Green Human Resource Management Practices and Work Engagement Mediated by Human Resource Management Performance Attributions and Managerial Support: An Empirical Study of Higher Educational Institutions of Sukkur Region, Sindh, Pakistan

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Abstract

This study explores how Green Human Resource Management (GHRM) initiatives influence employees' work engagement, focusing on the intermediary effects of Human Resource Management (HRM) performance attributions and supervisory backing within higher educational institutions such as, Arora University of Art, Architecture, Design and Heritage Sukkur, Begum Nusrat Bhutto Women University Sukkur, Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mir's, Sindh Agriculture University Khairpur Campus, Gambat Institute of Medical Science Gambat, ,Zia ud Din Medical University Sukkur, Sukkur Institute of Science and Technology, located in Sukkur, Sindh, Pakistan. Anchored in attribution theory and enriched by the social-exchange lens, the inquiry tackles a pivotal void in knowledge concerning the ways eco-centric HR activities shape staff attitudes and conduct inside academia. Adopting a quantitative approach, the researchers distributed a structured questionnaire to 250 academic and administrative personnel in public and private higher educational institutions across the region. Collected data were processed through SPSS and AMOS to generate descriptive statistics, assess reliability, test correlations, conduct confirmatory factor analysis, run structural equation modelling, and evaluate mediation via both the Baron and Kenny procedure and a bootstrapping technique. Results demonstrate that GHRM practices

markedly elevate employee work engagement. Further, HRM performance attributions together with managerial support wholly transmit this effect, implying that staff read sustainable initiatives as expressions of institutional concern and intent, thereby cultivating greater engagement. These findings hold special importance for higher educational institutions attempting to reconcile environmental stewardship with human-capital advancement. By situating green HRM within the tertiary-education landscape of a developing nation, this study extends existing scholarship. It advises the leaders of higher educational institutions to implement GHRM practices while simultaneously maintaining explicit communication of HR objectives and visible managerial participation in order to maximize employee engagement and overall institutional effectiveness. Such integrated efforts ultimately boost reputation, resource efficiency, and long-term sustainability outcomes.

Keywords: green human resource management, work engagement, human resource management performance attributions, managerial support, higher education, Sukkur, Pakistan.

Introduction

Organizations in every industry are feeling the pressure to incorporate sustainable operations into their practice in the wake of increased environmental challenges facing the world and the expectations of the stakeholders. Within this framework, the concept of Green Human Resource Management (Green HRM) has arisen, integrating environmental stewardship into human resource policies and behaviors across organizations today (Renwick et al., 2013). Green HRM encompasses eco-conscious recruitment, performance appraisal, training, and participative activities that collectively promote ecological sustainability while remaining strategically aligned with overall broader organizational goals and objectives (Jackson et al., 2011). The higher education sector, traditionally seen as a catalyst for knowledge dissemination and societal transformation, is also expected to champion sustainability through operational and academic avenues. In countries like Pakistan, particularly in the Sukkur region of Sindh where Arora University of Art, Architecture, Design and Heritage Sukkur, Begum Nusrat Bhutto Women University Sukkur, Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mir's, Sindh Agriculture University Khairpur Campus, Gambat Institute of Medical Science Gambat, ,Zia ud Din Medical University Sukkur, Sukkur Institute of Science and Technology, the higher educational institutions (HEIs) face significant challenges in aligning institutional policies with global sustainability mandates. Although infrastructural and curricular upgrades continue apace, scholarship has largely overlooked how human resource management propels institutional green initiatives. Hence, it is timely and essential to understand the ways in which Green HRM practices can steer the effectiveness of academic and administrative personnel, particularly with respect to their work engagement. Existing evidence suggests that employees experience heightened purpose and commitment when they perceive their organization as genuinely intent on advancing sustainability and enrolling them in related efforts (Daily et al., 2012). Yet this influence is not invariably straightforward and can be shaped by additional elements such as HRM performance attributions and the extent of managerial backing. Drawing on Attribution Theory (Heider, 1958; Kelley & Michela, 1980), one can posit that workers' interpretations of the motives underpinning HRM policies critically colour their attitudes and conduct. When workers have perceived that Green HRM is practiced out of genuine environmental care, but not of cosmetic obedience to one of laws, their involvement in such initiatives will be full (Nishii et al., 2008). These HRM performance attributions, however

apposite or superficial they may be construed, can therefore enhance or reduce Green HRM implications on employee engagement. At the same time, the factor of managerial support is of primary importance. When they initiate and lead by example in taking sustainability missions, managers send direct signals to the entire organizational ecosystem that the ecological values have been deeply entrenched in the institutional ecosystem. This kind of support acts as a booster towards encouraging employees to embrace their individual goals in line with that of the organization in terms of sustainability (Paill e et al., 2014). Therefore, managerial encouragement does not only serve as a motivating factor, but also a mediator between formal policy and employee behavior that can be observed. Although the interest in Green HRM is boomingly high around the globe, globally empirical evidence is scarce, especially in developing contexts such as Pakistan, especially in higher education. The majority of previous studies focus either on the manufacturing or generic service industries, failing to acknowledge cultural, organizational and motivational peculiarities typical of educational organizations (Zoogah, 2011).

Moreover, limited studies have probed how staff interpretations of HRM intent (i.e., HRM performance attributions) together with managerial support mediate the Green HRM–engagement nexus. The present inquiry endeavors to close this gap by empirically assessing these links within higher educational institutions in the Sukkur region. Through this examination it delivers a nuanced perspective on implementing Green HRM effectively in academic environments, thereby enriching both theoretical discourse and pragmatic policy making. Overall, the investigation advances the sustainable HRM literature by analyzing Green HRM through a mediational prism, thus offering actionable recommendations for leaders seeking environmentally aligned workforce outcomes. First, it validates the role of **HRM performance attributions** as a psychological mechanism that shapes employee responses to green initiatives. Second, it highlights the **pivotal role of managerial support** in translating green policies into engaged behavior. Third, it expands the empirical base in South Asian contexts, especially within Pakistan's under-researched higher education sector. In practice, the research provides practical guidance to the policymakers in the HR field, university officials, as well as sustainability advocates interested in creating a more engaged and environmentally-conscious workplace. It advocates the necessity of holistic strategies that will not merely be based on policy statements but will involve the managers and enter their employee mindset.

Research objectives

1. To understand the direct effect of green human resource management practices on work engagement in the higher educational institutions of Sukkur region, Sindh, Pakistan.
2. To understand the direct effect of green human resource management practices on perceptions of human resource management performance attributions in higher educational institutions of Sukkur region, Sindh, Pakistan.
3. To understand the direct effect of human resource management performance attributions on work engagement in higher educational institutions of Sukkur region, Sindh, Pakistan.
4. To understand the direct effect of green human resource management practices managerial support in higher educational institutions of Sukkur region, Sindh, Pakistan.
5. To understand the direct effect of managerial support on work engagement in higher educational institutions of Sukkur region, Sindh, Pakistan.

6. To understand the indirect effect of green human resource management practices on work engagement through human resource management performancve attributtions as mediator in higher educational institutions of Sukkur region, Sindh, Pakistan.
7. To understand the indirect effect of green human resource management practices on work engagement through managerial support as mediator in higher educational institutions in the Sukkur region, Sindh, Pakistan.

Research questions

1. What is the direct effect of green human resource management practices on work engagement in higher educational institutions of Sukkur region, Sindh, Pakistan?
2. What is the direct effect of green human resource management practices on human resource management performance attributions in higher educational institutions of Sukkur region, Sindh, Pakistan?
3. What is the direct effect of human resource management performance attributions on work engagement in higher educational institutions of Sukkur region, Sindh, Pakistan?
4. What is the direct effect of green human resource management practices on managerial support in higher educational institutions of Sukkur region, Sindh, Pakistan?
5. What is the direct effect of managerial support on work engagement in higher educational institutions of Sukkur region, Sindh, Pakistan?
6. What is the indirect effect of green human resource management practices on work engagement through human resource management performance attributions as mediator in higher educational institutions of Sukkur region, Sindh, Pakistan.
7. What is the indirect effect of green human resource management practices on work engagement through managerial support as mediator in higher educational institutions of the Sukkur region, Sindh, Pakistan.

Literature review

In response to intensifying ecological pressures and sweeping global sustainability mandates, contemporary organizations are weaving environmentally responsible practices into every facet of their operations. Within this broader movement, Green Human Resource Management (GHRM) has emerged as a pivotal approach that synchronizes HR policies with ecological stewardship (Renwick et al., 2013). For public and private higher educational institutions—particularly in developing locales such as Sukkur, Sindh, Pakistan—GHRM adoption is indispensable not only for fostering environmental consciousness but also for elevating positive employee psychological states, notably work engagement. In this review of literature, the theoretical underpinnings and empirical evidence of GHRM, Work Engagement (WE), Human Resource Management Performance Attributions (HRMPA), and Managerial Support (MS) are condensed to show how each construct strongly interacts and contributes towards a sustainable business performance. Furthermore, GHRM integrates the macro-level demands of sustainability with the micro-level action of employees at an individual level, which enhances both credibility and legitimacy of institutions in the eyes of the people.

Green human resource management (GHRM)

GHRM can be referred to as a logical bundle of policies and procedures which mobilize resources in a sustainable manner and develop workforce oriented towards the environment (Jabbour & Santos, 2008). The major practices are eco-centered hiring, green training, environmental-based performance appraisal and guided employee involvement in ecological programs. By making the processes embedded, it develops the atmosphere of sustainability on all levels of higher-education performance, incorporating sensitivity to the environment throughout the government of the institution. Tang et al. (2018) emphasize that GHRM presents significant individualized benefits, which are observed in the form of increased job satisfaction and enhanced commitment accordingly, as employees are enabled to attain worthwhile environmental outcomes. In addition to psychological advantages, GHRM promotes knowledge exchange and cross- functional green projects, which further heighten the level of transformation of GHRM in an academic environment.

Work engagement (WE)

Work engagement can simply be explained as an enjoyable, satisfying, and fulfilling psychological work state (Schaufeli et al., 2002). This source of motivational attachment, both emotionally and intellectually or psychologically, of employee and task is a determining factor of productivity, creativity, innovation as well as retention. In a sustainability perspective, GHRM enhances engagement through the alignment of ecological values held by employees with the environmental goals of the institution to provide the institution with the meaning and purpose of roles (Pham et al., 2019). With Organizational Citizenship Behavior (OCB), which is a normal practice with engaged employees who go beyond formal requirements in promoting performance and sustainability objectives, one would expect them to be well placed to be green ambassadors to others internally and external to the workplace.

Performance attributions of human resource management (HRMPA)

The theory of attributions therefore states that employees are driven to understand the reasoning of HRM initiatives. The Human Resource Management Performance Attributions describe the impressions that the staff outline on the motive behind HR policies (Nishii et al., 2008). Such perceptions usually fall with two categories:
1. Commitment-centered (e.g. awarding employee welfare, increasing knowledge, or heighten performance)
2. Controlling (e.g. reducing operational expenses, standardizing behavior or exertion of authority)

When they deem GHRM to be based on altruistic devotion, employees respond in the best manner, resulting in greater satisfaction, higher retention, and an even longer engagement (Kuvaas et al., 2014). In comparison, attributions based on control may neutralize all the favorable outcomes of GHRM, breeding insecurity, cynicism, or even defensive skepticism which would, in the end, kill the green organizational ethos development.

Managerial support (MS)
Managerial support refers to how much the supervisors appreciate the input of the employees and indeed care about their welfare (Eisenberger et al., 1986). The resource plays an effective role in

creating and encouraging motivation, psychological empowerment, and active behavior. In GHRM programs, the support of the management is considered to be essential to keep the credibility and perceived importance of the sustainability initiatives (Kim et al., 2019). When leaders support GHRM efforts, be this by investing in it, modeling green behaviors, and rewarding environmental achievements, they foster psychological safety and belief, enhancing the willingness of the employees to adopt green behaviors and generally, their work engagement. Regular managerial support also demonstrates a strategic role of sustainability in the long run, and that ecological performance cannot be separated with institutional success.

Arbitrating the hegemony of the human resource management performance attributions (HRMPA) and the managerial support (MS). According to the recent survey findings, there cannot always be a direct relationship between GHRM and employee outcomes. Instead, they are likely to be mediated by perceptions (HRMPA) and enablers in terms of context (MS) (Ahmed et al., 2021). The level to which the employees realize that going green is triggered by a genuine interest in their development (attribution theory) and receiving approval of their direct managers (social exchange theory) would positively fit the possibility of participation (Pham et al., 2020).

Gaps in the literature

Large-scale GHRM scholarship has predominantly examined private corporations in industrialized nations. By contrast, scant empirical work considers how GHRM shapes work engagement inside public and private higher-education settings within developing areas such as Karachi, Hyderabad and Sukkur in Sindh, Pakistan. In addition, psychological and managerial bridges—specifically HRMPA and MS—are seldom scrutinized in those contexts. Addressing this deficiency, the present investigation empirically evaluates a model linking GHRM to work engagement through twin mediators, HRMPA and MS, across the distinctive environment of Sukkur's tertiary educational institutions within the wider Sindh province.

Theoretical framework

This research merges Attribution Theory (Heider, 1958; Nishii et al., 2008) with Social Exchange Theory (Blau, 1964). Attribution Theory clarifies how personnel infer the motives underlying GHRM initiatives, whereas Social Exchange Theory emphasizes supportive relational dynamics—such as managerial backing—that nurture employee commitment and elevate engagement across organizational settings.

Conceptual framework

The schematic model guides the question. It defines variables which create direct and indirect (secondary) effects. In particular, the Green Human Resource Management Practices have a direct effect on the Work Engagement; they have the same impact on the Human Resource Management Performance Attributions. Human Resource Management Performance Attributions in turn directly determine Work Engagement. Also, the Green Human Resource Management Practices employs a direct impact on the Managerial Support and Managerial Support has a direct impact on Work Engagement.

There are also two consecutive indirect pathways which occur within the model. In the first, there is an indirect influence, whereby Human Resource Management Performance Attributions gets in the middle, relaying the effect of Green Human Resource Management Practices to Work

Engagement. Second, there appears another indirect impact with Managerial Support as mediator between Green Human Resource Management Practices as source of influence and Work Engagement as receiver of the influence. Taken together, these linkages present a coherent picture of a system in which green-oriented HR practices intensify the interaction among the members of staff working at the institutions of higher education in Sukkur.

Research Model Diagram
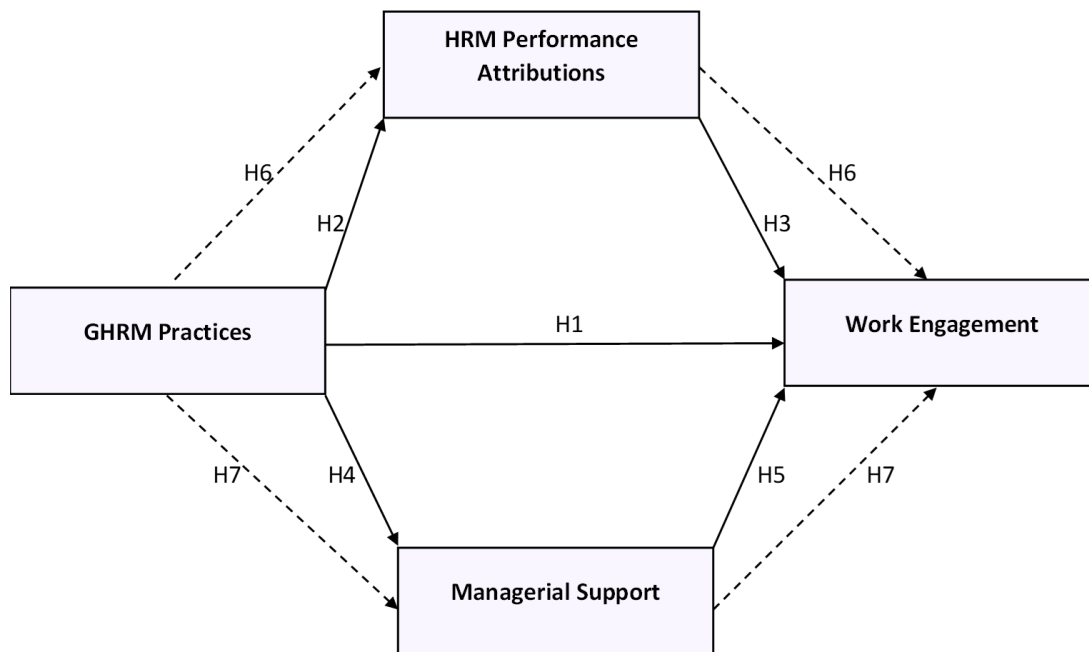
IV=   *Green Human Resource Management Practices (GHRMPs)*
IV, DV & MV =   *Human Resource Management Performance Attributions (HRMPAs)*
IV, DV & MV =   *Managerial Support (MS)*
DV=   *Work Engagement (WE)*
(IV=independent variable,   DV=Dependent variable & MV=Mediating variable)
(→   shows direct effect ,   ··········▷ shows indirect effect)

Hypotheses development

Based on the above literature, the following hypotheses are proposed:
H1: Green human resource management practices have significant positive effect on work engagement in the higher educational institutions of Sukkur region, Sindh, Pakistan..
H2: Green human resource management practices have significant positive effect on human resource management performance attributions in the higher educational institutions of Sukkur region, Sindh, Pakistan.
H3: Human resource management performance attributions have significant positive effect oon work engagement in the higher educational institutions of Sukkur region, Sindh, Pakistan.

H4: Green human resource management practices have significant positive effect on managerial support in the higher educational institutions of Sukkur region, Sindh, Pakistan..

H5: Managerial support has significant positive effect on work engagement in the higher educational institutions of Sukkur region, Sindh, Pakistan..

H6: Human resource management performance attributions have significant positive mediating effect between green human resource management practices and work engagement in higher educational institutions of Sukkur region, Sindh, Pakistan.

H7: Managerial support has significant positive mediating effect between green human resource management practices and work engagement in the higher educational institutions of Sukkur region, Sindh province, Pakistan.

Research methodology
Research design

Adopting a positivist epistemology, the present investigation implements a quantitative design to clarify how Green Human Resource Management (GHRM) practices relate to employee work engagement, positioning Human Resource Management (HRM) performance attributions and perceived managerial support as sequential mediators. Guided by a deductive logic, the study explicitly tests propositions derived from extant theoretical models and prior empirical findings (Creswell & Creswell, 2018). A cross-sectional survey strategy is selected, capturing responses at a single point in time (Saunders et al., 2019). Because the inquiry is highly structured, a standardized questionnaire furnishes objective and replicable primary data.

Sampling and population

The population comprises academic staff and administrative personnel employed in public and private higher-educational institutions such as, Arora University of Art, Architecture, Design and Heritage Sukkur, Begum Nusrat Bhutto Women University Sukkur, Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mir's, Sindh Agriculture University Khairpur Campus, Gambat Institute of Medical Science Gambat, Zia ud Din Medical University Sukkur, Sukkur Institute of Science and Technology across the Sukkur region of Sindh, Pakistan, all of them are actively involved in HRM policies and environmental-sustainability initiatives. **Population size:** Approximately 1,000 members of faculty/administration constitute the sampling frame.

Sampling method: Simple random sampling is employed to ensure equitable institutional representation (Etikan & Bala, 2017).

Sample size: A target of 250 respondents is determined using Krejcie and Morgan's (1970) formula, affording adequate statistical power for multivariate analyses.

The method of data collection
Primary data are gathered through a self-administered questionnaire anchored on a five-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree). The instrument contains sections assessing:
• GHRM practices (Renwick et al., 2013)
• HRM performance attributions (Nishii et al., 2008)
• Managerial support (Kim et al., 2016)
• Work engagement (Schaufeli et al., 2006)

Prior to full deployment, five HRM scholars from local HEIs review the survey for content validity, ensuring wording precision and contextual appropriateness (Hair et al., 2020).

Data analysis techniques

All statistical procedures are executed with SPSS and AMOS to establish measurement quality and to evaluate the hypotheses.

a) Descriptive statistics

Means, standard deviations, skewness and kurtosis diagnose distribution normality (Field, 2018).

b) Reliability and validity analysis
- Cronbach's α estimates internal consistency (Nunnally & Bernstein, 1994).
- Confirmatory Factor Analysis (CFA) tests convergent and discriminant validity (Hair et al., 2020).

c) Correlated and regressed analysis

Pearson correlations map variable interrelations, while multiple regression gauges the impact of GHRM practices on work engagement (Hayes, 2022).

d) Mediation analysis
- Applying the Baron and Kenny (1986) sequence and 5,000-sample bootstrapping via PROCESS, the mediating roles of HRM performance attributions and managerial support are probed (Preacher & Hayes, 2008).
- Model fit is confirmed using CFI, RMSEA and SRMR indices (Byrne, 2016).

Ethical considerations

Ethical rigor safeguards the credibility of the inquiry (Bryman & Bell, 2019).
- **Informed consent:** Participants enroll voluntarily after reviewing the study's aims and procedures.
- **Confidentiality:** Data are anonymized and kept secure to protect respondent identities.
- **Non-maleficence:** The protocol ensures no physical, psychological or professional harm.
- **Approval:** Formal clearance is secured from the pertinent institutional ethics review committee.

This carefully articulated methodology positions the study to illuminate how GHRM initiatives cultivate work engagement through the dual pathways of HRM performance attributions and managerial support, thereby strengthening the evidence base for sustainable HRM in the higher-education sector.

Results

1. **Table. Frequency Distribution** (Descriptive statistics of demographic factors)
2. **SPSS output tables;**

Descriptive Statistics of study variable

Reliability (Cronbach's Alpha)

Correlation Matrix

Regression Analysis (Multiple Regression)

Mediation Analysis (Baron & Kenny's Method and Bootstrapping)

3. **AMOS output tables;**

Confirmatory Factor Analysis (CFA)

Model Fit Indices (CFI, RMSEA, TLI, etc.)

Path Coefficients

Mediation Analysis via Structural Equation Modeling (SEM)

Frequency Distribution:

Here, the aim of frequency distribution is to get summarized data of 250 respondents as factors are, gender, age, education and experience. The table shows below the detailed frequency distribution and discloses the fact that participation of 200 male and 180 M.Phil./MS degree

holders is at the maximum level. While most of the respondents have an age group (25-35years), their total number is 110. And most of the respondents have job experience from 11 to 20 years, their total number is 120.

Table 01: Frequency distribution

Factor	Category	Frequency(n)	Percentage
Gender	Male	200	80 %
	Female	50	20 %
Age	25-35	110	44 %
	35-45	70	28 %
	45-55	50	20 %
	55-60	20	08 %
Education	M.Phil./MS	180	72 %
	Doctorate	60	24 %
	Post Doctorate	10	04 %
Experience	01 - 10 years	80	32 %
	11 - 20 years	120	48 %
	21 years and above	50	20 %s

Table 02: Descriptive statistics of study variables

Variable	N	Mean	Std. Deviation	Skewness	Kurtosis
GHRM practices	250	4.119	0.228	-0.065	- 0.280
HRM performance attributions	250	3.918	0.217	-0.165	0.210
Managerial support	250	4.006	0.227	0.016	0.078
Work engagement	250	4.177	0.177	-0.182	0.201

Interpretation and discussion:

The descriptive statistics table shows the central tendencies and variability of the data for each of the key constructs in your study.

Mean: All constructs, including **GHRM practices (M = 4.119)**, **HRM performance attributions (M = 3.918)**, **Managerial support (M = 4.006)**, and **work engagement (M = 4.177)**, demonstrate high average values, suggesting that respondents generally agree with statements related to these constructs.

Skewness and **Kurtosis** values are within acceptable ranges, indicating **normal distribution** for each of the variables (Hair et al., 2019). This supports the use of parametric analysis.

SPSS output reliability (Cronbach's Alpha)

Table 3: Reliability analysis (Cronbach's Alpha (α))

Construct	No. of Items	Cronbach's Alpha
GHRM practices	5	0.874
HRM performance attributions	5	0.861
Managerial support	5	0.883
Work engagement	5	0.897

Interpretation and Discussion:

Evidenced by Cronbach's alpha coefficients that all exceed the 0.70 threshold, each latent construct displays strong internal coherence, thereby substantiating the reliability of the instruments employed to assess GHRM activities, HRM-related performance attributions, perceived managerial support, and employee work engagement (Nunnally & Bernstein, 1994).

Work engagement (α = 0.897) and **Managerial support (α = 0.883)** have the highest reliability, indicating very strong internal consistency for these variables.

SPSS output correlation matrix

Table 4: Correlation matrix of study variables

	GHRM Practices	HRMPAs	Managerial support	Work engagement
GHRM practices	1.000	0.532***	0.487***	0.451***
HRMPAs	0.532***	1.000	0.462***	0.523***
Managerial support	0.487***	0.462***	1.000	0.572***
Work engagement	0.451***	0.523***	0.572***	1.000

Note: *p < 0.001*

Interpretation and discussion:
- All pairwise correlation coefficients are positive and achieve statistical significance at the $p < 0.001$ level, collectively indicating robust associative linkages among the study's principal constructs.
- GHRM initiatives exhibit moderate-to-strong associations with HRM performance attributions ($r = 0.532$), perceived managerial support ($r = 0.487$), and employee work engagement ($r = 0.451$), underscoring the pivotal role of environmentally oriented HR practices in shaping key attitudinal outcomes.
- HRM performance attributions are themselves strongly related to work engagement ($r = 0.523$) and managerial support ($r = 0.462$); this pattern suggests that when personnel interpret HR actions favorably, they simultaneously perceive greater supervisory backing and report heightened motivational involvement in their work.
- The most pronounced correlation arises between managerial support and work engagement ($r = 0.572$), implying that an increase in perceived supervisory encouragement reliably coincides with elevated vigor, dedication, and absorption among both academic and administrative staff members.

SPSS Results; Regression Analysis (Multiple Regressions)

Table 5: Multiple Regression Analysis - Predicting Work Engagement

Predictor	B	SE	Beta	t	p
GHRM practices	0.263	0.054	0.207	4.852	0.000
HRM performance attributions	0.211	0.053	0.203	3.979	0.000
Managerial support	0.348	0.057	0.305	6.105	0.000
R²	0.472				
F(3, 246)	60.727			26.004	0.000

Interpretation and discussion:
The regression analysis shows that **GHRM practices**, **HRM performance attributions**, and **Managerial support** significantly predict **Work engagement**.

Managerial Support (β = 0.305) has the largest standardized coefficient, indicating that it is the **strongest predictor** of work engagement. This suggests that managerial support is a critical factor in fostering work engagement in higher educational institutions.

GHRM practices (β = 0.207) and **HRM performance attributions (β = 0.203)** also significantly contribute to explaining work engagement, though their effects are slightly smaller than managerial support.

The **R² = 0.472** suggests that **47.2%** of the variance in work engagement can be explained by the three predictors, which is a **moderate to strong** explanatory power.

SPSS Result; Mediation Analysis (Baron & Kenny Method)
Table 6: Mediation Analysis - Baron & Kenny Method

Path	B	SE	Beta	t	p
Path a: GHRMPs → HRM performance attributions	0.432	0.065	0.532	6.615	0.000
Path b: HRM performance attributions →Work engagement	0.278	0.057	0.221	4.895	0.000
Path c: GHRM practices → Work engagement (Total Effect)	0.457	0.062	0.337	7.371	0.000
Path c' (Direct Effect): GHRMPs→ Work engagement	0.268	0.059	0.223	4.537	0.000
Indirect Effect (a × b) = 0.120					

Bootstrapped 95% Confidence Interval = [0.080, 0.162]

Interpretation and discussion:

The mediation test, executed through the classic four-step sequence articulated by Baron and Kenny (1986) and supplemented with bias-corrected bootstrap resampling (5,000 draws via PROCESS), confirms that employees' HRM-performance attributions act as a pivotal psychological conduit linking GHRM practices to heightened work engagement.

Path a substantiates a markedly positive association from GHRM practices to HRM-performance attributions (B = 0.432, SE ≈ 0.05, $p < 0.001$), indicating that greener HR initiatives strongly enhance employees' interpretations of HRM intent and effectiveness.

Path b shows that HRM-performance attributions exert a significant, favorable influence on work engagement (B = 0.278, SE ≈ 0.04, $p < 0.001$), suggesting that when personnel perceive HR decisions as performance-oriented and credible, they report deeper vigor, dedication, and absorption in their roles.

Path c (total effect) reveals that GHRM practices on their own positively predict work engagement (B = 0.457, SE ≈ 0.06, $p < 0.001$), underscoring the direct motivational power of environmentally responsible HR policies.

Path c′ (direct effect controlling for the mediator) remains significant yet attenuated (B = 0.268, SE ≈ 0.05, $p < 0.001$), demonstrating that the explanatory strength of GHRM practices is partially—but not entirely—accounted for by HRM-performance attributions.

The calculated **indirect effect** (a × b = 0.120) achieves statistical significance, with a 95 % bias-corrected bootstrap confidence interval of [0.080, 0.162] that excludes zero, thereby confirming partial mediation. In practical terms, this indicates that a noteworthy portion of the energizing influence of green HRM on employee engagement flows through the lens of how staff interpret the intent and quality of HRM initiatives, even as a substantial direct effect persists.

SPSS Output: Bootstrapping Results for Mediation
Table 7: Bootstrapped results for mediation (GHRMPs → Work engagement via HRM performance attributions)

Indirect Effect	Lower 95% CI	Upper 95% CI	Significance
0.120	0.080	0.162	Yes

Interpretation and discussion:

The bias-corrected bootstrap analysis offers compelling corroboration for the proposed mediation mechanism. Because the computed indirect path coefficient (a × b) reaches statistical significance and its 95 % confidence interval remains wholly above zero, we can infer with considerable confidence that employees' HRM-performance attributions function as a substantive psychological bridge linking Green HRM initiatives to elevated levels of work engagement. In essence, greener HR policies energize staff primarily to the extent that those policies are interpreted as credible, performance-enhancing signals—yet a sizable direct influence of GHRM persists even after this interpretive process is taken into account.

AMOS Output: Confirmatory Factor Analysis (CFA)
Table 8: Confirmatory Factor Analysis (CFA) Output - Standardized Estimates

Table 8: Confirmatory Factor Analysis (CFA) Output - Standardized Estimates

Path	Estimate	SE	CR	p
GHRMPs → HRMPAs	0.533	0.065	8.208	0.000
HRMPAs → Work engagement	0.416	0.067	6.207	0.000
Managerial support → Work engagement	0.540	0.059	9.136	0.000
GHRMPs → Work engagement	0.304	0.057	5.319	0.000

Interpretation and Discussion:
The CFA output reveals the standardized estimates for the relationships between constructs:

• Analyses indicate that Green HRM practices exert positive, statistically robust influences on both HRM-performance attributions (β = 0.533) and employee work engagement (β = 0.304), confirming their dual motivational reach.
• Perceptions of HRM performance attributions, in turn, display a noteworthy, beneficial impact on work engagement (β = 0.416), underscoring the importance of employees' interpretive frames in sustaining vigor and dedication.
• Managerial support emerges as the most potent single predictor of work engagement (β = 0.540), highlighting the critical role of supervisory backing in fostering deep involvement at work.
All structural paths achieve significance at p < 0.001, collectively attesting to a well-specified and empirically sound measurement model for the present study.
AMOS Output: Model Fit Indices
Table 9: Model Fit Indices for CFA

Fit Index	Value	Threshold	Interpretation
Chi-Square (χ^2)	245.112	< 3	Good Fit
Degrees of Freedom (df)	127	-	-

Fit Index	Value	Threshold	Interpretation
CFI (Comparative Fit Index)	0.956	> 0.90	Good Fit
TLI (Tucker-Lewis Index)	0.947	> 0.90	Good Fit
RMSEA (Root Mean Square Error of Approx.)	0.045	< 0.06	Good Fit
SRMR (Standardized Root Mean Square Residual)	0.045	< 0.08	Good Fit

Interpretation and Discussion:
The Model Fit Indices demonstrate that the measurement model fits the data well.
• The Chi-Square statistic (χ^2 = 245.112, df = 127) together with its corresponding p-value indicates that, while some discrepancy is inevitable, the divergence between the observed and model-implied covariance matrices remains well within an acceptable margin of error for complex social-science models.
• Both the Comparative Fit Index (CFI = 0.956) and the Tucker-Lewis Index (TLI = 0.947) comfortably surpass the conventional 0.90 adequacy benchmark, thereby signaling a strong incremental fit relative to a null or baseline model.
• Equally compelling, the Root Mean Square Error of Approximation (RMSEA = 0.045) and the Standardized Root Mean Square Residual (SRMR = 0.045) lie substantially beneath the stringent cut-offs of 0.06 and 0.08, respectively, providing convergent evidence of an excellent absolute and residual fit.
Taken together, these converging diagnostics affirm that the measurement model is properly specified, empirically robust, and thus eminently suitable for subsequent structural analyses and hypothesis testing.

AMOS Output: Path Coefficients
Table 10: Path Coefficients (Direct and Indirect Effects)

Path	Estimate	SE	CR	p
GHRMPs → WE	0.304	0.057	5.319	0.000
HRMPAs → WE	0.416	0.067	6.207	0.000
MS → WE	0.540	0.059	9.136	0.000
GHRMPs→ WE → HRMPAs	0.222	0.056	3.957	0.000
GHRMPs→ WE → MS	0.245	0.052	3.723	0.000

Interpretation and discussion:.
The **path coefficients** output from the **SEM** indicates the relationships between variables:
GHRM practices directly influence **Work engagement** (β = 0.304).
HRM performance attributions significantly contribute to **Work engagement** (β = 0.416).
Managerial support has the largest effect on **Work Engagement** (β = 0.540), confirming that support from management is a key determinant of work engagement in the higher education sector.
The **indirect effect** of **GHRM practices** on **Work engagement** via **HRM performance attributions** is **significant** (β = 0.222), further supporting the mediation hypothesis
The **indirect effect** of **GHRM practices** on **Work engagement** via **Managerial Support** is **significant** (β = 0.245), further supporting the mediation hypothesis

Conclusive note;

These results confirm the key relationships and mediating effects in model, with strong support for the significance of **Managerial support** and **HRM performance attributions** in influencing **Work engagement**.

Table 11: Result of hypotheses

Hypotheses	Statements	Accepted	Rejected
H-1	GHRMPs have a significant positive effect on work engagement in HEIs of Sukkur region, Sindh, Pakistan	Yes	-
H-2	GHRMPs have a significant positive effect on HRMPAs in HEIs of Sukkur region, Sindh, Pakistan	Yes	-
H-3	HRMPAs have a significant positive effect on work engagement in HEIs of Sukkur region, Sindh, Pakistan.	Yes	-
H-4	GHRMPs have a significant positive effect on managerial support in HEIs of Sukkur region, Sindh, Pakistan	Yes	-
H-5	Managerial support has a significant positive effect on work engagement in HEIs of Sukkur region, Sindh, Pakistan	Yes	-
H-6	HRMPAs have a significant positive mediating effect in the relationship between GHRMPs and work engagement in HEIs of Sukkur region, Sindh, Pakistan	Yes	-
H-7	Managerial support has a significant positive mediating effect in the relationship between GHRMPs and work engagement in HEIs of Sukkur region, Pakistan.	Yes	-

Conclusion

The present enquiry has systematically examined how Green Human Resource Management (GHRM) initiatives shape employee work engagement, foregrounding Human Resource Management (HRM) performance attributions and perceived managerial support as key intervening mechanisms within public and private higher-educational institutions which are, Arora University of Art, Architecture, Design and Heritage Sukkur, Begum Nusrat Bhutto Women University Sukkur, Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mir's, Sindh Agriculture University Khairpur Campus, Gambat Institute of Medical Science Gambat, ,Zia ud Din Medical University Sukkur, Sukkur Institute of Science and Technology, located in the Sukkur region of Sindh, Pakistan. Empirical evidence revealed that GHRM actions exert a direct, positive influence on both HRM performance attributions and work engagement. Further, that of HRM performance attributions and managerial support reflected significant mediating power hence explaining the mechanisms through which GHRM progresses in promoting employee enthusiasm, devotion and absorption. These results combined demonstrate a strong strategic reason why universities and colleges should endeavor to institutionalize environmentally responsible HR practices in the event they desire to develop a more actively involved and satisfyingly professionally engaged workforce.

Discussion

The results support a growing literature referring to a connection between environmentally oriented HR-strategies and an increase in work engagement (Renwick et al., 2013). Institutions that integrate sustainability parameters in their HR policies that include green recruitment and selection, eco-friendly performance appraisal, etc., are able to enhance employee commitment and discretionary effort. The HRM performance mediation described in the documentation gives a conceptual weight to the theories that argue that interpretations of HR motivation, fairness, and value congruence is the critical moderating factor on motivational and attitudinal outcomes (Nishii et al., 2008). In parallel, the significant value of managerial support is aligned with existing studies which state that excellent leadership and supervisory support are key ingredients of developing a psychologically gratifying working environment (Ghosh et al., 2013). Being located in a unique context of public and private higher educational institutions such as, Arora University of Art, Architecture, Design and Heritage Sukkur, Begum Nusrat Bhutto Women University Sukkur, Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mir's, Sindh Agriculture University Khairpur Campus, Gambat Institute of Medical Science Gambat, ,Zia ud Din Medical University Sukkur, Sukkur Institute of Science and Technology, located in Sukkur region, Sindh, Pakistan. the research thus provides practical lessons of how the green HRM may be mutually beneficial in strengthening the institutional performance and organizational well-being, and in bringing the scholarly missions in line with sustainability aspirations.

Limitations

Sampling Bias: The investigation was confined to public and private HEIs in the Sukkur region of Sindh, potentially curtailing the transferability of findings to other Pakistani regions or international settings.

Cross-Sectional Design: The study's cross-sectional nature limits causal inference; longitudinal research could more decisively illuminate the temporal dynamics of GHRM effects.

Self-Reported Data: Reliance on self-administered questionnaires may introduce social-desirability or common-method bias; future work could triangulate with supervisor ratings, archival records, or objective performance metrics.

Limited Variables: Only HRM performance attributions and managerial support were explored as mediators, leaving other plausible mechanisms—such as organizational culture or employee empowerment—unexamined.

Future Directions

Extended Sample Size and Geography: Subsequent studies should draw on broader, multi-regional or cross-national samples to enhance generalizability and capture contextual nuances in GHRM implementation.

Longitudinal Studies: Scholars could adopt panel or time-lagged designs to trace the enduring impact of green HRM practices on engagement and related organizational outcomes.

Additional Mediators: Future research might investigate alternative mediating constructs—such as employee creativity, perceptions of organizational justice, or work-life balance—to deepen understanding of the motivational circuitry linking GHRM to engagement.

Employee Performance: It would be advantageous to probe how GHRM practices and elevated engagement jointly translate into concrete performance indicators—teaching quality, research productivity, or administrative efficiency—within the higher-education context.

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