



A double-blind, peer-reviewed, open-access, and an HEC-recognized Y-category Journal

Research Journal of Human and Social Aspects

Web link: <https://rjhsa.com/index.php/rjhsa>

P-ISSN: [3006-9696](https://doi.org/10.71085/rjhsa.04.03.107), E-ISSN: [3006-970X](https://doi.org/10.71085/rjhsa.04.03.107)

Volume 4 Issue 3, 2026, Page Rang: 197-209



How Environmental Sustainability Orientation Translate into Environmental Performance Under NROT. A Moderated Mediation Model of Inter-Organizational Learning and Environmental Strategies in Manufacturing Firms

Imran Akram¹ Muhammad Rafiq² Dr. Hafiz Ihsan ur Rehman³

¹ PhD Scholar, Department of Management Sciences Superior University, Lahore, and Assistant Professor, Department of Commerce University of the Punjab Gujranwala Campus, Punjab, Pakistan.

² Department of Management Sciences, Superior University Lahore, FAST School of Management. National University of Computer and Emerging Sciences, Punjab, Pakistan.

³ Assistant Professor, Department of business administration University of the Punjab Gujranwala Campus, Punjab, Pakistan.

Correspondence Author: imran.akram@pugc.edu.pk

Article information

Article History:

Received: 2026-06-11

Received in revised form:
2026-07-07

Accepted: 2026-07-20

Published Online: 2026-08-11

Keywords:

Environmental Sustainability Orientation; Environmental Performance; Inter-Organizational Learning; Environmental Strategies; Natural Resource Orchestration Theory; Pakistan Manufacturing Firms.

ABSTRACT

In Modern world, manufacturing and environmental damage go hand in hand, and Pakistan is not an exception. This study is conducted to check the impacts of environmental sustainability orientation (ESO) on manufacturing firms' environmental performance (EP). The study is based on the Natural Resource Orchestration Theory (NROT) to tests a model in which inter-organizational learning (IOL) is an important mediator of the ESO-EP relationship, and environmental Strategies (ES) is considered as a key moderator. The study used a structured questionnaire to collect data from different Manufacturing Firms by simple random sampling in Pakistan. Partial least squares structural equation modeling (PLS-SEM) was used to test the model in Smart PLS. The results showed that ESO had a significant positive direct effect for both EP and IOL, However, IOL partially mediates the ESO-EP relationship. For firms that engaged with better Environmental Strategies proved worthy for EP directly and it also moderated the relationship of IOL and EP. The results are a complement to NROT as it demonstrates that the leveraging phase, which in the past was considered a single process, can be divided into several pathways with varying power in a manufacturing environment in a developing economy like Pakistan. The findings indicate that for managers and policy makers in Pakistan, it will be important to strengthen the environmental orientation of the firms directly, and not primarily through a reliance on inter-firm learning networks, as this is likely to yield the higher environmental return, although learning through alliances remain important, in firms with high long-term commitments and investments towards environment (ES).



© 2026 by the Authors. Licensee Akram, Rafiq & Rehman. This article is an open-access distributed under the terms and conditions of the Creative Commons Attribution (CC BY) License <https://creativecommons.org/licenses/by/4.0/>

1. Introduction

Sustainability is now the main discussion of modern industrialized World. Contemporary business environment has put sustainability concerns at the forefront of global agenda as the need to have an ecologically responsible enterprise is a question of concern globally (Asiaei et al., 2022). Factories are being supposed to do both—produce more and cause less harm—and that call is not going away. Climate goals are becoming ever more ambitious as international agencies, governments and even customers are asking questions on environmental issues. Pakistan's story is a part of this worldwide story. Its manufacturing, especially its textile industry, chemicals, plastics, tanneries and pharmaceuticals, is a primary job creator, exporter, and foreign currency earning hands but simultaneously a primary polluter of the environment (Rehman, Bhatti, et al., 2021). This is not a secret now as it is a publicly proven what the leather tanneries, Chemical units and the dying textiles units are seriously threatening the Areas of production.

In past, studies have been made to discuss the issue of sustainable manufacturing business by using green resources (Adomako et al., 2019; Mishra et al., 2024; Rehman et al., 2022). In the early research, the evidence was largely concerned with whether or not environmental sustainability orientation can predict firm's Environmental performance generally, with most studies concluding that it does, but the pathway through which the effect is mediated remained somewhat unexplored. Subsequent studies focused on the appropriateness between partners' practices in the supply chain (but not on Inter-Organizational learning) and on mechanisms of innovation (Shou et al., 2018). Recent research on the link between practice and performance in Pakistan (Aftab et al., 2023; Rehman et al., 2023) has focused on government regulation and top management commitment as boundary conditions that support this link of green entrepreneurial orientation as a driver for performance via green supply chain management

(Niamat & Qureshi, 2025). The gap is still that these studies say nothing about how much inter-organizational learning, rather than supply chain coordination, is the mechanism that transmits ESO's effect, nor say they whether a firm's Environmental Strategy affect the value of inter-organizational learning under NROT approach.

The study Used Natural Resource Orchestration Theory (NROT) which provides a valuable tool for analyzing the relationship of the constructs. Owning sustainable resources (green machines, trained staff, sustainability policies) is not enough to get good environmental outcomes but difficult to act upon unless those resources must be organized, orchestrated and deployed in a real way to produce desired environmental outcomes and organization would be considered as sustainable and greener entities (Sirmon et al., 2011). There is an important, practical and theoretical space to be researched, and NROT is the best theory to set the agenda of research The context of environmental management has gone further, arguing that firms must engage in active management of their environment if they hope to reap returns from it (Andersén, 2023). environmental sustainability orientation is a resource and a mindset for environmental performance to be translated, how and through which channels the resource has been leveraged makes the difference.

It is ideal for a Pakistani manufacturing company to possess a high environmental sustainability orientation, that is, they must have strong environmental practices, good environmental knowledge, and commitment from their management to improve their environmental performance (Zhang et al., 2019), which would include lower emissions, less waste, better compliance and more efficient use of water and energy to prove sustainable, greener and improved sector (Adomako et al., 2019). The Question of pathway between sustainability orientation practices, cross organizational learning support, and environmental performance is the main concern of this research. It is of particular importance in Pakistan, as the manufacturing sector of the country is trying to

serve Europe and developed countries of other continents, has a serious demand of greener operations (Aftab et al., 2023). The success of advanced operations in the growing economy rely on exceptional internal resources, such as ESO along with IOL support, and external resources, such as environmental policy instruments. (Rehman et al., 2022)

In practice, Pakistani manufacturers need to understand where to place limited sustainability funds: should they invest in learning partnerships with suppliers and industry peers, or should they invest more clearly in developing their own environmental capabilities and is the decision different based on the level of their Environmental Strategies Which includes the organizations 's effort to save the Environment by setting target of Sustainability goals ,by using green resources efficiently ,regulatory Compliance and long term historical environmental commitments. Proactive ES would help the firms to boost EP and helps in protection of the Environment (Aftab et al., 2023; Liang et al., 2022). In theory, testing inter-organizational learning as a formal mediator, and Environmental Strategies as a formal moderator, can respond to a call of NROT as leveraging the resources in environmental management is a key to get competitive advantage. Based upon the model of the study, this research has the following research objectives

1. To check the impact of ESO on EP
2. To examine the relationship between ESO and IOL
3. To find the relationships between IOL and EP
4. To check the impact of ES on EP
5. To check the mediating relationship of IOL with ESO -EP link
6. To find the moderating relationship of ES between IOL and EP

The study's main impact is to assess if sustainability orientation is important primarily because it is learned and disseminated across firm boundaries along with the Sustainable Strategy of a firm that influences the value of learning for the environment. The study answered to this

academic question for emerging-economy's manufacturing sector about the pathway required to boost EP through the mediation and moderation mechanism provided by the NROT which was not discussed before. The study is significant for the relevant policy makers and regulators to consider to invest in inter-firm learning networks or inter firm-level alliances or not. The study practically provides a solution to the industry' management that When plant managers are deciding between a learning partnership, or a R&D investment towards environment, they want to know which combination, will move the environmental needle further.

2. Literature Review

The central theme of this review was that NROT is the common thread weaved through the review and thus should be repeated before we address the hypotheses one by one. As per (Badrinarayanan et al., 2019) the actual performance of a firm is less about the resources a firm has and more about how the resources are structured, formed into capabilities and used in the market. Sirmon et al., (2011) further elaborated on this concept specifically to the field of environmental management, claiming that green resources, environmental commitments, and knowledge sharing among allied partners only become environmental value if a company activates them in the right way, and that the literature employing the term orchestration language does so in a slack manner without testing the actual leveraging mechanism.

ESO Relationship with EP

This is one of the more well-known results of this literature, namely that the orientation towards environmental sustainability can be used as a predictor of environmental performance, although the mechanism explaining this relationship has not been well specified (Mishra et al., 2024). The result of all the sustainability Strategies research, as well as Pakistan-specific research that has been conducted in recent years, is essentially the same: Companies with higher environmental practices, knowledge, and

commitment tend to perform better environmentally (Nazir et al., 2024). The ESO-EP relationship is treated as a black box, with some external process being responsible for mediating the impact of ESO on performance, which was useful as a boundary condition, but the study does not explain the internal/external process responsible for this mediation. It's the space that NROT is designed to fill, and which this study specifically measures, not assumes.

H1: *ESO has direct relationship with EP*

ESO determines IOL

Less research examines if environmental orientation is a determinant of inter-organizational learning, rather than supply chain coordination overall. Ur Rehman et al., (2019) conducted a survey of 185 textile managers in Pakistan and determined that green entrepreneurial orientation is linked to green supply chain management, which indicates that oriented firms do extend outward, albeit in terms of coordination of practices and not learning of new knowledge. Without focusing on learning as the channel, KEMİKKIRAN & KIZRAK, (2022) found that the "inter-organizational fit" of the supply chain is essential for environmental innovation, confirming that external engagement is also a key driver for it. The combined results of these studies indicate the plausibility of H2, but do not test it in the terms of this study.

H2: *ESO has direct relationship with IOL*

IOL has Direct Relationship with EP

The relationship between inter-organizational learning and environmental performance is least tested of the six relationships related to environmental performance found in the previous literature in Pakistan and in the region. A more comprehensive supply chain study has demonstrated that cross-firm knowledge transfers and organizational learning leads to better performance results, including sustainable performance, via social governance and collaboration, among others. The study which were the closest to this link in Pakistan's manufacturing industry, as they demonstrated

that green supply chain management (GSCM), as a concept containing the learning elements, served as a mediator between orientation variables and sustainable performance (Niamat & Qureshi, 2025). Of course, their discovery provides indirect evidence to support H3, but once more doesn't rule out learning from coordinating, thus opening the question this study directly addresses.

H3: *IOL has direct relationship with EP*

IOL mediates relationship between ESO and EP

The literature is closest to this study's model in the arena of mediation through boundary spanning mechanisms but it does not test this model as exactly. It was found that the relationship between orientation and performance, in Pakistani manufacturing and textile companies, is mediated in part by an orientation-performance relationship between the firm and its supply chain (Omar et al., 2019). This is consistent to NROT's understanding that leveraging logic requires a process that leads to performance, but neither study names nor measures inter-organizational learning as a process. The present study makes a contribution to the test of learning as the leveraging mechanism, instead of the supply chain management as a whole, as predicted by NROT.

H4: *IOL mediates ESO and EP relationship*

ES determines EP

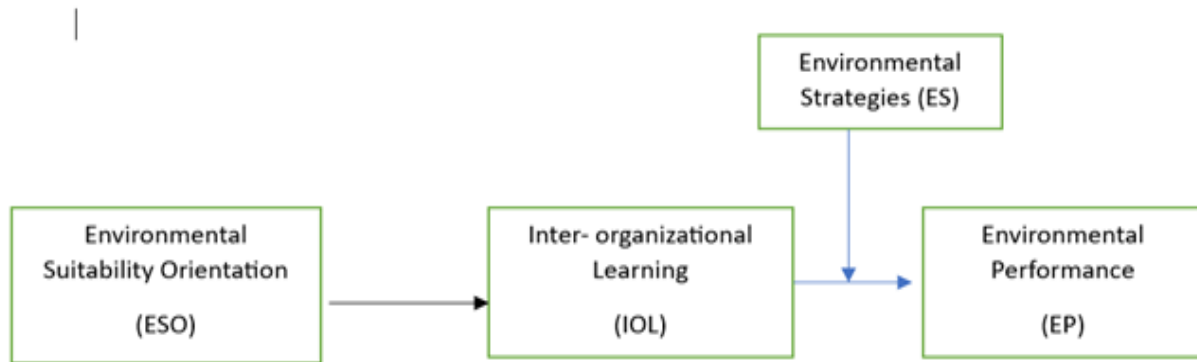
The direct impact of ES on environmental performance is better macro- than micro-level supported in developing economy manufacturing. "Environmental Strategies links corporate practices and the natural environment". Effective strategies help companies to improve their performance (Kong et al., 2022). The implementation of ES works for the performance of different level of organization depending upon their scale of operations and level of implementation of ES (Appiah et al., 2020). This literature has not, however, examined the same relationship on firm-level survey data within the boundaries of a single developing economy, the level tested here for the case of H5 in Pakistan.

H5: *ES has direct relationship with EP*

ES moderates the relationship of IOL and EP

It is the least established of the hypotheses, and indeed one of the more radical aspects of the study in comparison to current research (Ellis & Shpielberg, 2003). None of the studies examined focus on relationship, but instead one of the two other efforts, that is, on learning in the supply chain, or on ES, and the question of whether or not the Implementation of ES affects the environmental benefits of inter-organizational learning is left untested. ES add the sustainability concerns into an industries' s operational goals

Model of the Study based upon NROT



3. Data & Methodology

The design of this study was questionnaire based, cross sectional and targeted manufacturing industry in Pakistan. The study's goals were well addressed in the survey design because the constructs-being measured were perceptual in nature i-e environmental sustainability orientation, inter-organizational learning, technological intensity, and environmental performance. It is analyzed by using validated multi-item scales completed by respondents who had access to observe the practices and outcomes of the firms. This quantitative, deductive design also was consistent with the purpose of testing a set of fixed hypotheses generated by Natural Resource Orchestration Theory (Sirmon et al., 2011), rather than developing theory from the bottom up. Since the hypothesized model contained both a mediated path and a moderated path, the design was consistent with the well-

and ensures the implementation of true green practices to accomplish sustainable outcomes (Aftab et al., 2023). Since the manufacturing firms are from different nature and differently scales of operation from tanneries to more automated pharmaceutical plants in Pakistan, it would seem logical that the same learning relationship would not work as much for all of these firms, so this study tested the relationship of ES as moderators between IOL and EP.

H6: *ES *IOL has an impact on EP*

established practices followed in the field of survey-based structural equation modeling research in strategic and operations management, and item development, sampling, and analysis remained consistent with the confirmatory nature of the study.

The target population consisted of manufacturing companies registered with Lahore, Gujranwala, Faisalabad and Rawalpindi Chamber of commerce and industry, belonging to six sub-sectors: Textile, Chemicals, Plastic and PVC, Tanneries, Pharmaceuticals and allied manufacturing. A simple random sampling method was employed to select the firms from this frame, as it gave each and every registered firm an equal chance of selection and this could minimize the bias that may be introduced into industrial survey work by convenience sampling or purposive sampling (Schuberth et al., 2020). The questionnaire was sent to managerial respondents within each

selected firm, because managers are in the best position to report accurately on the firm-level environmental practices, external learning relationships, and technology use, which are matters that are less likely to be seen by junior staff.

After screening the data, a total of 390 valid and usable responses were retained. Table 1 revealed that the sample was largely male (82.05%) and largely senior managers (72.31%) with the rest of the group in junior managerial positions. Firm type of representation was broadly distributed and dominated by textile companies (41.03%), food and allied manufacturing (23.59%), chemicals (13.34%), leather and tanneries (10.25), medicine and drugs (6.15) and plastic and PVC (5.64). The respondents were reasonably well educated, with just over half having a bachelor's degree (51.53 %), close to a third a master's degree (29.49 %), and the remainder an Certification as M.Phil, MS or other qualification. The size of the firms ranged from less than 100 employees to more than 1000 employees, with 48.97% of the firms having 101 to 500 employees. Overall, the sample was skewed towards middle sized, textile based, businesses, with reasonably experienced managers, who have moderate level of education which is consistent with the typical characteristics of industrial base of Lahore.

A structured questionnaire developed from a series of multi-item scales from validated literature on the environmental management and strategic orientation literature was used as a major research instrument, and was modified as per the context of the manufacturing industry of Pakistan. Environmental sustainability orientation was conceptualized as a second-order reflective construct composed of three first-order constructs – practices, knowledge, and commitment – each of which was measured by multiple items representing the extent to which the firm's environmental behavior, knowledge, and management orientation was sustainable (Roxas et al., 2017). Inter-organizational learning was assessed via 6 items that reflect the extent that the firm has acquired, disseminated, and put into practice environmental knowledge from outside

parties (Janowicz-Panjaitan & Noorderhaven, 2008). Environmental Strategy was measured on seven dimensions that capture the extent of the firm's production process depending on its historical long term environmental commitments, its R& D investments and its Sustainable Reporting mechanism (Kong et al., 2022). The outcome variables included in environmental performance were the seven items of cuts in emissions, waste and resource consumption, as well as improvements in regulatory compliance and environmental reputation (Paillé et al., 2014). All items were placed on multi-point Likert-type scales and the question paper was pre-tested with a small group of industry managers prior to its full distribution to ensure that items designed principally for western manufacturing environment were meaningful in the present industrial environment of Pakistan.

This outcome was developed based on the measurement model of the study presented in Tables 2, 3 and 4 which included first-order and second-order convergent validity, heterotrait-monotrait ratio, and full collinearity statistics for each construct (Henseler et al., 2015). The rationale for selecting these measures was to satisfy a first task of the study, namely, demonstration that the latent constructs (ESO, IOL, ES, and EP) were indeed conceptually separate and adequately measured without testing structural relationships among them which would compromise the validity of the results of the study.

The data were analyzed by partial least squares (PLS) based structural equation modeling (SEM) in Smarts PLS software. This approach was suitable for the study because the model incorporated first- and second-order constructs and because it allowed that a mediating relationship (IOL between ESO and EP) and a moderating relationship (ES on the link between IOL and EP) could be tested in one estimation. The measurement model was first tested for factor loads, average variance extracted, composite reliability, Cronbach's alphas for each construct, and full collinearity variance inflation factors, and then the heterotrait-monotrait ratio was used for

discriminant validity tests for each construct. After establishing measurement adequacy, the structural model was estimated by bootstrapping with resampling to obtain *t* values, *p* values and bias-corrected confidence intervals for each hypothesized path and compared to conventional significance values. Effect sizes were also computed to assess the practical (not just statistical) significance of each predictor (table 5).

4. Discussion

The summary of the structural results showed that all six hypotheses were supported, with the effects on each hypothesis being quite different. Environmental sustainability orientation showed a strong direct effect on environmental performance ($\beta = 0.552$, $t = 12.344$, $p < .001$, $f^2 = 0.501$), and a strong effect on inter-organizational learning ($\beta = 0.571$, $t = 11.234$, $p < .001$, $f^2 = 0.482$). Inter-organizational learning had a comparatively modest direct effect on environmental performance ($\beta = 0.132$, $t = 3.922$, $p = .001$, $f^2 = 0.032$), and mediated the ESO-EP relationship ($\beta = 0.091$, $t = 3.881$, $p = .001$). Environmental Strategy had a small, but significant, direct effect on environmental performance ($\beta = 0.226$, $t = 5.534$, $p = .012$, $f^2 = 0.122$) and significant moderating effect on the relationship between IOL and EP ($\beta = 0.056$, $t = 2.592$, $p = .021$).

With the exception of Natural Resource Orchestration Theory, these findings present a coherent, though qualified, story. In the manufacturing sector, sustainability practices, knowledge and commitment actually have a strong positive direct impact on EP, with the effect size of the direct path ($f^2 = 0.501$) being significantly greater than the indirect path mediated by IOL ($\beta = 0.091$), suggesting that inter-organizational learning is one of the less dominant pathways in Pakistan's manufacturing sector. This aligns with the findings of (Nazir et al., 2024) that the link between practice and performance is enhanced through the impact of internally focused variables (i.e., regulation and top management commitment) without activating an external learning process; our results confirm that the

positive impact of an external learning process is real but only moderate, compared to the impact of the direct orientation variable. Our findings extend this previous work, however, in that orientation is a partially indirect catalyst of inter-organizational learning with ESO-related firms being more likely to find and incorporate environmental information from their partners, even if much of the environmental knowledge absorbed in this way does not provide a large amount of additional variance in environmental performance beyond that explained by orientation alone.

This pattern is clearly reflective of the mediation literature cited above. The results showed that there is a significant portion of the orientation-performance relationship that is captured by supply chain based mediating variables in Pakistani context of manufacturing and textile environment, respectively (Rehman, Kraus, et al., 2021), and confirmed that inter organizational fit is a significant factor in determining supply chain based environmental innovation in Pakistan (Shou et al., 2018). Our results, which show a comparatively small mediated effect from inter-organizational learning to the direct effect, indicate that learning, along with supply chain coordination, may be a necessary but not sufficient boundary-spanning mechanism: a firm's learning with its partners does not automatically result in its practice being coordinated with those partners in the more operational sense these previous studies suggest. Theoretically, this distinction is important because it suggests that NROT's leveraging stage could be further segmented than the research done so far indicates, and that coordination and learning can be separated entities with distinct performance payoffs, as suggested by (Badrinarayanan et al., 2019) when commenting on the lack of differentiated uses of orchestration language in environmental management research.

ES is the most important new finding of this study. The direct impact of ES on environmental performance ($f^2 = 0.122$) was also moderate and consistent with (Kong et al., 2022)'s macro-level analysis that shows ES affecting environmental outcomes in developing-economy manufacturing

and our firm-level results at a finer level of analysis. However, the relationship between inter-organizational learning and the EP is somewhat moderated by the type of the operations, with a tendency of a slightly stronger relationship in more commitments for environments specially to work with ISO certification and sustainable reporting mechanism, likely because such firms already have the technical infrastructure and talented people necessary to translate environmental knowledge gained outside the organization into actual operational change. None of the aforementioned studies have examined ES as a boundary condition of a learning-based mediating mechanism, thus making this the clearest empirical extension of previous studies.

These findings have implications for theory, policy and practice. Theoretically, it implies that the relationship between orientation and performance in this context is mediated by the NROT's leveraging construct, which is more broadly defined than the inter-organizational learning found in literature, because it assumes that there are three separate, but interacting processes that make up the leveraging stage: the coordination of the supply chain, the learning process, and the high R&D investments. As for policy, the findings indicate that an increased focus on inter-firm learning, industry associations, knowledge sharing platforms, cluster training, are likely to result in real, (though limited), environmental benefits; and that, policy may achieve the most by directly reinforcing the firm-level environmental orientation, through regulation, incentive policies, and disclosure laws, rather than primarily relying on inter-organizational learning to propagate the effect to performance. Organizations with highly sustainable Strategy seem to be better equipped to create external learning relationships to environmental value, suggesting that firms with lower ES, and particularly smaller tanneries and plastics units, may require absorptive capacity to be established in order to reap environmental benefits from inter-organizational learning programs.

5. Conclusion

The aim of this study was to determine that the environmental sustainability orientation enhances environmental performance of manufacturing firms in Pakistan, and whether this impact is partially mediated by inter-organizational learning, and environmental Strategy modifies the impact of inter-organizational learning. Survey data obtained from 390 managerial respondents of textile, chemical, plastics, tannery and pharmaceutical companies registered with Lahore Chamber of Commerce and Industry was used with model testing using partial least squares structural equation modeling and all the six hypotheses were supported. Environmental sustainability orientation had a strong direct effect on environmental performance and on inter-organizational learning; inter-organizational learning had both direct effect and mediating effect on environmental performance but mediation is not as strong as the direct impact. The ES is a significant predictor of environmental performance, as well as a moderator of the inter-organizational learning-performance link, such that the inter-organizational learning-performance link was somewhat stronger in organization with better environmental strategies. The results have implications that extend beyond the application of Natural Resource Orchestration Theory to the field of environmental management research. The results are not about a single, uniform leveraging mechanism linking resources in the environment to performance, but about an uneven leveraging strong direct orientation effect, more moderate inter-organizational learning, conditional depending on the strategic context. For organizational management, this implies that, in its pure form, inter-firm learning should not be considered as an alternative to the development of a good internal environmental orientation; rather it is a supplement to it, in the sense that its value is partly determined by the readiness of the firm, highly supportive ES, to absorb what is learned. For industrial policy in Pakistan, the findings indicate that there is more value in addressing firm level environmental commitment directly via regulatory and incentive incentives than via

primarily inter-organizational knowledge sharing platforms, although these do have real value for capable firms, although less than the former. These conclusions must be viewed as preliminary empirical mapping and not as a final statement because of the study's limitations, in part due to its cross-sectional design, its dependence on managerial self-report and its geographic focus around one industrial region. The future studies that examine this relationship across time, which deal with separate coordination and learning processes, and which use objective rather than perceptual measures of the Environmental Strategy

would greatly enhance the confidence in the causal story suggested herein. Despite these constraints, the research contributes to an understanding of how the three factors sustainability orientation, inter-organizational relationships, and the Environmental strategic context interact to influence environmental performance in an emerging manufacturing economy, when manufacturers in Pakistan are under increasing pressure, from export markets, regulatory agencies, and their own employees, to prove that growth and environmental responsibility are not mutually exclusive.

Table 1: *Demographic Profile of Respondents*

Demographic	Category	Frequency	Percentage
Gender	Male	320	82.05
	Female	70	17.95
Hierarchy Level	Junior Manager	108	27.69
	Senior Manager	282	72.31
Firm Type	Textile	160	41.03
	Chemicals	52	13.34
	Leather and Tanneries	40	10.25
	Plastic and PVC	22	5.64
	Food and Allied	92	23.59
	Medicine and Drugs	24	6.15
	Others	40	10.26
Education Level	Bachelors	201	51.53
	Masters	115	29.49
	M.Phil/MS	34	8.72
	Others	40	10.26
Firm Strength	Less than 100 employees	90	23.08
	101 to 500 employees	191	48.97
	501 to 1000 employees	83	21.28
	More than 1000 employees	26	6.67

Table 2: Convergent Validity (First-Order)

Construct	Item	Loading	AVE	CR	α	VIF
Practices of ESO	PES1–PES8	0.743–0.898	0.689	0.926	0.901	1.903
Knowledge of ESO	KES1–KES5	0.758–0.979	0.739	0.954	0.912	3.421
Commitment of ESO	CES1–CES4	0.810–0.881	0.754	0.921	0.829	2.541
Inter-Organizational Learning	IOL1–IOL6	0.712–0.841	0.654	0.832	0.541	1.656
Environmental Strategy	ES1–ES7	0.885–0.932	0.912	0.956	0.931	1.732
Environmental Performance	EVP1–EVP7	0.718–0.883	0.710	0.951	0.887	2.654

Table 3: Discriminant Validity for First-Order Constructs (HTMT)

Construct	CES	EVP	IOL	KES	PES	ES
CES	-					
EVP	0.532	-				
IOL	0.336	0.651	-			
KES	0.728	0.427	0.623	-		
PES	0.356	0.421	0.467	0.333	-	
ES	0.331	0.554	0.388	0.292	0.254	-

Table 4: Second-Order Convergent Validity

Second-Order Construct	First-Order / Item	Loading	AVE	CR	α	VIF
Environmental Sustainability Orientation	Practices of ESO	0.738	0.631	0.834	0.733	1.893
	Knowledge of ESO	0.816				
	Commitment of ESO	0.813				
Inter-Organizational Learning	IOL1–IOL6	0.712–0.841	0.654	0.832	0.541	1.656
Environmental Strategy	ES1–ES7	0.918–0.987	0.955	0.995	0.942	1.867
Environmental Performance	EVP1–EVP7	0.698–0.870	0.689	0.921	0.982	1.887

Table 5: Testing for Direct and Indirect Effects

Hyp.	Path	β	t-value	p-value	BCI LL	BCI UL	f ²	Remark
H1	ESO → EP	0.552	12.344	0.000	0.456	0.631	0.501	Supported
H2	ESO → IOL	0.571	11.234	0.000	0.514	0.645	0.482	Supported
H3	IOL → EP	0.132	3.922	0.001	0.087	0.162	0.032	Supported
H4	ESO → IOL → EP	0.091	3.881	0.001	0.051	0.101	—	Supported
H5	ES → EP	0.226	5.534	0.012	0.179	0.376	0.122	Supported
H6	IOL × ES → EP	0.056	2.592	0.021	0.018	0.053	—	Supported

References

- Adomako, S., Amankwah-Amoah, J., Danso, A., Konadu, R., & Owusu-Agyei, S. (2019). Environmental sustainability orientation and performance of family and nonfamily firms. *Business Strategy and the Environment*, 28(6), 1250–1259. <https://doi.org/10.1002/bse.2314>
- Aftab, J., Abid, N., Cucari, N., & Savastano, M. (2023). Green human resource management and environmental performance: The role of green innovation and environmental strategy in a developing country. *Business Strategy and the Environment*, 32(4), 1782–1798. <https://doi.org/10.1002/bse.3219>
- Andersén, J. (2023). Green resource orchestration: A critical appraisal of the use of resource orchestration in environmental management research, and a research agenda for future study. *Business Strategy and the Environment*, 32(8), 5506–5520.
- Appiah, B. K., Donghui, Z., Majumder, S. C., & Monaheng, M. P. (2020). Effects of Environmental Strategy, Uncertainty and Top Management Commitment on the Environmental Performance: Role of Environmental Management Accounting and Environmental Management Control System. *International Journal of Energy Economics and Policy*, 10(1), 360–370. <https://doi.org/10.32479/ijeep.8697>
- Asiaei, K., Bontis, N., Alizadeh, R., & Yaghoubi, M. (2022). Green intellectual capital and environmental management accounting: Natural resource orchestration in favor of environmental performance. *Business Strategy and the Environment*, 31(1), 76–93. <https://doi.org/10.1002/bse.2875>
- Badrinarayanan, V., Ramachandran, I., & Madhavaram, S. (2019). Resource orchestration and dynamic managerial capabilities: focusing on sales managers as effective resource orchestrators. *Journal of Personal Selling & Sales Management*, 39(1), 23–41.
- Ellis, S., & Shpielberg, N. (2003). Organizational Learning Mechanisms and Managers' Perceived Uncertainty. *Human Relations*, 56(10), 1233–1254. <https://doi.org/10.1177/00187267035610004>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135.
- Janowicz-Panjaitan, M., & Noorderhaven, N. G. (2008). Formal and informal interorganizational learning within strategic alliances. *Research Policy*, 37(8), 1337–1355. <https://doi.org/10.1016/j.respol.2008.04.025>
- Kemikkiran, N., & Kizrak, M. (2022). Controlled collaboration in organizations: the role of knowledge management, performance and trust. *Academic Review of Humanities and Social Sciences*, 5(2), 156–181. <https://doi.org/10.54186/arhuss.1174007>

- Kong, Y., Javed, F., Sultan, J., Hanif, M. S., & Khan, N. (2022). EMA Implementation and Corporate Environmental Firm Performance: A Comparison of Institutional Pressures and Environmental Uncertainty. *Sustainability*, 14(9), 5662. <https://doi.org/10.3390/su14095662>
- Liang, T., Zhang, Y.-J., & Qiang, W. (2022). Does technological innovation benefit energy firms' environmental performance? The moderating effect of government subsidies and media coverage. *Technological Forecasting and Social Change*, 180, 121728. <https://doi.org/10.1016/j.techfore.2022.121728>
- Mishra, A. K., Thakur, R. K., & Dhakal, S. (2024). The Influence of Environmental Sustainability Orientations on organizational Performance: A Review. *Journal of Productive Discourse*, 2(1), 121–136. <https://doi.org/10.3126/prod.v2i1.65730>
- Nazir, S., Zhaolei, L., Mehmood, S., & Nazir, Z. (2024). Impact of green supply chain management practices on the environmental performance of manufacturing firms considering institutional pressure as a moderator. *Sustainability*, 16(6), 2278.
- Niamat, R., & Qureshi, F. H. (2025). Dynamic capabilities and environmental performance of high-tech SMEs in Pakistan—the role of Eco-innovation and female executives. *Organizacija*, 58(2), 158–174.
- Omar, M. K., Mohd Yusoff, Y., & Kamarul Zaman, M. D. (2019). The effect of organizational learning capability as a mediating variable in the relationship between green intellectual capital and business sustainability: evidence from the manufacturing sector. *International Journal of Academic Research in Business and Social Sciences*, 9(6), 337–352.
- Paillé, P., Chen, Y., Boiral, O., & Jin, J. (2014). The Impact of Human Resource Management on Environmental Performance: An Employee-Level Study. *Journal of Business Ethics*, 121(3), 451–466. <https://doi.org/10.1007/s10551-013-1732-0>
- Rehman, S. U., Ashfaq, K., Bresciani, S., Giacosa, E., & Mueller, J. (2023). Nexus among intellectual capital, interorganizational learning, industrial Internet of things technology and innovation performance: a resource-based perspective. *Journal of Intellectual Capital*, 24(2), 509–534. <https://doi.org/10.1108/JIC-03-2021-0095>
- Rehman, S. U., Bhatti, A., Kraus, S., & Ferreira, J. J. M. (2021). The role of environmental management control systems for ecological sustainability and sustainable performance. *Management Decision*, 59(9), 2217–2237. <https://doi.org/10.1108/MD-06-2020-0800>
- Rehman, S. U., Bresciani, S., Yahiaoui, D., & Giacosa, E. (2022). Environmental sustainability orientation and corporate social responsibility influence on environmental performance of small and medium enterprises: The mediating effect of green capability. *Corporate Social Responsibility and Environmental Management*, 29(6), 1954–1967. <https://doi.org/10.1002/csr.2293>
- Rehman, S. U., Kraus, S., Shah, S. A., Khanin, D., & Mahto, R. V. (2021). Analyzing the relationship between green innovation and environmental performance in large manufacturing firms. *Technological Forecasting and Social Change*, 163, 120481.
- Roxas, B., Ashill, N., & Chadee, D. (2017). Effects of Entrepreneurial and Environmental Sustainability Orientations on Firm Performance: A Study of Small Businesses in the Philippines. *Journal of Small Business Management*, 55, 163–178. <https://doi.org/10.1111/jsbm.12259>
- Schuberth, F., Rademaker, M. E., & Henseler, J. (2020). Estimating and assessing second-order constructs using PLS-PM: the case of composites of composites. *Industrial Management & Data Systems*, 120(12), 2211–2241. <https://doi.org/10.1108/IMDS-12-2019-0642>

Shou, Y., Che, W., Dai, J., & Jia, F. (2018). Inter-organizational fit and environmental innovation in supply chains: a configuration approach. *International Journal of Operations & Production Management*, 38(8), 1683–1704.

Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource Orchestration to Create Competitive Advantage. *Journal of Management*, 37(5), 1390–1412. <https://doi.org/10.1177/0149206310385695>

Ur Rehman, S., Bhatti, A., & Chaudhry, N. I. (2019). Mediating effect of innovative culture

and organizational learning between leadership styles at third-order and organizational performance in Malaysian SMEs. *Journal of Global Entrepreneurship Research*, 9(1), 36. <https://doi.org/10.1186/s40497-019-0159-1>

Zhang, Y., Khan, U., Lee, S., & Salik, M. (2019). The Influence of Management Innovation and Technological Innovation on Organization Performance. A Mediating Role of Sustainability. *Sustainability*, 11(2), 495. <https://doi.org/10.3390/su11020495>

Declaration of Conflicting Interest

The author declared no potential conflicts of interest with respect to research.

Funding Statement

No funding is received for this project.