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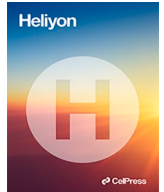


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## Research article

# The role of green innovation on environmental and organizational performance: Moderation of human resource practices and management commitment

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## ABSTRACT

Green innovation is an essential and burning topic for environmental and organizational performance. Therefore, this research aims to examine the effect of green innovation on environmental performance, which leads to organizational performance. Another objective is to measure the impact of two dimensions of green innovation, such as green process & green product measures, on green innovation. The second prime aim of this research is to evaluate the moderation of management commitment & human resource practices in an association between green innovation and organizational & environmental performance. A total of 320 employees provided their perspectives on a self-administrated questionnaire from the textile industry of Pakistan. We have employed SEM-based multivariate modeling to examine the data. This research has measured the reflective indicators measurement model through confirmatory factor analysis, an obvious choice of structural equation modeling to examine observed and unobserved variables and indicators using PLS-SEM (partial least square-structural equation modeling). The research findings reveal a positive & significant effect of product & process innovation on green innovation. Further, green innovation significantly impacts environmental and organizational performance. A two-way interaction (moderation) of human resource practices & green innovation does not have a cogent moderating effect on organizational & environmental performance. However, management commitment has a significant moderation between green innovation & organizational performance. A three-way interaction (moderated moderation) model finds a substantial effect on organizational attainment but an insignificant impact on environmental performance. The research outcomes significantly contribute and suggest that practitioners and policymakers must institutionalize green innovation practices in their organizations to enhance their organizational and environmental performance. HR practitioners play a vibrant role in creating green norms and organizational culture. The study findings also suggest that management commitment to green innovation advocates organization-level transformations toward adopting green practices.

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## 1. Introduction

With the advent of technology and scientific advancements, the world has provided immense exposure to artificial resources, making life leisurely. However, artificial resource opulence has come at the cost of sustainability and the environment. The world has thus been facing issues with balance acquisition between sustainable usage of resources and economic development [1,2]. Managing both have been a great concern for the economies as one comes at an expense and tradeoff. Researchers have observed that economic growth and sustainability cannot go together [3,4]. Green growth and general innovation are well recognized for their interrelationship [5]. It is essential to observe that national economic development is established through soaring industrial activities [6]. In this essence, Segerstrom [7] validated through his proposed model that firm-level innovations immensely support economic growth. Green innovation is beneficial to prevent the environment from pollution, help in recycling waste, and could also save non-biodegradable energy [8,9]. Moreover, green technologies could achieve sustainable development [10,11]. In order to implement and achieve the target of green innovativeness, firms need to adopt teamwork within their organizational ecosystems (Muisyo et al., 2022). The said process can be run by key parameters such as the organizations' access to large-scale data, the commitment of the management, and proper usage of human reserves [12,13], among other considerations. The outcomes demonstrated that firms are enticed to accept green innovation practices when internally and externally motivated organizations. Internal motives combine management's commitment and supplier's partnership, whereas external motives are regulations and demand pressures from customers. Thus, there is a direct relationship between the two [14]; (Parmar et al., 2022). Organizations can enhance their performance through green innovation as green practices guide them to devise strategies that can help them use fewer resources, reduce the chances of harm, and create a carbon footprint in the organization [15]. The green revolution is a unique strategy that permits organizations to create new techniques and systems that help organizations enhance their performance [16,17]. The product development process must follow such practices, which consume less energy and other resources and later could be analyzed to assess whether the resources can be reused and recycled in the manufacturing process [11]. It has been identified that green innovation has become an accepted notion in the modern era as environmental concerns and global warming have become critical issues globally [18]. Therefore, organizations must adopt green growth strategies as their future survival is based on sustainability which is considered the fundamental responsibility for organizations competing in the global competitive environment. Undoubtedly, the essential factor for green development is embracing technological advancements [17,19]. However, a significant challenge for organizations today is to gauge the costs incurred in greening the organizational practices and to what extent green innovation can lead to growth by addressing environmental concerns. Hence, the study's principal objective is to comprehend how greening an organization may support organizational growth. However, green growth and general innovation are well recognized for their interrelationship [5]. It is essential to observe that national economic development is established through soaring industrial activities (Parmar et al., 2022); [6]. In this essence, Segerstrom [7] validated through his proposed model that firm-level innovations immensely support economic growth.

Organizations always try to produce products with high economic value. Simultaneously, the decision-makers of an organization are always concerned regarding eco-friendly products and processes, which must be environmentally friendly [8,20]. Organizations must adopt and implement innovations and technological interventions to keep the environment green and healthy and manage organizational resources efficiently [21,22]. In the organizational context, it is necessary to realize the stakeholder's views about green products, their attitude to consuming green, and their demand for green products to formulate strategies based on these perspectives [23]. Furthermore, as the human factor is inseparable from organizations, it is essential to identify the commitment of managers and practices adopted by the human resource department to confront the challenges of technology, gain a competitive advantage along with enhancing the performance of the economy and environment [24].

### 1.1. Research gap

The study fills the gap in green innovation literature on organizational and environmental performances. The previous literature is inconclusive regarding the impact of green innovation on environmental and organizational performance. Therefore, the current study offers conclusive outcomes in this regard. Secondly, the moderation of HR practices and management commitment do not evaluate by the previous studies, and the first time the undertaken research has measured the moderating impact of HR practices and management commitment in a relationship between green innovation and environmental and organizational performance.

### 1.2. Objectives of the research

The undertaken research study has three objectives; the first objective is to examine the importance of green innovation and its impact on environmental and organizational performance. The second objective is to ascertain the significant and positive relationship between green innovation and its two dimensions, for instance, green products & green processes. The study's third objective is to measure the moderating impact of HR practices & management commitment between green innovation and environmental & organizational performance. According to Refs. [21,25]; green process & product innovations, marketing innovation & management innovation have a cogent and positive association with environmental & organizational performances. The study's researchers have investigated that such innovation helps organizations grow and develop a competitive advantage. The general objectives comprise theoretical and practical solutions and implications for future researchers and industry practitioners. Industry managers could devise strategies by incorporating green innovation in their products and processes for long-term sustainable growth.

### 1.3. Research questions

We have devised the following research questions to answer from the outcomes of undertaken research, which will be beneficial for future researchers and industry practitioners:

- Does the impact of green innovation have a significant and positive impact on an organization's environmental performance?
- Does the impact of green innovation have a significant and positive impact on overall organizational performance?
- Do green products and green processes have a significant and positive impact on green innovation?
- Do HR practices and management commitment have a significant moderating impact between green innovation and environmental and organizational performance?

### 1.4. Significance and contribution of the research

The current study has multifacet novelty, significance, and theoretical & practical contributions. For instance, it provides a modified novel conceptual framework, which evaluates the impact of green products & green processes on green innovation. The modified conceptual framework further evaluates the impact of green innovation on environmental and organizational performance. Finally, the novel conceptual framework measures the moderation of HR practices and management commitment between environmental & organizational performance. The current research also offers modified, unique measurement scales for future studies. Future researchers can replicate the modified conceptual framework in diverse industries in different geographical regions. There are significant managerial implications that could be drawn from the study. As [26] discussed, a relationship between consumer demands and product innovation positively impacts firm performance. Thus, managers are suggested to find customers' needs and wants, which results in competitive strategies. The best strategy is to provide customers with green products to help them improve their performance.

The rest of the paper was organized into numerous sections; for instance, Section 2 comprised of literature review, and Section 3 contained material and methods. However, Section 4 consisted of results and findings, Section 5 contained discussions, Section 6 comprised of conclusion, and Sections 7 and 8 consisted of theoretical & practical implications, limitations & future research areas, respectively.

## 2. Literature review

### 2.1. Theoretical framework – signaling theory

The signaling theory is a critical theory that relates to fundamental communication; signaling theory is based on suggestions in which the market responds positively or negatively [27]. The signaling theory was redirected by Ref. [28]; which demonstrates how individuals and organizations receive and perceive messages. The current study is linked to the signaling theory because green innovation, such as green products and processes, prevents the environment [29]. The eco-friendly environment and environmental hazards are now becoming burning questions in today's world [16]. Environmental degradation is responsible for the worst ecological changes in weather and pollution worldwide. The developed countries and their organization are responsible for these environmental hazards. The signaling theory relates this environmental degradation and its negative consequences on the atmosphere and people's quality of life [30]. However, simultaneously, green innovation with green products and processes provides an eco-friendly environment to the inhabitants of this universe [16]. Hence, the signaling theory is relevant to the good and bad signals to the ordinary people, governmental environmental departments, international environmental agencies, non-governmental organizations, and industrial policymakers. According to Refs. [31,32]; the signaling theory has also been used in HR practices and management commitment perspectives.

### 2.2. Green innovation (product & process innovation)

Green innovation could be defined as the services, products, and processes that do not harm or reduce the degradation of an eco-friendly environment and enhance natural resources. Green products and green processes are the two dimensions of green innovation. Green innovation is correlated with energy efficiency, carbon and fossil fuels emission control, waste management, production of renewable goods, and corporate environmental protection [21,33]. Green innovation comprises many dimensions, including green product & process innovation and green management & marketing innovation. Environmental managerial presentation refers to evaluating the inter-relationship between producer and customers, thus promoting the eco-friendly image of the industry. Nie et al. and Molina-Azorin et al. [34,35] concentrated on green administration and financial outcomes. They demonstrated substantial & affirmative effects of environmental performance on a firm's financial performance. Yunzhao and Ahmed et al. [16,33] defined and developed the association amid organization, green innovation, and environmental outcome. The research findings exhibited that the combination of green innovation, green operations, and creativity positively impacts the organization's societal, environmental & organizational performances. The outcomes also validated that adoption of 'green concepts' leads to manufacturers' concentration on designing creative processes to better cope with consumer demands, thus achieving higher customer service and better sales. Similarly, Amir et al. and Huang et al. [36,37] also stated that consumers' gravity encourages green organizational responses that increase green innovation functioning. In this regard, Alhadid and As'ad [38] assessed the influence of green innovation functions from the

perspective of the Jordanian industrial sector. They measured the interrelation between organizational performance & green innovation using environmental management attainment as a moderation. Assessing the green capabilities and their impacts on organizational societal sustainability, García-Sánchez et al. [39] identified an interrelatedness between environmental outcomes & green culture. Thus, introducing eco-friendly products and processes had a cogent effect on the firm's functioning and environmental enactment. Previous literature has extensively explored and empirically proved a connection between organizational greening, green culture, and innovative firms' functioning.

### 2.3. HR practices and management commitment

Green human resource management is defined as the organization contributing to green HR policies, which enhance the eco-friendly environment, protect environmental hazards, and achieve its goal, known as organizational attainment. Green organizational attainment is linked with green firms' uniqueness and innovative green attainment. Mushtaq et al. [40] empirically examined this link. They found the sequential chain process connecting organizational greening to green innovation capabilities, extending green organizational identity, and resulting in an organization's green performance. According to Refs. [41,42]; financial & ecological attainment could be improved through green innovation and support to attain a competitive advantage. A green organization is defined as an organization that reduces environmental hazards through its eco-friendly policies, for instance, introducing green products, green services, green processes, and a green supply chain. For the improvement of business excellence, the green supply chain is supposed to expand its operational efficiency. In addition, a direct relationship exists between green supply chain management & organizational fulfillment. Conversely, for evaluating the association, an in-direct significant relationship has also been substantiated between the green supply chain & organizational attainment, where operational and rational efficiency work as moderating variables in the relationship (Parmar et al., 2022); [43,44]. As can be observed from the literature, the role of HR practices and management commitment have not been examined so far to identify an association between organizational attainment and green innovation.

### 2.4. Environmental and organizational performance

Managerial role in green embracing and green organizational adaptation is pertinent. According to Ref. [45]; new demands have been developed globally to develop management models for firms that lead toward a sustainability direction. Sustainable innovation practices adopted by firms signify an affirmative influence on organizational fulfillment as it creates a green organizational identity. Song and Yu and Ahmed et al. [21,46] demonstrated a cogent & positive effect of green creativity and identity on green innovation. The association between green innovation and the organization's attempt at innovation strategy was found significant in the presence of organizational identity, which intervenes in the relationship and connects innovation strategy to green identity and creates innovative green capabilities. Furthermore, firms' potential for sustainable growth can be enhanced through the concept of green identity, and they must be capable of green creativity to enhance the firm's sustainable development. It is also observed that organizations could maintain their competencies and market gains through green innovation practices because eco-environment organizations tend to earn more profit than others [40,47]. Further, Ahmed et al. and Leal-Rodríguez et al. [16,48] evaluated the theoretical implications of green innovation generated positive relationships with firm performance and market orientation. Market orientation advocates a customer-centric approach to cater to divergent customer needs and positively impact the firm's performance. To reduce the consumption of gas, oil, electricity, and water, firms must lessen the emission of environment-harming substances and hazardous waste. Organizations are adopting green technologies, processes, and practices to perform well due to innovativeness, creativity, and resource efficiency. Labour productivity is sometimes attributable to green innovation practices [49,50]. Moreover, green innovativeness leads to tailor-made customer-centric production that produces performance benefits. It is noteworthy that large organizations which produce mass environmental pollution should extensively adopt greening to control environmental waste [16].

### 2.5. Hypotheses formulation

#### 2.5.1. Green innovation and firm performance

Creative processes and innovative products manifest higher firm performance [20,51]. Using the contrast analysis method, Ahmed et al. and Xie et al. [16,51] found that process and product innovations help organizations to improve their functioning. Alhadid and As'ad [38] found a decisive influence of green innovation on the organization's outcome, whereas ecological administration is a moderating construct amid organizational functioning and green innovation. There are many factors behind the future association amid green product creativity and organizational attainment. Proficient use of raw materials is encouraged by green product creativity [52], which results in low cost and helps firms to create different ways of converting waste into useable products, which enhances profitability. Furthermore, this relationship augments business performance and profitability, leading to market advantage [8,53]. Kammerer [54] asserted that consumer demand is generated through green products, which generate not only public profit but also provide several environmental and ecological benefits. Ahmed et al. and Kimario [21,26] also confirmed an affirmative association between consumer demand, organizational attainment, and green innovation. Therefore, based on previous research findings, green innovation as a variable has been adapted to check how it impacts organizational attainment; hence, we framed a subsequent hypothesis:

**H1.** Green innovation has a significant and positive relationship with organizational performance.

*2.5.2. Green innovation and environmental performance*

Organizational & environmental attainment includes recyclable and reusable packaging, and products, reduced hazardous emissions, and reduced waste. Moreover, adopting energy-efficient processes and resource efficiency improves ecological attainment [36, 55]. Comparably, Abu Seman et al. [56] found a positive impact of green innovation & green supply chains on environmental fulfillment. Furthermore, they have added that green innovation positively affects organizational environmental attainment. Similarly, Lu et al. and Eiadat et al. [8,53] confirmed a significant favorable influence of ecological innovation strategy on business excellence. Thus, it is evident that a firm’s attainment & environmental innovation strategy are significantly & positively associated, and industry practitioners anticipate finding desired solutions for their environmental problems. Previous literature shows an analogous relationship between firms’ environmental performance and green innovation [56,57]; (Parmar et al., 2022). Thus, to validate the relationship, we framed a subsequent hypothesis:

**H2.** Green innovation has a significant and positive relationship with environmental performance.

*2.5.3. Green product & green process innovations and green innovation*

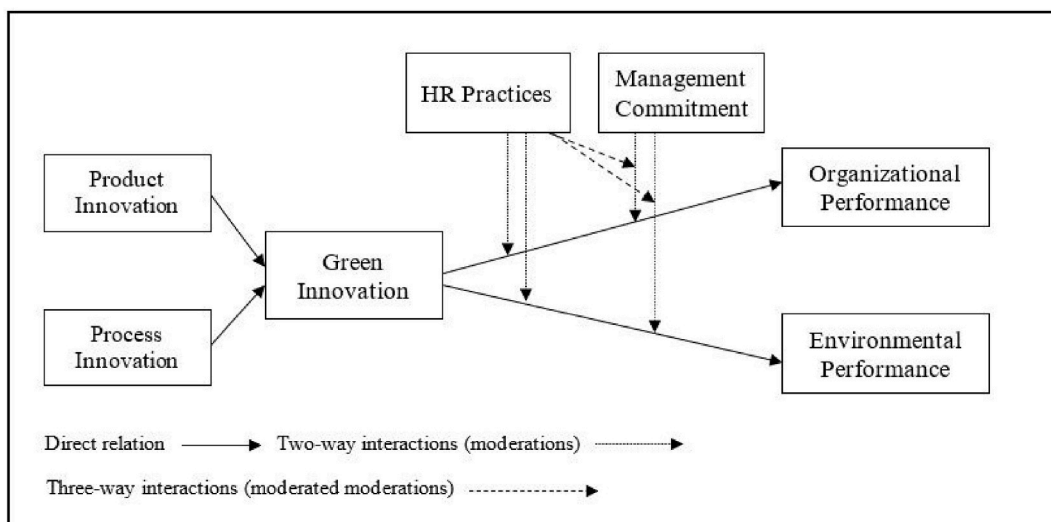
Green product and process innovation are widely considered by researchers worldwide [58,59]. However, the literature on a related topic is disjoint and not restricted to eco-process innovation, green innovation, green clean process innovation, product innovation, eco-friendly process innovation, and eco-friendly product innovation [16,56,60]. Dai and Zhang [61] have described the term “green innovation performance” as “it is an outcome derivative from all the environmental management struggles”. However, Xie et al. [62] later expressed the term as “hardware or software innovation linked to green processes or products, including innovation in technologies that are involved in energy saving, pollution prevention, waste recycling, green product design, or corporate environmental management.” The undertaken study has considered twofold factors of green innovation, for instance, green process & product innovation. However, Pollution prevention, green product design, energy-saving, and waste recycling belong to the green product innovation. Previous literature has confirmed a strong & cogent connection with green innovation [58,63,64]. Therefore, we framed a subsequent hypothesis:

**H3.** Green process innovation has a significant and positive relationship with green innovation.

**H4.** Green product innovation has a significant and positive relationship with green innovation.

*2.5.4. Human resource practices, environmental, and organizational performance*

Human resources and technologies positively influence green product innovation [8,42], which has empirical links with theoretical and managerial practices. According to Ref. [65]; human resource practitioners are accountable for training, recruiting, and evaluating to improve & enable a green organizational culture. Green mindsets and green thinking are infused in organizations through HR managers. Organizations’ green intent is facilitated through organizational green commitment and green attitude. HR managers’ green practices lead employees toward green goals and practice adoption. Relatedly, Ahmed et al. and Roscoe et al. [21,65] exhibited that enablers of a green firm’s culture exerted an affirmative & cogent moderating effect between green HR practices and organizational attainment. In contrast, the preceding literature substantiates the observation that green innovation brings a competitive advantage to firms that intensify their financial and production performance [14,57]. Hence, we formulated the following two moderating



**Fig. 1.** Conceptual framework of the study.

hypotheses:

**H5(a).** HR practices significantly & positively moderate between green innovation and environmental performance.

**H5(b).** HR practices significantly & positively moderate between green innovation and organizational performance.

#### 2.5.5. *Management commitment, environmental and organizational performance*

To obtain successful innovation applications, it is essential to have organizational support. Almomani et al. and Tseng et al. [43,66] suggested that management innovation is essential for developing the practices of green innovation. Furthermore, Nie et al. and Lin et al. [34,67] suggest that companies would enhance green innovation in firms if there were more involvement of management support. Organizations that are more committed to greening intend to foster green managerial concern (Parmar et al., 2022); [47,68], and commitment provides the foundations for instilling green practices in the organization. Green organizational commitment directs firms toward green product and process adaptability concerning ecological dimensions, communicating green strategies, and controlling green process implementation, which consecutively brings firms ecological & organizational attainment [8,12,69]. We derived an adapted conceptual framework for this study (see Fig. 1). Therefore, we framed the subsequent two moderating hypotheses and two conditional moderated moderation hypotheses:

**H6(a).** Management commitment significantly & positively moderating between green innovation and environmental performance.

**H6(b).** Management commitment significantly & positively moderating between green innovation and organizational performance.

**H7(a).** There is a conditional moderated moderating impact of management commitment interacted by HR practices between green innovation and environmental performance.

**H7(b).** There is a conditional moderated moderating impact of management commitment interacted by HR practices between green innovation and organizational performance.

### 3. Material and methods

#### 3.1. *Research design*

The research design of the undertaken study is quantitative, and this is a cross-sectional research study; the cross-sectional study could only examine the data for that particular period and could not predict the results with time. We have employed the deductive method to conduct this quantitative research and analyzed collected data using statistical tools. Centering around the deductive approach, several hypotheses have been deduced to find the impact and effect of the studied variables. Primary data was collected using well-established and validated modified questionnaires from previous studies. Primarily targeted companies for this piece of research were those organizations that not only have an awareness of and have implemented green innovation strategies in the textile sector but also train their employees to use green innovation practices in their operations. Funneling down, we collected the responses from the employees of these companies in particular, including both middle & upper-level management (CEOs, directors, HR managers, and policymakers) from the textile sector of Pakistan. We obtained responses through a self-administered procedure, and take prior appointments, and collected the data. The sampling frame of this study is the textile industry of Pakistan; this sampling frame comprises structured organizations and small and medium enterprises that follow green HR practices and eco-friendly environments. The considered sampling frame is restricted for the study according to the selected research topic. According to the All Pakistan textile mills association (APTMA), there are 517 textile units in Pakistan. Thus, we have collected our required sample from this sampling frame of 517 textile units. Out of 517 textile companies, we collected 320 responses from 245 textile units. However, we have targeted 517 textile units, but most of them needed to follow green HR practices and an eco-friendly environment. We have obtained prior informed consent from all participants of this research. The main motive for collecting the data from these companies was to check if green innovation impacts an organization's performance or if we can say how green innovation impacts a firm's attainment in the textile sector. Moreover, to check how several HR practices and organizational commitment exerted a moderating & moderated moderation effect between green innovation & organizational attainment.

#### 3.2. *Data collection and estimation techniques*

The sampling frame of the undertaken study is the textile sector of Pakistan; however, the textile sector of Pakistan mainly needs to follow the pro-environmental guidelines. The textile industry follows chemical wastes and non-pro-HR practices. There are two types of textile organizations in Pakistan, 1) established and structured organizations, for instance, Al-Karam, Gul Ahmed, Younus, Sitara, and several others that follow green HR practices and also take care the environmental hazards. However, hundreds of thousands of small and medium enterprises spread all over the country and mostly need to follow green HR practices and environmental degradation. Therefore, we have to take only those structured organizations and small and medium enterprises which follow green HR practices and eco-friendly policies. Therefore, we employed purposive sampling to attain the responses from the sampling frame and confirm that informed consent was obtained from all participants for this research. The data was collected through a survey from the decision-makers and HR managers of the structured textile companies from Karachi, Lahore, and Faisalabad. The researchers have taken an appointment and took a survey personally from January 2022 to July 2022, the survey was voluntary, and we did not pay any financial benefit to the respondents. The study's sample size was 320 respondents, which shows an 83.8% response rate. Since we used



a non-probability technique, we did not use any statistical method to collect the required sample size. We have gathered our sample from 245 textile units out of 517, which makes 47.39% of total textile units, which is a good number, as suggested by several researchers [70]. Since we used PLS-SEM through Smart-PLS software, the normality condition is not necessary for the employed method and software. As discussed earlier, it was a quantitative study; therefore, the validity & reliability of items of the questionnaire were evaluated using factor loading, composite reliability, Cronbach's alpha, and average variance extracted (AVE). There were two sections in the questionnaire first part carried information related to demographics and the second section contained information related to all variables of this paper.

A survey questionnaire consisted of a five-point Likert scale with structured items & constructs. For the analysis, we employed the Smart-PLS 4.0 software for this research. We validated the measurement and structural models through convergent and discriminant validities, Fornel-Larcker Criterion, HTMT matrix, regression analysis (R-squared values), f-squared values, predictive relevance  $Q^2$ , and hypothesized indirect & direct associations (Parmar et al., 2022). The measurement model is the outer model between observed & unobserved variables and is evaluated through convergent validity using factor loading, Cronbach's alpha, and composite reliability. However, the discriminant validity is validated using the average variance extracted, Fornel-Larcker Criterion, HTMT matrix. Thus, in this way, the modified items and constructs are validated, and our modified outer model (measurement model) is simultaneously validated. However, the structural model is an inner model between independent, dependent, and indirect variables. The structural or inner model is validated using regression analysis (R-squared values), f-squared values, predictive relevance  $Q^2$ , and hypothesized indirect & direct associations. Hence, the entire modified model of the undertaken study is validated using measurement and structural models through Smart-PLS 4.0. We also measured the moderation or the moderated moderation through the bootstrapping method with 5000 bootstraps [71]. The moderated moderation function is built-in Smart-PLS 4.0 software; previously, it was not available in the Smart-PLS 3.0 version. The smart-PLS 4.0 calculates the bootstrapping method by default. However, in the AMOS, we have to give this command, which is also built-in by default in conditional process modeling.

### 3.3. Items or scaling measurement

The items or indicators are examined using a five-point Likert scale in which green innovation has seven items by two dimensions, product innovation has four items & process innovation has three items, which were adapted from Refs. [1,60,62,64]. There are two outcome variables of the study: firm performance and environmental performance. The study measures firm performance with four items adapted from Refs. [26,53,72]. At the same time, environmental performance is examined with four indicators, which were adapted from Refs. [8,55,56,67]. HR practices are examined with five items from Refs. [14,15,65]. Finally, organizational commitment is examined with five indicators adapted from Refs. [69,73,74]. The detailed questionnaire is provided in Annexure I. This research has measured the reflective indicators measurement model through confirmatory factor analysis, an obvious choice of structural equation modeling to examine observed and unobserved variables and indicators using PLS-SEM (partial least square-structural equation modeling).

## 4. Results and data analysis

### 4.1. Demographic statistics

Table 1 exhibited that most respondents were male, with a frequency percentage of 54.1%, and females were 147, with a percentage of 45.9%, so we can say that findings depend on male respondents. The overall demographic statistics are narrated in Table 1.

### 4.2. Assessment of measurement model

#### 4.2.1. Convergent validity

According to Ref. [75] and Hashim (2012), indicator reliability is evaluated with the help of an item's outer loadings. The value should be above 0.7, which is the perfect value for indicator reliability. If the outer value is below 0.5, it should be removed from the

**Table 1**  
Demographic statistics.

Categories		Frequency	Percent
Gender	Male	173	54.1
	Female	147	45.9
Age (yrs.)	18–25	130	40.6
	26–35	148	46.3
	Above 35	42	13.1
Qualification	Graduate	105	32.8
	Masters	150	46.9
	Above	65	20.3
Management Level	LM	80	25.0
	MM	181	56.6
	TM	59	18.4



table. Table 2 shows that all values of outer loadings range between 0.65 and 0.88, which validates the construct reliability. As Kline (2015) discussed, convergent validity means all indicators that measure one construct have a high correlation and evaluate mutual variables based on appropriate theory. Researchers use outer loading and AVE to assess convergent validity. According to Ref. [16] and Chin (1998), the AVE considers the number of variables; however, a variable is represented with the help of its items obtained from measurement error. According to Ref. [76]; the acceptable value for AVE should be above 0.5, and the findings of Table 2 confirmed that each value of AVE is more significant than 0.5 for every construct. However, Cronbach's alpha evaluates each construct's consistency; similarly, composite reliability examines the internal constancy of each factor. It shows the relations of items with each other in a single construct. According to Ref. [75]; if the reading of each construct's composite reliability is above 0.7, it is considered acceptable. The CR values above 0.7 show that all items have internal consistency, and each construct evaluates different concepts.

#### 4.2.2. Discriminant validity

Table 3 exhibited the discriminant validity of every factor through the Fornell-Larcker criteria. Fig. 2 and Table 2 demonstrate the factor loading of each item, which is higher than 0.70, and the broad range of outer loading between 0.694 and 0.888. However, the squared root of the AVE of every factor is higher than the achieved correlation of the factors, which shows that it is differentiated from its relationship with other constructs. Thus, convergent and discriminant validities have also been achieved [76].

#### 4.2.3. Heterotrait-Monotrait (HTMT) ratio matrix

Table 4 demonstrated that each HTMT is less than 0.90, another criterion to achieve discriminant validity between two constructs; therefore, the discriminant validity condition has also been achieved [75,77]. However, discriminant values between green innovation and product & process innovation are higher than 1, and it is because green innovation is derived from the items of product & process innovation. Therefore, it reflects a low discriminant validity in HTMT values. However, the alternative method to establish the discriminant validity is the Fornell-Larcker criterion, which established a discriminant validity between green innovation and product & process innovation. Thus, it is determined that the considered measurement model is endorsed for the dependent variables, such as environmental & organizational performance.

### 4.3. Assessment of the structural model

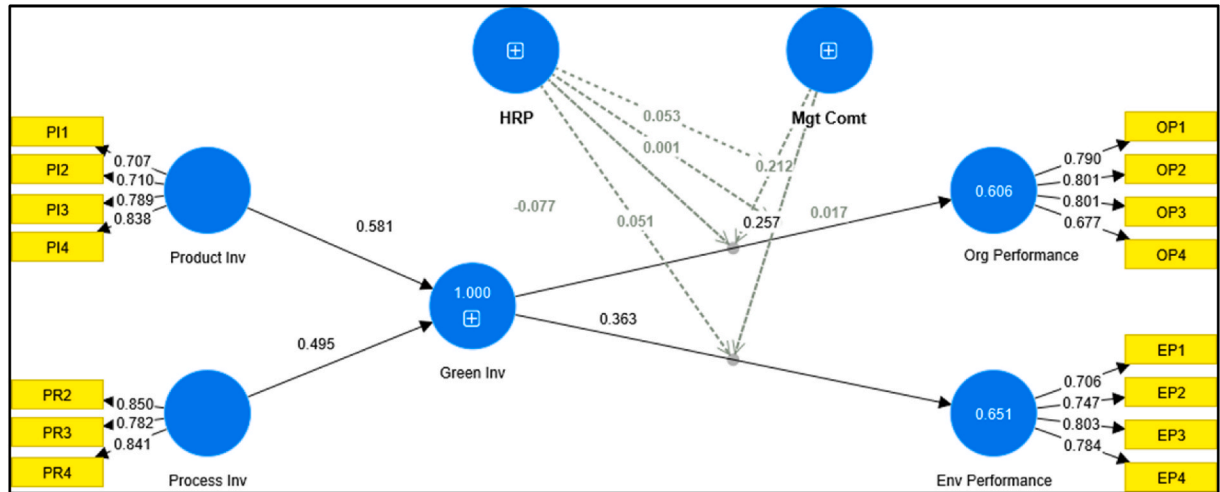
Edwards and Bagozzi and Ahmed et al. [16,78] have exhibited that SEM-based multivariate modeling aids the evaluation of the relationship between constructs and indicators with the help of hypothesized measurement model. However, the association among constructs is examined through the path model between the constructs. The measurement model is classified into two models, i.e., formative & reflective, determined by the direction of association between items and constructs [21,79]. Indicators developed by latent constructs are known to be impact indicators, and reflective models help to endorse the association between effect indicators and their factors. However, in the formative model, indicator impacts are known as causal indicators, and the construct formed is a composite variable [75,80]. As [8,81] evaluate the reflective model, classical test theory is mostly followed based on construct recognition developed with the support of CFA, and reliability is evaluated through Cronbach alpha.

**Table 2**  
Measurement model.

Construct	Items	Loadings	Composite Reliability	AVE
Environmental Performance	EP1	0.694	0.846	0.579
	EP2	0.743		
	EP3	0.804		
	EP4	0.797		
Organizational Performance	OP1	0.792	0.851	0.588
	OP2	0.794		
	OP3	0.785		
	OP4	0.692		
Product Innovation	PI1	0.707	0.847	0.582
	PI2	0.710		
	PI3	0.789		
	PI4	0.838		
Process Innovation	PR1	0.850	0.864	0.680
	PR2	0.782		
	PR3	0.841		
Human Resource Practices	HRP1	0.718	0.896	0.634
	HRP2	0.789		
	HRP3	0.888		
	HRP4	0.762		
	HRP5	0.814		
Management Commitment	MC1	0.789	0.907	0.662
	MC2	0.704		
	MC3	0.888		
	MC4	0.842		
	MC5	0.833		

**Table 3**  
Fornel-Larcker criterion.

Factors	EP	HRP	MC	OP	PR	PI
Environmental Performance	<b>0.761</b>					
HRP	0.681	<b>0.796</b>				
Management Commitment	0.663	0.726	<b>0.814</b>			
Organizational Performance	0.672	0.488	0.470	<b>0.767</b>		
Process Innovation	0.691	0.562	0.583	0.575	<b>0.825</b>	
Product Innovation	0.633	0.489	0.556	0.650	0.725	<b>0.763</b>



**Fig. 2.** Measurement model.

**Table 4**  
Heterotrait-monotrait ratio (HTMT) - Matrix.

Factors	Env Performance	Green Inv	HRP	Mgt Comt	Org Performance	Process Inv	Product Inv	Mgt Comt x Green Inv	HRP x Green Inv
Env Performance									
Green Inv	0.865								
HRP	0.827	0.643							
Mgt Comment	0.806	0.701	0.845						
Org Performance	0.871	0.804	0.573	0.555					
Process Inv	0.893	1.127	0.686	0.711	0.729				
Product Inv	0.817	1.170	0.590	0.674	0.842	0.847			
Mgt Comment x Green Inv	0.595	0.628	0.475	0.648	0.549	0.595	0.637		
HRP x Green Inv	0.488	0.482	0.465	0.494	0.441	0.477	0.472	0.813	

**4.3.1. Regression analysis or R-squared values**

We analyzed the association of independent variables with the dependent variables with and without incorporating the moderating variables to assess the change in the model (see Table 5). However, we assume that the remaining variables remained constant. Without incorporating the moderating variable, the values of R-squared, such as 0.25, 0.50, and 0.75, are considered low, reasonable, and high, respectively [75,77]. Outcomes of Table 5 demonstrated that values of R-squared are within the threshold cut-off; for instance, 0.636 (environmental performance), 1.000 (green innovation), and 0.474 (organizational performance) exerted the change on their respective dependent variables. The discussion on change in R-square values with moderating is provided in moderating

**Table 5**  
Regression analysis or R-squared values.

Factors	R-square	R-square adjusted
Environmental Performance	0.636	0.627
Green Innovation	1.000	1.000
Organizational Performance	0.474	0.462

relationship section.

#### 4.3.2. F-squared analysis

Table 6 demonstrated that the f-squared value of green innovation with environmental performance is 0.242, which is a medium change when the exogenous construct is removed from the model. According to Ref. [82]; if  $f \geq 0.02$  is small;  $f \geq 0.15$  is medium &  $f \geq 0.35$  is large, the value between HR practices and environmental performance is 0.151, which is considered medium. The f-squared analysis between green innovation and process & product innovation are 0.390 & 0.390, respectively. The moderation of HR practices with environmental and organizational performance is insignificant—however, the rest of the f-squared analysis is either small or medium between the variables.

#### 4.3.3. Multicollinearity analysis (VIF)

The findings of Table 7 exhibited that the values of variance inflation factors (VIF) are less than 5. Therefore, there is no potential issue of multicollinearity amongst the constructs [83]. The VIF values between green innovation and environmental & organizational performance are 1.918 & 1.97, respectively. Similarly, the remaining values of VIFs are also less than between the factors. Thus, it is concluded that there is no problem with multicollinearity.

#### 4.3.4. Predictive power of accuracy ( $Q^2$ )

Finally, we measured the predictive accuracy of regressors through the value of  $Q^2$  [84]. The threshold values of  $Q^2$  were determined by Ref. [85] and demonstrated that values from 0, 0.25 & 0.50 are assumed to be meaningful, small, medium, and large accuracy of the model, respectively. The findings of Table 8 exhibited that  $Q^2$  values of green innovation have a significant accuracy, i.e., 0.798 & 0.798 with green product and green process, respectively, and environmental performance has 0.542, and organizational performance has 0.653 with green innovation. However, predictive accuracy  $Q^2$  of organizational & environmental performance with management commitment and HR practices are 0.211, 0.161, 0.112, & 0.122, respectively. Finally, it is concluded that all the variables' predictive power of accuracy  $Q^2$  is either meaningful, trim, or significant, as shown in Table 8.

#### 4.3.5. Hypothesized direct relationship

For the supported hypothesis, we checked the T-values and P-values; the threshold values are  $T > \pm 1.96$  and  $P < 0.05$ . If the results of variables consist of these variables, then the relationship between the two variables will be supported and significant. Table 9 explains the findings of the hypothesis, which are established on the association amid independent factors. For instance, green products and process innovation are considered independent variables. However, their dependent variable is green innovation. However, at the same time, green innovation is considered independent, and environmental and organizational performances are dependent variables. Similarly, we have taken two moderating variables, HR practices and management commitment, amid independent and dependent factors. The relationship of these variables is explained through a graphical path in Fig. 3 for SEM that identifies the values required to evaluate the hypothesis. Table 9 exhibited that green innovation exerted a cogent & affirmative impact on environmental performance ( $\beta = 0.363$  and  $P = 0.000$ ) and organizational performance ( $\beta = 0.257$  and  $P = 0.000$ ). Similarly, green process innovation significantly impacts green innovation ( $\beta = 0.459$  and  $P = 0.000$ ), and green product innovation positively & significantly affects green innovation ( $\beta = 0.581$  and  $P = 0.000$ ). Thus, it is established that H1 and H2 are validated.

#### 4.3.6. Hypothesized moderating relationship

Table 10 and Fig. 3 evaluated the moderation of human resource practices & management commitment interacted with green innovation on a firm's performance and environmental performances (two-way interactions). Further, the conditional moderated moderation effect of management commitment affected by HRP interacted with green innovation on organizational and environmental performance (three-way interaction) is tested using Smart-PLS 4.0, as demonstrated in Fig. 3. The results for two-way and three-way interactions for all hypothesized relationships are provided in sub-sections.

4.3.6.1. Two-way interactions. While evaluating the moderating effect of HR practices on environmental performance, Table 10 demonstrated that the result is not supported (H5a-  $\beta = 0.051$ ,  $p = 0.491$ ). Similarly, HRP had an insignificant moderating effect on organizational performance (H5b -  $\beta = -0.077$ ,  $p = 0.69$ ). Likewise, the moderating impact of management commitment on

**Table 6**  
F-squared values.

Factors	Env Performance	Green Inv	HRP	Mgt Comment	Org Performance
Env Performance					
Green Inv	0.242				0.277
HRP	0.151				0.024
Mgt Comment	0.022				0.023
Org Performance					
Process Inv		0.390			
Product Inv		0.390			
Mgt Comment x Green Inv	0.028				0.029
HRP x Green Inv	0.000				0.000

**Table 7**  
Multicollinearity statistics (VIF).

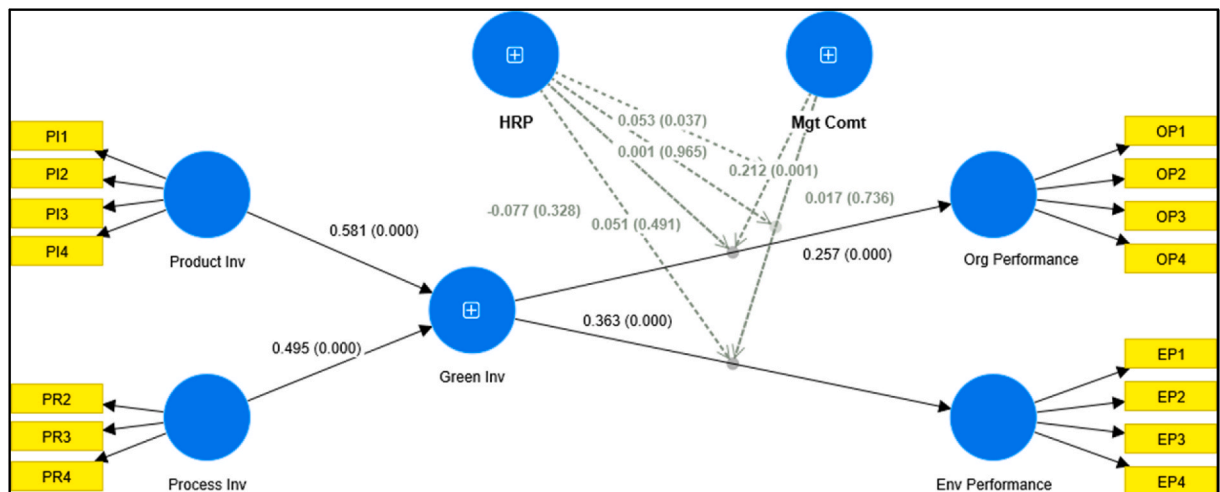
Factors	Env Performance	Green Inv	HRP	Mgt Comment	Org Performance
Env Performance					
Green Inv	1.918				1.917
HRP	2.406				2.406
Mgt Comment	2.903				2.903
Org Performance					
Process Inv		4.705			
Product Inv		4.705			
Mgt Comment × Green Inv	4.199				4.199
HRP × Green Inv	3.190				3.190

**Table 8**  
Predictive Power of accuracy (Q2).

Factors	Env. Performance	Green Inv	HRP	Mgt Comment	Org. Performance
Env Performance					
Green Inv	0.542				0.653
HRP	0.211				0.161
Mgt Comment	0.112				0.122
Org Performance					
Process Inv		0.798			
Product Inv		0.798			
Mgt Comment × Green Inv	0.011				0.091
HRP × Green Inv	0.021				0.043

**Table 9**  
Hypothesized direct relationship.

Hypothesized direct relationship	Beta	Standard deviation	P values	95% Confidence interval		Decision
H1: Green Inv → Env Performance	0.363	0.357	0.000	0.205	0.511	Accepted
H2: Green Inv → Org Performance	0.257	0.254	0.000	0.107	0.392	Accepted
H3: Process Inv → Green Inv	0.495	0.019	0.000	0.460	0.534	Accepted
H4: Product Inv → Green Inv	0.581	0.021	0.000	0.541	0.623	Accepted



**Fig. 3.** Structural model.

**Table 10**  
Hypothesized moderating & moderated moderation relationship.

Moderating and moderated moderation	Beta	Standard deviation	P values	95% Confidence interval		Decision
H5(a) HRP × Green Inv → Env Performance	0.051	0.074	0.491	−0.1	0.189	Rejected
H5(b) HRP × Green Inv → Org Performance	−0.077	0.079	0.328	−0.24	0.069	Rejected
H6(a) Mgt Commitment × Green Inv → Env Performance	0.017	0.051	0.736	−0.08	0.119	Rejected
H6(b) Mgt Commitment × Green Inv → Org Performance	0.212	0.063	0.001	0.075	0.32	Accepted

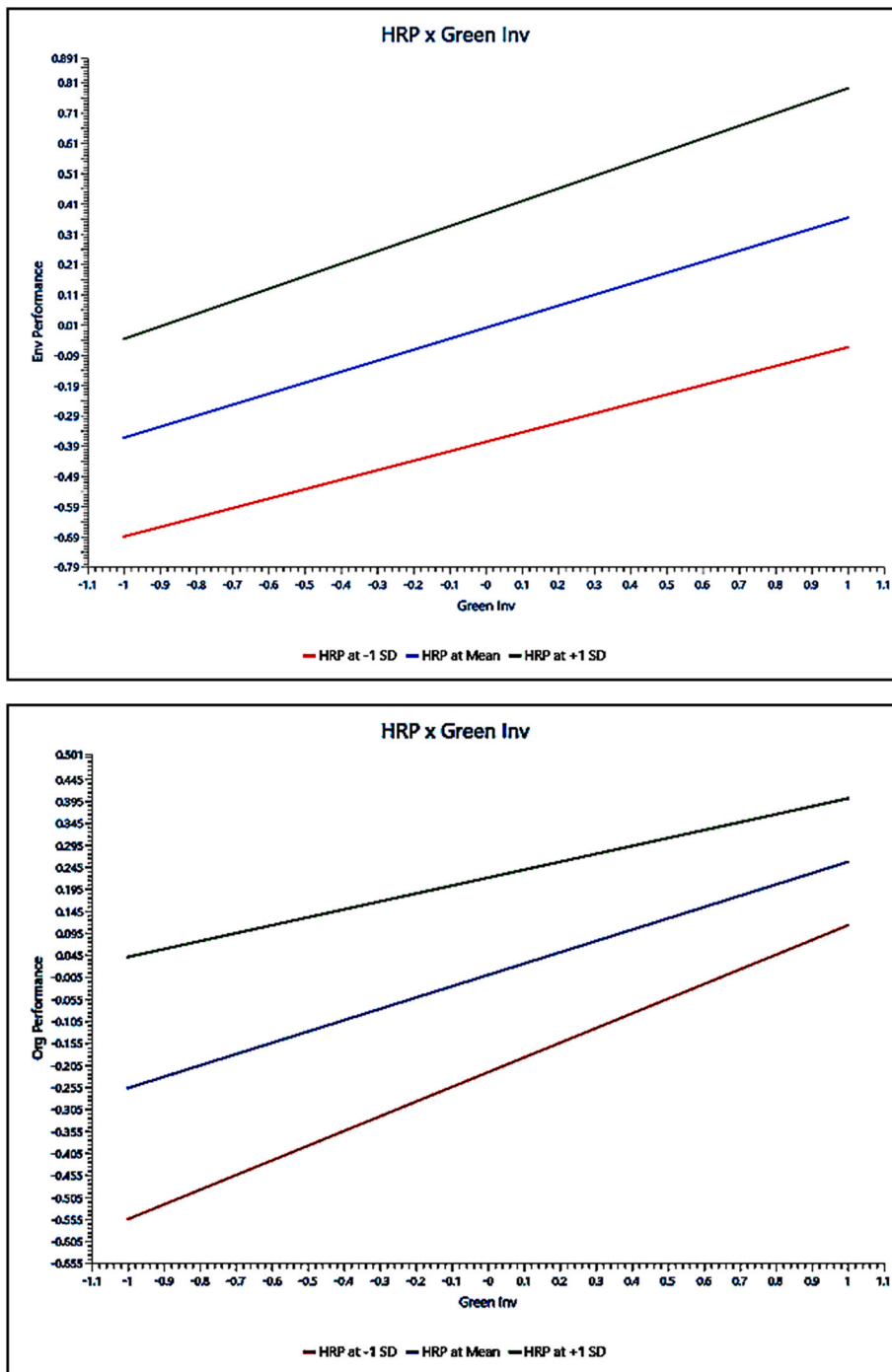
environmental performance (H6a –  $\beta = 0.0071$ ,  $p = 0.118$ ) is not substantiated. However, the moderating impact of management commitment on organizational performance is supported (H6b –  $\beta = -0.212$ ,  $p = 0.01$ ) (see Table 10 and Fig. 4a–4d).

**4.3.6.2. Three-way interactions.** The study assessed hypotheses H7(a) and H7(b) on how management commitment might influence environmental and organizational performance when there are green innovation initiatives and HR practices at organizations. A three-way interaction (a conditional moderating effect of management commitment in the presence of HR commitment) is examined using Smart-PLS 4.0. A 5000 sub-sample using bias-corrected and accelerated (BCa) bootstrap is applied. The overall three-way interaction model explained after incorporating the moderating variables 65.1% with an increase of 14% for environmental performance and 60.6% with an increase of 10% for organizational performance, as demonstrated by Table 11. Thus, it is apparent that moderating constructs contribute to the model. In Table 11, the moderated moderation model for environmental performance does not show the significant moderated moderation role of environment attainment in HR practices (H7a –  $\beta = -0.001$ ,  $p = 0.965$ ). However, the study found a significant moderated moderation effect of HR practices & management commitment between green innovation & organizational performance ((H7b –  $\beta = -0.053$ ,  $p = 0.20.25$ ). The findings are visualized in Fig. 5a and 5b. Looking closely at Fig. 5b, we can see an increase in organizational performance at a high level of HR practices & management commitment. Thus, it is evident that management commitment in connection with HR practices can increase the affiliation between green innovation & organizational performance. However, this interaction does not affect environmental performance.

## 5. Discussions

This research has derived a novel modified conceptual framework with three independent variables: green innovation, product innovation & process innovation, in which product & process innovation are the dimensions of green innovation. The modified conceptual framework has two dependent variables: environmental and organizational performance. Finally, the modified conceptual framework has two moderating variables: HR practices and management commitment. We have validated the modified conceptual framework using the measurement model (outer model) and structural model (inner model) through different measures, as mentioned in the results section for the undertaken empirical study. The study's findings demonstrated that green innovation has a significant and positive relationship with environmental and organizational performance; thus, hypotheses H1 and H2 are substantiated. Preceding literature demonstrated that green innovation is essential to organizational and environmental performance. However, green innovation produces an affirmative association with organizational attainment and market orientation that focuses on consumer demands and the provision of customized products [8,48]. The findings of this study analyzed the influence of green product & process innovation on green innovation and evaluated the effect of green innovation on ecological & organizational performances. Similarly, we examined the moderation of HR practices & management commitment to green innovation and organizational & environmental performance. After analyzing data and obtaining statistical results, it has been identified that green processes & green product innovations have a cogent & assertive influence on green innovation. Thus the hypotheses H3 and H4 are substantiated [58,63,64]. Similarly, green innovation cogently & affirmatively affects environmental and organizational performance. The findings align with previous studies [26,36,38,52,53,55,56,86]. As demonstrated by Refs. [20,53,87]; green innovation influence both competitive capability and organizational performance and have an extensive impact on both, as per statistical findings. Similarly, Refs. [12,36,63,88] confirmed cogent & and affirmative effects on green innovation & environmental attainment. The statistical results found that organizations can lessen resource consumption and waste material with green innovation that benefits the organizational environment. Since green innovation has two constructs, such as product & process innovations, based on the outcomes, process innovation helps to increase environmental performance more than organizational performance, and product innovation will increase organizational performance more than environmental performance [38,52,56].

While evaluating the moderating effect of HR practices on environmental performance, the findings are not supported. Similarly, HR practices have an insignificant moderating impact on a firm's attainment. Thus, hypotheses H5(a) and H5(b) are rejected. Likewise, the moderating effect of management commitment on environmental functioning needs to be supported. Thus hypothesis H6(a) is rejected. These outcomes are similar to preceding studies, for instance, Refs. [14,57,65,86]. However, the moderating impact of management commitment on organizational performance is supported. Hence, hypothesis H6(b) is supported. However, the study finds consistent results with a prior study conducted for a developing country in which the HR role was significant [43,89]. A three-way interaction (a conditional moderating effect of management commitment in the presence of HR commitment) is examined using Smart-PLS 4.0. The overall three-way interaction model explained after incorporating the moderating variables 65.1% with an increase of 14% for environmental performance and 60.6% with an increase of 10% for organizational performance. Hence, it is evident that moderating variables contribute to the model; the moderated moderation model for environmental performance does not show the significant moderated moderation role of environmental performance in the presence of HR practices; hence, hypothesis H7



**Fig. 4.** (a) Two interactions (HR Practices × Env Perf) on environmental performance. (b) Two interactions (HR Practices × Env Perf) on organizational performance. (c) Two interactions (Mgt Commitment × Env Perf) on environmental performance. (d) Two interactions (Mgt Commitment × Org Perf) on organizational performance.

(a) is rejected). One of the possible explanations is the weak HR practices observed in this country. These results are consistent with the previous literature, such as [34,67,69]. Pakistan’s HR department has primarily focused on compliance with routine HR practices and does not focus on the firms’ strategic goals [21,90]. However, the study finds the significantly moderated moderation of HR practices & management commitment amid green innovation and firm’s attainment; thus, the hypothesis H7(b) is substantiated. The result is justified for the context of the study, as one of the limitations in organizational development literature is the lack of organizational

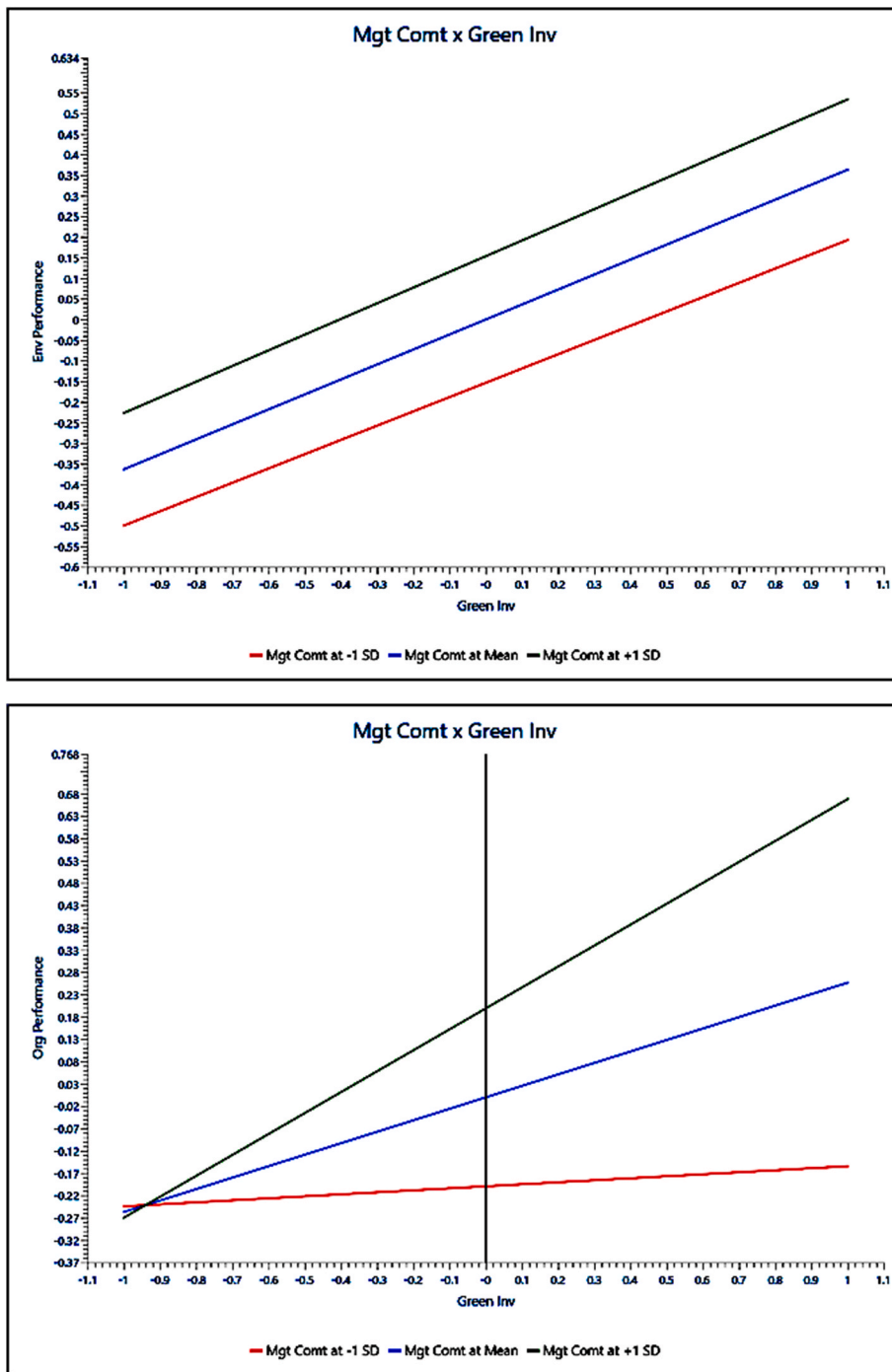


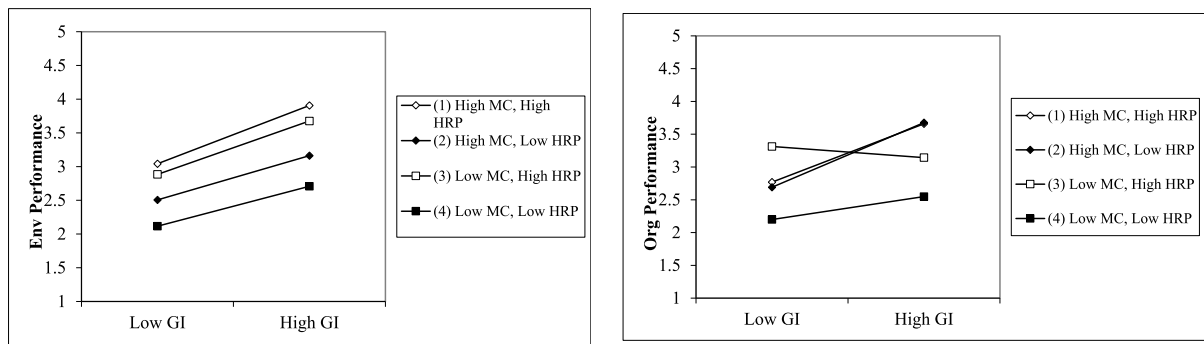
Fig. 4. (continued).

Table 11

Three-way Interaction among HR practices, management commitment, and green innovation on environmental & organizational performance.

Three-way moderated moderation interaction	Beta	Standard deviation	P values	95% Confidence Interval		Decision
HRP × Mgt Comment × Green Inv → Env Performance	0.001	0.023	0.965	-0.042	0.048	Rejected
HRP × Mgt Comment × Green Inv → Org Performance	0.053	0.025	0.037	-0.002	0.101	Accepted





**Fig. 5.** (a) Three-way Interaction (Management Comment  $\times$  HRP  $\times$  Green Inv) on environmental Performance. (b) Three-way Interaction (Management Comment  $\times$  HRP  $\times$  Green Inv) on Organizational Performance.

commitment [91]. Commitment is highly intertwined with trust in leadership and requires attention from top management (Parmar et al., 2022); [14]. The visualized results demonstrated that at a high level of management commitment and HR practices, there is an increase in organizational performance. Thus, it is evident that management commitment in connection with HR practices can increase the association amid green innovation & organizational attainment. However, this interaction does not affect ecological performance. Therefore, managers are suggested to formulate strategies that increase process and product innovation, significantly impacting organizational and environmental performance. It will increase the organization's performance level and aid the companies in indulging in ecological transformations and gaining a competitive edge.

## 6. Conclusion

This study evaluated the connotation between green product & process innovations and green innovation. Moreover, the study examined the impact of green innovation in affiliation with organizational & environmental attainment. The study's findings explored all the hypotheses devised to meet study objectives. Moderation effects of management commitment towards greening and green human resource practices were also examined between the primary relationship. Primary responses were obtained from the mid-career and upper management of the textile sector of Pakistan. This research revealed that product & process innovations have a cogent and affirmative effect on green innovation. The findings further demonstrated that green innovation exerted an affirmative and cogent effect on organizational & environmental performance. Thus, the senior management should seriously consider green innovation projects to increase the firm's environmental performance and the long run, sustainable competitive growth. While evaluating the moderating effect of HR practices on environmental attainment, the findings are not supported.

Similarly, HRP has an insignificant moderating impact on a firm's attainment. Likewise, the moderating effect of management commitment on environmental attainment needs to be supported. Hence, it is evident that moderating variables contribute to the model. The moderated moderation model for environmental performance does not show the significant moderated moderation role of environmental performance in the presence of HR practices. One of the possible explanations is the weak HR practices observed in this country. Pakistan's HR department has primarily focused on compliance with routine HR practices and does not focus on the firms' strategic goals. However, the study finds the significantly moderated moderation of HR practices & management commitment amid green innovation & firm attainment. Commitment is highly intertwined with trust in leadership and requires attention from top management. Thus, management commitment in connection with HR practices can increase an affiliation between green innovation and organizational attainment. However, this interaction does not affect environmental performance. The findings of the undertaken research have significant theoretical and practical implications. The study produces a novel modified conceptual framework and measurement scale, which might be replicated the future researchers in diverse industries and different parts of the world. Similarly, the study's findings also offer significant managerial implications. For instance, policymakers and HR managers should inculcate green HR policies to empower their employees to improve overall environmental dilemmas. Top management should also devise strategies to introduce green products, processes, and services to prevent this planet's inhabitants.

## 7. Theoretical implications

The current study has provided a significant theoretical contribution; the findings have multifacet novelty and significance. For instance, it provides a modified novel conceptual framework, which evaluates the impact of green products & green processes on green innovation. The modified conceptual framework further evaluates the impact of green innovation on environmental and organizational performance. Finally, the novel conceptual framework measures the moderation of HR practices and management commitment between environmental & organizational performance. The current research also offers modified, unique measurement scales for future studies. Future researchers can replicate the modified conceptual framework in diverse industries in different geographical regions. There are significant managerial implications that could be drawn from the study.

## 8. Practical implications

The undertaken study offers several practical implications to industry practitioners and decision-makers on the roadmap towards greening the organization and leveraging green innovation benefits. Firstly, managers are suggested to inculcate green innovation practices to increase environmental & organizational performance. The green innovation has a significant & positive influence on both dependent variables (OP & EP). The green innovation processes & practices establish a green organizational culture, which is essential in creating a green corporate image for the customer. The fast-changing global business canvas urge organizations to take a proactive approach toward environmental sustainability and ecological surveillance. In doing so, the HR department and practitioners play a vibrant role in creating green norms and organizational culture. The study findings also suggest that management commitment to green innovation advocates organization-level transformations toward adopting green practices. Human resource managers can identify the prospects of inculcating 'green' into organizational cultural roots through hiring, training, compensation, and other procedural systems.

## 9. Policy implications

The study offers several policy implications to government agencies, international and national environmental agencies, and organizations. There should be proper legislation that protects the environmental hazards by empowering employees of the organization. International environmental agencies should strictly adhere the organizations to the environmental protection manual. Lastly, organizations should consider green HR practices for competitive advantage & long-term growth and utilize a green human resource mindset to acquire their environmental objectives. The HR department should also reward employees who follow the green policies at the workplace (Parmar et al., 2022); [92]. The organizations should inculcate environmental protection slogans in their mission, vision, and values, and the HR department should mainly focus on this issue and oversee all the relevant departments of the organization.

## 10. Limitations and potential areas of future studies

The study has specific limitations; firstly, this paper has focused on the textile manufacturing sector and was limited to organizations based in Karachi, Lahore, and Faisalabad, Pakistan. We have taken a 47% sample of the overall population. Therefore the outcomes could only be generalizable for some of the industries. Therefore, it is recommended that future researchers take a larger sample for robust results. The study has taken only the textile industry. Therefore, this is another limitation of the current study, and the findings cannot be generalizable for other industries. Therefore, it is suggested that future research scholars take multiple industries and larger geographical areas for more robust results. Secondly, the employee-level constructs, including employee job commitment and green awareness, were not considered in this study as moderators. Employee-level variables might be considered in future studies frameworks to investigate the suggested dimension. Furthermore, the undertaken study has evaluated the effect of green innovation on ecological & organizational attainments with moderating constructs of management commitment & HR practices. Future researchers should take environmental performance and dynamism as mediating variables. Furthermore, other micro-elements of organizational performance, such as administrative, innovative, and technological, could constrict study findings to specific organizational performance. The current study does not evaluate the cause-and-effect analysis; therefore, it is recommended that future researchers employ the cause-and-effect models for more meaningful results. Finally, the study's sample size is not very large, and moderating variables are only two and did not take any mediating variable; therefore, the results cannot be generalizable. Hence, it is recommended that future researchers take a larger sample with multiple mediating and moderating variables for robust results [93, 94].

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.heliyon.2022.e12679>.

## References

- [1] Y.-S. Chen, S.-B. Lai, C.-T. Wen, The influence of green innovation performance on corporate advantage in Taiwan, *J. Bus. Ethics* 67 (4) (2006) 331–339. <https://doi.org/10.1007/s10551-006-9025-5>.
- [2] S. Zia, M.U. Rahman, M.H. Noor, M.K. Khan, M. Bibi, D.I. Godil, M.K. Anser, Striving towards environmental sustainability: how natural resources, human capital, financial development, and economic growth interact with ecological footprint in China, *Environ. Sci. Pollut. Control Ser.* 28 (37) (2021) 52499–52513. <https://doi.org/10.1007/s11356-021-14342-2>.
- [3] J. Holmberg, R. Sandbrook, *Sustainable development: what is to be done?*, in: *Policies for a Small Planet* Routledge, 2019, pp. 19–38.
- [4] R. Kurniawan, S. Managi, Economic growth and sustainable development in Indonesia: an assessment, *Appl. Artif. Intell.* 54 (3) (2018) 339–361. <https://doi.org/10.1080/00074918.2018.1450962>.
- [5] G.M. Grossman, E. Helpman, Endogenous innovation in the theory of growth, *J. Econ. Perspect.* 8 (1) (1994) 23–44.
- [6] A.V. Stel, M. Carree, R. Thurik, The effect of entrepreneurial activity on national economic growth, *Small Bus. Econ.* 24 (3) (2005) 311–321. <https://doi.org/10.1007/s11187-005-1996-6>.
- [7] P.S. Segerstrom, Innovation, imitation, and economic growth, *J. Polit. Econ.* 99 (4) (1991) 807–827.

- [8] J. Lu, L. Ren, C. Zhang, D. Rong, R.R. Ahmed, J. Streimikis, Modified Carroll's pyramid of corporate social responsibility to enhance organizational performance of SMEs industry, *J. Clean. Prod.* 271 (2020) 1–18. <https://doi.org/10.1016/j.jclepro.2020.122456>.
- [9] C.-H. Chang, The influence of corporate environmental ethics on competitive advantage: the mediation role of green innovation, *J. Bus. Ethics* 104 (3) (2011) 361–370. <https://doi.org/10.1007/s10551-011-0914-x>.
- [10] A. Gunasekaran, T. Papadopoulos, R. Dubey, S.F. Wamba, S.J. Childe, B. Hazen, S. Akter, Big data and predictive analytics for supply chain and organizational performance, *J. Bus. Res.* 70 (2017) 308–317. <https://doi.org/10.1016/j.jbusres.2016.08.004>.
- [11] M. Shafique, M. Asghar, H. Rahman, The impact of green supply chain management practices on performance: moderating role of institutional pressure with mediating effect of green innovation, *Bus. Manag. Educ.* 15 (1) (2017) 91–108. <https://doi.org/10.3846/bme.2017.354>.
- [12] E. Mitta, P. Kaur, Green HRM, green innovation and environmental performance: the moderating role of servant leadership, *Hum. Syst. Manag.* (2022) 1–14. <https://doi.org/10.3233/hsm-220066>.
- [13] Y.-X. Yen, S.-Y. Yen, Top-management's role in adopting green purchasing standards in high-tech industrial firms, *J. Bus. Res.* 65 (7) (2012) 951–959. <https://doi.org/10.1016/j.jbusres.2011.05.002>.
- [14] F. Irani, H. Kilic, An assessment of implementing green HRM practices on environmental performance: the moderating role of green process innovation, *J. Global Hospital. Tourism* 1 (1) (2022) 16–30. <https://doi.org/10.5038/2771-5957.1.1.1001>.
- [15] A.-N. El-Kassar, S.K. Singh, Green innovation and organizational performance: the influence of big data and the moderating role of management commitment and HR practices, *Technol. Forecast. Soc. Change* 144 (2019) 483–498. <https://doi.org/10.1016/j.techfore.2017.12.016>.
- [16] R.R. Ahmed, D. Štreimikienė, H. Qadir, J. Streimikis, Effect of green marketing mix, green customer value, and attitude on green purchase intention: evidence from the USA, *Environ. Sci. Pollut. Control Ser.* (2022) <https://doi.org/10.1007/s11356-022-22944-7>.
- [17] S.-H. Wang, M.-L. Song, Review of hidden carbon emissions, trade, and labor income share in China, 2001–2011, *Energy Pol.* 74 (2014) 395–405. <https://doi.org/10.1016/j.enpol.2014.08.038>.
- [18] R. Kunapatarawong, E. Martínez-Ros, Towards green growth: how does green innovation affect employment? *Res. Pol.* 45 (6) (2016) 1218–1232. <https://doi.org/10.1016/j.respol.2016.03.013>.
- [19] H.S. Ogalo, Strategic management of HRM practices and innovation performance in the high tech fiberglass sector in Bahrain: mediating role of organizational innovation, *Ann. Contemp. Dev. Manag. HR* 2 (3) (2020) 43–55. <https://doi.org/10.33166/acdmhr.2020.03.006>.
- [20] S. Darwish, S.M.M. Shah, U. Ahmed, The role of green supply chain management practices on environmental performance in the hydrocarbon industry of Bahrain: Testing the moderation of green innovation, *Uncertain Supply Chain Manag.* 9 (2) (2021) 265–276. <https://doi.org/10.5267/j.uscm.2021.3.006>.
- [21] R.R. Ahmed, D. Štreimikienė, X. Zheng, The impact of proactive environmental strategy on competitive and sustainable development of organizations, *J. Competit.* 13 (4) (2021) 5–24. <https://doi.org/10.7441/joc.2021.04.01>.
- [22] J. Costa, Carrots or sticks: which policies matter the most in sustainable resource management? *Resources* 10 (2) (2021) 12. <https://doi.org/10.3390/resources10020012>.
- [23] I. Kahupi, C. Eiríkur Hull, O. Okorie, S. Millette, Building competitive advantage with sustainable products – a case study perspective of stakeholders, *J. Clean. Prod.* 289 (2021), 125699. <https://doi.org/10.1016/j.jclepro.2020.125699>.
- [24] K. Haldorai, W.G. Kim, R.L.F. Garcia, Top management green commitment and green intellectual capital as enablers of hotel environmental performance: the mediating role of green human resource management, *Tourism Manag.* 88 (2022), 104431. <https://doi.org/10.1016/j.tourman.2021.104431>.
- [25] A. Narayan, The impact of green innovation types on organization performance in the construction industry, *Inset Integr. Omics Appl. Biotechnol. J.* 7 (5) (2016) 207–214.
- [26] J. Kumari, Influence of customer demand and green product innovation on firms' performance: a case of food processing firms in Tanzania, *Oper. Res. Soc. East Afr. J.* 4 (2) (2019) 1–10.
- [27] B.L. Connelly, S.T. Certo, R.D. Ireland, C.R. Reutzel, Signaling theory: a review and assessment, *J. Manag.* 37 (1) (2011) 39–67. <https://doi.org/10.1177/0149206310388419>.
- [28] M. Spence, Signaling in retrospect and the informational structure of markets, *Am. Econ. Rev.* 92 (2002) 434–459.
- [29] J. Berger, Signaling can increase consumers' willingness to pay for green products. Theoretical model and experimental evidence, *J. Consum. Behav.* 18 (3) (2019) 233–246. <https://doi.org/10.1002/cb.1760>.
- [30] S.M. Bae, M.A.K. Masud, J.D. Kim, A cross-country investigation of corporate governance and corporate sustainability disclosure: a signaling theory perspective, *Sustainability* 10 (2018) 2611. <https://doi.org/10.3390/su10082611>.
- [31] D.E. Guest, K. Sanders, R. Rodrigues, T. Oliveira, Signaling theory as a framework for analysing human resource management processes and integrating human resource attribution theories: a conceptual analysis and empirical exploration, *Hum. Resour. Manag. J.* 31 (3) (2021) 796–818. <https://doi.org/10.1111/1748-8583.12326>.
- [32] M.M. Suazo, P.G. Martinez, R. Sandoval, Creating psychological and legal contracts through human resource practices: a signaling theory perspective, *Hum. Resour. Manag. Rev.* 19 (2009) 154–166.
- [33] L. Yunzhao, Modelling the role of eco-innovation, renewable energy, and environmental taxes in carbon emissions reduction in E–7 economies: evidence from advance panel estimations, *Renew. Energy* 190 (2022) 309–318. <https://doi.org/10.1016/j.renene.2022.03.119>.
- [34] L. Nie, H. Gong, X. Lai, Green research intensity and diversified performance: the moderating role of environmental regulation, *Eur. J. Innovat. Manag.* (2022) <https://doi.org/10.1108/ejim-02-2022-0100>.
- [35] J.F. Molina-Azorín, E. Claver-Cortés, J. Pereira-Moliner, J.J. Tarí, Environmental practices and firm performance: an empirical analysis in the Spanish hotel industry, *J. Clean. Prod.* 17 (5) (2009) 516–524. <https://doi.org/10.1016/j.jclepro.2008.09.001>.
- [36] M. Amir, N. Iqbal, S. Tahir, Impact of corporate environmental responsibility on firm's financial performance: moderating role of organizational slack and industry competition, *Sukkur IBA J. Manag. Business* 8 (2) (2022) 76–92. <https://doi.org/10.30537/sijmb.v8i2.603>.
- [37] X.-X. Huang, Z.-P. Hu, C.-S. Liu, D.-J. Yu, L.-F. Yu, The relationships between regulatory and customer pressure, green organizational responses, and green innovation performance, *J. Clean. Prod.* 112 (2016) 3423–3433. <https://doi.org/10.1016/j.jclepro.2015.10.106>.
- [38] A.Y. Alhadid, H.A.-R. As'ad, The impact of green innovation on organizational performance, environmental management behavior as a moderate variable: an analytical study on Nuqul group in Jordan, *Int. J. Bus. Manag.* 9 (7) (2014) 51–58.
- [39] I.M. García-Sánchez, J. Martínez-Ferrero, M.A. García-Benau, Integrated reporting: the mediating role of the board of directors and investor protection on managerial discretion in munificent environments, *Corp. Soc. Responsib. Environ. Manag.* 26 (1) (2019) 29–45. <https://doi.org/10.1002/csr.1655>.
- [40] S. Mushtaq, D.S.S. Zubair, M. Khan, S. Khurram, Mediating role of environmental commitment between green organizational identity and green innovation performance, *Pak. J. Commerce Social Sci.* 13 (2) (2019) 385–408.
- [41] T.-Y. Chiou, H.K. Chan, F. Lettice, S.H. Chung, The influence of greening the suppliers and green innovation on Taiwan's environmental performance and competitive advantage, *Transport. Res. E Logist. Transport. Rev.* 47 (6) (2011) 822–836. <https://doi.org/10.1016/j.tre.2011.05.016>.
- [42] C. Mothe, T.U. Nguyen-Thi, Does age diversity boost technological innovation? Exploring the moderating role of HR practices, *Eur. Manag. J.* 39 (6) (2021) 829–843. <https://doi.org/10.1016/j.emj.2021.01.013>.
- [43] R.Z.Q. Almomani, K.M. Banyhamdan, R.R. Al-Ghdabi, The impact of green human resource management (GHRM) practices on environmental orientation of chemical industrial companies in Jordan: the moderating role of employee environmental knowledge, *J. Adv. Res. Dyn. Control Syst.* 11 (10) (2019) 297–308. <https://doi.org/10.5373/jardcs/v11sp10/20192805>.
- [44] S.M. Lee, S. Tae-Kim, D. Choi, Green supply chain management and organizational performance, *Ind. Manag. Data Syst.* 112 (8) (2012) 1148–1180. <https://doi.org/10.1108/02635571211264609>.
- [45] J.M. Kneipp, C.M. Gomes, R.S. Bichueti, K. Frizzo, A.P. Perlin, Sustainable innovation practices and their relationship with the performance of industrial companies, *Rev. Gestão* 26 (2) (2019) 94–111. <https://doi.org/10.1108/REG-01-2018-0005>.
- [46] W. Song, H. Yu, Green innovation strategy and green innovation: the roles of green creativity and green organizational identity, *Corp. Soc. Responsib. Environ. Manag.* 25 (2) (2018) 135–150. <https://doi.org/10.1002/csr.1445>.

- [47] Z. Liao, M. Zhang, The influence of responsible leadership on environmental innovation and environmental performance: the moderating role of managerial discretion, *Corp. Soc. Responsib. Environ. Manag.* 27 (5) (2020) 2016–2027. <https://doi.org/10.1002/csr.1942>.
- [48] A.L. Leal-Rodríguez, A.J. Ariza-Montes, E. Morales-Fernández, G. Albert-Morant, Green innovation, indeed a cornerstone in linking market requests and business performance. Evidence from the Spanish automotive components industry, *Technol. Forecast. Soc. Change* 129 (2018) 185–193. <https://doi.org/10.1016/j.techfore.2017.07.021>.
- [49] D. Pandithasekara, Green innovation practices and its impact on organizational performance: evidence from apparel industry of Sri Lanka, *Int. J. Res. Publ. Rev.* (2022) 743–758. <https://doi.org/10.55248/gengpi.2022.3.9.18>.
- [50] C. Woo, Y. Chung, D. Chun, S. Han, D. Lee, Impact of green innovation on labor productivity and its determinants: an analysis of the Korean manufacturing industry, *Bus. Strat. Environ.* 23 (8) (2014) 567–576. <https://doi.org/10.1002/bse.1807>.
- [51] X. Xie, J. Huo, H. Zou, Green process innovation, green product innovation, and corporate financial performance: a content analysis method, *J. Bus. Res.* 101 (2019) 697–706. <https://doi.org/10.1016/j.jbusres.2019.01.010>.
- [52] L. Qiu, X. Jie, Y. Wang, M. Zhao, Green product innovation, green dynamic capability, and competitive advantage: evidence from Chinese manufacturing enterprises, *Corp. Soc. Responsib. Environ. Manag.* 27 (1) (2020) 146–165. <https://doi.org/10.1002/csr.1780>.
- [53] Y. Exadata, A. Kelly, F. Roche, H. Eyadat, Green and competitive? An empirical test of the mediating role of environmental innovation strategy, *J. World Bus.* 43 (2) (2008) 131–145. <https://doi.org/10.1016/j.jwb.2007.11.012>.
- [54] D. Kammerer, The effects of customer benefit and regulation on environmental product innovation.: empirical evidence from appliance manufacturers in Germany, *Ecol. Econ.* 68 (8) (2009) 2285–2295. <https://doi.org/10.1016/j.ecolecon.2009.02.016>.
- [55] H.-H. Weng, J.-S. Chen, P.-C. Chen, Effects of green innovation on environmental and corporate performance: a stakeholder perspective, *Sustainability* 7 (5) (2015) 4997–5026. Retrieved from, <https://www.mdpi.com/2071-1050/7/5/4997>.
- [56] N.A. Abu Seman, K. Govindan, A. Mardani, N. Zakuan, M.Z. Mat Saman, R.E. Hooker, S. Ozkul, The mediating effect of green innovation on the relationship between green supply chain management and environmental performance, *J. Clean. Prod.* 229 (2019) 115–127. <https://doi.org/10.1016/j.jclepro.2019.03.211>.
- [57] S.U. Rehman, S. Kraus, S.A. Shah, D. Khanin, R.V. Mahto, Analyzing the relationship between green innovation and environmental performance in large manufacturing firms, *Technol. Forecast. Soc. Change* 163 (2021) 1–6. <https://doi.org/10.1016/j.techfore.2020.120481>.
- [58] S. Karimi Takalo, H. Sayyadi Tooranloo, Z. Shahabaldini parizi, Green innovation: a systematic literature review, *J. Clean. Prod.* 279 (2021), 122474. <https://doi.org/10.1016/j.jclepro.2020.122474>.
- [59] G. Albert-Morant, J. Henseler, G. Cepeda-Carrión, A.L. Leal-Rodríguez, Potential and realized absorptive capacity as complementary drivers of green product and process innovation performance, *Sustainability* 10 (2) (2018) 381. <https://doi.org/10.3390/su10020381>.
- [60] G. Albert-Morant, A. Leal-Millán, G. Cepeda-Carrión, The antecedents of green innovation performance: a model of learning and capabilities, *J. Bus. Res.* 69 (2016) 4912–4917. <https://doi.org/10.1016/j.jbusres.2016.04.052>.
- [61] R. Dai, J. Zhang, Green process innovation and differentiated pricing strategies with environmental concerns of South-North markets, *Transport. Res. E Logist. Transport. Rev.* 98 (2017) 132–150. <https://doi.org/10.1016/j.tre.2016.12.009>.
- [62] X. Xie, J. Huo, G. Qi, K.X. Zhu, Green process innovation and financial performance in emerging economies: moderating effects of absorptive capacity and green subsidies, *IEEE Trans. Eng. Manag.* 63 (1) (2016) 101–112. <https://doi.org/10.1109/TEM.2015.2507585>.
- [63] R.M. Dangelico, Green product innovation: where we are and where we are going, *Bus. Strat. Environ.* 25 (8) (2015) 560–576. <https://doi.org/10.1002/bse.1886>.
- [64] J. Amores-Salvadó, G. Martín-de Castro, J.E. Navas-López, Green corporate image: moderating the connection between environmental product innovation and firm performance, *J. Clean. Prod.* 83 (2014) 356–365. <https://doi.org/10.1016/j.jclepro.2014.07.059>.
- [65] S. Roscoe, N. Subramanian, C.J.C. Jabbour, T. Chong, Green human resource management and the enablers of green organisational culture: enhancing a firm's environmental performance for sustainable development, *Bus. Strat. Environ.* 28 (5) (2019) 737–749. <https://doi.org/10.1002/bse.2277>.
- [66] M.-L. Tseng, S.F. Chiu, R.R. Tan, A.B. Siriban-Manalang, Sustainable consumption and production for Asia: sustainability through green design and practice, *J. Clean. Prod.* 40 (2013) 1–5. <https://doi.org/10.1016/j.jclepro.2012.07.015>.
- [67] C.-Y. Lin, Y.-H. Ho, S.-H. Chiang, Organizational determinants of green innovation implementation in the logistics industry, *Int. J. Oral Implant.* 2 (1) (2009) 3–10.
- [68] M. Tang, G. Walsh, D. Lerner, M.A. Fitz, Q. Li, Green innovation, managerial concern and firm performance: an empirical study, *Bus. Strat. Environ.* 27 (1) (2018) 39–51. <https://doi.org/10.1002/bse.1981>.
- [69] W. Przychodzen, F. Gómez-Bezares, J. Przychodzen, Green information technologies practices and financial performance – the empirical evidence from German privately traded companies, *J. Clean. Prod.* 201 (2018) 570–579. <https://doi.org/10.1016/j.jclepro.2018.08.081>.
- [70] U. Sekaran, R. Bougie, *Research Methods for Business: A Skill Building Approach*, seventh ed., John Wiley & Sons Ltd, United Kingdom, 2016.
- [71] A.F. Hayes, N.J. Rockwood, Conditional process analysis: concepts, computation, and advances in modeling of the contingencies of mechanisms, *Am. Behav. Sci.* 64 (1) (2020) 19–54. <https://doi.org/10.1177/0002764219859633>.
- [72] L. Yuan, S. Zhongfeng, L. Yi, Can strategic flexibility help firms profit from product innovation? *Technovation* 30 (5–6) (2010) 300–309. <https://doi.org/10.1016/j.technovation.2009.07.007>.
- [73] H. Liang, N. Saraf, Q. Hu, Y. Xue, Assimilation of enterprise systems: the effect of institutional pressures and the mediating role of top management, *MIS Q.* 31 (1) (2007) 59–87.
- [74] P.L. McClelland, X. Liang, V.L. Barker, CEO commitment to the status quo: replication and extension using content analysis, *J. Manag.* 36 (5) (2009) 1251–1277. <https://doi.org/10.1177/0149206309345019>.
- [75] J.F. Hair, M. Howard, C. Mitzi, Assessing measurement model quality in PLS-SEM using confirmatory composite analysis, *J. Bus. Res.* 109 (5–6) (2020) 101–110. <https://doi.org/10.1016/j.jbusres.2019.11.069>.
- [76] C. Fornell, D. Larcker, Structural equation modeling and regression: guidelines for research practice, *J. Market. Res.* 18 (1) (1981) 39–50. <https://doi.org/10.1177/002224378101800104>.
- [77] R.R. Ahmed, S. Hussain, M.H. Pahi, A. Usas, E. Jasinskaskas, Social media handling and extended technology acceptance model (ETAM): evidence from SEM-based multivariate approach, *Transform. Bus. Econ.* 18 (48) (2019) 246–271. No. 3.
- [78] J.R. Edwards, R.P. Bagozzi, On the nature and direction of relationships between constructs and measures, *Psychol. Methods* 5 (2) (2000) 155–174. <https://doi.org/10.1037/1082-989X.5.2.155>.
- [79] K. Bollen, R. Lennox, Conventional wisdom on measurement: a structural equation perspective, *Psychol. Bull.* 110 (2) (1991) 305–314. <https://doi.org/10.1037/0033-2909.110.2.305>.
- [80] S.B. MacKenzie, P.M. Podsakoff, C.B. Jarvis, The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions, *J. Appl. Psychol.* 90 (4) (2005) 710–730. <https://doi.org/10.1037/0021-9010.90.4.710>.
- [81] C.B. Jarvis, S.B. MacKenzie, P.M. Podsakoff, A critical review of construct indicators and measurement model misspecification in marketing and consumer research, *J. Consum. Res.* 30 (2) (2003) 199–218. <https://doi.org/10.1086/376806>.
- [82] J. Cohen, *Statistical Power Analysis for the Behavioral Sciences*, second ed., Lawrence Erlbaum Associates, Publishers, Hillsdale, NJ, 1988.
- [83] J.F. Hair, C. Ringle, M. Sarstedt, PLS-SEM: indeed a silver bullet, *J. Market. Theor. Pract.* 19 (2011) 139–151. <https://doi.org/10.2753/MTP1069-6679190202>.
- [84] S. Geisser, A predictive approach to the random effect model, *Biometrika* 61 (1974) 101–107. <https://doi.org/10.1093/biomet/61.1.101>.
- [85] J.F. Hair, J.J. Risher, M. Sarstedt, C. Ringle, When to use and how to report the results of PLS-SEM, *Eur. Bus. Rev.* 31 (1) (2019) 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>.
- [86] S.K. Singh, M.D. Giudice, R. Chierici, D. Graziano, Green innovation and environmental performance: the role of green transformational leadership and green human resource management, *Technol. Forecast. Soc. Change* 150 (2020), 119762. <https://doi.org/10.1016/j.techfore.2019.119762>.

- [87] I.M. Ar, The impact of green product innovation on firm performance and competitive capability: the moderating role of managerial environmental concern, *Procedia - Social Behav. Sci.* 62 (2012) 854–864. <https://doi.org/10.1016/j.sbspro.2012.09.144>.
- [88] U.V.D. Berg, J.-P. Labuschagne, H.V.D. Berg, The effects of greening the supplier and innovation on environmental performance and competitive advantage: original research, *J. Transp. Supply Chain Manag.* 7 (1) (2013) 1–7. <https://doi.org/10.4102/jtscm.v7i1.121>.
- [89] J. Aftab, N. Abid, N. Cucari, M. Savastano, Green human resource management and environmental performance: the role of green innovation and environmental strategy in developing countries, *Bus. Strat. Environ.* (2022) <https://doi.org/10.1002/bse.3219>.
- [90] M. Mujtaba, M.S. Mubarik, Talent management and organizational sustainability: role of sustainable behaviour, *Int. J. Organ. Anal.* 30 (2) (2022) 389–407. <https://doi.org/10.1108/IJOA-06-2020-2253>.
- [91] B. Zainab, W. Akbar, F. Siddiqui, Impact of transformational leadership and transparent communication on employee openness to change: mediating role of employee organization trust and moderated role of change-related self-efficacy, *Leader. Organ. Dev. J.* 43 (1) (2022) 1–13. <https://doi.org/10.1108/LODJ-08-2020-0355>.
- [92] S. Makhija, W. Akbar, Linking rewards and creative performance: mediating role of intrinsic and extrinsic motivation and moderating role of rewards attractiveness, *Int. J. Innov., Creat. Change* 8 (12) (2019) 36–55.
- [93] P.K. Mayo, S. Qin, T.H. Ho, M.M. Julius, The effect of green HRM practices on green competitive advantage of manufacturing firms, *J. Manuf. Technol. Manag.* 33 (1) (2022) 22–40. <https://doi.org/10.1108/JMTM-10-2020-0388>.
- [94] M. Michael, Job market signaling, *Q. J. Econ.* 87 (3) (1973) 355–374. <https://doi.org/10.2307/1882010>.