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Research Article

Sustainability-Oriented Environmental Management and Organizational Performance: Mediating and Moderating Effects in the Tile and Ceramic Industry

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Abstract

The environmental challenges confronting modern corporations compel managers to actively engage in reshaping strategies, management systems, and internal practices to address sustainability-related concerns. This study aims to investigate the impact of environmental management on organizational performance, with a particular focus on the mediating roles of green innovation and labour productivity, as well as the moderating roles of environmental leadership and quality management. The research was conducted in the tile and ceramic industry of Yazd province, Iran. The statistical population consists of employees and managers working in this sector, and data were collected using a convenience sampling method. Given the use of structural equation modelling (SEM) in the study, the sample size was determined based on the standard guideline of 5 to 15 observations per questionnaire item (5q<n <15q), where q represents the number of survey questions and n denotes the sample size. With a total of 23 items in the questionnaire, 180 participants were selected, and 146 completed responses were ultimately analysed. The results, obtained using SmartPLS 3 and SEM analysis, indicate that environmental management has a positive and statistically significant impact on organizational performance, labour productivity, and green innovation. Furthermore, the findings reveal that both green innovation and labour productivity not only contribute directly to organizational performance but also serve as mediating variables in the relationship between environmental management and organizational performance. However, the moderating effects of environmental leadership and quality management on this relationship were not supported by the data.

Keywords Environmental Management . Organizational Performance . Environmental Leadership . Green Innovation . Labour Productivity

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Introduction

In recent years, rising public awareness and concern regarding environmental sustainability have driven companies to integrate environmental considerations into their operations and strategic activities (Xie et al., 2024). Concurrently, intensifying regulatory pressures and growing societal expectations have compelled businesses to expand and enhance their environmental initiatives (Saffari Darberazi et al., 2025). These environmentally driven demands from stakeholders have pushed sustainability concerns into the realm of strategic management, prompting firms to adopt diverse environmental management strategies (Wang et al., 2018). Environmental management constitutes a component of the broader management system and encompasses organizational structures, planning activities, responsibilities, practices, procedures, processes, and resources required to formulate, implement, achieve, review, and sustain an environmental policy (Hidayat et al., 2024; Machado et al., 2020). The emergence of environmental concerns as a source of competitive advantage has encouraged many scholars to explore the managerial competencies and organizational capabilities that can enhance corporate outcomes—including both environmental and economic performance (Dzhengiz and Niesten, 2020).

Advancements in environmental management processes and systems have the potential to improve business performance while minimizing ecological risks (Padash et al., 2021; Padash et al., 2020). A firm's commitment to robust environmental management practices can enhance operational efficiency by lowering and optimizing operating costs (Alhossini et al., 2021). Resource and energy consumption patterns significantly influence a company's financial and organizational performance. Implementing effective environmental management practices can strengthen competitive advantage and open growth opportunities by boosting corporate reputation and improving stakeholder relationships, ultimately contributing to better organizational performance (Aslam et al., 2021). This study examines two key mediating variables in the relationship between environmental management and organizational performance: green innovation and labour productivity. Green innovation is considered a critical factor in achieving both environmental and economic performance due to its dual role in reducing environmental burdens and fostering technological and economic renewal (Hidayat et al., 2024). Green innovation refers to adaptations or improvements related to green products and processes, including innovations in technologies aimed at energy conservation, pollution prevention, waste recycling, and green product design (Liu et al., 2025; Zhang and Ma, 2021).

Another mediating variable explored in this study is labour productivity. As a key input resource, labour contributes directly to productive capacity and supports the formation of regional GDP and total real output (Varona and Gonzales, 2025; Atiyatna et al., 2021). Beyond the mediating variables, the study also investigates the moderating effects of environmental leadership and quality management. Environmental leadership is defined as the ability to influence individuals and mobilize organizations toward achieving a long-term vision of ecological sustainability (Miao and Nduneseokwu, 2025; Zhang and Ma, 2021). It typically manifests through four primary leadership behaviours: inspiring a shared environmental vision, promoting environmentally responsible management practices, fostering stakeholder partnerships to address environmental challenges, and taking responsibility for environmental education and encouraging employee participation (Ashraf et al., 2024; Rousseau et al., 2016). In addition to environmental leadership, quality management is also considered a moderating factor in this study. Quality management shares several operational similarities with environmental management, including continuous assessment and improvement, cross-functional collaboration, and employee engagement. Given these parallels, organizations with a strong track record in quality management are more likely to respond effectively to the

uncertainties of environmental management and successfully implement advanced environmental strategies (Hidayat et al., 2024; Ma et al., 2020).

Many studies have examined the relationship between environmental management practices and organizational performance, emphasizing both financial and non-financial outcomes. For instance, Ur Rehman et al. (2023) investigated the link between responsible leadership with financial and environmental performance. The population included employees of construction companies in Pakistan, with 385 participants sampled. The results demonstrated that responsible leadership directly influences both financial and non-financial company performance. Zhang and Ma (2021) examined the impact of environmental management on the economic performance of companies. The study population included 246 manufacturing companies in China. Results showed a significant positive effect of environmental management on economic performance. Green innovation mediated this relationship, while environmental leadership moderated the effect of environmental management on company performance.

The purpose of Gunarathne et al. (2021) was to examine how environmental management accounting may be used to improve the effectiveness of environmental management strategies in the workplace. Environmental management accounting and environmental management strategy were both shown to be impacted by institutional influences, which the research used to further describe how these factors affect corporate environmental practices. The population included 144 commercial companies in Sri Lanka. Results indicated that environmental management strategy positively correlates with environmental and economic performance, with environmental management accounting mediating this relationship. Additionally, the organizational environment positively affects environmental management strategies and environmental management accounting.

The efficiency of the workforce was the primary indicator of economic health in the work of Ma et al. (2020). They contended that, in the unique setting of China's increasingly strict environmental legislation, environmental management has a negative effect on companies' labour productivity, but that quality management mitigates this effect. The findings demonstrated a significant positive effect of environmental management on labour productivity. Quality management was found to moderate the impact of environmental management on labour productivity.

Today, ensuring sustainable development in any country hinges on the preservation and efficient utilization of limited and non-renewable resources. To address this challenge, governments have taken various measures, including enforcing green policies such as the use of eco-friendly raw materials in industrial facilities, reducing fossil fuel consumption, recycling paper, and reusing waste materials in both public and private sector organizations. Stringent environmental regulations and growing public consciousness have driven companies to "green" their supply chains. Environmental degradation has emerged as a major global challenge, and if left unaddressed, it poses a potential threat to the survival of humanity. With mounting environmental concerns voiced by consumers, governments, and communities worldwide, manufacturing companies have begun adopting eco-conscious programs, including green product development, green branding, and green technologies. These concerns have extended to industries such as tile and ceramics, where environmental considerations are now seen as a vital element of business operations. Environmental concerns now span a wide scope—from raw material procurement and production processes in manufacturing plants to the environmental impact of product use by end consumers. Ignoring these issues may result in severe consequences such as reduced organizational performance, diminished competitiveness, and negative perceptions among customers, stakeholders, and the broader public. Consequently, prioritizing environmental issues is now imperative for both manufacturing and service-based firms across the country.

Given the increasing significance of environmental concerns, various industries are moving toward expanding their environmental activities. Among these, the tile and ceramic industry stands out as one that must consistently consider its environmental impact due to the nature of its operations. With abundant raw materials and a long-standing tradition in Iran, this industry has evolved into a leading sector through industrial development. However, neglecting environmental issues in this sector can lead to substantial ecological damage.

Therefore, the present study aims to investigate the effect of environmental management on organizational performance, with green innovation and productivity as mediating variables, and environmental leadership and quality management as moderating variables—focusing on the tile and ceramic industry in Yazd, Iran.

Concepts, Perspectives, and Theoretical Foundations

Organizational Performance

Organizational performance is defined as an evaluative process that enables organizations to assess and compare their goals, patterns, past decisions, and other processes and outputs. Essentially, the core of organizational performance lies in value creation. As long as the value generated from shared assets meets or exceeds expected value, those assets remain within the organization (Alameeri et al., 2020). In other words, evaluating organizational performance is critical for an organization's survival and continued operation in the market. Many scholars have measured organizational performance using both financial and non-financial indicators. These indicators include market-based metrics such as return on investment, market share, profit margins, ROI growth, sales volume, and other variables. Although organizational performance has become a key issue for all organizations—both for-profit and non-profit—its conceptualization and measurement remain challenging (Al Shebli et al., 2021).

According to the literature, organizational performance is generally categorized into financial and non-financial dimensions. Since the late 1980s, most researchers and consulting firms have emphasized the importance of incorporating non-financial indicators into performance measurement systems. Financial performance refers to changes in the financial status of the organization and is seen as the result of managerial decisions and their execution by organizational members. In contrast, non-financial performance encompasses factors such as quality of work life, social interactions, employee job satisfaction, and environmental concerns (Hanaysha and Alzoubi, 2022).

Environmental Management

Environmental management refers to a set of strategic and operational activities through which an organization seeks to manage the environmental aspects of its operations and reduce environmental risks (Padash et al., 2024). From the organization's perspective, this concept encompasses all efforts aimed at minimizing the adverse impacts of activities, services, and products on the environment (Dubey et al., 2015). According to Bakkass et al. (2025), Environmental management refers to the set of organizational activities implemented to reduce environmental damage. Environmental management systems are designed to help firms control, monitor, and improve their environmental performance. These systems also enable companies to assess the environmental consequences of their activities and, through preventive and corrective actions, minimize harmful environmental impacts.

Environmental management is a critical aspect of sustainability and has become a strategic necessity for organizations. As pressures from regulatory bodies, customers, and society increase, firms must proactively integrate environmental considerations into their decision-

making processes. This includes waste management, energy efficiency, pollution control, and compliance with environmental regulations (Sharma and Henriques, 2005). In the context of organizational strategy, effective environmental management enhances corporate image, boosts competitive advantage, and may lead to long-term cost savings. It requires a systemic approach that aligns environmental goals with business objectives, often supported by top management commitment, employee training, and stakeholder engagement (Daily et al., 2009).

Green Innovation

Green innovation refers to innovations that aim to reduce environmental harm, improve energy efficiency, and support the sustainable use of resources throughout the product lifecycle. Green innovation includes green product innovation, green process innovation, and green managerial innovation (Cheng et al., 2014).

Green product innovation involves developing products that are environmentally friendly throughout their lifecycle—from production and use to disposal. Green process innovation refers to modifications in production processes that reduce waste, energy consumption, and pollutant emissions. Managerial green innovation entails implementing new environmental management systems, corporate policies, and organizational practices that contribute to sustainable development (Chen et al., 2006).

Green innovation not only benefits the environment but also serves as a source of competitive advantage for firms. It can enhance brand image, improve stakeholder relationships, and create opportunities for entering new markets. Moreover, firms engaging in green innovation often achieve cost reductions through more efficient resource utilization and waste minimization (Porter and Linde, 1995). According to Wu (2013), green innovation plays a significant role in enhancing firm performance, particularly when it is supported by internal capabilities such as employee engagement, R&D investment, and leadership commitment. Thus, firms that adopt green innovation are better positioned to achieve both environmental sustainability and economic performance.

Environmental Leadership

Environmental leadership is defined as the ability of leaders to influence, motivate, and enable others to contribute toward the effectiveness and success of environmental objectives. These leaders set clear environmental visions, inspire organizational members to engage in sustainable practices, and drive environmental innovation (Egri and Herman, 2000). Environmental leaders play a crucial role in integrating sustainability into organizational culture and strategy. They foster a shared vision for environmental responsibility, support the development of green competencies, and encourage collaboration across departments to achieve ecological goals. Their actions influence both employee attitudes and firm-wide behaviours toward environmental performance (Alemu, 2025).

Leadership that emphasizes environmental values is linked with better environmental performance and can shape long-term organizational change. Such leaders are proactive in adopting clean technologies, pursuing certifications (e.g., ISO 14001), and responding to stakeholder demands for sustainability. In this regard, environmental leadership is not limited to top management but can emerge at all organizational levels (Robertson and Barling, 2013).

In summary, environmental leadership is a critical factor in achieving organizational sustainability. It aligns individual and organizational efforts with environmental goals and fosters a culture of continuous improvement and innovation in environmental performance (Fryxell and Lo, 2003).

Quality Management

Undoubtedly, quality management is a critical and fundamental concept across organizations and various industries. The principles of quality management have been developed as structured and organized approaches aimed at improving processes, enhancing performance, and delivering better products and services to customers. At its core, quality management refers to establishing and maintaining high standards in all aspects of an organization's activities. Continuous improvement and the pursuit of efficiency in processes lead to increased customer satisfaction, error and cost reduction, improved productivity, and the preservation of organizational competitiveness (Ebrahimi and Sadeghi, 2013).

Quality management is an organizational approach focused on enhancing overall performance, improving customer satisfaction, and delivering high-quality products and services. This approach ensures that the processes, technologies, and resources used in the organization are properly designed and managed to achieve continuous improvement in organizational performance (Zhang and Ma, 2021). In order to establish a deep and comprehensive quality culture, quality management in organizations employs a wide range of methods and tools, including standards, management processes, performance evaluation, customer feedback, and change management. The main goal of quality management is to improve quality and add value to the products and services offered to customers. Its benefits include increased customer satisfaction, cost reduction, improved organizational performance, enhanced competitiveness, and the creation of trust and transparency in the market (Barbosa et al., 2022).

Labour Productivity

Labour productivity, as a driver of growth, holds particular significance not only in the industrial sector but also in the service sector of the economy. It is one of the most critical factors for the growth and advancement of organizations. This concept refers to the optimal utilization of workforce capabilities, skills, and capacities to achieve organizational goals and values. Labour productivity essentially reflects the effectiveness of labour use in production, performance, and service delivery.

Previous research has focused on scientific and technological advancements, methods of efficient production modernization, and the organization of workspaces. Nowadays, the term "progress" is less commonly used and is often replaced by concepts such as innovation—especially technological, organizational, and personnel-related innovations (Vertakova and Maltseva, 2020). Nevertheless, all these factors generally aim at more efficient resource utilization, increased output, and reduced production costs. These objectives ultimately lead to enhanced labour productivity.

It is important to note that researchers have identified two main approaches to understanding the nature and role of labour productivity within productivity measurement systems. Some scholars link labour productivity closely with output and labour intensity, while others associate it more with the concept of efficiency (Ma et al., 2020).

The concept of total factor productivity—which assesses the cumulative impact of resources and economic growth influenced by scientific and technological progress—is also widely acknowledged. Labour productivity is one of the primary indicators of socioeconomic development effectiveness. It can be assessed in terms of both content and volume. From a volumetric perspective, labour productivity indicators can be applied at the national level, within specific regions, or at the level of a particular firm or workplace. Based on the above, the conceptual model of this study is presented in Figure 1.

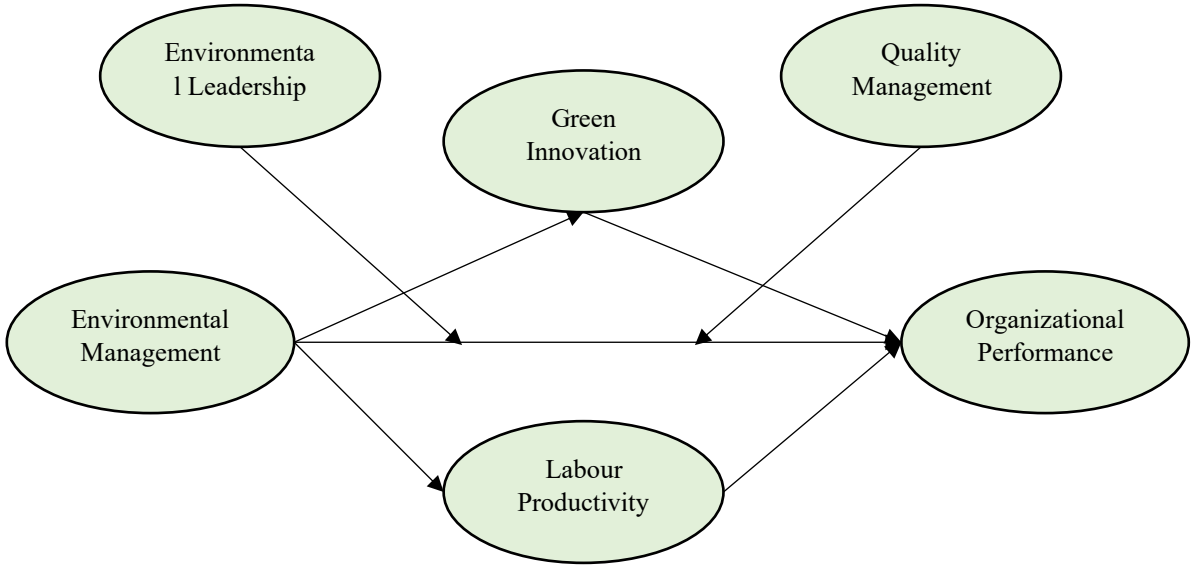

Figure 1. Conceptual research model

Research Methodology

This study follows a positivist research philosophy, which considers reality as objective and measurable. In terms of purpose, the present research is applied, with findings relevant to the Yazd tile and ceramic industry. Methodologically, it is a descriptive-correlational study conducted using a survey strategy. The statistical population consists of employees and managers within the Yazd tile and ceramic industry, selected through convenience sampling. The sample size was determined based on the formula $(5q < n < 15q)$, where q represents the number of questionnaire items. Given 23 designed questions, the sample size was set at 180 individuals, of whom 146 completed and returned the questionnaires.

Data collection was performed using a questionnaire based on a 5-point Likert scale, measuring the study variables, including green innovation, organizational performance, environmental leadership, environmental management, quality management, and labour productivity. The validity of the questionnaire was confirmed through convergent validity, assessed by factor loadings and Average Variance Extracted (AVE), as well as discriminant validity verified using the Fornell-Larcker criterion. The reliability of the instrument was examined by Cronbach's alpha and composite reliability indices, with values above 0.7 indicating acceptable reliability. The questionnaire comprised 23 items distributed across six main constructs: green innovation (items 1 to 5), organizational performance (6 to 8), environmental leadership (9 to 11), environmental management (12 to 15), quality management (16 to 19), and labour productivity (20 to 23). The questionnaire was carefully designed to ensure validity and reliability, enabling accurate measurement of the various research dimensions.

Data analysis was conducted using Structural Equation Modelling (SEM) with Smart PLS 3 software. This method was chosen due to its capability to analyse complex relationships among latent and observed variables. The analysis proceeded in two stages: first, the measurement model fit was evaluated by assessing the validity and reliability of the items and constructs; second, the structural model fit was examined through path coefficients, t-statistics, and the coefficients of determination (R^2), predictive relevance (Q^2), and effect size (F^2). Additionally, the Standardized Root Mean Square Residual (SRMR) index was employed to assess the overall model fit, with values below 0.08 indicating a good fit. The results of these analyses elucidate both the direct and indirect effects among variables, as well as their mediating and moderating roles.

Research Findings

This study aimed to examine the impact of environmental management on organizational performance with the mediating roles of green innovation and labour productivity, and the moderating roles of environmental leadership and quality management in the Yazd tile and ceramic industry.

Data collected from 146 respondents were analysed using SmartPLS 3 software and Structural Equation Modelling (SEM). The findings are presented in the following sections. The demographic data analysis (Table 1) shows that most respondents (50%) hold a bachelor's degree, 30.13% have a master's degree, and 6.84% possess a doctoral degree. Regarding work experience, 47.26% of respondents had 5 to 10 years of experience, and 40.41% were in the age group of 30 to 40 years. These characteristics indicate a suitable diversity in the sample in terms of education and work experience.

Table 1. Demographic Information of Respondents

Demographic Characteristic	Grouping	Percentage (%)	Frequency
Education	Diploma and Associate Degree	13.01	19
	Bachelor’s Degree	50.00	73
	Master’s Degree	30.13	44
	Doctorate Degree	6.84	10
Work Experience	1 to 5 Years	21.91	32
	5 to 10 Years	47.26	69
	10 to 15 Years	19.18	28
	More than 15 Years	11.64	17
Age	20 to 30 Years	26.02	38
	30 to 40 Years	40.41	59
	40 to 50 Years	19.86	29
	Over 50 Years	13.69	20
	Total	100.00	146

As shown, 50% of respondents hold a bachelor's degree, 47.26% have 5 to 10 years of work experience, and 40.41% fall within the 30–40 age group, confirming appropriate sample diversity. Regarding model fit, convergent validity was confirmed with AVE values exceeding 0.5 for all variables, indicating strong correlations between items and their constructs. Discriminant validity was supported by the Fornell-Larcker criterion, where diagonal values (square root of AVE) were greater than off-diagonal correlations. Reliability was established with Cronbach’s alpha and composite reliability values above 0.7 for all constructs, indicating high instrument consistency.

Structural model analysis revealed that environmental management has a significant positive impact on labour productivity (path coefficient=0.895, t=27.40), green innovation (0.883, t=27.34), and organizational performance (0.270, t=3.21). Furthermore, labour productivity (0.339, t=3.98) and green innovation (0.184, t=1.97) served as significant mediators positively affecting organizational performance. However, the moderating roles of environmental leadership and quality management on the relationship between environmental management and organizational performance were not supported (t-values<1.96). Discriminant validity assessed via the Fornell-Larcker criterion confirmed that each construct shares greater variance with its indicators than with other constructs, as diagonal values (square roots of AVE) exceeded off-diagonal correlations (Table 3).

Table 2. Reliability and Convergent Validity Indicators

Construct	Composite Reliability	Cronbach's Alpha	AVE
Labour Productivity	0.976	0.893	0.757
Environmental Leadership	0.919	0.867	0.790
Organizational Performance	0.903	0.838	0.756
Environmental Management	0.935	0.908	0.783
Quality Management	0.930	0.899	0.768
Green Innovation	0.930	0.906	0.727

Table 3. Fornell-Larcker Discriminant Validity Results

Construct	Labour Productivity	Environmental Leadership	Organizational Performance	Environmental Management	Quality Management	Green Innovation
Labour Productivity	0.912					
Environmental Leadership	0.870	0.889				
Organizational Performance	0.882	0.875	0.899			
Environmental Management	0.887	0.867	0.869	0.912		
Quality Management	0.821	0.873	0.880	0.834	0.933	
Green Innovation	0.836	0.887	0.836	0.847	0.818	0.895

Model adequacy was evaluated using R^2 and Q^2 indices. R^2 represents explained variance, with values of 0.19, 0.33, and 0.67 indicating weak, moderate, and strong explanatory power, respectively. In this study, all endogenous constructs had R^2 values above 0.67, indicating strong explanatory power. The Q^2 statistic assesses predictive relevance, with values above 0.35 denoting strong predictive capability. The model demonstrated strong predictive power, as shown in Table 4.

Table 4. R^2 and Q^2 Values for Endogenous Constructs

Construct	R^2	Q^2
Labour Productivity	0.800	0.570
Organizational Performance	0.881	0.622
Green Innovation	0.779	0.531

The overall model fit was confirmed using the Standardized Root Mean Square Residual (SRMR), which compares the observed covariance matrix with the model-implied covariance matrix. An SRMR value of 0.053, well below the 0.08 threshold, indicates excellent model fit. Hypothesis testing via path analysis with standardized coefficients and t-statistics was performed at a significance level of 0.05 (critical t-value=1.96). Relationships with t-values greater than 1.96 were supported at a 95% confidence level. Mediation and moderation effects were tested using standard SEM procedures. The detailed results are presented in Table 5.

Table 5. Hypothesis Testing Results

Hypothesis	Path Coefficient	t-value	Result
Environmental management positively affects organizational performance	0.270	3.21	Supported
Environmental management positively affects green innovation	0.883	34.77	Supported
Environmental management positively affects labour productivity	0.895	27.40	Supported
Green innovation positively affects organizational performance	0.184	1.97	Supported
Labour productivity positively affects organizational performance	0.339	3.98	Supported
Green innovation mediates the relationship between environmental management and organizational performance	0.163	0.97	Supported
Labour productivity mediates the relationship between environmental management and organizational performance	0.303	3.97	Supported
Environmental leadership moderates the relationship between environmental management and organizational performance	-0.002	0.11	Not supported
Quality management moderates the relationship between environmental management and organizational performance	0.005	0.28	Not supported

The results confirm all direct and indirect (mediating) hypotheses, showing that environmental management has both direct and indirect positive effects on organizational performance through green innovation and labour productivity. The moderating roles of environmental leadership and quality management were not supported. Figure 2 illustrates the t-values and path coefficients of the model.

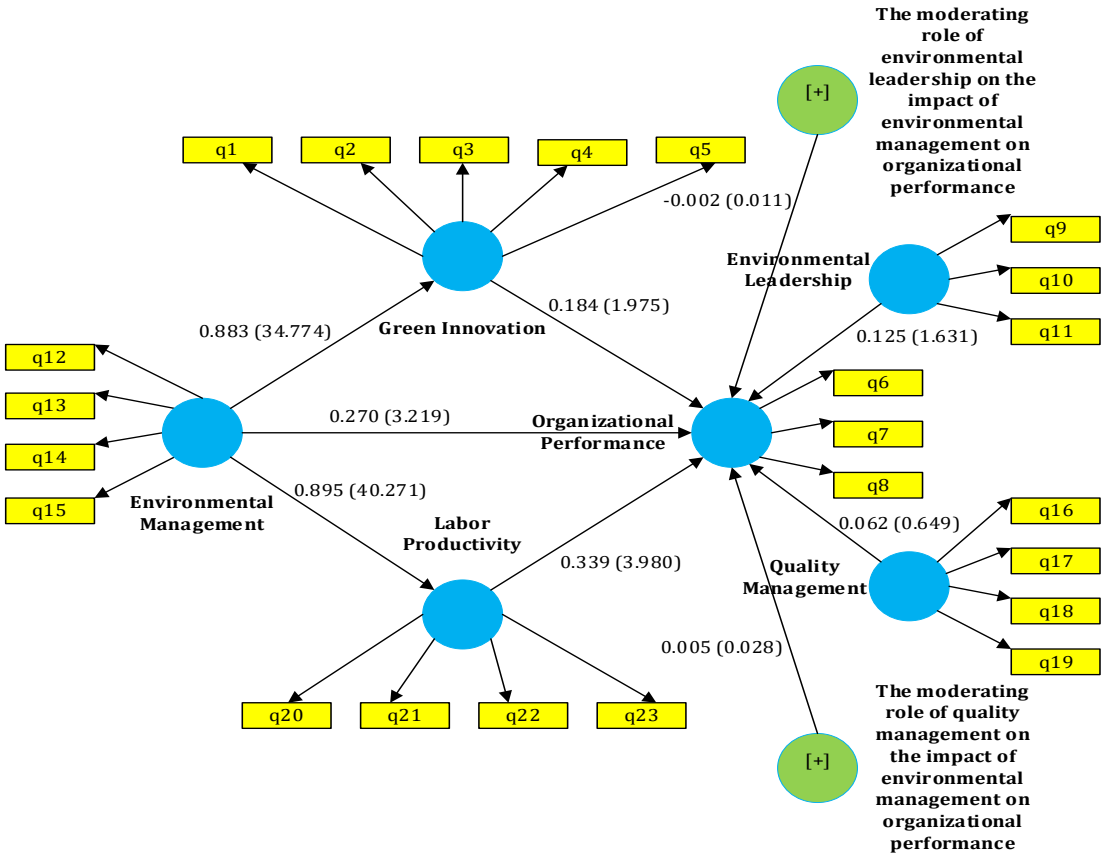

Figure 2. Path Coefficients and t-values

Conclusion

The environment, as one of the most pressing challenges of our time, plays a vital role in safeguarding human health and ensuring the sustainability of life on Earth. In this context, the present study aimed to examine the impact of environmental management on organizational performance, with a mediating role of green innovation and labour productivity in the tile and ceramic industries of Yazd. From a theoretical standpoint, this study extends the existing literature on environmental management and organizational performance by integrating multiple mediating and moderating mechanisms within a single comprehensive framework. Unlike prior research that examined these relationships separately, this study simultaneously explores how green innovation and labour productivity mediate, and how environmental leadership and quality management moderate, the effect of environmental management on organizational performance. Furthermore, by applying the VBN theory within an industrial context, the research bridges behavioural and managerial perspectives, illustrating how environmental values and organizational systems interact to shape sustainable outcomes. This multidimensional approach contributes to theory by highlighting the dynamic interplay between managerial capability, innovation, and human performance as key drivers of sustainability in developing-country industries.

The results demonstrated that environmental management has a significant positive effect on organizational performance, with a path coefficient of 0.270 and a t-value of 3.21. This finding aligns with the studies of Vachon and Klassen (2008) and indicates that attention to environmental issues not only avoids imposing financial burdens on organizations but can also enhance overall organizational performance. Implementing environmental management systems—through waste reduction, energy and resource optimization, and process improvements—can increase efficiency and reduce operational costs.

Another key finding revealed a strong positive effect of environmental management on labour productivity, with a path coefficient of 0.895 and a t-value of 40.27. Consistent with Lannelongue et al. (2017), this result highlights that training employees on environmental issues and fostering a pro-environmental organizational culture can improve both individual and collective labour performance. When employees are aware of the environmental impact of their actions, they tend to be more motivated to enhance their performance and productivity. Regarding green innovation, environmental management showed a substantial positive influence on the development of green innovations, with a path coefficient of 0.883 and a t-value of 34.77. This outcome, consistent with Huong et al. (2021), suggests that organizations attentive to environmental concerns are more inclined to invest in eco-friendly products and processes. Such innovations not only reduce pollution and preserve the environment but also serve as a competitive advantage for the organization.

Furthermore, labour productivity and green innovation were found to mediate the relationship between environmental management and organizational performance, with path coefficients of 0.303 (t=3.97) and 0.163 (t=3.97), respectively. These findings indicate that environmental management influences organizational performance both directly and indirectly through improvements in labour productivity and the advancement of green innovations. This concurs with Zhang and Ma (2021), underscoring the importance of simultaneously addressing human and technological dimensions in environmental strategies. Additionally, labour productivity exhibited a significant positive effect on organizational performance, confirmed by a path coefficient of 0.339 and a t-value of 3.98 at a 95% confidence level. In line with Kenney (2019), this finding demonstrates that enhancing labour productivity through increased efficiency, cost reduction, and improved output quality directly contributes to better organizational performance. This emphasizes the critical importance of investing in human

resource development and creating an environment conducive to high employee productivity for achieving organizational goals.

The study also found that environmental leadership did not have a significant moderating effect on the relationship between environmental management and organizational performance ($t=0.011$, $p>0.05$). This result diverges from Zhang and Ma (2021), who reported a positive moderating role of environmental leadership. The discrepancy may be due to specific characteristics of the tile and ceramic industry, cultural contexts, or organizational maturity in implementing environmental strategies. It appears that in this sector, the direct effects of environmental management are so pronounced that little room remains for leadership to exert a moderating influence. This highlights the necessity of considering organizational and industrial contexts in future research. Similarly, quality management did not significantly moderate the relationship between environmental management and organizational performance ($t=0.028$, $p>0.05$), contrasting with the findings of Ma et al. (2020). The present results suggest that, within this industry, environmental management and quality management independently influence organizational performance without a significant interaction effect. This underlines the importance of contextualizing environmental and quality management studies to specific organizational and industrial settings.

Moreover, green innovation itself showed a significant positive impact on organizational performance, with a path coefficient of 0.184 and a t-value of 1.97 at a 95% confidence level. Consistent with Wang et al. (2021), this suggests that implementing green innovative solutions in processes and products can improve organizational performance by reducing operational costs, increasing customer satisfaction, and establishing sustainable competitive advantages. These findings highlight the critical role of investing in environmental innovations to enhance the performance of industrial organizations.

Practical Implications

This study offers several important practical and policy implications for managers, decision-makers, and sustainability officers, particularly within the tile and ceramic industry and similar resource-intensive sectors. Firstly, the findings emphasize that investing in environmental management systems (EMS) should not be seen merely as an ethical or compliance requirement but as a strategic instrument that enhances operational efficiency, reduces waste, and strengthens overall organizational performance. Implementing EMS enables firms to establish measurable environmental objectives, monitor progress, and continuously improve resource efficiency and cost-effectiveness.

Secondly, the results highlight the central role of human capital in driving sustainability outcomes. Developing structured training and awareness programs—such as employee workshops on green practices, “eco-efficiency” campaigns, and departmental energy-saving competitions—can effectively translate environmental goals into daily operational behaviour. These behavioural interventions also help foster a pro-environmental organizational culture, where employees are motivated and rewarded for sustainable actions. Thirdly, the study underscores the importance of integrating green innovation into corporate and institutional strategies. Policymakers and organizational leaders should provide incentives for R&D in eco-friendly technologies, promote cross-functional collaboration for process redesign, and encourage partnerships with academic and governmental bodies to scale up innovation-driven sustainability initiatives.

Moreover, the findings suggest that organizations should adopt a comprehensive policy framework that aligns environmental management with leadership development and human resource strategies. Establishing leadership training programs on environmental responsibility and embedding sustainability performance indicators into managerial evaluations can

significantly enhance accountability and long-term environmental performance. Finally, to extend impact beyond the organizational level, industry associations and government bodies could design sectoral programs—such as resource-sharing platforms, energy-efficiency certifications, and public awareness campaigns—to accelerate collective progress toward sustainability. Altogether, these actionable measures transform the study's findings into concrete guidance for implementing effective, evidence-based environmental and behavioural policies.

Suggestions for Future Research

While some relationships in the model approached the conventional significance threshold, they should be interpreted cautiously. These findings nonetheless provide valuable managerial insight, indicating directions for future strategic and policy development. The study's results underline the importance of fostering environmental management and innovation even when statistical evidence is modest, as these practices can still generate long-term organizational and social value. At the same time, the study acknowledges limitations such as the sample size and contextual scope, suggesting that future research with broader and more diverse datasets could further validate and generalize these findings.

Building upon the current study's findings, several avenues for future research are recommended to deepen and broaden the understanding of environmental management's impact on organizational performance. First, replicating this research model in diverse industries beyond the tile and ceramic sector would help verify the generalizability of the findings. Different industrial contexts may present unique challenges and opportunities, which could influence the relationships between environmental management, innovation, labour productivity, and performance. Second, the inclusion of additional moderating variables could enrich the explanatory power of the model. For instance, investigating the role of emerging clean technologies, digitalization, and organizational culture as moderators may reveal complex interactions that affect how environmental management translates into performance gains. Exploring factors such as leadership styles (e.g., transformational or sustainable leadership), employee engagement, or external pressures (regulatory, societal) could also provide valuable insights.

Third, future research would benefit greatly from adopting longitudinal designs. Tracking organizations over time would allow for the examination of the dynamic and long-term effects of environmental management practices, green innovation adoption, and labour productivity improvements. This approach could clarify causal relationships and identify delayed or cumulative impacts that cross-sectional studies cannot capture. Additionally, qualitative research methods such as case studies or interviews could complement quantitative findings by offering in-depth perspectives on how environmental management strategies are implemented, challenges encountered, and best practices developed in different organizational and cultural settings. Finally, exploring the financial implications more explicitly could help organizations justify sustainability investments from a purely economic standpoint, further facilitating the integration of environmental management into core business strategies.

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