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Research Article

The Nexus Between Green Human Resource Management Practices and Environmental Sustainability of Tanzanian Manufacturing Firms: An Integrative Framework.

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Abstract

The study aimed to examine the influence of GHRM practices on environmental sustainability. The study used the Ability-Motivation-Opportunity (AMO) theoretical framework to achieve this objective. The study adopted a quantitative approach for data collection and analysis, whereby 250 self-administered questionnaires were distributed to human resource managers of manufacturing firms. Partial least squares structural equation modelling (PLS-SEM) was used to analyze the field data. Interestingly, the results of the study revealed that environmental sustainability is significantly and positively influenced by all of the selected GHRM practices, including green hiring, green training, and green performance management. This study contributes to the scientific body of knowledge by providing an explanation of the importance of management in attracting and retaining human resources who possess knowledge of eco-friendly practices. The study suggests that managers and policymakers in the manufacturing sector should prioritize and encourage the recruitment of a workforce with environmental awareness, introduce various green training programs to employees, and completely engage them in the implementation of sustainability practices.

Keywords: Green Human Resource Management, Environmental Sustainability, Manufacturing.

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Introduction

In today's era of globalization and a competitive business environment, organizations face increasing pressure to adopt sustainable practices (Herman, 2016; Mehta & Rajan, 2017). This is because stakeholders, policymakers, and consumers perceive that some business activities have negative consequences on the environment (Nosratabadi et al., 2019). To date, various efforts have been made by the governments and international organizations to facilitate the campaigns for promoting environmental sustainability with the focus of maintaining planetary health (Herman, 2016). As a result, companies are obliged to adopt environmentally friendly practices that would lead to sustainable development and economic growth for the current and future generations (Williams et al., 2017). Indeed, by operating in an environmentally responsible way, companies can reduce their risk of reputational damage and regulatory penalties by increasing profitability and capitalizing on the long-term well-being of the planet (Alhaddi, 2015). This makes matters related to environmental engagement an important area of interest.

At the organizational level, environmental sustainability requires employees with awareness of sustainable business strategies (Mariappanadar, 2020). Companies recognize employees with knowledge of environmental management as crucial for supporting sustainability initiatives (Mazur & Walczyna, 2020). Their commitment, support, and active participation are considered useful in embedding sustainability practices into the organizational structure.

According to Bansal et al. (2014), employees who are knowledgeable about the environmental impacts of their work can take part in sustainable actions. One way to proactively engage employees in sustainability initiatives is through green human resource management (GHRM) practices (Masri & Jaaron 2017; Amrutha & Geetha 2020).

Recently, companies have started to consider GHRM practices as one of the strategies to improve environmental sustainability (Milliman & Clair, 2017; Nisar et al., 2021). Going green means integrating environmental criteria into everyday business routines and not just a trendy label (Jerónimo et al., 2020). In practice, GHRM practices are expected to help organizations to create a working environment that is eco-friendly (Ahmed et al., 2021). According to Siyambalapitiya et al. (2018), GHRM practices encourage employees to adopt sustainable behavior and promote eco-friendly activities. Research studies generally indicate that GHRM is not a universal practice, but rather an effort to motivate business firms to enhance their environmental performance (Amrutha & Geetha, 2020). These practices include green hiring, green training, and green performance management. For instance, green hiring focuses on hiring candidates who already know about environmental management (Munawar et al., 2022). Organizations expect green hiring practices to assist in securing job applicants who have a strong commitment to supporting sustainability initiatives.

According to Nisar et al. (2021), green training is an educational program that focuses on preparing employees to have better skills in how to handle environmental issues in a sustainable way. Green training makes employees aware of the environment and assists companies in adopting eco-friendly policies (Mousa & Othman, 2020; Milliman & Clair, 2017). Green performance management has to do with evaluating, controlling, and enhancing the work performance of an employee with regard to their participation in sustainability initiatives (Pallavi & Bhanu 2016). Organizations anticipate integrating environmental sustainability criteria into employee performance measurements through green performance management (Renwick et al., 2013). It serves to encourage and motivate the efforts of employees directed toward achieving the sustainability objectives of the organization (Masri & Jaaron, 2017). Although such practices are meant to assist organizations in embracing sustainable environmental practices, earlier studies by Longoni et al. (2018) and Guerci et al. (2016) revealed that within HRM literature, green hiring, green training, and green performance management are rarely studied or empirically examined practices, despite their role in creating a working environment that is eco-friendly.

The discussion of environmental sustainability and GHRM practices in this study is centered around the manufacturing sector. This is because in Tanzania the manufacturing sector has been considered as a cornerstone that makes a significant contribution to the growth of the national economy (Wangwe et al., 2014). According to the World Bank (WB) report of 2022, in urban areas, the manufacturing sector accounts for 12% of total workers (World Bank, 2022). This implies that the sector provides employment opportunities to many people in the country.

Additionally, the sector contributes to research and development, attracts investment in countries' infrastructure, drives a country's exports, and generates revenue from the sales of goods to foreign markets, just to mention a few. Despite its importance, the sector contributes to various environmental challenges, among others, including emissions of greenhouse gases, depletion of natural resources, production of noise, water and air pollution, deforestation, and depletion of local biodiversity and ecosystems (Herman, 2016; Mehta & Rajan, 2017). This means sustainability issues in the context of the manufacturing sector need further exploration and research (Giret et al. 2015). Additionally, most of the research studies about environmental sustainability in the manufacturing sector have been conducted in developed countries, with a few in the developing world (Herrmann et al. 2014). Guerci et al. (2016) argue that there is a need for more research on environmental issues in developing countries because problems brought by environmental degradation are devastating. Therefore, this study was conducted to examine how GHRM practices can influence the environmental sustainability of organizations in the manufacturing sector based in the Tanzanian context.

Literature

Theoretical Perspectives

Grounded on the ability, motivation, and opportunity (AMO) theoretical framework, this study examines the influence of GHRM practices on environmental sustainability. This is because AMO theory has lately been considered among the theoretical frameworks frequently used in management research (Renwick et al., 2013; Iftikar et al., 2022). The main assumption of the theory is that employee performance is the result of interaction between ability, motivation, and opportunity to get the job done (Sobaih et al., 2020). The main idea is that organizations are expected to attract and develop high-performing employees through hiring and training programs that are offered within the companies (Pandey & Risal, 2025). The emphasis should be on encouraging organizations to adopt human resource management practices that improve employee abilities to perform to required standards, such as recruitment and development (Iftikar et al., 2022). Additionally, the theory argues that employees need to be motivated by management to put their abilities to perform into action through performance management, which also gives employees an opportunity to participate in the decision-making of the company (Sobaih et al., 2020).

From the sustainability perspective, the AMO theory assumes that organizations can really benefit from GHRM practices that are expected to enhance the ability, motivation, and opportunity of employees to participate in improving the environmental performance of the companies (Iftikar et al., 2022). In simple words, according to the theory, when workers have the required abilities, feel motivated, and get opportunities to contribute, they're more expected to adopt eco-friendly behaviors (Abbas et al., 2022). Furthermore, supporters of AMO believe that if workers are taught how to enhance their skills, encouraged to take action, and given the chance to be involved in green projects, they will naturally support sustainability. Green training programs play a major role in improving the ability of employees to deal with the management activities that will improve the overall environmental performance (Sobaih et al., 2020). Again, according to the theory, employee motivation can be achieved when management values sustainability and rewards eco-friendly behaviors among employees that protect the environment (Amrutha & Geetha, 2020). Lastly, the theory suggests that employees should be provided an opportunity to participate in decisions about environmental matters as well as encouraging them to share their ideas for better eco-friendly practices that can make a big difference (Sobaih et al., 2020). Additionally, according to Iftikar et al. (2022), environmental performance can be improved when organisations are informed by the AMO framework to put GHRM practices into action.

GHRM practices are expected to contribute to organizational reputation improvement and enhance employee engagement because they encourage environmentally sustainable workplace behaviors (Iftikar et al., 2022). The study selected this theory because it shows methods that manufacturing companies need to operate their HRM systems in order for employees to be successful in supporting environmental initiatives. The method creates opportunities for employees to develop their environmental competencies and skills which allows them to support eco-friendly activities effectively (Abbas et al., 2022; San Román-Niaves et al., 2025). According to the theory the use of green performance management as a strategy should lead employees to maintain sustainability principles. According to Pandey & Risal (2025) employers need to give workers access to participate in sustainability management as an initial activity after hiring them. In light of the principles of AMO theory, the objective of this study was to explain the influence of GHRM practices, specifically green hiring, green training, and green performance management, on the environmental sustainability of manufacturing firms in Tanzania.

Hypotheses Development

Green Hiring and Environmental Sustainability

Green hiring includes all processes of recruiting new employees who are ready to engage in eco-friendly work activities (Jerónimo et al. 2020). Through green hiring, companies often fill vacant positions by recruiting people who are aware of environmental management (Amrutha & Geetha 2020). Green hiring practices focus on selecting the best candidates who care about

the environment and are ready to support the sustainability initiatives of the company (Nisar et al., 2021). Further research studies indicate that hiring employees with environmental awareness improves the overall environmental performance of business firms (Cherian & Jacob, 2012; Andjarwati et al., 2019). According to Grolleau et al. (2012), newly recruited employees are expected to come up with creative and innovative ideas that can facilitate the smooth implementation of systems, processes, and policies that support environmental sustainability. Moreover, team members with an awareness of environmental issues often help the management to implement sustainability actions and socially responsible business practices (Robertson & Barling, 2013). Additionally, Pekovic (2012) and Kramar (2014) argued that green hiring can also improve organizational reputation, thus achieving a competitive advantage. From this perspective, companies known for their commitment to environmental management attract the attention of both eco-friendly employees and other relevant stakeholders (Amrutha & Geetha, 2020). As a result, these organizations tend to secure a better position in the market because they are recognized as champions of environmental sustainability (Kramar, 2014). This is due to the fact that employees with environmental expertise can help to maintain and implement policies by ensuring that investors and partners also adhere to green practices (Kramar 2014). The AMO theorists further argue that green hiring practices are expected to provide opportunities to the best candidates with unique skills to participate in environmental management (Abbas et al., 2022; Sobaih et al., 2020). Based on the above discussion, it was therefore hypothesized that;

H1: Green hiring has a positive influence on environmental sustainability.

Green Training and Environmental Sustainability

According to Jabbour and Santos (2008), employees who acquire proper training on environmental management issues demonstrate sustainable behaviors in their professional duties and personal activities. Green training programs are expected to provide people with essential environmental knowledge and skills and proper attitudes required to execute work that minimize environmental degradation (Nisar et al., 2021). Moreover, Amrutha and Geetha (2020) argued that green training programs are designed to educate employees about environmental issues, the importance of sustainability, and how their actions are impacting the environment. Other scholars believe that organizations that implement comprehensive green training programs for their employees experience a significant increase in environmental knowledge and awareness of their workforce (Yafi et al., 2021). Jackson et al. (2011) stated that employees who received green training will be useful in supporting sustainability efforts within their organizations. Studies also show that training about environmental awareness makes employees more likely to support eco-friendly activities (Mousa & Othman, 2020). Additionally, learning about sustainability can change the daily work habits of employees (Nisar et al., 2021). Additionally, based on the assumption of the AMO theory, these training programs aim to give employees the knowledge needed for putting sustainable practices into action (Fahy, 2002; Jerónimo et al., 2020). Green training programs give employees unique knowledge to make informed decisions that promote environmental sustainability (Masri & Jaaron 2017). By integrating environmental issues into the training programs of companies, organizations can create a work setting where sustainability becomes a priority agenda (Mousa & Othman 2020). Based on the above contribution, the following hypothesis was proposed;

H2: Green training has a positive influence on environmental sustainability.

Green Perfomance Management and Environmental Sustainability

Previous research studies indicated that when companies integrate environmental criteria in assessing the performance of employees, they are making employees motivated and ready to learn about the best practices of supporting environmental sustainability (Ahmed et al., 2021). Chaudhary (2019) and Jerónimo et al. (2020) further narrated that adding environmental factors to performance management can stimulate a learning mindset among employees, where they are expected to be accountable in implementing environmental sustainability.

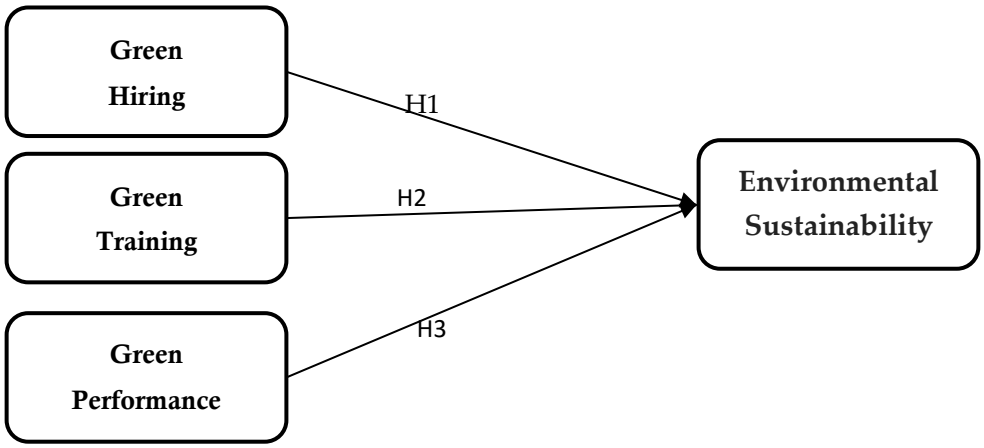
Thus, green performance management serves as the mechanism through which the management of business firms can encourage behaviors and actions that protect the environment (Shoaib et al., 2022). The empirical evidence suggests that by observing and evaluating the performance of employees against certain predetermined environmental standards, companies will be able to control individual behaviors in ways that gradually enhance overall environmental performance (Martins et al., 2021). Likewise, Kipp et al. (2012) observed that green performance management practices ensure that employees are involved and committed to supporting sustainability initiatives. Moreover, Muisyo and Qin (2021) and other scholars who support green performance management argue that the practices enhance organizational performance by increasing employee involvement, motivation, commitment, and productivity. Likewise, Masri and Jaaron (2017) further emphasized that providing employees with feedback helps them to understand areas that need improvement as well as recognize their contributions. Based on the above discussion, the following hypothesis was proposed:

H3: Green performance management has a positive influence on environmental sustainability.

Conceptual Framework

This study developed its conceptual framework as represented in Figure 1 based on theoretical and practical literature research to explain GHRM practice effects on environmental sustainability, as illustrated in the previous section.

Figure 1: Conceptual Framework



Source: Synthesized from Literature Review

This study developed its conceptual framework based on theoretical and practical literature research to explain GHRM practice effects on environmental sustainability, as illustrated in the previous section. This study hypothesized that environmental sustainability depends on three separate variables made up of green hiring, green training, and green performance management. The environmental sustainability operated independently as a single variable. The main assumption was that when manufacturing firms effectively design and implement GHRM practices, they are more expected to enhance the environmental sustainability of firms (Ahmed et al. 2021; Jerónimo et al. 2020).

Methodology

The main focus of the study was to examine the influence of GHRM practices on environmental sustainability. To achieve this objective, this study adopted an explanatory research design that relied on quantitative research methods. Quantitative research methods were suitable for this study because they helped in providing useful insights toward a greater understanding of the empirical problem under investigation in the social world (Sahu, 2013). On the other hand, explanatory research design was used as it was useful in investigating a complex phenomenon in a real-life context in order to discover the effects and nature of causal-effects relationships (Rovai et al. 2013). Human resource managers who were the respondents for this study were selected through probability sampling techniques, explicitly simple random

sampling, whereby every individual had an equal opportunity of being chosen through random number generation to be the best representative of the whole population (Taherdoost, 2016).

Human resource managers for this study were selected due to their specialized knowledge about the implementation of various GHRM practices within manufacturing firms. The study was geographically conducted in the Dar es Salaam (DSM) and Arusha regions. The underpinning reasons for the study to focus only on two regions, namely DSM and Arusha regions, were hinged on the fact that DSM was a suitable place for this study because DSM is the commercial hub as well as the dominant industrial center of the country, accounting for 33.1% of the total manufacturing firms in Tanzania (NBS, 2018). Arusha was also selected because the region is second in the country with a total of 10.3% of all manufacturing firms in the country, particularly in agricultural processing industries, including coffee and tea production, as well as food packaging and textile manufacturing (NBS, 2018). Due to the presence of many manufacturing firms, the level of environmental pollution is high in these two regions (NEMC, 2017). Therefore, the study focused on the DSM and Arusha regions to collect data from key informants. A sample size of 250 human resource managers from selected manufacturing firms was chosen. The sample size was obtained through the Yamane's formula (1967) to determine the sample size $n = \frac{N}{1+Ne^2}$ whereby n= sample size, N= population of the study, e = the acceptance sampling error (0.05). The sample size proved to be suitable by considering resources and time limitations since it was able to provide diversity of participants with necessary insights about the topic.

A deductive approach that was informed by the positivist paradigm was used in the collection of primary data. The approach involved using questionnaires to collect data directly from the human resource managers of manufacturing firms. The method was appropriate for this study because it was relatively inexpensive, quick, and efficient in gathering information from a large sample of the population (Rovai et al. 2013). In this study data collection started on July 1 and ended on September 30, 2024. The study used self-administered questionnaires to examine the influence of GHRM practices on environmental sustainability. The researcher guided human resource officers through the questionnaire filling process. For respondents who were not comfortable with this way of collecting data, they were given time to fill out the questionnaire, and then after finishing it, a researcher came to collect responses later on. This method was useful in the sense that it assured cooperation from respondents, achieving a high response rate and saving time (Tikito & Souissi 2020).

The research used quantitative methods during data analysis. PLS-SEM methods were used for data analysis because they can identify how variables are related without producing the conflicting results that can happen with other multivariate techniques (Hair et al., 2019). The researcher used PLS-SEM because it can analyze how different variables affect each other in both a combined and predictive way. The researcher used Smart-PLS 4 software to perform a test of the theoretical assumptions that established relationships between variables of interest. This software was used because, according to Hair et al. (2019), analysis of latent variable relationships and measurement model quality determination in large datasets is possible through this software.

To increase the validity and reliability of the research findings, the study began by defining key research variables, formulating research hypotheses, and developing research methods to guide the study with the purpose of achieving clarity and removing ambiguity whenever necessary. According to Tikito and Souissi (2020), these procedures ensured content validity since they are informed by the previous research. Moreover, researchers conducted an in-depth literature. review of study variables throughout the questionnaire's development. A pilot study was then conducted involving 20 HR practitioners in Dar es Salaam-based manufacturing firms to ensure that the questionnaires produced the intended results. This was done after consulting experts and experienced practitioners in the field of human resource management to provide their constructive opinions and to certify the relevance of the variables adopted by the study, its content validity, and its completion time.

Results

Demographic Characteristics of the Respondents

The results revealed that among the 235 selected respondents, male respondents were 81 (34.5%) and female respondents were 154 (65.5%). These findings reflect the operational nature of human resource management, as this job is preferably done by women over more technical jobs like engineering and technicians. The results also indicate that 59 respondents (25.1%) were single, 159 respondents (67.7%) were married, 9 respondents (3.8%) were divorced, and 8 respondents (3.4%) were either widows or widowers. It was important to consider these results in this study because marital status is expected to influence individual's perception of environmental sustainability. For instance, according to Ababneh (2021), married individuals might have different preferences or responses to GHRM practices compared to single individuals. The findings also indicate that 180 respondents (76.6%) were aged between 20-30 years, 35 respondents (14.9%) were aged between 31-40 years, 16 respondents (6.8%) were aged between 41-50 years, 4 respondents (1.7%) were aged between 51-60 years, and no one was above 60 years. This suggests that most of the participants are in mid-career stages, indicating that they could be more environmentally conscious and proactive about sustainability. Moreover, the education level of respondents revealed that many respondents hold a degree (58.3%), with a significant proportion having a master's degree (20.0%). Only a small percentage of respondents had a PhD (1.7%) or lower-level certificates (5.1%). This indicates that a significant number of respondents possess education and are likely to be familiar with sustainability initiatives. Lastly, most of the respondents have 12-15 years of working experience (50.6%), followed by those with over 20 years (34.0%), indicating a highly experienced workforce. Di Vaio and Varriale (2018) argued that employees with more years of work experience often possess deeper practical knowledge and expertise in their fields, which can significantly impact how sustainability practices are implemented. Table 1 below presents a clear picture of the demographic composition of respondents included in the study.

Table 1: Descriptive Statistics of the Respondents

Demographic	Category	Frequency	Percentage (%)
Gender	Male	81	34.5
	Female	154	65.5
Marital Status	Single	59	25.1
	Married	159	67.7
	Divorced	9	3.8
	Widow/Widower	8	3.4
Age Group	20-30 years	180	76.6
	31-40 years	35	14.9
	41-50 years	16	6.8
	51-60 years	4	1.7
	Above 60 years	0	0
Education Level	Certificate	12	5.1
	Diploma	35	14.9
	Degree	137	58.3
	Masters	47	20
	PhD	4	1.7
Working Experience	1-4 years	8	3.4
	4-8 years	6	2.6
	8-12 years	22	9.4
	12-15 years	119	50.6
	Above 20 years	80	34

Source: Field data (2024)

Measurement Model Evaluation Results

The reliability assessment of reflective measurements used indicator loading as the evaluation method in this study. The achievement of indicator reliability happens when the standardized outer loading reaches 0.708 or higher (Kimberlin & Winterstein, 2008). The analysis confirmed good indicator reliability based on outer loading since 26 measurement items exceeded the recommended threshold of 0.7 (Kimberlin & Winterstein, 2008). According to Hair et al. (2019) and Saunders et al. (2018), during data analysis, researchers should remove indicators with outer loadings lower than 0.4 since they can affect findings reliability and validity. The researcher eliminated three (3) measurement items because they produced outer loadings lower than 0.4 in this stage. The researchers eliminated loading factors under 0.4 since their removal enhanced the values of AVE and composite reliability.

This study applied Cronbach's alpha and composite reliability for analyzing internal consistency reliability throughout the research. According to Hair et al. (2019), a measurement tool demonstrates internal consistency if its Cronbach's alpha values exceed 0.7. This research used composite reliability to surpass Cronbach's alpha limitations because this procedure enables to complete observation of measurement instrument internal consistency (Hair et al., 2021). Based on the explanation above Table 2 presents results for assessing internal consistency through Cronbach's alpha and composite reliability. The assessment tool achieved reliability results exceeding 0.7 which demonstrates the instrument has demonstrated strong internal consistency.

The researchers assessed convergent validity through Average Value Extracted (AVE). According to Hair et al. (2019), a construct shows good convergent validity only if its AVE goes above 0.5. All the AVE values measured in Table 2 achieved minimum thresholds of 0.5 which demonstrates convergent validity of the study variables. On the other hand, the research used the Heterotrait-Monotrait ratio (HTMT) as a method that helps researchers to decide if the constructs are truly different by comparing the correlations between them. Usual thresholds for HTMT tend to be around 0.85 or 0.90 (Henseler et al., 2015; Sarstedt et al., 2022).

The current study results demonstrate the model shows strong discriminant validity. The research shows that most HTMT scores fell below 0.85 except for one score at 0.873 (GT*ES). The constructs shared conceptual similarities in measuring research constructs based on the HTMT values exceeding 0.85, even though one result (GT*ES) crossed 0.85 but fell short of 0.90 according to recommendations from Hair et al. (2021), Henseler et al. (2015), and Sarstedt et al. (2022). In research, this indicates that the model has good discriminant validity, and the measurement methods used were appropriate.

The results presented in Table 3 below illustrate the HTMT values used to evaluate discriminant validity among constructs in the measurement model.

Table 3: Heterotrait-Monotrait Ratio (HTMT) results

	ES	GH	GPM	GT
ES				
GH	0.823			
GPM	0.698	0.503		
GT	0.873	0.822	0.627	

Source: Field data (2024)

Table 2: Measurement Model Evaluation Results

Construct	Items	Outer Loading	Cronbach's Alpha	rho_A	Composite Reliability	AVE	VIF
GH	GH1	0.756	0.869	0.873	0.902	0.605	1.769
	GH2	0.765					1.817
	GH3	0.782					1.821
	GH4	0.727					1.746
	GH5	0.789					1.969
	GH6	0.843					2.329
GT	GT1	0.754	0.908	0.911	0.926	0.609	2.023
	GT2	0.760					2.167
	GT3	0.801					2.408
	GT4	0.810					2.292
	GT5	0.764					2.007
	GT6	0.763					2.125
	GT7	0.779					2.492
	GT8	0.810					2.511
GPM	GPM1	0.756	0.892	0.900	0.915	0.606	2.265
	GPM2	0.712					1.870
	GMP3	0.783					2.161
	GPM4	0.744					2.071
	GPM5	0.847					2.678
	GMP6	0.831					2.639
	GPM7	0.767					2.205
ES	ES2	0.790	0.833	0.838	0.882	0.600	1.890
	ES4	0.703					1.616
	ES6	0.806					1.803
	ES7	0.809					2.000
	ES8	0.761					1.701

The Structural Model Evaluation Results

Multicollinearity Results (VIF)

According to Sarstedt et al. (2022), it is generally recommended to check for collinearity before measuring the path relationships in a reflective model. This ensures that the researcher can accurately estimate hypothetical relationships between variables and interpret research results in a valid manner (Hair et al. 2021). Most of the time, biased estimates of path coefficients due to high collinearity compromise the model's reliability (Sarstedt et al., 2022). Many scholars recommended the Variance Inflation Factor (VIF) as the statistical instrument for detecting collinearity, with a recommended threshold value of 3.3. The results presented in table 2 above show that the VIF score falls below that threshold, indicating that collinearity isn't really presenting any complications in the results. All in all, these results imply that multicollinearity isn't a problem within this study, so model estimation and interpretation proceed without those extra challenges.

Coefficient of Determination (R^2), Effect Size (F^2), Predictive Relevance (Q^2).

The model's Explanatory power of the model was explained using the coefficient of determination (R^2). The general rule of thumb in social science research is that an R^2 of approximately 0.67 is considered strong power, 0.33 is considered moderate power, and near 0.19 is considered weak power (Hair et al., 2019; Sarstedt et al., 2022). In this study, the R^2 values for environmental sustainability are 0.675, and the R-square adjusted is 0.670, as demonstrated in Table 4. In essence, this implies that the independent variables, specifically GHRM practices, are responsible for approximately 67.5% of the environmental sustainability that we observe. Other variables can explain approximately 32.5% of the variation.

Table 4: Coefficient of Determination (R^2) & Predictive Relevance Stone-Geisser's (Q^2)

	R Square	R Square Adjusted	Q square
Environmental Sustainability (Direct Effects)	0.675	0.670	0.656

Source: Field data (2024)

Additionally, Stone-Geisser Q^2 was adopted in this study due to its capacity to predict endogenous variables (Chin, 1998; Hensler et al., 2016). The researcher was able to evaluate the model's practical relevance for decision-making and predictions with the assistance of Q^2. Memon et al. (2021), Hair et al. (2021), and Sarstedt et al. (2022) have established the rule of thumb that predictive power is small, medium, and large when Q^2 values exceed 0, 0.25, and 0.50, among other general parameters. The Q^2 values in Table 4 were 0.656, which suggests a high degree of predictive relevance, as they exceed 0.5. Furthermore, the extent of the relationship between environmental sustainability and GHRM practices was assessed using the effect size (f^2) in this study. The general principle for interpreting f^2 is that $f^2 = 0.02$, $f^2 = 0.15$, and $f^2 = 0.35$ for small, medium, and large values (Shmueli & Koppius, 2011; Raithel et. al. 2012). Table 5 below demonstrates that the f^2 results of the direct relationships with their corresponding values were as follows: GH -> ES f2=0.122, GT ->ES F2 0.203, and GPM ->ES f^2 0.127. These results suggest that f^2 exceeds the minimum required threshold of 0.02, which is considered to be a modest effect size.

Model Assessment

The primary objective of the study was to examine the influence of GHRM practices on environmental sustainability. The results of table 5 below demonstrate that the endogenous variable (GHRM) is significantly and positively influenced by all of the exogenous variables (environmental sustainability). The results of this study demonstrated a significant and positive relationship between environmental sustainability and green hiring ($\beta = 0.291$, $p < 0.001$), leading to the acceptance of hypothesis (H1). Again, the results demonstrated that green training has a positive and significant impact on environmental sustainability ($\beta = 0.411$, $p < 0.001$), indicating that hypothesis (H2) was supported. Finally, the results demonstrated that green performance management has a positive and significant impact on environmental sustainability ($\beta = 0.249$, $p < 0.001$), thereby supporting the hypothesis (H3).

Table 5: Hypothesis Testing

No	Path	Std. BeTa (β)	Std. Error	T-value	P-value	F^2	95% CI	Decision
H1	GH -> ES	0.291	0.070	4.160	0.001	0.122	[0.175;0.405]	Supported
H2	GT -> ES	0.411	0.066	6.248	0.001	0.203	[0.306;0.519]	Supported
H3	GPM -> ES	0.249	0.052	4.825	0.001	0.127	[0.164;0.337]	Supported

The findings of the study after doing two-tail test analysis also revealed that the cutoff of T-values are above >1.96, indicating that there is a significant relationship between GH -> ES at the confidence intervals [0.175:0.405], GT -> ES at the confidence intervals [0.306;0.519], and GPM -> ES at the confidence intervals [0.164;0.337]. This shows that the decisions regarding the direct relationships were suitable and supported for further discussion.

Discussion of the Results

The current study's findings, guided by AMO theory, demonstrated a significant relationship between GHRM practices and environmental sustainability. Specifically, the findings revealed that green hiring has a positive and significant influence on environmental sustainability. This result aligns with previous studies by Siyambalapitiya et al. (2018) and Pekovic (2012), which demonstrated that organizations that prioritize hiring employees with environmental competencies can gain a competitive advantage, ultimately leading to environmental sustainability. Empirically, this study suggests that companies that focus on recruiting employees who care about the environment often lead to the effective implementation of sustainability principles. In most cases, green hiring leads to the creation of a team that can effectively implement eco-friendly practices within a business environment (Amrutha & Geetha 2020). Previous research by Jamil et al. (2023) and Martins et al. (2021) also cemented the idea that green hiring can influence individuals to support sustainability initiatives. Furthermore, Cherian and Jacob (2012) argued that by recruiting candidates with knowledge of the environment and a green mindset, they can ensure sustainability is a main agenda throughout the organizations. Moreover, when companies consider sustainability factors in hiring workers, as Shahrulnizam et al. (2024) found, businesses will be in a better position to get rid of practices that harm the environment since employees will also be directly involved in environmental management.

The second objective of the study was to examine the influence of green training on environmental sustainability. The results of the study supported the H2 by confirming that there is a positive and significant influence of green training on environmental sustainability. The findings revealed that by educating employees on sustainable practices and environmental management systems, companies can significantly reduce the impacts of the companies on the environmental degradation by providing an ability to employees to deal with environmental management. This aligned with the findings of Jabbour and Santos (2008), Chaudhary (2019), and Milliman and Clair (2017), who together agreed that companies that implement comprehensive green training programs have good advantages for implementing sustainable practices. According to Fahy (2002) and Jerónimo et al. (2020), these practices empower employees with green skills that will contribute to the overall environmental performance of the business organizations. Again, Yafi et al. (2021) argued that including green values in employee training helps to align employees attitudes with the company's sustainability objectives, which leads to improved environmental performance. Moreover, the findings of this study align with Esen and Caliskan (2019), who stated that green training empowers employees to adopt environmental practices, thus leading to reduced resource consumption, minimized waste generation, and improved operational efficiency. In this study, it was generally understood that green training is an important instrument in promoting pro-environmental behavior among employees. Previous studies by Marumbu et al. (2024) and Odhiambo et al. (2023) indicate that training programs that are offered encourage active participation in sustainability initiatives that ultimately improve employee performance by encouraging competencies that are crucial for implementing sustainable practices.

Lastly, the study examined how green performance management practices influence environmental sustainability. The results of the study demonstrated that green performance management practices maintain a direct positive relationship to environmental sustainability. Awwad Al-Shammari et al. (2022) also found that organizations that integrate environmental indicators within procedures for assessing employee performance produce staff with enhanced environmental consciousness, which leads business performance toward sustainability. In the same line of argument, Abbas et al. (2022) and Sobaih et al. (2020) also argued that often, green performance management encourages workers to adopt eco-friendly behaviors that align with the environmental goals of firms. Empirically, study results show that organizations that perform green performance assessment standards demonstrate greater success in environmental sustainability due to their ability to monitor people's actions. Green performance management leads employees to choose environmentally friendly practices, which make sustainability the fundamental core of business operations (Ahmed et al., 2021; Shoaib et al., 2022). The study's findings supported the idea of AMO theory by showing that green performance management practices encourage employees to commit to sustainability in their organizations. Workers show better motivation toward adopting sustainable daily practices if they understand their performance evaluations utilize environmental criteria (as per Delmas & Toffel 2008). Additionally, Aggarwal et al. (2023) contend that incorporating environmental objectives into performance assessments can enhance employees' environmental awareness, thereby facilitating more effective implementation of green initiatives. In fact, as Shoaib et al. (2022) and Tang et al. (2018) have further suggested, by improving environmental performance, raising employee involvement, and also reinforcing a company's green standards, green performance management remained an important component in enhancing the environmental sustainability of business firms.

Conclusion and Implications of the Study

Due to the limited research available on GHRM, the results of the current study provide new evidence that green hiring, green training, and green performance management are the important GHRM practices in influencing environmental sustainability. Furthermore, grounded on the AMO theoretical framework, this research contributes to environmental sustainability literature through its emphasis that modern organizations, specifically manufacturing companies, need to follow sustainability guidelines to obtain business benefits by managing human resources effectively. The study reveals beneficial insights about the integration between sustainability and GHRM and how companies can use sustainable recruitment along with training and performance models. The study presents critical information to managers along with practitioners, especially in manufacturing firms who need to understand why sustainability initiatives should be implemented in their organizational framework. Based on the findings, managers should demonstrate their commitment to sustainability through their actions. The study also informs policymakers to develop and implement policies that are directly related to the promotion and protection of the environment in the manufacturing sector. Efforts should be made by managers to advocate for sustainability through public education campaigns that encourage businesses in the manufacturing industry and their employees to adopt eco-friendly practices.

The current research, despite its valuable findings, exhibited several limitations. The analysis of environmental sustainability in this study relied solely on three GHRM practices, including green hiring, green training, and green performance management. Future research investigating GHRM practices should increase their scope to include several qualifying practices that did not appear in the present study. The investigation concentrated solely on environmental sustainability, while other sustainability elements, like economic and social sustainability, require research to understand sustainability agenda implications more broadly. Lastly, investigating environmental sustainability through GHRM practices in one industry (manufacturing) is insufficient. More studies need to be done since examining the nexus between GHRM practices and environmental sustainability is equally important in other industries where environmental issues are a matter of concern.

Declaration

During the manuscript preparation, the authors used QuillBot for language and grammar improvements. There was no content generated or analyzed by using this tool. The researchers proceeded by reviewing and editing the content as required and assumed full responsibility for the content of the published article.

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