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Title: The Nexus Between Sustainable Business Performance and Green HRM in Mediation with Green Innovation & Moderation of Organizational Support & Data-driven Culture

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Conflict of Interest
The author (s) declared no conflict of interest and have not received any funds for the project.

The Nexus Between Sustainable Business Performance and Green HRM in Mediation with Green Innovation & Moderation of Organizational Support & Data-driven Culture

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Abstract

This research explores the interplay between GHRM and GI, examining their impact on SBP. The study, conducted within the manufacturing sector of Karachi, Pakistan, focuses on SMEs. Utilizing 330 survey responses, Smart PLS analysis was employed for data evaluation. Findings underscore a substantial effect of green human resource management practices on the sustainable business performance of SMEs. Additionally, this research indicates a noteworthy relationship between sustainable business performance and green innovation, with green innovation mediating the relationship between GHRM practices and SMEs' sustainable business outcomes. Furthermore, the study uncovers that organizational support and a DDC play significant moderating roles in the intricate relationship between SBP, GHRM, and GI. This research contributes valuable insights for policymakers and guides future researchers exploring this domain.

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Keywords: *Sustainable business performance, green innovation, green human resource management, perceived organizational support, data-driven culture.*

Introduction

In the prevailing era, businesses have become highly competitive. Besides other factors concerning sustainability, the diffusion of technology and green innovations has made it difficult to achieve sustainability (Patwary et al., 2024). Sarfraz et al. (2023) noted that government bodies are forcing business entities to strictly follow regulations related to environmental sustainability. Moreover, firms worldwide are modifying their internal and external initiatives for green innovation and sustainable development (Almeida & Wasim,2023). Furthermore, poor or wasteful utilization harms the environment. On the one hand, proper wasteful utilization increases operating costs. Moreover, poor utilization of wasteful resources decreases the operation cost (Zhen et al., 2025). Therefore, many researchers suggest that firms must balance financial and environmental consequences by adopting better green human resource (GHRM) practices (Rong et al., 2025). Moreover, sustainable business management (SBP) focuses on the environment by aligning all corporate operations with society and the ecosystem (Srouji et al., 2023). Extant literature suggests that business sustainability has focused on low-waste resources. Therefore, we argue that researchers must identify antecedents affecting business sustainability (Patwary et al., 2024).

Several studies emphasize the importance of sustainability performance in today's business activities and offer nuanced methodologies and suggestions. For example, a study of the mining sector in Ghana found that GHRM practices were more strongly linked to economic performance than social performance and that there was an insignificant connection between GHRM and environmental performance (Suleman et al., 2024). The research suggested that companies in developing economies should integrate GI into their GHRM practices to boost sustainability. In another study, Sun et al. (2018) examined how corporations incorporate sustainability frameworks to improve financial performance within strategic settings. The study recommended that managers embed sustainability into core strategic organizational management to enhance performance and increase stakeholder confidence. Another study in Malaysian SMEs shows that perceived organizational green readiness (POG) and external green readiness (PEG) positively influence the initial adoption of GHRM. Based on these findings, the study recommended that organizations adopting GHRM align their strategic sustainability initiatives with broader organizational goals. It also noted that this alignment is essential for the growth of SMEs in Malaysia (Zihan et al., 2024).

Another study in Pakistan's health sector documents that risk management and green innovation moderate the relationship between GHRM and SBP. The study recommends that top managers in the healthcare sector focus on green selection, hiring, training, and development. The study also noted that these HRM practices could motivate employees toward green innovation and performance (Correia et al., 2024). Another study documents that CSR moderates the relationship between the initial adoption of Green HRM and its institutionalization. Given this effect, the study documents that firms that focus on CSR would enhance their reputation as firms concerned about a sustainable environment (Zihan et al., 2024).

This study investigates green human resources management (GHRM) and Green Innovation (GI) as pivotal components impacting sustainable performance in SMEs in Karachi. Additionally, it contributes to the eco-friendly management literature by enhancing our comprehension of the intricate mechanisms by which a data-driven culture (DDC) influences GHRM and GI. Moreover, organizational support is examined as a moderator of sustainable business performance (SBP) and GI.

Literature Review

Theoretical Grounding

The resource-based view studies how managers use firm resources and capabilities to create products that serve customers better than competitors (Penrose, 1959). Resource-based theory (RBT) helps firms develop and market new products and services by effectively using organizational resources (Robb et al., 2025). Consequently, it helps firms meet customers' needs better than competitors (Petcu., 2024). The theory postulates allow firms to develop unique business processes that competitors cannot imitate (Ristyawan). Assuming a favorable attitude toward employees, the theory asserts that all employees cooperate to achieve common goals (Kumar & Gembali,2025). As a result, such cooperation increases the chances of achieving organizational goals (Stoelhorst, 2023). (Widiatmaka et al. (2024) noted that the theory also suggests that workers and managers are assets for organizations since they use knowledge and cooperation to generate organizational activities (Varadarajan, 2023). As a result, it promotes employee engagement, a precursor of organizational growth and sustainability (Bahn et al., 2025).

Theoretically, the researcher believes misbehaving employees are considered firms' adverse assets (Chen et al., 2024). Such employees often create ethical and legal issues for firms (Robb et al., 2025). On the contrary, many researchers believe such employees are sources of advantage. Because they are more often found in developing countries, helping firms win contracts by bribing civil servants and politicians (Willie, 2025).

Moreover, the theory also views competitors as often imitating multinational firms' capabilities in developing countries. The multinationals believe it is intended spillover effects (Widiatmaka et al., 2024). Moreover, many researchers argue that one of the advantages of foreign direct investment in the host country is that multinationals, besides investing, also help transfer technology to the host country (Kumar & Gembali,2025).

Variables

Sustainable Business Performance

SBP enables firms to enhance and optimize their business processes. As a result, they improve operations and work toward a sustainable future (Danish et al., 2025). Patwary et al. (2024) noted that SBP, along with other factors, helps firms evaluate their economic, social, and environmental performance. Identifying areas for improvement and implementing changes helps firms achieve long-term success and positively impact society (Perano et al., 2025). Several standards are available to measure SBP, including the Sustainability Accounting Standards Board (SASB) and the Dow Jones Sustainability Index (DJSI). Moreover, Baawain et al. (2025) suggest that firms that continuously measure SBP gain several benefits, including improved decision-making, greater transparency, and better risk management (Obeidat et al., 2023). Consequently, it promotes long-term success, increases stakeholder trust, and benefits the environment and society (Taamneh et al., 2025).

Green HRM

Green Human Resource Management (GHRM) enables HR to develop and implement environmentally sustainable practices and policies (Awan et al., 2023). However, researchers believe that the firm must ensure its mission and vision include sustainable practices before developing policies related to sustainability (Mubeen et al., 2024). Srouji et al. (2023) assert that firms must create a supportive GHRM environment by encouraging employees to adopt sustainable practices. As a result, the firm's reputation in the market would improve, and its competitiveness would increase significantly (Almeida & Wasim, 2023). Moreover, researchers believe that, besides training existing employees, HR should ensure that new employees' values align with sustainable principles during onboarding (Sarfraz et al., 2023).

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Green Innovation

Consumers' concern about a sustainable environment has increased profoundly in the current era. Therefore, firms must focus on launching and marketing innovative products and processes to remain competitive (Patwary et al., 2024). Researchers believe that for green innovation, firms must focus on innovative products and

processes that reduce environmental harm and promote sustainability (Srouji et al., 2023). The researchers believe that apart from innovative products and processes, green innovation also includes innovative business models (Rong et al., 2025). (Wasiq et al. (2023) assert that green innovation has several benefits. For example, it reduces waste and emissions, adversely affecting the sustainable environment (Zhen et al., 2025). Moreover, green innovation reduces energy consumption, waste disposal, and other expenses (Srouji et al., 2023). As a result, it leads to efficiency and significant cost savings (Almeida & Wasim,2023). Many industries, including those that use green innovation, have brought positive changes and prompted sustainability (Indrawati et al., 2025). For example, Patagonia's environmentally-friendly clothing lines have profoundly increased consumers' awareness about sustainable fashion by adopting eco-friendly practices (Sarfraz et al., 2023).

Data Culture-Driven Organization(DCDO)

All businesses worldwide must make decisions on various issues. Making the right decision at the right time (Jaaron et al., 2025). A DCDO focuses on data-driven decisions and promotes a culture of data analysis and interpretation throughout the organization (Khan et al., 2024). As a result, such organizations make informed decisions and remain competitive in a dynamic market environment (Tseng et al., 2018). Extending this idea, researchers suggest that decisions based on data analysis and insights, rather than intuition or anecdotal evidence, are more likely to be correct (Aslam et al., 2025). However, aside from other factors, data literacy is an important aspect of DCDO. Data literacy enables employees to understand basic concepts, interpret data, and draw rational conclusions (Awan et al., 2023). DCDO also emphasizes experimentation, learning from failures, and continuous improvement, which drive innovation and growth (Indrawati et al., 2025). Jaaron et al. (2025) argue that developing a data strategy aligned with business goals is essential for establishing DCDO. Investing in data infrastructure, such as data warehouses and analytics tools, is also crucial (Aslam et al., 2025).

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Perceived Organizational Support (POS)

Employees' attitudes toward organizations increase significantly if they believe in their organization's values and support their efforts to contribute to sustainability (Piao et al., 2025). As a result, employees in such organizations participate in environmental initiatives, reduce energy consumption, or promote sustainable practices in their daily work (Amjad et al.,2024). Rosa et al. (2023) assert that the management must be committed to sustainability and reward employees for adopting sustainability practices to promote sustainability in the organization. Moreover, researchers believe that organizational communication about sustainability goals must be clear, and management must ensure that all employees understand the importance of sustainability (Kannan &

Gambetta, 2025). Furthermore, by promoting POS, organizations can create a culture of sustainability that drives positive change and promotes environmental responsibility (Geng et al., 2023).

Conceptual Framework

A conceptual framework is a structured plan or model that outlines the key concepts, variables, and their presumed relationships in a research study or project. It provides a visual or narrative explanation of how the researcher understands and intends to explore the problem. The study has developed a conceptual model, as depicted in Figure 1.

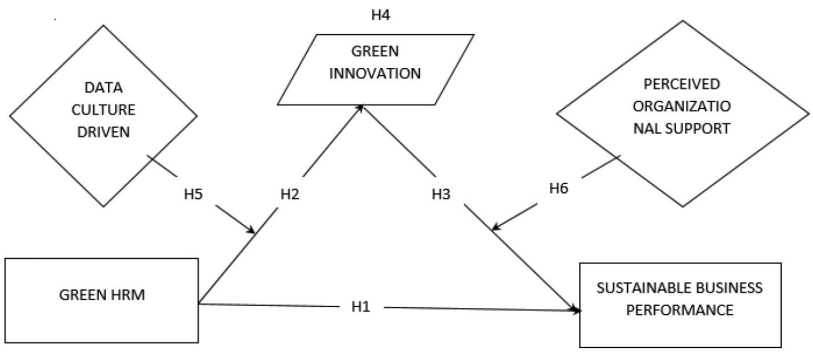

Figure 1: Conceptual Framework

Hypotheses Development

Green Human Resource Management (GHRM) and Sustainable Business Performance (SBI)

GHRM is extremely influential in promoting sustainability, which contributes to achieving greater sustainable performance in business (Perano et al., 2025). Extant literature noted that the focus of traditional HRM practices is on individual practices. However, GHRM develops policies and procedures to encourage employees to adopt and practice sustainable practices. As a result, the firms become more resource-efficient and socially responsible (Liu et al.,2023). Extending Resource Based Theory (RBT), many studies highlighted that a firm's performance profoundly depends on its unique internal resources and capabilities (Handayani et al., 2024). The studies also added that if a firm manages them effectively, it could have a competitive advantage over competitors (Sahan et al., 2025). Moreover, it may allow a firm to develop a unique selling proposition that would be difficult for others to imitate (Shahzad et al., 2023). Furthermore, Suleman et al. (2025) assert that during the recruitment process, the HRM must focus on selecting candidates whose values align with socially responsible behavior

(Correia et al., 2024). Such a short- and long-term selection would promote a conducive environment for sustainable business performance (Lee & Ahn, 2025). Additionally, many studies suggested that firms must invest heavily in sustainable practices (Chau et al., 2024). Such investments increase employee satisfaction and retention and improve stakeholder relationships (Obeidat et al., 2023). They all collectively and individually promote SBP (Mutmainah et al., 2025). Based on the above discussions, we argue that firms that adopt GHRM practices could enhance sustainable business performance(SBP) (Taamneh et al., 2025).

H1: GHRM positively affects SBP.

Green Human Resource Management (GHRM and Green Innovation (GI)

Many past studies document that GHRM motivates employees to adopt green-sustainable- practices (GSPs) (Al-Romeedy et al., 2025). As a result, it promotes GI. Awan et al. (2023) assert that firms that consistently launch GIs would have a competitive advantage, leading toward sustainable performance. Moreover, Rana and Arya (2024) assert that by integrating sustainable practices in all aspects, GHRM encourages and motivates employees to adopt green, sustainable behavior (Taamneh et al., 2025). For example, when an organization focuses on training and development programs, it equips employees with the necessary knowledge to develop innovative green products (Shah & Soomro, 2023). Conversely, researchers suggest that organizations must focus on recruiting and retaining employees whose values align with a sustainable environment (Muhammad et al., 2025). This process allows firms to develop a workforce passionate about green innovation and solutions. Similarly, researchers believe that GHRM enhances employee engagement. As a result, they share their ideas about green innovative products (Zhou et al.,2024). Some ideas are initially raw and not financially viable. However, with further discussions and refinement, the firms develop marketable green products over time (Zhang et al., 2025).

H2: GHRM positivity affects GI.

Green Innovation (GI) and Sustainable Business Performance (SBP)

Many past studies have noted that GI has a multifaceted effect on SBP (Zhen et al., 2025). For example, existing literature highlights that GI improves the well-being of employees and society's customers (Mubeen et al., 2024). Consequently, it promotes a healthy and safe environment for both employees and society (Zhou et al., 2023). Researchers also assert that GI has economic implications (Almeida & Wasim, 2023). For instance, GI significantly enhances firms' profitability and competitiveness (Indrawati et al., 2025). As a result, firms gain increased access to new markets (Sarfraz et al.,

2023). Additionally, it enables firms to differentiate themselves from competitors, making them more attractive to environmentally conscious consumers (Patwary et al., 2024). Furthermore, green technologies and practices allow firms to reduce energy consumption and environmental compliance costs (Srouji et al., 2023), thereby positively impacting SBC (Rong et al., 2025). Therefore, we argue that GI substantially contributes to SBC in the short and long term (Wasiq et al., 2023).

H3: GI positively affects SBP.

Mediating Role of Green Innovation (GI)

Examining the interaction between GHRM and GI offers valuable insights into their combined impact on sustainable performance (Zhen et al., 2025). In the RBV framework, Zhen et al. (2025) argue that HRM practices can influence organizational performance by transforming employees into unique and critical resources. Mubeen et al. (2024) emphasize the importance of talent in innovation, highlighting its role in achieving organizational goals. Talent alignment with innovation boosts organizational performance (Indrawati et al., 2025) and helps maintain a competitive advantage (Wasiq et al., 2023). The RBV framework systematically explores the GHRM-GI relationship and its effect on sustainability outcomes, clarifying the connection between sustainable business performance and green practices (Zhou et al., 2024).

H4: GI mediates the relationship between GHRM and SBP.

Moderating Effect of Data-Driven Culture (DDC) on Green Innovation (GI)

Earlier research has consistently supported the concept of DDC by establishing a connection with HR practices, fostering a data-driven culture, and improving business performance (Jaaron et al., 2025). The collective findings indicate that DDC encompasses a set of behaviors and practices essential for organizational success (Khan et al., 2024). Highlighting a strong correlation, Tseng et al. (2018) emphasized the vital role of industrialized symbiosis practices. Several studies have emphasized the necessity of DDC for gaining a competitive advantage and enhancing overall company performance (Aslam et al., 2025). However, these studies not only highlight the importance of DDC but also present it as a transformative journey crucial for success in the economic domain (Awan et al., 2023).

H5: DDC moderates the relationship between GHRM and GI.

Moderating Role of Perceived Organizational Support (POS) on Sustainable Business Performance (SBP)

The study by Piao et al. (2025) explored the interconnectedness of POS, GI, and SBP and concluded that POS has varying effects on GI and SBP. Additionally, Amjad et al. (2024) observed that employees put in extra effort for GI. As a result, this boosts profits and enhances public satisfaction and a company's reputation (Rosa et al., 2023). Furthermore, researchers believe employees go the extra mile for eco-friendly products and services when organizations meet their needs and offer incentives for high performance (Kannan & Gambetta, 2025). Therefore, effective organizational support acts as a catalyst, establishing a strong connection as a moderator (Geng et al., 2023).

H6: POS moderates the relationship between GI and SBP.

Methodology

Sampling and Population

This research focused on SME manufacturing organizations in Karachi, recognizing their extensive use of natural resources, their significant contribution to environmental issues, and their vital role in the country's development. The participating SMEs included textile, chemical, automobile, and pharmaceutical manufacturers. Using an online questionnaire, six enumerators collected data from SMEs across the five industrial zones of Karachi. The analysis only included fully completed questionnaires. We chose Karachi because many previous studies have noted that samples from Karachi represent a sample of Pakistan. The study involves 21 indicators. Following the suggestion of Hair Jr. et al. (2022), we determined that a sample size of 210 (21 indicators x 10) would be suitable for this study. The six recruited enumerators gathered data from the target population via social media. They received 367 complete questionnaires.

Scales and Measures

The survey instrument used a five-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree). The questionnaire was adapted from previous research with contextual relevance, covering five latent variables and 26 indicator variables. SBP included five items adapted from Singh et al. (2020). GHRM consisted of seven items, while GI included four, also adapted from Singh et al. (2020). The DDC scale has five items adapted from Kiron et al. (2012). POS, with five items, was adapted from Eairween (2018).

Response Rate and Common Method Bias

The integrity of data collected based on survey response rate is important. Low response rates and common method bias (CMB) can negatively impact the results. The study found that the response rate was 85% which is appropriate. The study's VIF values were below 1.75, indicating that the collected data is not affected by CMB bias.

Respondents Profile

Our analysis shows that 43% of the survey participants are female, while 57% are male. The age distribution indicates that 16% of employees are between 18-28 years old, 56% are between 29-39, 16% are between 40-50, and the remaining are 51 years and older. Additionally, 57% hold Bachelor's degrees, 41% hold a Master's degree, and the rest have some diploma or certification. We also found that 50% have up to five years of experience, 30% have between 6 and 10 years, and 20% have more than 11 years of experience.

Statistical Analysis

Utilizing Smart PLS version 4, our investigation initiated the development of a measurement model encompassing assessments of "reliability" and "validity" perspectives, progressing to the formulation of a structural model that delved into the outcomes of these hypotheses (Henseler et al., 2009).

Findings and Results

Measurement Model

A measurement (outer model) assesses the relationship between constructs and indicators. After running the PLS algorithm, SmartPLS provides values such as outer loadings for reflective models and outer weights for formative models. Researchers then evaluate the quality of the model by examining reliability and validity metrics, such as indicator reliability, internal consistency, convergent validity, and multicollinearity. The measurement model is crucial because it ensures that constructs are measured accurately and consistently before analyzing the relationships among them in the structural model. Figure 2 depicts the measurement model.

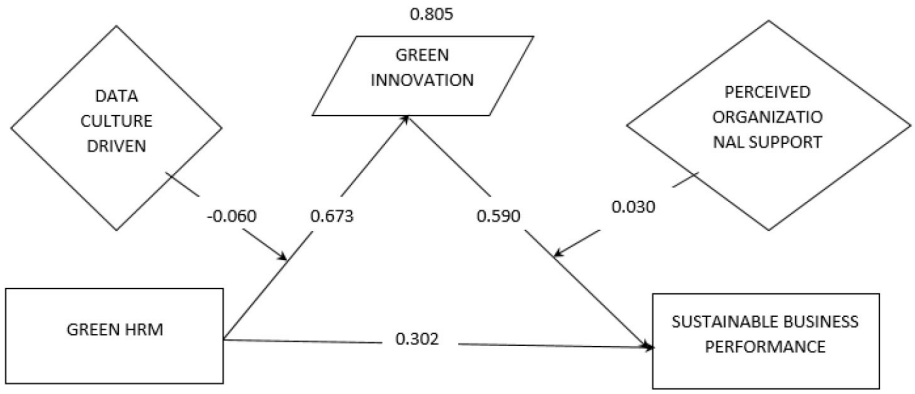

Figure 2: Measurement Model

Descriptive Analysis

Descriptive analysis summarizes results, helping researchers draw meaningful conclusions. Table 1 depicts results related to Cronbach's alpha, composite reliability, AVE, skewness, and Kurtosis. The Cronbach's alpha, composite reliability values are greater than 0.709 and AVE values are greater than 0.60, suggesting the constructs have adequate internal consistency and acceptable convergent validity. Moreover, Skewness and Kurtosis values ranged between ± 3.5, suggesting adequate univariate normality (Cain, Zhang, & Yuan, 2017).

Table: 1 Descriptive Analysis

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted	Skewness	Kurtosis
Sustainable Business Performance	0.924	0.962	0.768	-0.987	1.164
Green HRM	0.952	0.958	0.780	-1.227	1.114
Green Innovation	0.881	0.888	0.739	-1.330	1.028
Data-driven Culture	0.999	0.999	0.995	-0.934	0.927
Perceived Organizational Support	0.862	0.902	0.634	-1.258	1.439

Discriminant Validity

Results in Table 2 reveal that all the constructs are unique and distinct since AVE square root values, which are presented diagonally in Table 2, are higher than all Pearson Correlation Values (Fornell & Larcker Criterion, 1981).

Table 2: Discriminant Validity (Fornell and Larcker 1981 criterion)

Constructs	DDC	GHRM	GI	POS	SBP
Data-driven Culture	0.823				
Green HRM	0.844	0.811			
Green Innovation	0.750	0.806	0.822		
Perceived Organizational Support	0.512	0.561	0.566	0.603	
Sustainable Business Performance	0.446	0.491	0.550	0.356	0.508

Structural Model

A structural (inner) model illustrates the relationships between latent variables (constructs) in a research framework. While the measurement model describes how each construct is measured through indicators, the structural model details how the constructs influence one another. It tests the study's hypotheses by illustrating the direction and strength of relationships between variables. Figure 3 depicts the structural model.

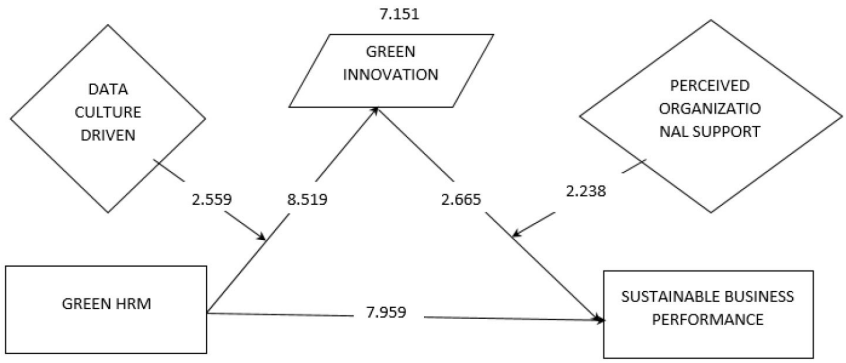

Figure 3: Structural Model

Hypothesis Results

The study tested six hypotheses. Table 3 below depicts the results.

Table 3: Hypotheses Results

Relationships	Beta	t	p	Results
GHRM -> SBP (H1)	0.302	7.598	0.000	Accepted
GHRM -> GI (H2)	0.673	8.519	0.000	Accepted
GI -> SBP (H3)	0.590	2.665	0.000	Accepted
GHRM -> GI -> SBP (H4)	0.805	7.151	0.000	Accepted
DDC x GHRM -> GI (H5)	-0.060	2.599	0.009	Rejected
POS x GI -> SBP (H6)	0.030	2.238	0.025	Accepted

Our results support Hypothesis 1 (β=0.302, t=7.598<0.05), Hypothesis 2 (β=0.673, t=8.519<0.05), Hypothesis 3 (β=0.590, t=2.665<0.05), Hypothesis 4 (β=0.805, t=7.151<0.05), and Hypothesis 6 (β=0.030., t=2.238<0.05). However, our results do not support Hypothesis 5 (β=-0.060, t=2.599>0.05).

Discussion and Conclusion

Discussion

These findings support the assertion that a "positive relationship exists between GHRM and SBP." Green HRM is extremely influential in promoting sustainability, which contributes to achieving greater sustainable performance in business (Perano et al., 2025). Extant literature noted that the focus of traditional HRM practices is on individual practices. However, GHRM develops policies and procedures to encourage employees to adopt and practice sustainable practices. As a result, the firms become more resource-efficient and socially responsible (Liu et al.,2023). Extending Resource-Based Theory (RBT), many studies highlighted that a firm's performance profoundly depends on its unique internal resources and capabilities (Handayani et al., 2024). The studies also added that if a firm manages them effectively, it could have a competitive advantage over competitors (Sahan et al., 2025). Moreover, it may allow a firm to develop a unique selling proposition that would be difficult for others to imitate (Shahzad et al., 2023). Furthermore, Suleman et al. (2025) assert that during the recruitment process, HRM must focus on selecting candidates whose values align with socially responsible behavior (Correia et al., 2024). Such a short- and long-term selection would promote a conducive environment for sustainable business performance (Lee & Ahn, 2025).

The study shows that GHRM positively influences GI. Many previous studies indicate that GHRM encourages employees to adopt green-sustainable practices (GSPs) (Al-Romeedy et al., 2025). Consequently, it boosts GI. Awan et al. (2023) state that companies regularly implementing GIs gain a competitive edge, leading to sustainable performance (Citation). Additionally, Rana and Arya (2024) argue that by integrating sustainable practices into all areas, GHRM motivates employees to engage in green, sustainable behavior (Taamneh et al., 2025). For instance, when organizations prioritize training and development programs, they provide employees with the knowledge needed to create innovative green products (Shah & Soomro, 2023). On the other hand, researchers suggest that organizations should focus on recruiting and retaining employees whose values align with sustainability (Muhammad et al., 2025).

We found that GI positively influences SBP. Many previous studies have noted that GI has a multifaceted effect on SBS (Zhen et al., 2025). For example, existing literature

highlights that GI enhances the well-being of employees and society's customers (Mubeen et al., 2024). Consequently, it fosters a healthy and safe environment for both employees and society (Zhou et al., 2023). Researchers also argue that GI has economic implications (Almeida & Wasim, 2023). For example, GI significantly improves firms' profitability and competitiveness (Indrawati et al., 2025). As a result, firms' access to new markets increases notably (Sarfraz et al., 2023). Moreover, it helps firms differentiate themselves from competitors, making them more appealing to environmentally conscious consumers (Patwary et al., 2024). Additionally, green technologies and practices enable firms to cut energy consumption and environmental compliance costs (Srouji et al., 2023).

The study documents that GI mediates GHRM and SBP. Examining the interplay between Green HRM and GI provides valuable insights into their collective impact on sustainable performance (Zhen et al., 2025). In the RBV framework, Zhen et al. (2025) posited that HRM practices can shape organizational performance by transforming employees into unique and crucial resources. Mubeen et al. (2024) put great emphasis on the role of talent in innovation, stressing its utilization to achieve organizational goals. Talent alignment with innovation enhances organizational performance (Indrawati et al., 2025), fostering a sustainable competitive advantage (Wasiq et al., 2023). The RBV framework systematically explores the GHRM-GI relationship and its implications for sustainability outcomes, elucidating the interplay between sustainable business performance and green practices (Zhou et al., 2024).

We found that DDC moderates GHR and GI. Earlier research has consistently supported the concept of DDC by establishing a link with HR practices, fostering an extensive data-driven culture, and enhancing business performance (Jaaron et al., 2025). The collective findings suggest that DDC includes a set of behaviors and practices crucial for organizational success (Khan et al., 2024). Highlighting a significant correlation, Tseng et al. (2018) emphasized the vital role of industrialized symbiosis practices. Several studies have underscored the importance of DDC for gaining a competitive edge and improving overall company performance (Aslam et al., 2025).

The study documents that POS moderates the relationship between GI and SBP.The study by Piao et al. (2025) delved into the interconnectedness of POS, GI, and SBP and concluded that POS has a varying impact on GI and SBP. Moreover, Amjad et al. (2024) noted that employees exert additional efforts toward GI. As a result, it enhances profits and increases public satisfaction and firms' reputation (Rosa et al., 2023). Moreover, researchers believe employees go the extra mile for eco-friendly products and services when organizations address their needs and incentivize high performance (Kannan & Gambetta, 2025).

Conclusion

Concern for sustainable performance has increased in the prevailing era. Given its importance, the study has examined the effect of GHRM on SBP and GI, the effect of GI on SBP, the mediating role of GI, and the moderating roles of DDC and POS. We focused on the textile industry, which has become highly competitive and contributes to environmental decay. The study found that GHRM positively affects SBP and GI. GI positively affects SBP. The study documents that GI has a mediating effect between GHRM and SBP. We also found that DDC moderates the relationship between GHRM and GI. Moreover, DCC moderates the relationship between GHRM and GI. The study's contribution is that it has extended SET theory and proposed six hypotheses. Since our results support all the proposed hypotheses, the generalizability of SET has increased.

Implications

Practically, this research offers actionable insights for manufacturing SMEs in Karachi, guiding them to implement Green HRM to foster sustainable innovation and enhance sustainable business performance. The emphasis on data-driven culture highlights the need for organizations to invest in technology and analytics to leverage the full potential of GHRM-GI dynamics.

Furthermore, the study also greatly accentuates the role of leadership and organizational practices in fostering an environment that encourages and supports sustainability initiatives. The implications extend beyond individual organizations to the broader business community in Karachi and similar contexts.

Policymakers can utilize these findings to support the integration of green practices in HRM and innovation strategies, recognizing their potential impact on sustainable business performance. Additionally, the study highlights the importance of educational programs that provide employees and leaders with the knowledge and skills to adopt and promote green initiatives.

Limitations and Future Research

Our study utilized two antecedents of SBP (GHRM and GI). Other studies might include more antecedents, such as strategic leadership, innovation, and entrepreneurship. We incorporated a mediator in this research. Future research could explore different mediators in the conceptual framework, including employee engagement and motivation, customer satisfaction and loyalty, and risk management. This study used DDC and POS as moderators. Future studies may consider moderators like sustainable orientation, change management, and external environment. We focused on one sector and one city (i.e., textiles and Karachi). Other research might examine different sectors and cities.

Annexure: 1

Constructs and Items Used in the Questionnaire
Green HRM
GHRM1. Much effort goes into the selection of the culture-fit person.
GHRM2. Selection preference is given to those who carry sustainable business values.
GHRM3. A green (sustainable) process of staffing is being followed.
GHRM4. Mandatory sustainable business performance development is being carried out
HRM5. Sustainable performance training is being offered.
Green Innovation
GI1. Initiates customer-oriented products.
GI2. Conserves energy.
GI3. Fabricates environment-friendly products.
GI4. Recycle, reuse, and decompose.
Data-driven Culture
DDC1. Makes extensive use of data as well as information.
DDC2. Open to out-of-the-box ideas as well as approaches.
DDC3. Offers new data-based products.
DDC4. Offers new data-based services/
DD5. Makes data-based decisions.
Perceived Organizational Support
POS1. Your company takes care of you.
POS2. Your company helps you do things to the best of your capacity.
POS3. Your company tries to make your jobs too interesting.
POS4. Your company takes extreme pride in your work.
POS5. Does your organization show much concern for you?
Sustainable Business Performance
SBP1. Green activities significantly reduce head costs.
SBP2. Green activities reduce lead times..
SBP3. Green activities in your organization improve product/process/service quality.
SBP4. Green activities improve the prestige of your organization.
SBP5. Green activities reduce waste underlying the entire value chain process in your organization.

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