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Exploring the Role of Internal Drivers of Corporate Sustainability on Firm Practices and Performance: Evidence from Pakistani Manufacturing Sector

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Abstract

This study delves into the relatively underexplored role of internal drivers of corporate sustainability within Pakistan's manufacturing sector. It aims to elucidate the relationship between internal corporate-sustainability drivers, firm practices, and performance. By leveraging empirical analysis, the research seeks to provide actionable insights for policymakers and organizations committed to worldwide sustainable development goals. The primary objective of this research is to examine the increasing viability of sustainable practices in manufacturing, propelled by technological innovations and advancements, stricter internal policy frameworks, and the growing influence of corporate social responsibility awareness. It also highlights the pivotal role of government support and the shifting public mindset in driving sustainable practices. This study aims to promote environmental sustainability and green investment practices within Pakistan's manufacturing sector, fostering a transition toward a more environmentally conscious industrial landscape. In this research, we used the statistical approaches, including PLS-SEM and ANN to quantify the impact of internal policy frameworks, corporate social awareness, and technological innovation on green investment practices and environmental sustainability practices, and on Firm Performance. This study used a straightforward random sample technique to gather information from the employees of manufacturing sector. The study found that environmental sustainability practices and green investment practices strengthen the firm performance and are positively impacted by technological innovation, internal policy frameworks, and corporate social awareness. Additionally, the aforementioned relationships are positively moderated by government support and public attitude.

Keywords: Internal corporate sustainability drivers, Technological innovation, Corporate social awareness, Environmental sustainability practices, Green investment practices, Firm performance.

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Introduction

Sustainable development in the manufacturing sector is critical in the face of increasing environmental challenges, the depletion of natural resources, and evolving global trade requirements (Oliveira & Gomes, 2025). Corporate sustainability, in this regard, has emerged as a strategic imperative for firms seeking long-term competitiveness. In the context of Pakistan, a rapidly developing nation with an extensive manufacturing base, achieving sustainable industrial growth is a significant challenge (Ahmad et al., 2025; Khan et al., 2024). The country's manufacturing sector is crucial to its economic development, contributing approximately 12.4% to its GDP, but it is fraught with inefficiencies, environmental pollution, and low adoption of green practices (Bilal et al., 2024). This sector is facing a range of intrinsic challenges such as poor energy efficiency, insufficient waste management systems, lack of innovation and internal policy frameworks that hinder the integration of sustainability practices (Bilal et al., 2024; Ullah et al., 2022). Moreover, as global environmental standards tighten and consumer expectations shift towards more sustainable products, firms in Pakistan are under increasing pressure to adopt practices that align with both environmental and economic goals (Rubab et al., 2024). However, the implementation of sustainability practices remains inconsistent, primarily due to the absence of a cohesive strategy that integrates internal drivers, such as technological innovation (TI), internal policy frameworks (IPF), and corporate social awareness (CSA), into the sustainability agenda (Alraja et al., 2022; Camilleri, 2017; Dzage et al., 2024).

One of the major hurdles in achieving sustainability in Pakistani manufacturing is the technological gap (Kumar et al., 2024). The industry is predominantly dependent on outdated, energy-inefficient machinery and processes that contribute significantly to environmental degradation. Technological innovation (TI) is seen as a key enabler of corporate sustainability globally, as it offers the opportunity to reduce the ecological footprint while enhancing operational efficiency (Bilal et al., 2024). However, the adoption of green technologies in Pakistan has been slow, often due to high initial costs, lack of awareness, and the absence of strong market incentives. Despite these barriers, firms that invest in innovative technologies can improve both their environmental and financial performance by reducing energy consumption, minimizing waste, and improving product quality (Anser et al., 2025; Ngisau & Ibrahim, 2020). Therefore, focusing on technological innovation is crucial to overcoming the inefficiencies in the Pakistani manufacturing sector and promoting sustainability.

In parallel with technological barriers, the lack of internal policy frameworks (IPF) for effective governance has been a significant obstacle in promoting sustainability (Octavio et al., 2025). Policies that promote environmental responsibility and resource conservation are often absent or poorly enforced, which weakens the ability of firms to effectively implement sustainability strategies (Mehmood et al., 2024). Internal policy frameworks are essential in providing the structure needed for firms to institutionalize sustainability practices and ensure compliance with both local and international regulations (Liu et al., 2025). In Pakistan, where compliance requirements are rising, the role of IPF becomes increasingly vital under expert guidance, enabling firms to align operations with sustainability goals while improving efficiency and competitiveness (Irum & Awan, 2024).

Another critical internal driver is corporate social awareness (CSA), which encourages firms to consider their environmental and social impacts when making business decisions (Zhang et al., 2023). In a country like Pakistan, where corporate behavior towards social responsibility is still in its early stages unlike developed

economies, an increased awareness can help organizations integrate sustainability into their business model pose themselves as market leader. By recognizing the importance of environmental responsibility, firms with high levels of CSA are more likely to invest in environmentally friendly technologies and practices, reduce emissions, and improve waste management (Chuang & Huang, 2018). As consumers increasingly demand eco-friendly products and services, CSA can help firms align their corporate objectives with societal expectations, thus improving their reputation and market positioning (Curras-Perez et al., 2023).

While these internal drivers are critical, their combined influence on sustainability outcomes in Pakistani manufacturing has not been well understood. This study aims to fill this gap by analyzing how these drivers affect the key environment centric practices. ESP encompasses practices aimed at reducing environmental harm, such as waste reduction, resource efficiency, and emissions control, while GIP refers to investments in sustainable technologies, renewable energy, and green infrastructure (An & Madni, 2023; Hossain et al., 2025). Both ESP and GIP are vital to improving environmental performance and achieving long-term sustainability in the manufacturing sector.

This research is vital for understanding how manufacturing firms in Pakistan can leverage these internal drivers to not only improve their environmental practices but also achieve better financial outcomes (Weston & Nnadi, 2023). Given the growing global demand for sustainable practices, this study provides much-needed insights into how firms can align their strategies with sustainability goals while simultaneously boosting their performance in the marketplace. Rooted into the foundation of stakeholder's theory (ST), Institutional theory (IT), and Resource Based View (RBV), this study focuses the internal drivers of corporate sustainability to offer practical solutions for improving sustainability outcomes in Pakistan's manufacturing sector, contrary to previous studies on external factors (Khan et al., 2024). This research could have broader implications for other developing economies with similar industrial challenges.

Most importantly, the study will investigate the mediating role of ESP and GIP in the relationship between these internal drivers and firm performance. We adopt the motivations and concept to expand the scope of this study ranging from drivers to performance by previous well-established studies. As firms adopt sustainable practices, the impact on their financial performance may be indirect, as these practices can lead to long-term cost reductions, improved reputation, and enhanced competitiveness. Finally, the moderation effects of public attitude and government support will be analyzed to understand how these external forces influence the relationship between internal drivers and sustainability outcomes (Ngisau & Ibrahim, 2020; Octavio et al., 2025). Public attitude can serve as a catalyst for sustainability by increasing consumer demand for sustainable products, while government support through policies and incentives can ease the adoption of green technologies and practices. Refer to Figure 5.1 for the complete conceptual model of the study; the main research questions addressed in this chapter are as follows.

1. How does the internal drivers influence the adoption of environmental sustainability and green investment practices directly and indirectly to enhance firm performance?
2. How does the external backing factors of public attitude and government support influence the relations to proposed constructs of internal drivers?

Literature Review and Hypotheses' Development

Sustainability in the manufacturing sector has gained significant attention over the last two decades, with an increasing body of literature exploring the role of internal drivers in shaping corporate sustainability strategies. The growing importance of corporate sustainability drivers, especially in emerging economies like Pakistan, can be understood through a combination of theoretical perspectives and practical challenges. The ST, IT and RBV backed framework, covering the internal CSDs influence on firm practices and performance, underscores the critical role of stakeholder, institutional and internal capabilities engagement in supplementing green practices and investments, leading to enhanced firm performance. ST and RBV supports our research idea to assess the role of internal CSDs as it suggests that organizations that exhibits social awareness and effectively respond to society expectations will likely enhance their internal policy framework and culture, fostering robust sustainable business practices (Freeman et al., 2021). Moreover, the RBV theory postulates that firms can leverage their organizational policies into competitive rewards using in-house resources, such as Technological innovation (He, 2025). TI may act as a dynamic capability that enables the implementation of sustainability policies, energy efficiency initiatives, and waste management strategies. (He, 2025). A study by Vijayakumar and Davidova (2025) demonstrate that firms promoting circular economy through innovative technologies not only reduce their carbon footprint but also improve operational efficiency, thus supporting the RBV perspective that valuable resources contribute to enhanced firm performance. Finally, IT helps explain how corporate social awareness (CSA) and internal policy frameworks (IPF) drive firms to adopt sustainability practices. As firms conform to institutional norms around social responsibility, they create internal capabilities that enhance both operational efficiency and reputation. Thereby, aligning with Renukappa et al., (2020) study, who advocate that institutional pressures is the mother of organizational learning and green technological innovation. Below Table 2.1 summarizes the theory alignments with hypothesized construct in a comprehensive tabular form.

Table 2.1: Theory-Aligned Developments of the Framework Relationships

Path Relationships	Variable(s) Involved	Theoretical Basis	Description
Internal Drivers → ESP, GIP	TI, IPF, CSA → ESP, GIP	Resource-Based View (RBV)	Internal resources like innovation, policies, and corporate awareness serve as strategic assets enabling sustainability integration.
ESP, GIP → Firm Performance	ESP, GIP → FP	RBV + Stakeholder Theory	Sustainable practices help firms build stakeholder trust and competitive advantage, enhance performance.
Internal Drivers → FP (Mediated)	TI, IPF, CSA → ESP, GIP → FP	RBV	Internal capabilities indirectly boost performance by shaping sustainable practices.
Public Attitude Moderation	PA × (Internal Drivers → ESP → FP)	Stakeholder Theory	Public pressure amplifies the firm's responsiveness to internal initiatives toward environmental practices.
Gov. Support Moderation	GS × (Internal Drivers → GIP → FP)	Institutional Theory	Government support acts as enabling institutional structure for internal resources to convert into effective GIP.

Influence of Internal Drivers of Corporate Sustainability

As trends towards sustainability continue to escalate, there is an increasing focus and optimism on fostering positive systemic change by leveraging inner transformation drivers more effectively. Various efforts emphasize the importance of internal drivers of corporate sustainability that enable firms to adopt sustainability practices (Broccardo et al., 2019; Omoloso et al., 2024; Prashar & Sunder, 2025). Internal CSDs provide firms with the necessary capabilities and resources to integrate sustainability into their operations and business strategies. These drivers are actually organizational factors, which are described below in detail and mainly include technological innovation, internal policy frameworks, and corporate social awareness. Here, the deliberate exclusion of managerial commitment, a widely studied factor, is based on several important rationales. First, managerial commitment is more closely associated with individual behavior rather than being a justified driver in the context of the extensive, technically viable factors we are studying. It is more relevant to the domain of human resource management (HRM). Second, as this variable is based on the personal traits of individuals in management positions, including it may introduce significant bias, which could undermine the validity of our study and results. Third, many local organizations in Pakistan operate within family-owned structures characterized by bureaucratic leadership, where managerial goals and commitments are often set unilaterally. Therefore, we recommend studying this determinant in the context of non-listed family owned firms, as suggested by prior research (Broccardo et al., 2019).

Technological innovation (TI) is often recognized as a key enabler of corporate sustainability, providing firms with the tools to improve resource efficiency and reduce environmental impact. A series of publications highlighted Technological innovation being a critical internal driver of corporate sustainability (Linnér & Wibeck, 2021; Nwani et al., 2025; Shabir et al., 2023). The resource-based view (RBV) of the firm offers a theoretical foundation for understanding the role of TI in enhancing sustainability outcomes (Barney, 1991). According to RBV, firms that possess unique technological capabilities can gain a competitive advantage by using these resources to reduce waste, improve production processes, and align with environmental standards. Technological innovation in manufacturing settings has been linked to increased energy efficiency, waste reduction, and enhanced environmental performance (Bilal et al., 2024).

In the context of Pakistan's manufacturing industry, the adoption of technological innovation remains relatively low, despite the country's significant industrial base. Challenges such as insufficient research and development, outdated production technologies, and limited access to information sources hinder firms from fully capitalizing on sustainable innovation. However, some firms in Pakistan have started to adopt cleaner production technologies to address these inefficiencies, demonstrating the potential of TI as a key driver of sustainability (Ullah et al., 2022). The limited adoption of innovative technologies in Pakistan's manufacturing sector, therefore, presents a gap that this research seeks to address by examining the impact of TI on ESP and GIP. Given these considerations, we hypothesize that:

H1a: Technological innovation positively influences Environmental sustainability practices.

H1b: Technological innovation positively influences Green investment practices.

From a theoretical perspective of IT, firms operate within a broader institutional context, where external pressures (such as regulations, norms, and social expectations) interact with internal policies to shape organizational behavior (DiMaggio & Powell, 1983). Firms institutionalize these internal policy frameworks (IPF) into their organizational structures and systems that guide the implementation of corporate sustainability strategies. They encompass company's formal and informal rules, codes of conduct, and organizational culture that shape employee and management behavior towards sustainability (Octavio et al., 2025).

In the Pakistani manufacturing sector, weak internal policies and a lack of cohesive sustainability strategies have been identified as major barriers to the widespread adoption of green practices (Mehmood et al., 2024). This is compounded by a lack of clear regulations from the government, which leads firms to operate without strong policy frameworks guiding their sustainability efforts. However, several firms that have adopted robust company-wide sustainability policies have seen positive outcomes in terms of resource efficiency and improved environmental performance (Camilleri, 2017; Zhang & Hao, 2024). By integrating IT and RBV, strong internal policy frameworks can align firm behavior with strategic sustainability objectives. Accordingly, we hypothesize the following:

H2a: Internal policy frameworks positively influence Environmental sustainability practices.

H2b: Internal policy frameworks positively influence Green investment practices.

Next, corporate social awareness (CSA), which refers to the degree to which a firm acknowledges its responsibility towards societal well-being in which business (Suto & Takehara, 2025). CSA is an essential driver of corporate sustainability, as it influences how firms integrate environmental and social concerns into their strategic objectives. The stakeholder theory provides a theoretical basis for understanding the CSA impact (Freeman, 1984). Stakeholder theory asserts that firms must consider the interests of a diverse range of stakeholders, including consumers, employees, and the broader community, when making strategic decisions. The increasing corporate awareness about community builds benefits in multiple ways (Zhang et al., 2023). Firstly, it supports the much needed social and environmental initiatives and brings the organizations closer with the community in which businesses operate. Secondly, this synergy translates into long term firm performance which led many firms to adopt more environmental sustainability and invest in green operations (Liao, 2023).

In Pakistan, CSA is still an emerging concept, with many firms focusing primarily on immediate financial gains rather than long-term sustainability goals. A recent study investigates the relationship between various dimensions of corporate social responsibility and consumer buying intentions in Pakistan. The findings indicate that legal, ethical, and philanthropic CSR activities significantly influence consumer purchasing decisions, reflecting a growing consumer demand for eco-friendly products. This trend is encouraging forward-looking companies in Pakistan to integrate sustainability into their corporate strategies to align with international standards and meet evolving market expectations (Subhani et al., 2024). As a result, CSA can be seen as a crucial internal driver of sustainability practices in the Pakistani manufacturing sector. Therefore, in the view of past research and stakeholder theory, we hypothesize that:

H3a: Corporate social awareness positively influences Environmental sustainability practices.

H3b: Corporate social awareness positively influences Green investment practices.

To summarize, below compiled Table 2.2 presents an outlook of prior studies that investigate internal organizational capabilities and their influence on sustainability practices. Most existing research centers on a single internal enabler, typically technological innovation, while often neglecting the broader constellation of internal drivers like policy frameworks or awareness motivation. Given that the resource-based view suggests that sustained performance arises from bundling multiple strategic resources, this study addresses the literature gap by considering all three core internal drivers together. This perspective provides a more comprehensive understanding of how internal capacities, aligned with stakeholder expectations and institutional norms, jointly drive environmental and investment outcomes.

Table 2.2: Previous studies on Internal Drivers influence

Study References	Study objective	Focused Driver	Driving force /motivational type	Theories, Sample Size, and Industry type	Integrated Variables
(He, 2025)	To explore interplay b/w org. policies, tech. innovation on firm performance	Internal Policy Frameworks, Technological Innovation	Governance capability, Innovation capability	Institutional alignment; n=331-Survey (manufacturing)	Green policy, compliance systems, stakeholders concern
(Nuryanto et al., 2024)	To investigates the relation between eco-friendly technologies, green investment, business innovation, and corporate sustainability	Technological Innovation	Innovation capability	n=160- Survey (manufacturing)	Eco-Control and Eco-Friendly Technologies, sustainable business practices
(Yazıcı & Çiçeklioğlu, 2025)	To study how green innovation awareness is integrated into CSR practices	Corporate Social Awareness, Technological Innovation	Innovation capability	Stakeholder Theory; n=397-survey (power plants)	CSR orientation, social commitment, environmental ethics
(Aslam et al., 2025)	To investigate internal factors influencing sustainable performance	Technological Innovation	Innovation capability	Resource-Based View; n=212-Survey based (SMEs)	Green innovation, tech linkages, knowledge management
(Mandung et al., 2025)	To investigates the relationship b/w technological innovation and FP	Technological Innovation	Innovation capability	RBV; Dynamic capability theory: Literature review. (multiple)	Innovation management practices, Competitive advantage

Study References	Study objective	Focused Driver	Driving force /motivational type	Theories, Sample Size, and Industry type	Integrated Variables
(Nwani et al., 2025)	To explore the role of technological innovation on eco-efficiency	Technological innovation	Innovation capability	Ecological modernization, Resource curse; Secondary data	Tech innovation, natural resource rent, eco-efficiency
(Noja et al., 2025)	To investigate the inferences of tech innovations in achieving economic & environmental sustainability	Technological Innovation	Innovation capability	RBV; 2016 to 2023 and integrating 28 European countries	Green investments, Product innovation
(Sukumar et al., 2022)	To examine tech innovation on firm performance of manufacturing in Switzerland	Internal Resources	Resource-based capabilities	Schumpeter's innovation theory; n=249, Survey (manufacturing)	Tech innovation, productivity, service innovation
(Mofokeng et al., 2023)	To examine the relation b/w internal drivers and sustainability of SME manufacturers	Internal Policy Framework, Technological Innovation	Governance capability, Innovation capability	RBV; n=500, (manufacturing SMEs)	Internal management systems, innovativeness
(Li et al., 2023)	To identify the internal and external drivers of corporate responsible innovation	Internal Policy Framework, Technological Innovation	Innovation capability	Resource-Based View; Case studies	Responsible innovation motivation, system, and elements
(Zhang et al., 2023)	To assess the influence of CSR awareness and implementation practices on listed and non-listed firm performances	Corporate Social Awareness	Dynamic capability	Resource-Based View; Survey of China based firms (construction)	CSR awareness, CSR implementation practices, performance outcomes
(Suto & Takehara, 2025)	To investigate how management CSR awareness and engagement affects their firm green investment and performance	Corporate Social Awareness	Dynamic capability	RBV, risk mitigation view, information advantage view n=8783, (manufacturing and non-manufacturing)	Organizational governance, market valuation, green investment

Mediating Effects between Environmental Sustainability and Green Investment Practices

ESP and GIP witnessed to exert both direct and indirect effects on firm performance in the prior research, highlighting their multifaceted strategic importance. Understanding this twofold relationship of ESP and GIP is substantial for scholarly attention. In the context of this chapter, we examine how ESP and GIP mediate the relationships between the internal CSDs and FP. Both of these mediators represent a key pathway through which our three internal drivers can influence firm performance.

Firstly, ESP have emerged as a cornerstone for achieving long-term firm performance, especially in the modern business landscape where sustainability is not only a regulatory requirement but also a strategic imperative. Rooted in the principles of the RBV, ESP enables firms to leverage their resources in ways that foster environmental stewardship while simultaneously creating economic value (Hart, 1995). The mediating role of ESP is further elucidated by institutional theory, which emphasize that organizational behavior is shaped by robust internal policies originated in response to institutional pressures (DiMaggio & Powell, 1983). For firms operating in Pakistan's manufacturing sector, characterized by rising export-oriented challenges, the integration of ESP into core operations is not only necessary but strategic. Technological innovation plays a critical role in driving ESP by introducing advanced tools and processes that enable resource efficiency and eco-friendly production (Nwani et al., 2025). Innovations in energy-efficient machinery, renewable energy integration, and green manufacturing technologies directly contribute to reducing environmental impact while lowering costs, thus facilitating firm performance (Ngisau & Ibrahim, 2020). Further, strong internal policies that prioritize sustainability ensure that environmental goals are systematically integrated into decision-making processes and promote accountability for environmental impacts (Bravi et al., 2020). Robust policy frameworks play a critical role in addressing performance challenges across the TBL dimensions, particularly in manufacturing sectors like Pakistan's, where weak external enforcement increases reliance on IPF (Jizi & Thomas, 2025). Furthermore, firms with increased awareness towards social responsibility are more inclined to adopt ESP as a response to societal pressures and stakeholder expectations (Carlini & Grace, 2021). Addressing environmental concerns through community relations build stronger reputations, which, in turn, contribute to better firm performance. Hence, the mediating role of ESP can be conceptualized as follows:

H4: Environmental sustainability practices mediate the relation among Technological Innovation (H4a), Internal Policy frameworks (H4b), and Corporate Social Awareness (H4c) to Firm Performance.

Likewise, GIP is equally critical for long-term sustainability because it ensures that firms are continuously upgrading their technologies and operational processes to stay ahead of regulatory and market demands (Zhang et al., 2023). As GIP are closely tied to technological innovation, internal policies and CSR initiatives, they serve as a crucial pathway through which firms can leverage performance benefits in return (Indriastuti & Chariri, 2021; Liu, 2024; Ye et al., 2022). The RBV theory also emphasizes on the role of firm's unique resources and capabilities to mobilize strategic investments in adapting to competitive environments. Thus, understanding how internal drivers influence GIP provides valuable insights into how Pakistani manufacturers can leverage internal resources and capabilities to overcome barriers to green investment and

enhanced firm performance. Accordingly, we can hypothesize that:

H5: Green investment practices mediate the relation among Technological Innovation (H5a), Internal Policy frameworks (H5b), and Corporate Social Awareness (H5c) to Firm Performance.

Below Table 2.3 summarizes the prominent studies in the literature, depicting the importance of ESP and GIP with scarce studies on their holistic effect on FP.

Table 2.3: Previous studies on Firm Practices and Performance

Study References	Objective	Focused Practices	Focused Performance dimension	Theories, Sample Size and Industry type	Integrated Variables
(Nuryanto et al., 2024)	Examine the role of internal CSDs on green practices and performance	Green investments	Financial and operational	Resource-Based View; n = 245 (manufacturing)	Eco-Friendly Technologies, Business innovation
(Rahman et al., 2024)	To assess the influence of ESG practices on FP	Environmental, ESG	Financial Performance	ST; Survey based, n = 255 (non-financial)	Earning management, firm size
(Islam, 2024)	Identify key drivers impact on sustainability practices and competitive performance	Sustainability practices (TBL)	Overall Firm performance	RBV; Interview based, n=16 (services industry)	Technological resources, innovation adoption, regulatory policy
(Gomes et al., 2024)	To identify the influence of ESP on green innovation performance	Environmental sustainability practices	Operational, Learning	RBV, Survey based, n=3184 (manufacturing SMEs)	Performance metrics, Green service/product, process, organizational innovation.
(Nogueira et al., 2023)	To understand the relations between ESP and firm performance	Environmental sustainability practices	Financial (Accounting & Economic), Operational, Customer	Stakeholder, Institutional, Contingency; literature review n=96 (multiple)	ESP, Firm Performance dimensions
(Mwansasu & Mwagike, 2025)	To link sustainability performance with performance outcomes	Environmental sustainability practices	Financial and Customer performance	Stakeholder Theory; Survey based, n- 155 (supply chain & manufacturing)	Carbon emissions, circular packaging, waste management
(Zhang et al., 2024)	To evaluate the effect of green investment on firm green innovation performance	Green investment practices	Operational, Learning (innovation performance)	Innovation theory; n=1358, (listed firm's data - multiple)	Corporate green innovation, state vs private firm type, competition,

Study References	Objective	Focused Practices	Focused Performance dimension	Theories, Sample Size and Industry type	Integrated Variables
(Zhongping et al., 2023)	To analyze the impact of green financial investment on firm performance	Green investment	Financial and environmental performance	green finance, privatization theories; listed firms' data 1995-2021 (multiple)	Green investment, economic performance, privatization
(Lee & Isa, 2024)	To evaluate the relationship between corporate sustainability practices and financial performance	Sustainability practices (TBL)	Financial	Stakeholder, Legitimacy theory; n=771 based on secondary data (non-financial multiple)	Corporate sustainability practices, corporate controversies
(Zhang et al., 2022)	To link sustainability practices within supply chain to market competitiveness	Environmental sustainability practices	Customer	Stakeholder theory; n=283 survey based (Italian food industry)	Environmental visibility, environmental management systems, market competitiveness
(Khalid et al., 2023)	To determine corporate green investment, enhance profitability	Green investment practices	Financial	Institutional theory; listed companies' data 2010-2019 (multiple)	Environmental policy, regional development, industry type
(Nigatu et al., 2024)	To find the structural link b/w Green practices and economic performance through green innovation	Environmental sustainability practices, green investment practices	Financial, Operational	Stakeholder theory; n=201 survey based (manufacturing)	Green marketing orientation, green manufacturing practices, green investment

Moderating influence of Government Support and Public Attitude

Public attitude (PA) towards sustainability has been shown to influence firms' strategic decisions, especially when consumers are becoming increasingly concerned about environmental health (Lucas et al., 2021). When the public awareness is rising, firms may face greater pressure to adopt environmental practices, as consumers tend to favor companies exercising their resources towards ESP adoption (Octavio et al., 2025). This synergy amplifies the effectiveness of corporate sustainability efforts, highlighting the significant role that public attitude can play in moderating the relationship between internal factors and ESP adoption, which in turn influences firm performance in confounding ways. This moderation is particularly relevant in Pakistani context, where public perceptions are based on religious, cultural, or contextual origins and play critical role in shaping performance outcomes of sustainability practices (Ud Din et al., 2023). The ever-increasing awareness of climate change and environmental changes in the

region through digital media has prompted constructive changes in consumer behaviour, leading to a rising demand for eco-friendly practices (Chukwu et al., 2025; Ud Din et al., 2023). Based on the above discussion, the study hypothesizes the following:

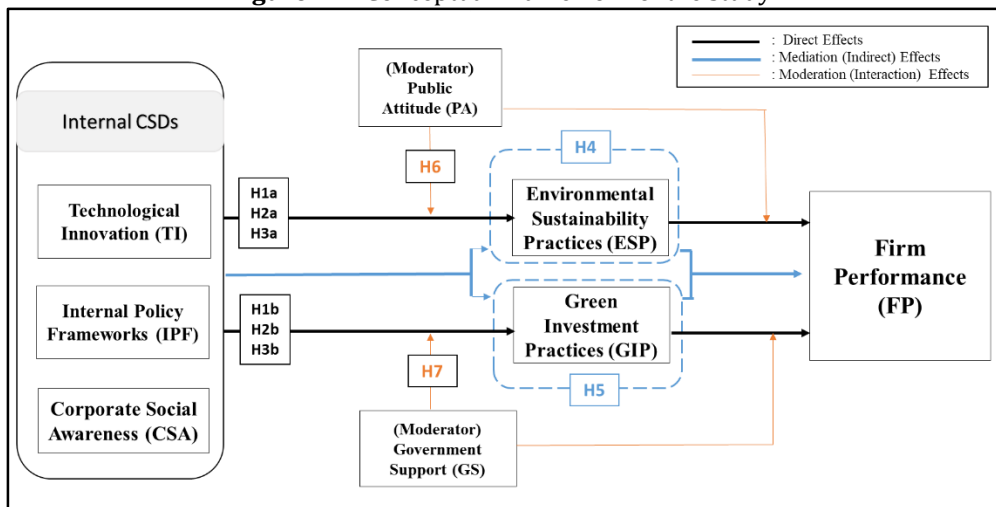
H6: Public Attitude positively moderates the aforesaid relationships towards Environmental Sustainability Practices and Firm Performance in perplexing ways.

Previous scholars also demonstrated that government support (GS) plays a crucial role in encouraging firms to invest in green initiatives, particularly through incentives, subsidies, and soft regulations (Li et al., 2024). In emerging economies, the government's role in fostering GIP is even more pronounced due to the lack of private-sector motivation and market-driven competition (Soomro et al., 2025; Wijeweera & Rashid, 2023). When the government support system is active through technical, regulatory, or financial incentives, firms are more likely to engage their resources in green investments to initiate renewable energy project, green R&D, and infrastructure (Wenqi et al., 2022). In Pakistan, government initiatives to promote green energy, waste management, and sustainable production practices have been relatively weak, but recent policies show promise (Ahmad et al., 2025). The introduction of green certifications, renewable energy subsidies, and waste management regulations is expected to strengthen firms' resource capabilities and improve performance. Thus, based on the above discussion on government support, we hypothesize that:

H7: Government Support positively moderates the aforesaid relationships towards Green Investment Practices and Firm Performance in perplexing ways.

Based on the aforementioned hypotheses, the research model depicted in Fig. 2.1 is developed.

Figure 2.1: Conceptual Framework of the study



Research Methodology

Data Collection Procedure

To collect the data, the study carefully approached professionals working at manufacturing organizations of Pakistan through emails. A questionnaire was duly filled

between March 2023 to August 2023, carefully forwarded to 851 email addresses. Table 3.1 provides a valuable insight of the demographic and professional association of the respondents. The questionnaire was prepared on a user-friendly online survey link (Google Docs Forms). The survey form link along with a brief cover letter was distributed among target population via official email addresses of companies available on Pakistan Stock Exchange (PSX 100). To improve the response rate, two follow-up emails were sent with an interval of 2 weeks. The target respondents were management level employees from Pakistani manufacturing industries. The decision to exclude non-management staff was based on their limited involvement in the strategic development and implementation of sustainability policies, as well as their relatively lower awareness of the broader sustainability initiatives within the organization. Similarly, for better insights, the research incorporated diversified businesses based on their significant contributions to Pakistan's economy and their potential to implement green manufacturing practices, with mostly holding reputable certification ISO 14000.

Out of the 851 questionnaires distributed, 578 responses were found valid after data cleaning, yielding a valid response rate of 68%. The majority of respondents held upper-management roles (43%) and were between the ages of 30 and 45, with 57.4% being male. The sample size followed the "10X rule" for structural equation modeling as recommended by (Hair Jr et al., 2017), ensuring an adequate sample for analysis. Data screening was performed for unfilled items, less engage respondents, and outliers. Low engagements were tracked and discarded by calculating the standard deviation of the responses with a threshold of 0.5.

Table 3.1: Details of Survey Respondents

Particulars	Description	Frequency	Percentage (%)
Response rate	Questionnaire	851 sent 578 received	67.92
Gender	Male	332	57.44
	Female	246	42.56
Respondent ages	18 – 30	189	32.70
	30 – 45	241	41.70
	46 and above	148	25.60
Position levels	Upper management	245	42.39
	Middle management	193	33.39
	Lower management	140	24.22
Experience	Less than 5 years	76	13.15
	5 – 10 years	146	25.26
	11 – 15 years	224	38.75
	15 or more years	132	22.84
No of employees	Below 150	168	29.06
	151 – 300	221	38.23
	Above 300	189	32.71
Industry	Textiles and apparel	163	28.20
	Food and FMCG	132	22.84
	Cement & construction materials	78	13.49
	Chemicals & fertilizers	69	11.94
	Automobiles & auto parts	54	9.34
	Pharmaceuticals	48	8.30

Particulars	Description	Frequency	Percentage (%)
EMS	Electronics & appliances	34	5.88
	ISO 14001, and equivalent	411	71.10
Certifications	No certification	167	28.89

Measurement of Variables

All measurement items are derived and adapted from prior well-established studies. Firstly, the literature provides a comprehensive framework for measuring the internal drivers. We assess the internal CSDs, where technological innovation scale items adapted from Li et al., (2006). internal policy frameworks, specified as companies' in-house legal responsibilities carried from Helmig et al., (2016), and corporate social awareness from Ng et al., (2022). In order to predict ESP and GIP, we adopted measure items from Yu and Ramanathan (2015) and Le and Ferasso (2022) respectively. For the next crucial factor of firm performance, we adopt items from Li et al., (2006). Finally, the moderator variables public attitude adopted from Watling and Zhou (2011), and government support taken from Ngisau and Ibrahim (2020). The complete survey consists of eight different variables with each having measure items range between 3 to 5 according to the general guidelines of measuring a latent construct, adapted from previous publications (see Appendix A). While adapting the scale items from the above studies to our context, minor adjustments were made under the guidance of an expert panel composed of senior professors and experienced professionals in the field of corporate sustainability. The deliberate exclusion or inclusion of certain items from the aforementioned studies, ensuring scale consistency and balance in item allocation, based on the panel assessment to enhance clarity, avoid duplication and redundancy, and maintain respondents' interest (Latif et al., 2024). This study also incurred four topic-specific control variables, age, gender, position and experience levels, to prevent other factors from intruding with the latent variable.

Results and Findings

The results analysis employ PLS-SEM, which is highly recommended when an investigation is exploratory and intends to predict causal relationships (Hair Jr et al., 2017). Normal distribution is not a precondition in this technique compared to other methodologies, and it can work with a small sample. Also, it has the potential to measure all causal relationships concurrently and can test a complex model without the removal of any model variable. These properties suits to employ the PLS-SEM methodology in this study (Hair Jr et al., 2017). Additionally, ANN is more robust and proficient in recognizing both linear and non-linear relations and outperform classical regression investigations, e.g. multiple regression analyses (Sim et al., 2014). Nevertheless, its operational algorithms come with the limitation of a "black box" and is therefore not appropriate for testing hypotheses. Thus, PLS-SEM is utilized for hypotheses testing, whereas, the variables relativity importance is measured by using ANN approach.

Analysis of Measurement Model

To evaluate the measurement model, construct reliability and validity was thoroughly assessed. Construct reliability evaluated through Cronbach's alpha (CA) and composite reliability (CR), whereas validity was assured by evaluating the discriminant and convergent validity methods, according to (Hair Jr et al., 2017). As shown in Table

4.1, the CA and CR statistics exceeded the threshold of 0.70, confirming the reliability of the constructs (Hair Jr et al., 2017). The convergent validity (CV) was determined by examining the factor loadings and Average Variance Extracted (AVE). Both of these values surpassed the recommended thresholds of 0.7 and 0.50, respectively, as suggested by Hair et al., (2017), supporting the CV of the variables. Discriminant validity (DV) was confirmed using two methods: the traditional Fornell-Larcker criterion (Fornell & Larcker, 1981) and the advanced heterotrait-monotrait (HTMT) ratio (Henseler et al., 2015). In the Fornell-Larcker method, the square root of AVE should be higher than the correlation among the constructs, and the HTMT method recommends a cutoff of 0.85 (Sarstedt et al., 2017), both satisfied in Table 4.2 and 4.3.

Table 4.1: Reliability and Validity Metrics

Constructs	Factor Loadings	Cronbach's Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Technological Innovation (TI)		0.731	0.89	0.566
TI1	0.802			
TI2	0.733			
TI3	0.747			
TI4	0.711			
Internal Policy Frameworks (IPF)		0.843	0.90	0.611
IPF1	0.746			
IPF2	0.801			
IPF3	0.811			
IPF4	0.739			
Corporate Social Awareness (CSA)		0.732	0.91	0.659
CSA1	0.775			
CSA2	0.801			
CSA3	0.826			
CSA4	0.762			
Environmental Sustainability Practices (ESP)		0.806	0.88	0.628
ESP1	0.791			
ESP2	0.778			
ESP3	0.752			
ESP4	0.755			
Green Investment Practices (GIP)		0.841	0.89	0.593
GIP1	0.784			
GIP2	0.814			
GIP3	0.803			
GIP4	0.821			
Firm Performance (FP)		0.892	0.87	0.621

Constructs	Factor Loadings	Cronbach's Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)
FP1	0.751			
FP2	0.728			
FP3	0.732			
FP4	0.765			

Table 4.2: Discriminant Validity (Fornell-Larcker Criterion)

Constructs	TI	IPF	CSA	ESP	GIP	FP
TI	0.821					
IPF	0.763	0.774				
CSA	0.642	0.751	0.763			
ESP	0.541	0.621	0.431	0.753		
GIP	0.622	0.445	0.512	0.703	0.841	
FP	0.652	0.344	0.412	0.673	0.641	0.735

Table 4.3: Discriminant Validity (HTMT)

Constructs	TI	IPF	CSA	ESP	GIP	FP
TI						
IPF	0.718					
CSA	0.737	0.719				
ESP	0.754	0.716	0.747			
GIP	0.676	0.728	0.793	0.718		
FP	0.776	0.785	0.791	0.678	0.698	

Analysis of Structural Model

After validating the measurement model, the structural model was assessed to test the hypotheses. The structural model analysis was conducted by evaluating path coefficients, t -statistics, and predictive power using R^2 values. According to (Hair et al., 2017). R^2 values are categorized into three levels of predictive accuracy: weak (0.25), moderate (0.50), and substantial (0.75). In our model, the R^2 values for Environmental Sustainability Practices (ESP), Green Investment Practices (GIP), and Firm Performance (FP) were found to be 0.534, 0.567, and 0.590, respectively, indicating moderate explanatory power for each construct. Model fit was further assessed using the Standardized Root Mean Square Residual (SRMR), where a value below 0.08 is considered indicative of good model fit (Hair et al., 2017). The observed SRMR value of 0.063 falls within this acceptable range, confirming that the model fits the data well. Additionally, Goodness of Fit (GOF) was calculated using formula $GOF = \sqrt{(AVE \times R^2)}$, as proposed by (Wetzels et al., 2009), yielding a GOF value of 0.427, indicating that the model meets large criteria. The resulting GOF value of 0.427 exceeds the recommended threshold for a large effect size, suggesting that the model demonstrates strong overall fit and explanatory power, as presented in Table 4.4. Also, this study's control variables yielded statistically insignificant results, with β coefficients of age = 0.030, gender = 0.035, position-level = 0.024, and experience = -0.009.

Table 4.4: Structural Model Predictive Assessment

Endogenous variables	R2	Q2	Exogenous variable	F2
ESP	0.534	0.343	TI	0.042
GIP	0.567	0.354	IPF	0.022
FP	0.590	0.290	CSA	0.028
			ESP	0.012
			GIP	0.053

A bootstrapping approach using 5000 iterations was employed to determine the relevance of the hypotheses. The results showed a significant and positive effect of TI (H1a: beta = 0.180, $p < 0.000$), IPF (H2a: beta = 0.152, $p < 0.002$), and CSA (H3a: beta = 0.210, $p < 0.000$) on ESP, supporting hypotheses H1a, H2a, and H3a, respectively. Additionally, significant and positive effects were found for TI (H1b: beta = 0.136, $p < 0.001$), IPF (H2b: beta = 0.121, $p < 0.023$), and CSA (H3b: beta = 0.157, $p < 0.001$) on GIP, thus supporting hypotheses H1b, H2b, and H3b, respectively. The overall results of the hypotheses are summarized in Table 4.5 below.

Table 4.5: Hypotheses Testing Results

Hypotheses	Path Coefficients (β)	T-values	P-values	Support
H1a: TI -> ESP	0.180	4.129	0.000	Yes
H1b: TI -> GIP	0.136	3.124	0.001	Yes
H2a: IPF -> ESP	0.152	3.304	0.002	Yes
H2b: IPF -> GIP	0.121	2.125	0.023	Yes
H3a: CSA -> ESP	0.210	3.312	0.000	Yes
H3b: CSA -> GIP	0.157	3.182	0.001	Yes
Mediation Analysis	(Indirect Effects)			
H4a: TI -> ESP -> FP	0.041	3.047	0.002	Yes
H4b: IPF -> ESP -> FP	0.031	2.532	0.009	(Complementary
H4c: CSA -> ESP -> FP	0.036	2.836	0.003	Partial Mediation)
H5a: TI -> GIP -> FP	0.029	1.976	0.038	Yes
H5b: IPF -> GIP -> FP	0.048	3.106	0.002	(Complementary
H5c: CSA -> GIP -> FP	0.035	2.491	0.011	Partial Mediation)

Mediation Analysis

The mediating effects of ESP and GIP were examined through a series of steps (Nitzl et al., 2016). Initially, the indirect effects of TI, IPF, and CSA on FP through ESP were analyzed, revealing significant effects with beta values of 0.041, 0.031, and 0.036, respectively. The direct effects of these variables on FP, without removing ESP, were also significant, with beta values of 0.180, 0.152, and 0.210, respectively. Similarly, the indirect effects of TI, IPF, and CSA on FP through GIP were significant, with beta values of 0.029, 0.048, and 0.035, respectively, while the direct effects of these variables on FP, without removing GIP, also showed significant positive outcomes, with beta values of

0.136, 0.121, and 0.157, respectively. The results, shown in Table 4.5, indicate partial mediation. The positive direction of both indirect and direct effects suggests that ESP and GIP have complementary partial mediation, as supported by (Hair Jr et al., 2017). Therefore, hypotheses H4 and H5 are fully supported.

Moderation Analysis: Multi Group Analysis (MGA) approach

The moderating effects of Public Attitude and Government Support were checked using MGA in SmartPLS software. MGA helps estimate significant differences among groups within the same model, especially when categorical moderators are involved (Hair Jr et al., 2017). In order to run MGA in PLS-SEM, moderators need to be converted into categorical variables, because this method compares group-wise structural models, not interaction terms like in regression. When categorizing responses from a 5-point Likert scale into "Low," "Medium," and "High," a common statistical method involves dividing the scale range (5 - 1 = 4) by three, resulting in intervals of approximately 1.33; this yields the categories: Low (1.00-2.33), Medium (2.34-3.66), and High (3.67-5.00), a technique widely recognized in academic research (Al Rahahleh, 2025; Hijazi, 2023; Yusoff & Sarifin, 2023).

Table 4.6 and 4.7 through MGA shows that PA and GS levels varied significantly across these groups. In organizations with low green awareness in public attitude, the effects of TI and CSA on ESP were insignificant. For organizations with medium levels of public attitude, the impact of TI on ESP was insignificant, while for larger organizations, the effects of all three drivers were significant. These results suggest that the propensity for ESP varies from low to high across these groups. Organizations with low environmental consciousness have less pressure to adopt sustainable practices, resulting in lower FP, unlike organizations with medium or high levels of green awareness. Thus, hypothesis H6 is fully supported. In terms of government support, organizations with low levels of support showed no significant effect of TI, IPF, and CSA on GIP. For organizations with medium government support, only the effects of IPF and CSA were insignificant, while for high-support organizations, the effect of TI found close to significant or marginally significant as above the threshold for the 10% level ($t > 1.645$) in a two tailed test. These findings indicate that government support facilitates the adoption of GIP. This, in turn, enhances firm performance outcomes. Hence, the last hypothesis H7 is also completely reinforced.

Table 4.6: MGA for Public Attitude moderation

Constructs	β -value	T-value	β -value	T-value	β -value	T-value
H6	(Low PA)		(Med. PA)		(High PA)	
TI -> ESP	0.190	0.973	0.034	0.316	0.223	2.327
IPF -> ESP	0.152	1.991	0.230	2.028	0.268	2.604
CSA -> ESP	0.036	0.606	0.248	2.665	0.281	3.232

Table 4.7: MGA for Government Support moderation

Constructs	β -value	T-value	β -value	T-value	β -value	T-value
	H7 (Low GS)		(Med. GS)		(High GS)	
TI -> GIP	0.132	0.326	0.298	2.592	0.180	1.890
IPF -> GIP	0.052	0.953	0.031	1.034	0.290	3.816
CSA -> GIP	0.091	1.29	0.084	0.777	0.311	2.641

Robustness Test: Artificial Neural Network Approach

Drawing upon previous studies (Chavoshi & Hamidi, 2019; Zafar et al., 2021), an ANN approach was used to determine the relative importance of each variable and to enhance the SEM results. The multilayer perceptron (MLP) model was employed, which is a widely used type of ANN (Zafar et al., 2021). The model included one input layer, one or more hidden layers, and one output layer. The number of hidden layers was determined based on the complexity of the problem (Sheela & Deepa, 2013). In the first step, all significant covariates were considered as input variables, while FP was used as the output variable. Considering the hidden and output layers, a sigmoid function is used to represent the activation function of neurons. The model was further verified by incorporating hidden nodes of different numbers from 1-10, with tenfold cross-validation to prevent overfitting. The accuracy of the model was assessed using the Root Mean Square Error (RMSE), which was found to be 0.1335 for dataset training and 0.1321 value for the dataset testing (see Table 4.8). This small difference indicates high accuracy (Leong et al., 2018). Finally, sensitivity analysis shows the importance (significance) and normalized importance of the variables, revealing that CSA was the most important predictor for FP, followed by TI, IPF, ESP, and GIP (Table 4.9).

Table 4.8: ANN Validation for Dataset Training and Testing

Neural Networks	Training				Testing Data			
	N	Sum of Square Error	Mean Square Error	RMSE	N	Sum of Square Error	Mean Square Error	RMSE
1	355	6.213	0.0172	0.1317	157	2.811	0.0175	0.1328
2	346	6.238	0.0177	0.1337	166	2.750	0.0162	0.1278
3	376	7.182	0.0188	0.1377	136	2.353	0.0169	0.1304
4	339	6.043	0.0175	0.1329	173	3.141	0.0178	0.1338
5	377	6.791	0.0177	0.1337	135	2.351	0.0170	0.1309
6	361	6.213	0.0169	0.1306	151	2.872	0.0186	0.1369
7	351	6.603	0.0185	0.1368	161	2.472	0.0152	0.1230

Neural Networks	Training		Data		Testing Data			
	N	Sum of Square Error	Mean Square Error	RMSE	N	Sum of Square Error	Mean Square Error	RMSE
8	383	7.172	0.0184	0.1363	129	2.137	0.0163	0.1276
9	341	5.913	0.0170	0.1311	171	3.179	0.0184	0.1354
10	350	6.005	0.0168	0.1304	162	3.333	0.0203	0.1424
Average				0.1335				0.1321
St. Dev.				0.0024				0.0053

Table 4.9: Sensitivity Analysis Results

Neural Networks	TI	IPF	CSA	ESP	GIP
1	0.232	0.648	0.229	0.165	0.071
2	0.588	0.109	0.187	0.208	0.093
3	0.131	0.167	0.071	0.088	0.193
4	0.243	0.116	0.309	0.026	0.047
5	0.097	0.092	0.242	0.188	0.112
6	0.144	0.108	0.304	0.223	0.065
7	0.151	0.103	0.229	0.167	0.112
8	0.215	0.119	0.180	0.206	0.187
9	0.148	0.109	0.196	0.155	0.105
10	0.178	0.030	0.261	0.167	0.272
Average	0.213	0.160	0.221	0.159	0.126
Importance					
Relative	0.962	0.726	1.000	0.722	0.571
Importance					
Normalized	96.17	72.57	100.00	72.19	57.13
Importance					

Discussion and Conclusion

Main Findings

This study expands our understanding of the unanimous power of internal drivers of corporate sustainability measured through the mechanism of sustainability practices and performance, illustrated by taking an example of Pakistani manufacturing sector.

Firstly, the results show that Technological Innovation (TI), Internal Policy Framework (IPF), and Corporate Social Awareness (CSA) have a significant and positive effect on ESP, supporting hypotheses H1a ($\beta=0.180$, $p<0.05$), H2a ($\beta=0.152$, $p<0.05$), and H3a ($\beta=0.210$, $p<0.05$), respectively. This finding suggests that manufacturing firms with hi-tech innovations, robust inhouse policies, and high levels of corporate social awareness are more likely to conserve natural resources and protect the environment by adopting ESP. The results broadly align with prior research by Mofokeng et al., (2023), emphasizing the positive impact of internal drivers including internal management policy, innovativeness, and sustainability awareness in the African manufacturing sector. Furthermore, the study also found positive and significant effects of TI ($\beta=0.136$, $p<0.05$), IPF ($\beta=0.121$, $p<0.05$), and CSA ($\beta=0.157$, $p<0.05$), on GIP (H1b,

H2b, H3b), suggesting that these internal drivers also play a critical role in pushing firms to practice green investments. This reflects the growing recognition that sustainable investment decisions are increasingly driven by internal capabilities and values as indicated by previous researchers (Nazari et al., 2015).

Secondly, the mediation analysis also confirms that ESP plays a distinct role in mediating the relationship between TI, IPF, and CSA and FP, while GIP provides a complementary partial mediation between IPF, CSA, and FP. This suggests that internal sustainability drivers do not operate in isolation but are interlinked in driving firm performance through ESP and GIP (Weihong et al., 2022; Yasin et al., 2023).

Thirdly, the results from the multi-group analysis (MGA) on the moderating effects of public attitude (PA) and government support (GS) show that the relationship between internal drivers and sustainability practices varies significantly based on the levels of these moderators. Specifically, for organizations with lower public support, the effects of TI (t-value=0.973, $\beta=0.190$) and CSA (t-value=0.606, $\beta=0.036$) on ESP were insignificant. While higher levels of public and authority support led to stronger positive effects for both the moderation variables. This supports H6 and H7, indicating that firms operating in societies with higher levels of green awareness and government support are likely to invest in green practices, reinforcing the role of external environmental consciousness and governmental incentives in shaping sustainability decisions.

Finally, the most widely used type of ANN approach, the multi-layer perceptron (MLP) model reinforce the PLS-SEM evaluated significance of TI, IPF, and CSA on FP. A sensitivity analysis determines normalized importance values of the variables, revealing that CSA (100) was the most important predictor for FP, followed by TI (96.17), IPF (72.57), ESP (72.19), and GIP (57.13). These results are highly consistent with previous study by (Leonidou et al., 2017), who identified the critical role of internal company factors in shaping a green business strategy and firm performance, under the supportive moderation of external forces. They reported the implementation of a green business strategy driven by internal factors was found to create a positional competitive advantage, strengthening further under conditions of high government support and high public concern (Leonidou et al., 2017). Last but not the least, they observed that the reliance on internal factors for green development is more pronounced in firms operating in industries with higher environmental impact, which is again highly pertinent to this study's practical conditions.

Main Theoretical Contributions

This study makes a significant theoretical by extending our knowledge of the interplay between resource-based theory, stakeholders' theory, and institutional theory in the context of corporate sustainability. It offers a novel approach by examining a mediation mechanism of ESP and GIP in the relationship between internal driving factors and firm performance. Particularly, it explains that these practices not only represent a reactive measure to efficiently leveraging internal resources and systems, as suggested by resource-based view, but they also operate as a counter of corporate social awareness, adhered to align firms' response to internal stakeholder pressures, as emphasized by stakeholder's theory. Furthermore, private and public support play a crucial role in this context, as highlighted by institutional theory. The presence of strong government support and a favourable public attitude enhances the impact of internal drivers on sustainability outcomes, reinforcing the idea that firms are not only influenced by their internal resources but are also shaped by the broader institutional environment.

This research addresses the limited understanding of how internal driving factors translates into sustainability practices, particularly within Pakistan manufacturing context. Chiefly, this study is the pioneer to conceptualize the ESP and GIP, not merely as an output of growing compliances and expectations, but as a mechanism of transforming internal resources and capabilities into competitive advantage to enhance firm performance. This unified approach, combining resource-based, stakeholder, and institutional theory, allows for a deeper and more thorough understanding of the drivers behind corporate sustainability.

Practical Contributions and Conclusion

This study has valuable practical contribution by emphasizing the constructive role that innovative technologies, company policy structures, and corporate social consciousness can play in fostering environmental sustainability and investments. Firstly, manufacturing companies in Pakistan should develop integrated sustainability strategies where internal resources and systems aligned well with environmental sustainability objectives. Leaders should leverage internal capabilities to implement green investment practices that not only enhance environmental conduct but also offer a competitive edge in the marketplace. For instance, by incorporating innovative and cleaner production technologies into operations, organizations of Pakistan can reduce environmental impacts and enhance their strategic reputation (Awan et al., 2021).

Secondly, Policymakers should introduce incentives for green initiatives, such as subsidies for green technologies and tax rebates, to encourage firms to scale up their green practices and investments. Given the strengthening role of public and governmental support, these incentives can help shape regulations that foster technological innovation and corporate responsibility. By offering technical and financial support for companies that demonstrate strong internal commitments to sustainability, the government can drive the widespread application of green investments practices across the country. Similarly, for firms operating in societies with low levels of green awareness, the study recommends a collaborative public-private effort and highlights the need for effective campaigns to raise environmental consciousness. These transformational efforts can not only strengthen national environmental commitment but also enhance business performance by attracting the loyalty of eco-conscious customers and investors.

In conclusion, this study contributes to the growing body of research on internal drivers of corporate sustainability and provides practical insights for policymakers, business leaders, and managers in developing economies like Pakistan, where sustainability practices are still emerging. It aligns with global Sustainable Development Goals and offers a roadmap for firms looking to build a sustainable future while enhancing their performance in a competitive global market.

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Appendix A

S. No	Survey Questionnaire (1 =strongly disagree; 5 =strongly agree)
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1.	Technological Innovation (Li et al., 2006) My company frequently adopt innovative technology to upgrade manufacturing processes My company accelerate R&D timelines to fast-track innovation We observe high success rates for new product and process development. We regularly renew equipment to incorporate advanced eco-friendly technologies
2.	Internal Policy Framework (Helmig et al., 2016) We have programs that encourage environmental sustainability at our workplace (e.g., resource conservation and waste minimization). Internal policies ensure compliance with environmental regulations and promote sustainable practices. We defined internal standards/policies for actions not regulated explicitly by current law (e.g., unauthorized waste disposal). Our internal sustainability policy goes far beyond minimal legal requirements.
3.	Corporate Social Awareness (Ng et al., 2022) My company does not ignore the social issues My company prioritizes safety and well-being in the workplace My company advocates for social justice My company upholds employee rights at workplace
4.	Firm Performance (Li et al., 2006) My company's sales revenue has increased after adopting sustainability practices My company profits are increased after adopting sustainability practices My company boosts return on investment (ROI) through environmental initiatives My company gains market share due to environmental commitments.
5.	Green Investment Practices (Le & Ferasso, 2022) We invest in product research and development towards green practices direction We invest in renewable energy systems We invest in solid, liquid and exhaust gas treatment systems as per international standards. We invest in green technology applications
6	Environmental Sustainability Practices (Yu & Ramanathan, 2015)

My company has achieved national and international environmental certifications

My company achieves targets of energy conservation, recycling or waste reductions

My company has saved significantly in the past through eco-friendly practices. On average, my company's environmental performance has improved over the past 05 years.

7 **Public Attitude** (Watling & Zhou, 2011)

People care and show responsibility towards the wellbeing of economy, society, environment, institutions, individual and community.

People want local companies, organizations and authorities are working together to create a sustainable community.

People are willing to pay more for sustainable products and services.

People are not willing to accept negative effects on environment.

8 **Government Support** (Ngisau & Ibrahim, 2020)

Government supports my company through technical consultancy services (e.g. assistance related to new technologies through technology transfer)

Government supports my company through technical support service (e.g. evaluation of equipment, implementation of productivity improvements, registration of patents)

Government policies supports our sustainability practices (e.g. in terms of tax incentive, duty-free importation of machinery or equipment)

The government supports the commercialization of R&D through funding, grants, and innovation incentives.

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