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Examining the Influence of Green HR Practices on Green Organizational Performance: Evidence from Pharmaceutical Sector of Asian Economies

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The study investigates the relationship of green HR practices with green organizational performance. This paper further analyzes the impact of different dimensions: green performance management, green HR data and analytics, green recruitment and selection, green compensation and evaluation, green succession planning, green training and development, and green HR information systems on green HR practices. This paper examines the mediation of green HR purchasing and environment and eco-design and internal management between green HR practices and organizational performance. The researchers used structured and modified questionnaires and collected 465 responses from the pharmaceutical sector of Asian economies such as China, India, Pakistan, South Korea, and Japan. The researchers employed PLS-SEM modeling using Smart-PLS 4.0 software to analyze the data. The findings of this research demonstrate that green HR practices have a significant and affirmative relationship with green organizational performance. Results further indicate that green performance management, green HR data and analytics, green recruitment and selection, green compensation and evaluation, green succession planning, green training and development, and green HR information systems positively and significantly impact green HR practices. Finally, the findings show that green HR purchasing, environment, eco-design, and internal management significantly mediate between green HR practices and organizational performance. The study's findings have demonstrated a significant theoretical and managerial implication for researchers, academicians, industry practitioners, and policymakers. Moreover, the findings of this study also provide the roadmap to attain one of the most important goals of the sustainable development goals (SDGs) of the United Nations (UN): eco-friendly sustainability.

Keywords: *Green HR Practices; Green Organizational Performance; Eco-Design & Internal Management; Green Secession Planning; Green Compensation & Evaluation; Green HR Information System; Green HR Data & Analytics.*

Introduction

In the contemporary world, according to the sustainable development goals (SDGs) of the United Nations (UN), eco-friendly sustainability is one of the seventeen goals that has become a grave challenge, stimulating firms to re-examine their strategies and processes to reduce environmental hazards (Xie *et al.*, 2022). Therefore, green human resource management (GHRM) has surfaced, stressing the incorporation of environmental issues into HR practices (Sobaih *et al.*, 2020; Awais Bhatti, Alnehabi, 2023. Green HRM emphasizes nurturing a green firm's attitude, fostering sustainability plans, and supporting green HR initiatives with eco-friendly intentions (Rawashdeh, 2018). According to Chillakuri and Vanka (2021), Van Buren (2020), and Lopes *et al.* (2017), the initiative of integrating sustainability in production processes is gaining more consideration than ever before, and now, an eco-friendly environment is one the major companies'

practices. Similarly, Wu *et al.* (2018) and Nejati *et al.* (2017) have argued that sustainability is one of the most prominent drifts in sustainability challenges, which is the rising sensitivity of industries toward environmental challenges. Luu (2019) and Nejati *et al.* (2017) have demonstrated that companies financing eco-friendly management might gain first-mover benefits, permitting them to start distinct and diverse policies to increase their eco-friendly imageries and attain competitive advantage. Therefore, measuring a company's success in achieving environmental sustainability targets and objectives is recognized as green organizational performance. According to Hameed *et al.* (2020) and Su and Swanson (2019), companies are zealous regarding eco-friendly strategies that eventually help improve workers' results. Kim *et al.* (2019) demonstrated that companies need to motivate workers' results in eco-friendly performance to benefit from green prospects in companies. Therefore, according to Luu (2019) and Kim *et al.* (2019), eco-friendly companies' performance is gaining growing consideration because of the problem-solving attitude of employees toward environmental challenges. Kuo *et al.* (2022) established that to sustain an eco-friendly atmosphere, companies need to discover how Green HR practices impact workers' pro-environmental attitude that ultimately certifies its inclusive eco-friendly performance.

Yong *et al.* (2020) and Dumont *et al.* (2017) have established that green HRM is vital to organizational sustainability. According to Kramar (2014, p. 1075), "the green HRM practices provide the conducive ecosystem to increase the constructive eco-friendly effects." Similarly, Renwick *et al.* (2013) refer to the HRM features of green management, which target to boost eco-friendly worker's behavior. There is ample evidence demonstrating an advancement in the workforce's pro-environmental and green HRM behaviors and higher management at the workplace (Ahmed *et al.,* 2023; Ojo *et al.,* 2020). According to Hameed *et al.* (2020) and Su and Swanson (2019), the comprehension of the impact of green HRM practices on green organizational performance, which is imperative for realistic studies, must be revised. Saeed *et al.* (2019) emphasize that green HR initiatives involve a wide range of actions that foster ecological sustainability within the companies, including green selection and recruitment that comprises hiring employees with the assurance of environmental sustainability.

Moreover, green training and development offers the workforce the skills and knowledge to embrace eco-friendly initiatives and green performance management. It involves appraising employees built on their inputs to ecological objectives (Hameed *et al.,* 2020; Pham *et al.,* 2019). Similarly, green succession planning includes finding and evolving prospect managers dedicated to sustainable solutions; green compensation and appraisal entail paying employees for their roles to eco-friendly outcomes (Su & Swanson, 2019). Finally, green HR information procedures employ technology to assist environmental practices and green HR data analytics, including data collection and analyses to gauge the growth of eco-friendly objectives (Ahmed *et al.,* 2021).

Several research studies have investigated that many organizations have incorporated green HRM strategies (Imtiaz *et al.,* 2023; Jain & Adlakha, 2019). However, only a few studies have been carried out to examine the impact of green HRM strategies on green organizational performance. Researchers have discussed that companies' green performance depends not only on the execution of green HRM strategies but also on senior management's eco-friendly behavior, for instance, green recruitment & selection, green performance management, green training & development, green secession planning, green compensation & evaluation, green HR information system, and green HR data & analytics (Lou Zhang, 2023; Bhatti, 2024). Researchers further argued that green HRM might have mediation of green purchasing and environment and eco-design and internal management between green HR practices and green organizational performance (Nugraha *et al.,* 2022; Kuo *et al.,* 2022). The previous literature demonstrated that influential stakeholders such as senior management, employees, suppliers, buyers, and legislators' knowledge and attitude of green HRM stimulus the application of green HRM strategies (Stahl *et al.,* 2020; Guerci *et al.,* 2016). According to Saeed *et al.* (2019) and Dumont *et al.* (2017), there is a dire need to examine the magnitude to which policymakers are conscious of green HR practices and the benefits of executing them. Moreover, to achieve one of the most imperative goals of the sustainable development goals (SDGs) of the United Nations (UN), which is eco-friendly sustainability in the pharmaceutical sector.

This research examines the influence of green human resource management on organizational performance. This area has gained significant interest among industry practitioners and research scholars (Sobaih *et al.,* 2020; Nayak & Mohanty, 2017). Despite the growing body of research that supports the positive association between green HR initiatives and green performance, more empirical studies are still necessary, especially in the framework of Asian economies.

Thus, the current study bridges the gaps by evaluating the influence of green HR practices on green organizational performance from the perspective of the pharmaceutical sector of China, India, Pakistan, South Korea, and Japan. Specifically, this research investigates the influence of green recruitment and selection, green performance management, green training and development, green secession planning, green compensation and evaluation, green HR information system, and green HR data and analytics on green HR practices.

Additionally, the study investigates the mediating effect of two significant constructs, including green purchasing and environment and eco-design and internal management, between green HR practices and organizational performance. This research provides valuable insights for pharmaceutical companies in the Asian economies, including China, India, Pakistan, South Korea, and Japan, to advance their ecological sustainability by adopting green HR initiatives. Furthermore, this research contributes significantly to the theoretical and practical comprehension of green HR practices and their function in compelling sustainability practices within organizations.

The remainder of the research paper consists of a Review of the literature and the development of hypotheses, Methodology, Estimations and data analyses, Discussion, and Conclusion.

Review of Literature and Hypotheses Development

Theoretical Framework – Signaling Theory

Introduction to Signaling Theory

Connelly *et al.* (2011) suggested that the signaling theory is a significant model for understanding essential communication in the marketplace. The signaling theory suggests that the marketplace responds positively and negatively to signals. Initially proposed by Spence (1973), the signaling theory explains how people and companies communicate and interpret these communications (Spence, 2002).

Relevance to the Green HR Practices

This research connects the signaling theory to green HR practices and their dimensions, which include:

- Green recruitment selection.
- Green performance management.
- Green training development.
- Green secession planning.
- Green compensation and evaluation.
- Green HR information system.
- Green HR data & analytics.

Green HR practices are believed to enhance green organizational performance (Nugraha *et al.*, 2022).

Environmental Challenges

Ahmed *et al.* (2021) state that environmental challenges have become severe threats for today's global organizations. Similarly, green environmental challenges are vital for every department of the organization, including HRM, marketing, production, and finance. Pollution and ecological variations in weather are examples of these daily challenges that degrade the global environment. Developed and emerging economies contribute to these hazards due to non-eco-friendly production processes (Bae *et al.*, 2018).

Green HR and Marketing Practices

According to Sobaih *et al.* (2020) and Ahmed *et al.* (2021), green HR practices and green marketing practices provide an eco-friendly ecosystem to the people of this world. Thus, the signaling theory is pertinent to international environmental organizations, local government and non-government organizations, industrial policymakers, and ordinary people.

Application of Signaling Theory

Several studies demonstrated that the signaling theory had been employed in the perspective of green HR practices and organizational performance (Guest *et al.*, 2021; Suazo *et al.*, 2009). Therefore, the researchers have employed the signaling theory in the current research because it has already been proved that it is closely linked with green HR practices and organizational practices (Ahmed *et al.*, 2021; Guest *et al.*, 2021).

Green Organizational Performance (GOP)

The measurement of a company's success in attaining ecological sustainability targets and goals is known as green organizational performance (GOP) (Mishra, 2017). It includes examining companies' struggles and effects in decreasing carbon release, preserving resources, diminishing waste production, and supporting environmental initiatives. Companies with robust green organizational performance exhibit a promise of eco-friendly sustainability and are pre-emptive in executing green practices (Masri & Jaaron, 2017). These organizations have practices and rules to minimize ecological degradation, contribute to the world's security, and fulfill rules and regulations (Mandago, 2018). Assessing green organizational performance can comprise several indicators and metrics, such as recycling tariffs, waste production, water treatment, greenhouse gas emanations, and energy depletion. These mediums support companies in trail development towards eco-friendly sustainability and recognize zones for progress (Haldorai *et al.*, 2022). Every company stakeholder, such as employees, customers, buyers, suppliers, shareholders, and regulators, has great significance in the green business environment and GOP (Darvishmotevali & Altinay, 2022). Companies that excel in GOP can increase their corporate image, fascinate eco-friendly aware investors and customers, and attain a competitive benefit in the market (Kuo *et al.*, 2022; Renwick *et al.*, 2016).

Green HR Practices

According to Guerci *et al.* (2016) and Teixeira *et al.* (2016), green HR initiatives denote HRM within eco-friendly challenges. It includes workforce recruitment established on green measures, employees' skills, and training in sustainability administration; within this perspective, linked performance appraisal gauges the sustainability functioning of the workforce and incentivizes them to attain green objectives (Yong *et al.*, 2020; Yusliza *et al.*, 2017). In summary, green HR practices are an eco-friendly HRM drive as they confirm and organize workforce engrossment through more excellent green proficiencies and lower costs, encouraging the company to condense and conserve assets wherever feasible. According to Renwick *et al.* (2013), this procedure signifies that companies align their business tactics and struggle toward a greener business approach. In this regard, Tang *et al.* (2018) and Paille *et al.* (2013) establish the association between environmental administration and HRM by emphasizing how and what extend workforce is attached in green practices at their companies. Boudreau and Ramstad (2005), and Kuo *et al.* (2022) endorsed that HR devisions of companies should have the capacity to examine motivation, attitude, behavior, and sustainability related knowledge among the workforce. With these actions and capacities, companies can find it simpler to employ HRM to stimulate viable eco-friendly workforce behaviors (Jabbour & de Sousa Jabbour, 2016; Dumont *et al.*, 2017) Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H1): Green HR practices have a significant and positive relationship with green organizational performance.

Green Recruitment & Selection – GRS

The definition of green recruitment and selection (GRS) demonstrates that hiring employees dedicated to eco-friendly sustainability is associated with companies' objectives and green values (Obaid & Alias, 2015). Green practices are measured as a vital element of green HRM and should positively influence green organizational performance. Several studies have established that GRS initiatives can lead to numerous advantages for companies regarding eco-friendly sustainability (Kuo *et al.,* 2022; Mwita & Kinemo, 2018). Organizations hire those individuals who are conscious of ecological sustainability and can promote and adopt green initiatives within the company (Nayak & Mohanty, 2017). This workforce is more liable to participate in eco-friendly activities, such as preserving resources, diminishing wastage, and promoting sustainability practices.

Additionally, individuals employed through GRS procedures are more likely to be dedicated and inspired by the companies' eco-friendly objectives (Masri & Jaaron, 2017). Thus, the GRS process can enhance workforce commitment, job retention, and job fulfillment, eventually contributing to greater green organizational performance levels (Kuo *et al.,* 2022; Ahmed *et al.,* 2021). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H2): Green recruitment and selection have a significant and positive relationship with green HR practices.

Green Performance Management – GPM

Prakash and Das (2022) have defined green performance management (GPM) as including examining and supporting the workforce founded on its commitment to eco-friendly sustainability and affiliating their performance objectives with the companies' green goals (Chen *et al.,* 2015). The GPM is a vital feature of green HRM and is supposed to have an affirmative influence on green organizational performance. Previous literature has exhibited that GPM can lead to numerous gains for companies regarding eco-friendly, sustainable solutions (Kuo *et al.*, 2022). Besides aligning workforce performance objectives with green purposes, companies can confirm that the workforce is dynamically involved in promoting eco-friendly practices and working to attain sustainable solutions (Ahmed *et al.,* 2023). Thus, GPM can enhance eco-friendly performance, for instance, decrease carbon emissions, reduce waste production, and diminish energy depletion (Prakash & Das, 2022; Ojo *et al.,* 2020).

Additionally, GPM can assist companies in recognizing and giving incentives to the workforce, creating substantial influences on eco-friendly sustainable initiatives (Darvishmotevali & Altinay, 2022; Mishra, 2017). This process can motivate the workforce to exert their energies and craft an eco-friendly concern culture within the company (Pham *et al.,* 2019). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H3): Green performance management has a significant and positive relationship with green HR practices.

Green Training & Development – GTD

The definition of green training and development (GTD) demonstrates that it is a process of devolving the workforce with skills and knowledge that is imperative to embrace eco-friendly initiatives and assist the companies' green objectives (Kuo *et al.,* 2022; Obaid & Alias, 2015). The GTD is a vital element of green HRM and is supposed to have an affirmative influence on green organizational performance. Several studies have established that GTD initiatives can lead to numerous advantages for companies regarding eco-friendly sustainability (Gill *et al.,* 2021; Rani & Mishra, 2014). Besides cultivating eco-friendly challenges and best initiatives in the workforce, companies can enhance consciousness and stimulate behavior modification by promoting eco-friendly practices and working to attain sustainable solutions (Ojo *et al.,* 2020). The workforce who attains GTD is more liable to participate in eco-friendly activities, such as conserving resources, lessening wastage, and promoting sustainability practices.

Additionally, GTD can assist companies in creating a sustainability initiative culture by imparting eco-friendly principles and values to their employees (Mwita & Kinemo, 2018). The workforce trained in eco-friendly challenges is more anticipated to be dedicated and inspired to the companies' eco-friendly objectives (Darvishmotevali & Altinay, 2022). Thus, the GTD process can lead to enhanced workforce commitment and job fulfillment, eventually contributing to more excellent green organizational performance (Jabbar & Abid, 2015). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H4): Green training and development has a significant and positive relationship with green HR practices.

Green Secession Planning – GSP

Ifekwem (2018) and Chibuoke *et al.* (2018) have defined green succession planning (GSP) as including building potential leaders within a company who are devoted to sustainable solutions and proficient in compelling eco-friendly practices onward (Bilal & Rehman, 2017). The GSP is a vital feature of green HRM and is supposed to positively influence green organizational performance (Yasmeen *et al.,* 2022; Verlinden, 2022). Previous literature has exhibited that GSP can lead to numerous gains for companies regarding eco-friendly, sustainable solutions (Ahmad *et al.,* 2021; Ali & Mehreen, 2019). Besides finding and fostering eco-friendly leaders, companies can confirm that sustainability remains an urgent priority at the highest level of the company (Ogundele *et al.,* 2019). Thus, GSP can enhance eco-friendly practices, for instance, device green initiatives, reduce waste production, diminish energy depletion, and stimulate others to embrace eco-friendly activities (Amaechi *et al.,* 2023). Therefore, GSP can substantially influence eco-friendly sustainable initiatives (Joseph *et al.,* 2018). Hence, by evolving a force of eco-friendly conscious managers, companies can craft an eco-friendly concern culture built into their companies' DNA and beneficial for long-term competitive advantage for the company and environmental solutions (Okeke, 2021;

Adedayo *et al.*, 2016). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H5): Green succession planning has a significant and positive relationship with green HR practices.

Green Compensation & Evaluation – GCE

The definition of green compensation and evaluation (GCE) demonstrates that it rewards the workforce for their commitment to eco-friendliness and sustainability and examines performance based on their green practices' contribution (Ardiza *et al.*, 2021; Rawashdeh, 2018). The GCE is a vital component of green HRM that is imperative for motivating the workforce to be involved in eco-friendly actions and positively influencing green organizational performance (Jabbar & Abid, 2015). Several studies have established that GCE initiatives can lead to numerous advantages for companies regarding eco-friendly sustainability (Mandago, 2018; Maderazo, 2016). Besides cultivating eco-friendly challenges and best initiatives in the workforce, companies can enhance consciousness and stimulate behavior modification by promoting eco-friendly practices and working to attain sustainable solutions (Ahmad, 2015; Renwick *et al.*, 2013). The workforce who attains GCE is more liable to participate in eco-friendly activities, such as conserving resources, lessening wastage, and promoting sustainability practices (Ardiza *et al.*, 2021).

Additionally, GCE can assist companies in creating a sustainability initiative culture by rewarding their employees for green initiatives, who are more expected to be committed and motivated to the companies' eco-friendly objectives (Darvishmotevali & Altinay, 2022). Thus, the GCE process can lead to enhanced workforce commitment and job fulfillment that can eventually contribute to greater levels of GOP (Silahtaroglu & Vardarler, 2016; Silva & Madushani, 2017). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H6): Green compensation and evaluation have a significant and positive relationship with green HR practices.

Green HR information system – GHRIS

Imtiaz *et al.* (2023) have defined the green HR information system (GHRIS) as GHRIS employing technology to enhance and help green HR initiatives within a company (Waqas *et al.*, 2021; Ahmad, 2015). This includes using software and information systems to accomplish green HR practices and enable communication and teamwork among the workforce and other stakeholders (Pham *et al.*, 2020). The GHRIS is a vital feature of green HRM and is supposed to have an affirmative and significant influence on the GOP. Previous literature exhibited that GHRIS can lead to numerous advantages for companies regarding eco-friendly, sustainable solutions (Štreimikienė & Ahmed, 2021). Besides using technology to enhance green HR initiatives, companies can modernize their procedures, diminish the use of paperwork, and reduce their ecological effects (Maheshwari *et al.*, 2024). Thus, GHRIS can assist companies in trialing and examining ecological routine matrices, recognizing room for improvement, and permitting organizations to make conversant decisions concerning sustainability practices (Jain & Adlakha, 2019). Therefore, GHRIS can play a vital role in improving stakeholder communication, helping to interchange opinions, and creating the best initiatives for eco-friendly, sustainable solutions (Aggarwal & Agarwala, 2023). Hence, this can assist in crafting a sustainability culture within the companies for long-term competitive advantage for the company and environmental solutions (Lu *et al.*, 2020). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H7): Green HR information systems have a significant and positive relationship with green HR practices.

Green HR Data & Analytics – GHRDA

The Green HR data analytics (GHRDA) comprises data collection and analysis concerning green HR initiatives and their influence on green organizational performance (Mahmood *et al.*, 2022). The GHRDA is an imperative element of green HRM and should have an affirmative and significant influence on green organizational performance (Di Prima *et al.*, 2023). Several studies have established that GHRDA can lead to numerous advantages for companies regarding eco-friendly sustainability (Obeidat & Abdalla, 2022; Singh & El-Kassar, 2019). Organizations can track their green eco-friendly progress through data collection and analysis (Jeronimo *et al.*, 2020). Hence, GHRDA can assist companies in trialing and examining ecological promotion and adopting green practices within the company routine matrices, recognize room for improvement, and permit organizations to make conversant decisions concerning sustainability practices (Waqas *et al.*, 2021; Amini *et al.*, 2018). Thus, GHRDA can play a vital role in improving stakeholder communication, helping to interchange opinions, and finding the best initiatives for eco-friendly, sustainable solutions (Ahmed, 2022). Hence, this can assist in measuring and crafting a sustainability culture within the companies for long-term competitive advantage for the company and environmental solutions (Ahmed *et al.*, 2021; Ardiza *et al.*, 2021). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H8): Green HR data analytics has a significant and positive relationship with green HR practices.

Mediation Analysis

The researchers have employed two mediating constructs, for instance, green purchasing and environment and eco-design and internal management, that positively and significantly impact green HR practices and organizational performance.

Green Purchasing and Environment – GPE

According to Hlaváček *et al.* (2023), GPE signifies purchasing services and goods, which reduces the ecological effect and lively engages the workforce in green practices within the company. This facet of GHRM can mediate to increase green HR initiatives and organizational performance (Hazaea *et al.*, 2022; Anuar *et al.*, 2020). Previous literature has exhibited that GPE can lead to numerous advantages for companies regarding eco-friendly,

sustainable solutions (Yook *et al.,* 2018; Yang & Zhang, 2012). Companies can decrease carbon emissions and reduce environmental challenges by obtaining services and products from eco-friendly suppliers (Al-Swidi & Saleh, 2021). Therefore, GPE can assist companies in tracking and examining workforce involvement in green practices, which can produce a feeling of ownership and obligation concerning sustainability practices that further increase contribution and commitment to green initiatives (Visser & Dlamini, 2021; Jain *et al.,* 2020). Hence, GPE can mediate between green HR practices and organizational performance (Mutum *et al.,* 2021). Hence, by supporting eco-friendly procurement initiatives and appealing to the workforce with green practices, companies can craft a sustainability culture infused throughout the company (Dangelico *et al.,* 2021). The GPE can increase ecological performance within the organization for long-term competitive advantage in terms of cost saving and corporate image as an eco-friendly company (Beatson *et al.,* 2020; White *et al.,* 2019). Hence, based on previous literature, the researchers have framed the hypothesis as:

Hypothesis (H9): Green purchasing and the environment significantly mediate between green HR practices and green organizational performance.

Eco-Design and Internal Management – EIM

The eco-design and internal management (EIM) comprise designing services, products, and procedures considering the environmental degradation solutions and internal operational management and their influence on green organizational performance (Li & Sarkis, 2022; Karlsson & Luttropp, 2006). The EIM is an imperative element of green HRM, which acts as a mediating construct in a relationship between green HR practices and green organizational performance (Nugraha *et al.,* 2022; Knight & Jenkins, 2009). Previous literature has established that EIM can lead to numerous advantages for companies regarding eco-friendly sustainability (Thamsatitdej *et al.,* 2017; Gheorghe & Ishii, 2007). Organizations can track their green, eco-friendly progress by designing services and products using fewer resources, producing less waste, and enhancing energy efficiency (Rehema *et al.,* 2016). Hence, EIM can manage internal operations by minimizing ecological effects, which leads to enhanced efficiency, cost saving, and increased corporate image as an eco-friendly, reliable company (Deutz *et al.,* 2013). Additionally, EIM can play a vital role in improving products and services for eco-friendly, sustainable solutions (Sihvonen & Partanen, 2016). Hence, this can assist in measuring and crafting a sustainability culture within the companies for long-term competitive advantage, regulatory compliance, and customer loyalty that leads to green organizational performance (Hubner, 2012; Yung *et al.,* 2012).

Hypothesis (H10): Eco-design and internal management significantly mediate between green HR practices and green organizational performance.

Methodology

Research Design and Ethical Guidelines

The study's research design is quantitative and cross-sectional; data was collected using a modified and structured questionnaire. The conceptual framework and items of questionnaires were derived from previous literature (Ringle *et al.,* 2020; Lu *et al.,* 2020). The conceptual framework was based on a deductive research approach (Hair *et al.,* 2018). The authors have incorporated the signaling theory because the green HR practices and their dimensions, such as green recruitment and selection, green performance management, green training and development, green secession planning, green compensation and evaluation, green HR information system, and green HR data & analytics enhance the green organizational performance. Moreover, the authors have employed two mediating variables, green purchasing and environment (GPE) and eco-design and internal management (EIM), to examine the relationship between green HR practices and green organizational performance. The modified items were proposed based on the research questions and objectives of the study. The authors followed the research ethical guidelines and obtained informed consent from the respondents (Ahmed *et al.,* 2023; Hair *et al.,* 2022). The authors maintained the confidentiality and anonymity of the respondents, and the objectives, protocol, and nature were demonstrated to the study participants (Sarstedt *et al.,* 2019).

Data Collection Method and Sampling Strategy

The researchers used a structured, modified, and five-point Likert scale questionnaire to collect the data from 465 respondents. The questionnaires were modified based on the research objectives using previous studies (Hair *et al.,* 2014). The researchers have collected data from the pharmaceutical industry's HR professionals and decision-makers from Asian countries, such as China, Pakistan, India, South Korea, and Japan. For this purpose, the researchers have used both online and in-person methods. The researchers have employed personal emails, LinkedIn profiles, Google Docs, and Facebook social media channels for online data collection. The data was collected from June 17, 2023, to December 15, 2023. The researchers have selected the respondents and companies based on green HR practices, and they are well-versed regarding the benefits of eco-friendly solutions (Ringle *et al.,* 2020). The researchers used a purposive sampling technique to collect data and find the right candidate for the study (Hair *et al.,* 2018).

Measurement Scales

The modified items of constructs were taken from the previous literature; for instance, items of green HR practices were extracted from Yong *et al.* (2020), Tang *et al.* (2018), and Yusliza *et al.* (2017). The adapted items of green organizational performance were taken from studies such as Darvishmotevali and Altinay (2022), Masri and Jaaron (2017), and Mishra (2017). The modified items of green recruitment selection were extracted from the previous literature (Kuo *et al.,* 2022; Mwita & Kinemo, 2018; Nayak & Mohanty, 2017). However, the customized items of green

performance management were taken from previous studies such as Prakash and Das (2022), Ojo *et al.* (2020), and Mishra (2017). Moreover, the adjusted items of green training and development were taken from previous literature, for instance, Kuo *et al.* (2022), Ojo *et al.* (2020), and Obaid and Alias (2015). The modified items of green secession planning were extracted from previous studies such as those of Amaechi *et al.* (2023), Yasmeen *et al.* (2022), and Ali and Mehreen (2019). Similarly, the adapted items of green compensation and evaluation were taken from previous literature such as Ardiza *et al.* (2021), Rawashdeh (2018), and Jabbar and Abid (2015). Finally, the amended items of green HR information system were extracted from previous studies such as Maheshwari *et al.* (2024), Waqas *et al.* (2021), and Jain and Adlakha (2019), and modified items of green HR data analytics were taken from the previous literature such as Di Prima *et al.* (2023), Mahmood *et al.* (2022), and Jerónimo *et al.* (2020). The researchers have incorporated two mediating variables: green purchasing and involvement and eco-design and internal management. The modified items of green purchasing environment were extracted from the previous studies, for instance, Hlaváček *et al.* (2023), Al-Swidi and Saleh (2021), and Yook *et al.* (2018), and adapted items of eco-design & internal management were taken from the previous literature such as Nugraha *et al.* (2022), and Sihvonen and Partanen (2016).

Data Analysis Techniques

The researchers used partial least square-structural equation modeling (PLS-SEM) using Smart-PLS 4.0 software for data analysis purposes. The PLS-SEM comprises two phases; in the first phase, the researchers have validated the measurement model (Ahmed *et al.*, 2024; Hair *et al.*, 2022). For the measurement model, the researchers have employed factor loadings (FLs), Cronbach's alpha (CA), composite Reliability (CR), and average variance extracted (AVE) (Ahmed *et al.*, 2023; Henseler *et al.*, 2014). The convergent validity is measured through CL and AVE, and reliability is established using CA and CR. The discriminant validity is also established through the Fornell-Larcker Criterion and Heterotrait-Monotrait ratio of the correlation matrix (HTMT) (Sarstedt *et al.*, 2016; Hair *et al.*, 2014). The second phase of PLS-SEM is to validate the structural model; in this regard, the researchers have used the coefficient of determination (R^2), effect size (f^2), path coefficient analyses (Ahmed *et al.*, 2024; Rigdon *et al.*, 2017).

Demographic Analyses

The researchers used a structured five-point Likert scale to obtain data from respondents in the pharmaceutical sector of Asian economies such as China, India, Pakistan, South Korea, and Japan. The researchers distributed 500 questionnaires to the respondents, of which 465 questionnaires were found to be filled; therefore, in this way, the response rate was 93%. The targeted respondents were the HR professionals including HR directors, HR managers and HR executives, and top management (including CEOs, direcors of different departments) of the pharmaceutical industry from Asian countries, such as China, Pakistan, India, South Korea, and Japan. The data was comprised of 229 males and 196 females. The experience ranged from 10 to 25 years, and the qualification of respondents was either a bachelor's or a master's degree. The age bracket of respondents was from 30 years to 55 years. However, the income bracket of respondents ranged between $500 to $5000 US dollars depending on their experience, qualification, designation, and region.

Estimations and Data Analysis

The analyses of PLS-SEM comprise two phases. The first phase validates the measurement model, in which the researchers establish the convergent and discriminant validities.

The Evaluation of the Measurement Model

The first step of PLS-SEM modeling is to validate the measurement model using factor loading (FL), Cronbach's alpha (CA), composite reliability (CR), and average variance extracted (AVE) to establish the convergent validity. However, the researchers have used the Fornell-Larcker criterion and HTMT correlation matrix to establish the discriminant validity (Ahmed *et al.*, 2024; Hair *et al.*, 2022).

Reliability and Validity

According to Henseler *et al.* (2014), if the factor loadings (FLs) of all items are higher than 0.70, then the reliability and validity of FLs are validated. Similarly, the findings of Table 1 demonstrated that Cronbach's alpha and composite reliability values are also greater than 0.70. Hence, the reliability of constructs is established. Table 1 also exhibited that AVE values are higher than 0.50. Hence, the convergent validity of constructs is validity (Fornell & Larcker, 1981; Sarstedt *et al.*, 2017). Hence, the reliability and convergent validity of the measurement model are validated.

Heterotrait-Monotrait Ratio of Correlation Matrix (HTMT) for Discriminant Validity

The next step is to establish the discriminant validity of constructs for endorsing the measurement model. The discriminant validity of constructs is validated through the Heterotrait-Monotrait ratio of the correlation matrix (HTMT) (Hair et al., 2022). The findings of Table 2 demonstrated that values of the HTMT correlation matrix are less than 0.85; hence, the discriminant validity of constructs is established (Henseler et al., 2014).

The Fornell-Larcker Criterion of Discriminant Validity

The Fornell-Larcker criterion is an alternative method to establish discriminant validity (Fornell & Larcker, 1981). The findings of Table 3 exhibited that the square root of AVE is greater than the readings of latent constructs (off-diagonal values). The diagonal values represent the square root values of AVE, and the off-diagonal values represent the readings of latent variables (Sarstedt *et al.*, 2017). Hence, once again, the discriminant validity of constructs has been proved. Hence, the convergent and discriminant validities of items and constructs have been established; therefore, the hypothesized measurement model has also been validated (Ahmed *et al.*, 2024).

The Evaluation of the Structural Model

The second step of PLS-SEM modeling is to validate the structural model using the coefficient of determination (R^2), effect size (f^2), and path coefficient analyses (Ahmed *et al.*, 2024; Hair *et al*., 2022).

Coefficient of Determination (R^2)

The coefficient of determination (R^2) depicted the individual endogenous variables' causation or change due to their respective exogenous variables (Hair *et al.*, 2018). According to Ridgon *et al.* (2017), the coefficient of determination is also known as the predictive power of the sample. The findings of R^2 showed variables with significant R-squared values ranging between 51.6% and 87.1%, including Eco-design and internal management, green organizational performance, Green Purchasing and environment, and green HR practices. Hence, the results demonstrated that endogenous variables significantly influence their respective exogenous variables (Hair *et al.*, 2022). Hence, it is established that the data significantly fits the regression model.

F-squared Statistics (f^2)

According to Cohen (1988), the effect size $f^2 \geq 0.02$ is considered a small effect, $f^2 \geq 0.15$ is considered a medium, and $f^2 \geq 0.35$ is reflected as a large effect size. The findings of f^2 exhibited that Eco-design, internal management, and green organizational performance are 1.016, which is considered a significant effect. Therefore, these constructs have a significant relationship. Similarly, green compensation evaluation, green HR data & analytics, green HR information system, and green HR practices have an effect (f^2) of 18.895, 12.480, and 41.555, showing a significant relationship between the variables. The findings of effect size (f^2) further demonstrated that green performance management, green recruitment selection, green secession planning, green training development, and green HR practices have a significant effect, and green HR practices and, green organizational performance, Green Purchasing & Environment also have a significant effect size. However, green HR practices, green organizational performance, Green Purchasing & Environment, and green organizational performance have a medium effect size, i.e., 0.133 and 0.306 respectively. Hence, it is concluded that these variables have a medium relationship.

Hypothesized Direct Relationship

The findings of Table 4 exhibited that dimensions of green HR practices such as green recruitment selection, green performance management, green training development, green secession planning, green compensation evaluation, green HR information system, and green HR data & analytics have a significant and positive relationship green HR practices because (T>

±1.96 & P<0.05). The findings further revealed that green HR practices have a significant and positive relationship with green organizational performance (T>

±1.96 & P<0.05). The individual impact of variables demonstrated that green HR practices have the highest impact on green organizational performance (β=0.234, T=5.027, and p<0.05), and green performance management has the second highest impact on green HR practices (β=0.217, T=32.095, and p<0.05). However, green recruitment selection has the lowest impact on green HR practices (β=0.111, T=26.726, and p<0.05), followed by the impact of green HR information system on green HR practices (β=0.122, T=18.010, and p<0.05). Therefore, it is finally concluded that hypotheses H1 to H8 are substantiated, and green HR practices have a significant and positive relationship with green organizational performance. Similarly, green recruitment selection, green performance management, green training development, green secession planning, green compensation evaluation, green HR information system, and green HR data & analytics have a significant and positive relationship with green HR practices.

Hypothesized Mediating Relationship

The findings of Table 5 exhibited the mediating relationship between green purchasing and the environment, as well as eco-design and internal management, in a relationship between green HR practices and green organizational performance. The findings demonstrated that Green Purchasing and environment (β=0.248, T=7.273, and p<0.05) and Eco-design and internal Management (β=0.667, T=10.804, and p<0.05) have significant and positive mediation between GHRP and green organizational performance. Hence, it is concluded that hypotheses H9 and H10 are substantiated. It is further established that Green Purchasing and environment, and Eco-design & internal management as mediating constructs enhance green organizational performance.

Table 1

Construct Reliability and Validity

Constructs	Cronbach's alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average variance extracted (AVE)
Eco-design & Internal Management	0.797	0.803	0.881	0.713
Green Compensation & Evaluation	0.841	0.849	0.895	0.681
Green HR Data & Analytics	0.678	0.719	0.819	0.604
Green HR Information System	0.845	0.841	0.908	0.768
Green HR Practices	0.965	0.969	0.968	0.545
Green Organizational Performance	0.935	0.946	0.952	0.799
Green Performance Management	0.875	0.885	0.908	0.666
Green Purchasing & Environment	0.856	0.891	0.889	0.573
Green Recruitment & Selection	0.719	0.738	0.842	0.641
Green Succession Planning	0.758	0.766	0.847	0.581
Green Training & Development	0.829	0.839	0.888	0.667

Source: Authors' calculations

Table 2

HTMT—Heterotrait–Monotrait Ratio (HTMT)—Matrix

Constructs	EIM	GCE	GHRDA	GHRIS	GHRP	GOP	GPM	GPE	GRS	GSP	GTD
Eco-design & Internal Management	1.000										
Green Compensation & Evaluation	0.814	1.000									
Green HR Data & Analytics	0.759	0.734	1.000								
Green HR Information System	0.778	0.761	0.807	1.000							
Green HR Practices	0.747	0.727	0.702	0.799	1.000						
Green Organizational Performance	0.431	0.849	0.801	0.654	0.716	1.000					
Green Performance Management	0.502	0.823	0.738	0.664	0.602	0.626	1.000				
Green Purchasing & Environment	0.726	0.808	0.653	0.793	0.761	0.771	0.611	1.000			
Green Recruitment & Selection	0.699	0.639	0.754	0.766	0.752	0.716	0.666	0.715	1.000		
Green Succession Planning	0.545	0.714	0.632	0.715	0.694	0.680	0.706	0.735	0.611	1.000	
Green Training & Development	0.430	0.490	0.527	0.727	0.670	0.697	0.602	0.719	0.598	0.722	1.000

Source: Authors' calculations

Table 3

Fornell–Larcker Criterion of Discriminant Validity

Constructs	EIM	GCE	GHRDA	GHRIS	GHRP	GOP	GPM	GPE	GRS	GSP	GTD
Eco-design & Internal Management	0.844										
Green Compensation & Evaluation	0.813	0.897									
Green HR Data & Analytics	0.792	0.825	0.931								
Green HR Information System	0.639	0.647	0.777	0.876							
Green HR Practices	0.834	0.940	0.665	0.731	0.918						
Green Organizational Performance	0.805	0.734	0.641	0.586	0.738	0.894					
Green Performance Management	0.757	0.776	0.782	0.587	0.692	0.575	0.816				
Green Purchasing & Environment	0.826	0.711	0.762	0.680	0.719	0.853	0.558	0.757			
Green Recruitment & Selection	0.760	0.812	0.870	0.615	0.863	0.597	0.719	0.595	0.929		
Green Succession Planning	0.734	0.824	0.851	0.586	0.734	0.580	0.703	0.613	0.800	0.888	
Green Training & Development	0.755	0.725	0.889	0.621	0.857	0.620	0.649	0.633	0.896	0.762	0.816

Source: Authors' calculations

Table 4

Hypothesized Direct Relationships

Direct Relationship	Original sample (β)	Standard deviation	T statistics	P values
Green HR Practices -> Green Organizational Performance	0.234	0.047	5.027	0.000
Green Compensation & Evaluation -> Green HR Practices	0.196	0.006	34.018	0.000
Green HR Data & Analytics -> Green HR Practices	0.126	0.005	27.603	0.000
Green HR Information System -> Green HR Practices	0.122	0.007	18.010	0.000
Green Performance Management -> Green HR Practices	0.217	0.007	32.095	0.000
Green Recruitment & Selection -> Green HR Practices	0.111	0.004	26.726	0.000
Green Succession Planning -> Green HR Practices	0.149	0.004	33.650	0.000
Green Training & Development -> Green HR Practices	0.171	0.005	35.206	0.000

Source: Authors' calculations

Table 5

Hypothesized Mediations

Hypothesized Mediation Relationship	Original sample (β)	Standard deviation	T statistics	P values
Green HR Practices -> Green Purchasing & Environment -> Green Organizational Performance	0.248	0.034	7.273	0.000
Green HR Practices -> Eco-design & Internal Management -> Green Organizational Performance	0.667	0.062	10.804	0.000

Source: Authors' calculations

Discussion

The findings of this research exhibited that green HR practices significantly and positively impact green organizational performance. Previous literature also demonstrated similar results and established that green HR practices influence organizational performance (Yong *et al.*, 2020; Tang *et al.*, 2018; Yusliza *et al.*, 2017). The findings also demonstrated that green recruitment and selection have a significant and affirmative relationship with green HR practices. Previous studies also showed an affirmative relationship between green recruitment and selection and green HR practices (Mwita & Kinemo, 2018; Nayak & Mohanty, 2017). The findings further demonstrated that GPM has a cogent and positive relationship with green HR practices; the results of previous studies are also consistent with the results of the current study (Prakash & Das, 2022; Mishra, 2017).

Similarly, the findings showed that Green Training and development has a positive and significant association with green HR practices, which aligns with previous studies' findings (Kuo *et al.*, 2022; Ojo *et al.*, 2020). The current study also demonstrated that green secession planning has a significant positive relationship with green HR practices. Previous literature also exhibited similar results and established that green secession planning has a cogent and affirmative association with green HR practices (Amaechi *et al.*, 2023; Yasmeen *et al.*, 2022; Ali & Mehreen, 2019). The current study's findings demonstrated that green compensation and evaluation are positively and significantly associated with green HR practices. These results are also coherent with the outcomes of previous studies (Ardiza *et al.*, 2021; Jabbar & Abid, 2015). The findings further demonstrated that green HR information system has a cogent and affirmative relationship with green HR practices, which is very much coherent with the previous literature (Maheshwari *et al.*, 2024; Waqas *et al.*, 2021; Jain & Adlakha, 2019). Finally, the outcomes of the current study showed that green HR data and analytics have a significant and positive relationship with green HR practices. Previous studies, for instance, Di Prima *et al.* (2023) and Jerónimo *et al.* (2020), also demonstrated that green HR data and analytics have played a vital role in green HR practices and organizational performance. The current study also examined the influence of two mediation variables, Green purchasing and environment, and eco-design and internal management, in a relationship between green HR practices and green organizational performance. The findings demonstrated that green purchasing and environment have a significant and positive mediation between green HR practices and green organizational performance; these results are consistent with previous studies such as Hlavacek *et al.* (2023) and Yook *et al.* (2018). Lastly, the current study established that eco-design and internal management have a positive and cogent impact as a mediating variable between green HR practices and green organizational performance. Previous literature also supported these results and demonstrated a positive and significant impact of eco-design and internal management that enhances green organizational performance (Nugraha *et al.*, 2022; Sihvonen & Partanen, 2016).

Theoretical and Practical Implications

The current study's findings have significant theoretical and practical implications; for instance, theoretical implications suggested that the signaling theory is very relevant to green HR practices and GOP. The signaling theory is a significant model that narrates essential communication; moreover, the signaling theory is grounded on propositions in which the marketplace responds affirmatively and adversely. This research is connected to the signaling theory because the green HR practices and their dimensions, such as green recruitment selection, green performance management, green training development, green secession planning, green compensation and evaluation, green HR information system, and green HR data & analytics enhance the green performance management (Ahmed *et al.*, 2021). Moreover, the current research has provided a novel conceptual framework for future researchers. Therefore, they can replicate their studies across different industries by using this modified conceptual framework. The current study also provided significant industrial implications, such as that green HR practices can enhance organizational eco-friendly performance (Islam *et al.*, 2023). Hence, the HR department and higher management should prioritize green HR practices while making green strategies. The HR department and senior management should include green recruitment and selection, Green Performance Management, Green Training & Development, green secession planning, Green Compensation & Evaluation, green HR information system, and green HR data and analytics in their green HR practices for competitive strategies and green organizational performance. Moreover, green organizations should incorporate green purchasing and environment and eco-design and internal management because this research established that eco-design and internal management and green purchasing and environment are mediating variables in a relationship between green HR practices and green organizational performance.

Limitations and Potential Areas of Future Research Studies

The current study has certain limitations; for instance, the current study has focused only on the pharmaceutical industry of specific economies, including China, India, Pakistan, South Korea, and Japan. Therefore, it is recommended that future researchers take multiple sectors and more geographic regions for more robust and generalizable results. The study considered limited exogenous and mediating variables. However, other thematic variables may be considered independent, mediating, and moderating variables for more robust outcomes. The study's research design is quantitative and cross-sectional; the findings do not capture the changing behavior of stakeholders with time. Thus, future researchers should replicate this study on a longitudinal basis to evaluate the changing behavior of green organizations. The study does not capture the cause-and-effect and directional causality between the variables (Štreimikienė & Ahmed, 2021). Therefore, it is recommended that future research studies include a directional causality model.

Conclusion

The findings of the current study concluded that green HR practices and their dimensions, such as green recruitment and selection, Green Performance Management, Green Training & Development, green secession planning, Green Compensation & Evaluation, green HR information system, and green HR data and analytics significantly and positively influencing the green HR practices. Hence, green organizational performance significantly and positively impacts green organizational performance. Hence, the hypotheses H1 to H8 have been substantiated. The study concluded that green HR practices increase green organizational performance and enhance the green competitive advantages over competitors. The study also concluded that organizations should adopt green HR practices and incorporate significant factors such as green recruitment and selection, Green Performance Management, Green Training & Development, green secession planning, Green Compensation & Evaluation, green HR information system, and green HR data and analytics while devising their HR strategies. These factors increase the motivation of internal and external stakeholders, including employees, management, suppliers, distributors, customers, and shareholders. The current study's findings provide the blueprint of green HR practices for the other industrial sectors to adopt and practice green HR practices for long-term growth, competitive advantage, and green organizational performance. Moreover, this study also aims to achieve one of the most imperative goals of the sustainable development goals (SDGs) of the United Nations (UN), which is eco-friendly sustainability in the pharmaceutical sector. This research concluded that green recruitment and selection, Green Performance Management, Green Training & Development, green secession planning, Green Compensation & Evaluation, green HR information system, and green HR data and analytics enhance green HR practices leading to green organizational performance. The current study's findings further demonstrated that green purchasing, environment, eco-design, and internal management are mediating constructs that significantly and positively influence the relationship between green HR practices and green organizational performance. Hence, the hypotheses H9 and H10 were also substantiated. Therefore, the study finally concluded that green organizations in the pharmaceutical sector of specific Asian economies, including China, India, Japan, Pakistan, and South Korea, should invest in their employees, processes, and products for environmental sustainability and get optimal benefits to enhance their profit and corporate image in a long-term perspective.

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