

**RESEARCH PAPER**

Impact of Green Transformational Leadership and Green Human Resource Management on Sustainable Project Management in the Projects of Pakistan: Moderated Mediation Model

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ABSTRACT

Sustainable project management in Pakistan's construction sector is essential for mitigating environmental impacts, maximizing resource efficiency, and improving project success in the context of rising urbanization and resource limitations. This study examines the antecedents of Sustainable Project Management (SPM) specially see the influence of Green Transformational Leadership (GTL) along through the intervening effect of Green Human Resource Management (GHRM), with Perceived Organizational Support (POS) serving as a moderating variable. Data were obtained from professionals engaged in sustainability projects in the construction sector of Pakistan using Partial Least Squares Structural Equation Modeling (PLS-SEM) to investigate the potential links. The outcomes indicate that both GTL substantially affect SPM, with GHRM serving as a partial mediator of these influences, underscoring the significance of organizational support in improving sustainable project results. The research enhances the literature by amalgamating leadership, human resource management, and support mechanisms within sustainable project practices. Managerial implications indicate the necessity of promoting green leadership and human resource practices within supporting organizational contexts to attain sustainability objectives in project management. Limitations encompass possible contextual constraints and the cross-sectional approach, indicating opportunities for longitudinal and cross-cultural research.

Keywords:

Sustainable Project Management, Green Human Resource Management, Green Transformational Leadership, Perceived Organizational Support

Introduction

The construction sector considerably encourages our economy, society, and environment; consequently, its sustainable management is vital for accomplishing the central objective of sustainable development. Developing nations are lecturing sustainability issues in the development and accomplishment of building projects, although underdeveloped nations are dropping short in gathering sustainability standards (Ullah et al., 2020). Dealing projects in a difficult economy presents risks on behalf of both leaders and stakeholders. Risk management in Project takes improved due to effects such as unstable organizational structures, economic assimilation, and widespread technological integration (Elrayah & Piaralal, 2023).

Green Transformational Leadership (GTL) is reflected a critical element in gaging green success. Moreover, research specifies that green transformational leadership evidently improves green creativity and environmental performance. Sustainable Performance has been evaluating by the Green transformational Leadership but there is

inadequate attention present here. Green transformative leadership is observed as an organizational asset (Bhatti et al., 2023).

The sustainability triple bottom line principle incorporates three dimensions: social, economic, and environmental growth. The three pillars are mutually dependent, and sustainability indicates the ability to maintain the above-mentioned three features of a human system over time (Malik et al., 2020; Yong et al., 2022). The functions, procedures, and practices of Green Human Resource Management (GHRM) serve as a foundation of managing sustainability in projects as a competitive advantage and nurturing the values of sustainability (Caliskan & Esen, 2019).

Businesses must appreciate the complicated associates among Sustainable Project Management, Green Human Resource Management (GHRM), decision-making, leadership, and project risk management to discourse current project challenges. Even though progressions in considerate Sustainable Project Management and Green Transformational Leadership in past researches, there are still gaps in the business that oblige further investigation. Pakistan, being a developing state, has traits alike to those of further developing countries. Reports disclose that the Pakistani construction sector confirmations a insufficiency of initiatives unveiling inadequate or no devotion to sustainability management in construction projects. The prevailing literature deficiencies focused and context-specific sustainability research from Pakistan (Silva & Magano, 2024).

Employees with a vigorous exchange ideology resumed perceived organizational support by altering their exertions to bring into line with organizational objectives, including reducing absenteeism, improving affective attachment to the organization, and aggregate work effort. Furthermore, perceived organizational support is positively correlated with employee happiness, work satisfaction, entrepreneurial passion, employee performance, and organizational performance (Sun, 2019).

This study explores the influence of Green Transformational Leadership on Sustainable Project Management, intervened by Green Human Resource Management. The moderating effect of Perceived Organizational Support proceeding the connection among Green Transformational Leadership and Green Human Resource Management happening the construction's projects. The research question is: SQ1: What is the effect of Green Transformational Leadership on Sustainable Project Management? SQ2: What is the result of Green Human Resource Management on Sustainable Project Management? SQ3: What is the mediating part of Green Human Resource Management in the association among Green Transformational Leadership and Sustainable Project Management? SQ4: What is the moderating effect of Perceived Organizational Leadership taking place the association among Green Transformational Leadership and Green Human Resource Management? This work is structured as a literature review of the variables and their interrelationships, followed by way of the methodology, data analysis, and the outcomes and findings of the research. The report delineates its limitations and delimitations, along with the managerial execution and upcoming recommendations.

Literature Review

Sustainability originates on or after the idea of sustainable development, well-defined by the World Commission on Environment and Development as "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs" (Brundtland, 1987, p. 17). The study defines sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"; this one intentions to endorse coordination between humanity and nature, as well as amongst individuals (Brundtland, 1987, p. 41).

A more inclusive and broadly permitted perception of sustainability has appeared, constructed on the triple-bottom line (TBL) framework that comprises “environmental, economic, and social dimensions” (Elkington, 1998). Sustainability give emphasis toward the Triple Bottom Line (TBL) somewhat than solely monetary objectives, pursuing both immediate and enduring success through judicious resource utilization, achieving human needs, and protective the well-being of future generations. The essential evidence of TBL theory postulates that the improvement of any dimension is connected with the growth of the other two dimensions (Khalifeh et al., 2020).

The GTL perception is considered by means of a behavioral style that inspires devotees to achieve environmental intentions in addition to encourages people to exceed projected levels of environmental performance. Resource-based theory give highlighting to the value of intangible assets besides corporate competencies (Barney, 1991). It also speculates that leadership behavior is familiar as an internal resource and ability of organizations (Singh et al., 2020). This concept advances that GTL behavior is an appreciated resource and capability of a firm. A comprehensive literature study has been accompanied to climax the role of GTL in realizing objectives linked to environmental sustainability (Özgül & Zehir, 2021).

Leadership approach like Green Transformational Leadership that highlights provided that a strong vision, encouragement, and motivation to employees although also lecturing their growing wants to achieve the organization's ecological goals. GTL is fundamental for enlightening sustainability performance of corporate. Green transformational leadership highlights the cooperative performance of the team and promotes employee environmentally sustainable behavior in corporate operations (Thi et al., 2024).

Green Transformational Leadership (GTL) and Sustainable Project Management (SPM)

Transformational leadership can significantly boost innovation performance. Our study postulates that green transformational leadership is a critical determinant of Sustainable Project Management, a constituent earlier overlooked by scholars. According to the Resource-Based View (RBV), leadership is observed as a fundamental advantage for organizations. The natural RBV hypothesis emphasizes that green competences explicate the associating concerning green resources and sustainable performance.

Transformational leadership comprises a multidimensional notion that comprises vision and aims, values, structure, intelligent stimulation, distinct support, and concert prospects (Luyten & Bazo, 2019). Green transformational leadership will reinforce the motivation, knowledge, and abilities of employees, so authorizing them to implement innovative ideas (Mansoor et al., 2021). Besides, transformational leaders involve followers by fostering self-motivation to achieve organizational goals and comprehensive tasks synergistically. Through these performances, transformational leaders can encourage innovative ideas then innovations inside the organization, together with motivating team members to address problems in novel ways. Consequently, green transformational leadership significantly influences the social, economic, and environmental aspects of the construction sector, contributing to sustainability (Cient et al., 2020).

Bhatti et al. (2023) suggested that Green Transformative Leadership prominently improves sustainable performance. The consequences specify that green transformational leadership stimuli green performance (Bhatti et al., 2023). Green Transformational Leadership highlights both the team's generally performance under his direction and nurtures individual followers to envision sustainable developments in business procedures. The leader retains an efficient network of communication using supporters to encourage

the discussion of ideas for improving green business practices and managing sustainable performance (Zhao & Huang, 2022).

Resource-based theory highlights the implication of intangible assets and corporate capabilities and competencies (Barney, 1991). The resource-based concept postulates that GTL behavior is a appreciated resource and capability of a firm (Özgül & Zehir, 2021). Previous studies have enthusiastic deficient attention in the direction of green transformational leadership trendy assessing Sustainable Project Management. This paper pursues to discourse this gap and recommends the following hypotheses:

H1: There is positive association among Green Transformational Leadership (GTL) and Sustainable Project Management (SPM).

Green Human Resource Management (GHRM) and Sustainable Project Management (SPM)

The sharp emphasis of researchers proceeding sustainable strategy takes highlighted the significance of HR performs and sustainability. The association concerning HR practices in addition to organizational sustainability over the viewpoint of the Resource-Based View (RBV). Organizations that main concern the sustainability of their human resources might experience boosted productivity, leading to a competitive edge. The main function of HRM is to follow sustainable administrations. Institutional and public pressures, evolutionary procedures, renewal, organizational attractiveness, and the ambition to enhance natural resources require managers to highlight human attributes that boost corporate sustainability (Yong et al., 2020).

Green human resource management (GHRM) practices heighten the sustainable goals of social fairness, well-being, the comfort and wellness of both the business and its employees, although also nurturing economic stability and environmental equilibrium. The study pursues to associate GHRM and Sustainability literature by signifying that employee green behavior in the workplace mediates this relationship, utilizing Ability, Motivation, Opportunity (AMO) theory and Social Identity theory (Amrutha & Geetha, 2020).

Green human resource management exists a sustainable approach inside human resource management that enables the acceptance of environmental management and sustainable development values (Andjarwati et al., 2019). GHRM is essential in encouragement the linking amongst "green transformational leadership, green innovation, and environmental sustainability" (Jehan et al., 2020).

The resource-based approach approves Green HRM practices. Organizations must highlight acquisition, developing, and likeable workers that express green principles and values to reach a competitive advantage that is sustainable (Sathasivam et al., 2021). Green HRM is realized as retaining a comprehensive perspective that incorporates employees with the organization's environmental plan. Commencing green-focused activities is challenging due to the requirement for systemic change, which must be begun, effected, and incorporated by staff members as this is a essential objective of green HRM (Yong et al., 2020).

Valéau (2019) observes current, motivated employees promised with their employer, as an alternative of those anticipating joining organizations imminently or those about to resign. This research only highlights green HR methods that improve employee capabilities (e.g., training), foster engagement (e.g., involvement), and monitor their daily environmental activities (e.g., performance management).

Caliskan and Esen (2019) conducted an evaluation to consider three elements of green human resource management: cultivating green competencies, incentivizing green

people, in addition to contribution in green chances. Green recruiting and hiring constitute a significant aspect of green human resource management techniques. Employing enhances the pool of applicants, but the selection job diminishes this pool by identifying the most suitable prospects. Potential employees' environmental consciousness, sustainable employer branding, and ecological criteria are three sub dimensions of green recruiting and selection. Performance management, compensation, and reward systems are crucial elements in encouraging environmentally conscious personnel. Managers should establish environmental objectives focused on attaining sustainable results and paybacks, and implement a financially-based ecological managing system. Finally, to create sustainable opportunities for workers, organizations must participate in employee contribution, enablement, engagement, a sympathetic climate and values, and industrial relations.

The AMO hypothesis posits that Human Resource Management may positively influence motivation and productivity by recruiting, selecting, training, developing, and adequately compensating a skilled and competent staff. It enhances their effectiveness and efficiency regarding increased profit, optimal profit, and superior quality (Jehan et al., 2020).

Currently, various organizations globally are implementing GHRM practices as a strategy for employer branding, as it is regarded as a primary means of gaining competitive advantage by educating the youth about environmental issues and sustainable practices within the organization.

(Shaukat et al., 2023) investigates the correlation of Green Human Resource Management (GHRM), ecological actions, employee pro-environmental behavior, and employer empowerment within the industrial sector of the Islamic Republic of Pakistan. The study emphasizes the role of employee empowerment in alleviating the relationship between Green Human Resource Management (GHRM) and Environmental Performance, confirming a favorable and statistically significant association between GHRM and pro-environmental behavior, hence advancing sustainability. Based on the aforementioned literature regarding the construction sector in Pakistan, the following hypothesis is proposed:

H2: There is positive relationship between Green Human Resource Management and Sustainable Project Management.

Green Transformational Leadership (GTL) and Green Human Resource Management (GHRM)

GTL has a significant role in fostering positive GHRM practices, including recruitment and selection, training and growth and development, performance appraisal and management, as well as compensation and incentive systems, thereby inspiring, stimulating, and motivating supporters to attain administrative objectives. According to the AMO theory (Appelbaum et al., 2000) emphasize that GTL exploits GHRM to enlarge supporters' capabilities and encouragements while contribution possibilities to contribute in ecological management actions (Singh et al., 2020).

Niazi et al. (2023) accomplishments to observe the inspiration of Green Human Resource Management (GHRM) and Green Innovation (GI) proceeding performance within the banking sector's environmental setting. The study emphasized the subsidiary influence of Green Human Resource Management (GHRM) on Environmental Innovation (EI) via Green Corporate Social Responsibility (GCSR) to boost the green interior system (GHRM and innovations); banks are persuaded to distribute greater resources to GCSR, foremost to amended environmental performance, while Green Transformational Leadership (GTL) is observed as a moderator that strengthens the connotation between the independent variables GHRM and Green Innovation (GI).

Green Transformational Leadership is essential in raising sustainability in company success. Green Transformational Leadership highlights the cooperative performance of the team although fostering and motivating individual followers to anticipate ecological enhancements in corporate practices. The great leader raises an exposed communication network using admirers to implore their recommendations for augmenting business performance must be green and attaining lasting success. Green HRM performs can assist organizations in make straightforward commercial strategy with environmental concerns. This research consumed resource-based perspective theory to observe the stimulus of green HRM practices on corporate sustainability. The belongings of green employment and green training on business sustainability were also surveyed. The study specified that, in green employment and high-quality, applications are observe to via virtual platforms, and telephone or video interviews are accompanied to mitigate transportation-related ecological effect. Additionally, green training provides personnel to discourse ecological challenges and expands the sustainability performance of organizational (Zhao & Huang, 2022). Transformational leadership fully integrates the values, attitudes, and behaviors of top managers, suggestively manipulating an organization's processes for human resources management. Green transformational leaders, as principal decision-makers, define the organization's vision and trajectory, cultivating employee collaboration, dedication, and trust while overseeing resources to facilitate GHRM activities. The implementation of human resources management guidelines and procedures may be affected by leaders' pro-environmental behavior to ensure that organizational actions and sequences are lead in an ecologically accountable manner (Thi et al., 2024). The Port Managers monitor GTL dimensions. Inspirational motivation was demonstrated to the greatest extent, whereas personalized deliberation was demonstrated to the slightest extent. GHRM practices were prominently implemented in Project Management Offices (PMOs). Organizational culture is the most observed GHRM practice, whereas rewards and remuneration are the least seen (Thi et al., 2024). Based on the above-mentioned literature, the ensuing hypothesis is offered in this research:

H3: There is positive relationship between Green Transformational Leadership and Green Human Resource Management.

Green Human Resource Management (GHRM) as a Mediator

According to the AMO hypothesis, HRM methods affect an worker's capacity (e.g., through staffing and hiring, training and development), inspiration (e.g., financial rewards, non-financial rewards, incentives, and remuneration), and prospect (e.g., cooperation, empowerment) to enhance business performance and sustainability. Leadership emphasizes the comprehension, anticipation, and regulation of personal and interpersonal dynamics that influence individuals towards collective objectives, while Human Resource Management (HRM) manages organizational systems and processes to systematically affect personnel, often on a larger scale (Aboul-Dahab & Saied, 2024). Consequently, it is believed that leadership and human resource management collaboratively engage in workforce management, although from distinct perspectives. The initial body of existing literature indicates that leaders have a crucial mediating function in endorsing the activities advocated by HRM to enhance worker engagement and sustainable performance (Singh et al., 2020; Thi et al., 2024).

The environmentally conscious behaviour of leaders be able to impact the formulation besides execution of human resource management strategies and procedures to guarantee that organizational events and practices are conducted in an environmental manner. Leaders exhibiting environmentally conscious behavior typically guarantee that governmental policies and activities priorities environmental conservation (Huelgas & Arellano, 2021). Construction projects in Pakistan may or may not adhere to environmentally sustainable approaches such as Green Transformational Leadership and Green Human Resource Management. This hypothesis proposes:

H4: Green Human Resource Management significantly mediates the relationship between Green Transformational Leadership and Sustainable Project Management.

Perceived Organizational Support (POS) as a Moderator

Kusi et al. (2021) conducted comprehensive research to elucidate the relationship between green transformational leadership, organizational support and business sustainability. Gopinath et al. (2021) disclose the moderating effects of organizational support proceeding the relationship among green HRM and sustainable business success. With green HRM practices and organizational support, such as recruiting and selection, employee record maintenance, study and progress, and compensation and rewards be able to be more effectively executed due to employee cooperation. Furthermore, the enhancement of organizational procedures contributes to the advancement of sustainability in business performance. Employees stay extra probable to follow a transformational leader's advice on green improvement in their work duties when the organization offers them social and financial support, as demonstrated by the transformational leader's behaviour towards followers. In order for the company to have sustainable business performance, the employees who exist enthusiastic to the organization or transformational leader go above and outside their capabilities to take about green improvements in the procedures, the superiority of products, and consumer services (Zhao & Huang, 2022).

Believed that "perceived organizational support" raises employees' emotional affection to the company and their expectancy that harder work will be rewarded for attaining the organization's objectives. The strength of the employee's exchange ideology supporting the exchange of work efforts for tangible and intangible compensations determines in what way much these fundamentals improve work efforts (Al-Swidi et al., 2021; Zhao & Huang, 2022). The subsequent hypothesis is put out grounded on the variable conversation above.

H5: Perceived Organizational Support (POS) moderate the association among Green Transformational Leadership and Sustainable Project Management.

Proposed Model

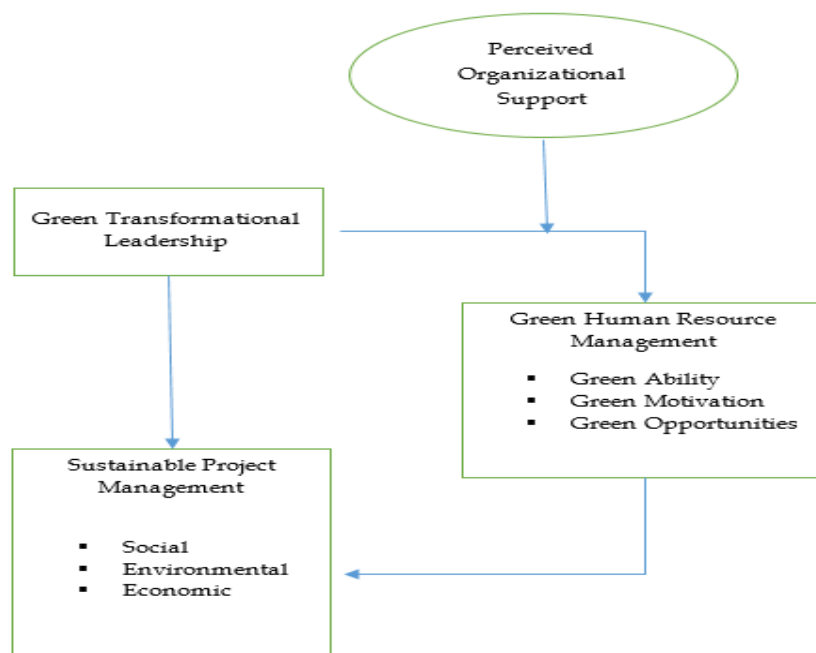


Figure 1 Conceptual Framework

Material and Methods

Demographic Data and Sampling

The population of the data comprises the construction sector, encompassing all registered construction firms operating in Pakistan that have undertaken construction projects in various cities around the country. These construction firms registered in Punjab Housing and Town Planning Agency (PHATA). The primary objective of construction businesses that implement green practices in their project operations is to attain Sustainable Project Management. The data sample is collected using Snowball Sampling and Purposive Sampling procedures. The initial sample for the Snowball approach is selected using the Simple Random Method. The study successfully obtained a sample of 225 after the emission of incomplete questionnaires. Demographic data is sample is given below:

Table 1
Demographic information

Respondents (n)	Frequency (f)	Percentage (%)
Gender		
Male	121	60.81%
Female	78	39.19%
Age-Group		
21-30 years	97	48.74%
31-40 years	34	17.08%
More than 40 years	68	34.17%
Experience of project based working		
Below 3 year	30	15.08%
Between 3 to 5 year	105	52.76%
More than 5 years	64	32.16%

According to Table 1, the demographic data is mentioned here. There are major respondents are male are of 60.81%. The respondents' categories in three age groups. First one is between 21 to 30 age group include 48.74% responses. In age group of 31 to 40 years the respondents are 17.08% and in age group of more than 40 years, the respondents are 34.17%.The respondents experience level between below 3 years are 15.08%, the respondents' have working experience between 3 to 5 years are 52.76%. and respondents having more than 5 years' experience are 32.16%.

Measurement Instrument

Measurement instrument is developed by adopting scales from previous studies shown in Appendix A. Sustainable Project Management, as derived from Martens & Carvalho (2016a; 2016b), is rated on a scale from 1 (unimportant) to 5 (extremely important).It is a dependent variable of this study. It is a higher-order reflective construct, as the latent construct exists independently of the metrics employed for economic, environmental, and social sustainability.

Green Transformational Leadership (GTL) as proposed by Singh et al. (2020).Green Transformational Leadership constitutes one independent variable. It is of lower or first order. A reflective construct, like a latent construct, exists independently of the measures employed.

Green Human Resource Management (GHRM) as referenced by Singh et al. (2020). Green Human Resource Management (GHRM) serves as a mediating variable. It is a higher-order reflective construct, as the latent construct exists independently of the measures employed for Green Abilities, Green Motivations, and Green Opportunities.

Perceived Organizational Support (POS) Derived from (Zhao & Huang, 2022). Perceived Organizational Support serves as a moderating variable. It is of lower or first order. A reflective construct, like a latent construct, exists independently of the measures employed.

Results and Discussion

We used SmartPLS (V. 4.1.1.5) software to estimate the variance-based structural equations models approach. The PLS method was employed for these reasons: the structural model's complexity, which has direct and indirect associations to second-order constructions, the utilization of accumulated scores to represent the multidimensional construct in accordance with the two-stage methodology. The data follow by to a normal distribution; latent variables are compounds, a ubiquitous characteristic in the Sustainable Project Management study domain and Green Human Resource Management and Green Innovation. As well as Green Transformational Leadership and Perceived Organizational Support is lower order construct (Vatamanescu and Vintilă, 2023; Cepeda-Carrion et al., 2019; Hair et al., 2019; Rigdon, 2012).

Evaluations of Measurement of Model

Based on **SRMR (Standardized Root Mean Square Residual)**, **d_ULS Unweighted Least Squares discrepancy**, **d_G Geodesic discrepancy**) indices, the Saturated model fit is near but somewhat better than the Estimated model fit. This is in line with the predicted role of saturated models. The tables 2, 3 and 4 display comprehensive fit indices that compare a Saturated model with an estimated model in structural equation modeling (SEM).

SRMR (Standardized Root Mean Square Residual)

According to Table 1 SRMR is a measure of the average difference between expected and observed correlations. The saturated model's SRMR is 0.101 (the original sample), and the sample mean is 0.040 with a 95% confidence interval around 0.050. The model's estimated SRMR is 0.107 while the sample mean is 0.045. Values below 0.08 are generally regarded as acceptable (Hu & Bentler, 1999), indicating a modest fit.

Table 2
Model Fit: SRMR

	Original sample (O)	Sample mean (M)	95%	99%
Saturated model	0.101	0.040	0.050	0.055
Estimated model	0.107	0.045	0.056	0.062

d_ULS Unweighted Least Squares discrepancy:

This shows the difference between the covariance matrices that were actually observed and those that were predicted by the model. It's preferable if it's lower. The values are 2.162 for Saturated and 2.402 for Estimated model, which means that Saturated matches a little bit better (Nevitt & Hancock, 2001).

Table 3
Model Fit: d_ULS

	Original sample (O)	Sample mean (M)	95%	99%
Saturated model	2.162	0.348	0.521	0.632
Estimated model	2.402	0.441	0.661	0.809

d_G Geodesic discrepancy

Another discrepancy measure, lower values mean better fit. Saturated model scores 2.241 versus 2.342 for Estimated. Close values but Saturated model is preferred (Hu & Bentler, 1999; Nevitt & Hancock, 2001).

Table 4
Model Fit: d_G

	Original sample (O)	Sample mean (M)	95%	99%
Saturated model	2.241	0.326	0.520	0.647
Estimated model	2.342	0.319	0.519	0.645

The Saturated model, which guesses all parameters freely, is the best standard for fit. The Estimated model fits quite well, which means it fits well but moderate level.

Measurement Model Assessment: First Step Lower Order and Higher Order Convergent Validity

The model and reliability analysis for this study were conducted using SmartPLS 4.1.1.5 software and the structural equation modeling technique. The results showed that Cronbach's alpha (CA) was stuck between 0.941 and 0.873, which is not good enough because it should be higher than 0.70 (Chin, 2009; Bagozzi & Yi, 1988) (See in Table 5). George and Mallery (2024) developed the standards for Cronbach alpha. Values more than 0.9 (excellent), values greater than 0.8 (good), values greater than 0.7 (acceptable), values greater than 0.6 (problematic), values greater than 0.5 (poor), and values less than 0.5 (unsatisfactory).

This means that everything is good enough to stand for what it is supposed to and that everything is reliable. The CR (Rho_A) is between 0.936 and 0.805, and the threshold value is >0.70 (Chin et al., 2013). This means that the reliability of internal consistency is good.

The factor loading (FL) was among 0.550 and 0.903, which is additional than 0.60 (Hair et al., 2019) (See in Table 5). This means that it was reliable on its own. Table 5 shows that the average variance extracted (AVE) used for all variables is between 0.513 and 0.797. The AVE, which is 0.50, is the average variance explained and shows how much of the idea variance (Bagozzi & Yi, 1988) is explained by it. It also shows the AVE values within each build span.

Table 5
Convergent Validity

2 nd Order	1 st Order	Items	FL	VIF	CA	AVE	CR(Rho_A)
Sustainable Project Management	Economic	ECS1	0.550	1.613	0.900	0.597	0.914
		ECS2	0.714	2.008			
		ECS3	0.758	2.652			
		ECS4	0.826	3.712			
		ECS5	0.724	1.825			
		ECS6	0.882	4.394			
		ECS7	0.891	4.672			
		ECS8	0.780	3.368			
	Environmental	ENS	0.601	3.527	0.900	0.592	0.914
		ENS2	0.752	2.317			
		ENS3	0.822	2.861			
		ENS4	0.793	2.756			
		ENS5	0.706	2.353			
		ENS6	0.703	3.361			
		ENS7	0.855	4.138			
		ENS8	0.882	3.718			
	Social	SOS3	0.870	3.068	0.805	0.513	0.830
		SOS4	0.835	3.622			
		SOS5	0.826	2.805			
		SOS6	0.830	3.130			
		SOS7	0.757	2.721			

Green Transformational Leadership	GTL1	0.823	2.403	0.906	0.681	0.915	
	GTL2	0.839	2.642				
	GTL3	0.809	2.704				
	GTL4	0.779	2.094				
	GTL5	0.916	4.181				
	GTL6	0.777	2.268				
Perceived Organizational Support	POS1	0.877	4.668	0.936	0.696	0.941	
	POS2	0.841	4.723				
	POS3	0.857	3.174				
	POS4	0.850	3.199				
	POS5	0.857	3.890				
	POS6	0.860	3.297				
	POS7	0.874	4.342				
	POS8	0.628	2.513				
Green Human Resource Management	Green Abilities	GHRM_GA1	0.798	3.452	0.917	0.708	0.922
		GHRM_GA2	0.794	2.235			
		GHRM_GA3	0.873	3.716			
		GHRM_GA4	0.892	3.551			
		GHRM_GA5	0.836	3.130			
		GHRM_GA6	0.850	3.889			
	Green Motivation	GHRM_GM1	0.903	3.263	0.851	0.698	0.879
		GHRM_GM2	0.902	3.441			
		GHRM_GM3	0.860	2.203			
		GHRM_GM4	0.649	1.356			
	Green Opportunities	GHRM_GO1	0.834	4.371	0.871	0.797	0.873
		GHRM_GO2	0.850	4.068			
		GHRM_GO3	0.806	1.661			

Note: FL= “Factor loading”; CA= “Cronbach's alpha”; CR= “Composite Reliability”; VIF= “Variance Inflation Factor”; AVE= “Average Variance Explain”

According to Table5, the AVE value meant for the economic dimension is 0.498, which is nearby to the cut-off point of 0.50 (Hair et al., 2016). Furthermore, other criteria, including factor loading, CR_Rho_A values, meet the acceptable level, with the exception of the AVE value. Consequently, it indicates that the study demonstrated sufficient convergent validity (Chin et al., 2013; Hair et al., 2021). The variance inflation factor (VIF) results sort from 1.356 to 4.394, which is underneath the cut-off point of 5. Hair et al. (2021) posited that collinearity issues could arise when VIF values surpass 5. Consequently, the results validate that the multicollinearity problem is absent in this study.

Discriminant Validity

Barclay, Higgins, & Thompson (1995) asserted that the square root of the average variance obtained for every construct, above the correlations with all additional constructs, indicated discriminant validity. Table 6 confirms that the square root of the AVE values show good discriminant validity because they are superior to the parallel off-diagonal correlation values.

Table 6
Fornell-Larcker criterion

	ECS	ENS	GHRM_GA	GHRM_GM	GHRM_GO	GTL	POS	SOS
ECS	0.772							
ENS	0.780	0.769						
GHRM_GA	0.692	0.713	0.841					
GHRM_GM	0.583	0.339	0.669	0.835				
GHRM_GO	0.578	0.477	0.785	0.818	0.893			
GTL	0.653	0.667	0.837	0.630	0.836	0.825		
POS	0.669	0.564	0.774	0.822	0.871	0.762	0.834	
SOS	0.768	0.580	0.653	0.704	0.687	0.711	0.768	0.717

The coefficient range is “0.91 to 1.00” according to Hair et al. (2007) research denotes a strongly correlated relationship, “0.71 to 0.90” denotes a high correlation, “0.41 to 0.70” denotes a moderately correlated relationship, “0.21 to 0.40” denotes an insignificant correlation, and “0.01 to 0.20” denotes a weak, essentially minor correlation.

Structural model assessment

The second stage of the PLS-SEM approach, structural equation modeling, was utilized to evaluate the hypothesis (Zaman et al., 2020). The path coefficient indicates the link strength, while R² indicates the degree of independent variable prediction. Bootstrapping was used to obtain t-values to evaluate the model's relevance. T-values must be larger than 1.69 per Hair et al. (2017) recommendations.

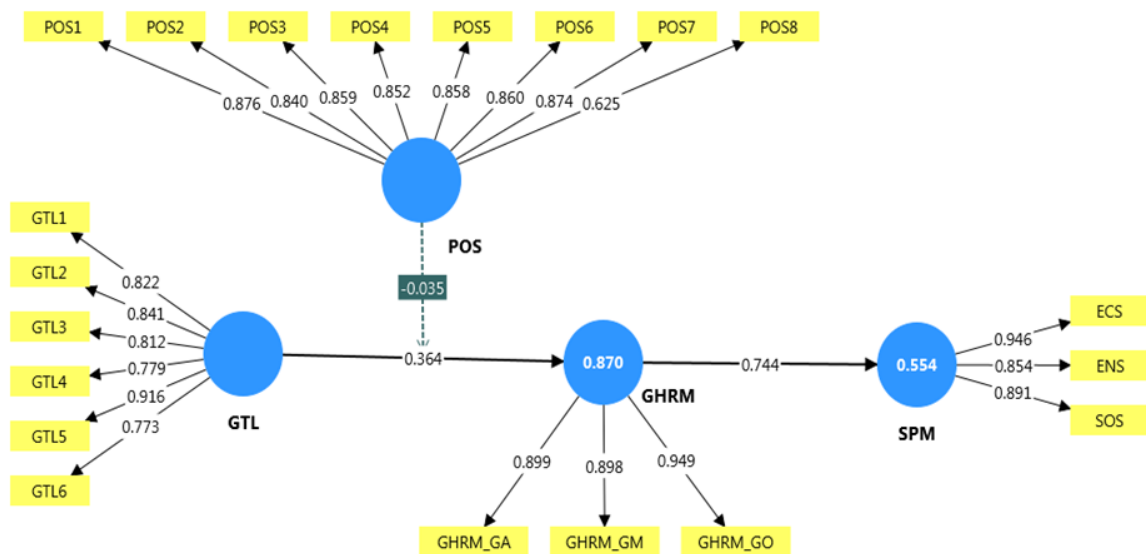


Figure 2 Structured Model

Second step of analysis shows in Figure 2 where higher order reflective constructs are shown with their latent variables as well as lower order reflective construct of POS is shown with its items. Factor loading of all the latent variables are above the criterion of 0.6 (Hair et al., 2019). This figure also shows the path coefficient value that are positive except in one relationship of moderating relationship.

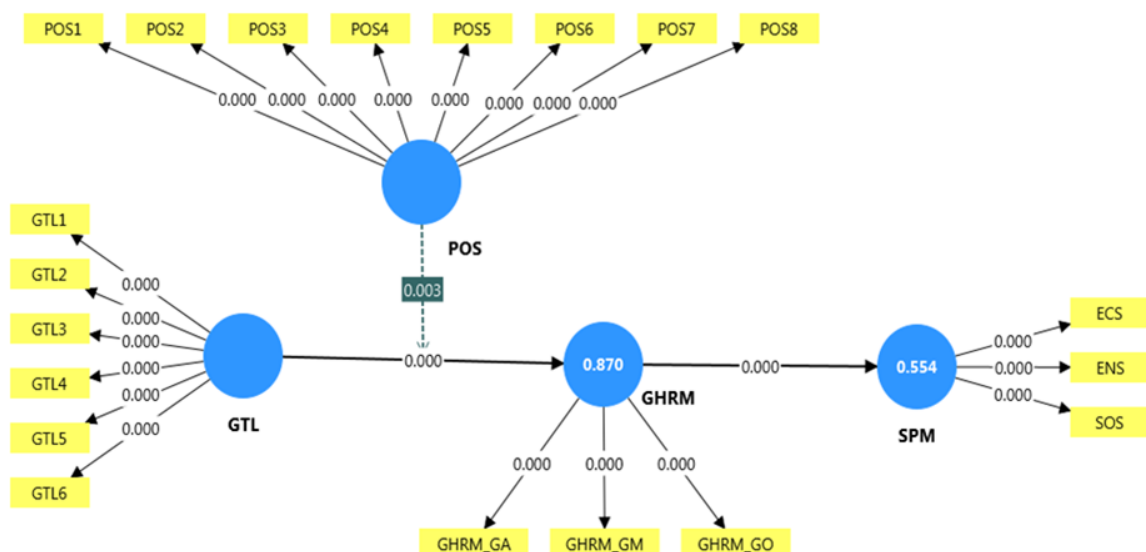


Figure 3 Bootstrapping

Figure 3 shows the p value of the associations among higher besides lower order reflective constructs, all values of P are 0.000 and 0.003 that fulfill the criteria of $P < 0.05$.

Table 7
Hypotheses Testing

	Hypothesis	β	t-value	P value	Comment	Q2	f ²	R ²
H1	GTL→SPM	0.271	6.034	0.000	Supported	0.617	1.083	0.870
H2	GHRM→SPM	0.744	20.148	0.000	Supported		1.242	
H3	GTL→GHRM	0.364	6.437	0.000	Supported	0.864	0.405	0.554
Mediating Effect								
H4	GTL→GHRM→SPM	0.271	6.034	0.000	Supported			
Moderating Effect								
H5	GTL*POS→GHRM	-0.026	2.709	0.003	Supported with negative Standardized coefficient beta		0.021	

Note: SD=Standard Deviation

In table 8, the R^2 multiple correlation coefficient, an indicator of predictive capability of model, is utilized to denote the extent of variance present in the dependent variables. The average R^2 values exist “Strong = 0.67, Weak = 0.19, and Moderate = 0.33” (Hair et al. 2019; Henseler & Chin 2010; Götz, Liehr-Gobbers, & Krafft 2009; Henseler, Ringle, & Sinkovics 2009). If the two-tailed t-test value is below 5% (0.05) and the one-tailed t-statistic exceeds 1.96, the path coefficient is deemed significant (Wong, 2013).

The f^2 quantifies the extent of an exogenous variable's influence as determined by changes in R^2 within structural models. The interpretation of f^2 large effect size (substantial impact) ≥ 0.35 , Medium effect size (moderate impact) ≥ 0.15 , Small effect size (weak impact) ≥ 0.02 (Cohen, 1992). According to table 8 f^2 values are 1.083, 1.242, 0.405, and 0.021 all are above 0.35. So, the variables have large effect size and substantial effect.

The predictive relevance of the PLS model was validated using the blindfolding process (Chin, 1998). According to Table 7, the calibrated Stone–Geisser value ($Q^2 = 0.864$ and 0.617) satisfied the established criterion ($Q^2 > 0$), indicating the statistical validity of the PLS model (Aguinis et al., 2005).

All path coefficients, or betas, for any structure are robust, as seen by the table 8. The relationship among GTL and SPM is strong with ($\beta=0.271$, $t>1.96$, $p=0.000$). So, **H1 is strongly accepted**. The association among GHRM and SPM is strong with ($\beta= 0.744$, $t>1.96$, $p=0.000$). So, **H2 is strongly accepted**. The relationship among GTL and GHRM is strong with ($\beta= 0.364$, $t>1.96$, $p=0.000$). So, **H3 is strongly accepted**.

Similarly, in the mediating relationship of GHRM between GTL and SP is also show the strong mediating relationship with ($\beta= 0.271$, $t>1.96$, $p=0.000$). So, **H4 is strongly accepted**. In case of moderating relationship of POS between GTL and GHRM ($\beta= -0.026$, $t>1.96$, $p=0.003$). So, **H5 is acceptable** with negative standardized coefficient value.

Conclusion

The present study empirically examined the effect of GTL, GHRM, POS on SPM in the construction sector of Pakistan. Although prior studies explored the effect GTL on Sustainability and Sustainable Project Performance but directly it is not explored with Sustainable Project Management. The relationship among GTL and Sustainable Project Management is supported by the studies like (Çop et al., 2021; Elrayah & Piaralal, 2023; Muralidharan & Pathak, 2018; Özgül & Zehir, 2021). The mediating relationship of GHRM between GTL and SPM shows the strong mediating relationship that relationship supported by (Aboul-Dahab & Saied, 2024; Amrutha & Geetha, 2020; B., 2023; Huelgas & Arellano, 2021). The moderating relationship of POS between GTL and GHRM play important role for

the organization to achieving sustainable project management that is supported by (Al-Swidi et al., 2021; Zhao & Huang, 2022). The results of this study also emphasized on the practical sight of Project management practitioners who can achieved their sustainable project management, if they avail GTL and GHRM in their operation of projects like in planning, organizing, leading, directing and execution of projects as well as Perceived organizational Support is play the moderating effect. It means in the context of Perceived Organizational support the Green transformational leadership and Green Human Resource Management plays better effect on Sustainable project management. Study finding also suggest that GHRM and POS can amplify on GTL to create opportunities that break the carriers towards Sustainable Project Management (Al-Swidi et al., 2021; Niazi et al., 2023; Zhao & Huang, 2022).

Managerial Implementation

Employ green leadership strategies to motivate personnel towards sustainability objectives and enhance involvement in sustainable project management. Foster green transformational leadership by educating leaders to inspire employees towards sustainability objectives and advocate for environmentally friendly techniques in project management. Establish green HR policies encompassing training, recruitment, and performance management to foster environmental sustainability. Execute Green HRM performs by recruiting environmentally responsive personnel, providing sustainability training, and matching performance assessments with green objectives. Foster organizational commendation for ecological initiatives by make sure individual feel valued and supported, resulting in heightened enthusiasm to sustainable project results.

Tactically incorporate leadership, human resource management, and provision systems to implant sustainability during project management, so refining business performance and environmental stewardship.

Limitation and Future Directions

The conclusions of the study may be embarrassed by Construction sectors in the perspective of Pakistan. Distinctive cross-sectional data designs in PLS analysis inhibit fundamental implications between mechanisms. Self-reported capacity preferences and technical unpredictability may cooperation result reliability. Measurement constructs may fail to capture all scopes of green transformational leadership, green human resource management, and organizational support. Observe the fundamental relationships and associates among GTL, GHRM, POS, and SPM across time through longitudinal studies. Inspect moderating elements such as corporate culture, environmental legislature, and staff obligation to sustainability to enhance considerate. Implement the approach across diverse sectors (such as IT sectors, Engineering sector, education sector, Food and sciences etc. where project based work are executed), locations (other than Pakistan foreign countries), and cultures to authenticate and broaden its application. Employ qualitative approaches to examine the influence of green leadership and Green human resource management on sustainable project management.

References

- Aboul-Dahab, S. A., & Saied, B. (2024). The influence of green human resources practices on sustainable performance in the Egyptian hotels. In *Research Anthology on Business Law, Policy, and Social Responsibility* (pp. 1702–1720). IGI Global.
- Al-Swidi, A. K., Gelaidan, H., & Saleh, R. M. (2021). The joint impact of green human resource management, leadership and organizational culture on employees' green behaviour and organisational environmental performance. *Journal of Cleaner Production*, 316(September 2020), 128112. <https://doi.org/10.1016/j.jclepro.2021.128112>
- Amrutha, V. N., & Geetha, S. N. (2020). A systematic review on green human resource management: Implications for social sustainability. *Journal of Cleaner Production*, 247, 119131. <https://doi.org/10.1016/j.jclepro.2019.119131>
- Aguinis, H., Beaty, J. C., Boik, R. J., & Pierce, C. A. (2005). Effect size and power in assessing moderating effects of categorical variables using multiple regression: a 30-year review. *Journal of applied psychology*, 90(1), 94.
- Andjarwati, T., Budiarti, E., Audah, A. K., Khouri, S., & Rębilas, R. (2019). The impact of green human resource management to gain enterprise sustainability. *Polish Journal of Management Studies*, 20(2), 93–103. <https://doi.org/10.17512/pjms.2019.20.2.08>
- Barclay, D., Higgins, C., & Thompson, R. (1995). *The partial least squares (PLS) approach to casual modeling: personal computer adoption ans use as an Illustration*.
- B., P. (2023). Green Human Resource Management (GHRM). *GBS Impact: Journal of Multi Disciplinary Research*, 9(1), 118–123. <https://doi.org/10.58419/gbs.v9i1.912312>
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the academy of marketing science*, 16(1), 74–94.
- Bhatti, A., Ur Rehman, S., Mirza, F., Nguyen, N. T., Samad, S., & Kamal, I. Z. (2023). Green Intellectual Capital, Green Transformational Leadership, and Sustainable Performance: A Moderated Mediation Model. *World Journal of Science, Technology and Sustainable Development*, 19(2), 85–102. <https://doi.org/10.47556/J.WJSTSD.19.2.2023.2>
- Cepeda-Carrion, G., Cegarra-Navarro, J. G., & Cillo, V. (2019). Tips to use partial least squares structural equation modelling (PLS-SEM) in knowledge management. *Journal of Knowledge Management*, 23(1), 67–89.
- Cohen, J. (1992). Statistical power analysis. *Current directions in psychological science*, 1(3), 98–101.
- Caliskan, A. O., & Esen, E. (2019). Green human resource management and environmental sustainability. *Pressacademia*, 9(9), 58–60. <https://doi.org/10.17261/pressacademia.2019.1065>
- Cient, E., Jos, A., Guevara, H., Assistente, E., & Avalia, R. R. (2020). *Como a Liderança Transformacional Verde Influencia a Sustentabilidade ? Efeitos Mediante Da Criatividade Verde*. 11, 69–87.
- Çop, S., Olorunsola, V. O., & Alola, U. V. (2021). Achieving environmental sustainability through green transformational leadership policy: Can green team resilience help? *Business Strategy and the Environment*, 30(1), 671–682. <https://doi.org/10.1002/bse.2646>

- Chin, W. W. (2009). How to write up and report PLS analyses. In *Handbook of partial least squares: Concepts, methods and applications* (pp. 655-690). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Chin, W. W., Thatcher, J. B., Wright, R. T., & Steel, D. (2013). Controlling for common method variance in PLS analysis: the measured latent marker variable approach. In *New perspectives in partial least squares and related methods* (pp. 231-239). New York, NY: Springer New York.
- Chin, W. W. (1998). Commentary: Issues and opinion on structural equation modeling. *MIS quarterly*, vii-xvi.
- Elrayah, M., & Piaralal, S. K. (2023). Leadership Dynamics in Sustainable Project Management: Insights From the Electronics Industry. *Journal of Modern Project Management*, 11(3), 50–63. <https://doi.org/10.19255/JMPM03305>
- George, D., & Mallery, P. (2024). *IBM SPSS statistics 29 step by step: A simple guide and reference*. Routledge.
- Götz, O., Liehr-Gobbers, K., & Krafft, M. (2009). Evaluation of structural equation models using the partial least squares (PLS) approach. In *Handbook of partial least squares: Concepts, methods and applications* (pp. 691-711). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In *New challenges to international marketing* (pp. 277-319). Emerald Group Publishing Limited.
- Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, 1(2), 107-123.
- Hair, J. F., Money, A. H., Samouel, P., & Page, M. (2007). Research methods for business. *Education+ Training*, 49(4), 336-337.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, 6(1), 1-55.
- Huelgas, S. M., & Arellano, V. A. (2021). Green transformational leadership, green human resource management and green innovation: Key to environmental performance of selected port management offices of Philippine ports authority. *IOER International Multidisciplinary Research Journal*, 3(3), 48-58.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Henseler, J., & Chin, W. W. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *Structural equation modeling*, 17(1), 82-109.
- Hair, J. F., Astrachan, C. B., Moisescu, O. I., Radomir, L., Sarstedt, M., Vaithilingam, S., & Ringle, C. M. (2021). Executing and interpreting applications of PLS-SEM: Updates for family business researchers. *Journal of Family Business Strategy*, 12(3), 100392.

- Hair, Jr, J. F., Sarstedt, M., Matthews, L. M., & Ringle, C. M. (2016). Identifying and treating unobserved heterogeneity with FIMIX-PLS: part I–method. *European business review*, 28(1), 63-76.
- Jehan, Y., Hussai, D., Batool, M., & Imran, M. (2020). Effect of green human resource management practices on environmental sustainability. *International Journal of Human Capital in Urban Management*, 5(2), 153–164. <https://doi.org/10.22034/IJHCUM.2020.02.06>
- Malik, S. Y., Cao, Y., Mughal, Y. H., Kundi, G. M., Mughal, M. H., & Ramayah, T. (2020). Pathways towards sustainability in organizations: Empirical evidence on the role of green human resource management practices and green intellectual capital. *Sustainability (Switzerland)*, 12(8), 1–24. <https://doi.org/10.3390/SU12083228>
- Mansoor, A., Farrukh, M., Lee, J. K., & Jahan, S. (2021). Stimulation of employees' green creativity through green transformational leadership and management initiatives. *Sustainability (Switzerland)*, 13(14), 1–14. <https://doi.org/10.3390/su13147844>
- Muralidharan, E., & Pathak, S. (2018). Sustainability, transformational leadership, and social entrepreneurship. *Sustainability (Switzerland)*, 10(2), 1–22. <https://doi.org/10.3390/su10020567>
- Niazi, U. I., Nisar, Q. A., Nasir, N., Naz, S., Haider, S., & Khan, W. (2023). Green HRM , green innovation and environmental performance: the role of green transformational leadership and green corporate social responsibility. *Environmental Science and Pollution Research, February*. <https://doi.org/10.1007/s11356-023-25442-6>
- Nevitt, J., & Hancock, G. R. (2001). Performance of bootstrapping approaches to model test statistics and parameter standard error estimation in structural equation modeling. *Structural equation modeling*, 8(3), 353-377.
- Özgül, B., & Zehir, C. (2021). The Influence of Green-Transformational Leadership Style on Corporate Sustainability: A Systematic Literature Review and Propositions for Future Studies. *Istanbul Management Journal*, 0(90), 1–30. <https://doi.org/10.26650/imj.2020.90.0001>
- Rigdon, E. E. (2012). Rethinking partial least squares path modeling: In praise of simple methods. *Long range planning*, 45(5-6), 341-358.
- Sathasivam, K., Abu Bakar, R., & Che Hashim, R. (2021). Embracing organisational environmental sustainability: Experiences in green human resource management. *Business Strategy and Development*, 4(2), 123–135. <https://doi.org/10.1002/bsd2.133>
- Singh, S. K., Giudice, M. Del, Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological Forecasting and Social Change*, 150(November 2019), 119762. <https://doi.org/10.1016/j.techfore.2019.119762>
- Sun, L. (2019). Perceived Organizational Support: A Literature Review. *International Journal of Human Resource Studies*, 9(3), 155. <https://doi.org/10.5296/ijhrs.v9i3.15102>
- Thi, T., Nhung, B., Nga, N. T., Y, N. N. N., Thi, N. H., & Son, L. T. (2024). *T He Green Transformational Leadership , Green Human Resource Management , Green Innovation And Sustainable Performance : Evidence From V ietnam*. 91–105.

- Vătămănescu, E. M., & Vintilă, F. (2023). A co-occurrence scrutiny of transformational leadership, employee engagement, well-being and burnout via a bibliometric analysis. In *Proceedings of the International Conference on Business Excellence* (Vol. 17, No. 1, pp. 1306-1318). Sciendo.
- Wong, K. K. K. (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing bulletin*, 24(1), 1-32.
- Yong, J. Y., Yusliza, M. Y., Ramayah, T., Chiappetta Jabbour, C. J., Sehnem, S., & Mani, V. (2020). Pathways towards sustainability in manufacturing organizations: Empirical evidence on the role of green human resource management. *Business Strategy and the Environment*, 29(1), 212–228. <https://doi.org/10.1002/bse.2359>
- Yong, J. Y., Yusliza, M. Y., Ramayah, T., Farooq, K., & Tanveer, M. I. (2022). Accentuating the interconnection between green intellectual capital, green human resource management and sustainability. *Benchmarking: An International Journal*, 30(8), 2783–2808.
- Zaman, U., Nawaz, S., Tariq, S., & Humayoun, A. A. (2020). Linking transformational leadership and “multi-dimensions” of project success: Moderating effects of project flexibility and project visibility using PLS-SEM. *International Journal of Managing Projects in Business*, 13(1), 103-127.
- Zhao, W., & Huang, L. (2022). The impact of green transformational leadership, green HRM, green innovation and organizational support on the sustainable business performance: evidence from China. *Economic Research-Ekonomska Istrazivanja*, 35(1), 6121–6141. <https://doi.org/10.1080/1331677X.2022.2047086>