



The Renewable Energy Adoption in Sustainability Practices for Sustainable Competitive Advantages in Pakistan Context

Nauman Mushtaq¹, Fahad Saddique² & Dr. Asmat N. Khattak³

¹Ph.D. Scholar, Institute of Management Sciences (IMS), Lahore, Pakistan,

Email: nauman_mushtaq1@yahoo.com

²Ph.D. Scholar, Institute of Management Science, Lahore, Pakistan,

Email: fahad.sadique@gmail.com

³Associate Professor & Dean, Institute of Management Sciences (IMS), Lahore, Pakistan,

Email: asmat.khattak@gmail.com

ARTICLE INFO

Article History:

Received:	February	28, 2026
Revised:	April	02, 2026
Accepted:	April	12, 2026
Available Online:	April	19, 2026

Keywords:

Renewable Energy, Sustainability Practices, Sustainable Competitive Advantage, Pakistan

Corresponding Author:

Nauman Mushtaq

Email:

nauman_mushtaq1@yahoo.com



ABSTRACT

The purpose of this paper is to find out the impact of renewable energy adoption on sustainable performance and sustainable competitive advantage (SCA) in the power sector of Pakistan. Data from 275 employees in Pakistan's power sector were analyzed using a quantitative method. The Statistical Package for the Social Sciences (SPSS) was used to analyze data collected from respondents' responses. Results from our study showed that renewable energy has positive effects on firm efficiency, cost reduction, and corporate reputation, which contribute to SCA. Our results show that renewable energy is important, as it supports firms in performing their sustainability functions while linking them to corporate objectives. As such, these results are useful for businesses that wish to position themselves positively in their markets by implementing sustainable practices. In addition, the results have shown how renewable energy contributes to long-term SCA and thereby expands the existing knowledge base regarding business sustainability and strategic management. Finally, we offer policymakers and business leaders guidance on implementing sustainability efforts.

© 2026 The Authors, Published by [VIPRC](https://journals.viprc.org/index.php/vijbe/index). This is an Open Access Article under the Creative Common Attribution ([CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/))

Introduction

Businesses use renewable energy to achieve both economic and environmental sustainability in a world that is sustainable. People across the globe are turning to renewable energy to reduce rising energy prices and address global warming. Pakistan's high energy costs and dependence on imports provide a compelling reason for companies to invest in renewable energy especially for those who have struggled financially. Governments implement policies that offer firms incentives to invest in renewable energy however, there has been little understanding of the overall impact of renewable energy use on firms. Therefore, this study will investigate business strategies and competitive positioning via the utilization of renewable energy. In addition to addressing this knowledge gap, this study will also inform government and business strategies for sustainability and long-term competitive positioning. As international focus on sustainability and accountability continues to grow, businesses are being forced to adopt policies that promote long-term environmental and economic success. Renewable energy can be integrated into company operations to meet sustainability objectives while creating a competitive advantage (Batool et al., 2024). However, technology-based and industrial companies must adapt to regulations, remain competitive, and focus on sustainability

(Khawaldeh et al., 2025). Batoool et al. (2024), Hamed et al. (2023), and Khawaldeh et al. (2025) indicate that investment in renewable energy represents a sustainable competitive advantage for businesses. For companies, adopting renewable energy is necessary because energy use is one of the most significant sustainability issues. By investing in green energy, firms can potentially reduce costs, improve their reputations, comply with regulatory requirements, and attract customers (Hamed et al., 2023). The study investigated the impact of renewable energy on business sustainability practices and how corporate sustainability strategies can lead to the development of long-term competitive advantages. What is the effect of utilizing renewable energy on competitive advantage in sustainability practice? This question investigates the effects of integrating renewable energy into business strategy and the role of green energy in enhancing competitiveness within an environmentally conscious market. The study examines the influence of sustainability policies on competitive advantage through both direct and indirect paths, such as the adoption of renewable energy.

Literature Review

Renewable energy adoption and sustainability practices: Renewable energy will likely have large-scale impacts on sustainable development (Dato, 2018) as small businesses (SMEs) are capable of enhancing their own sustainability through implementing renewable energy options thus, they will reduce environmental impacts (air pollution, greenhouse gas emissions), waste generation, resource utilization, and optimize energy usage (Chen et al., 2022; Wang et al., 2025). The adoption of renewable energy technology is expected to significantly drive the incorporation of "green" practices across the supply chain and the business's operations. Therefore, the implementation of renewable energy technologies is anticipated to become one aspect of the organization's overall sustainability strategy, generating the adoption of additional "green" practices and a holistic sustainability strategy (Awamleh et al., 2024). Hence, this research proposes:

H1: Renewable energy adoption improves sustainable competitive advantages.

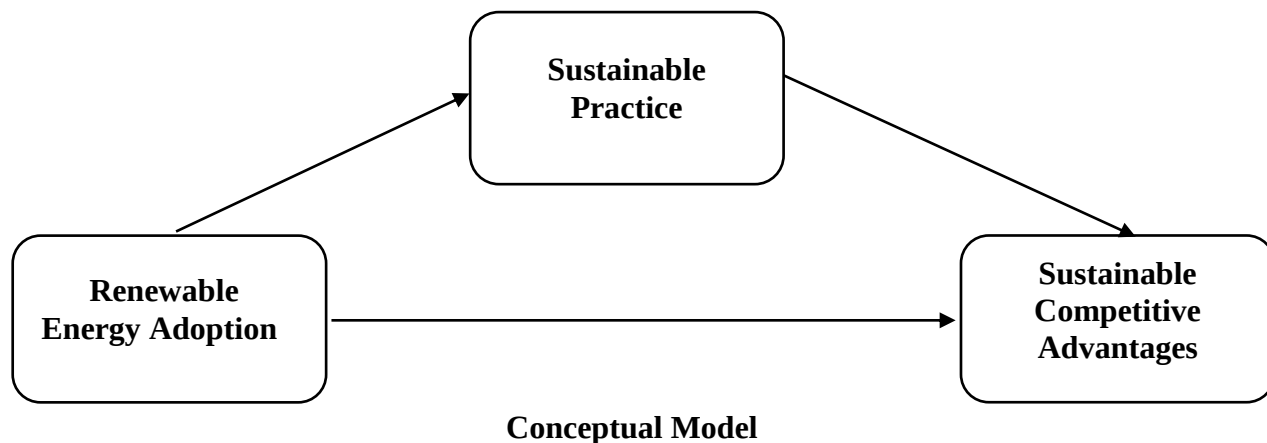
Mediating role of sustainable practice: Renewable energy use and adoption lead to improved "green" performance and cost efficiency for an organization. The strategic potential of renewable energy will be realized when it is implemented as part of an overall organizational sustainability strategy (Potrč et al., 2021). Although renewable energy reduces both energy consumption and greenhouse gas emissions from operations, the longer-term benefits will be most fully realized when it is used in combination with other elements of a sustainable business model. Elements of a sustainable business model could include reducing waste, improving resource efficiency, using sustainable or environmentally responsible suppliers or vendors, and implementing green marketing or branding programs to promote products and services. Such sustainable business models can help smaller organizations develop and implement long-term competitive advantages in the rapidly expanding global green marketplace (Thakkar, 2021; Ameer et al., 2024; Song et al., 2024). The implementation of a renewable energy-based sustainability plan may also provide an organization with opportunities to reduce costs, comply with existing environmental protection regulations, and develop new products and processes. In addition, combining renewable energy with other sustainability efforts will likely improve an organization's reputation. Organizations which focus upon sustainability and incorporate renewable energy options into their sustainability plans will attract customers who purchase products and services based upon the sustainability characteristics of those products and services attract investors who support companies which have sustainability at the core of their mission and strategy and attract partners who support sustainability and wish to partner with like-minded organizations (Patil et al., 2025). Research indicates that developing and implementing sustainability plans may lead to increased consumer loyalty and trust, easier access to green financing, and other benefits. Therefore, organizations that adopt sustainability plans will potentially establish themselves as leaders in their industry segments over time (Haseeb et al., 2019). Additionally, implementing sustainable business models helps organizations mitigate risks associated with economic uncertainty and/or environmental uncertainty. Sustainable business models enable organizations to manage better risks associated with fluctuating commodity prices (e.g., fossil fuels), changes in government policies and regulations related to environmental issues (e.g., carbon pricing), and

other factors. Overall, a comprehensive sustainability strategy will enhance the effectiveness of renewable energy usage and create a sustainable competitive advantage. Incorporating renewable energy into a company's sustainability strategy will enhance the company's value, brand, and sustainability. As previously noted, a comprehensive sustainability strategy includes not only energy efficiency but also sustainable procurement practices, socially responsible corporate behavior, stakeholder participation in sustainability-related decision-making, etc. Therefore, this study hypothesizes:

H2: There are positive relationship of renewable energy on sustainable practice

H3: There are positive relationship of sustainable practice on competitive advantage.

H4: There are mediating role of sustainable practice in between renewable energy and competitive advantages.



Methodology

This research examines how a company can adopt renewable energy as part of its sustainability strategy to achieve a long-term competitive advantage in the Pakistani power sector. This research uses methodologies and analytical tools that have been developed over time, based on previous research using multidisciplinary articles written by F. Saddique & N Mushtaq et al. (2020 to 2026), in which survey instruments were distributed to employees of the Pakistani power generation industry. A total of 350 surveys were initially sent; however, only 275 were completed and returned.

Table 1: Variables, No. of Items, and Reference

Variable	Items	Reference
Renewable Energy Adoption	5	(Nauman et al., 2023)
Sustainability Practices	5	(Khalil et al., 2024)
Sustainable Competitive Advantage	6	(Fahad et al., 2023)

Table 2 shows that the Total Number of Respondents was 210. Of those, 65 were females. The respondents' ages were grouped into 5 categories. The largest group of respondents was aged 26-40 (n=110) as depicted in Table 2. 35 respondents fell into the less than 25 categories. As for qualifications, respondents were categorized into four groups. A large proportion of the sample (n = 120) had graduated from university, and a very small proportion (n = 25) had completed Matric. Regarding Experience, respondents were categorized into four groups. The largest percentage of respondents (n = 112) had 6 to 10 years of Experience, while the smallest percentage (n = 33) had more than 10 years of Experience.

Table 2: Sample Distribution

	Characters	F
Gender	Male	210
	Female	65
	Total	275
Ages	Below than 25	35
	26-40	110
	41-55	79
	Above 55	51
Qualification	Matric	25
	Intermediate	66
	Graduation	120
	Post Graduate	64
Experience	Less One Year	55
	From 1 to 5 years	75
	From 6 to 10 Years	112
	Above 10 years	33

The reliability test of each scale was examined using Cronbach's alpha all given values are above then 0.70. See table 3.

Table 3: Reliability Analysis

Variable	Cronbach's Alpha
Renewable Energy Adoption	0.79
Sustainability Practices	0.82
Sustainable Competitive Advantage	0.87

Correlation Analysis:

Table 4 presents the relationships that exist between the elements of this research. The relationship between Sustainability Practices and Renewable Energy Adoption shows a moderate to high positive correlation ($p = .00$; $r = 0.389$). Likewise, there is a moderate to high positive correlation between Sustainable Competitive Advantage and Renewable Energy Adoption ($p = .000$; $r = 0.390$). Lastly, the relationship between Sustainability Practices and Sustainable Competitive Advantage exists as a large to very large positive correlation ($p = .000$; $r = 0.413$).

Table 4: Correlation Analysis

Variables	1	2
1. Renewable Energy Adoption	1	
2. Sustainability Practices	0.389**	1
3. Sustainable Competitive Advantage	0.390**	0.413**

** Correlation is Shown Significant at 0.01 Level, *Correlation is Significant at 0.05 Level

Regression Analysis

The results in Table 5 represent an initial assessment of the relationship between renewable energy adoption and sustainable competitive advantage, using appropriate regression analysis. In addition, the model fit well, as indicated by an ANOVA P-Value of 0.05 or lower. Based on the R-Square of 0.123, it can be observed that each unit increase in renewable energy adoption results in approximately a 12.3% variance in sustainable competitive advantage. Additionally, the p-value for the coefficient is 0.00, which is less than 0.05; therefore, the relationship between the two variables is statistically significant. As demonstrated by the

estimated coefficient ($B = 0.254$), renewable energy adoption appears to affect sustainable competitive advantage. Therefore, hypothesis 1 is supported.

Table 5: Model between Renewable Energy Adoption and Sustainable Competitive Advantage

Variables	R ²	B	T	sig
Renewable Energy Adoption	0.123	0.254	8.86	0.000

Dependent Variable: Sustainable Competitive Advantage * $p < 0.05$.

Table 6 shows that regression analysis results are shown to determine whether sustainability practices are affected by renewable energy adoption. The model was determined to be valid based on the f-statistic p-value (.000) being $< .05$. Based on the r-squared (.192), a unit increase in renewable energy adoption will result in a 19.2% increase in sustainability practices. The coefficient's p-value (.000) is also below .05, indicating an association. The coefficient "B" has been estimated at .487. This indicates a positive relationship between renewable energy adoption and sustainability practices. Therefore, hypothesis no 2 is supported.

Table 6: Model between Renewable Energy Adoption and Sustainability Practices

Variables	R ²	B	T	Sig
Renewable Energy Adoption	0.192	0.487	9.23	0.000

Dependent variable: Sustainability Practices, * $p < 0.05$.

Table 7 shows that an initial regression analysis was conducted to assess the effect of Sustainability Practices on Sustainable Competitive Advantage. Since the ANOVA significance (sig) value for this table is $0.00 < 0.05$, we have a good model. The R-Square Value of 0.212 indicates that if we increase Sustainability Practices by 1 unit, it will cause a 21.2 % change in Sustainable Competitive Advantage. The P-Value of the Coefficient (B), 0.00, is less than 0.05; thus, as indicated above, there is a statistically significant relationship between them. Therefore, $B = .457$ shows the extent to which Sustainability Practices impact Sustainable Competitive Advantage. In conclusion, Hypothesis 3 is supported.

Table 7: Model between Sustainability Practices and Sustainable Competitive Advantage

Variables	R ²	B	t	Sig
Renewable Energy Adoption	0.212	0.457	10.90	0.000

Dependent Variable: Sustainable Competitive Advantage, * $p < 0.05$

Mediation Analysis

The mediator variable was assessed by performing 1,000 bootstrap samples to obtain upper and lower limits for a 95% Confidence Interval. The mediation model indicated that sustainability practices mediate the relationship between renewable energy adoption and sustainable competitive advantage. An indirect effect ($\beta = .421$; LL = .390; UL = .591; $P < .01$) existed; however, it was less than the direct relationship ($\beta = .112$; $P < .01$). Therefore, since there is no "zero" value within the upper and lower bounds or limit of the confidence interval, the results provide support for Hypothesis H4.

Table 8: Mediation analysis using through Bootstrap

Relationships	<i>B</i>	<i>P</i>	Bootstraps @ 95%		Hypotheses
			LL	UL	
<i>REA → SP → SCA</i>					
Direct effect	0.112	***	0.178	0.267	
Indirect effect	0.421	***	0.390	0.591	

Note: REA= Renewable Energy Adoption, SP= Sustainability Practices, SCA= Sustainable Competitive Advantage, *** $p < 0.01$

Discussion

In addition to encouraging the development of "green" practices throughout a company's supply chain and in general operations through the use of renewable resources, using renewable energy will most likely lead to a dramatic change in how companies develop sustainability programs. For example, if a company decides to incorporate renewable energy into its sustainability program, this can serve as one of many triggers for it to pursue or adopt even more "green" practices. As noted above, while the short-term benefits of reduced energy consumption and lower emissions from renewable energy will continue to exist so long as renewable energy is used, the long-term benefits of this form of energy are realized when they are included in a comprehensive sustainability strategy. Some ways renewable energy can contribute to this overall strategy include reducing waste, increasing resource efficiency, pursuing environmentally responsible purchasing practices in supply chain management, and establishing "green" marketing programs. These activities will enable small- and medium-sized enterprises (SMEs) to maintain their ability to adapt over time and remain competitive in increasingly "green" markets. To create these long-term advantages, a company must first establish a comprehensive sustainability strategy that includes a plan for renewable energy. This type of strategy will provide a company with cost-saving opportunities, support compliance efforts, and foster a culture of innovation.

Additionally, integrating renewable energy into a company's sustainability strategy will positively impact its reputation and image. Companies that focus on sustainability will attract customers who share similar values, investors who support businesses that make decisions based on social responsibility, and partners who are interested in working with organizations that conduct themselves ethically. According to research, companies that implement sustainability plans will experience increased customer loyalty and confidence, as well as improved access to funding through green financing mechanisms, thereby enhancing their long-term standing in the marketplace. Lastly, companies that operate under a sustainable business model will be better equipped to handle both economic and environmental uncertainty associated with fluctuating energy prices and changing regulations; thus, reducing the potential risks of using renewable energy sources. The integration of renewable energy into a company's sustainability strategy creates a sustainable competitive advantage. Companies that choose to integrate renewable energy into their sustainability strategy will enhance their value proposition, improve their brand, and reinforce their commitment to sustainability. As discussed above, all possible hypotheses are accepted.

Conclusion

Renewable energy use and sustainability practices drive competitive advantage in Pakistan's power sector. By using renewable energy, companies can develop sustainable business practices that enhance their competitive advantage. Organizations can achieve these enhanced competitive advantages by developing and implementing appropriate sustainability strategies. Policy makers and other organizations interested in promoting renewable energy development should implement programs to encourage the adoption of sustainable business practices and the sharing of knowledge and best practices.

Funding: Funding is inappropriate for this research study.

Data availability: The statistics supporting the outcomes of this research are accessible upon reasonable request from the first author.

Declarations

Ethical approval: Not applicable

Consent to participate: Not applicable

Consent to publish: All authors have given consent to publish.

Competing interest: The authors have no competing interests to declare.

References

1. Anjum, R., Daud, S., Bhatti, G. A., & Saddique, F. (2026). Evaluation of AI-based mental health interventions using the grey relational analysis. *Grey Systems: Theory and Application*, 16(1), 75-90.
2. Awamleh, F. T., Alarabiat, Y. A., & Bustami, A. N. (2024). Enhancing sustainable development through international performance indicators: The role of business intelligence techniques. *Chall. Sustain.*, 12(3), 203–218.
3. Azizian, D., & Ullah, A. (2024). Assessing the role of leadership styles in promoting innovation in renewable energy project management.
4. Batool, K., Zhao, Z.-Y., & Irfan, M. (2024). Factors influencing consumers' willingness to adopt renewable energy technologies: A paradigm to alleviate energy poverty. *Energy*, 309, 133005.
5. Chen, H., Shi, Y., & Zhao, X. (2022). Investment in renewable energy resources, sustainable financial inclusion and energy efficiency: A case of US economy. *Resour. Policy*, 77, 102680.
6. Dato, P. (2018). Investment in energy efficiency, adoption of renewable energy and household behavior: Evidence from OECD countries. *Energy J.*, 39(3), 213–244.
7. Hamed, M. M., Mohammed, A., & Olabi, A. G. (2023). Renewable energy adoption decisions in Jordan's industrial sector: Statistical analysis with unobserved heterogeneity. *Renew. Sustain. Energy Rev.*, 184, 113568.
8. Haseeb, M., Hussain, H. I., Kot, S., Androniceanu, A., & Jermisittiparsert, K. (2019). Role of social and technological challenges in achieving a sustainable competitive advantage and sustainable business performance. *Sustainability*, 11(14), 3811.
9. Khan, K. N. (2025). Psychological capital to innovation from digital technology to cyberloafing in Pakistani universities. *International Journal of Applied Mathematics*, 38(7s), 722-745.
10. Khan, K. N., Anjum, S., Abbas, M. M., & Jabeen, A. (2024). Unlocking Teacher's Innovative Work Performance with Idiosyncratic Deals. The Parallels Mediating Models of Pakistani Universities. *International Journal of Social Science Archives (IJSSA)*, 7(2).
11. Khan, K. N., Shah, M. H., & Saddique, F. (2025). Innovative Work Behaviour Amid Faculty Shortage: The Role of Idiosyncratic-Deals, Digital Technology and Perceived Leadership Support. *Journal of Posthumanism*, 5(4), 978-992.
12. Khawaldeh, K., Awamleh, F. T., Al-Shibly, M. S., & Al-Kharabsheh, A. (2025). Data-driven strategic planning: The mediating role of the Blockchain-based supply chain in enhancing digital logistics performance. *Int. J. Innov. Res. Sci. Stud.*, 8(1), 2680–2687.
13. Maroof, L., Basit, A., & Khan, K. N. (2022). Responsiveness of Banks' Stability Towards Peak and Trough Phases of Business Cycle: A Comparative Analysis of Islamic Banks and Conventional Banks. *COMSATS Journal of Islamic Finance (CJIF)*, 7(2).
14. Maroof, L., Basit, A., & Khan, K. N. (2022). Responsiveness of Banks' Stability Towards Peak and Trough Phases of Business Cycle: A Comparative Analysis of Islamic Banks and Conventional Banks. *COMSATS Journal of Islamic Finance (CJIF)*, 7(2).
15. Mushtaq, F. S. U. N. N., & Ali, B. L. A. (2023). Implementation of digitalization supply chain helps in gaining of competitive advantages as mediating role in the supply chain performance in construction organization in Pakistan. *Journal of Humanities*, 1(01).
16. Mushtaq, N., & Khattak, A. N. (2026). Adoption of Solar Energy Sources and Sustainable Performance for Environment in Power Sector of Pakistan: An Empirical Analysis Based on Mediation Model of Green Innovation. *The Critical Review of Social Sciences Studies*, 4(1), 1690-1701.
17. Mushtaq, N., & Khattak, A. N. (2026). Deployment of Wind Powered Resources and Ecologically Sound Performance in Pakistan's Energy Sector: An Empirical Research Based on the use of Green Technology Mediation Model. *Journal for Social Science Archives*, 4(1), 466–479. <https://doi.org/10.59075/jssa.v4i1.501>
18. Mushtaq, N., Badar, M., Akhtar, F., Batool, F., Sandhu, M. E., Khan, M. I., ... & Zia, M. A. (2021).

- Efficiency of Power Distribution Companies in Pakistan (Application of Non-Parametric Approach).
19. Mushtaq, N., Mirza, H. H., Rehman, S. U., & Saddique, F. (2020). Efficiency of Power Generation Companies in Pakistan: Application of Non-Parametric Approach. *Ilkogretim Online*, 19(4), 3486-3504.
 20. Mushtaq, N., Saddique, F., Abbas, Z., & Nawaz, M. (2023). How important is Efficiency in any Organization?“Estimating the Efficiency Reform of Power Distribution Companies in Punjab Province, Pakistan”(LESCO, FESCO & IESCO). *Traditional Journal of Law and Social Sciences*, 2(01), 44-59.
 21. Nawaz, M., Khan, S. A., Rana, S. L., & Saddique, F. (2020). Role Of Human Resource Best Practices To Improve Quality Education Of Pakistani Schools. *International Journal of Management (IJM)*, 11(11).
 22. Naz, F., Manzoor, A., Khan, K. N., & Ali, L. (2021). Islamic Equities Volatility and US Economic Influence: Case of Emerging Market. *COMSATS Journal of Islamic Finance (CJIF)*, 6(2).
 23. Nwagwu, F. S. N. M. U., & Naeem, A. R. (2024). *Traditional Journal of Law and Social Sciences*.
 24. Nwagwu, U., Niaz, M., Chukwu, M. U., & Saddique, F. (2023). The influence of artificial intelligence to enhancing supply chain performance under the mediating significance of supply chain collaboration in manufacturing and logistics organizations in Pakistan. *Traditional Journal of Multidisciplinary Sciences*, 1(02), 29-40.
 25. Østergaard, P. A., Duic, N., Noorollahi, Y., & Kalogirou, S. (2022). Renewable energy for sustainable development. *Renewable energy*, 199, 1145-1152.
 26. Patil, G., Tiwari, C., Kavitar, S., Makwana, R., Mukhopadhyay, R., Aggarwal, S., Betala, N., & Sood, R. (2025). Optimising energy efficiency in India: A sustainable energy transition through the adoption of district cooling systems in Pune. *Chall. Sustain.*, 13(1), 1-17.
 27. Potrč, S., Čuček, L., Martin, M., & Kravanja, Z. (2021). Sustainable renewable energy supply networks optimization—The gradual transition to a renewable energy system within the European Union by 2050. *Renew. Sustain. Energy Rev.*, 146, 111186.
 28. Saddique, F., & Khan, M. I. (2026). Impact of Adoption of Artificial Intelligence in Sustainable Supply Chain Performance in Manufacturing Organization of Pakistan: The Mediating Role of Supply Chain Integration. *The Critical Review of Social Sciences Studies*, 4(1), 1763-1776.
 29. Saddique, F., & Khan, M. I. (2026). Unlock the Sustainable Supply Chain Performance Through Artificial Intelligence and Moderator Digital Leadership in Pakistan Context. *Journal for Social Science Archives*, 4(1), 500–511. <https://doi.org/10.59075/jssa.v4i1.504>
 30. Saddique, F., Khan, K. N., Joyia, S. Z., & Jabeen, A. (2024). Impact of internet of things on sustainable supply chain performance: the empirical parallel mediation models. *Pakistan Islamicus (An International Journal of Islamic & Social Sciences)*, 4(02), 76-89.
 31. Saddique, F., Mushtaq, N., Abbas, Z., & Nawaz, M. (2023). Creative performance of healthcare professionals (nurses) in hospitals Lahore, Pakistan. *Traditional Journal of Law And Social Sciences*, 2(01), 60-72.
 32. Saddique, F., Mushtaq, N., Hasan, R., Rehman, Z. U., & Ali, M. (2022). Access and Secure Storage Based Block Chain Scheme with IPFS Implemented in Electronic Medical Record in Lahore, Pakistan. . *Netw. Commun. Syst. JNACS*, 5(4).
 33. Saddique, F., Mushtaq, N., Imran, Z., Nawaz, M., & Usman, M. (2021). Impact of Green Supply Chain Management Practices on Environment Performance and Competitive Advantage.
 34. Saddique, F., Patel, K. R., Niaz, M., Chukwu, M. U., & Nwagwu, U. (2023). Impact of supply chain transformation on supply chain performance: the empirical study that bases on mediating role of supply chain resilience on construction organization on Pakistan. *Asian Journal of Engineering, Social and Health*, 2(9), 1072-1086.
 35. Saddique, F., Ramzan, B., Sanyal, S., & Alamari, J. (2023). Role of digital leadership towards sustainable business performance: A parallel mediation model. *Journal of Infrastructure, Policy and Development*, 7(3), 2416.

36. Scholar, F. S. P. D., Fatima, H., Hassan, M., Scholar, N. M. P. D., & Asghar, K. A. (2023). Impact of ethical leadership on creative work performance: the empirical mediating roles of work engagement and attitude toward performing wells in construction organizations in Pakistan.
37. Shah, M. H. (2025). Strengthening Innovative Work Behavior via Psychological Capital: A Moderated Mediation Framework. *FishTaxa-Journal of Fish Taxonomy*, 36(1s), 90-101.
38. Sharif, S., Lodhi, R. N., Iqbal, K., & Saddique, F. (2022). Gender disparity in leadership boosts affective commitment and tacit knowledge sharing about libraries. *International Journal of Organizational Analysis*, 30(5), 1212-1234.
39. Sharif, S., Lodhi, R. N., Siddiqueg, F., & Munir, M. A. (2021). Service quality of higher education digital library (DL) and loyalty behaviors: Testing the mediating role of student satisfaction. *Library Philosophy and Practice*, 1-22.
40. Sheer, M. F., Hassan, S. G., Ali, A., Sabir, S. A., & Waemustafa, W. (2024). The influence of renewable energy, humanistic culture, and green knowledge on corporate social responsibility and corporate environmental performance. *Clean Technol. Environ. Policy*, 1–20.
41. Shinta, D., Khan, K. N., & Nadeem, M. (2025). Evaluating Generative AI Initiatives in Human Resources: Multiple Criteria Decision Analysis. *Management Science and Business Decisions*, 5(2), 5-19.
42. Wang, S., Rahman, S. U., Zulfiqar, M., Ali, S., Khalid, S., & e Ali, M. S. (2025). Sustainable pathways: Decoding the interplay of renewable energy, economic policy uncertainty, infrastructure, and innovation on transport CO2 in QUAD economies. *Renewable Energy*, 242, 122426.
43. Ameer, W., Ali, M. S. E., Farooq, F., Ayub, B., & Waqas, M. (2024). Renewable energy electricity, environmental taxes, and sustainable development: empirical evidence from E7 economies. *Environmental Science and Pollution Research*, 31(34), 46178-46193.
44. Song, M., Anees, A., Rahman, S. U., & Ali, M. S. E. (2024). Technology transfer for green investments: exploring how technology transfer through foreign direct investments can contribute to sustainable practices and reduced environmental impact in OIC economies. *Environmental Science and Pollution Research*, 31(6), 8812-8827.
45. Thakkar, R. (2021). Green marketing and sustainable development challenges and opportunities. *Int. J. Manage. Publ. Policy Res.*, 1(1), 15–23.
46. Batool, K., Zhao, Z. Y., & Irfan, M. (2024). Factors influencing consumers' willingness to adopt renewable energy technologies: A paradigm to alleviate energy poverty. *Energy*, 309, 133005.