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Integrating Environmental Features for Green Knowledge-Driven Sustainability

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Abstract

Organizations face substantial pressure to protect the ecosystem and achieve sustainable results due to the increasing impact of climate change, accompanied by evolving regulations, policy adjustments, shifting consumer habits, technological advancements, and transformations in business practices. Effectively addressing environmental challenges is crucial for companies to achieve sustainability. Effectively managing knowledge is regarded as a crucial element of product innovativeness. Despite this, there is a shortage of literature that highlights the significance of green knowledge sharing for long-term organizational success. This research aims to explore the impact of green knowledge sharing on sustainable project performance through product innovation. This research seeks to determine whether the relationships between these factors are impacted by environmental aspects in small and medium-sized enterprises (SMEs) operating in Pakistan. Information was gathered from a sample of 254 small and medium-sized enterprises in Pakistan, comprised of engineers and managers. The data were analyzed using a Smart partial least squares structural equation modeling, specifically version 3.0.

The study found a significant and positive correlation between green knowledge sharing and product innovativeness. Additionally, the data analysis revealed that environmental features act as a moderator between product innovativeness and sustainable project performance. This study's shows environmental features coupled with product innovativeness can enable a company to grasp and integrate the significance of knowledge sharing into its internal operational systems. This can subsequently enable them to become environmentally innovative, both ecologically, economically and socially.

Keywords

Green knowledge sharing, product innovativeness, environmental features, sustainable project performance.

1. Introduction

Research by marketing, environment, business and ethics experts (Verma et al., 2024) has notably focused on product innovativeness. Product innovativeness development would enhance environmental sustainability and enable businesses to attain a competitive edge (Singh et al., 2020). Effective green knowledge sharing presents a significant strategic opportunity for firms that adopt product innovativeness (Polas et al., 2023). The research concentrates on the elements that enable product innovativeness to occur in SMEs enterprises (Singh et al., 2019). This research also examines the environmental sustainability implications of product innovativeness. El-Kassar and Singh (2019), found that one of the key factors influencing SMEs' adoption of product innovativeness are green knowledge sharing responsiveness. One of the difficulties lies in the fact that firms' product innovativeness practices are frequently catalogued and evaluated, yet certain organizations are deficient in their comprehension of product innovativeness initiatives. Only a handful of studies have investigated the key green knowledge sharing affecting product innovativeness within companies (Polas et al., 2023).

The present research goals follow the SDGs goal 9 and 13 to observe the effect of green knowledge sharing (GKS) facets on environmentally sustainable innovation in SMEs enterprises in the Pakistan. Almost 95% of the Pakistan corporate community is considered to be the backbone of the Pakistan economy for SMEs. As noted by Pervan et al. (2015), approximately 43% of the total workforce in the country has been aided by SMEs. The global economy is now evolving into an integrated free-market economy (Al Dari et al., 2021). The local consumer sector's liberalization and privatization have fostered a dynamic environment, characterized by stringent regulatory needs and inadequate oversight, alongside effective knowledge management strategies, innovative product offerings, and the consolidation of company and retail operations, ultimately empowering SMEs to strive successfully within the local market (Afshar Jahanshahi et al., 2020). Only a limited number of green knowledge sharing studies have taken place in the Pakistan, and these studies relied on data from large organizations (Hardiningsih et al., 2024; Zhang, 2023).

Research has investigated how green knowledge sharing influences innovation within companies (Polas et al., 2023). The significance of GKS is widely acknowledged in existing research, which identifies it as a crucial element to consider in the analysis of sustainable project performance and knowledge-based innovation. Despite industry discussions, limited research has focused on the connection between GKS and product innovativeness. Research has identified a correlation between GKS and the implementation of product innovativeness (Adedoyin, 2023). Research by El-Kassar and Singh (2019), reveals that knowledge sharing is an essential aspect in achieving corporate sustainability goals. Tran et al. (2020), highlighted the significance of broadening the existing body of research on GKS, environmental features, and product innovativeness. This investigation was driven by the previously mentioned problems and a lack of relevant research, and its primary objective was to decrease the level of insecurity near these relationships by examining the following study areas.

RQ: What is the effect of green knowledge sharing on sustainable project performance, and to what degree does product innovativeness act as a mediator in this relationship, with environmental features serving as moderators that affect the influence of product innovativeness on sustainable project performance?

The present study improves to the existing form of knowledge by examining the relationship between green knowledge sharing practices (GKS) and product innovativeness through the use of structural equation modelling (SEM). Professionals and supervisors now possess the knowledge and skills required to integrate GK principles into everyday activities in order to enhance product innovativeness. This research study focuses on a lesser-known yet crucial aspect of GKS and product innovativeness, both of which play a significant role in achieving environmental sustainability. This research primarily focuses on Pakistan, a country with a significant level of manufacturing progress that has been relatively underrepresented in existing literature. Thus, there is a strong motivation to observe the influence of the green knowledge sharing Process (GKS), environmental features, and product innovativeness on a business (Teixeira et al., 2020).

2. Theoretical foundation

2.1 Resource based view theory

A number of studies concentrated solely on the industrial factors influencing organizational performance, and as a result, the resource-based view (RBV) was formulated within the strategic organization discipline to comprehend organizational internal capabilities and vulnerabilities, and their correlation with performance (Barney, 2018). The Resource-Based View theory sights the organization as an aggregate of creative capitals (Barney, 2018). From this perspective, a company's distinct resources, whether intangible or tangible, are the source of its competitive edge (Kull

et al., 2016). Organizational resources encompass properties, aids, methods, capability, firm features, and data, which collectively enable an organization to devise and execute approaches that enhance its productivity and performance (Barney, 2018). Barney (2018), explored the characteristics of corporate properties to promote enduring competitive advantage. These characteristics are highly valued, distinct, rare, and essential assets. Their influence is considerable on the approaches and corporate objectives. These exclusive and hard-to-find assets can be sourced from external suppliers, thereby enhancing an organization's performance (Gupta & Chopra, 2018).

From a resource-based view, ecologists have contended that product innovativeness can enhance an organization's competitiveness and boost its durable performance. Its success is also contingent on having access to appropriate and serious organizational resources (Barney et al., 2021). The resources of manufacturing firms, including high-level management assurance and environmental reserves, are essential to the product innovativeness process. The RBV has also been usually employed as a real instrument for manufacturing executives to uncover the connection between a company's assets and its performance (Evans et al., 2017).

2.2 Green knowledge sharing and sustainable project performance

Lin et al. (2015), introduce the term green knowledge sharing "the exchange of information among employees focused on green initiatives, environmental management strategies, and eco-friendly innovations. Knowledge sharing involves a broad spectrum of actions". Knowledge can serve as a valuable skill for a firm and a crucial reserve for achieving its accomplishment (Jen et al., 2020; Shahzad et al., 2021). In the rapidly changing business environment, companies that effectively manage knowledge embedded in their processes are regarded as being at an advantage over their rivals (Ahmed et al., 2021; Shahzad et al., 2021), with a lack of this management potentially leading to a reversal of fortunes. In industrialized economies, the traditional notion of competitiveness has been significantly impacted by knowledge (Ahmed et al., 2021).

Knowledge sharing is also closely related to both knowledge interest and incorporation processes. Research by Lin et al. (2020), suggests that heightened resource strength can be attained via knowledge sharing. Achieving lasting success in any field requires knowledge, which is now widely accepted as a fundamental principle among many companies (Akanmu et al., 2020). Abbas and Khan (2023), share that sharing green knowledge enhances a firm's green innovation abilities, ultimately contributing to sustainable project performance. Companies are presently facing a pressing requirement to produce environmentally sustainable information and seek knowledge that provides them with a competitive edge over their participants (Al-Qudah et al., 2023).

Firms are now recognizing environmental knowledge sharing as a valuable instrument for achieving operational excellence (Contreras-Barraza et al., 2021), boosting consumer happiness (Kumari et al., 2021), and driving creativity and competitiveness (Fu et al., 2022). According to Ishak et al. (2010), a robust knowledge management culture is likely to yield consistently superior outcomes. Hoopes and Postrel (1999), observe that an assimilated strategy can lead to competitive benefits, ultimately increasing long-term performance through the development of a distinctive knowledge-sharing framework. Researchers Dinesh et al. (2021), have argued that innovative models of knowledge creation and dissemination are necessary in the framework of climate change, with a focus on their impact on society. Encouraging workers to share knowledge and foster an open culture, in line with human capital theory, can facilitate organizational growth and development that is both financially lucrative and environmentally sustainable (Jilani et al., 2020). Green knowledge sharing has now become crucial for a firm's long-term sustainability. Companies have started to view environmental knowledge sharing as a crucial component in achieving operational excellence (Contreras-Barraza et al., 2021), consumer happiness (Kumari et al., 2021), and creativity and competitive (Fu et al., 2022). This research concludes that the mechanisms for sharing knowledge can facilitate the transmission of information and ultimately lead to improved long-term results. Founded on the preceding discussions concerning the effects of knowledge-sharing practices on sustainable outcomes, we hypothesize that environmental knowledge-sharing practices have a positive and substantial effect on companies' sustainable project performance, as stated below.

H1: Green knowledge sharing positively influence sustainable project performance.

2.3 Mediating role of product innovativeness

Innovativeness provides not only a competitive edge, but also offers environmentally friendly and socially positive outcomes (Wang et al., 2021). Furthermore, industry and environmental experts view product innovativeness as a significant corporate asset that drives market demand and helps firms achieve market success (Tjahjadi et al., 2023). Product innovativeness reflects a company's preparedness to introduce advancements in processes that allow it to sustain a high level of sustainability in its environmental practices. Product innovativeness enables the creation of new

products that minimize their negative environmental impacts throughout their entire lifespan. This comprises manipulative products that are nutritious, offer recycling preferences, have a high value of convenient life, and are characterized by low emissions and low energy consumption (Ali et al., 2022).

Previous study has publicized that GKS has a positive impact on product innovativeness (Martínez Falcó et al., 2024). Following this, organizations should track a joint approach to share green knowledge for enhancing sustainable project performance (Rehman, Bhatti, et al., 2021). Innovative companies can improve their efficiency and establish long-lasting competitive advantages by disseminating knowledge and being responsive to it (Huang et al., 2021). Innovative and more competitive firms are more effective at sharing knowledge and responding to it. So, we hypothesize that:

H2: Product innovativeness mediates the relationship between green knowledge sharing and sustainable project performance.

2.4 Moderating role of environmental features

The external environment's impact on performance and innovativeness is widely acknowledged (Jiang et al., 2023). Jiang et al. (2023), found that environmental factors influence the association between innovation and corporate performance. Previous studies on both experimental and exploitative innovations have indicated that competitiveness and environmental dynamism are likely to reduce the impact of both types of innovations on performance (Kump, 2023). Wamba et al. (2020), define environmental dynamism as the rate at which change occurs and the level of environmental instability. Previous research has demonstrated that environmental dynamism is characterized not only by the speed at which change occurs but also by its unpredictability (Schilke, 2014). Characteristics of dynamic environments include technological advancements, shifting consumer preferences, and variations in product demand or material availability. In rapidly changing environments, existing products and services require periodic updates, which in turn calls for the creation of new offerings (Tidd & Bessant, 2020). To mitigate the risk of becoming outdated, organizational units need to introduce new, experimental ideas that differ from their current products, offerings, and target markets.

Environmental competitiveness is defined as the level at which external environments are marked by severe competition (Wei et al., 2025). The level of rivalry is indicated by both the number of rivals and the number of competitive areas (Sandbrink et al., 2023) found that competitive situations are associated with extreme pressure to lower costs and boost efficiency, ultimately leading to thinner profit margins and reduced flexibility within organizations (Stettler et al., 2025). Taking excessive risks, being overly reactive, and prioritizing innovative novelty can be hazardous when competition becomes increasingly intense and demanding (Heubeck & Meckl, 2024). Rivals' populations tend to swiftly embrace the results of exploratory innovations (Cordeiro de Sousa, 2024). Furthermore, exploratory innovations are often inadequately funded by environmental competitiveness (Agrawal et al., 2024), and pursuing such expensive and high-risk innovations would substantially erode the sustainability of organizational units (Wu et al., 2024).

H3: Environmental features moderate the relationship between product innovativeness and sustainable project performance (Figure 1).

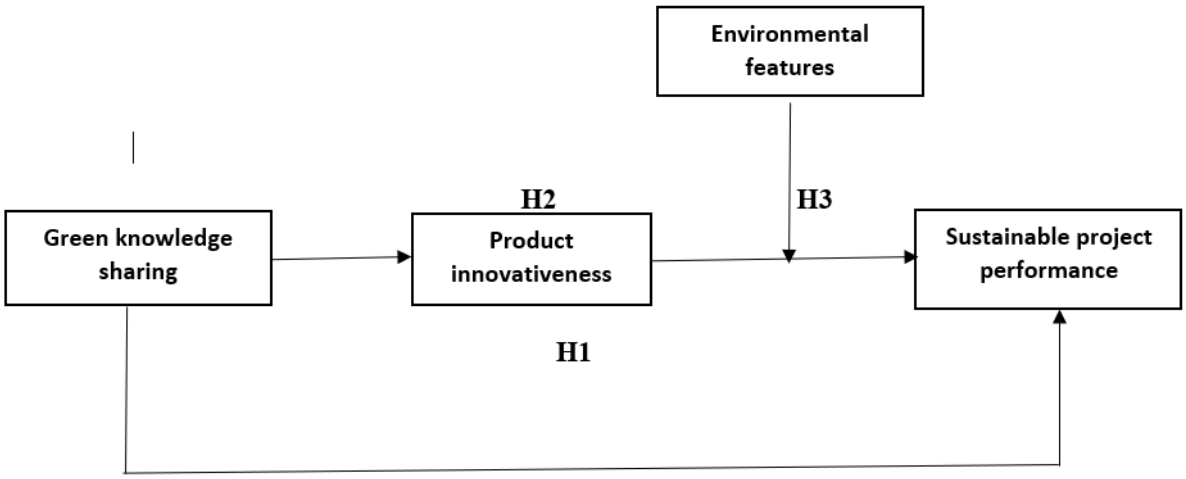

Figure 1. Theoretical framework

3.Methodology

3.1Research approach

For this current study, a survey methodology was employed because data collection and analysis can be undertaken relatively straightforwardly (Hussain et al., 2023). The author prefers a questionnaire survey method because it offers a higher likelihood of collecting reliable information from a substantial number of participants within a constrained time period. Rasool et al. (2019), found that the questionnaire survey method commences with designing a research questionnaire.

3.2Variable measurement

The variables were measured using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Green knowledge sharing was assessed using six items, which were adapted from the research of (Kim et al., 2019) published their research in 2019. Sample item include "Our firm applies the newly acquired green knowledge to daily management and operation". The measurement of product innovativeness in this study is grounded in six items that were specifically developed (Wang et al., 2008). Sample item includes "In new product and service introductions, our firm is often first to market". Environmental features comprised two sub-scales based on (Jansen et al., 2006)—environmental dynamism and competition dynamics. Samples items include "Environmental changes in our local market are intense" and "Our organizational unit has relatively strong competitors", respectively. The managers and team leads assessed the sustainable project performance using a 5-item scale (Ozorhon et al., 2016). Sample include "the productivity and efficiency of the project". All the measurement scales are in appendix I.

3.3 Sampling and data collection

The present study was accompanied in production-based SMEs located in the Punjab Province of Pakistan. The data collection was focused on Punjab Province due to its status as the largest province in Pakistan. Most of the SMEs are predominantly located in this region. In the past twenty years, the deployment of information technology in Pakistan has been growing rapidly day by day. To date, limited study has been directed on the digitalization of firms in Pakistan, with no prior studies specifically focusing on production-based SMEs. The data were gathered via an online questionnaire, targeting managers, and employees. In the present research, data collection was confined to a single wave. A total of 300 survey questionnaires were circulated to the target population, with 254 SPSS responses obtained in return. From the responses received, 46 questionnaires were incomplete (Table 1).

Table 1. Demographics of respondents

Gender Distribution		**Educational Background**	
Males	57.60%	Undergraduate Degrees	81.55%
Females	42.40 %	Graduate Degrees	18.45%
Age Distribution		**Experience on Projects**	
20-30 years	70.40%	Up to 5 years	71.20%
31-55 years	29.60%	More than 5 years	28.80%

3.4 Data analysis

Data were analyzed across four distinct groups through a blend of descriptive and inferential statistical methods, encompassing frequency, percentage, mean, and standard deviation, along with structural modeling techniques, (PLS-SEM), utilizing Smart PLS version 3.3.3. The demographic analysis was carried out utilizing descriptive statistical techniques. The reliability and validity were evaluated through a measurement modeling analysis. We also performed a descriptive analysis to investigate the mean and standard deviation. Quantitative analysis was conducted using structural modeling methods to identify and evaluate both direct and indirect relationships between various parameters.

4. Results

Partial least squares-structural equation modeling (PLS-SEM) was applied to examine the relationships among the variables presented in the research framework. The analysis was conducted using Smart PLS version 3.3.3, which offers improved statistical efficiency compared to traditional covariance-based SEM methods. The data analysis commenced with an evaluation of the measurement model to verify the reliability and validity of the constructs. Reliability was examined using factor loadings, Cronbach's alpha, rho_A, and composite reliability, with acceptable thresholds set at 0.60 for factor loadings and 0.70 for Cronbach's alpha, rho_A, and composite reliability. As indicated in Table 2, all constructs exceeded the recommended threshold values, demonstrating strong internal consistency. Convergent validity was further established through the average variance extracted (AVE), where all constructs reported AVE values above the minimum acceptable level of 0.50. These results confirm that the measurement instrument employed in this study is both reliable and valid, allowing for the progression to the structural model evaluation.

Table 2. Reliability and convergent validity

Measurement scale	**Factor loading**	**Cronbach's alpha**	**Rho_A**	**Composite reliability**	**AVE**
Green knowledge sharing		0.874	0.889	0.908	0.664
GKS1	0.824				
GKS2	0.833				
GKS3	0.730				
GKS4	0.825				
GKS5	0.858				
Product innovativeness		0.975	0.976	0.980	0.889
PI1	0.953				
PI2	0.946				
PI3	0.961				
PI4	0.930				
PI5	0.957				
PI6	0.910				
Environmental features		0.963	0.995	0.968	0.771
EF1	0.821				

EF2	0.878				
EF3	0.889				
EF4	0.925				
EF5	0.868				
EF6	0.909				
EF7	0.927				
EF8	0.778				
EF9	0.896				
Sustainable project performance		0.954	0.962	0.964	0.844
SPP1	0.930				
SPP2	0.905				
SPP3	0.906				
SPP4	0.925				
SPP5	0.927				

Note: *GKS: Green knowledge sharing, SPPP: Sustainable project performance, PI: Product innovativeness, EF: Environmental features.*

The heterotrait-monotrait ratio (HTMT) method is currently regarded as the most reliable and widely used technique for assessing discriminant validity (Henseler, 2017) in Partial Least Squares Structural Equation Modeling (PLS-SEM) (Henseler, 2017). Previous research, including the work of (Henseler, 2017), has criticized traditional methods such as the Fornell-Larcker criterion, suggesting that it is conceptually and statistically inadequate for accurately detecting discriminant validity issues. Consequently, in alignment with (Henseler, 2017)'s recommendations, the present study adopted the HTMT approach to evaluate discriminant validity. According to Henseler (2017), a commonly accepted threshold for HTMT values is 0.90; values below this cutoff indicate that discriminant validity between constructs has been established. As presented in Table 3, the HTMT values for all pairs of constructs in this study were found to be below the 0.90 threshold. Therefore, it can be concluded that the constructs demonstrate adequate discriminant validity, confirming that each construct in the measurement model is empirically distinct from the others.

Table 3. Discriminant validity

Constructs	**GKS**	**EF**	**PI**	**SPP**
GKS				
EF	0.303			
PI	0.329	0.385		
SPP	0.141	0.085	0.041	

Note: *GKS: Green knowledge sharing, SPP: Sustainable project performance, PI: Product innovativeness, EF: Environmental features.*

4.1 Structural modeling

The details of the direct relationship used in structural modeling analysis are provided in Table 4, which was conducted using the statistical software SmartPLS, version 3.3.3. The findings show that the green knowledge sharing (GKS) is strongly linked to SPP, with a correlation coefficient of 0.317, resulting in a statistically significant outcome at $p < 0.05$, thereby supporting hypothesis H1. The association of product innovativeness (PI) between GKS and sustainable project performance (SPP) is statistically significant, with a correlation coefficient of $\beta = 0.317$, and a P-value of less than 0.05, which support to H2. Environmental features (EF) were found to have a negative association with PI and SPP, with a correlation coefficient of 0.00 and a statistically non-significant p-value of greater than 0.05, thereby rejecting hypothesis 3.

Table 4. Structural modelling

Direct relations	**Coefficients**	**Mean**	**SD**	**T value**	**P values**	**Results**
GKS →SPP	0.317	0.325	0.057	5.513	0.00	Sig.
Indirect relations						
GKS →PI →SPP	0.317	0.325	0.057	5.513	0.00	Sig
EF ×PI →SPP	0.00	0.00	0.00	0.702	0.483	Non-sig

Note: *GKS: Green knowledge sharing, SPP: Sustainable project performance, PI: Product innovativeness, EF: Environmental features.*

5. Discussion

According to the sustainable development goal 9 and 13, SMEs give eco-friendly products top priority during their manufacture process. To meet this sustainability objective, production-focused SMEs inevitably leverage to adopt innovative environmentally friendly practices. The key objective of this study was to examines the connection between green knowledge sharing and the progress of environmentally-friendly products. We also examine the link between innovative product and environmental features.

Firstly, a direct link between GKS and sustainable project performance has been examined. The results indicate a substantial, positive correlation between green knowledge sharing and sustainable project performance, thereby validating hypothesis H1. According to a study by Malkawi and Rumman (2016), the implementation of green knowledge sharing practices was found to have a positive impact on sustainable project performance for SMEs. Abdelqader et al. (2013), discovered that knowledge sharing can lead to improved performance. These studies are consistent with the consequences of the existing investigation.

The findings of this study further revealed that GKS has a positive and significant influence on product innovativeness, aligning with (Abbas & Sagsan, 2020), investigation into the relationship between green knowledge sharing practices, and application in relation to product innovativeness and sustainable project performance. Green knowledge sharing is seen as a means of achieving sustainable corporate growth via environmentally sustainable innovation methods. It can be concluded that GKS-based organizational inventiveness for environmental sustainability lead to employees gaining knowledge of green practices and procedures (Shahzad et al., 2021). The results showed a consistent pattern, where product innovativeness has a positive effect on SPP. According to Rehman, Kraus, et al. (2021), product innovativeness has been initiate to have a positive effect on a company's sustainable project performance. So, hypothesis 2 accepted.

It is stated in reference H3 that environmental features have a non-significant effect on the relationship between product innovativeness and sustainable outcomes The outcome suggests that the mitigating effects of innovativeness are largely attributed to sectors with significant technological and environmental advancement, and product innovativeness results in decreased reactive environmental concerns when accounting for interaction effects(Yu et al., 2016) . The findings Binsar et al. (2025), suggest that product innovativeness contributes to proactive sustainable project performance, regardless of technological advancements, whereas innovativeness enhances reactive sustainable project performance primarily in situations with high environmental features, ultimately leading to Hypothesis 3 being unsupported.

5.1 Theoretical implications

The existing research yields some theoretical contributions. The present study suggests a progressive alignment of NRBV, with knowledge and nature serving as the primary assets to actualize product innovativeness and SPP (Aslam et al., 2024). Additionally, this investigation is a pioneering effort in the realm of NRBV, proposing that GKS, a dynamic capability, holds significant potential to confer a competitive edge and boost the firm’s sustainable project performance (Aslam et al., 2024). This research indicates that GKS is essential for enhancing product innovativeness and achieving SPP in manufacturing companies (Javed et al., 2024). This study provides further insight into the mediating effect of product innovativeness between GK and SPP (Albloushi et al., 2023). This research has expanded the existing sustainability research by examining the influence of EF as a boundary condition between product innovativeness and SPP, a lesser-explored area in the literature (Zaman et al., 2022).

5.2 Practical implications

The current study results deliver various practical implications for policymakers, professionals, and the broader societal context. Choosing environmentally responsible practices has positive effects for the organization and those it affects. In order to successfully implement GKS, policymakers should initiate various preparatory measures and arrange training and development sessions to enhance employee skills, ultimately transforming the organization into a sustainable model capable of generating substantial revenue while reducing its environmental footprint. This study encourages senior management and professionals to foster and incorporate a green culture within their companies, as it may enhance the connection between green knowledge sharing and environmentally friendly organizational innovation. Enhancing a company's organizational sustainable project performance also contributes to building a positive reputation and fostering customer loyalty.

Environmentalists and global leaders are exerting significant pressure to advance sustainable development through the integration of green knowledge and achieve the goals of sustainability. In countries such as Pakistan, a promising chance exists for professionals to emulate developed countries and implement corrective actions to reduce environmental deterioration. State and law execution agencies should promote organizations to undertake environmentally friendly initiatives and increase the use of renewable energy sources. Practitioners also need to appreciate the significance of the context of SPP when transforming organizational actions into SPP. Organizations must cultivate knowledge-based capabilities to effectively address the intricate workplace dynamics and facilitate the dissemination of environmental knowledge to the appropriate stakeholders, ultimately translating it into product innovativeness and SPP. Engaging in such actions can support environmental attentiveness among participants, thereby increasing their enthusiasm for SPP initiatives.

5.2 Limitations and future directions

This investigation had definite limitations, which would provide additional opportunities for future research. This initial study relied on data from SMEs situated within a single nation Pakistan. For this purpose, further analysis involving data from other nations, encompassing major corporations, is necessary to establish the applicability of the results. Further research is also necessary in this area. Evidence suggests that product innovativeness rates are not extremely low in developed nations. This paper's data were collected at a specific point in time, resulting in a cross-sectional research design. Studies have also shown that the religious perspectives of high-ranking executives can hinder their focus on environmental responsibility (Hardiningsih et al., 2024). Furthermore, it is suggested that a further research study be conducted to investigate more effective ways of achieving environmental sustainability in high-pollution developing countries.

6. Conclusion

The proposed research model centers on evaluating the connections between green knowledge sharing and environmentally friendly product innovation. The practices of green knowledge and product innovativeness outline the variables being examined in the study. A SEM approach has been employed to validate the proposed hypotheses or to assess the research model. Product innovativeness is positively influenced by awareness management. SMEs in Pakistan, tend to exhibit greater product innovativeness, particularly in sharing to knowledge. This study examined the perSPPectives of SMEs on green knowledge sharing practices, environmental features and product innovativeness as integral components of knowledge management to enhance innovation within SMEs.

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APPENDIX I

Table. Measurement Scale

Variables	Items
Green knowledge sharing	1. Our firm applies the newly acquired green knowledge to daily management and operation. 2. Our firm focuses on developing information systems to share green knowledge and information. 3. Colleagues from all departments usually share necessary information and knowledge in green innovation work. 4. Our firm organizes meetings to effectively obtain information and advice on green innovation practices. 5. We usually use web search to gain new environmental knowledge. 6. Your company will provide you with opportunities for green training to improve the adaptability of new tasks.
Product innovativeness	1. In new product and service introductions, our firm is often first to market. 2. Our new products and services are often perceived as novel by customers. 3. New products and services in our company often put us up against new competitors. 4. Our recent new products and services are significant changes from our previous products and services. 5. In comparison with competitors, our company has introduced more innovative products and services during the past five years. 6. In comparison with competitors, our company is faster in bringing new products or services to the market
Environmental features	**Environmental Dynamism** 1. Environmental changes in our local market are intense. 2. Our clients regularly ask for new products and services. 3. In our local market, changes are taking place continuously. 4. In a year, many things changed in our market. 5. In our market, the volumes of products and services to be delivered change fast and often **Environmental Competitiveness** 1. Competition in our local market is intense. 2. Our organizational unit has relatively strong competitors. 3. Competition in our local market is extremely high. 4. Price competition is a hallmark of our local market
Sustainable project performance	1. The project duration has been saved. 2. The project cost has been reduced. 3. The productivity and efficiency of the project has been improved. 4. The experience gaining has been promoted. 5. The satisfaction of stakeholders has been increased