainability Pressures	0.760	0.645	0.791	0.618		
6. Sustainability Identity	0.841	0.538	0.785	0.808	0.754	

*Model analysis*

The next step after examining the reliability and validity of data was to examine the structural relationship between constructs and green process and product innovation performance. Correlation analysis was conducted to ascertain the relationship between latent variables under study. Although correlation

does not equal causation, it does provide insights into the characteristics of data and further ascertain if issues of multicollinearity are present. The outcome of the test indicated some degree of relationship between constructs and green process innovation performance and green product innovation performance, respectively. The outcome of the correlation analysis is presented in (Table 4).

**Table 4.** Correlation Analyses

Variables	1	2	3	4	5	6
1. Green Creativity	.480	.385**	.515	.486	.239	
2. Green Process Innovation		.294*	.341	.385*	.499***	
3. Green Product Innovation			.567*	.387	.435	
4. Green Core Competence				.279**	.518	
5. Stakeholder Sustainability Pressures					.428	
6. Sustainability Identity						

In furtherance to the above, the R<sup>2</sup> value obtained showed that the independent constructs can explain an acceptable part of the variance of the dependent variables. The study obtained R<sup>2</sup> values of 0.841, 0.779, and 0.739 for green creativity, green process innovation performance, and green product innovation performance, respectively. The result obtained demonstrated that the model was in agreement with the criteria such as nomological validity posited by Chin (1998). In addition, the outcome satisfied the criteria as discussed by Chin (1998). Sustainability-oriented pressures from internal and external stakeholders of an organization have a significant influence on

the green creativity of employees. Pressures from stakeholders, in addition to shaping the mental model and attitude towards sustainability thinking, further encourage organizations to reallocate resources and align talents to address sustainability gaps. Achieving the sustainability feat of organizations requires a collective effort by ensuring talents are utilized in a proactive manner to generate and maintain the organization's core capabilities and core competencies.

Judging by the path coefficient, it is seen that sustainability identity does not play a significant role in shaping the green creativity of firms. There are different ascribed reasons for this assertion. Moreover, green creativity is found to impact the green process and product innovation performance, respectively. The path coefficient value and R<sup>2</sup> value indicate green creativity has a positive impact on the green process and product innovation performance of firms. The outcome of the inner model evaluation is presented in (Figure 2).

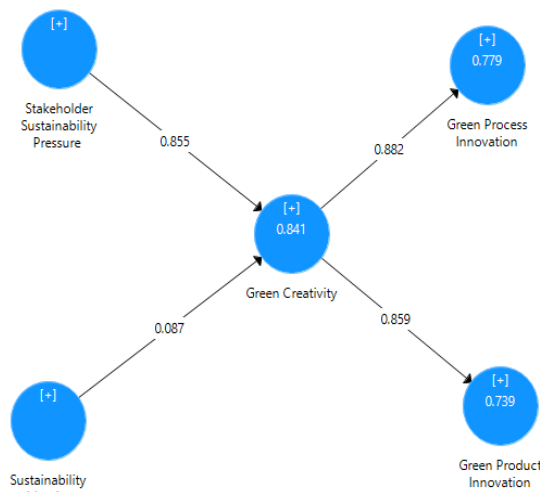


Figure 2. Structural Model

*Moderating effect*

The moderating effect of green core competencies on the relations between green creativity and green process and product innovation performance was examined using cluster analysis and bootstrapping test. The results ascertain the changes in path coefficient and R<sup>2</sup> value. Adopting these techniques to ascertain the moderating effect is acknowledged by studies conducted by DeSarbo *et al.* (1992) and Kamakura and Wedel (2000). Once the clustering is done, the bootstrap test is conducted to examine the significance of the variables. The study employed the k-means clustering method to group respondents. During the clustering analysis, each observation was assigned to a specific cluster. The ANOVA test revealed that all the measurement items contributed to differentiating the two clusters. It is worth noting that the clustering was done based on the similarities. To test the difference in path coefficient and R<sup>2</sup>, multi-group analysis and bootstrapping test were performed. The outcome of the test indicated a change in path coefficient and R<sup>2</sup> value. Green creativity had a path coefficient value of 0.878 and 0.632, with green process innovation performance and green product innovation performance, respectively. The R<sup>2</sup> value obtained was 0.834 and 0.845 for green process innovation performance and green

product innovation performance. Although there was a change in the R<sup>2</sup> value, the change was not significant. However, the outcome from the bootstrap test revealed green core competence could moderate the relationship between green creativity and green process innovation performance.

**RESULTS AND DISCUSSION**

The stated hypotheses of the study were tested using t-statistics and bootstrap tests. (Table 5) presents the outcome of the hypotheses tests. The outcome revealed the sample mean, standard deviation, t-statistics, and the p-value. The results of the hypotheses tests indicated that out of the six (6) stated hypotheses, the empirical outcome supported four (4) hypotheses. The study supports H1, H3, H4 and H5.

Table 5. Overall Results of Hypotheses Tests

Hypotheses	Sample Mean	Std Deviation	T-Statistics	P-Value
H1: Stakeholder Sustainability Pressure → Green Creativity	0.889	0.031	28.210	0.000
H2: Sustainability Identity → Green Creativity	0.087	0.072	1.217	0.224
H3: Green Creativity → Green Process Innovation	0.864	0.055	15.612	0.000
H4: Green Creativity → Green Product Innovation	0.864	0.032	26.875	0.000
H5: Green Creativity → Green Core Competence → Green Process Innovation	0.230	0.108	2.100	0.000
H6: Green Creativity → Green Core Competence → Green Product Innovation	0.012	0.050	0.328	0.743

The purpose of the study was to determine the impact of stakeholder sustainability pressures, sustainability identity, and green creativity on green process and product innovation performance. It further examined the moderating effect of green core competence. Although studies have identified some antecedents of green creativity and green innovation performance, there was still a lack of consensus on the impact of the factors on the green innovation performance of firms. A holistic model that depicted the theoretical relationship between variables was developed using scales from studies in management and sustainability literature. The proposed conceptual model was tested using data collected from a sample of 130 respondents selected from different recycling firms and green enterprises. These businesses operated mostly in the recycling and waste management sectors of the Ghanaian economy. In addressing the first question of the study depicted in the model – thus, the effect of stakeholder sustainability pressures and sustainability identity on the green creativity of the organization. The outcome of the study indicated



stakeholder pressures have an impact on the green creativity of firms. Pressures from internal and external stakeholders within the business environment of organizations indicated that the demands from civil societies and environmental advocates influence firm decisions to allocate resources to green and sustainability activities. The continuous demand by regulatory agencies for firms to adhere to environmental benchmark and standards steer firms to enact specific strategies and mechanism. The outcome of the study supports a study conducted by El Akremi (2011) that indicated that environmental regulation demand from the community and society, coupled with increasing calls for sustainable development and consumption, influences the sustainability behavior and attitude of firms. These demands encourage employees and management to reallocate and align firm resources, strategies, and talents to achieve stipulated sustainability goals and objectives. And this assertion is buttressed by Eiadat *et al.* (2008).

The identity of an organization, in most cases, dictates the functional activities and values of such an entity. The sustainability identity of the organization is posited to influence the firm's green creativity (Chen, 2011). However, the outcome of the study revealed a contradicting outcome. The outcome showed that sustainability identity had no significant impact on the green creativity of firms. Sustainability identity is documented not to impact the green creativity of firms. The rationale for such an assertion can be attributed to the size and age of the firms under consideration. Most of these enterprises were small and medium and, in some cases, start-ups that lacked the requisite knowledge and skills to chart a formidable sustainability plan and develop relevant sustainability knowledge. The inability of firms to cultivate sustainability knowledge and skills pool affects the shared beliefs and collective efforts of a firm towards achieving its sustainability organizational goals.

Green creativity is revealed to impact green process and product innovation performance. The green creativity of a firm is enriched when the attitude and cognitive behaviors of employees are geared towards the attainment of superior green innovation performance. The collective nature of green creativity requires contributions from various employees and talents. Employee talents, in most cases, translate into organizational creativity. Therefore, when employee talents are steered towards achieving sustainability benchmarks, it results in an improvement in organization-wide competence and green capabilities development (Song & Yu, 2018). In addition, due to increasing pressure from internal and external stakeholders, organizations reallocate, reconfigure, and align organizational resources and talents to achieve competitive advantage and organizational creativity. This finding supports studies conducted by Rubashkina *et al.* (2015).

Green creativity is revealed to impact green processes and green product innovation performance. The creativity of talents translates into the building and maintenance of a firm's green competitive advantage. Individual creativity is converted into organizational creativity capabilities. The availability of these capabilities and resources enables firms to smoothen their processes and product development. Creative enterprises are able to allocate resources to the design and development of green processes that meet environmental standards and regulatory measures. Similarly, the green product innovation

performance of the firm is enhanced when creativity is superior to its counterparts.

Green core competence was postulated to influence the green innovation performance of firms. Although the findings of the study indicated no significant moderation effect provide insights into how the core competence of a firm enriches innovation processes. The core competence of a firm is argued in management and strategic management literature to be a form of organizational resource that is rare and difficult to imitate. The weak moderation effect of green core competence is attributed to the early stage of sustainability adoption in these SMEs, thereby resulting in a lack of ability to build core competencies in the green industry. Most firms are in the early stage and, therefore, lack the relevant competence required to boost their competitive advantage and performance.

## CONCLUSION

The study examined the complex relationship between stakeholder sustainability pressures, sustainability identity, green creativity, green core competence, and green innovation performance. Green innovation performance was examined as green process and product innovation performance. Using data from firms in the manufacturing, recycling, and waste management sectors of the Ghanaian economy, the study revealed that stakeholder sustainability pressures have a significant and positive impact on the green creativity of organizations. In addition, green core competence has a significant influence on the green process and product innovation performance of firms. However, the moderating effect of green core competence is weak and insignificant. Although the study makes some intriguing revelations and contributions to the field of study in sustainability literature, there exist some shortcomings that need to be addressed in future studies.

Future research should endeavor to integrate both qualitative and quantitative methods – this would enable the study to provide both qualitative and quantitative insights into the factors that contribute both directly and indirectly towards a firm's green innovation performance. In addition, a comparative study can be conducted to provide insights into how these factors influence a firm's green innovation performance in different geographic jurisdictions. Studies can extend the current conceptual model to include other factors, such as green supply chain networks, green human resource management practices, and social innovation factors (El-Kassar & Singh, 2019). This will broaden the understanding of how environmental factors influence the green innovation performance of firms. Finally, future studies should adopt a longitudinal approach to provide a nuanced understanding of how the factors evolve over time.

**ACKNOWLEDGMENTS:** The authors express gratitude to anonymous reviewers for their valuable feedback, enhancing the manuscript. They also thank department colleagues for their initial review and insightful comments, contributing to the research's development. The collaborative and supportive academic environment.

**CONFLICT OF INTEREST:** None

**FINANCIAL SUPPORT:** None

**ETHICS STATEMENT:** None

## REFERENCES

- Achi, A., Adeola, O., & Achi, F. C. (2022). CSR and green process innovation as antecedents of micro, small, and medium enterprise performance: Moderating role of perceived environmental volatility. *Journal of Business Research*, 139, 771-781.
- Ahmad, B., Shafique, I., Qammar, A., Ercek, M., & Kalyar, M. N. (2022). Prompting green product and process innovation: Examining the effects of green transformational leadership and dynamic capabilities. *Technology Analysis & Strategic Management*, 1-13.
- Anik, S., & Sulisty, H. (2021). The role of green intellectual capital and green innovation on the competitive advantage of SMEs. *International Journal of Learning and Intellectual Capital*, 18(1), 28-44.
- Awan, F. H., Dunnan, L., Jamil, K., & Gul, R. F. (2023). Stimulating environmental performance via green human resource management, green transformational leadership, and green innovation: a mediation-moderation model. *Environmental Science and Pollution Research*, 30(2), 2958-2976.
- Baeshen, Y., Soomro, Y. A., & Bhutto, M. Y. (2021). Determinants of green innovation to achieve sustainable business performance: Evidence from SMEs. *Frontiers in Psychology*, 12, 5052.
- Barczak, G., Lassk, F., & Mulki, J. (2010). Antecedents of team creativity: An examination of team emotional intelligence, team trust, and collaborative culture. *Creativity and Innovation Management*, 19(4), 332-345.
- Cao, H., & Chen, Z. (2019). The driving effect of internal and external environment on green innovation strategy-The moderating role of top management's environmental awareness. *Nankai Business Review International*, 10(3), 342-361.
- Carmeli, A., & Dothan, A. (2017). Generative work relationships as a source of direct and indirect learning from experiences of failure: Implications for innovation agility and product innovation. *Technological Forecasting and Social Change*, 119, 27-38.
- Chang, C. H. (2011). The Influence of corporate environmental ethics on competitive advantage: The mediation role of green innovation. *Journal of Business Ethics*, 104(3), 361-370.
- Chen, M. H. (2007). Entrepreneurial leadership and new ventures: Creativity in entrepreneurial teams. *Creativity and Innovation Management*, 16(3), 239-249.
- Chen, W. J. (2011). Innovation in hotel services: Culture and personality. *International Journal of Hospitality Management*, 30(1), 64-72.
- Chen, Y. S. (2008). The driver of green innovation and green image-green core competence. *Journal of Business Ethics*, 81(3), 531-543.
- Chen, Y. S., & Chang, C. H. (2013). Greenwash and green trust: The mediation effects of green consumer confusion and green perceived risk. *Journal of Business Ethics*, 114, 489-500.
- Chen, Y. S., Chang, T. W., Lin, C. Y., Lai, P. Y., & Wang, K. H. (2016). The Influence of proactive green innovation and reactive green innovation on green product development performance: The mediation role of green creativity. *Sustainability*, 8(10), 966.
- Chen, Y. S., Lai, S. B., & Wen, C. T. (2006). The Influence of green innovation performance on corporate advantage in Taiwan. *Journal of Business Ethics*, 67(4), 331-339.
- Chin, W. W. (1998). Commentary: Issues and opinion on structural equation modeling. *MIS quarterly*, vii-xvi.
- DeSarbo, W. S., Wedel, M., Vriens, M., & Ramaswamy, V. (1992). Latent class metric conjoint analysis. *Marketing Letters*, 3, 273-288.
- Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Hazen, B., Giannakis, M., & Roubaud, D. (2017). Examining the effect of external pressures and organizational culture on shaping performance measurement systems (PMS) for sustainability benchmarking: Some empirical findings. *International Journal of Production Economics*, 193, 63-76.
- Eiadat, Y., Kelly, A., Roche, F., & Eyadat, H. (2008). Green and competitive? An empirical test of the mediating role of environmental innovation strategy. *Journal of World Business*, 43(2), 131-145.
- El-Kassar, A. N., & Singh, S. K. (2019). Green innovation and organizational performance: The Influence of big data and the moderating role of management commitment and HR practices. *Technological forecasting and Social Change*, 144, 483-498.
- Fan, Q., Abbas, J., Zhong, Y., Pawar, P. S., Adam, N. A., & Alarifi, G. (2023). Role of organizational and environmental factors in firm green innovation and sustainable development: Moderating role of knowledge absorptive capacity. *Journal of Cleaner Production*, 411, 137262.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50.
- Fosso Wamba, S., & Akter, S. (2015). Big data analytics for supply chain management: A literature review and research agenda. In *Enterprise and Organizational Modeling and Simulation: 11th International Workshop, EOMAS 2015, Held at CAiSE 2015, Stockholm, Sweden, June 8-9, 2015, Selected Papers 11* (pp. 61-72). Springer International Publishing.
- Guo, J. (2022). The significance of green entrepreneurial self-efficacy: Mediating and moderating role of green innovation and green knowledge sharing culture. *Frontiers in Psychology*, 13, 5854.
- Hair Jr, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, 26(2), 106-121.
- Imran, R., Alraja, M. N., & Khashab, B. (2021). Sustainable performance and green innovation: Green human resources management and big data as antecedents. *IEEE Transactions on Engineering Management*.
- Iqbal, S., Akhtar, S., Anwar, F., Kayani, A. J., Sohu, J. M., & Khan, A. S. (2021). Linking green innovation performance and green innovative human resource practices in SMEs; a

- moderation and mediation analysis using PLS-SEM. *Current Psychology*, 1-18.
- Irani, F., & Kilic, H. (2022). An assessment of implementing green HRM practices on environmental performance: The moderating role of green process innovation. *Journal of Global Hospitality and Tourism*, 1(1), 16-30.
- Kamakura, W. A., & Wedel, M. (2000). Factor analysis and missing data. *Journal of Marketing Research*, 37(4), 490-498.
- Khan, P. A., Johl, S. K., & Akhtar, S. (2022). Vinculum of sustainable development goal practices and firms' financial performance: a moderation role of green innovation. *Journal of Risk and Financial Management*, 15(3), 96.
- Lee, C. S., Chen, Y. C., Tsui, P. L., & Yu, T. H. (2014). Examining the relations between open innovation climate and job satisfaction with a PLS path model. *Quality & Quantity*, 48, 1705-1722.
- Nasrollahi, M., Fathi, M. R., & Hassani, N. S. (2020). Eco-innovation and cleaner production as sustainable competitive advantage antecedents: The mediating role of green performance. *International Journal of Business Innovation and Research*, 22(3), 388-407.
- Qu, X., Khan, A., Yahya, S., Zafar, A. U., & Shahzad, M. (2022). Green core competencies to prompt green absorptive capacity and bolster green innovation: the moderating role of organization culture. *Journal of Environmental Planning and Management*, 65(3), 536-561.
- Roxas, B., & Lindsay, V. (2012). Social desirability bias in survey research on sustainable development in small firms: An exploratory analysis of survey mode effect. *Business Strategy and the Environment*, 21(4), 223-235.
- Rubashkina, Y., Galeotti, M., & Verdolini, E. (2015). Environmental regulation and competitiveness: Empirical evidence on the Porter Hypothesis from European manufacturing sectors. *Energy Policy*, 83, 288-300.
- Shamsuzzoha, A., Tran, G., & Jovanovski, B. (2022). Fostering Green Innovation in Organizations: Accompanied Opportunities and Challenges. In *5th International Conference on Industrial and Mechanical Engineering and Operations Management (IMEOM)-2022 IEOM Bangladesh Conference*. IEOM Society International.
- Simpson, B. J., & Radford, S. K. (2012). Consumer perceptions of sustainability: A free elicitation study. *Journal of Nonprofit & Public Sector Marketing*, 24(4), 272-291.
- Singh, S. K., Del Giudice, M., Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological Forecasting and Social Change*, 150, 119762.
- Song, W., & Yu, H. (2018). Green innovation strategy and green innovation: The roles of green creativity and green organizational identity. *Corporate Social Responsibility and Environmental Management*, 25(2), 135-150.
- Stevens, J. M., Kevin Steensma, H., Harrison, D. A., & Cochran, P. L. (2005). Symbolic or substantive document? The influence of ethics codes on financial executives' decisions. *Strategic Management Journal*, 26(2), 181-195.
- Su, X., Xu, A., Lin, W., Chen, Y., Liu, S., & Xu, W. (2020). Environmental leadership, green innovation practices, environmental knowledge learning, and firm performance. *Sage Open*, 10(2), 2158244020922909.
- Thong, K. C., & Wong, W. P. (2018). Pathways for sustainable supply chain performance-evidence from a developing country, Malaysia. *Sustainability*, 10(8), 2781.
- Walker, H., & Brammer, S. (2012). The relationship between sustainable procurement and e-procurement in the public sector. *International Journal of Production Economics*, 140(1), 256-268.
- Wang, S., Abbas, J., Sial, M. S., Álvarez-Otero, S., & Cioca, L. I. (2022). Achieving green innovation and sustainable development goals through green knowledge management: Moderating role of organizational green culture. *Journal of Innovation & Knowledge*, 7(4), 100272.
- Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 177-195.
- Wuyts, S., & Geyskens, I. (2005). The formation of buyer-supplier relationships: detailed contract drafting and close partner selection. *Journal of Marketing*, 69(4), 103-117.
- Xing, X., Wang, J., & Tou, L. (2019). The relationship between green organization identity and corporate environmental performance: The mediating role of sustainability exploration and exploitation innovation. *International Journal of Environmental Research and Public Health*, 16(6), 921.
- Yahya, S., Jamil, S., & Farooq, M. (2021). The impact of green organizational and human resource factors on developing countries' small business firms tendency toward green innovation: A natural resource-based view approach. *Creativity and Innovation Management*, 30(4), 726-741.
- Yousaf, Z. (2021). Go for green: green innovation through green dynamic capabilities: accessing the mediating role of green practices and green value co-creation. *Environmental Science and Pollution Research*, 28(39), 54863-54875.
- Yu, D., Tao, S., Hanan, A., Ong, T. S., Latif, B., & Ali, M. (2022). Fostering green innovation adoption through green dynamic capability: The moderating role of environmental dynamism and big data analytic capability. *International Journal of Environmental Research and Public Health*, 19(16), 10336.