

ANALYSING THE INFLUENCE OF GREEN CREATIVITY ON GREEN INNOVATION WITH THE ROLE OF GREEN SELF-EFFICACY AS A MODERATOR

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Abstract

Considering developing economies which are facing severe challenges related to the environment, several organisations have considered incorporating sustainability as a significant element into their day to day operations. This article analyses the impact of Green Creativity on Green innovation. Green self-efficacy is the moderator between Green creativity and Green innovation. Social Cognitive theory has been used to provide theoretical support. A structured online questionnaire was used for the purpose of data collection. 430 employees associated with manufacturing and Fast-Moving Consumer Goods (FMCG) organisations in Pakistan completed the questionnaire. These organisations were ISO 14001- certified. SmartPLS4 was used as a software to analyse data. Findings revealed that between Green creativity and Green innovation a significant relationship was observed. Furthermore, Green self-efficacy was a significant moderator between Green creativity and Green innovation. Empirical results emphasize upon the need of the organisations to ensure that such an organisational culture exists which ensures creative thinking amongst employees so that they could introduce innovative ideas in their organisations. The results contribute to the literature on green management.

INTRODUCTION

Organisations have shifted their focus towards green management practices in order to lessen the harmful effects of pollution as well as waste from the industries (Li et al., 2019). Various stakeholders have realised the importance of developing such policies within the organisations which will be aligned with the objectives showing the principles of sustainability (López-Cabrales & DeNisi, 2021). The focus of previous green business models was on ensuring environmental efficiency and maximum utilization of the

resources, while on the other hand, the focus of contemporary models was on combining sustainability with leadership and management processes, emphasizing upon the significance of green leadership as a major element of sustainable strategy (Rehman et al., 2025). With rapid economic growth as well as industrialization harm has been done to the environment and the resources have been exhausted, this led towards an urgent need for the organisations to use green innovation

practices (Ashfaq et al., 2021; Bhatia & Jakhar, 2021). In the year 2015, the Paris Agreement was signed by 197 countries and its aim was to ensure that businesses adopt sustainable operations (Qureshi et al., 2016). Those organisations who use environmental sustainability in their day to day operations are known as green firms and they play an extremely important role in promoting those practices which are environmentally friendly (Renwick et al., 2013; Awan et al., 2019). Even though there has been awareness about climate change globally, there are several developing countries who focus upon growth models and their aim is to achieve industrial expansion even if it is leading towards the degradation of the ecosystem (Kardooni et al., 2018; Mohsin et al., 2021). There are several consequences such as ecological instability, air pollution and overexploitation of resources. Therefore, the concept of Green innovation developed as a main area of concern in institutional and sustainability research (Fazale-Hasan et al., 2023). With the passage of time, Green innovation has become popular as it promotes eco-friendly technologies as well as sustainable manufacturing processes (Awan et al., 2020; Xie et al., 2019). If the organisations are engaged with the process of Green innovation, then their reputation is improved, they are successful in attracting those customers which are conscious about the environment and over time they could achieve benefits which will help them in becoming competitive (Chen et al., 2022; Ahmed et al., 2020).

Green creativity is important in driving Green innovation considering the context of environmental sustainability. Prior studies have analysed the influence of Green transformational leadership on creativity, innovation and organisational culture (Mittal & Dhar, 2016; Singh et al., 2020; Ahmad et al., 2023). Few studies have explored the influence of Green self-efficacy especially as a moderator. There is no research carried out previously to explore the influence of Green self-efficacy as a moderator between Green creativity and Green innovation. Social Cognitive Theory (Bandura, 1986) is providing theoretical support to this research.

This article demonstrates that when employees have a firm belief in themselves that they could perform such tasks which will be beneficial for the environment then they will be more successful in evolving their Green creative ideas into sustainable outcomes. Data for this article was collected from Fast-Moving Consumer Goods (FMCG) as well as manufacturing sectors of Pakistan, explaining about green practices especially within the context of developing countries.

This article plays a meaningful role by contributing towards the literature on green management as Green creativity, Green innovation and Green self-efficacy are used in a single framework. It also provides practical as well as theoretical implications for organisations so that they could use strategies in order to enhance innovation.

Following research objectives and research questions are addressed through this article:

RO1: To examine the impact of Green creativity on Green innovation.

RO2: To evaluate the moderating role of Green Self-Efficacy in strengthening the relationship between Green Creativity and Green innovation.

RQ1: What is the impact of Green creativity on Green innovation?

RQ2: Does Green Self-Efficacy moderate the relationship between Green creativity and Green innovation?

Following hypotheses are addressed through this research paper:

H1: Green creativity will positively impact Green innovation.

H2: Green self-efficacy will moderate the relationship between Green creativity and Green innovation. High Green self-efficacy will strengthen the positive impact of Green creativity on Green innovation.

Social Cognitive theory is used as a conceptual framework to examine the relationship among variables explored in this research article. Furthermore, the upcoming sections will give a detailed explanation about the literature review, hypotheses as well as the theoretical framework, the methodology and data analysis, and lastly, an analysis of the findings, their practical and

theoretical implications and recommendations for future research.

Literature Review

2.1 Social Cognitive Theory

Social Cognitive Theory, as a theoretical framework, is essential for analysing the behavior of employees within organisations. The main propositions of this theory focus on the interaction between cognitive processes of an individual, his personal goals, and environmental factors that collectively are responsible in shaping the behavior (Bandura, 1991). Self-efficacy represents a fundamental component of this theory and it plays a vital role as a mechanism which brings about change in the behavior of an individual (Carter et al., 2018). It also represents an important connection between external factors and the behavioral responses of the employees (He et al., 2020). When an organisation provides a supportive environment to its employees and the goals are clear, then it helps in increasing the self-efficacy of the individuals (Bandura, 1989).

Considering this theory as a theoretical lens, the environment which is provided to the individuals in organisations is important in improving the cognitive skills of the employees (Gundlach et al., 2003), this then helps in understanding how Green creativity leads to Green innovation. This theory explains that an individual not only learns through experience but also by observing others (Özgül & Demir, 2024). It provides a perspective in analysing how employees could engage in environmentally friendly practices and could change their creative ideas into innovation. As a theoretical lens, social cognitive theory has explained about a wide variety of behavioral outcomes such as effectiveness of an individual as a leader, continuous learning, and employee engagement. All these elements make this theoretical framework extremely important for this article. Particularly, Bandura (1986) proposed that those individuals who have a higher self-efficacy see themselves as those who are more capable and more often engage themselves in performing creative tasks. This argument provides an explanation about those

employees who have a higher Green self-efficacy show a higher Green creativity, leading to greater Green innovation. If an individual has a positive outlook about his own abilities then it could enhance his motivation and learning behaviors, which would ultimately lead towards improved performance outcomes (Bandura, 1982; Bandura, 1999). Therefore, those employees are more confident and determined who have a higher Green self-efficacy. However, Social Cognitive Theory provides a rigorous foundation which helps in understanding about Green self-efficacy as a moderator between Green creativity and Green innovation.

2.2 Green Creativity

Psychological and social elements are involved in the multidimensional process of creativity and through this process individuals are able to come up with fresh ideas as well as innovative solutions to problems (Walia, 2019; Glăveanu et al., 2020). The environment which is provided by the organisation acts as a key determinant in either encouraging or discouraging the motivation as well as innovative thinking of the employees (Amabile, 2011). If the opportunities are provided to the employees by the organisations so that their skills could be developed which must be aligned with their work ethics, then creativity of the employees could be improved. However, with the help of continuous practice, creativity could be enhanced ultimately improving the innovative thinking capacity of both the employees and the organisations (Amabile, 2011). If novel ideas are generated in order to develop eco-friendly products, services, processes, or behaviors then this process is known as Green creativity (Chen & Chang, 2013). In the modern business environment, creative behavior is important in order to make an organisation successful (Fraj et al., 2015). Human resource management has an important responsibility for promoting Green creativity as organisations are facing severe environmental challenges (Tang et al., 2018). Considering this context, Green creativity comprises innovative ideas which are both focused on sustainability and socially

responsible (Chen & Chang, 2013; Mittal & Dhar, 2016).

Chen and Chang (2013) are regarded as the pioneers for the concept of Green creativity. Their work mainly focused on the product dimension, but future researchers have also included the concept of green processes and services in their research (Chen et al., 2015). They explained that in order to ensure Green creativity within organisations there must exist a strong organisational leadership as well as an organisational culture aimed towards sustainability values. Providing strong support to this argument, Mittal and Dhar (2016) in their research found that if the leadership style of Green transformational leadership is used in organisations then it could help employees to engage in such behaviors which are creative as well as environmentally responsible, this would then lead towards environmental sustainability.

Previous studies have analysed the importance of Green creativity in leading towards sustainable goals. The results of a research demonstrated that Green creativity played the role of a significant mediator between Green transformational leadership and sustainability (Shah et al., 2021). Another mediator used in this study was Green procurement. Findings show that when leaders within an organisation are engaged in promoting environmental values, then creative thinking towards those products which are eco-friendly is encouraged, this then leads towards sustainable goals within an organisation. Likewise, another study in the hotel industry of Saudi Arabia demonstrated that both Green self-efficacy and Green creativity as mediators played a significant role between green transformational leadership, environmental knowledge learning, and work-related pro-environmental behaviors (Qasim et al., 2024).

Furthermore, Ding et al. (2023) found that employees' environmental awareness helped strengthen the relationship between Green transformational leadership and Green creativity. It means that if employees are more aware then it would enhance their creativity. Consistent with these findings, a research which was conducted in small and medium-sized enterprises (SMEs) in

Pakistan, the results showed that Green transformational leadership helped in enhancing the Green creativity of the employees. Findings imply that if the managers focus on strengthening Green leadership practices then it would help in encouraging creative as well as environmentally focused concepts among employees.

To sum it all up, findings from the previous research demonstrated that Green creativity is important in leading towards sustainable innovation, environmental awareness and leadership. The concept of Green creativity lay a foundation for organisations through which they could successfully build long-term Green innovation strategies within organisations.

2.3 Green Innovation

These days due to the rising legal and policy challenges (Huang et al., 2016) as well as rising consumer concern about environmental sustainability, businesses need to develop eco-friendly products and services (Chen, 2008). How quickly firms respond to the growing pressure from the stakeholders depends upon the resources which an organisation has along with their organisational competencies (Soewarno et al., 2019). Organisations respond to the environmental challenges which they face by utilizing their internal resources especially through initiatives which help in promoting Green innovation within an organisation (Huang et al., 2016).

Several terms have been used to describe the concept of Green innovation in previous literature. Generally it is referred to as environmentally oriented innovation (Soewarno et al., 2019; Garcia-Machado & Martinez-Avila, 2019). Related constructs frequently used interchangeably include eco-innovation (Cheng et al., 2014; Hojnik & Ruzzier, 2016), environmental innovation (Rennings & Rammer, 2011), and sustainable innovation (Lopez-Valeiras et al., 2015; Shen et al., 2020). These terms focus on minimizing environmental damage and ensuring that sustainability is promoted. While Green innovation focuses upon the technological as well as managerial

innovations whose objective is ecological development.

Furthermore, several organisations adopt the practice of Green innovation so that it is aligned with its goals for environmental protection (Wang, 2019) and market driven pressures (Soewarno et al., 2019). Within the context of this research, Green innovation is defined based on Chen, Lai, and Wen's (2006) definition as "a process encompassing energy conservation, pollution prevention, waste recycling, green product design, and environmental management through technological advancement". Aligned with previous findings (Farrukh et al., 2021; Albort-Morant et al., 2017), the concept of Green innovation is analysed considering its two primary dimensions.

Green product innovation focuses upon the manufacturing and design of eco-conscious products. Green process innovation aims at improving the operational processes which will help in minimizing wastage and use of resources (Chen et al., 2006). In the article, Green innovation is the development of novel products and procedures which aim at substantially reducing impact on the environment. It also acts as a strategic resource for an organisation which helps in minimizing pollution and waste, while incorporating ecological awareness into day to day activities of an employee (Wang, 2019). The concept of Green innovation also ensures that advanced technologies are fully utilized by an organisation and they must focus on pollution control, recycling and energy efficiency while also keeping into consideration that sustainability is included in both the product as well as the organisational systems (Fosu et al., 2023).

2.4 Green Creativity and Green innovation

Creativity plays a significant role in generating innovative strategies to resolve problems faced by an organisation (Chen & Chang, 2013; Halbesleben et al., 2003). Creativity and innovation are two distinct concepts. On one hand, creativity refers to the introduction of valuable as well as original ideas within an organisation, on the other hand innovation focuses upon the implementation of these ideas

so that practices, processes and products could be improved. Chen and Chang (2013) introduced Green innovation in response to growing concern about unsustainable practices carried out within the corporate sector. The main goal of the concept is that eco-friendly approaches are included in the strategies of an organisation, its products as well as processes so that sustainability challenges could be effectively addressed.

Creativity contributes to an idea-generation phase within an organisation (Anderson et al., 2014). Innovation is the implementation of these ideas. Using this perspective as a foundation, Chen and Chang (2013) put forward the concept of Green creativity, extending the concept of traditional creativity into the environmental domain. When new and useful ideas are introduced within an organization with the objective of building products, services and processes which are environmentally friendly, it is known as Green creativity (Chen & Chang, 2013; Mittal & Dhar, 2016). Nowadays, consumers are demanding those products which are eco-friendly and strict guidelines introduced by the government about sustainability (Tseng et al., 2013; Eiadat et al., 2008) have encouraged organisations to focus on innovation for sustainability. Since there is a pressure by the government as well as the consumers, managers in various organisations are utilizing the practice of Green innovation and are developing such products which are aligned with the sustainable goals. These strategies could contribute to the successful improvement of an organization's overall performance.

Furthermore, the process of Green innovation also includes the improvements which should be brought in production as well as procurement processes within an organisation with the objective of minimizing harm to the environment and also to conserve resources. Organizations which effectively use their technical as well as creative skills can enhance both green process innovation and green product innovation by transforming creative ideas into environmentally friendly practices. Green innovation could help in achieving competitive advantage by incorporating environmental sustainability into

the strategies of an organisation (de Burgos-Jiménez et al., 2013; Kratzer et al., 2017). Due to increasing demand from the consumers for eco-friendly products, firms are investing in the process of Green innovation. In this way organisations could meet the expectations of the stakeholders, this would help in enhancing customer loyalty as well as improving the environmental performance (Song & Yu, 2018).

Previous research has shown a significant association between variables used in this research article. For example, Ma et al. (2022) found that Green creativity played an important role between leadership and innovation. Likewise, a study by Song and Yu (2018) conducted in various Chinese industries demonstrated that Green creativity had a significant influence on Green innovation. The findings revealed that those organisations which are engaged in sustainable practices are able to develop eco-friendly solutions. In another study, Malik et al. (2021) further confirmed the relationship between Green creativity and Green innovation. Tran (2024) in his research in Vietnam's manufacturing industry found that encouraging Green creativity within an organisation not only promotes environmental sustainability but also leads towards the competitiveness as well as operational efficiency of an organisation.

Using Social cognitive theory (Bandura, 1986), cognitive and motivational processes influence employees' creative performance. When the employees see that their organisation is supportive and it is also aligned with the sustainability objectives, they are encouraged to develop green creative ideas which are then translated into innovative outcomes.

In light of the above discussion, the following hypothesis is proposed:

Hypothesis 1: Green Creativity will positively impact Green Innovation.

2.5 Green self-efficacy

An individual's confidence in their own ability to carry out specific tasks or actions as well as to complete the tasks in an effective manner which are required to achieve the objectives, this is

known as self-efficacy (Bandura, 1997). In this way individuals have control over their external environment and they are able to achieve the desired outcomes (Lin & Hsu, 2015). Green self-efficacy as defined by Chen et al. (2015) is the belief which an individual has in his capability to implement the actions which are necessary so that the sustainable goals could be achieved.

Those individuals who have strong self-efficacy have a firm belief that they will be successful in introducing innovative ideas (Hmieleski & Baron, 2008). Such a belief leads towards creative engagement of employees as well as improved innovation performance (Kumar & Uzurt, 2010; Mumford et al., 2002). Self-efficacy also motivates the employees to perform desired behaviors (Carter et al., 2016) and it also enhances their ability so that they could manage challenging tasks in an effective manner (Eissa et al., 2018).

Green self-efficacy means the confidence which employees have in their ability to use environmentally-friendly practices, this helps in supporting the sustainable objectives of an organisation (Chen et al., 2014). According to the previous research, Green self-efficacy helps in resolving environmental problems, it ensures that employees engage in pro-environmental behaviors, and also helps in promoting sustainability within an organisation (Abraham et al., 2015). Those individuals who have a higher level of Green self-efficacy, their motivation level is high as they consider it a part of their job that they should engage themselves in environmentally friendly practices and are consistent that they have to pursue environmental objectives despite the challenges which they face (Carter et al., 2016; Kim et al., 2016). Green self-efficacy plays a crucial role in stimulating green creativity (Chen et al., 2015; Aeknarajindawat & Jermisittiparsert, 2019; Khan et al., 2022; Farooq et al., 2021), enhancing green performance (Chen et al., 2014; Nisar et al., 2017), and fostering pro-environmental behaviors (Nisar et al., 2022).

The idea of Green self-efficacy reflects the awareness of the employees and also the self-assurance which they have about their potential

so that they could contribute towards sustainability. In the case where individuals have a higher Green self-efficacy, then they are more likely to work towards those actions which are contributing towards the environment, they would introduce creative ideas as well as would show consistency towards environmental goals (Yang et al., 2021; Al-Hamdan & Bani Issa, 2021). Green self-efficacy is significant in enhancing both the individual and organisational efforts so that it could lead towards innovative performance.

2.6 Green self-efficacy as a moderator

Green Self-Efficacy refers to the belief possessed by an individual that he could coordinate as well as to implement the actions which are vital to achieve the required environmental performance within an environment which is focused on sustainability (Guo et al., 2019). There are several reasons due to which employees engage in developing novel ideas as well as environmentally responsible behavior. Firstly, these individuals see that their long-term career goals and the sustainable goals of an organisation are aligned (Mittal & Dhar, 2016). Secondly, such individuals get inner satisfaction by performing the tasks at their work, they also pay attention to the environmental challenges and also consider business practices which are socially responsible as a significant element of their job roles (Guo et al., 2019).

Previous literature has shown that Green self-efficacy has played a role as a moderator in previous research in different kinds of organisations. For instance, in a study it was found that Green Self-Efficacy played a role as a significant moderator between Green Transformational Leadership and Green Creativity (Rehman et al., 2025). Findings demonstrated that those individuals who possess a higher Green Self-Efficacy have a belief that they could generate innovative ideas and could adopt a proactive approach in order to confront environmental problems. In a research focusing on Pakistan's energy sector, it was discovered that those employees who had a higher Green self-

efficacy, engaged themselves in pro-environmental behaviors and Green servant leadership style played an effective role in this relationship (Faraz et al., 2021). Furthermore, a research was conducted in the hospitality sector where those individuals who had a higher Green self-efficacy showed greater involvement in corporate social responsibility and knowledge sharing (Rafique et al., 2024). Nurul Alam et al. (2025) found in a research which was conducted in the hospitality sector of Nigeria that Green self-efficacy played a significant role between Employee green commitment and Green empowerment. Collectively, these studies show the importance of Green self-efficacy which helps in encouraging employees to transform their environmental beliefs into significant environmental actions.

However, in spite of the rising importance of Green self-efficacy as a moderator in research, there is no research conducted considering its role as a moderator between Green creativity and Green innovation. This article focuses upon a strong emphasis on the argument that with the help of Green self-efficacy, green creative ideas could be changed to innovative practices.

In light of the above discussion, the following hypothesis is proposed:

Hypothesis 2. Green Self-Efficacy will moderate the relationship between Green Creativity and Green Innovation. High Green self-efficacy will strengthen the positive impact of Green creativity on Green innovation.

2.7 Conceptual model

In Figure 1 the conceptual framework is shown which is used in this research article. Green creativity is an independent variable and Green innovation is a dependent variable. Green self-efficacy is a moderator in this study. Social Cognitive Theory is providing a theoretical lens to investigate the relationship between variables. It helps in understanding how personal belief systems work together with contextual factors to shape environmentally responsible behaviors.

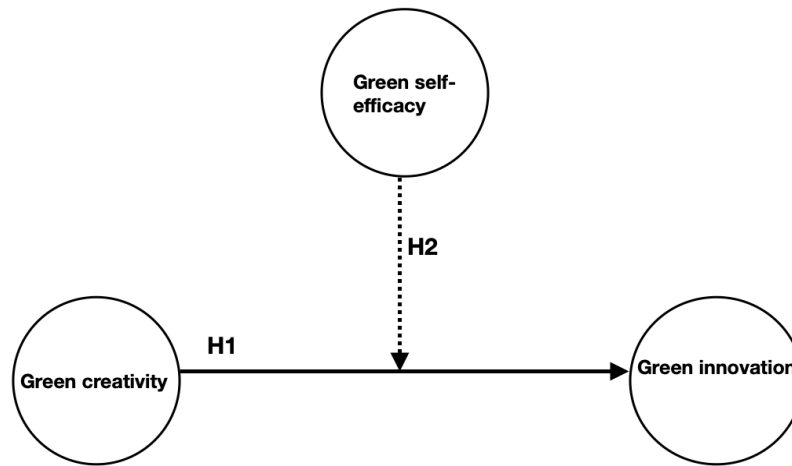


Figure 1. Conceptual framework

3. Methods

3.1 Measures

Measurement items for the questionnaire for this research article were adapted from questionnaires used in previous research studies. 5-point Likert scale was used to measure the responses which were given to multiple statements so that both reliability as well as validity could be ensured (Hair et al., 2014b). Green creativity was measured using 6 items adapted from Rego et al. (2007) and Barczak et al. (2010). Sample items included: “The members of the organisation suggest new ways to achieve environmental goals” and “The members of the organisation promote and champion new green ideas to others”. Green innovation has been measured using the scale developed by Chen, Lai, and Wen (2006). This scale includes 8 items and 2 dimensions; these are product innovation and process innovation. The scale includes items such as “The company chooses the materials of the product that produce the least amount of pollution for conducting the product development or design” and “The company chooses the materials of the product that consume the least amount of energy and resources for conducting the product development or design” to measure the size of

green product innovation. The scale includes items such as “The manufacturing process of the company effectively reduces the emission of hazardous substances or waste” and “The manufacturing process of the company recycles waste and emission that allow them to be treated and re-used”. Green Self-efficacy was measured using 5 items adapted from Chen et al (2014). Sample items included: “I feel I can succeed in accomplishing environmental ideas” and “I can achieve most of the environmental goals”.

3.2 Reliability and validity

In line with Hinkin’s (1998) recommendation, firstly a pilot study was conducted so that feasibility and clarity of the questionnaire could be ensured before the main data collection. In order to conduct pilot study, 50 employees from manufacturing and Fast Moving Consumer Goods (FMCG) sectors completed the questionnaire. Cronbach alpha value was used as a means to assess internal reliability. Internal consistency was confirmed as for all the constructs Cronbach’s alpha values were above 0.7 which was the threshold used. However, the results confirmed that the questionnaire used in this research article was suitable.

Furthermore, other tools were also used such as convergent and discriminant validity. Outer loading values of all the items were above 0.7, this confirmed convergent validity. Heterotrait - Monotrait (HTMT) ratio was used to verify Discriminant validity. All the values were below 0.9 and hence discriminant validity was confirmed.

3.3 Population and sampling

A non-random sampling approach was employed, specifically convenience sampling, which is commonly used in quantitative studies due to its practicality. This technique plays an effective role in collecting data from several individuals and it can easily be implemented (Etikan, Musa, & Alkassim, 2016; AlShammre et al., 2023).

There are several reasons due to which convenience sampling was used. Firstly, it is an efficient method and a large number of respondents could be reached, this helps in minimizing time and resource constraints (Stratton, 2021). Secondly, this method was used commonly in previous research considering the context of leadership studies.

Hair et al. (2014a) guidelines were used to determine an appropriate sample size for this research article. According to the "10-times rule," the requirement for the minimum sample size should be equal to the number of items used to measure a construct. This research article involved 20 items, so a minimum of 200 participants was required. But the final sample consisted of 430 responses, this was more than

sufficient enough for the statistical power for SMART-PLS analysis.

For this research article, the target population comprised employees working in Pakistan's manufacturing and Fast-Moving Consumer Goods (FMCG) sectors. Several factors were considered for the demographic profile of the respondents. These factors include gender, age, education, job position, years of experience, sector, and company size. Considering the age of the respondents, 55.82% were male and 44.19% were female. Considering age distribution as one of the factors, 22.33% of the respondents belonged to the age group 18 - 27 years, 33.95% belonged to the age group 28 - 37 years, in the age group 38 - 47 years there were 25.35% of the respondents, 15.11% belonged to the age group 48 - 57 years and 3.26% of the respondents were above 58 years. As far as the educational qualifications of the respondents were concerned, 58.84% held a bachelor's degree, 37.91% of the respondents held a master's degree and 1.63% had a doctoral degree. Considering work experience as one of the factors, 36.51% of the respondents had a work experience of 0 - 5 years, 28.84% had 6 - 10 years, 16.51% of the respondents had an experience of 11 - 15 years, 10.47% of the respondents had a work experience of 16 - 20 years and 7.67% of the respondents had a work experience of over 21 years.

A detailed summary of respondents' demographic information is presented in Table 1.

Table 1. Demographic characteristics of respondents

	N	%
Gender		
Male	240	55.82%
Female	190	44.19%
Age		
18-27 years	96	22.33%
28-37 years	146	33.95%
38-47 years	109	25.35%
48-57 years	65	15.11%
58 years and above	14	3.26%
Education		
Bachelor's Degree	253	58.84%
Masters Degree	163	37.91%
Doctoral Degree (PhD)	7	1.63%
Other	7	1.63%
Position		
Entry-Level	116	26.98%
Senior Staff	107	24.88%
Supervisor	81	18.84%
Middle Management	84	19.53%
Senior Management	42	9.77%
Years of experience in the current organisation		
Less than 1 year	56	13.02%

	N	%
1–3 years	116	26.98%
4–6 years	108	25.12%
7–10 years	88	20.47%
More than 10 years	62	14.42%
Total work experience		
0-5 years	157	36.51%
6-10 years	124	28.84%
11-15 years	71	16.51%
16-20 years	45	10.47%
21 years and above	33	7.67%
Sector		
Fast-Moving Consumer Goods (FMCG)	172	40%
Textile Manufacturing	128	29.77%
Pharmaceutical Manufacturing	70	16.28%
Chemical Manufacturing	60	13.95%
Number of employees in the company		
200-399 employees	75	17.44%
400-599 employees	81	18.84%
600-799 employees	95	22.09%
800-999 employees	79	18.37%
More than 1000 employees	100	23.26%

3.4 Data collection method

A diverse sample was used for this research article. Karachi, Lahore and Islamabad were selected as the major cities in order to facilitate the data collection process. In these cities both the manufacturing as well as the Fast-Moving Consumer Goods (FMCG) organizations which were ISO 14001- certified were targeted. A list of companies was compiled through several means such as LinkedIn, company websites and business directories.

In order to ensure a higher rate of participation by the respondents as well as to make it convenient, an online survey method was used. By using online means for data collection, participants were given the flexibility to complete the questionnaire whenever it was convenient for them. The entire process of data collection was from May 2025 to August 2025. The online questionnaire was distributed through professional WhatsApp groups, official company emails and LinkedIn connections. This ensured that a diverse sample of employees completed the questionnaire.

3.5 Analytical approach

SmartPLS 4 software was used with Partial Least Squares Structural Equation Modeling (PLS-SEM) for data analysis. This technique was used due to several reasons. Firstly, it is a modern technique used for analysing data and this technique is ideal for complex models which have several constructs and indicators. This data analysis technique also helps in estimating both the measurement as well as the structural models simultaneously while also keeping measurement error into consideration (Hair et al., 2017a).

PLS-SEM is considered a suitable technique for social science and management research as it helps in theory development, exploratory studies

and predictive modeling (Hair et al., 2012; Hair et al., 2019). It is useful when both the mediating and the moderating variables are involved in a research model or when data distributions deviate from normality (Hair et al., 2017b). The use of SmartPLS was also preferred for its user-friendly interface, computational efficiency, and wide acceptance in recent management studies (AlNuaimi et al., 2021; del-Castillo-Feito et al., 2022; Kusi-Sarpong et al., 2021).

4. Assessment of measurement model

The initial stage in assessing a reflective measurement model is to evaluate the indicator loadings, as they indicate the extent to which each observed item reliably reflects its underlying construct. To ensure reliability, the values of both Cronbach alpha as well as composite reliability must be above 0.7 (Kraus et al., 2020; Hair et al., 2018; Sarstedt et al., 2013). As shown in Table 2, all the constructs are reliable as the values are above the threshold of 0.7.

Convergent validity could be determined by the values of the outer loadings and they must be greater than 0.7 (Richter et al., 2020). It could also be determined by Average Variance (AVE) values which must be above 0.5. Both the criterias were fulfilled so convergent validity was ensured. As shown in Table 3, VIF values were less than 5, this means that there was no multicollinearity (Hair et al., 2019).

Furthermore, Fornell and Larker's (1981) criterion was used to assess discriminant validity. According to the results in Table 4, on-diagonal values are higher than the off-diagonal values. This shows that discriminant validity has been achieved. HTMT criterion was also used for this purpose. All HTMT values were below the recommended threshold of 0.90 (Hair et al., 2019).

Table 2. Items loading, cronbach alpha, composite reliability and convergent validity.

Constructs	Items	Loading	Cronbach alpha	CR	AVE
Green creativity	GC1	0.876	0.941	0.941	0.771
	GC2	0.868			
	GC3	0.873			
	GC4	0.880			
	GC5	0.879			
	GC6	0.891			
Green innovation	GIP1	0.866	0.950	0.951	0.742
	GIP2	0.872			
	GIP3	0.868			
	GIP4	0.865			
	GIPr1	0.831			
	GIPr2	0.855			
	GIPr3	0.872			
	GIPr4	0.864			
Green self-	GSE1	0.884	0.939	0.939	0.766

efficacy					
	GSE2	0.868			
	GSE3	0.870			
	GSE4	0.884			
	GSE5	0.882			
	GSE6	0.865			

Table 3. Collinearity statistics (VIF) - Outer model list

	VIF
GC1	3.110
GC2	2.884
GC3	2.934
GC4	3.159
GC5	3.132
GC6	3.385
GIP 1	3.084
GIP 2	3.355
GIP 3	3.190
GIP 4	3.088
GIPr1	2.699
GIPr2	2.987
GIPr3	3.325
GIPr4	3.059

GSE1	3.281
GSE2	2.896
GSE3	2.914
GSE4	3.228
GSE5	3.162
GSE6	2.789

Table 4. Discriminant validity using Fornell and Larker criterion

	GC	GI	GSE
GC	0.878		
GI	0.708	0.862	
GSE	0.149	0.458	0.875

Note(s): GC = green creativity, GI = green innovation, GSE = green self-efficacy

4.1 Assessment of the structural model

In order to check the validity and the reliability, the measurement model was analysed first. Figure 2 illustrates the measurement model. Green Creativity, Green Innovation, and Green Self-

Efficacy are variables which are part of the model and they are measured by their reflective indicators. The figure shows how each indicator loads onto its respective latent construct.

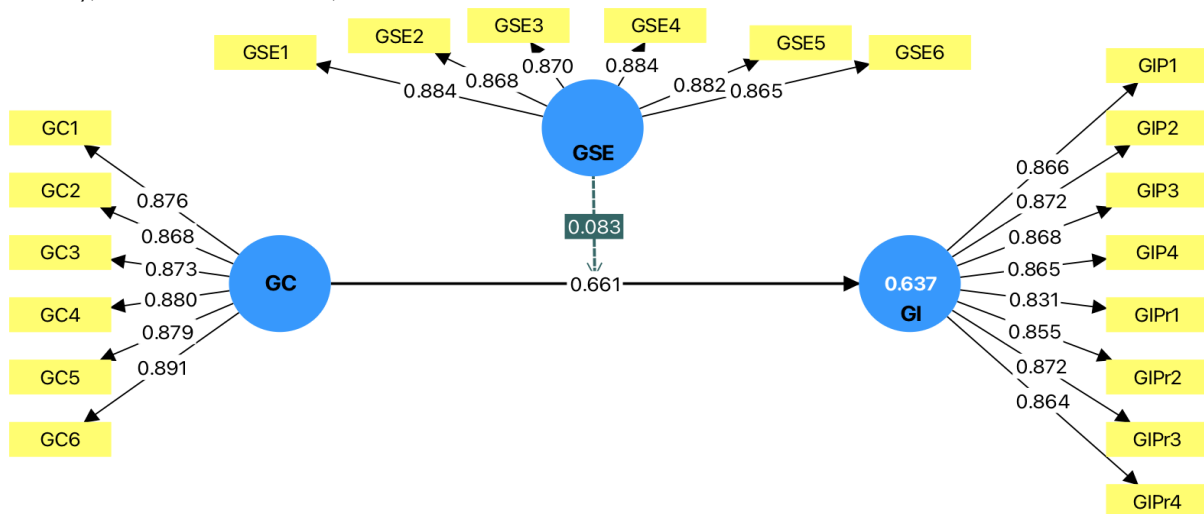


Figure 2. Measurement model

The focus of the structural model was to analyze the path coefficients that represent the relationships among the constructs (Hair et al., 2017b). *t*-values and values for confidence intervals were used for analysing significant relationships (Hair et al., 2017b). Standardized beta (β) was used as a tool so that the strength and the significance of the regression path coefficients could be assessed. To determine whether the constructs are significant, the *t*-values must be greater than 1.64 at the 0.05 significance level (Hair et al., 2017b; Henseler et al., 2014). 5000 bootstrap samples were used in this research article. There should be no value of 0 in between the upper and lower levels confidence intervals.

Table 5 shows the bootstrapping analysis results. According to the findings, the direct effects (β 0.661) are significant as both the confidence intervals, that is the upper confidence interval and the lower confidence interval were positive and they did not have a value of 0 in between. This shows that Green creativity has a significant influence on Green innovation. Thus, H1 is supported. Furthermore, Green self-efficacy moderated the relationship between Green creativity and Green innovation (β 0.083, *t* > 1.64). Hence, H2 is also supported.

Cohen's *f*² measure was used to evaluate the effect size of each construct. The *f*² statistic analyzes the influence of an independent construct on a dependent construct. Large, medium and small effects are analysed by the values of 0.35, 0.15 and 0.02 respectively (Cohen, 1988). According to the findings in Table 5, a

very large effect is shown by Green creativity (*f*² = 1.170).

Table 6 highlights the value of *R*². It is also known as the coefficient of determination and it represents how much percentage of the variance in the dependent variable is explained by the independent variable. *R*² value of 0.26 is considered weak, 0.50 is moderate and 0.75 is substantial according to PLS-SEM (Hair et al., 2019). *R*² value is 0.634 in this study. This means that the value has an explanatory power of moderate level. *Q*² value was used so that the predictive model could be evaluated. According to the criteria by Hair et al. (2019), *Q*² > 0 shows that the model is predictive. In this research article *Q*² value is 0.630. This shows that the model has a strong level of predictive power.

Green self-efficacy as a moderator between Green Creativity and Green innovation is shown in Figure 3. The interaction plot shows that Green creativity has a stronger positive effect on Green Innovation when Green self-efficacy is high. This is represented by the steeper slope of the green line (+1 SD). When Green self-efficacy is low as shown by the red line (-1 SD), the relationship between Green creativity and Green innovation weakens considerably. The blue line that is the mean and it shows Green self-efficacy between two extremes indicating a moderating effect.

The findings demonstrate that those individuals who have a higher level of Green self-efficacy have a greater capability of transforming their creative ideas into innovation. As these individuals have a firm belief in themselves and they are self-motivated. In this research article Green self-efficacy plays the role of a significant and a positive moderator.

Table 5. Structural model: hypothesis testing

Hypotheses	Beta	STDEV	T statistics	p values	LLCI	ULCI	F ²
GC -> GI	0.661	0.026	25.635	0.000	0.605	0.709	1.170
GSE x GC -> GI	0.083	0.031	2.702	0.007	0.026	0.146	

Note(s): GC = green creativity, GI = green innovation, GSE = green self-efficacy

Table 6. R² and Q²

	R ²	Q ²
Green Innovation	0.634	0.630

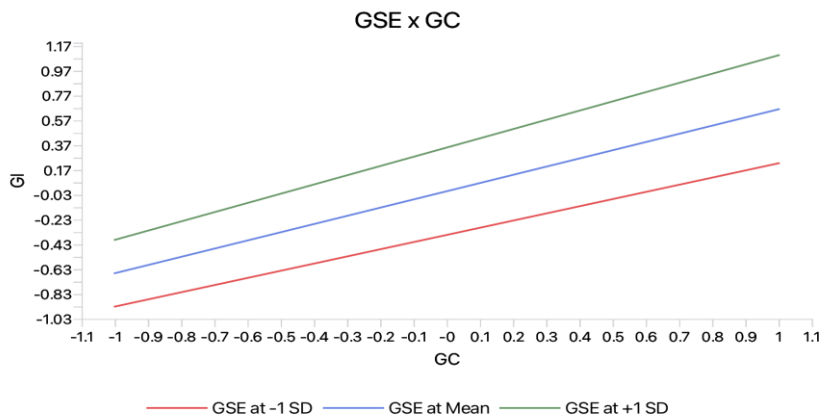


Figure 3. Simple slope analysis

5. Conclusion and discussion

The purpose was to explore the role of Green self-efficacy as a moderator in the relationship between Green Creativity and Green Innovation. Findings highlighted that Green creativity had a significant influence on Green innovation. Green self-efficacy played a significant role as a moderator in this relationship.

Previous research has emphasized upon the central role of Green Creativity in encouraging Green innovation within organisations. For example, in a research Green creativity played an important role as a mediator between Green Transformational Leadership and Green innovation (Ma et al., 2022). Importance of this study is that encouragement should be shown to employees so that they could generate sustainable and creative ideas. This creativity of the employees help them in developing eco-friendly products and also in improving green processes. Likewise, Song and Yu (2018) in their research found a positive relationship between Green

creativity and Green innovation. This research was conducted in several industries in China. Findings show that those organisations who encourage creativity and who have an environment focused on sustainability, they could translate their creative ideas into practical solutions. In another study conducted in Pakistan, it was demonstrated that Green creativity leads towards Green innovation and this research was conducted in various organisational contexts (Malik et al., 2021). Tran (2024) in his research conducted in Vietnam’s manufacturing sector found that Green creativity does not only help in improving the environmental performance but it also helps in improving organisational competitiveness. Moreover, in this research article Green self-efficacy is a significant moderator between Green creativity and Green innovation. The findings are aligned with previous research where Green self-efficacy helped in enhancing the belief of an individual in his ability to use his creativity

towards sustainable innovation. It was found that Green Self-Efficacy significantly moderated the relationship between Green Transformational Leadership and Green creativity in a research in Pakistan (Rehman et al., 2025). Similarly, in another study in China, Chen and Wu (2022) found Green self-efficacy played a significant role between leadership and Human resource management with employees' green behavior also playing an important role. The findings demonstrated that those employees who have a higher confidence are more responsive to the initiatives related to sustainability. Faraz et al. (2021) reported that Green Self-Efficacy strengthened the relationship between Green Servant Leadership and Pro-Environmental Behavior. In another study, Green self-efficacy played a crucial role between Green empowerment and Employee commitment in Nigerian hotels (Nurul Alam et al., 2025).

To sum it all up, findings from these studies demonstrate that employees with a higher Green self-efficacy are able to transform creative ideas into innovation. This is because they have a strong confidence that they can overcome any barriers which they face and could also experiment with sustainable practices. This research article has contributed towards existing literature by confirming that Green self-efficacy plays an extremely instrumental role in strengthening the relationship between Green creativity and Green innovation. This article has also confirmed the moderating role of Green self-efficacy considering Social cognitive theory as a theoretical lens.

The findings of this research article are in alignment with the propositions of Social Cognitive Theory (Bandura, 1986). It emphasizes the relevance of the role of self-efficacy in shaping human behavior by considering various factors such as personal, behavioral, and environmental factors which interact with one another.

5.1 Theoretical contribution

In this research article, Social Cognitive Theory has been used as a theoretical lens. Findings of this article support this theoretical perspective that those employees who have a higher level of

Green self-efficacy and have a firm belief in their ability that they could perform eco-friendly actions and they could also translate the creative ideas which they have into innovative practices. Since this article shows that Green self-efficacy plays a significant role in strengthening the relationship between Green creativity and Green innovation, this article demonstrates the boundary conditions through which creativity of the employees is transformed to innovative outcomes. This research article helps in addressing a key gap in previous literature, where no research has been done between Green creativity and Green innovation with the role of Green self-efficacy as a moderator (Chen & Chang, 2013; Rehman et al., 2025). By including Green self-efficacy as a moderator in this research article, it has extended the Social cognitive theory and it has shared valuable information about how sustainability has influenced the cognitive self-beliefs of the employees.

This is the first article that has examined the role of Green self-efficacy as a moderator between Green creativity and Green innovation. Therefore, this research article is making a novel contribution towards the Green innovation literature by utilizing Social cognitive theory as a framework in the underexplored context of Pakistan's manufacturing and FMCG sectors. In these sectors, resources are limited and immense environmental pressures are there. This research article has not only reinforced the importance of Social Cognitive Theory but it has also provided an understanding that Green self-efficacy plays an important role in transforming creativity into innovation.

5.2 Practical contribution

This research article provides several practical contributions for those organisations which are in the manufacturing and the Fast-Moving Consumer Goods (FMCG) sectors of Pakistan. Since in this article Green creativity has a significant influence on Green innovation, this highlights the critical role which the creative thinking skills of the employees play in generating sustainable solutions. The findings are aligned with the previous research where

creativity played a vital role in contributing towards innovation (Song & Yu, 2018; Malik et al., 2021). If the managers within an organisation will motivate their employees so that they could use innovative methods in their daily activities and ensure that such an organisational culture exists where Green innovation is encouraged, it would be a competitive advantage for the organisations and the environmental outcomes will then be improved.

Past research has also confirmed the role of Green self-efficacy as a moderator. It has shown that individuals who show strong self-efficacy display resilience and persistence with the aim of achieving sustainable related objectives (Chen et al., 2015; Rehman et al., 2025). If mentoring sessions and skill-based training is provided then employees' self-efficacy could be enhanced and they could have hands-on experience related to sustainability initiatives. Furthermore, if recognition is shown and rewards are given to the employees for their contributions towards the green project, this would help in boosting their confidence and it would ultimately lead towards Green innovation.

The findings of the study also highlight the significance of integrating environmental goals with the leadership as well as human resource strategies for organisations in Pakistan. All the policies in organisations which empower employees to take control of environmental initiatives not only ensure that there is a Green organisational culture which exists but it also enhance employee engagement as well as their long-term commitment towards the goals of the organisation (Lopez-Cabrales & DeNisi, 2021).

In conclusion, by encouraging the creative capabilities of employees and also strengthening the belief which they have in their green competencies, organisations can successfully and effectively address the environmental challenges. Organisations could also ensure that resource efficiency is encouraged and their goals are aligned with the national as well as the global sustainability objectives.

5.3 Limitations and suggestions for future research

This study has several limitations. Firstly, a cross-sectional research design was used. Due to this causal relationships among variables could not be inferred. Longitudinal research design could be used in future. Secondly, data was collected through self-reported questionnaires completed online by the respondents. This could lead towards potential bias. Future research could use multiple sources of data collection such as ratings from the supervisor or peer assessments. Next this study mainly focused on the manufacturing and Fast Moving Consumer Goods (FMCG) sectors of Pakistan. This limits the generalizability of the findings to other sectors and countries. Diverse industrial sectors could be considered as well as different cultural contexts for further research. Lastly, in the current research model only one moderating variable that is Green self-efficacy was analysed. Future studies could consider several other variables as mediators and moderators such as Green Organizational Culture, Green Organizational Support, or Green Transformational Leadership. This would help in providing an understanding about the framework through which Green creativity could influence Green innovation.

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