RESEARCH ARTICLE

When and how the implementation of green human resource management and data-driven culture to improve the firm sustainable environmental development?

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Abstract

The process by which manufacturing firms incorporate data-driven culture into existing routines and use them to generate organizational learning (OL) and improve sustainable environmental development is a central concern in the green management literature. For this, the study examines how and to what extent data-driven culture contributes to developing and integrating organizational learning capability (OLC) for environmental performance (EP). The analysis is informed by theory on a knowledge-based view and dynamic capabilities. We propose a conceptual model that examines the moderation-mediation impact of data-driven culture on green human resource management (HRM) and EP through OLC. We empirically test our model using primary survey data from 274 manufacturing enterprises in Pakistan. Partial least-square structural equation modeling and moderated-mediation regression analysis were used to assess the hypothesized correlations between the variables. The study implies that green HRM practices can facilitate OLC to achieve and gain high EP in contexts of rapid change. Further, the findings show that firms adopting a data-driven culture may have better EP. Having a robust data-driven culture makes organizations focus more on learning capability development that promotes increased EP. This research offers several significant contributions to green management literature and theory. Managers should promote green human resource strategies and the importance of data-driven culture for greening organizations. In today's data-rich and unpredictable world, these empirical studies provide relevant and practical advice for managers to implement data-driven culture to make shift and support sustainable development issues.

KEYWORDS
data-driven culture, environmental performance, green human resource management, organizational learning, sustainable developments

1 | INTRODUCTION

Green Management scholars have increasingly shown the consequences of green human resource management (HRM) in addressing climate challenges and sustainability issues (Dumont et al., 2017). Green HRM is about integrating green management aspects in human resources to pursue large-scale environmental challenges (Renwick et al., 2012). The significance of green HRM adoption for firms is gaining attention and is a central concern in the management literature (Roscoe et al., 2019). Literature acknowledges that green HRM can allow firms to improve the existing process to improve environmental performance (EP) (Rehman et al., 2021), exploit green innovation

(Singh et al., 2020), psychological green climate (Dumont et al., 2017), environmental cooperation (Yu et al., 2020) and green employee behavior (Yeşiltaş et al., 2022). Yu et al., (2021) argue that green HRM is a critical research area that would be especially important for organizations that have yet to take stringent measures to tackle sustainability challenges. Therefore, not surprisingly, literature has now provided a reasonable understanding of the key antecedents of green HRM (Roscoe et al., 2019) and organizational innovation learning (Koseoglu et al., 2022). Despite the literature on organizational learning (OL) and green HRM practices (Roscoe et al., 2019), literature has not fully explored the link to OL for creating, sharing, and transfer of knowledge and data-driven cultural aspects together to achieve sustainability goals of EP (Awan et al., 2021; Yu et al., 2021).

It has been suggested that OL and exploiting green HRM for EP is still a major challenge for practitioners and academicians (Subramanian & Suresh, 2022; Yong et al., 2020). OL is an employee attitude toward learning and managerial characteristics that transform knowledge into distinct competencies (Real et al., 2014). However, on the other hand, researchers have frequently argued that cultural values encourage firms to adopt innovative behavior and help to improve the OL process (Piwowar-Sulej, 2021). Organizational learning capability (OLC) and culture are key antecedents through which a firm modifies the existing process and improves its EP (Piwowar-Sulej, 2021). A study of Subramanian and Suresh (2022) showed that green HRM and identifying OLC are key to understanding environmental sustainability issues. Firstly, OLC has been extended to consider how dynamic capabilities may be instrumental in modifying, building, integrating, and reconfiguring external and external competencies (Teece, 2017), which links the firm's ability to integrate and reconfigure competencies to improve the business core process (Alerasoul et al., 2022). Although most of the previous studies have investigated the consequences of green HRM (Rehman et al., 2021; Roscoe et al., 2019; Singh et al., 2020; Song et al., 2020) and green workplace behavior (Dumont et al., 2017). Recently, research studies have been conducted into the organizational process that links green HRM and organizational processes (Chaudhary, 2019; He et al., 2021). While there is anecdotal evidence of the emergence of links between green HRM and organizational processes (Lu et al., 2022), OLCs have not been thoroughly investigated, and their effect on EP (Subramanian & Suresh, 2022). Thus, understanding the consequences of OLC is important for environmental management practitioners when deciding between alternative implementations of green HRM for their overall EP (Subramanian & Suresh, 2022). Thus, it is clearly useful to investigate how organizations integrate OLC into their routines and processes to enhance sustainability performance.

Secondly, an alternative stream of research examining data-driven culture (DDC) posts that firms and organizations are taking advantage of DDC to improve their operational performance (Chatterjee et al., 2021). Further, the resource-based view (RBV) (Dubey et al., 2019) has illustrated the conceptual linking of the data-driven culture (DDC) and organizational interpretation of external knowledge resources. However, previous studies have examined the DDC as moderating between adopting business analysis and product innovation (Chatterjee et al., 2021). Recently, Yu et al. (2021) investigate

how DDC may facilitate the integration of organizational processes and improve innovation (Chatterjee et al., 2021).

Recognizing the importance of DDC, researchers have suggested that DDC is important to improve overall firm performance (Dubey et al., 2019). Chatterjee et al. (2021) call for more empirical studies to understand the relationship between green HRM practices and DDC. A study by Awan et al. (2021) suggests that managers need to understand whether DDC contributes to the development of OLC and impacts the reduction in resource consumption. Following Chatterjee et al. (2021), the importance of DDC has been widely recognized in the literature as a promising area for firm Performance. Therefore, the organization needs to evaluate DDC's effect on OLC's expansion to achieve and exceed performance targets (Yu et al., 2021).

Therefore, understanding the DDC is especially important to learn about design adjustment and data on eliminating waste and pollution to increase EP (Chatterjee et al., 2021). However, there is still a lack of empirical validation about how an organization's DDC affects employee information processing (Yu et al., 2021) and brings about changes in the EP (Chatterjee et al., 2021). Contributing to this discussion, Chatterjee et al. (2021) emphasize how DDC gives rise to OLC and improves EP. However, we argue that existing literature provides an understanding of the DDC and related OLC influence on the EP. Our research investigates how an organization's DDC impacts OLC and leads to enhance EP.

This study aims to address two gaps in the literature. Firstly, we examine the impact of green HRM on EP through OLC. Secondly, due to the importance of the DDC for EP, current studies provide little evidence on how and under what conditions it is an important predictor of EP. To address this gap, we state the following research questions: (1) How do green HRM and OLC affect EP? (2) what are DDC's direct and indirect effects on OLC and EP? To answer these research questions and to test the hypothesis, we collected data from a sample of manufacturing firms, which were tested using the structural equation modeling partial least-square method. This study uses a knowledge-based view (KBV) for green HRM and theory on dynamic capability (DC) for OLC to support and explain our empirical results.

The study contributes to the literature on green management and theory in three areas. Firstly, in the scholarly literature, where most studies have been conducted on the effects of green HRM on employee workplace green behavior, green organizational culture, and EP (Dumont et al., 2017; Rehman et al., 2021; Roscoe et al., 2019). Consistent with the findings of Appolloni, Chiappetta Jabbour, et al. (2022), sustainable development is a key strategy for pursuing long-term performance objectives. Secondly, following Roscoe et al. (2019), this study extends this perspective by showing the mediating role of OLC on the relationship between green HRM and EP. These findings suggest that an OLC is particularly important when using resources from green HRM. Thirdly, the previous research has demonstrated the moderating role of DDC on the relationship between AC and innovation (Chatterjee et al., 2021). This research has brought the gap between the green HRM and OLC that drives the growth of DC, but it also extends EP is dependent on OLC and DDC. We suggest that organizations can acquire and develop more knowledge about

the factors that contribute to EP when they consider the DDC that are related to OLC. The findings suggest that DDC is particularly important when organizations build up OLC using organizational resources for EP because the EP decreases when low DDC exists.

2 | THEORY AND HYPOTHESIS

2.1 | Literature review

Prior literature on pathways toward sustainability in manufacturing organizations (Yong et al., 2020) has studied green HRM based on a resource-based view (RBV). Green HRM has been identified as the most significant resource that changed organizational practices to minimize material and energy use and reduce waste from production (Roscoe et al., 2019). Consistent with the previous literature, human resource managers seek to train employees on environmental sustainability issues and develop attitudes toward reducing waste in their daily roles (Jabbour & de Sousa Jabbour, 2016). Sustainability significantly influences EP (Appolloni, Chiappetta Jabbour, et al., 2022). In line with recent research that argues that the key organizational performance process is what and how resources are integrated and implemented(Camilleri, 2015). Trujillo-Gallego et al. (2022) demonstrate that organizations with a sound focus on environmental management and sustainable development programs are able to incorporate the knowledge resources in operational activities (Lu et al., 2022). Corporate responsibility and environmental management theoretically allow organizations to develop internal and external knowledge resources (Camilleri, 2022b). The knowledge base view (KBV) focuses on scaling up and re-sharing knowledge within an organization to improve performance outcomes (Grant, 1996). Similarly, Barney (2001) has argued that knowledge resources are firm-specific and difficult to intimate and explain the individual ability to learn to benefit personally and collectively. Barney (2001) has classified resources as a source of competitive advantage and characterized them as "physical capital resources, human capital resources, and organizational capital resources". These resources predict the organization's capability to identify the foundations for distinctive and difficult-to-replicate advantages to develop, maintain, and enhance in response to a rapidly changing environment (Augier & Teece, 2009). Pereira and Bamel (2021) postulates that RBV focuses only Ricardian notion of creating rent, but it disregards the Schumpeterian concept that resources can be reorganized, redirected, transformed, shaped, and put together in new ways. The KBV expands on the RBV by combining the Ricardian and Schumpeterian approaches (Pereira & Bamel, 2021).

The conceptualization of the KBV takes an OL perspective, focusing on the rebuild and reconfiguring the learning resources. de Souza Moraes et al. (2018) have pointed out that the transferability of knowledge is a collective and individual process embedded in the group of an employee or individual employee abilities, skills, and experience. Recently, scholars have pointed out the importance of KBV at the firm level to address environmental issues and impact society

(Fernandes et al., 2022). Knowledge sources are embedded within the firm on scaling up and re-sharing knowledge within an organization and cocreated within the firm to understand an organization's commitment to adopt emerging environmental management initiatives (Fernandes et al., 2022; Rehman et al., 2021; Roscoe et al., 2019; Scuotto et al., 2022). These knowledge resources should allow an organization to expand employee understanding on environmental issues and improve decision-making regarding the benefits of environmental management (Camilleri, 2022b; Jabbour & de Sousa Jabbour, 2016; Singh et al., 2020). The findings offered by Roscoe et al. (2019) have discussed the importance of KBV for green HRM in the context of environmental management to improve EP. Several firm-level environmental management initiatives have been shown to impact performance (Rizzi et al., 2014). Green HRM should also possess knowledge and skills in reducing waste generation and achieving environmental targets and objectives (Renwick et al., 2012; Úbeda-García et al., 2021).

The main objective of green HRM is to implement appropriate environmental training programs to increase the employee's sustainability knowledge and skills in eradicating material waste (Renwick et al., 2012). The importance of green HRM lies in enhancing employee involvement to improve EP (Roscoe et al., 2019). Given the centralized nature of green HRM, Roscoe et al. (2019) empirically examined the relationship between green HRM and green employee behavior. The results show that implementing waste reduction program benefits organizations by inducing efficient waste disposal in all operational processes (Dumont et al., 2017). According to Yasin et al. (2022), green HRM shall implement a waste reduction program to encourage efficient waste disposal in all operational activities. This means that an organization's green HRM practices play an important role in developing and setting employee compliance for waste reduction and minimizing the material adverse effect on the environment(Dumont et al., 2017). Although the literature generally classifies knowledge resources as an important source for EP, we follow (Renwick et al., 2012) and hypothesize that green HRM is a strategic practice of scaling up and re-sharing knowledge within an organization as a basis for the EP. Thus,

> **Hypothesis 1.** The green HRM has a positive effect on organization EP.

OL stems from effective HRM practices in training, recruitment, and selection (Jerez-Gómez et al., 2005). HRM can be essential or boost the organization's learning capacity (Miller, 1996). However, as HRM advances, organizations recognize the importance of green HRM for collective learning culture (Dumont et al., 2017). OLCs are important for their EP (Singh et al., 2020). Organizational internal learning mechanisms positively influence EP (Awan, 2019). For example, Ul-Durar et al. (2023) claim that OL should be aligned with organization orientation to improve organizational sustainability performance. Prior studies rely on a measure of EP to operationalize green HRM and stakeholder pressure (Guerci et al., 2016). Beyond that Dumont et al.

(2017) present a model for OL with a focus on green HRM. OL is a multi-stage process with a focus on acquiring existing knowledge to take advantage of or use what has been learned (reductive logic), and assimilate new learning (feedforward). The benefits offered by green HRM (Subramanian & Suresh, 2022), are such as corporate environmental and social sustainability (Yasin et al., 2022), psychological green climate (Dumont et al., 2017), green innovation (Singh et al., 2020), and EP (Rehman et al., 2021; Trujillo-Gallego et al., 2022). There is a lack of understanding and little know-how on the best practices to effectively develop and integrate routine knowledge in an employee until such a shared understanding is established (Jabbour & de Sousa Jabbour, 2016; Song et al., 2020). Environmental management pertains to diverse, complex processes and awareness of the environmental risk management dimension help a firm identify new green initiatives (Appolloni et al., 2021). Further, Dumont et al. (2017) reveal that green HRM influences an OL environment in which employees can act and contribute to the development of learning capability. Recognizing this, organizations with a great focus on implementing green HRM have yet to realize the fundamental components essential for an organization to acquire knowledge that makes up the style of our OL structure (Dumont et al., 2017; Renwick et al., 2012). Following DC, we hypothesize that the organization develops a well-learning capability and triggers employees to acquire, create and integrate knowledge to engage in green-related decisions and activities. Thus, we suggest that,

> **Hypothesis 2.** Green HRM practices positively affect OLC.

EP is regarded as reducing material usage and energy consumption and improving waste management (Zhu et al., 2007). The EP takes place by adopting new knowledge while reassessing the knowledge transfer and integration at an individual level within the organization (Zhu et al., 2007). Understanding the resource consumption and production process is especially important because it helps to mitigate emissions and reduce waste for organizational sustainability (Camilleri, 2020). For example, the previous studies have been shown to help employees better understand environmental issues when the organization implies shared understanding and focuses on integrating new knowledge (Roscoe et al., 2019). Further, Rehman et al. (2021) find that manufacturing firms can improve their EP with employee commitment to learning and integrating knowledge (Subramanian & Suresh, 2022). Highlighted that organizations need to understand better the condition of OLC embedded in the firm DC. Individuals in the organization adapt to the new knowledge resources and disseminate them to make changes in the existing processes, which is likely to offer new ways of reducing waste and energy consumption. Following DC (Teece et al., 1997), we argue that OLC must correctly specify and quantify the environmental management process and procedures for scale-up and process development to improve EP.

> **Hypothesis 3.** OLC positively affects EP.

2.2 | Mediating of OLC

Recent literature has recognized the importance of green HRM in OL. OL (Miller, 1996) is "the acquisition of new knowledge by actors who are able and willing to apply that knowledge in making decisions or influencing others in the organization" (p. 486). OLC entails both knowledge acquisition and dissemination. OLC provides organizations with insights into implementing knowledge obtained, either because of the discussion with the HR manager or the training programs for waste reduction and performance (Roscoe et al., 2019).

The present study includes OLC due to its alignment with DC theory (Teece et al., 1997). In this vein, DC is defined by Teece et al. (1997) "as the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (p. 591)". In a resource-rich environment, the resource perspective shapes the firm's capability to integrate various knowledge resources into internal processes to safeguard competitive advantage (Augier & Teece, 2009). Park and Ko (1996) argues that the nature of organizational capabilities mainly developed depends on the firm's ability to utilize its knowledge resources. OLC is, therefore the ability to alter, develop and reconfigure these knowledge resources and organizational capabilities.

Previous research studies provide conflicting perspectives on green HRM and EP (Rehman et al., 2021). Research findings include the mediating mechanism between green HRM and EP, such as psychological green climate, organization culture (Roscoe et al., 2019), green operational practices (Trujillo-Gallego et al., 2022), and green innovation (Rehman et al., 2021). The manufacturing industry faces sustainability and environmental challenges and struggles to develop learning capabilities (Rehman et al., 2021). Previously, Roscoe et al. (2019) utilized the KBV for green HRM to investigate its effect on green organizational culture. Recently, green HRM has emerged as one of the organizational priorities for the management of EP in the past few years, green HRM has brought a significant change in the organizational process (Song et al., 2020). In this context, scholars have indicated the importance of organizational tangible and intangible resources for interpreting how green HRM influence on OLC.

Green HRM is an ongoing process, and organizations may broadly be focused on developing learning capability to transform knowledge to improve EP (Yong et al., 2020). There is little evidence in the literature on the process of learning capabilities through which green HRM influences EP (Subramanian & Suresh, 2022). In light of these circumstances, recently Subramanian and Suresh (2022) argue that understanding the EP requires the integration of OLC Further, the existing literature indicated the need to understand whether or not green HRM directly or indirectly improves EP by focusing on the nature of the new learning capabilities. In particular, researchers have demonstrated that improvement in EP requires an organization to involve in new learning capabilities, such as implementing external and internal adaptation of knowledge transfer and integration processes. The result of such activities is related to an ideal case of improving learning capability, which may enable an organization to modify existing practices and improve EP. Based on the DC perspective, it can be

inferred that OLC allows the organization to learn and implement proper environmental management practices, procedures, and structures. Thus we argue:

> **Hypothesis 3.** There will be a significant indirect effect of green HRM (x) on EP (y) through OLC (M).

2.3 | Moderating–mediation role of DDC

In addition to the mediation role of OLC, the literature has identified many factors, which hinder or facilitate the EP. The EP is affected by green organizational culture (Roscoe et al., 2019). Previous studies have used technical support and circular environment as a moderator between green HRM and EP (Marrucci et al., 2021).The impact of DDC on environmental and green innovation has been examined by research (Chatterjee et al., 2021; Yu et al., 2021). Environmental management practices in the organization can influence contextual factors (Camilleri, 2022a). A DDC is the beliefs, attitudes, and practices of data-driven decision-making in management and operations (Kiron & Shockley, 2011). A common theme in the DDC has been that it treats data as an intangible asset created by the employees and top management and can help management to use big data technology to gain data-driven insights (Kiron & Shockley, 2011). Thus, DDC builds upon the organization's current governance structure, data management strategy, and accuracy and security of the data (Yu et al., 2021). DDC is an antecedent of the assimilation of knowledge (Zhang et al., 2020). For this, OLC is fundamental in knowledge acquisition and transfer with the adoption of specific GHRM practices. In today's data-driven decision-making environment, organizations must design and deploy their DDC to improve performance (Davenport & Bean, 2018; Gupta & George, 2016). In contrast to OLC, DDC is argued to relate to the usefulness and newness of the product (Duan et al., 2020). In particular, DDC helps organizations create new learning insights, nurture the development of unique capabilities, and enhance firm performance (Zhang et al., 2020). Previous studies have examined different cultural dimensions, such as organizational culture on innovation (Scaliza et al., 2022) and knowledge-sharing tendency (Ng, 2022). There has been some evidence from earlier investigations that firms need to makeshift to data-driven culture. However, still, knowledge is limited on its effects on performance (Davenport & Bean, 2018).

Research has shown that organizations can use GHRM effectively to develop employee sustainability-related knowledge, attitude, and behavior to deliver and implement environmentally sustainable policies. DDC increases the individual perspective on information processing and offers decision-making insights that support strategy (Dubey et al., 2019) Arguments of the complementarity between GHRM, and green organizational culture have been used to justify the organization EP (Roscoe et al., 2019). We follow (Zhang et al., 2020) recent conceptualization and assume that DD can influence employees to work together and improve decision-making. Previous studies suggest that DDC helps managers make better decisions because it gives themes subjective knowledge and more trustworthiness (Dubey

et al., 2019). Following the importance of GHRM. Úbeda-García et al. (2021) argue that EP is generated when GHRM and OLC are compatible. Similarly, when the DDC is high, enterprises can use green HRM practices for formulating and implementing minimizing waste reduction and energy consumption to achieve sustainable development goals (SDGs). However, in the low DDC, with changes in the organizational ability to acquire, process create and integrate knowledge, organization must therefore modify existing processes and find new environmental sustainability initiatives. Thus, the stronger the DDC, the more it can perceive and seize learning opportunities. Therefore, a strong DDC is more conducive to organizational EP in developing countries. We argue that OLC is a key organizational DC for gaining EP from GHRM. An important issue is whether or not DDC culture provides a clear understanding of assimilation and dissemination of the knowledge to improve performance effectively. We argue that when there is high competition among the firms on EP, in such a situation, the use of DDC in manufacturing firms leads to a new solution perspective for minimizing waste and lowering resource use. Thus, we propose that,

> **Hypothesis 5.** DDC will positively moderate the relationship between green HRM, such that, when DDC is high, the positive relationship between green HRM and EP is high,

> **Hypothesis 6.** The indirect effects between green HRM and EP via OLC will be moderated by DDC, such that the indirect effect of green HRM becomes stronger as DDC becomes stronger (moderation–mediation) (Figure 1).

3 | METHODOLOGY

3.1 | Sample and procedures

The empirical frame consisted of a list of firms obtained from the chamber of commerce and industry. The setting of this study is the manufacturing industry. The manufacturing industry in Pakistan has experienced a rapid expansion of environmental sustainability measures over the past few years, making it an ideal setting to study, providing an interesting empirical setting to study the linkages between green HRM and EP. The manufacturing industry in a developing country is expanding at a rapid rate, and the various operations of the value chain have adapted to sustainability initiatives to mitigate the climate change effect on the operations (Mathivathanan et al., 2022). The manufacturing sector is a good place to study green HRM and data-driven OL since firms' ability to learn from new big data knowledge is crucial to their EP. Recently, Awan et al. (2021) have highlighted the relevance and importance of the data-driven decision-making culture for managing and tackling climate challenges and improving EP. Data-driven organizational culture can shape decision-

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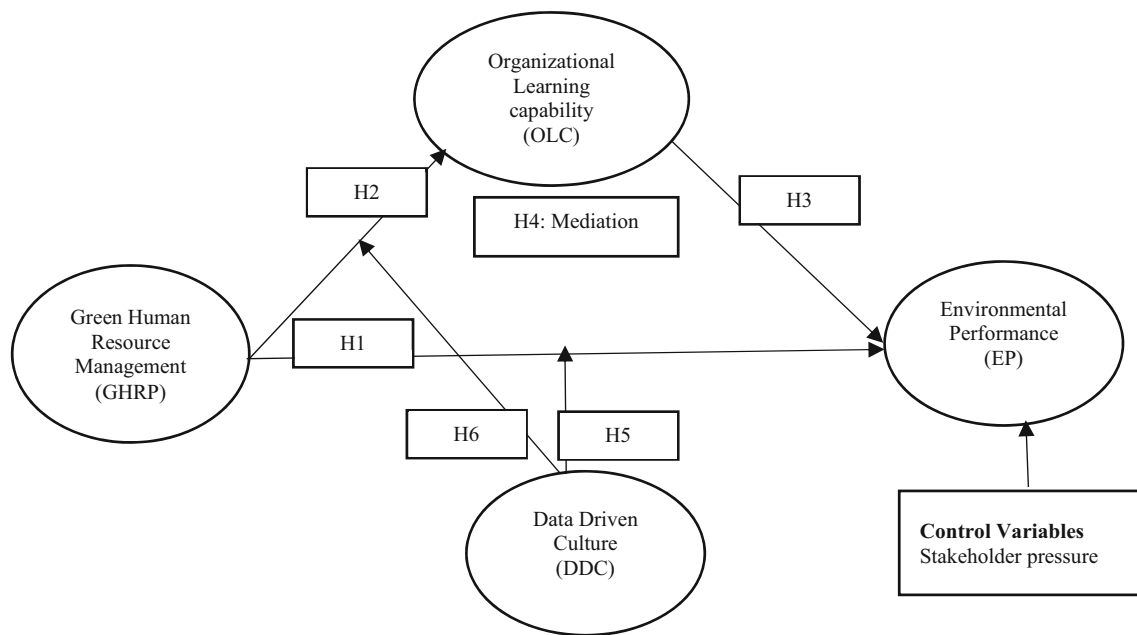
FIGURE 1 Research model and hypothesis.

making and improve EP (Davenport & Bean, 2018). The existing literature on green HRM and EP has not exclusively considered how DDC influences OL (Subramanian & Suresh, 2022). The previous research that has employed empirical studies related to green HRM can be found in the scientific literature, and the manufacturing sector has acknowledged the importance of green HRM and EP (Marrucci et al., 2021;Rehman et al., 2021; Singh et al., 2020).

The study construct measures employed in the study have already been verified in research before this investigation (Rehman et al., 2021; Singh et al., 2020). Previous research on green HRM and EP that was carried out in the manufacturing sector acquired information from senior managers (Rehman et al., 2021). Environmental management practices thus serve to build distinctive sustainability initiatives (Camilleri, 2019). Along with an understanding that sustainability is crucial for EP, it has risen in prominence as a strategic factor (Hristov et al., 2022).

This study employs a quantitative research approach. We collected our data from manufacturing businesses, including, but not limited to, those used in the automotive, electrical, medical, textile, and information technologies firms located in various parts of the country from March 2022 to July 2022. Earlier, the constructs employed in this study were pre-tested by a panel of seven people (four with substantial industry experience in production and three academics from the strategic management field), confirming the questionnaire's face validity. To assess whether or not our sample size is appropriate for testing the hypothesis, we check the appropriateness of the sample size using Cochran sample size formula (Cochran, 1977). The support to proceed with the data analysis and test the hypothesis, as this study should have a minimum of a 229-sample size (with a 0.04 margin error and alpha value = 0.02). We emailed 760 surveys to senior

TABLE 1 Test of Levene's statistics.

Construct	Levene's test	Sig,
Green HRM	0.261	0.186
OLC (Organizational Learning Capability)	0.524	0.398
DDC	0.6354	0.4331
EP	0.415	0.254

managers at each firm. Each firm completed one response, where the respondent was directly involved in developing the green initiatives and disseminated the knowledge to achieve the organization's sustainability goals and targets. A total of 287 respondents answered our survey, and 13 were not considered due to missing values. Our response rate was 26% (274).

The higher response rate was because we made follow-up calls and reminder emails to these organizations, who did not respond after 2 months. In line with the previous studies, a 29% response rate is sufficient (Marrucci et al., 2021). Consistent with the previous research results, we collected data into two streams, early and late respondents. We performed Levene's test for the homogeneity of variance between early respondents (wave 1, who returned the survey within 2 months) and late (wave 2, who returned the survey after 2 months). The t-test results reveal no significant statistical difference ($p > 0.05$) among the category means for the demographic characteristics. Thus, we concluded that non-response bias is not likely to be a concern in this study. As a result, we can generalize these findings to the entire population because the dataset utilized in this investigation did not contain any non-response biases. Table 1 presents the results of levee's test of statistics.

3.2 | Sampling characteristics

We found that 38 (13.8%) of the enterprises in our sample had between 50 and 250 employees and that 124 (45.2%) of those businesses had between 251 and 300 employees. The vast majority of the respondents from automotive manufacturers, 77(28.10%); electronics and information technology manufacturers, 59(21.53%); leatherwear and chemicals 37(13.50%); sporting goods manufacturers, 35 (12.87%); and 15 (05.47%). The details of a sample are shown in Table.2. The results of descriptive statistics are shown in Table 3.

3.3 | Measures

We obtained all items and measures from the previously published studies and used a 7-point scale for all the measures. However, the measurement scales had been used early in different empirical settings and proven valid. Nonetheless, we took further precautions before distributing the survey to ensure its scale validity. To ensure the questionnaire's reliability and face validity, a few of the questionnaires were reworded through pilot testing of the questionnaire. All scales have high-reliability levels [Cronbach's alpha and composite reliability (CR) values].

3.3.1 | Green HRM

Even though we looked at some published studies about green HRM, there are not many studies about environmental issues in the manufacturing business in emerging economies. we adopted the green HRM scale from Renwick et al. (2012), Sun et al. (2007). Numerous authors have found this scale useful in their work (Guerci et al., 2016). We ask the respondents how much their companies have used green HRM practices for employee learning and EP on a seven-point Likert scale anchored at 1 = strongly disagree to 7 = strongly agree. Regarding

TABLE 3 Mean, standard deviation, and correlations.

	STK	DDC	EP	GHRM	OLC
STK	**0.816**				
DDC	0.594	**0.883**			
EP	0.478	0.428	**0.835**		
GHRM	0.668	0.47	0.443	**0.814**	
OLC	0.504	0.432	0.697	0.431	**0.876**
Mean	4.708	5.217	5.112	4.68	5.33
Standard deviation	1.64	1.41	1.41	1.63	1.40

Note: The diagonal values in bold are the square root of the AVE of each construct.

TABLE 2 Sample characteristics, $n = 274$.

Descriptive	f	%	Firm size[a]	F	%
Production managers	86	31.38	50–100	15	05.47
General managers IT	74	27.00	101–250	23	08.39
Chief operating officer	61	22.26	251–300	124	45.25
Director HR	53	19.34	>301	112	40.87
Industry type	**f**	**%**	**Firm age[b]**	**F**	**%**
Automotive manufacturers	77	28.10	Less than10	46	16.78
Electronics and information technology manufactures	59	21.53	Between 11 and 20	89	32.48
Medical equipment and related products	51	18.61	Between 21 and 30	41	14.96
Leatherwear and chemical	37	13.50	>31	98	35.76
Sporting goods manufacturers	35	12.77	Gender	F	%
Others	15	05.47	Males	159	58.02
Experience	**f**	**%**	**Females**	**115**	**41.98**
Less than 5	51	18.61			
Between 5 and 15	136	49.63			
More than 15	87	31.75			

[a]Firm size: number of employees.
[b]Firm age: number of years in the same business.

the scale validity and reliability, the Cronbach alpha and CR for the green HRM scale in this study were 0.869 and 0.887, respectively.

3.3.2 | Organizational learning capability (OLC)

The 4-item scale of OLC was adopted from Jerez-Gómez et al. (2005) and measured on a seven-point Likert scale anchored at 1 = strongly disagree to 7 = strongly agree. We asked respondents to what extent do you agree or disagree with the following statements about their employee learning orientation being affected by green HRM. The items are OLC1: "Employees view the ability to learn as the key to improvement," OLC2: "Employees long for learning to enrich themselves," OLC3: "Employees feel that once they quit learning, they endanger their future in the firm," and OLC4: "Employees sense that learning is an investment, not an expense." The Cronbach alpha value was 0.899, and the CR 0.899 showed that the construct is valid and reliable.

3.3.3 | Data-driven culture (DDC)

DDC was measured using five items adopted by Duan et al. (2020) anchored at the 1 = strongly disagree to agree Likert scale 7 = strongly. Most of the DDC measures were based on the measurement items proposed by Davenport et al. (2001), Kiron and Shockley (2011). This DDC scale has been used previously to examine the relationship between DDC and environmental scanning (Duan et al., 2020). The items are DDC1: "We believe that having, understanding, and using data and information plays a critical role." DDC2: "We are open to new ideas and approaches that challenge current practices based on new information," DDC3: "We depend on data-based insights to support decision making," DDC4: "We use data-based insights for the creation of new services or products," DDC5: "Individuals need for data to make decisions." The value of both CR 0.937 and Cronbach's 0.929alpha was greater than the threshold value of 0.70.

3.3.4 | Environmental performance

EP construct was measured with 4-items developed by Zhu et al. (2007). The measurement items were anchored at the 1 = not at all to 7 = to a great extent. Likert scale. The items include EP1, "cost savings Significant % reduction in costs due to environmental projects and activities," EP2 "continuous improvement Continuously achieve and/or exceed environmental targets and reduction r in environmental incidents Reduction," EP3 "waste reduction Significant reduction of waste," EP4 "resource consumption Significant reduction in resource consumption."

3.3.5 | Control variables

It has been examined that the type of stakeholder pressure is positively associated with EP (Zhu et al., 2007). In addition, we controlled

for green product and process innovation because it has been shown to have a positive relationship between green HRM and EP (Rehman et al., 2021). Although the previous literature has acknowledged the importance of green HRM and green innovation in dealing with the EP, the literature further provides evidence that firm age and employee number promote the spread of environmental activities and improviser EP (Yu et al., 2020). This led us to believe that firm age and size (number of employees) could positively connect to firm EP as an indicator for supporting environmental initiatives in a firm internal environment initiative. In particular, the education level of the employee helps to build green knowledge and skills. Thus, high employee education in the firm may be related to the manager's effective decision-making toward environmental-friendly initiatives (Singh et al., 2020). Previous studies in the green HRM perspective argued that education level might influence employee environmental attitudes and beliefs toward further minimizing negative environmental impact (Rehman et al., 2021; Song et al., 2020). This led us to control the respondent's education level.

3.3.6 | Common method bias

When all the data originate from the same self-reported questionnaire, the likelihood that the four latent variables will share some variation is increased. Common method bias (CMB) in the method may also be a contributing measurement error across all measured variables. To help remedy this situation, we gathered information from two distinct groups of people (Podsakoff et al., 2003). Our sample of different manufacturing industries helps to minimize common method bias. Further, our confirmatory factor analysis results further backed up the uniqueness of the analyzed variables. We also investigated the possibility of indirect and mediated effects among the variables in this analysis. It has been argued that bias from the conventional method will be less of a problem for testing moderation hypotheses (Podsakoff et al., 2003). The primary component accounts for 32.76% of the total variance among all the factors. No single factor accounts for more than 50% of the variation (Podsakoff et al., 2003). Hence the study's findings may be trusted to be accurate.

3.4 | Analysis

We used partial least-square structural equation modeling to test our hypothesized four-factor model. Hypotheses 4 and 5 were tested in PROCESS 3.4 (Hayes, 2017) in SPSS (version 24) using model 4 (mediation analysis) and model 8 (moderation mediation). We controlled for stakeholder pressure, green product and process innovation, firm size, firm age, and employee experience. PROCESS 3.4 allows testing of the moderation mediation model with a bootstrapping approach suggested by Hayes and Preacher (2014) to test the indirect effects with a 95% bias-corrected confidence interval (CI) for the mediation analysis and moderation-mediation analysis. We conducted the empirical analysis following the guidelines of Preacher et al. (2007) to assess the indirect and

conditional effects. Methods developed by Baron and Kenny (1986) for the evaluation of mediation's efficacy is commonly used. However, no direct quantitative measurement can be taken to determine the strength of the mediation effect (MacKinnon & Fairchild, 2009).

According to the ACE, variance inflation factors (VIFs) are presented when moderating variable predicts the relationship between the dependent and independent variables. To examine the non-essential multicollinearity issue among the variables, we follow the technique recommended by Neter (1985). The VIF factors are therefore calculated; the highest value of VIF was less than 5, supporting that there is no multicollinearity issue in the data. The validity and reliability of the scale were confirmed using average variance extraction (AVE) and CR. The reliability of the indicator was determined by analyzing the relationship between the factor loadings of the indicator and its variance; the loadings should be bigger. The Cronbach's alpha value was also included in Table 4. The results confirmed that the

values of AVE and CR for all constructs are greater than the recommended threshold values of 0.50 and 070, respectively.

Further, we conducted an alternative analysis to assess the discriminant validity, the results show that the square root of AVE of all measures is greater than the correlation between all pairs (Table 3). Because the average variance extracted (AVE) value for each

TABLE 5 HTMT ratio of correlations.

	STK	DDC	EP	GHRM	OLC
STK	1				
DDC	0.676	1			
EP	0.556	0.475	1		
GHRM	0.783	0.512	0.512	1	
OLC	0.572	0.466	0.793	0.479	1

TABLE 4 Overall model assessment.

Items	Factor loadings	AVE	CR	Cronbach's alpha
Green human resource management (Green HRM)				
green HRM1	0.831	0.662	0.887	0.869
green HRM2	0.875			
green HRM3	0.868			
green HRM4	0.842			
green HRM5	0.626			
green HRM6	0.462*			
Organizational learning capability (OLC)				
OLC1	0.879	0.767	0.899	0.899
OLC2	0.893			
OLC3	0.858			
OLC4	0.873			
Data-driven culture (DDC)				
DDC1	0.895	0.779	0.937	0.929
DDC2	0.880			
DDC3	0.903			
DDC4	0.845			
DDC5	0.890			
Environmental performance (EPF)				
EPF1	0.804	0.698	0.856	0.855
EPF2	0.833			
EPF3	0.845			
EPF4	0.859			
Stakeholder pressure (STK)				
STK	0.766	0.665	0.834	0.832
STK	0.829			
STK	0.879			
STK	0.784			

Note: Item * is not included in the analysis.
Abbreviation: AVE, average variance extraction; CA, Cronbach's alpha CA; CR, composite reliability.

construct was more than the required threshold value of 0.50, and there was no problem with the convergent validity of the results (Fornell & Larcker, 1981). Reliability and validity for discrimination as a fundamental component of model assessment. In line with this, a new set of Heterotrait–monotrait (HTMT) criteria was established by analyzing the correlations between hetero-traits, and various approaches.HTML analysis was performed to assess the discriminant validity, and the results supported that all correlations between the construct are less than 0.90 (Hair Jr et al., 2013). Correlations between mono-traits and hetero-dynamic approaches are quite sensitive, making them ideal for identifying insufficient discriminant validity. Our investigation reveals that none of the HTMT criteria points to discrimination (Table 5).

3.5 | Hypothesis testing

PLS-SEM is a composite bases approach focuses on prediction in the process of estimating complex models, and provides reliable results when the sample size is small. The approach of partial least squares (Smart PLS), since it employs a complex algorithm, can assist researchers in locating patterns in data as contrasted with the covariance variance. To test the structural model in the PLS-SEM, we first assess the predictive relevance of the model using a bootstrap procedure of 5,000 resampling procedures. Studies have reported that Stone–Geisser's Q 2 (Geisser, 1975; Stone, 1974) is best understood for the predictive relevance of the model if Stone–Geisser's Q2 values fall within the range, as 0.02 (small), 0.15 (medium), and high. (Cohen, 2013). The values of OLC and EP are (Q2 = 0.276) and (Q2 = 0.224), respectively. The effect size of the structural model is also a reliable criterion used to determine whether independent variables significantly impact the dependent variables. The effect size (f2) ranges between small (f2 = 0.02), medium (f2 = 0.15), and high (f2 = 0.35), respectively. Evidence shows that the value of R2 of OLC (0.31) and EP (0.51) is higher than the recommended value of 0.5. Table 6 shows the results of the effect size. The results support that DDC has a higher impact on EP, whereas OLC has a medium effect on EP.

TABLE 6 The effect size of a model.

Construct	OLC	EP
Green HRM	0.124	0.052
OLC	–	0.64
DCC	–	0.144

Table 5 shows the results of the effect size.

The results support that green HRM significantly affects EP (β = .456, p < 0.05).The result also supports Hypothesis 2, that green HRM positively affected OLC (β = .431, p < 0.05).To test Hypothesis 3, we further examined the link between OLC and EP, and the results revealed that OLC positively affected EP (β = .621, p < 0.05). The results indicated that the control variable stakeholder pressure was not significant with the EP (β = .081, p > 0.01) and significantly related to OLC (β = .2941, p < 0.01). Accordingly, MacKinnon and Fairchild (2009) and Zhao et al.'s (2010) methodology is preferable to clarify the type and strength of the indirect effect of the mediation. The indirect effect can be employed to assess whether full or partial mediation has occurred (MacKinnon & Fairchild, 2009; Zhao et al., 2010). In order to investigate the possibility of a mediating influence, we carried out a number of studies by following some of the most recent recommendations (Hayes & Preacher, 2014; MacKinnon & Fairchild, 2009) and used recommended criteria of MacKinnon et al. (2007), Zhao et al. (2010) for evaluating the mediation effect. We used variable scores obtained from PLS and used SPSS with process macro developed by Preacher and hays to examine the mediation output at 95% confidence interval (Hayes & Preacher, 2014). If the production of mediating effect CI does not contain the value zero, then the indirect effect is significantly different from zero with a degree of confidence of 95% (MacKinnon et al., 2007). The results provide the support that when we entered the mediating variable (OLC), the direct effect of the model is significant (β = .176, p < 0.05, SE:0.065, CI: 0.070, 0.285), and the indirect impact was significant (b = 0.268, SE:0.045 with CI: 0.192, 0.338), support H4. A non-zero CI indicates a considerable indirect influence.

Next, to examine the moderating impact of DDC in the link between green HRM and EP. The result suggests that the interaction effect of DDC × green HRM on EP was not statistically significant (b = −0.024, SE = 0.035, CI: −0.080, 0.033). Hypothesis H5 was not supported. Several different models have been proposed to analyze the potential size of effects that may be brought about by combining evaluations of mediation and moderation (MacKinnon & Fairchild, 2009). The term "mediated moderation" has been used to describe this phenomenon (Baron & Kenny, 1986). MacKinnon and Fairchild's (2009) studies have demonstrated that moderation affection on mediation may occur when the interaction effect brings about a significant change in the strength of the mediation relationship. In other cases, when there is no significant interaction between the moderator variable on the dependent variable, then there is no mediation moderation (MacKinnon et al., 2007). Table 7 shows the output of the moderation–mediation results. We next use Hayes and Preacher's (2014) method with a bootstrapping method to examine

TABLE 7 Conditional indirect effect of green HRM on EP through OLC.

Relationship	b	se	t	95% BC CI
GHRM→OLC→EP conditional on DDC at +1 SD	0.179	0.050	3.942	0.096, 0.261
GHRM→OLC→EP conditional on DDC at −1 SD	−0.022	0.053	0.238	−0.102, 0.071
GHRM→OLC→EP conditional on DDC at Mean	0.079	0.042	2.128	−0.013, 0.152
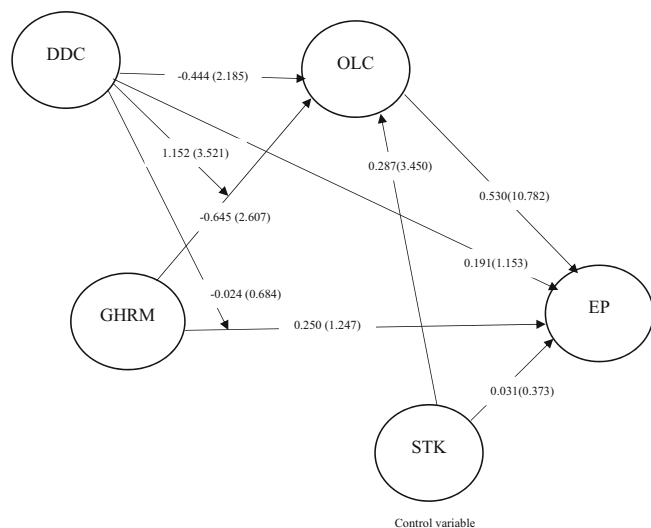
FIGURE 2 Summary of mediating effects.

the moderation-mediation impact of the DDC on the mediating relationship OLC between green HRM and EP. Figure 2 shows the summary of the moderation–mediation statistics.

The interaction effect between green HRM × DDC on OLC is ($\beta = .152$, SE = 0.43, CI: 0.082, 0.223). Results show that the conditional indirect effect of DDC on OLC through green HRM was statistically significant ($b = 0.081$, SE = 0.024, CI: 0.044, 0.122) supporting H6. The results indicate that green HRM positively affects OLC, when the DDC is high, but not when it is low. To probe the conditional indirect effect of DDC on the mediation effect of OLC on the relationship between green HRM and EP. We followed the steps outlined by Preacher et al. (2007), and we set the DDC's high and low points as being one standard deviation above and below the mean, respectively. The results show that DDC conditional indirect effect was statistically significant at a high level and non-significant at a low level (see Table 6). The results reveals that the DDC moderates the mediated relationship between green HRM and EP, specifically, the mediation relationship is stronger when the firm has a higher level of DDC.

4 | THEORETICAL CONTRIBUTIONS AND IMPLICATIONS

This study contributes to the previous green HRM research, and the following aspects highlight the key theoretical contributions of this study. Firstly, we followed Chatterjee et al. (2021) and investigated that DDC plays an important role in shaping organization DC. In response to Awan et al. (2021) underlining the need to understand DDC in creating a sustainable strategy for EP, this study explains that green HRM influences OLC to promote EP. Previous research has investigated the links between green HRM and EP. Thus, our findings respond to the call (Subramanian & Suresh, 2022) for more research on green HRM and EP in developing countries. On the other hand, few studies have examined the link between green HRM and firm

sustainability performance in a developing country context (Masri & Jaaron, 2017). Following the findings of the previous studies, our study extends the finding of the previous studies and reinforces the importance of green HRM to strengthen the EP. Also, researchers are now calling for more research studies not only at the individual level but also at the team level in different organizational settings (Piwowar-Sulej, 2021). The findings of this study offer the first empirical analysis that OLC boosts the EP of manufacturing firms in developing countries through green HRM practices. Organizations in developing countries have more to learn about the interrelation between green HRM and OLC and its consequences on the EP.

Secondly, we developed and tested a conceptual model showing the OLC process through which green HRM influences EP. Based on the literature from two theoretical perspectives, KBV and DC have been tested empirically because green HRM and its consequences on OLC are still in their infancy. Green HRM research that takes KBV (Ali et al., 2021), has acknowledged that absorption and integration of new knowledge largely depend on the organizational practices and systems. Diverse studies use the KBV approach to examine companies' abilities to develop and transmit knowledge to strengthen OLC (Fernandes et al., 2022). Subramanian and Suresh (2022) call for a more in-depth understanding of the human element in an organization setting is necessary for effective environmental management. DC (Teece, 2007) examines how organizations build and maintain a competitive advantage in unpredictable situations. We contribute to the DC theory, including organization and structural learning. We argue that green HRM would positively impact the OLC. It is suggested that organizational green HRM practices shape the OLC, which is significantly related to EP. Our findings lend credence to the theory that KBV as an organizational capability is predicated on the learning behaviors of members operating at all levels of the organization and is susceptible to influence from both organizational and individual factors. This study extends the green HRM theorizing from the KBV perspective. Green HRM is a strategic process through which organizations reconfigure their existing learning or develop or maintain new learning to improve their performance. Our findings reveal that the organizational capability of effectively creating and implementing new practices, the constant development of resource configuration, and decision-making is largely affected by green HRM.

Thirdly, to the best of the authors' knowledge, this is the first quantitatively to synthesize the moderating role of DDC on the relationship between green HRM and EP. We conceptualize DDC (Zhang et al., 2020) as organization practices and behaviors to build and maintain a competitive advantage. Recently, Davenport and Bean (2018) have highlighted the importance of DDC playing an important role in shaping an organization's OLC. Moreover, the previous studies have mainly explored green HRM on green training and the psychological environment. The literature has not yet sufficiently accounted for the effect of DDC on the OLC and EP. This study examined the moderation–mediation analysis of DDC in the green HRM and EP through OLC. Our study has shown a positive mediation link of OLC between green HRM and EP. However, we have included the DDC as a moderator on the path between green HRM to OLC and EP. We

suggest that the development of OLC starts from the organization's ability to select candidates who adhere to a perspective that supports the environment, effective reward management, and green training initiatives. We also observe that OLC significantly influences the EP, which is still more strongly moderated by the DDC. Our research proves that DDC must be aligned with the organization's knowledge development practices to build OLC and improve EP. DDC shapes the decision-making insights, as they often involve environmental scanning, a conscious effort motivated by future activities.

5 | CONCLUSIONS

This study explores the impact of DDC on green HRM and EP in the manufacturing firms of developing countries. This study looked at DDC's importance for green HRM for learning development and organization EP. By doing so, the finding shows that green HRM and OLC are important drivers of EP. The interaction effect of DDC and green HRM has no significant impact on EP outcomes. The findings further link OLC between green HRM and EP outcomes. This implies that DDC and green HRM are viable options for OLC and, consequently, EP outcomes. DDC, which leverages analytics and statistics on optimizing EP outcomes, has the potential to develop strong OLC with a high level of green HRM. DDC can be an effective part of driving OLC. Finally, the findings suggest that the presence of DDC in an organization is complementary in explaining OLC in improving EP outcomes. Embracing DDC is one way to respond to sustainability intensity in the marketplace, and increasing the pace might increase OLC's avenues. In summary, we suggest that OLC can contribute to EP, whereas DDC, which makes it stronger OLC, in turn, increases organization EP.

5.1 | Research limitation, future research, and implications

The study findings are an essential step toward figuring out how organizations can deploy DDC, which is a key part of a firm EP. When evaluating the overall usefulness of this study, it is important to remember that certain limitations must be considered. One limitation of the study concerns the sample under investigation. This sample represents a relatively insignificant portion of Pakistan's whole industrial sector compared to other manufacturing sectors. Specifically, our study examines the OLC as a mediating role between green HRM and EP. In the future research studies, it is suggested that future research studies would need to consider knowledge dissemination behavior and knowledge combination capability to have a clear and comprehensive picture of green organizations. It has already been discussed how difficult it can be to investigate company culture via the lens of innovation studies(Davenport & Bean, 2018). Future research studies that employ a set of sustainability cultures will help broaden the understanding of how green HRM contributes to sustainable development. This research has practical relevance for practitioners.

Moreover, the findings of our study have provided some avenues for improvement in EP by examining OLC as a mediation mechanism between green HRM and EP. We suggest that future researchers assess the extent to which different organizational technology resources together with varying mechanisms of orientation, can improve the organization EP (Wang & Juo, 2021). We suggest that top management should consider OLC in driving EP improvements and the DDC's plays in sustainable development. The results show that the DDC is important in generating OLC and EP. Given the importance of DDC (Chatterjee et al., 2021), our study encourages top management to consider the role of DDC in boosting EP.

Furthermore, more organizations have adopted data-driven decision-making approaches in the last decades, being DDC has become a critical organizational capability. We suggest managers continue evolving OL orientations at a certain level and identify new ways to prevail more DDC. When a firm faces sustainability competition and climate change pressure, top management often senses urgency to develop and introduce sustainability-led initiatives, which could lead to organizational complexity. Sustainability complexity indicates the firm's inability to predict climate change's impact and the resources required to achieve sustainable development targets. We advise managers to embed new sustainability orientations to respond to complex environmental challenges (Ul-Durar et al., 2023). Furthermore, given the rise of green HRM for sustainability (Ali et al., 2021) and the circular economy, it would be worthwhile to investigate the degree of sustainability complexity that may influence the relationship in our framework.

Furthermore, our results suggest that when a firm operates in a developing country, a DDC profoundly affects developing OLC and increases EP. We advise managers to evaluate their relative EP and continuously improve resources and skills to attain a sustainable learning environment (Lu et al., 2022). Our study points to the necessity of the DDC, which can benefit the firms because it allows managers to understand better the conditions under which green HRM leads to successful EP. Our findings may also assist managers in recognizing how DDC enables firms to achieve superior green sustainability performance.

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