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The Effect of GHRM and GSCM on Firm Performance: The Moderating Role of Eco-Innovation

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ABSTRACT

This research meticulously investigates the influence of Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) on the overall firm performance, placing significant stress on the moderating role of eco-innovation within this context. The research adopts a comprehensive and multifaceted approach integrating and analysing data from a diverse range of industries. A quantitative research method was employed using structured survey questionnaires, and data were collected from 304 respondents across various manufacturing firms. Partial Least Squares Structural Equation Modelling (PLS-SEM) was applied to examine the hypothesized relationships among the constructs. It aims at assessing the positive contribution of environmentally friendly practices in both human resource management as well as supply chain management broadening organizational performance metrics. The findings reveal that both GHRM and GSCM are indeed instrumental in enhancing the performance of firms, thereby underscoring the critical importance of adopting environmentally sustainable practices within corporate strategies. Nevertheless, it is noteworthy that eco-innovation exhibited an insignificant moderating influence on the relationship of GHRM and firm performance, implying its contingent impact on other contextual factors were not fully explored within the scope of this study. Therefore, this study provides invaluable insights for practitioners and policymakers alike, highlighting the need for the strategic implementation of green practices to concurrently achieve both economic and ecological advantages. Furthermore, the study identifies several promising areas for future research including the exploration of additional moderating variables and the necessity of conducting longitudinal studies for gaining a nuanced understanding of the complex relationships among GHRM, GSCM, eco-innovation, and overall firm performance outcomes.

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1. **Introduction**

Over the last few years, the imperative to confront environmental sustainability challenges has heightened, compelling organizations to implement eco-friendly practices to alleviate their ecological impact. The relationship dynamics of Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) possesses considerable significance in this project. GHRM comprises a spectrum of practices designed to cultivate environmentally conscious behaviour among employees, including green recruitment, training, and performance evaluation targeting the alignment of human resource policies with environmental management goals, thereby fostering sustainability at the organizational level [1]. In a different light, GSCM embeds green considerations throughout supply chain operations, extending from the design phase of products to their disposal at the end of their lifecycle, with the intention to shrink the ecological footprint left by supply chain endeavours [2].

The incorporation of green practices within organizational structures transcends mere compliance with regulatory demands; it represents a strategic initiative aimed at improving firm performance. Organizations are increasingly acknowledging that sustainable practices can yield cost reductions, enhance efficiency, and bolster corporate reputation, all of which collectively contribute to superior financial outcomes [3]. Additionally, eco-innovation, noted for the generation and adoption of innovative products, processes, or practices that offer meaningful environmental gains, is rising in significance as a factor that boosts the positive influences of GHRM and GSCM on company performance. By embracing eco-innovation, organizations can obtain a competitive lead by highlighting their products and procedures in a sustainability-focused market [4].

Although there is a growing curiosity about GHRM and GSCM, a substantial gap remains in fully grasping how these frameworks collaborate to affect business outcomes, particularly through the influencing role of eco-innovation. Prior research has largely concentrated on isolated components of GHRM or GSCM, with minimal investigation into their synergistic effects and the mechanisms through which they influence organizational results [5]. This examination seeks to reconcile this discrepancy by scrutinizing the complex relationship dynamics among GHRM, GSCM, and enterprise performance, particularly underlining the supportive role of eco-innovation. Through this approach, it fortifies the theoretical model of sustainable management strategies and presents applicable wisdom for organizations aiming to boost their operational success and sustainability.

Considering the increasing focus on sustainability initiatives, there exists a paucity of empirical data concerning the interactive effects of GHRM and GSCM on organizational performance. The majority of existing research has predominantly analyzed these practices independently, neglecting the potential synergistic benefits that may arise from their concurrent application. Additionally, the function of eco-innovation remains significantly underexamined as a moderating variable within this dynamic. Addressing this deficiency is imperative, as it can yield a more integrated perspective on how cohesive sustainable practices can enhance organizational performance. This investigation aspires to reduce this disparity by assessing the joint effects of GHRM and GSCM on organizational performance, with eco-innovation acting as a moderating element. In doing so, it aims to enrich both theoretical and practical domains by proposing a more thorough framework that underscores the significance of amalgamating internal and external green practices to bolster performance. This research could yield important revelations for policymakers and corporate leaders about practical approaches to executing sustainable initiatives that not only shield the environment but also encourage commercial success.

The principal aim of the current research endeavour is to conduct a comprehensive investigation into the intricate ways in which GHRM and GSCM impact overall firm performance, with a particular emphasis on elucidating the moderating influence that eco-innovation exerts within this context. The study aims not only to clarify the distinct avenues through which these eco-friendly strategies promote improved organizational performance but also to play a crucial role in the larger conversation regarding sustainable business frameworks and their significance for long-term viability in a market increasingly attuned to ecological consciousness.

Accordingly, we propose the following research questions. First, how does the implementation of Green Human Resource Management (GHRM) practices affect firm performance? Second, what is the impact of Green Supply Chain Management (GSCM) practices on firm performance? Third, to what extent does eco-innovation moderate the relationship between GHRM and firm performance?

These research inquiries are formulated to examine the direct repercussions of GSCM on organizational performance, alongside the indirect repercussions moderated by eco-innovation. The objective is to furnish empirical evidence regarding how enterprises can methodically incorporate environmentally-friendly practices to attain both ecological sustainability and improved business results.
This investigation enriches the prevailing corpus of knowledge in several significant manners. At the outset, it intends to yield a thorough interpretation of the dynamics between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) and their synergistic role in enhancing organizational performance. The investigation focuses on understanding the key ways in which eco-innovation influences the outcomes within organizations. This integrative approach addresses a critical void in the literature, which has predominantly analysed GHRM and GSCM in a fragmented manner. Secondly, through the empirical evaluation of the interrelations and moderating effects, this study advances theoretical constructs pertinent to sustainable business practices and their ramifications for organizational performance.

The outcomes of this investigation bear practical ramifications for practitioners, policymakers, and business executives alike. Initially, highlighting the beneficial effects of GHRM and GSCM on company performance allows businesses to validate and focus their investments in sustainability projects. Grasping the moderating influence of eco-innovation yields actionable insights regarding how enterprises can strategically harness innovation to augment their environmental and economic performance concurrently. Furthermore, the study provides direction on the effective integration of green practices into HRM and SCM strategies, thereby fostering sustainable development within organizations. Policymakers can also derive benefits from this research by acquiring insights into efficacious

regulatory frameworks and incentives that bolster sustainable practices across various industries. This analysis strives to reconcile the discrepancies between academic theory and hands-on practice, aspiring to nurture a business ecosystem where organizations can flourish economically while aiding both society and the environment.

2. Literature review

2.1 Green Human Resource Management (GHRM)

Green Human Resource Management (GHRM) amalgamates ecological stewardship with human resource strategies, with the objective of fostering sustainable practices within organizations. GHRM initiatives encompass environmentally conscious recruitment, employee engagement, educational programs and performance evaluation in ecological efforts. F. Amjad et al [6] claim that GHRM develops an organizational culture that highlights sustainability, thus improving environmental performance and possibly increasing organizational effectiveness.

Although Green Human Resource Management (GHRM) broadly encompasses a range of functions—including green recruitment, training, performance management, rewards, and exit strategies (Sparrow et al [7]—this study focuses specifically on green recruitment and training due to both theoretical relevance and space constraints. These two functions were selected because they serve as foundational pillars in shaping an environmentally responsible workforce and directly influence organizational culture and strategic alignment [8]. This narrower scope was adopted to ensure construct clarity and maintain parsimony in the empirical model, a common practice in sustainability research to prevent model over-specification [9]. Including too many sub-dimensions without robust theoretical justification can introduce construct redundancy or multicollinearity, potentially distorting the estimation of structural paths in partial least squares models [10]. Thus, while acknowledging the full GHRM framework, the study narrows its scope to recruitment and training as critical levers of green transformation. Future research may broaden the GHRM construct by integrating additional elements such as green performance appraisal and reward systems to capture a more holistic representation.

Analytical research has revealed the advantageous outcomes of GHRM for organizational success. For instance, research conducted by A. Alegbesogie [11] indicated that entities exhibiting strong GHRM frameworks documented superior environmental results, such as diminished waste and energy usage, which subsequently augmented their operational effectiveness and competitive positioning. Likewise, Daily, A. Ojo et al. [12] discovered that green training initiatives, an essential aspect of GHRM, heightened employees' ecological consciousness and proactive conduct, thereby enhancing overall organizational performance.

Nevertheless, the direct financial advantages of GHRM remain an area of ongoing inquiry. Even though the operational and environmental perks are obvious, the long-range effects on financial metrics merit extra exploration. N. Ansari et al. [13] put forth that subsequent inquiries ought to focus on defining a stronger relationship between GHRM practices and financial results, to achieve a broader comprehension of its benefits.

H1: Green Human Resource Management (GHRM) has a positive influence on Firm Performance.

2.2 Green Supply Chain Management (GSCM)

Green Supply Chain Management (GSCM) encompasses the incorporation of ecological considerations into the practices of supply chain management, which include procurement, production, distribution, and reverse logistics. The primary objective of GSCM is to mitigate the environmental footprint of supply chain operations while simultaneously preserving or augmenting economic performance. Studies show that implementing GSCM practices can significantly improve how organizations perform. A. Al-Sheyadi et al. [14] discovered that firms that embraced green procurement and green manufacturing methodologies attained superior environmental and operational outcomes, resulting in cost efficiencies and heightened productivity. Additionally, F. H. Awan et al. [15] indicated that the integration of green logistics and reverse logistics strategies not only lessens ecological harm but also heightens customer satisfaction and enhances brand equity.

Regardless of these positives, hurdles in adopting GSCM consist of the demand for major investments in pioneering technologies and systems, paired with the need for teamwork along the entire supply chain. M. Agi and R. Nishant [16] underscore that the effective execution of GSCM is contingent upon a robust commitment from both senior management and supply chain collaborators.

H2: Green Supply Chain Management (GSCM) has a positive influence on Firm Performance.

2.3 Eco-innovation

Eco-innovation is the process of creating and utilizing novel products, methodologies, or strategies that yield ecological advantages. It plays a pivotal role in fostering sustainability by enhancing resource utilization, minimizing waste, and generating new market prospects. Eco-innovation operates as a significant connector between GHRM and the effectiveness of organizational outcomes. M. Kanan et al. [17] posits that eco-innovation can magnify the beneficial impacts of GHRM by converting environmentally-conscious human resource practices into measurable performance gains. P. Ch'ng et al. [18] assert that companies that invest in eco-innovation are inclined to attain a competitive edge with better ecological achievements and notable market allure. Investigations conducted by W. Cai and G. Li [19] underscore that eco-innovation contributes not only to ecological sustainability but also bolsters economic success by facilitating new business ventures and enhancing operational efficiency. Achieving effective eco-innovation demands a supportive organizational culture and enough resources, as highlighted by M. del Rosario et al. [20].

H3: Eco-innovation has a positive influence on Firm performance.

2.4 Firm Performance

The performance of firms constitutes a complex construct that is typically evaluated through various dimensions, including financial performance (such as profitability and return on investment), operational performance (encompassing efficiency and productivity), and environmental performance (which includes emissions reduction and resource conservation). Analysing the interplay between

GHRM and GSCM concerning these performance measures is vital for illuminating the holistic efficiency of sustainability structures. Empirical research demonstrates that sustainability initiatives, comprising both GHRM and GSCM, exert a favourable influence on firm performance. Findings from A. Keskin et al. [21] and A. Setyadi et al. [22] suggest that entities with comprehensive sustainability initiatives exhibited superior financial and operational achievements. Furthermore, N. Bari et al. [23] posits that the incorporation of sustainability principles into fundamental business operations can yield enduring competitive benefits. Accordingly Figure 1 is developed as conceptual model of the study.

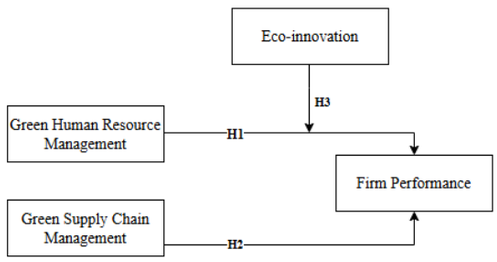

Figure 1: Conceptual research model

3. Methodology of the study

3.1 Research Design

The present analysis applies a quantitative research structure to assess the relationship between GHRM and GSCM and their influence on organizational success, where eco-innovation is considered a moderating variable, supported by findings from S. R. Ali et al. [24] and involving statistical investigation and hypothesis assessment from data sourced from 304 respondents. A detailed view of the measurement instrument is shown in Appendix 1.

3.2 Sample Characteristics

The analysis of the demographic characteristics of 304 respondents demonstrates a heterogeneous sample. Gender distribution consisted of 64% male and 36% female, with varied managerial levels, predominantly aged between 21 and 50, most possessing 2- or 4-year degrees alongside several advanced degrees, and experience ranging from less than 2 to over 8 years, across companies of differing sizes and types, including yarn and fabric manufacturing (see Table 1).

Table 1: Demographic features (N=304)

Variables	**Categories**	**Frequency**	**Percentage**
Gender	Male	195	64.10%
	Female	109	35.90%
Position	Senior	70	23.00%
	Middle	120	39.50%
	Junior	114	37.50%
Age	21-25	40	13.20%
	26-30	65	21.40%
	31-35	55	18.10%
	36-40	50	16.40%
	41-50	64	21.10%
	Above 50	30	9.90%
Education	High School or less	25	8.20%
	2-year college	75	24.70%
	4-year college	120	39.50%
	Graduate degree or higher	84	27.60%
Experience	Under 6 months	45	14.80%
	Over 6 months - 1 year	60	19.70%
	Less than 2 years	80	26.30%
	Less than 4 years	65	21.40%
	Less than 8 years	30	9.90%
	8 or more years	24	7.90%
Number of Employees	Below 50	50	16.40%
	50-100	70	23.00%
	100-150	60	19.70%
	150-200	45	14.80%
	200-250	35	11.50%
	More than 300	44	14.50%
Company Types	Yarn manufacturing	35	11.51%
	Fabric manufacturing	33	10.85%
	Garments manufacturing	20	6.57%
	Dyeing industry	35	11.51%
	Painting industry	37	12.17%
	Washing industry	32	10.52%
	Home textiles	36	11.84%
	Sweater Manufacturing	26	8.55%
	Accessories industry	23	7.57%
	Others	27	8.88%

3.3 Data Collection and Analysis

The study drew upon insights gathered through carefully structured surveys, conducted both in-person and online, utilizing a seven-point Likert scale to illuminate participant viewpoints. The approach utilized involved Partial Least Squares Structural Equation Modelling (PLS-SEM), recognized in both management and social sciences for its proficiency in effectively addressing complex interrelations among latent constructs, especially in the domain of outcome prediction as opposed to establishing causal relationships.

3.4 Validity and Reliability

To evaluate the integrity and coherence of our measurement instruments, we calculated Cronbach's alpha and composite reliability coefficients, which revealed commendable reliability metrics, with Cronbach's alpha values surpassing the 0.70 threshold; in addition, we scrutinized convergent and discriminant validity through the average variance extracted (AVE) and the Fornell-Larcker criterion [25], reinforcing the dependability and authenticity of the constructs.

4. Results

4.1 Factors loadings

The factor loadings associated with the constructs in the analysis reveal significant correlations between the items and their corresponding factors, highlighting exceptional convergent validity. For Eco-Innovation (EI), the loadings span from 0.718 to 0.854, illustrating that items EI1 through EI4 serve as dependable indicators of the eco-innovation concept. Firm Performance (FP) items, exhibiting loadings from 0.855 to 0.882, provide a solid representation of firm performance via FP1 to FP4. Likewise, the items related to GHRM show loadings from 0.771 to 0.871, confirming that GHRM1 to GHRM4 proficiently assess the GHRM concept. GSCM items, with loadings ranging from 0.728 to 0.800, also demonstrate strong representation, validating that GSCM1 to GSCM4 are credible indicators of the GSCM concept (see Figure 2 and Table 2). The interaction term (EI x GHRM) boasts a perfect loading of 1.000, as anticipated for an interaction variable. Collectively, these elevated factor loadings indicate that the measurement model effectively encapsulates the intended constructs, affirming the appropriateness of the items utilized for evaluating eco-innovation, firm performance, GHRM, and GSCM within the study's framework.

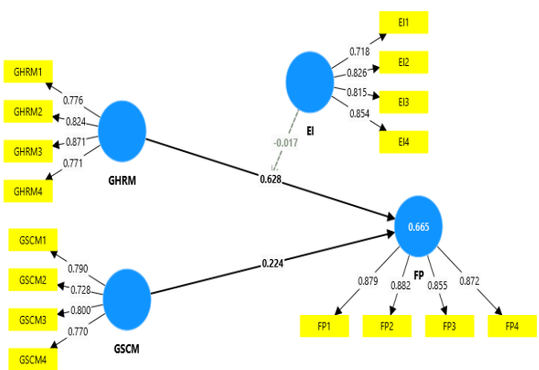

Figure 2: Factor loadings

Table 2: Factor loadings

	EI	FP	GHRM	GSCM	EI x GHRM
EI1	0.718				
EI2	0.826				
EI3	0.815				
EI4	0.854				
FP1		0.879			
FP2		0.882			
FP3		0.855			
FP4		0.872			
GHRM1			0.776		
GHRM2			0.824		
GHRM3			0.871		
GHRM4			0.771		
GSCM1				0.790	
GSCM2				0.728	
GSCM3				0.800	
GSCM4				0.770	
EI x GHRM					1.000

4.2 R-square and adjusted R-square

The R-square (R^2) and adjusted R-square metrics are vital benchmarks in regression analysis, illuminating the model's capacity for explanation. The R-squared parameter shows the scope of variation in the dependent variable (Firm Performance, FP) that can be unravelled through the independent variables (GHRM; GSCM; and Eco-Innovation, EI, serving as a moderating force). In this scenario, the R-square stands at 0.665, signifying that 66.5% of the fluctuations in Firm Performance can be attributed to the synergistic influences of GHRM, GSCM, and the moderating role of Eco-Innovation (see Table 3). This reflects a considerable explanatory strength of the model, indicating that the independent variables play a crucial role in clarifying the variance in Firm Performance.

Table 3: R-square and adjusted R-square

	R-square	R-square adjusted
FP	0.665	0.660

The adjusted R-square recalibrates the R-square metric to factor in the count of predictors present in the equation, yielding a more exact assessment of the model's explanatory strength, particularly when numerous predictors are influencing the outcome. In this instance, the adjusted R-square is 0.660, a tad lower than the R-square figure. This minor reduction suggests that while the model remains robust, there's a slight adjustment for the count of predictors utilized. The adjusted R-square considers the degrees of

freedom, yielding a more cautious estimate of the model's explanatory prowess.

The results from the regression analysis showcase that the model elucidates a considerable segment of the variance in Firm Performance. The R-square value being 0.665 showcases that 66.5% of the variations in Firm Performance are clarified by GHRM, GSCM, plus the moderating effect of Eco-Innovation (EI). This elevated R-square value implies that these elements collectively exert a significant effect on Firm Performance. Furthermore, the adjusted R-square value of 0.660 reinforces the model's integrity, accounting for the predictor count while upholding a high explanatory capacity. The minimal gap between the R-square and adjusted R-square values suggests that the model is well-structured and that the predictors are pertinent and substantially contribute to explaining Firm Performance. This analysis highlights the significance of GHRM, GSCM, and EI in boosting firm performance, offering insights for scholars and professionals in the domain.

4.3 F-square

The F-square metrics derived from the analysis unveil the comparative influence of each predictor on Firm Performance (FP). The F-square metric for Eco-Innovation (EI) concerning FP is 0.000, signifying that EI independently does not exert a direct influence on FP in this model. The F-square metric for GHRM impacting FP is 0.072, indicating a modest yet significant influence of GHRM on Firm Performance. In a similar vein, the F-square metric for GSCM on FP stands at 0.064, reflecting a slight influence of GSCM on Firm Performance (see Table 4). Finally, the F-square metric for the interaction between Eco-Innovation and Green Human Resource Management (EI x GHRM) on FP is 0.001, demonstrating that this interaction has an insignificant effect on Firm Performance. These results underscore the distinct roles of GHRM and GSCM in enhancing Firm Performance, while the interaction between EI and GHRM seems to exert a negligible effect.

Table 4: F-square

F square	EI	FP	GHRM	GSCM	EI x GHRM
EI		0.000			
FP					
GHRM		0.072			
GSCM		0.064			
EI x GHRM		0.001			

4.4 Reliability and validity

Table 5 showcases the metrics of reliability and validity for the constructs utilized in this research. The Cronbach's alpha coefficients for Eco-Innovation (EI), Firm Performance (FP), Green Human Resource Management (GHRM), and Green Supply Chain Management (GSCM) are reliably measured at 0.820, 0.895, 0.826, and 0.778, respectively, indicating a robust level of internal consistency among all constructs. Supporting these outcomes, the composite reliability (rho c) values stand at EI 0.880, FP 0.927, GHRM 0.885, and GSCM 0.855, all surpassing the advisable threshold of 0.7. Moreover, the average variance extracted (AVE) scores for EI (0.648), FP (0.760), GHRM (0.658), and GSCM (0.597) decisively demonstrate that each construct captures more than fifty percent of the variance associated with its indicators, thereby confirming convergent validity. The composite reliability (rho_a) values, which are marginally lower than rho_c yet still robust, further substantiate the reliability of the constructs. Taken together, these metrics illustrate that the measurement model displays significant reliability and validity, guaranteeing that the constructs are accurately assessed and dependable for future analyses.

Table 5: Reliability and validity

	Cronbach's alpha	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**	**Average variance extracted (AVE)**
EI	0.820	0.839	0.880	0.648
FP	0.895	0.896	0.927	0.760
GHRM	0.826	0.834	0.885	0.658
GSCM	0.778	0.793	0.855	0.597

4.5 Fornell-Larcker criterion

Table 6 delineates the values associated with the Fornell-Larcker criterion, which are instrumental in evaluating the discriminant validity among the theoretical constructs. The values located on the diagonal indicate the square root of the Average Variance Extracted (AVE) for each specific construct, whereas the off-diagonal values signify the correlations between the respective constructs. For Eco-Innovation (EI), the square root of the AVE is 0.805, suggesting that EI accounts for greater variance with its indicators when compared to any other construct. Firm Performance (FP) presents a square root of the AVE of 0.872, which exceeds its correlations with EI (0.775), GHRM (0.800), and GSCM (0.694), thereby affirming discriminant validity. In a similar vein, Green Human Resource Management (GHRM) exhibits a square root of the AVE of 0.811, which is greater than its correlations with EI (0.967), FP (0.800), and GSCM (0.735). Green Supply Chain Management (GSCM) further illustrates discriminant validity with a square root of the AVE of 0.773, exceeding its correlations with EI (0.721), FP (0.694), and GHRM (0.735). These findings collectively indicate that each construct is conceptually distinct and accounts for greater variance with its indicators compared to other constructs within the model, thereby reinforcing the overall discriminant validity.

Table 6: Fornell-Larcker criterion

	EI	**FP**	**GHRM**	**GSCM**
EI	0.805			
FP	0.775	0.872		
GHRM	0.967	0.800	0.811	
GSCM	0.721	0.694	0.735	0.773

4.6 Variance Inflation Factor (VIF)

Table 7 illustrates the Variance Inflation Factor (VIF) metrics for the outer model indicators, which are employed to evaluate multicollinearity among the constructs. VIF values beneath 3 signify low to moderate multicollinearity, indicating that the constructs are sufficiently distinct and exhibit minimal

correlation. For Eco-Innovation (EI), the VIF values range from 1.792 to 2.170, signifying acceptable multicollinearity levels. Firm Performance (FP) indicators exhibit slightly elevated VIF values, spanning from 2.254 to 2.637, yet remain within acceptable thresholds. The Green Human Resource Management (GHRM) indicators display VIF values between 1.594 and 2.192, further indicating low multicollinearity. The Green Supply Chain Management (GSCM) indicators possess VIF values ranging from 1.396 to 1.703, which are comfortably within the acceptable spectrum. The interaction term (EI x GHRM) demonstrates a VIF value of 1.000, signifying the absence of multicollinearity concerns. Collectively, these VIF values imply that multicollinearity is not an issue within this model, and the indicators for each construct are adequately independent.

Table 7: VIF

	VIF (outer)
EI1	1.792
EI2	2.170
EI3	1.866
EI4	2.070
FP1	2.488
FP2	2.637
FP3	2.254
FP4	2.425
GHRM1	1.605
GHRM2	1.911
GHRM3	2.192
GHRM4	1.594
GSCM1	1.396
GSCM2	1.486
GSCM3	1.703
GSCM4	1.566
EI x GHRM	1.000

4.7 Model Fit

Table 8 delineates the model fit indices for both the saturated model and the estimated model. The SRMR value of 0.092 for the two models suggests an acceptable goodness of fit. An SRMR value below 0.08 is typically regarded as indicative of a good fit; thus, these figures imply a satisfactory fit, albeit marginally exceeding the optimal threshold. The d_ULS (unweighted least squares discrepancy) values are 1.156 for the saturated model and 1.144 for the estimated model, signifying very comparable and acceptable fit levels. The d_G (geodesic discrepancy) values are 339.718 for the saturated model and 339.645 for the estimated model, which are also closely aligned, suggesting consistent model efficacy. The Chi-square values are infinite (∞) for both models, an unusual occurrence that may signify a potential complication with model estimation or the characteristics of the data. The Normed Fit Index (NFI) is not available (n/a) for these models, thus hindering further comparative analysis on this metric. In summary, while the majority of fit indices indicate an acceptable model fit, the infinite Chi-square values necessitate further scrutiny.

Table 8: Model Fit

	Saturated model	Estimated model
SRMR	0.092	0.092
d_ULS	1.156	1.144
d_G	339.718	339.645
Chi-square	∞	∞
NFI	n/a	n/a

4.8 Hypothesis results

The Figure 3 represents the hypothesis model and details results in Table 9 showcases the outcomes of hypothesis analysis, featuring the initial sample estimations, average samples, standard deviations, T statistics, and p-values for each proposed connection. The p-value reflecting the influence of Eco-Innovation (EI) on Firm Performance (FP) stands at 0.901, considerably surpassing the conventional cut off of 0.05, signifying that this connection lacks statistical significance. Likewise, the interaction effect of Eco-Innovation and Green Human Resource Management (EI x GHRM) on Firm Performance registers a p-value of 0.607, which also exceeds the 0.05 limit, implying this interaction does not substantially affect Firm Performance.

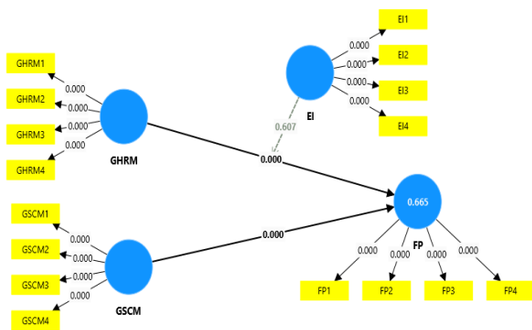

Figure 3: Hypothesis results

Table 9: Hypothesis results

Hypothesis	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
EI -> FP	-0.015	-0.008	0.122	0.125	0.901
GHRM -> FP	0.628	0.618	0.121	5.188	0.000
GSCM -> FP	0.224	0.228	0.053	4.202	0.000
EI x GHRM -> FP	-0.017	-0.016	0.033	0.514	0.607

Alternatively, the straightforward influence of Green Human Resource Management (GHRM) on Firm Performance is profoundly significant, with a p-value of 0.000 and a T statistic of 5.188, illustrating a robust positive consequence. It is evident that the impact of Green Supply Chain Management (GSCM) on Enterprise Performance is highly significant, supported by a p-value of 0.000 and a T statistic of 4.202, showcasing that GSCM has a strongly positive influence on Enterprise Performance. These findings

indicate that while GHRM and GSCM exert substantial positive effects on Firm Performance, the contributions of Eco-Innovation alone and its interplay with GHRM do not significantly sway Firm Performance in this framework.

Table 10: Total effects

Total effects	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
EI -> FP	-0.015	-0.008	0.122	0.125	0.901
GHRM -> FP	0.628	0.618	0.121	5.188	0.000
GSCM -> FP	0.224	0.228	0.053	4.202	0.000
EI x GHRM -> FP	-0.017	-0.016	0.033	0.514	0.607

The comprehensive table of total effects elucidates the aggregate impact of each predictor on Firm Performance (FP). The p-value associated with the total effect of Eco-Innovation (EI) on FP is 0.901, clearly demonstrating that EI fails to exert a statistically significant effect on FP. The T statistic of 0.125 corroborates this absence of significance. The evidence suggests that the interaction of Eco-Innovation and Green Human Resource Management (EI x GHRM) on Firm Performance (FP) does not achieve statistical significance, with a p-value of 0.607 and a T statistic of 0.514, hinting that this interaction may not lead to any considerable benefits for FP.

Viewed from another angle, the cumulative effect of Green Human Resource Management (GHRM) on FP is distinctly highlighted, revealing a p-value of 0.000 and a T statistic of 5.188, suggesting a robust affirmative link of GHRM with FP. Lastly, Green Supply Chain Management (GSCM) has a remarkable positive relationship with FP, proven by a p-value of 0.000 and a T statistic of 4.202. These results indicate that while GHRM and GSCM exert significant and positive effects on Firm Performance, the direct effects and interaction effects of Eco-Innovation do not significantly enhance Firm Performance within this analytical framework.

5. Discussion and Implication

5.1 Discussion

The outcomes of the study present compelling evidence supporting the affirmative impact of GHRM on organizational performance. This is in accordance with prior investigations that have indicated the significant enhancement of organizational results through green HR practices. For example, a research endeavor within the hospitality sector revealed that GHRM possesses a direct and beneficial correlation with organizational performance, which is moderated by environmental results [26]. In a similar vein, research conducted in the manufacturing sector of Palestine illustrated that GHRM initiatives and green innovation exert considerable positive influences on sustainable performance, with green innovation partially moderating the association between GHRM practices and sustainable performance [17]. Our results indicated that GHRM exerted a remarkable positive influence on organizational performance ($\beta = 0.628$, $p < 0.001$), implying that enterprises incorporating environmental considerations into their HR practices are predisposed to attain enhanced performance. This phenomenon can be attributed to the heightened environmental consciousness and involvement among employees, culminating in improved operational efficiencies and an augmented corporate reputation. Furthermore, it has been demonstrated that GHRM practices can affect both individual and collective green creativity, which may subsequently lead to a firm's green performance [27]. For instance, Unilever's "Sustainable Living Plan" integrates employee training on eco-friendly practices with performance targets, resulting in reduced energy use and waste across global operations. Similarly, Tata Motors has embedded green goals in employee performance appraisals, enhancing both sustainability outcomes and staff engagement.

Analysis of Green Supply Chain Management (GSCM) has shown a remarkable advantageous influence on the effectiveness of organizations ($\beta = 0.224$, $p < 0.001$), aligning with results from prior research. For instance, a systematic review and meta-analysis underscored that GSCM practices wield a positive influence on organizational performance, particularly across environmental, operational, and economic dimensions [28]. This study is consistent with our findings, accentuating the significance of sustainable supply chain practices in propelling overall organizational performance. Nonetheless, certain research suggests that while GSCM positively influences competitive advantage, it may not exert a direct influence on organizational performance, with competitive advantage moderating this association [29]. However, our investigation identified a direct and significant positive impact, highlighting the advantages of green supply chain practices.

It turned out that eco-innovation didn't really affect the connection between GHRM and the performance of the organization ($\beta = -0.017$, $p = 0.607$). This outcome contrasts with some studies that highlighted the essential role of eco-innovation in bridging environmental management practices with enhanced organizational results. Research by [13] indicated that the financial outcomes of businesses are shaped by GHRM, with eco-innovation playing a crucial moderating role. A potential rationale for this inconsistency could reside in the disparate levels of emphasis and investment in eco-innovation among the sampled firms. This indicates that while GHRM and GSCM directly contribute to organizational performance, the function of eco-innovation as a moderator may be contingent upon specific contextual factors such as industry type, organizational size, and the degree of innovation implementation.

5.2 Implication

The implications of this research yield considerable theoretical and practical relevance enlarging the pool of knowledge regarding the impact of ecological management methods on organizational efficiency. It emphasizes the unmistakable gains of GHRM and GSCM, supplying research data that reinforces the belief that these strategies elevate corporate performance. However, this analysis prompts further contemplation about the role of eco-innovation, hinting that its outcomes could be less straightforward than earlier thought. This indicates an exigent requirement for additional inquiry to examine the circumstances under which eco-innovation can proficiently moderate the association between green management practices and corporate performance.

Practically, the outcomes emphasize the necessity for managers to embrace holistic GHRM and GSCM

methodologies to augment corporate performance. In contemporary business environments, organizations are increasingly compelled to exhibit their dedication to environmental sustainability. The incorporation of GHRM practices, such as environmentally-focused recruitment, training, and performance evaluation, can foster heightened employee engagement and organizational allegiance toward environmental objectives. Likewise, the execution of GSCM practices, including sustainable manufacturing and reverse logistics, can curtail waste, enhance resource efficiency, and improve overall operational efficacy.

For instance, within manufacturing sectors, the adoption of GHRM principles can cultivate a workforce that is more attuned to environmental concerns, which can subsequently propel initiatives aimed at reducing energy consumption and minimizing waste. In the context of supply chains, green logistics and sustainable sourcing can yield cost efficiencies and bolster the organization's reputation among environmentally conscious consumers and stakeholders.

While this investigation revealed that eco-innovation did not significantly moderate the correlation between green management practices and corporate performance, it remains an essential component of sustainability that organizations should not disregard. In sectors driven by technological advancements, for instance, eco-innovation can serve as a pivotal catalyst for competitive advantage by allowing organizations to devise novel products and processes that mitigate environmental impact. Organizations should keep investing in eco-innovation as a crucial component of their overall sustainability approach, endeavouring to build a culture of creativity that matches their environmental goals.

6. Conclusions, Limitations, and Future Work

6.1 Conclusion

This assessment diligently investigated the influence of GHRM and GSCM on the advancement of organizational performance, especially concerning the moderating elements of eco-innovation. The results reveal that both GHRM and GSCM practices significantly enhance firm performance, aligning with existing scholarly work that endorses the integration of environmental sustainability within HRM and supply chain practices. Nevertheless, eco-innovation did not significantly moderate the GHRM-performance relationship, indicating that its moderating effect may be affected by contextual factors, thereby suggesting areas for further inquiry by researchers and emphasizing the necessity for practitioners to implement comprehensive green practices for dual economic and ecological advantages.

6.2 Limitations

This study possesses several limitations that warrant recognition. Primarily, the cross-sectional design restricts causal inference, suggesting that future research should adopt longitudinal methodologies to elucidate the causal dynamics among GHRM, GSCM, eco-innovation, and firm performance. Moreover, reliance on self-reported data may introduce common method bias, which, despite efforts to minimize, indicates that future investigations should incorporate objective performance metrics and diverse data sources. Additionally, the industry-specific sample may limit generalizability, thus prompting future studies to examine these constructs across varied industries and cultural contexts for enhanced robustness and applicability of findings. Lastly, while the study accentuates the moderating function of eco-innovation, it disregards other possible moderators like organizational culture and external environmental determinants. Subsequent inquiries should explore these variables to provide a more holistic understanding of the mechanisms through which GHRM and GSCM impact firm performance.

6.3 Future Work Suggestions

The initial method consists of extensive longitudinal research focused on uncovering the causal relationships between GHRM, GSCM, eco-innovation, and the performance of firms as time progresses. Such studies will elucidate the enduring impacts and sustainability of green practices, thereby facilitating the development of more effective strategies for long-term performance enhancement. The second approach emphasizes the necessity of diverse industry contexts; broadening the research to encompass various sectors and cultural settings is essential for improving the generalizability of the findings. Distinct industries encounter specific environmental challenges and regulatory demands that may variably influence the application and efficacy of GHRM and GSCM practices. Lastly, the investigation of additional moderators is imperative; exploring further variables that may affect the relationship between green practices and firm performance can yield a more comprehensive understanding of these dynamics. Variables like the organization's cultural environment, leadership approaches, and external ecological factors might considerably modify the performance of GHRM and GSCM programs.

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Appendix 1

Code	Questions
Green Human Resource Management	
GHRM1	The firm prefers to recruit employees that have knowledge about environment.
GHRM2	Job seekers are attracted by the policies of the firm.
GHRM3	The firm provides formal environmental training programs for employees to increase their ability to promote them.
GHRM4	Our firm sets green targets, goals and responsibilities for managers and employees.
Green Supply Chain Management	
GSCM1	My firm use Green transportation and distribution.
GSCM2	My firm try to reduce air emission, waste water, solid wastes
GSCM3	We do recovery of company's end-of-life products
GSCM4	We provide consumers with information on environment-friendly products and production methods
Firm Performance	
FM1	We can reduce the cost of acquiring materials.
FM2	The firm's strategies can be implemented to enhance community health and safety.
FM3	This firm reduces waste and enhances recycling in the manufacturing process.
FM4	This firm can implement enhancements to improve our company's environmental state.
Green Eco-innovation	
GE1	We co-operate with customer for eco-design
GE2	We co-operate with customers for cleaner production and distribution
GE3	We co-operation with customers for green packaging
GE4	We co-operation with customers for using less energy during product transportation