

GREEN LEADERSHIP: DRIVING ORGANIZATIONAL CHANGE TOWARD SUSTAINABILITY

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Abstract

This research examines the role of Green Leadership and Organizational Culture on Sustainability Performance through structural equation modeling. Based on a sample of manufacturing firms from Khyber Pakhtunkhwa, Pakistan, the study assesses the integration of leadership, organizational culture, and the resultant sustainability impacts. The findings indicate that Green Leadership has a positive Organizational Culture influence ($\beta = 0.254, p \leq 0.001$) and a positive effect on Sustainability Performance ($\beta = 0.214, p \leq 0.001$). Furthermore, Green Leadership has positive direct influence on Sustainability Performance ($\beta = 0.644, p \leq 0.001$). The above outcomes highlight the importance of Green Leadership towards creation of sustainability-focused organizational culture to enhance environmental and operational performance.

For business executives, the research demonstrates how green leadership training and employee engagement programs can help in sustaining the organizational culture supporting policies which is a not norm but a need. It also draws attention to the importance of governmental policy which is required to support sustainable practices through positive incentives and structured restrictions. Unsurprisingly, the generalizability limitations of the research and the study's reliance on self-reported data underline the challenge, but the work does set the stage for future research to consider further mediating and moderating factors, as well as the dynamics of industry type and culture in the context of leadership, organizational culture, and sustainability performance.

INTRODUCTION

In the face of global crises, there has been an undeniable increase in environmental sustainability practices. This is due to the increased focus and concern regarding climate change. Because of the growing need to ameliorate human health, ecosystems, and economic stability, organizations,

governments, and industries are now compelled to implement environmental protection measures. As one of the most resource-intensive industries, manufacturing has traditionally been a major target for policy initiatives geared toward sustainable development. The manufacturing sector remains

environmentally unsustainable due to its high consumption of natural resources, carbon emissions, energy usage, and waste production (Awan et al., 2023). Since the impact of the manufacturing sector on the environment is so critical, there is immense stress on the manufacturing sector to adopt more sustainable processes. The focus of the United Nations Sustainability Development Goals (SDGs) on responsible industrialization and climate action puts further impetus on the adoption of sustainable business models and eco-friendly initiatives (UN, 2015). These frameworks are used to mobilize businesses across the globe to alter their operating models to mitigate their environmental impact and enhance their sustainability efforts.

The term green leadership has emerged because it seems to possess the capacity to drive transformative change in organizations as one of the most sustainable approaches. Green leadership can be defined as a type of leadership that engages in environmental stewardship and motivates organizations to shift their business focus to sustainable actions. Green leaders must develop a culture of innovation, responsibility, and environmental protection which is imperative for achieving sustainability outcomes (Chen et al., 2022). Green leaders have the potential to transform their organizations, and society beyond the organizational boundaries by nurturing pro-environmental behaviors in their employees and other stakeholders. The manufacturing sector in developing economies like Pakistan is critical for stimulating economic growth. However, the sector is coupled with many problems such as high pollution, depletion of resources, and waste management (Ali & Rahman, 2022). The Pakistan Environmental Protection Act (1997) and the Paris Agreement include national and international commitment frameworks for environmental protection, respectively. Despite their promises, these frameworks are poorly enforced with no tangible results created. The lack of sustainable growth is due to underdeveloped technology, weak legal enforcement, and organizational ignorance about the implementation of sustainable practices. In addition to these reasons, the absence of green leaders has exacerbated these issues because many leaders from the manufacturing sector focus on short-term profits instead of long-term sustainability

(Aslam et al., 2023). Such practices undermine the importance of proactive policies. Sheds light on how it distracts the sector from meaningful milestone achievements towards sustainability.

Green leadership initiatives are impacted by organizational culture, which is yet another preeminent driver of sustainability outcomes. A culture with a high innovation focus and an environmental element adds greatly to the impact of green leadership on organizational sustainability performance. An organizational culture that needs to be addressed is one that upholds innovation and allows employees to contribute actively toward the realization of sustainable environmental goals. Such cultures allow robust employee participation where employees actively help realize the organizational environmental objectives. On the other hand, indifferent or rigid hierarchical organizational cultures have the potential to stagnate innovation and diminish the effectiveness of green leadership, therefore counteracting attempts to realize sustainability (Kumar & Gupta, 2021). There is ample evidence regarding the impact of culture on organizational outcomes. However, there is still a gap in understanding the dynamics of green leadership integrated with organizational culture for sustainability in Pakistan's manufacturing industry.

This study seeks to fill these gaps by assessing the influence of green leadership on organizational sustainability performance within the context of Pakistan's manufacturing industry. Furthermore, the study looks into the moderating role of organizational culture in an effort to identify what hinders or facilitates sustainable changes in the sector. Through these analyses, the study elucidates the insights forthcoming from the interplay of responsible leadership, culturally coordinated corporate practices, and mitigation of environmental harms. The overarching aim of this study is to help formulate approaches that improve the sustainability and competitiveness of organizations operating in international markets and, at the same time, contribute to the global efforts of environmental protection.

Supporting Theory

This research combines Transformational Leadership Theory with Organizational Culture Theory in

investigating the impact of green leadership and organizational culture on sustainability performance in the manufacturing industry in Pakistan. Bass (1985) advanced Transformational Leadership Theory, which explains how leaders can actively motivate and help their followers reach the desired heights of development and creativity within an organization. In terms of green leadership, transformational leaders are those who actively endorse sustainable practices and who work to ensure organizational targets are congruent with environmental protection efforts (Kumar & Gupta, 2021). Such leaders are important for changing organizational priorities, particularly in manufacturing, which tends to disregard environmental considerations for more immediate financial gains (Awan et al., 2023).

Schein's Organizational Culture Theory (1990) alongside transformational leadership provides a comprehensive interpretation regarding the impact of shared values, beliefs, and practices within an organization. As highlighted by Kumar and Gupta (2021), a positive organizational culture which sustains green initiatives can enable effective green leadership through enhanced collaboration, innovation, and accountability at the employee level. This is particularly true for the manufacturing sector in Pakistan where the prevailing profit-centered culture poses challenges to adopting green initiatives. Understanding the interplay of culture and leadership is crucial in developing strategies that nurture sustainable progress (Ali & Rahman, 2022). Collectively, these perspectives imply that effective green leadership can promote eco-sustainability and improve the sustainability performance of manufacturing firms if there is an organizational culture conducive to green initiatives and aligned with sustainability principles.

The integration of Transformational Leadership Theory and Organizational Culture Theory emphasizes that leadership actions should be attuned to organizational practices and behaviors in order to build a sustainable culture. Transformational leaders, alongside other roles, are key in motivating employees to adopt green behaviors, but the organization's culture is most likely the deciding factor on whether such initiatives will be successful and embraced. This is especially the case in

Pakistan's manufacturing industry, which is marked by traditionalism and resistance to change (Aslam et al., 2023). A culture that is not particularly prone to new ideas or is overly preoccupied with "right-sizing" might severely limit the effectiveness of green leadership, while the opposite—one that embraces new ideas, teamwork, and strategic foresight—can enhance the ability of leaders to achieve much more meaningful results for the environment (Chen et al., 2022). It becomes necessary to combine these two aspects—leadership and culture—to understand the impact that green leadership can have on sustainability performance within the framework of this context.

Green Leadership and Its Influence on Organizational Culture in the Pakistani Corporate Sector

The concept of green governance integrates environmental considerations with leadership and is relatively new in the business context in Pakistan. Jabbour (2015) defines green leadership as the behaviors and practices of a leader who is committed to fostering sustainable practices and green initiatives within a given organization. In the context of Pakistan where issues like pollution, resource depletion, and climate change pose significant concerns, the adoption of green leadership can greatly aid in the realignment of corporate policies and the organizational ethos towards achieving sustainable development (Ramos et al., 2018).

Organizational culture represents the shared values and assumptions that are prevalent in an organization, thus giving context to the operations of businesses in the Pakistani corporate culture (Schein, 2010). Traditionally, businesses in Pakistan have maintained an acute focus on economic profitability and growth. Of late, however, there have been some declines in these profits, which have highlighted the need for integrating CSR with strategic management, including environmental management (Eid & El-Gohary, 2013). This change came about as a result of a myriad of internal and external factors such as policies from the government, international markets, and the growing expectation among consumers for companies to be responsible for environmental stewardship (Tian & Robinson, 2019).

Green leadership can shape the culture of organizations in Pakistan by promoting values of environmental care within the company's staff. In Pakistan, green leaders promote taking measures that reduce the environmental impacts of the organization's operations such as waste reduction, energy conservation, and eco-friendly initiatives (Chen, 2011). Such leaders help to develop a green organizational culture which is one that integrates sustainability as part of the organizational identity and employees accept and practice these values in their routines (Chan et al., 2020). This transformation not only drives positive change in the environmental performance of the organization, but also improves the perception of the business by its stakeholders and customers who, nowadays, appreciate value sustainability (Kurniawati et al, 2021).

In Pakistan, green leadership goes beyond the implementation of eco-friendly policies to include fostering an organizational culture where employees actively participate in sustainability efforts. Environmental behavior by employees is essential for meeting the long-term goals of sustainability and it is those leaders who encourage such practices that create the environment and support needed for employees to feel that they ought to participate (López et al., 2020). For instance, people in organizations that observe green leadership are likely to be more active in implementing supporting policies like recycling, conserving energy, and promoting sustainability both in professional and personal settings.

Like many other countries, green leadership in relation to organizational culture enhancement in Pakistan is growing commensurately with the interest in corporate social responsibility (CSR) in the country. There is an emerging concern about CSR in Pakistan's corporate world, and more and more companies are trying to incorporate sustainability into their business models. Effective green leadership can encourage businesses to adopt social responsibility beyond mere legal compliance and global standards (Boiral et al., 2015). The same change in mindset improves relations with other stakeholders such as consumers, governmental agencies, and even the local society who are more

concerned with the impact of the business on the environment (Renwick et al., 2013).

Furthermore, sustainable leadership can help facilitate organizational change by integrating sustainability into the mission and vision of the business. Green leaders are important for guiding organizations through the change process in Pakistan, where businesses green businesses have to cope with the global trends of sustainability. Such actions are aimed at enhancing the sustainability performance of the organization. Green leaders motivate their workforce to adopt eco-friendly practices which contribute towards the improvement of the organism. This is very important for those companies that want to remain competitive responsive to changes in the market, where a lot of emphasis is placed on sustainability (Ramos et al. 2018).

Much like other aspects of organizational functioning, the impact of green leadership, particularly on corporate social responsibility, is also felt in Pakistani organizations. In addition to being responsible for integrating surroundings value into their organizations, green leaders in Pakistan also concern themselves with ensuring that organizations are accountable and ethical in their sustainability practices (Kurniawati et al., 2021). Green leaders in Pakistani firms strengthen the environmental responsibility of organizations while accompanying good governance by bridging environmental responsibility and corporate social responsibility (Eid & El-Gohary, 2013).

To summarize, it is evident that green leadership can transform the organizational culture of businesses in Pakistan. It was noted that a responsible business enhances its employee's willingness to participate in activities beneficial to the organization, which, in turn, improves the business' reputation internationally and nationally. This is achieved through raising social awareness. Corporate social responsibility, accompanied by Pakistan's worrying environmental situation, places imperative priority on adopting green leadership principles to succeed and sustain businesses in the long run.

Organizational Culture and Its Influence on Sustainability Performance in the Pakistani Corporate Sector

Culture has emerged as a crucial component of how a company undertakes its sustainability efforts in the contemporary business world. Organizational culture, as explained by Schein in 2010, concerns itself with the shared values and beliefs within a business, which shapes the culture of the firm and affects its decision-making, workforce, and overall operational performance. The significance of the relationship between culture and sustainability performance is of particular interest in the business domain of Pakistan, as companies are increasingly being compelled to pursue sustainable business practices owing to environmental concerns and legal obligations (Kurniawati et al., 2021).

The term sustainability performance is understood as the ability of a business to achieve economic, environmental, and socially defined goals, where environmentally sustainable business practices are used alongside with socially responsible activities (López et al., 2020). Businesses that prioritize social responsibility often enjoy greater long-term profitability, reputation, and stakeholder satisfaction, as well as meeting regulatory obligations (Renwick et al., 2013). There is an increasing trend towards adopting sustainability practices in Pakistan, but the country's level of demonstrable sustainability practice performance remains inconsistent across organizations. Therefore, the impact of organizational culture on sustainability performance emerges as a significant contributor to the achievement of environmental, social, and economic dimensions of sustainability in the Pakistani corporate world.

The effect of organizational culture on sustainability performance is observable in companies with a developed culture of environmental stewardship and social justice. Eid and El-Gohary (2013) noted that a positive organizational culture focusing on sustainable practices motivates all employees to engage in environmental and corporate social responsibility (CSR) activities. Such organizations in Pakistan are believed to perform better in other environmental practices like reduction of waste, conservation of energy, and sustainable procurement (Jabbour, 2015). Moreover, these companies tend to

be more proactive with regard to the challenges and opportunities on sustainable development and align their operational policies with prevailing international sustainability policies (Tian & Robertson, 2019).

Culture plays an important role in the integration of sustainability into business strategies. An organization's culture can significantly impact its efficiency; with enhanced cultural integration, companies are able to perform better socially, economically, and environmentally (Boiral et al., 2015). In Pakistan's corporate sector, organizations that practice sustainability have an edge over competitors in the long run. For example, firms that have a good sustainability culture tend to undertake proactive sustainable practices such as developing green products, improving carbon footprints, enhancing employee wellness, and increasing overall performance (Chen, 2011).

An employee engagement level is a domain where the correlation between organizational culture and sustainability performance is particularly telling. Employees generally make an effort to engage with the self-sustaining ecosystem of the corporation when sustainability is built into the organizational culture. In the Pakistani setting, where employee engagement is often perceived in terms of organizational loyalty and performance, cultures fostering sustainability are likely to attract higher employee commitment toward achieving corporate sustainability (López et al., 2020). Moreover, organizations imbued with a sustainability culture also tend to have a greater passion for sustainability, which helps improve the firm's innovation and sustainability performance (Renwick et al., 2013).

Fostering innovation in sustainability requires an organization's culture to be conducive to it. Such organizations emphasize the environmental, social, and managerial concerns of sustainability in the design and innovation of their products, services, and processes. Those companies needing solutions to sustain problems and having a cultural orientation towards sustainability will dominate the market in Pakistan, which is well-known for its unsustainable practices (Jabbour, 2015). Such innovation will not only foster sustainability effectiveness, but will also improve competitive advantage given the shift in

consumer and investor focus towards sustainable business practices (Kurniawati et al., 2021).

The linkage between organizational culture and sustainability performance is also impacted by the organization's commitment to corporate social responsibility. In Pakistan, where CSR is increasingly attracting the attention of businesses and consumers alike, those companies with a better culture of socio-responsibility and ethics are more capable of executing effective CSR. Such CSR activities, including but not limited to, environmental protection and philanthropy, are vital contributions towards the CSR sustainability performance of the companies. Organizations with sustainability culture stand a better chance to adopt CSR as a mainstream business activity, thus enhancing social performance and community development initiatives (Eid & El-Gohary, 2013).

Green Leadership and Its Direct Influence on Sustainability Performance in the Pakistani Corporate Sector

Green leadership is known to be one of the more important elements that defines the corporate sector's business practices and alters the approach taken towards achieving sustainability. It deals with leadership that advances active environmental sustainability, eco-conscious behavioral adoption, and pursuing sustainable objectives within their organizations (Jabbour, 2015). Sustainability has become a corporate concern and focus in Pakistan due to its high impacts caused by degradation, making green leadership extremely important in fulfilling sustainability's corporate performance needs (Kurniawati et al., 2021).

For these purposes, sustainability performance means the capability of an organization to manage the achieving of set environmentally, socially, and economically targets objectives while positively contributing to societal and ecological wellbeing over time. Addressing the concern entails reducing environmental degradation, conserving resources, enhancing community welfare, and ethical business conduct (López et al., 2020). By strengthening organizational strategies, green leaders facilitate being put into action at diverse organizational levels, which ensures prioritization at every organizational stratum (Boiral et al., 2015).

Tackling environmental problems and adopting regulatory frameworks are clear signs of a pressing need for adequate business practices in Pakistan. These do not only plunge the region into chaos but also create fresh avenues for enhanced green leadership which can navigate organizations to achieve better sustainable development goals. As it is stated in earlier literature, leaders who possess green leadership characteristics tend to provide the essential groundwork on the adoption of policies related to energy efficiency, waste minimization, and sustainable resource nutzen (Tian & Robertson, 2019). Moreover, these leaders do not restrict themselves at fostering sustainable practices within their businesses but also motivate, in the strongest terms, the employed workforce, other stakeholders, and even the suppliers towards similar actions which in turn contributes throughout the entire supply chain.

Adopting policies and action plans aimed towards encouraging greater and appropriate practices of green leadership can maximize the efficiency of sustainability interventions. An effective green leadership approach embedded into the core strategy of the organization greatly supplements ecosystem services directly into business practices. Leading in green context in the Pakistani companies turns out to be related to choosing strategic options based on green technologies, renewable energy, and effective waste management systems which greatly reduce the negative impacts of the organization on the environment. Furthermore, the predominantly negative perception within the business world which associates green overhead with lower profit margins without considering the value gained after the spending has led to misunderstanding the idea of profit maximization in decision making directly related to influencing environmental and social standards. Hence, green leaders help organizations integrate competitive positioning which assists them capitalize on the escalating market opportunities while achieving international benchmarks on the enhancement of the sustainable performance of the company (Jabbour, 2015). This is significant for companies indented to achieve desired benefits from aggressive competition while improving their environmental performance, and subsequently sustaining their growth.

Furthermore, green leadership nurtures innovative efforts in sustainability. Green leaders motivate their employees to create new strategies that are useful to the environment and strengthen the company's market position. In the case of Pakistan, where there is an increasing market opportunity for sustainable products and services, green leadership can directly impact sustainability performance by guiding the firm to focus on the creation of green products, eco-friendly procedures, and sustainable business practices (Chen, 2011). Such developments not only mitigate harm to the environment, but also capture the attention of increasing investors and consumers who are concerned about ecological issues.

Engagement of stakeholders is another important factor under green leadership that affects sustainability performance. Customer, supplier, governmental, and local community participation are example stakeholders that incorporate sustainability issues, and Pakistani green leaders are extremely skillful concerning stakeholder engagement. Green leaders make certain that the stakeholders of the firm are actively engaged with the organization by promoting sustainability objectives, which ensures that the stakeholders are aligned with the organizational goals on sustainability. This alignment, in turn, increases the company's sustainability performance by providing greater support towards achieving sustainability goals in a more collaborative environment (Boiral et al., 2015). For instance, green suppliers may foster achievement of organizational sustainability performance by engaging with other suppliers to encourage the adoption of sustainable sourcing policies or work with local community members on environmental preservation projects.

The relationship between green leadership and sustainability performance is affected with corporate social responsibility (CSR) as one of the intense factors. There is growing attention within the corporate circles in Pakistan on green leadership and

its role in elevating the CSR practices to advance the sustainability performance of the companies. Through CSR activities, green leaders advocate for sustainability and ensure that organizations go beyond compliance to social and environmental pruning (Eid & El-Gohary, 2013). In Pakistan, where CSR is increasingly becoming an important component of a company's image and stakeholder engagement, it is noted that green leadership directly drives the sustainability performance by enhancing CSR activities for better environmental, social, and governance (ESG) impact (López et al., 2020).

In addition, green leadership is important for increasing employee participation in sustainability activities. Green leaders are more likely to motivate employees to get involved in sustainability initiatives. This is particularly true in Pakistan where engaged employees actively work towards achieving the organizational goals, and therefore, an employee's engagement in sustainable activities leads to better sustainability performance. Employees tend to emulate the behaviors and practices of their leaders, and thus, when provided with an opportunity, will take steps aimed at sustainability, such as reducing waste and conserving energy (Kurniawati et al., 2021).

To summarize, green leadership has a potentially important impact on the sustainability performance of corporations in Pakistan. By supporting sustainability at the organizational level, green leaders are able to make decisions, promote changes, motivate relevant stakeholders, and encourage employee participation in sustainability activities. All of these measures contribute to the enhancement of sustainability performance, allowing organizations to meet local and international standards of sustainability. The impact of green leadership in striving towards achieving long term sustainability for businesses is crucial due to ever increasing environmental concerns and legislative requirements in Pakistan.

Conceptual Model

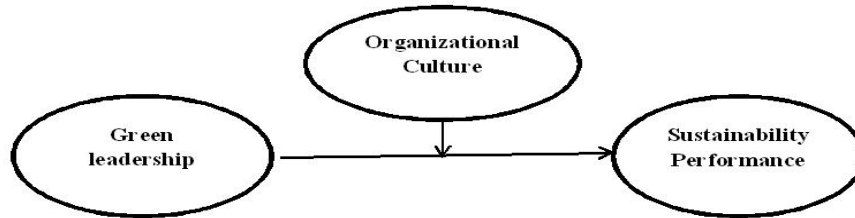


Figure 1. Conceptual Model

Methodology

Respondents' Background

The data for this research was obtained from an online survey with primary employees of the manufacturing sector in Pakistan as its respondents. The survey was conducted with the aim of ensuring more diverse participation from other regions within Khyber Pakhtunkhwa (KP) as well as ease of access to the survey. The survey questions were tailored towards gathering data regarding the respondents' background, their views regarding green leadership, their organizational culture, and the sustainability performance of their organizations.

With the help of a questionnaire, a sample of 500 employees in mid-sized to large manufacturing companies based in KP Pakistan was selected. The companies were chosen for participation in the study due to their specific relevance, and all study participants were properly briefed about why the study was being conducted along with the strict confidentiality maintained regarding the participants' responses. Participants were granted

complete anonymity regarding their personal details while the data collected was claimed to be only used for educational reasons. Out of the overall collected responses, 280 were received, which gave a percentage of 56. After the elimination of the incomplete or invalid responses which were 260, the remaining set of validated data was utilized for the analysis.

As for the gender distribution, there were more male respondents (about 70%) than Female respondents (30%). 45% of the respondents were within the age range of 26-30 years, while 35% were aged between 20 and 25. The other respondents were in the 31-35 (13%) and 36 and above (7%) age groups. Most respondents had a graduate degree (approximately 55%) while 30% of them completed post-graduate studies. The remaining respondents were either pursuing or had completed their PhDs. Around 60% of the respondents occupied managerial or supervisory roles within the organization, while the remaining 40% worked in operational or staff-level positions.

Table Demographics

Background	Categories	No. of Respondents	Percentage of Respondents (%)
Gender	Male	182	70%
	Female	78	30%
Age	20-25	91	35%
	26-30	117	45%
	31-35	34	13%
	36 and above	18	7%
Educational Level	Graduate	143	55%
	Post-graduate	78	30%
	Ph.D.	39	15%
Position	Managerial/Supervisory	156	60%
	Operational/Staff	104	40%

Survey Development

The survey was designed after consulting with three experts who have a direct relation with the areas of green leadership, organizational culture, and sustainability performance. The other two experts were academic professors in management and environmental sustainability sciences. One of the experts was a practitioner who possessed vast knowledge and experience in the application of green leadership practices in manufacturing companies. The survey items were adapted from available literature to guarantee reliability and validity. The items were chosen from literature and modified to suit the study's context which is the manufacturing industry in Pakistan.

Each of the respondent's level of agreement to each of the items was assessed using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The survey was structured around four key constructs: Green Leadership, Organizational Culture, Sustainability Performance, and Demographic Information. Chen et al. (2022) contributions were used for the operationalization of Green Leadership, while Schein (2010) provided a four-item scale for Organizational Culture. Awan et al. (2023) provided a four-item scale of Sustainability Performance which concentrated on the Environment, resource use, waste management, and carbon emissions reduction.

Table 2 Instrumentation

Construct	Items/Codes	Loading
Green Leadership	GL1–The leadership at my organization promotes sustainability practices.	0.811
	GL2–Green leadership is a core component of my organization's strategy.	0.832
	GL3–Leaders in my organization encourage employees to participate in environmental initiatives.	0.863
	GL4–My organization's leadership supports eco-friendly business practices.	0.849
Organizational Culture	OC1–Our company values sustainability and integrates it into everyday operations.	0.815
	OC2–Employees are encouraged to innovate sustainable solutions at work.	0.822
	OC3–Environmental responsibility is a key component of our organizational culture.	0.854
	OC4–Our organizational culture supports green practices across all departments.	0.845
Sustainability Performance	SP1–My organization has significantly reduced its environmental impact in the past year.	0.829
	SP2–We have improved our waste management practices.	0.871
	SP3–Resource conservation has been a major focus for my organization.	0.839
	SP4–My organization has set clear goals for reducing carbon emissions.	0.810

Data Analysis

Data were analyzed using SPSS 26.0 for initial descriptive statistics, reliability analysis, and correlation analysis, followed by AMOS 24.0 for Structural Equation Modeling (SEM). The protocol of data analysis procedures consisted of two important phases. In the first stage, the measurement model was assessed for validity and reliability of the constructs which included confirmatory factor analysis (CFA) of factor loadings and goodness of fit indices. The second stage comprised evaluating the hypothesized research model by means of SEM to test the relationships posited between green leadership, organizational culture, and sustainability performance.

Also using AMOS, multi-group analysis was performed to test the organizational culture as a moderating variable in the relationship between green leadership and sustainability performance. This analysis made it possible to assess the impact that varying organizational cultures may have on the efficacy of green leadership strategies. Moreover, mediation analysis was conducted to determine the indirect effect to assess whether organizational culture mediates the relationship between green leadership and sustainability performance.

Research Results

Common Method Bias (CMB)

To assess possible Common Method Bias (CMB) in the data of this study, the Harman One-Factor Test was applied following the directions of Podsakoff et al. (2003). For this test, all items from the study were loaded onto one factor without rotation. The single factor comprised only 31.254% of the total variance, indicating that CMB was not a significant concern with the data. Further, the Marker Variable Technique was used as an additional test for CMB contamination in accordance with recommendations

from other recent studies (e.g., Conway & Lance, 2010). Analysis verified that there is no CMB in the data.

Measurement Model

The measurement model's psychometric properties were evaluated using Confirmatory Factor Analysis (CFA) in AMOS (Version 24.0). The 16 items used in the analysis were divided into the four constructs: Green Leadership, Organizational Culture, Sustainability Performance, and Demographics. The measurement model yielded a satisfactory CFI of 0.951, RMSEA of 0.073, and SRMR of 0.061, which all fall within acceptable limits as cited by Hu & Bentler (1999). As presented in Table 3, all the factor loadings were statistically significant, confirming that these items adequately represent their associated constructs.

The validity of the measurement model was also confirmed through the two-step approach mentioned earlier. This involves first assessing the convergent validity and construct reliability (CR). The CR values of all constructs lie between 0.856 and 0.933; hence, the reliability of the constructs is confirmed. Secondly, all factor loadings greater than 0.6 and significant at $p \leq 0.001$ are sufficient to establish convergent validity. Indeed, the loadings ranged from 0.750 to 0.906. Moreover, each construct demonstrated an Average Variance Extracted (AVE) value exceeding 0.5, 0.629 being the lowest and 0.814 the highest as shown in Table 4.

Moreover, discriminant validity was determined by evaluating the Maximum Shared Variance (MSV) alongside the AVE of each construct. The outcomes were that the AVE was greater than the MSV for each construct confirming good discriminant validity. Furthermore, the HTMT values were below the cutoff of 0.90 confirming the distinction between the constructs as illustrated in Table 5.

Table 3. Factor Loading Scores

Items	Factors
Green Leadership (GL)	
GL1	0.826
GL2	0.842
GL3	0.854
GL4	0.869
Organizational Culture (OC)	

OC1	0.876
OC2	0.822
OC3	0.832
OC4	0.833
Sustainability Performance (SP)	
SP1	0.844
SP2	0.879
SP3	0.861
SP4	0.833

Table 4. Convergent and Discriminant Validity

Construct	CR	AVE	MSV	ASV	Green Leadership	Organizational Culture	Sustainability Performance
GL	0.933	0.814	0.487	0.945	0.903	0.726	0.592
OC	0.912	0.798	0.520	0.903	0.773	0.874	0.609
SP	0.856	0.629	0.504	0.916	0.794	0.627	0.890

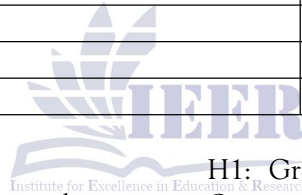
Note: CR = Composite Reliability; AVE = Average Variance Extracted; MSV = Maximum Shared Variance; ASV = Average Shared Variance.

Table 5. HTMT Analysis

Green Leadership	Organizational Culture	Sustainability Performance
-	0.760	0.604
0.885	-	0.746
0.813	0.684	-

Structural Model

The structural model incorporating the relationships among Green Leadership, Organizational Culture and Sustainability Performance was assessed using Structural Equation Modeling (SEM) within the AMOS Software Version 24.0. The fit indices CMIN/df = 2.817, CFI = 0.967, TLI = 0.957, and RMSEA = 0.079, suggest that the model fit is satisfactory and the proposed model does fit the data. The outcomes of hypothesis testing are illustrated in Table 6. The analysis verified three significant direct effects:



H1: Green Leadership has a positive impact on Organizational Culture (($\beta = 0.254, p \leq 0.001$)).
 H2: Organizational Culture has a positive impact on Sustainability Performance ($\beta = 0.214, p \leq 0.001$).
 H3: Green Leadership has a direct impact on Sustainability Performance ($\beta = 0.644, p \leq 0.001$).
 The results above confirm the hypotheses and demonstrate that Green Leadership is indeed an important deciding factor in fostering Organizational Culture and in turn enhancing Sustainability Performance.

Table 6. Results of Hypothesis Testing

Hypotheses	Path	Beta	S.E.	C.R.	p-Value	Support
H1	GL → OC	0.254	0.062	4.117	***	Accepted
H2	OC → SP	0.214	0.052	4.522	***	Accepted
H3	GL → SP	0.644	0.065	10.941	***	Accepted

Note: $P \leq 0.001$ (∗).

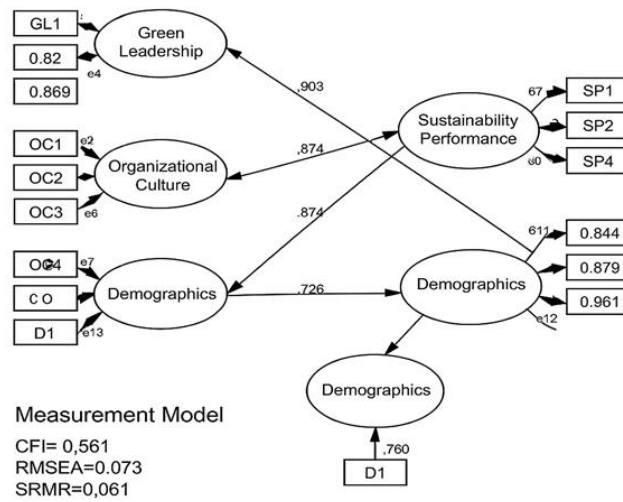


Figure 2. Measurement Model

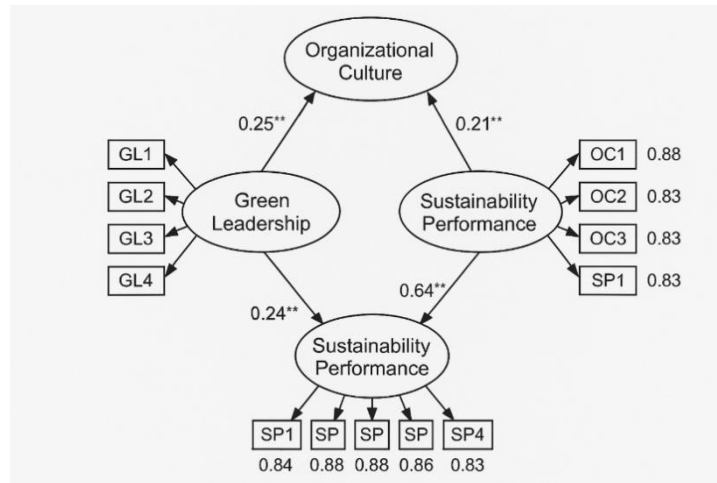


Figure 3. The Structural Model.

Table 7: Moderation Analysis

Relationship	Moderation of Organizational Culture (OC)	Low	High	CR
Green Leadership → Sustainability Performance	0.623 ***	0.724 ***	5.312 *	

Note: P ≤ 0.001 ***; P ≤ 0.05 *.

Moderation Analysis

The moderating role of organizational culture (OC) on the relationship between green leadership and sustainability performance was assessed using AMOS (24) in this research multi-group analysis. The sample was categorized into two groups depending on their OC level: low and high. Both groups faced a structural model, and cross group pairwise

comparisons of the beta estimates were conducted to assess the enhancement impact of OC on the relationship moderation.

A 4-item scale developed by Schein (2010) was used to assess OC. The respondents' OC mean of 3.52 demonstrates moderately high organizational culture. Using the median-split method, respondents scoring lower than the median of 3.1 were classified as low

OC while those scoring above were classified as high OC.

The data provided in Table 7 suggests that Organizational Culture has a moderating impact on the relationship between Green Leadership and Sustainability Performance. It demonstrates that the effect of Green Leadership on Sustainability Performance is stronger in the high OC group (β Low OC = 0.623***; β High OC = 0.724***). The disparity of impacts regarding Green Leadership's influence on Sustainability Performance in the low and high OC groups is considerable (C.R. = 5.312 for OC), which strengthens the hypothesis that Organizational Culture increases the potential of Green Leadership as a catalyst for improvements in Sustainability Performance.

Discussion

This research examined the impacts of Green Leadership and Organizational Culture on Sustainability Performance through structural equation modeling. The analysis gave strong evidence for the three hypotheses developed in this research.

The results for H1 show that Green Leadership has a positive impact on Organizational Culture ($\beta = 0.254$, $p \leq 0.001$). This is consistent with the literature (Chen et al., 2022) concerning the impacts of leadership on organizational norms within a firm. Leaders who green their businesses foster an environmentally responsible culture in organizations through their actions and directions. This is especially important for creating a culture that focuses on innovation and active employee participation and sustainability.

H2 shows that Organizational Culture has a positive effect on Sustainability Performance ($\beta = 0.214$, $p \leq 0.001$). This supports the existing literature (Awan et al., 2023) arguing that strong organizational culture based on shared values and commitment to sustainable practices significantly influences remarkable sustainability results. In a culture where there is commitment to sustainable values, it becomes a vehicle to actualize the shared objectives and improve performance at all levels within the organization.

Lastly, the results for H3 show that Green Leadership has a direct effect on Sustainability

Performance ($\beta = 0.644$, $p \leq 0.001$). This agrees with the earlier research analyzed in (Kumar, 2021) that emphasized that practitioners green planning and those who practice environmental stewardship do improve the sustainability metrics of an organization. Green Leadership enables the organization to effectively and efficiently provide steps towards the achievement of sustainability improvements which in turn benefits the organization's environmental and operational performance.

All these results combined demonstrate how crucial Green Leadership is in promoting an organizational framework that nurtures deeper focus concerning sustainable green processes and industry practices as well as triggers improvement in sustainability performance. To improve sustainability results, organizations should focus on building a culture that support the objectives of sustainability along with implementing green leadership cultivation strategies in their existing leadership training frameworks.

Key Findings and Implications

The structural model testing validated the relationships among the constructs of the study. The positive relationships were significant on both sides: Green Leadership (GL) and Organizational Culture (OC), and Organizational Culture and Sustainability Performance (SP). This has been studied in the literature, as it has been established that green leadership cultivates a sustainability culture within organizations (Chen et al., 2022). The data indicates that Green Leadership affects Organizational Culture directly and significantly ($\beta = 0.254$, $p \leq 0.001$). Furthermore, Organizational Culture positively affects Sustainability Performance ($\beta = 0.214$, $p \leq 0.001$). These findings reflect the fact that indeed, organizational leadership has a significant impact on creating a corporate culture that emphasizes sustainability and drives enhanced sustainability performance.

Also of interest is the direct impact of Green Leadership on Sustainability Performance ($\beta = 0.644$, $p \leq 0.001$). This tells us that leadership espousing the initiatives of sustainability directly impacts the environmental performance of the organization. This shows the extent of which organizational leadership dedicated to green measures commits in influencing

the organizational sustainability performance meaningfully.

The results of this study offer numerous practical and theoretical considerations. First, it emphasizes the role of green leadership as one of the overarching factors,' or as a transformational lever by which organizations are mobilized toward sustainability. The finding suggests that there is a need for stronger marketing, green management, or leadership training programs that encourage leaders to strive for ecological as well as business success.

Second, the importance of orientation towards sustainability sustaining organizational culture for improved sustainability performance warrants attention. Organizations are advised to work and put value on having sustainability embedded into the organizational norms and stipulations, policies, and practices. Such objectives may be attained through actively involving employees to works towards green goals, providing green training to employees, and developing their strategies and policies toward achieving environmental performance.

Third, this study highlights the role of policymakers and spectators actively supporting green leadership and cultural change in the organization. It is understood that organizations are encouraged to adopt and implement sustainable practices with the aid of government and industry through giving incentives, formulating policies that provide frameworks for sustainability reporting, and recognizing efforts at going green.

Finally, this study contributes toward understanding the scope and depth of future studies investigating concepts like strategy, leadership, culture and deepening sustainability. From these findings, scholars can analyze their applicability in particular sectors and investigate the influence of such external forces as the regulatory framework of the state as well as competition on the relationship between greening strategy, organizational culture, and sustainability performance.

Limitations and Future Research

Regardless of the limits pointed out in this work's study analysis, it offers useful information. The sample group employed in this study, especially in the quantitative phase, was narrowed down to manufacturing companies in KP, Pakistan. This

might be a problem for generalizability when comparing to other sectors or regions. Further research might assess the impact of green leadership and organizational culture in various industries or areas to test the organizational culture's relevance to the study's findings.

Second, the study used self-reported data, and most of those cases, such data is liable to some form of bias such as social desirability bias or common method bias. Although some procedures to mitigate this problem were implemented, future studies might add more valid measures by including more objective evaluations of sustainability performance or the use of multiple data sources.

Finally, other areas of studies could focus on the impact of green leadership along with organization culture on sustainability performance over time. Such studies could also look into other possible mediating or moderating factors like employee engagement or innovation, which may help to further clarify the ways in which green leadership affects sustainability.

Conclusion

This study examines the relationships among Green Leadership, Organizational Culture, and Sustainability Performance, contributing to the understanding of how these factors enhance organizational sustainability. The results show that Green Leadership affects Organizational Culture which, in turn, enhances Sustainability Performance. Moreover, Green Leadership has a direct, substantial effect on Sustainability Performance, reiterating the importance of Green Leadership in cultivating sustainability.

These findings highlight the need for leaders focusing on environmental ecology, in addition to an organizational culture focused on sustainability and corporate social responsibility. Together, these factors provide a comprehensive approach to strengthening environmental sustainability performance and achieving enduring results.

This study addresses the gaps within the literature concerning leadership, organizational culture, and sustainability performance from a multidisciplinary organizational perspective. It offers practical strategies for business leaders and policy makers to transform organizational culture to meet

international sustainability demands. Further investigation into the influence of certain external elements, such as industry-specific policies and market dynamics, will enhance the utility of these findings.

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