

DOES GREEN HUMAN RESOURCES MANAGEMENT PAY OFF? THE MEDIATING ROLE OF GREEN INNOVATION AND EMPLOYEE ATTITUDE IN SUSTAINABLE SUPPLY CHAIN MANAGEMENT

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Abstract. This research demonstrates that the relationship between Green Human Resource Management (GHRM) practices and Sustainable Supply Chain Management (SSCM) performance is mediated by organizational capabilities rather than a direct process, and this effect is supported by the Resource-Based View (RBV).

Research methodology – For the study, data were collected from a total of 476 participants from 71 companies operating in the textile sector and engaging in green management processes in the Southeastern Anatolia Region of Turkey. The significant role the region plays in machine-made carpet production was a key factor in this selection.

Findings – It has been observed that GHRM enhances a company's product and process innovation capacity; it also reveals a critical distinction between the impacts of different innovation types. Process innovation plays a strong role in enhancing environmental performance through internal improvements. Additionally, it has been observed that concern is a stronger motivator than knowledge in achieving sustainability goals.

Research limitations – The cross-sectional design of the study limits definitive proof of causal relationships between variables, it is recommended that future studies utilize longitudinal designs that can monitor the long-term effects of GHRM.

Practical implications – The social aspect of sustainability in SSCM can be achieved by visible product innovations. Additionally, the perception gap between senior management and operational employees has been identified as the primary obstacle to implementing sustainability strategies. It has been emphasized that addressing this gap requires mobilizing emotional concern, a driving force stronger than purely cognitive knowledge.

Originality/Value – This study brings together a detailed model by examining the effect of GHRM on SSCM relationship mediated by different innovation and attitude types simultaneously. This gives a more nuanced and applicable information.

Keywords: green human resources management, sustainable supply chain management, environmental attitudes, green innovation.

JEL Classification: M0, M12.

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1. Introduction

The pressures created by the climate change crisis, shifting environmental perceptions and expectations of stakeholders, and accordingly tightening legal regulations obligate businesses to transition from traditional profit-focused approaches to sustainability-focused strategies (Seuring & Müller, 2008). However, simply being environmentally friendly within a company's own borders is no longer considered sufficient. Sustainable Supply Chain Management (SSCM), which optimizes all processes from raw material procurement to final product

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distribution across environmental, social, and economic dimensions, is becoming the new determinant of competitiveness (Carter & Rogers, 2008). A review of the literature reveals that studies on improving SSCM performance largely focus on technical and operational factors such as technological investments, logistics optimization, and supplier selection (Dubey et al., 2017). However, the fact that the human factor is the primary factor in planning, implementing, and sustaining this green transformation in the supply chain is often overlooked. According to the Resource-Based View (RBV) theory, organizations need internal capabilities that are difficult to imitate to achieve a sustainable competitive advantage, and environmentally conscious human resources are at the forefront of these capabilities (Hart, 1995; Renwick et al., 2013). In this context, Green Human Resource Management (GHRM) stands out as a strategic lever that triggers SSCM performance by increasing employees' green skills, motivation, and opportunities.

Another important gap in existing literature is that the mechanisms involved in the performance-transformation process of GHRM have not been fully elucidated. While GHRM is known to increase innovation capabilities (Song et al., 2021), empirical studies on how different types of innovation, such as Green Product Innovation (GINPD) and Green Process Innovation (GINPR), differentially affect the sub-dimensions of supply chain performance – Environmental Sustainability (ENS), Social Sustainability (SOS), and Economic Sustainability (ECS) – are limited. More importantly, while employee environmental attitudes are generally addressed in the literature within the axis of Environmental Knowledge (EK) and the impact of the concept of Environmental Concern (EC), which refers to individuals' concern and sense of responsibility for environmental issues, on organizational behavior, and particularly on SSCM, is a unique area that has not yet been adequately researched.

This study aims to make an addition to these gaps in the literature by examining the impact of GHRM practices on SSCM with a holistic model. The study has a unique value in that it tests how GHRM contributes to SSCM performance by transforming not only Green Product Innovation (GINPD) and Green Process Innovation (GINPR), the foundations of innovation capacity, but also employees' Environmental Attitudes (EA) using the Chain Intermediation model.

In this context, the research questions sought to be answered within the framework of the primary objective of the study are presented below:

- RQ1: How do GHRM practices affect the organization's GINPD and GINPR capacity?
- RQ2: Are GHRM practices effective in transforming employees' individual environmental attitudes (EC and EK)?
- RQ3: How do GINPD and GINPR affect the sub-dimensions of SSCM (ENS, SOS, ECS)?
- RQ4: Are EC and EK developed among employees a significant mediating mechanism in improving supply chain performance?
- RQ5: What roles do green innovation capabilities and employee attitudes play in the impact of GHRM on SSCM performance?

By answering the above research questions, we aim to provide a clearer perspective on the contributions that GHRM can make to more sustainable supply chains. The Section 2 of the study includes a literature review that provides a conceptual synthesis of previous studies and the variables discussed. The Section 3 follows the methodology section, which provides information on the instruments used in the research. The Section 4 presents the findings from the analysis. The Section 5 includes the interpretation of the findings, discussion, and limitations of the research.

2. Literature

2.1. Green Human Resource Management (GHRM)

While the importance of technology and financial resources in achieving sustainability goals is undeniable, the primary element that manages these resources and translates green strategies into action is human resources. In the literature, GHRM is defined as the restructuring of human resource functions, such as recruitment, training, performance evaluation, and compensation, with a green perspective to achieve environmental sustainability goals (Renwick et al., 2013). GHRM is not merely an operational environmental management tool. It is the process of creating a strategic talent pool that builds environmental awareness and competence across the entire value chain of the company.

Analyzing the theoretical foundations of GHRM reveals that this concept is particularly well-grounded in the RBV and AMO (Ability-Motivation-Opportunity) theories. According to the RBV theory, a human resource that is environmentally conscious and proficient in green processes is a strategic "internal resource" that cannot be easily replicated by competitors (Hart, 1995). GHRM practices activating this strategic resource by enhancing employees' green capabilities through training, motivating them with green rewards, and providing opportunities for them to present their green ideas.

In the context of supply chain management, GHRM has the potential to transform employees from individuals who simply follow orders into proactive actors who anticipate environmental risks and develop effective solutions. This transformation primarily occurs through two primary channels: First, the ability to innovate, triggered by increasing employees' technical capacity. Second, the attitude shift that occurs among employees through the internalization of the organization's commitment to the environment. Green recruitment and training processes, in particular, directly nourish a company's GINPD and GINPR capacity, while green performance management and culture can be considered tools that increase employees' EK and EC levels (Song et al., 2021).

2.2. Environmental Attitude (EA): Environmental Knowledge (EK) and Environmental Concern (EC)

SSCM can achieve success not only through the improvement of technical processes but also through the transformation of the environmental attitudes of the individuals managing these processes. While employee attitudes toward the environment are generally considered one-dimensional in the GHRM literature, this study examined employee attitudes in two dimensions: EK and EC, in line with the distinction between "Cognitive" and "Affective" in social psychology. EK represents an individual's level of knowledge about environmental problems, while EC represents the individual's sense of concern and responsibility in the face of these problems (Dunlap & Jones, 2002).

Environmental Knowledge (EK) constitutes the cognitive dimension of employee attitudes, encompassing the ability to comprehend the impact of an organization's activities on the natural environment. According to the Theory of Planned Behavior (Ajzen, 1991), knowledge and awareness are the fundamental elements shaping behavior. Employees whose environmental

awareness increases through GHRM practices are expected to adhere more strictly to waste management procedures and act more competently in achieving environmental goals. However, whether simply being “informed” directly translates into economic or social outcomes is a controversial issue in the literature.

Environmental Concern (EC), on the other hand, is the affective dimension of attitude and a deeper source of motivation on which this study focuses. This concept, defined in the literature as “Environmental Concern”, refers to individuals’ sensitivity to environmental problems and their desire to be part of the solution (Bamberg, 2003). An employee concerned about the environment not only complies with regulations but also develops an intrinsic motivation to conserve resources, prevent waste, and save energy. Chan and Lau (2000) argue that affective concern is a more powerful behavioral driver than mere cognitive knowledge.

The literature examining the relationship between GHRM practices and SSCM argues that this relationship is shaped by complex intermediary mechanisms that transform a company’s internal capabilities and human capital, rather than a direct and linear process. From the perspective of RBV theory, human resource practices alone do not create a sustainable competitive advantage. However, these practices are reflected in performance when they transform a company’s organizational capabilities and employee psychological states into strategic outcomes (Wright et al., 2001). In this context, this study proposes a holistic model that synthesizes two main mechanisms: the “Capability-Focused Path” (Green Innovation: GINO) and the “Attitude-Focused Path” (Environmental Attitude: EA) to explain the transformative impact of GHRM on supply chain performance.

In the capability-based dimension of the research, GHRM practices are assumed to function as a strategic catalyst that triggers a company’s GINO capacity. Achieving environmental sustainability goals in supply chain processes necessitates the technical improvement of existing operational processes or the development of entirely new green products. GHRM transforms this necessity into an innovation opportunity by equipping employees with green competencies and providing a participatory environment where they can present their ideas (Song et al., 2021). In this context, GINPDR, developed with GHRM support, is likely to contribute to SSCM performance dimensions by strengthening the company’s market reputation and legitimacy with stakeholders. GINPR, which encompasses technical improvements in production and logistics processes, has the potential to directly enhance ENS and ECS through increased resource efficiency and reduced waste (Chen & Paulraj, 2004). Therefore, GINO serves as a strategic bridge between GHRM and multidimensional supply chain performance.

In the psychological and attitudinal dimensions of the study, it is argued that GHRM impacts performance by transforming employees’ mindsets. A company’s emphasis on environmental responsibility throughout all processes, from recruitment and performance to training and compensation, sends a strong corporate message to employees. This message not only increases employees’ EK, which represents a level of cognitive awareness, but can also trigger a sense of responsibility and concern for environmental issues, or EC. Employees concerned about the environment are expected not only to comply with established rules but also to proactively engage in voluntary behaviors, such as energy conservation, waste prevention, and efficient resource use (Bamberg, 2003). This protection drive among employees leads to reduced costs and increased productivity across the company and may create one of the strongest channels for transferring GHRM practices’ influence into SSCM.

Considering these theoretical justifications and synthesis, the mediation hypotheses underlying the research are presented below:

- **H1:** *GINPD mediates the relationship between GHRM and SSCM performance dimensions.*
- **H2:** *GINPR mediates the relationship between GHRM and SSCM performance dimensions.*
- **H3:** *EK mediates the relationship between GHRM and SSCM performance dimensions.*
- **H4:** *EC mediates the relationship between GHRM and SSCM performance dimensions.*

The methodological steps followed in testing the hypotheses formulated based on the review of the relevant literature are outlined in Section 3.

3. Methodology

This section of the study covers the scales used, sample selection, and the research model. Scale developed by Guerci and friends (2016) were used to measure the GHRM dimension; Cheng and Shiu (2012) for GINPD and GINPR; Munawar et al. (2022) for EK; Raineri and Paillé (2016) for EC; Zhu et al. (2008) for ENS; Paulraj et al. (2017) for SOS; and Zhu et al. (2013) for ECS performance. The survey form included 50 questions related to the scales, as well as demographic data.

For the study, data were collected from a total of 476 participants from 71 companies operating in the textile sector and engaging in green management processes in the South-eastern Anatolia Region of Turkey. The significant role the region plays in machine-made carpet production was a key factor in this selection. Furthermore, the region, undergoing a transformation process, represents a sample worthy of examination in terms of green management processes.

As mentioned in the previous section of the study, the SSCM performance sub-dimensions are the dependent variables, while GHRM is the independent variable. EK, EC, GINPR, and GINPD serve as mediating variables in this relationship. In the research model in Figure 1, variables are grouped under the related roof variable for parsimony. However, because the study aimed to observe the effects of each dimension separately, analyses were conducted on each sub-dimension.

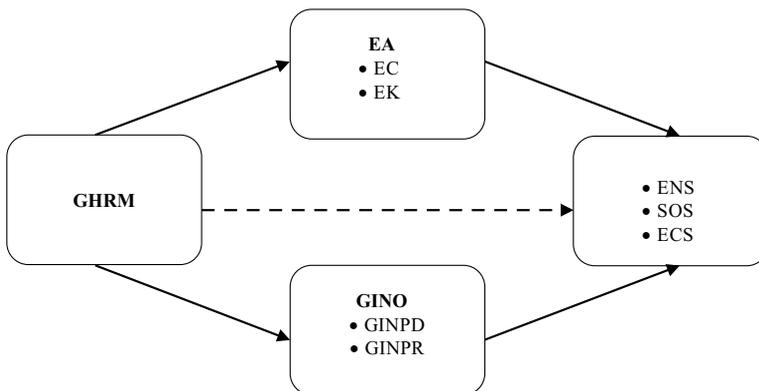


Figure 1. Research model

The research hypotheses are represented by continuous lines, while the background assumption for the GHRM-SSCM relationship is given by a dashed line. The following section presents the findings of the analyses conducted in line with the hypotheses proposed above and in accordance with the established research pattern.

4. Findings

This section analyses the data compiled for the research. The section covers sample information, validity and reliability analyses, and hypothesis testing. RStudio was used extensively in data analysis.

Table 1. Demographics

Variable	Group	Frequency	Percent
Gender	Female	295	62
	Male	181	38
Marital status	Married	251	52.7
	Single	225	47.3
Age	18–29	261	54.8
	30–39	120	25.2
	40–49	51	10.7
	50 years +	44	9.2
Education	Secondary Education	121	25.4
	High School	185	38.9
	Bachelor	122	25.6
	Graduate	48	10.1
Experience	1–5	178	37.4
	6–10	122	25.6
	11–15	66	13.9
	16–20	60	12.6
	21 years +	50	10.5
Title	Officer	78	16.4
	Specialist	180	37.8
	Dept. Manager	96	20.2
	CEO/General Manager	60	12.6
	Owner/Partner	62	13

Table 1 shows an examination of the demographic profile of the participants reveals that the gender distribution was 62% female and 38% male. In terms of marital status, 52.7% of the participants were married, and 47.3% were single. The age distribution reveals that the sample was predominantly comprised of young employees. More than half of the participants (54.8%) were between the ages of 18–29, followed by the 30–39 age group with 25.2%. In terms of education level, the largest group in the sample consisted of college graduates (38.9%), while 25.6% held a bachelor's degree and 10.1% held a postgraduate degree.

In terms of professional experience, 37.4% of the participants had 1–5 years, and 25.6% had 6–10 years. The proportion of experienced employees with 16 years or more of experience is 23.1% in total. The highest proportion of the distribution of internal job titles is in the specialist position at 37.8%. This is followed by department managers at 20.2% and officer positions at 16.4%. The total proportion of top management (CEO and company owner/partner) is approximately 25.6%.

4.1. Validity and reliability

In this section, Cronbach's Alpha coefficients were calculated to test the internal consistency and reliability of the scales used in the study. In literature, an Alpha coefficient above 0,70 is expected for a scale to be considered reliable (Hair et al., 2009).

Table 2. Cronbach scores

Variable	Items	α
GHRM	9	0.969
GINPD	5	0.952
GINPR	5	0.913
ENS	6	0.925
SOS	12	0.970
ECS	4	0.812
EK	3	0.848
EC	6	0.860

An examination of Table 2 reveals that Cronbach's alpha values for all scales in the study ranged from 0.812 to 0.970. The reliability levels of the GHRM ($\alpha = 0.969$) and SOS ($\alpha = 0.970$) scales were found to be excellent. Even the ECS scale ($\alpha = 0.812$), which had the lowest coefficient, was well above the acceptable limit.

These findings demonstrate that the internal consistency of the measurement instruments used was decent, the items successfully represented the relevant construct, and the data were suitable and reliable for further statistical analyses.

The exploratory factor analysis, the Average Variance Explained (AVE), and Composite Reliability (CR) values were conducted to test the structural validity of the scales used in the study, and the suitability of the data set for factor analysis is presented in Table 3.

The Kaiser-Meyer-Olkin (KMO) sample adequacy value is 0.900, and the Bartlett test of Sphericity result is statistically significant ($p < 0.001$). These values indicate that the data set is well-suited for factor analysis and that the data meet the assumptions of a multivariate normal distribution. The factor structure resulting from the analysis explained 62.416% of the total variance. Considering that 50% or more of the explained variance is considered sufficient in social sciences, this ratio proves that the scales have a strong structural representation.

Table 3. EFA–AVE & CR scores

Item	Load	L ²	AVE	√AVE	1-L ²
ghr1	0.767	0.588	0.639	0.799334271	0.412
ghr2	0.797	0.635			0.365
ghr3	0.804	0.647			0.353
ghr4	0.806	0.650			0.350
ghr5	0.808	0.654			0.346
ghr6	0.802	0.644			0.356
ghr7	0.812	0.660			0.340
ghr8	0.813	0.661			0.339
ghr9	0.782	0.612			0.388
ek1	0.700	0.490	0.510	0.714489597	0.510
ek2	0.764	0.583			0.417
ek3	0.677	0.458			0.542
ec2	0.724	0.524	0.571	0.755341554	0.476
ec3	0.540	0.292			0.708
ec4	0.821	0.674			0.326
ec5	0.835	0.697			0.303
ec6	0.815	0.665			0.335
ens1	0.723	0.523			0.641
ens2	0.747	0.558	0.442		
ens3	0.824	0.680	0.320		
ens4	0.835	0.697	0.303		
ens5	0.850	0.722	0.278		
ens6	0.817	0.667	0.333		
sos1	0.634	0.402	0.636	0.79741883	0.598
sos2	0.718	0.516			0.484
sos3	0.837	0.701			0.299
sos4	0.808	0.652			0.348
sos5	0.834	0.696			0.304
sos6	0.868	0.753			0.247
sos7	0.828	0.685			0.315
sos8	0.825	0.681			0.319
sos9	0.813	0.661			0.339
sos10	0.782	0.611			0.389
sos11	0.766	0.587			0.413
sos12	0.829	0.687			0.313
ecs1	0.770	0.592	0.511	0.714515652	0.408
ecs2	0.643	0.414			0.586
ecs3	0.780	0.608			0.392
ecs4	0.654	0.428			0.572

End of Table 3

Item	Load	L ²	AVE	√AVE	1-L ²
ginpd1	0.767	0.588	0.639	0.799679135	0.412
ginpd2	0.814	0.663			0.337
ginpd3	0.816	0.665			0.335
ginpd4	0.813	0.660			0.340
ginpd5	0.788	0.621			0.379
ginpr1	0.706	0.499	0.600	0.774864843	0.501
ginpr2	0.728	0.530			0.470
ginpr3	0.801	0.642			0.358
ginpr4	0.829	0.687			0.313
ginpr5	0.803	0.645			0.355
KMO: .900; Chi ² : 27964.07; df: 1225 sig: .000; TVE: %62.416 λ: 38.118; λ ² : 29.855; ε: 19.145; N: 49; AVE: 0.601549; CR: 0.9875					

When the factor loadings of the scale items are examined, it is seen that the values range from 0.540 to 0.868, and all items are above the acceptable lower limit of 0.50. This indicates that the items successfully represent the relevant theoretical construct. AVE values calculated for convergent validity, a key indicator of structural validity, were found to range between 0.510 and 0.641 for all dimensions, exceeding the reference threshold of 0.50. This finding confirms that each factor is highly explained by its individual items. Furthermore, the CR value, which indicates the internal consistency and reliability of the scales, is quite high at 0.98, demonstrating that the measurement tools produce error-free and consistent results. Consequently, when factor loadings, explained variance, AVE, and reliability coefficients are evaluated as a whole, it is understood that the data collection tools used in the research model possess structural validity and high reliability.

Discriminant validity analysis was conducted to test the degree to which the latent variables in the research model statistically differ from each other and whether each scale measures the targeted construct independently of the other constructs.

Table 4. Fornell-Larcker criteria & correlations

	ghr	ek	ec	ens	sosc	ecs	ginpd	ginpr
ghr	0.799	.154**	.410**	.154**	.691**	.239**	.528**	.159**
ek	.154**	0.714	.226**	.532**	.165**	.293**	.177**	.613**
ec	.410**	.226**	0.755	.289**	.341**	.561**	.303**	.285**
ens	.154**	.532**	.289**	0.801	.189**	.277**	.261**	.585**
sos	.691**	.165**	.341**	.189**	0.797	.315**	.582**	.176**
ecs	.239**	.293**	.561**	.277**	.315**	0.715	.308**	.348**
ginpd	.528**	.177**	.303**	.261**	.582**	.308**	0.800	.204**
ginpr	.159**	.613**	.285**	.585**	.176**	.348**	.204**	0.775

In this context, when the correlation matrix generated based on the Fornell-Larcker criterion is examined, it is observed that the values in the diagonal of the matrix, representing the square root of the AVE value of each variable, are higher than all pairwise correlation coefficients of the relevant variable with other variables (Table 4).

While the AVE square root of the GHRM variable is 0.799, its highest correlation with other variables is 0.691 with SOS. Similarly, while the ENS variable has an eigenvalue of 0.801, its correlation with GINPR, with which it is most strongly correlated, remains at 0.585. The fact that the diagonal values (between 0.714 and 0.801) for all variables in the Table 4 are greater than the correlation values in the rows and columns (between 0.154 and 0.691) demonstrates that the scales are not intertwined and that each construct is empirically differentiated from the others. Furthermore, the fact that all correlation coefficients between variables are below the 0.85 threshold indicates that there is no multicollinearity problem at the variable level in the data set and that structural model analyses can be conducted on a reliable basis.

When the goodness-of-fit indices calculated to test the fit of the Structural Equation Model (SEM) established within the scope of the research with the data set were examined, it was observed that the model had a generally high level of acceptable fit.

Table 5. Model fit indices

Indices	Criteria	Finding
CMIN/DF	<3	2.069
CFI	>0.90	0.932
TLI	>0.90	0.925
RMSEA	<0.08	0.059
SRMR	<0.08	0.114

The Chi-square/degrees of freedom ratio, one of the most fundamental criteria for assessing the structural validity of the model, was determined to be 2.069. A value below three is considered as perfect fit.

Similarly, the CFI (0.932) and TLI (0.925) values, which demonstrate the comparative fit of the model, are above the 0.90 threshold. Furthermore, the RMSEA (0.059) value, which represents the root mean square error, is well below the 0.08 critical limit, proving that the established theoretical model demonstrates strong consistency with the data set (Table 5).

The analysis results showed a Standardized Root Mean Square Residual (SRMR) value of 0.114, which is above the ideal limit of 0.08. However, Hu and Bentler (1999) suggests that one should not rely on a single index when assessing model fit. It is stated that deviations in the SRMR value can be tolerated, especially in complex structural models and large samples, if basic indices such as CFI, TLI, and RMSEA are at “perfect” levels. In this context, considering that all other fit indices are within perfect limits and the theoretical significance of the model, it is concluded that the structural validity of the model as a whole is ensured and that it is suitable for analysis.

As part of the validity and reliability analyses, One-Way Analysis of Variance (ANOVA) and T-tests were conducted to assess whether the selected sample exhibited sufficient separation (Table 6). Mean differences between groups are additionally provided to ensure the flow of the text.

Table 6. Anova & T-test results

	Age	Gender	Marital status	Education status	Experience	Title
GHRM	–	–	–	*P = 0.000	–	–
GINPD	–	–	–	*P = 0.000	–	–
GINPR	–	–	–	*P = 0.000	–	*P = 0.000
ENS	–	–	–	*P = 0.012	–	*P = 0.009
SOS	–	–	–	*P = 0.000	–	–
ECS	*P = 0.042	–	–	*P = 0.000	–	–
EK	–	–	–	*P = 0.000	–	–
EC	–	–	–	–	–	–

When the differentiation of the variables examined in the research in the context of demographic variable groups is examined, Significant relationships were detected in age, title, and especially education dimensions. The research variables did not show any significant differentiation in terms of gender, marital status and work experience.

4.2. Hypothesis testing

To ensure the structural validity of the research model and to improve the model's goodness-of-fit indices, a Confirmatory Factor Analysis (CFA) process was conducted. Items with factor loadings below the limits recommended in the literature or with high error covariance in the modification indices, which negatively affected the model fit, were excluded from the analysis (Figure 2).

Items coded ghr2 and ghr8 from the GHRM scale were removed from the model because they showed a high level of overlap with other items under the same factor and increased the model's margin of error (RMSEA).

A similar refinement process was applied to the SOS and GINPD scales. From the densely populated SOS scale, items coded sos1, sos6, sos8, and sos9, which had relatively low factor loadings and suppressed the model's CFI, were excluded, resulting in a simpler and statistically stronger model. In the GINPD scale, items coded ginpd2 and ginpd4 were excluded from the analysis because they were found to have a tendency to establish relationships with other variables through error terms, threatening discriminant validity.

All items from the GINPR, ENS, ECS, EK, and EC scales were retained because they had sufficient factor loadings and supported model integrity. As a result of these data refinement and improvement processes, the final measurement model achieved excellent goodness-of-fit values (CFI > 0.90, CMIN/DF < 3), and the structural validity required for SEM analyses was fully achieved.

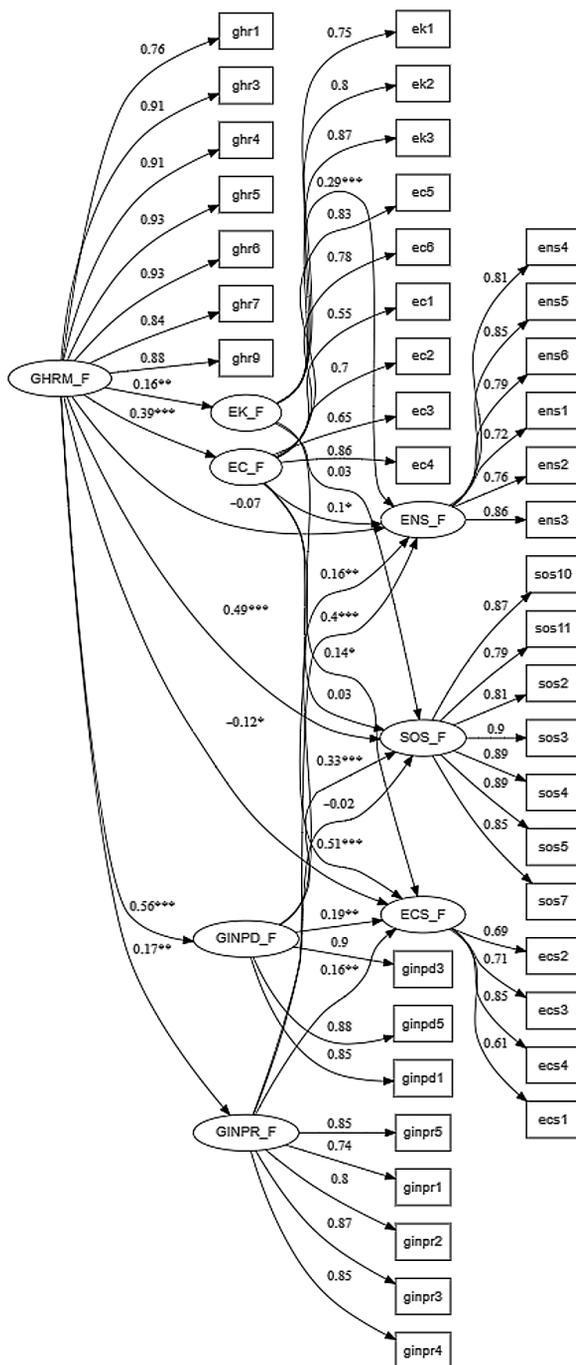


Figure 2. Path diagram of the final SEM and standardized path coefficients

4.2.1. Evaluation of direct effects

The results of the path analysis conducted to test the direct relationships between variables within the established structural equation model are presented in Table 7.

Table 7. Results for direct relations

Path	B	p	Significance
GHRM – GINPD	0.556	0.000	+
GHRM – GINPR	0.172	0.002	+
GHRM – EK	0.156	0.006	+
GHRM – EC	0.393	0.000	+
GHRM – ENS	-0.014	0.816	-
GHRM – ECS	0.045	0.477	-
GHRM – SOS	0.507	0.000	+
GINPD – ENS	0.126	0.004	+
GINPD – SOS	0.322	0.000	+
GINPD – ECS	0.124	0.009	+
GINPR – ENS	0.406	0.000	+
GINPR – SOS	-0.021	0.554	-
GINPR – ECS	0.162	0.002	+
EK – ENS	0.284	0.000	+
EK – SOS	0.028	0.394	-
EK – ECS	0.136	0.018	+
EC – ENS	0.076	0.109	-
EC – SOS	0.027	0.585	-
EC – ECS	0.475	0.000	+

Table 7 demonstrates that GHRM is a central driving force in the transformation process within a company. According to the findings, GHRM practices statistically significantly increase the company's innovation capacity for both product ($\beta = 0.556$) and process ($\beta = 0.172$). However, a comparison of the effect coefficients reveals that GHRM practices more strongly trigger new product development processes that require creativity than they do for improving technical processes. Similarly, GHRM transforms the mindset of employees, significantly increasing both EK ($\beta = 0.156$) and EC ($\beta = 0.393$); it is particularly noticeable that the "concern" and "sense of responsibility" it creates in employees are more dominant than their awareness level.

When the effects of innovation types and individual attitudes on performance were evaluated, highly variable relationships were identified between the variables. GINPD stands out as the most comprehensive factor positively affecting all of the company's SOS, ENS, and ECS dimensions. Conversely, GINPR inherently contributes to performance through ENS ($\beta = 0.406$) and ECS ($\beta = 0.162$) but does not have a significant impact on SOS. In terms of individual variables, EK, ENS, and ECS moderately support this, while EC has a very high impact on ECS at $\beta = 0.475$.

4.2.2. Evaluation of mediation analysis results

Table 8 shows the results of the analysis, which examined the mediating mechanisms used to test the hypotheses regarding the GHRM-SSCM relationship, indicate that innovation capabilities and individual attitudes play specialized roles in sub-dimensions of SSCM.

Table 8. Mediation analysis

Path	B	p	Hypothesis
GHRM – GINPD – ENS	0.092	0.008	Supported
GHRM – GINPD – SOS	0.185	0.000	Supported
GHRM – GINPD – ECS	0.106	0.002	Supported
GHRM – GINPR – ENS	0.070	0.007	Supported
GHRM – GINPR – SOS	–0.004	0.534	Not supported
GHRM – GINPR – ECS	0.027	0.024	Supported
GHRM – EK – ENS	0.046	0.031	Supported
GHRM – EK – SOS	0.005	0.453	Not supported
GHRM – EK – ECS	0.022	0.061	Not supported
GHRM – EC – ENS	0.037	0.035	Supported
GHRM – EC – SOS	0.012	0.523	Not supported
GHRM – EC – ECS	0.200	0.000	Supported

According to the findings, GINPD is the most comprehensive mediating variable, acting as a statistically significant and positive bridge between GHRM and all of the supply chain's SOS, ENS, and ECS performance dimensions. The indirect effect on SOS ($\beta = 0.185$), in particular, being higher than other performance items, indicates that GINPD is the most important variable in making a company's supply chain socially sustainable. In contrast, GINPR had a significant mediating effect on ENS and ECS, but no mediating role on SOS.

The other attitude variable, EK, had a more limited effect. While increased environmental knowledge among employees created a significant channel ($\beta = 0.046$) in increasing the impact of GHRM on ENS, no statistically significant mediating effect was found on the impact of this awareness on SOS or ECS.

5. Discussion and implications

This study examined the impact of GHRM practices on SSCM performance within the framework of a holistic model designed around green innovation capabilities (GINPR and GINPD) and employee attitudes (EK and EC). The findings reveal that GHRM acts as a strategic lever in enhancing SSCM performance when the appropriate intermediary mechanisms (GINO and EA) are activated. These mechanisms and antecedent conditions are discussed in this section.

5.1. Role of demographic traits

The difference tests conducted to determine the effect of participants' demographic traits on the variables addressed in the study showed that statistically significant differences existed in

all variables within the scope of the study due to the education factor. Multiple comparison analyses conducted to identify the source of these differences revealed a significant “threshold effect” in the data set and a radical change in perceptual processes as the education level shifted from secondary to higher education.

Difference analyses conducted based on the demographic characteristics of the participants revealed a significant managerial risk regarding the diffusion of the sustainability vision within the organization. While managers and upper-level employees have a high level of awareness of green processes and sustainable performance, operational-level employees do not fully embrace this vision. This perception gap indicates that green strategies are designed at the management level but have not been fully disseminated to the grassroots (Graves & Sarkis, 2018). For organizations to achieve their sustainability goals, GHRM practices (rewards, training, participation) need to be restructured with a comprehensive policy that focuses not only on white-collar employees but also on blue-collar workers in the production area.

According to the findings, the perception levels of secondary education graduates were significantly lower than all other employee groups with associate, undergraduate, and graduate degrees on the GHRM, GINPD, GINPR, ENS, SOS, ECS, and EK variables. When the groups with university degrees were compared among themselves on these variables, no significant difference was observed. This demonstrates that post-secondary education is a key determinant in the development of sustainability visions, technical innovation processes, and awareness of economic contribution. On the other hand, a more gradual differentiation was found in the perceptions of SOS and ENS, which differs from this general trend. While high school graduates had the lowest SOS perception, the perception of bachelor's degree graduates was significantly higher than that of associate degree graduates, and sensitivity to environmental issues increased parallel to the increase in education level. Similarly, there was no significant difference between high school graduates and associate degree graduates in the ENS dimension, with significant awareness becoming evident only at bachelor's degree and higher education levels. When all these results are considered together, it is understood that education level plays a critical role in the dissemination and internalization of green management strategies within the company, and that secondary education graduates, in particular, require more intensive information and training support to integrate these processes.

The results of the variance analysis conducted to determine the impact of participants' titles and positions within the organization on the research variables indicate that the title factor did not create a holistic difference in overall perception, but it did produce statistically significant differences in the GINPR and ENS dimensions, which require technical and strategic knowledge. The divergence observed, particularly in the GINPR dimension, reveals that awareness among managers and specialists is statistically significantly higher than among other operational employee groups. This finding suggests that process-focused improvements (e.g., production techniques, energy systems, or waste management) within a company, are typically planned by senior management, and these strategic decisions are not adequately supported by widespread communication.

A similar trend was observed in the perception of ENS. While participants at the management level stated that the company had achieved its environmental goals and demonstrated high performance, this perception was significantly lower in lower-level job titles.

This suggests that the company's environmental achievements and reports remained at the management level and were not effectively communicated throughout the organization. On the other hand, no statistically significant difference was found between job title groups in more people-oriented and experiential dimensions, such as GHRM or SOS. When these results are evaluated as a whole, it can be concluded that the social climate and human resources practices within the company are perceived similarly at all levels, but there is a significant asymmetry of knowledge and perception between management and employees regarding technical and environmental strategies.

A variance analysis conducted to determine participants' perceptions of the company's ECS by age group revealed that age created a significant difference ($p < 0.05$). Multiple comparison tests conducted to determine the source of the difference revealed no clear statistical difference ($p < 0.05$) between the groups, but the distribution of the data suggests a distinct generational difference. In particular, employees aged 18–29, representing the youngest age group, were found to rate the cost advantage, savings, and economic efficiency benefits of green practices higher than those in the middle age group (40–49). This suggests that the younger generation tends to view the concept of sustainability not only as an environmental concern but also as a rational means of economic gain, while employees in older age groups exhibit a more cautious or neutral approach to establishing this economic relationship. Consequently, it can be said that younger employees have a higher level of awareness in internalizing the economic benefits of green transformation within the company.

5.2. Role of GINO

Research results show that GHRM practices positively and significantly increase a company's capacity for both product and process innovation. This finding supports the RBV theory's proposition that "Human resources are the architects of organizational capabilities" and aligns with recent studies in literature such as Song et al. (2021) and Singh et al. (2025). However, the unique contribution of this study lies in the difference in effect levels. Analysis reveals that GHRM has a stronger impact on GINPDR ($\beta = 0.56$), which requires creativity and design, than on GINPR ($\beta = 0.17$). This suggests that GHRM is more effective in unleashing employees' "idea generation" and "creativity" potential.

While the green innovation literature generally adopts a generalist approach that "innovation enhances performance," this study observed that product and process innovation serve different types of performance. According to the analysis of the relationship between GINPR and SSCM performance types, GINPR strongly increased ENS and ECS, but had no significant impact on SOS. This finding aligns with the visibility effect put forward by Liu et al. (2023) in the innovation literature. According to the authors, product innovation enhances corporate reputation and social legitimacy because it is directly observable by customers and the public, whereas process innovation, being a technical improvement within the company's boundaries, does not create direct social value for external stakeholders. Therefore, this finding suggests that social contribution can only be achieved through showcased product innovations, rather than the generalized approach that all green innovations enhance social performance.

5.3. Role of EA

Another finding of this study is the impact of EC and EK on ECS. While the literature generally focuses on "Environmental Knowledge," this study revealed that "Environmental Concern" is a more critical factor for economic sustainability of the supply chain. The findings indicate that employees' EK has a limited impact on ECS, while EC significantly increases ECS ($\beta = 0.475$). Employees concerned about environmental issues within a company are intrinsically motivated to avoid resource waste, conserve energy, and increase efficiency, which may translate into cost advantages for the company. This finding suggests that organizations should not only create information but also emotional awareness.

An examination of the mediating roles of individual attitude variables yielded one of the most striking findings of the study. The EC generated by GHRM practices in employees has a highly significant indirect effect on ECS at $\beta = 0.200$. This coefficient, higher than all other indirect effects, suggests that employees' EC levels may translate into cost-cutting, savings-oriented, and productive behaviors within the supply chain, potentially generating direct financial gains for the company. EC also had a significant, though less significant, effect on ENS ($\beta = 0.037$), while no significant effect was found on SOS.

6. Conclusions, limitations, and an agenda for future research

An examination of the direct effects of GHRM on performance outcomes yielded critical clues regarding the structure of the model. While GHRM had a very strong and direct effect on SOS at $\beta = 0.507$; the direct effects on ENS and ECS were found to be statistically insignificant. This suggests that organizations can directly increase employee satisfaction and social performance solely through GHRM policies, even if they do not innovate. However, they require intermediary mechanisms such as innovation and mindset transformation to achieve environmental and economic gains. The analysis revealed that the direct effect of GHRM on SOS ($\beta = 0.507$) is quite high. This finding is consistent with Renwick et al. (2013) that GHRM increases employee well-being and financial performance. Only by following a fair, participatory, and a green human resources policy can organizations increase employee engagement and make their supply chains more sustainable.

The results of the mediation analysis obtained within the scope of the research reveal that GHRM is not a standalone mechanism for improving SSCM performance. On the contrary, it is a driving force that creates performance by transforming the company's innovation capabilities and the mindset of employees. In particular, the different levels of impact of innovation types on different performance dimensions provide insight into a more holistic structure regarding the influence of GHRM. The study found that GINPD had a strong mediator effect ($\beta = 0.185$) on the GHRM-SOS relationship, while GINPR did not have a significant effect on SOS in the same relationship.

Another interesting finding in the study was the mediator role of EA. The analysis results showed that employees' EK was insufficient to transform into ECS ($p = 0.061$), while EC had a stronger mediator effect on ECS than innovation ($\beta = 0.200$). The gap in literature regarding the translation of EK into behavior is a frequently discussed topic (Kollmuss & Agyeman,

2002). The findings of this study reveal that cognitive awareness alone is insufficient to provide economic input to the business, while “concern,” an affective motivation, generates tangible economic outcomes by driving individuals toward resource conservation and savings behaviors. This result confirms in the context of organizational management and supply chain efficiency. Overall, important portion of the impact of GHRM on SSCM sustainability performance appears to be shaped by other mechanisms. Human resources practices do not provide competitive advantages not only on their own, but also when they are transformed into organization-specific capabilities and psychological capital. This study adds this theoretical insight to the supply chain management discipline, empirically demonstrating that the human factor is one of the hidden architects of SSCM performance.

This study, which demonstrates the impact of GHRM on SSCM performance using a multidimensional model, offers significant contributions to literature, but it does have some limitations that should be considered when evaluating its results. First, because the cross-sectional design of the study limits definitive proof of causal relationships between variables, it is recommended that future studies utilize longitudinal designs that can monitor the long-term effects of GHRM. In future research, supplementing the survey data with objective financial or environmental reports would enhance the reliability of the findings. Furthermore, because the study is limited to a specific geography and sector, conducting comparative analyses spanning different cultures or industries would contribute to understanding the universal impact of GHRM. Finally, beyond the innovation and attitude mechanisms as focused on, examining the moderating roles of different variables such as Green Leadership or Organizational Culture may create a more comprehensive vision on topic.

Author contributions

Author contribution rates are equal in all parts of the study.

Disclosure statement

There is no financial, professional, or personal conflict of interest between the parties involved in the research and the authors. The ethics committee approval required for the implementation of the survey is included in Decision No. 32, taken at Meeting No. 05 of the Gaziantep University Social and Human Sciences Scientific Research and Publication Ethics Committee, dated May 7, 2025.

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