

## Deriving green competitive advantage in the SMEs: A sustainable firm performance perspective

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### ABSTRACT

The role of SMEs is pivotal in driving the global economies. These represent 90 % of the business firms and provide over 50 % of the employment globally. Owing to an ever-increasing environmental consciousness, the manufacturing SMEs, particularly in the developing economies, have undergone strategic transformations by incorporating green capabilities into their production processes. Given the widespread environmental issues faced at the global landscape, especially the challenges encountered by the SMEs of the developing countries like Pakistan, it is important to investigate and address these issues in a sustainable manner. Therefore, this research investigated the collective influence of green resource capabilities such as Green Intellectual Capital (GIC), Green Entrepreneurial Orientation (GEO) and Green Innovation (GI) for deriving green competitive advantage in the SMEs of Pakistan. In this regard, the data were gathered from the Senior Managers who worked in 380 manufacturing SMEs of Pakistan and subsequently analyzed through Smart-PLS based SEM technique. The findings revealed a significant positive association between the examined variables. This research adds to the theory & practice of sustainability by suggesting the SMEs to adopt the empirically-tested green resource capabilities for achieving sustainable economic, social and environmental performance.

### 1. Introduction

Sustainability and sustainable development have long been the growing concerns for the global economies, especially during the past decade [1,2]. In general, when a country envisions to achieve a clean & green environment, this represents its overall sustainability efforts that are particularly aimed at achieving environmental betterment [3,4]. Due to its significant impact on the environment, the concept of sustainability led to the design of ecofriendly practices, particularly in the manufacturing firms. As a result, new sustainability direction and a sense of corporate responsibility have emerged in the business firms. It is because of these reasons that the manufacturing firms, especially in the developing countries, have undergone strategic transformations by incorporating green resource capabilities into their production processes

[5]. The contemporary manufacturing firms measure their sustainable success primarily in three major areas viz economic, environmental and social performance bottomline. An effective environmental strategy of a firm reflects its long-term priorities, actions and decisions which are evident from the sustainable nature of the business processes and activities [6]. A proactive green management refers to systematic efforts made by the firms aimed at addressing the environmental issues by taking the relevant protective measures and adhering to the environmental regulations [7]. In this regard, some firms take the lead by developing a proactive environmental strategy that necessitates strong entrepreneurial spirit and acquiring innovation capabilities and thus goes far beyond mere compliance with environmental regulations [2,4].

The role of SMEs is pivotal in driving the global economies, particularly in the developing countries. These represent 90 % of the business

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firms and provide over 50 % of the employment globally [8]. Furthermore, the growth of SMEs has become a top priority for all the governments owing to a need to accommodate 600 million workers globally by 2030 [9]. Despite the socioeconomic importance of SMEs, 9 million of them lack formal financing. Given a limited availability of resources, cash flows and customers coupled with an increased staff turnover, SMEs are frequently faced with firefighting situations. While the SMEs substantially contribute to job creation and trigger market competition, nevertheless, these account for 60 % of CO<sub>2</sub> emissions and 70 % of the global environmental degradation [10,7]. In Europe, SMEs contribute to 60–70 % of the industrial pollution [6]. Given this situation, SMEs can pose a double-edged economic and environmental impact if they are left unregulated. As a result, eco-innovators can steer SMEs towards the path of sustainable environmental performance. This is evident from the case of Finland and the UK where SMEs account for >70 % and 90 % of clean enterprises respectively [11]. It is therefore crucial for the SMEs of the developing countries to sustainably innovate and upgrade their production infrastructure if they ought to reduce the harmful effects of their carbon footprints on the environment [9,5].

Nevertheless, recent research reveals that SMEs in the developing countries lack commitment when it comes to realizing and reducing the harmful effects of their production activities on the environment [5,7]. This is because the SME owners believe that their production operations and activities pose a minor impact on the environment [12–14]. As a result, governments are concerned about the increased pace of environmental degradations and looking for solutions to overcome these problems in a sustainable manner [10]. Therefore, the concepts like GIC, GEO and GI have recently gained widespread attention in the contemporary manufacturing firms not only because of the increasing governmental regulations but also due to global emphasis on implementation of the UN SDGs [5,14,15]. In general, the green practices have been found to boost the economic and environmental performance in the manufacturing firms ([4,12,16]). It is positive to note that the SMEs are now preferring to implement green practices and response strategies owing to the ever-rising social and environmental concerns [5,13].

Therefore, it would be pertinent for the SMEs to consider the green resource capabilities such as: Green Intellectual Capital (GIC), Green Entrepreneurial Orientation (GEO) and Green Innovation (GI) as there is still an insufficient research governing the link between these factors in the sustainable performance context of the SMEs in the developing countries [5,10,12,17,18]. In this direction, the prior researches either operationalized a single or a combination of two variables in the sustainable firm performance context. These researches particularly include Dahri et al. [5] → GIC; Shahbaz & Malik [4] → GIC; Ishaq et al. [2] → GEO and GI; Riaz et al. [19] → GEO; Shahbaz et al. [13] → GIC and GI; Shehzad et al. [20] → GIC and GI; Wang et al. [21] → GEO and GI; Appiah et al. [22] → GI; Luu [23] → GEO; Muangmee et al. [24] GEO and GI; Asadi et al. [25] → GI etc. With a view to addressing this gap, this research uniquely examined the effects of all three variables (GIC, GEO and GI) for deriving Firm Sustainable Performance (FSP) as part of green resource strategy in the SMEs of Pakistan. In this regard, the research also examined the effectiveness of green innovation capabilities as a mediator in the relationship of GIC and GEO with the FSP. Accordingly, the hypothesis-based relationships between the above variables were theoretically substantiated using the prior relevant literature and RBV as a guiding theoretical framework and subsequently empirically validated through multivariate data analyses. This research contributes to the theory and practice of sustainability by suggesting SMEs of the developing countries to adopt the suggested green resource capabilities for achieving sustainable economic, environmental and social performance.

The rest of this paper is structured in a manner that the Section 2 presents Literature Review along with the developed hypotheses and theoretical research model. The Section 3 offers Research Methodology which is followed by the Section 4 on Results & Analyses. The Section 5 presents discussions on the research results which further leads to the Implications and Contributions in Section 6. Finally, the Limitation and

Conclusions are presented in Section 7 & Section 8 respectively.

## 2. Literature review and hypotheses development

### 2.1. Resource-Based-View (RBV) theory: the guiding theoretical framework

The RBV, originally put forth by Wernerfelt [26] and later on improved by Barney [27], is drawn upon the notion that a firm's capabilities & resources help it maintain market competitiveness. This is because of the rare, distinctive and inimitable nature of the firm's resource capabilities that enable it to achieve sustainable competitive edge [28,29]. When it comes to the sustainable firm performance, these capabilities assist a firm in implementing comprehensive green strategies and dealing with the internal and external challenges posed by the environment [30]. Moreover, a firm should acquire green technologies, create green products & implement green supply chain methods as part of its green strategy [25,31].

The green innovation in the environmental management context involves development of ecofriendly products, reduction of pollution, recycling of waste and use of energy-efficient technologies [32,33]. From the RBV perspective, adopting GEO as a firm resource capability can promote green innovation, which would lead to an improved social, economic and environmental performance, thereby enabling the firm to achieve a competitive market edge. Likewise, the Green Intellectual Capital (GIC) serves as an intangible resource that assists a firm in gaining a competitive advantage over its rivals through the application of green knowledge, skills and competencies of its employees [34,29]. In order to maintain a balance when it comes to deriving economic, social and environmental performance, green intellectual capital must constitute an essential part of a firm's competitive strategy [5,30,35]. Considering the above, this research uses RBV as a guiding framework to evaluate the effects of green resource practices for achieving sustainable performance in the SMEs of Pakistan.

### 2.2. SMEs in Pakistan

The challenges related to environmental sustainability are not just limited to a specific geography or country, they have wider socioeconomic implications on the global ecological front when viewed in the long run. Both developed & developing economies are impacted by the environmental degradation issues. Especially, the rise of governance inefficiencies and lack of sustainability efforts in the developing countries are currently the major issues [36]. As part of its 2030 Agenda, the United Nations developed SDGs in 2015 which were adopted by 193 World Leaders during 2016 UN Summit for the next 15 years [37]. With an aim to achieve sustainable development, many international organizations agreed to adopt the notion of green growth which involved achieving progress while protecting the natural environment at the same time [38]. Green growth also incorporates socio-economic factors to improve governmental and organizational performance. Green growth delivers optimum results for a country when it is integrated with policy & governance framework at national and organizational level by considering social, cultural, political and environmental factors [39,40]. As a result, developing countries like Pakistan must develop green policies to improve its ecological performance and achieve socioeconomic development [41,5].

Pakistan is a developing country and there are over 5.2 million SMEs. These SMEs are considered the backbone of the country, contributing to about 40 % of GDP, 78 % of the industrial employment and 25 % of the manufactured goods exports. This demonstrates a huge reliance of the Pakistani economy on the SME sector [42,19]. In the recent past, Pakistan faced devastating floods in 2022 which affected at least 33 million people with 6.4 million people requiring humanitarian assistance. According to Pakistan Floods Response Plan 2022 issued by the United Nations, approximately \$160.3 million would be required to

provide humanitarian assistance to 5.2 million people of those 6.4 million that required humanitarian assistance [43]. These floods also posed substantial negative effects on the agriculture sector and badly affected the activities of the SMEs which are considered the power-houses of the country's economy.

Traditionally speaking, a considerable chunk of its GDP comes from the use of indigenous natural resources that drive socioeconomic growth. Nevertheless, this model of economic growth comes at the expense of harming the environment in the long run [44,19]. Despite the growing public concern about the environmental issues, it is still unclear as to how SMEs can reduce environmental degradation through an interplay between green human capital management, entrepreneurial actions and innovation [45]. Therefore, this research operationalizes some key factors having a strong potential to boost the sustainable performance of the SMEs in the developing countries like Pakistan. In specific terms, this research examines GEO & GIC as strategic green resource competencies under the augmented effect of GI as a mediator and their collective effect on sustainable performance in the SMEs.

### 2.3. Green entrepreneurial orientation & green innovation

Comprised of social and innovation orientations, the GEO supports the firm's environmental and social performance by facilitating green production processes and operations including the activities that are sustainable in nature [46,2]. It serves as a strategically sustainable green resource for the firms, enabling them to deliver innovative products & services and promoting sustainable performance as a whole [46]. To this end, the recent studies such as Aftab et al. [17]; Ishaq et al. [2], Wang et al. [21], Muangmee et al. [24], Nan et al. [47] and Asadi et al. [25] have highlighted the collective effectiveness of GEO and GI practices for achieving improved performance in the SMEs. GEO is considered as a key organizational resource that assists the firms in exploring and pursuing ecofriendly products & services and identifying business growth opportunities through proactive strategies, aimed at meeting its strategic objectives [1,23]. In addition, GEO is also characterized by risk-taking strategies adopted by green-minded entrepreneurial firms of today which enables them to acquire and implement green innovation capabilities, paving the way towards achieving ecofriendly manufacturing of goods & products [5,21].

Manufacturing firms that apply green GEO as their competitive strategy are better positioned to utilize technology-led green innovation capabilities and thus can maintain market competitiveness [20]. The firms that utilize GEO can create and offer customer value through cost-effective and environment-friendly products. This is because GEO makes it convenient for such firms to produce innovative products that help them maintain operational sustainability [1,24]. Furthermore, the firms with strong GEO mindset can achieve sustainability of their business models while demonstrating strong environmental governance at the same time by incorporating green innovation capabilities into their business processes, operations and activities [48]. This implies that GEO directly promotes the green innovation practices. Thus, if the SMEs ought to lower the harmful effects of their production activities on the natural environment, they must adopt GI practices. These practices will eventually augment abilities of the SMEs to produce and deliver environment-friendly products & services and bring overall positive impact on economic, environmental & social fronts [25,1]. While the above researchers claim that GEO and Green Innovation are positively related, some believe that not all manufacturing firms that have adopted GEO can achieve Green Innovation [49,20]. Hence, a more detailed evaluation on how GEO influences green innovation capabilities in the SMEs is required. Based on this literature discussion, we hypothesize as follows:

H1: Green Entrepreneurial Orientation positively influences Green Innovation in the SMEs.

### 2.4. Green intellectual capital & green innovation

The contemporary firms are faced with environmental sustainability challenges and the SME sector is not an exception. To foster green innovation, the firms must utilize their in-house green resource capabilities such as green intellectual capital which includes human, structural & relational capabilities [5,31]. The green human capital that involves employee knowledge & experience can assist the SMEs in overcoming the sustainable development challenges by enabling them to carry out activities in an efficient and productive manner [5]. However, given the increasing sustainability pressures and with a view to promoting green innovation, the employees in SMEs need to adopt green thinking in their work processes and activities, especially when subject to utilization of their physical infrastructure and resources [50,51,52,53]. In addition, inculcating green relational capital facilitates better working relationships with the external stakeholders based on mutual trust and shared interests, aiding the firms in boosting their network of external relationships with the client, suppliers and partners [54,29].

Green innovation capabilities refer to a firm's technological prowess to perform sustainable business practices and deliver ecofriendly products & services while minimizing waste and conserving resources at the same time [3,53]. The green innovation capability stimulates a firm's ability to innovate their production processes to deliver ecofriendly products and consequently promote sustainable consumption at the consumer's end [1,55]. When a firm acquires green innovation capabilities, these become a source of competitive advantage in the form of increased employee knowledge, productivity and innovation [3]. Moreover, a firm's green IC resource competencies, when applied in conjunction with green innovation capabilities, these collectively assist a firm in achieving a transformation from a 'conventional business firm' to an 'environmentally-sustainable business firm'. Thus, by augmenting the performance of a firm's in-house green IC competencies, the green innovation capabilities serve as the dynamic capabilities for the firm [1,5]. Considering the above, the following hypothesis is suggested:

H<sub>2</sub>: Green Intellectual Capital positively influences the Green Innovation in the SMEs.

### 2.5. Green innovation & firm sustainable performance (Triple-Bottom-Line)

The Triple-Bottom-Line model emphasizes on the importance of firm performance from economic, social & environmental viewpoints. While recent literature studies such as: Alshebami [41], Le & Le [56], Asadi et al. [25], Hounneaux et al. [57] consider these firm performance dimensions as critical when it comes to the sustainable operations of the SMEs, we have therefore examined these dimensions in the context of GEO, GIC and GI in this research.

#### 2.5.1. Green innovation & economic performance

Green Innovation refers to a strategy that promotes firm sustainable development and helps maintain a competitive advantage. However, implementing the Green Innovation in all key aspects of business operations is crucial for the firm's success [58]. Nevertheless, prior research has revealed that organizations tend to prioritize economic aspects of firm performance over the environmental aspects [25,53]. From the viewpoint of economic performance, it is observed that if a firm implements green innovation practices, this results in an improved product quality and eventually the customer satisfaction, leading to increased economic performance [59,58]. This improvement on the firm's economic front is owing to the fact that the green innovation practices promote cost-effective operations & production activities, enabling the firm to minimize waste and economize the consumption of overall resources [60,61,62].

#### 2.5.2. Green innovation & environmental performance

Business operations and processes that follow green innovation are

instrumental for the firms in their effort to enhance environmental performance and thus result in gaining a competitive market edge [63, 64,53]. Green Innovation practices enable the firms to reduce hazardous waste such as emissions of CO<sub>2</sub> and other poisonous gases that pollute natural environment [60,65,66]. In this regard, the role of government regulations in reducing harmful emissions is also important by prompting the firms to adopt green innovation capabilities and achieve ecofriendly performance [34]. Once the firms begin to adopt green innovation capabilities as part of their business strategy, it becomes easier for them to support environment sustainability targets and gain an edge over the other competing firms [25,5,67]. The above literature arguments make it evident that the SMEs can achieve sustainable environmental performance by incorporating green innovation capabilities in their processes, operations and activities.

### 2.5.3. Green innovation & social performance

Besides the environmental challenges, the role of green innovation is instrumental when it comes to hiring and retaining appropriately skilled staff who can foster creative ideas to come up with innovative products & services and thus promote brand in the market. Likewise, the green innovation can serve as a crucial driver for creating social awareness and collective responsibility [67,57,68]. Accordingly, the firms that additionally consider green innovation on social fronts through advocacy and by promoting societal accountability are better positioned to achieve customer satisfaction as opposed to the firms that ignore the social performance aspects [51,65,53,62]. Given some notable work of authors such as Asadi et al. [25], Hourneaux et al. [57], Mehta & Chugan [65], DiPietro et al. [69], Dias-Sardinha & Reijnders [70], the contemporary firms attribute social performance as an important consideration when it comes to the overall sustainability of the firm. We therefore hypothesize as:

*H3: Green Innovation positively influences Firm Sustainable Performance in the SMEs.*

### 2.6. Green IC & firm sustainable performance: mediating role of green-innovation

The businesses that are subject to strict environmental regulations are likely to be more responsive to the adoption of green IC resource competencies. In this regard, the firms that utilize Green Human Capital (i.e., green knowledge, capabilities and creativity of their employees) in the development of green innovation strategies, such firms probably contribute to sustained environmental performance [22,4]. Furthermore, Green IC also involves building green relationships with the customers and suppliers which support green innovation, leading to the development of the products that are cost-competitive and ecofriendly at the same time [5,13]. Therefore, in a dynamic environment, green human capital aids a firm in identifying its intangible resources like green knowledge & competencies of the employees, thereby helping the firm to promote green innovation and resultantly achieve sustainable performance [53].

Researchers consider green innovation as an important solution for addressing the growing issues of environmental degradation and natural resource depletion [48,55]. In support of this argument, the 'Global Innovation Index' suggests incorporation of innovative technologies into the firm's production processes and activities. However, the key factors supporting the green innovation in the firms have gained little scholarly attention [1]. To achieve sustainable manufacturing in the firms while minimally impacting the environment, researchers advocate to adopt green innovation capabilities. However, acquiring the green innovation capabilities is challenging effort as these require green efforts, innovation thinking and relevant infrastructural competencies [3]. Since the green innovation involves the creation of new products & services through the application of innovative infrastructure and green human resource competencies, this when viewed in conjunction with green IC that involves green knowledge, infrastructural resources and

employee relations, both the green resources would collectively assist a firm in developing and preserving a robust pool of green resource capabilities. This implies that green innovation can further augment green intellectual capital for achieving and maintaining a sustainable performance in the SMEs [1,5]. Based on the above, we hypothesize that:

*H4: Green Innovation mediates the relationship between GIC and FSP in the SMEs.*

### 2.7. Green entrepreneurial orientation & firm sustainable performance: mediating role of green-innovation

This research examines the mediating effect of green innovation governing the individual relationship of GEO and GIC with firm sustainable performance. In general, the GEO accentuates environmental activities involving the adoption of ecofriendly manufacturing practices [71,72]. As compared to the other green factors contributing to a firm's sustainable performance, GEO is relatively a new dimension that aids the firms in achieving sustainable performance with an especial emphasis on their financial and environmental performance [73,74].

GEO involves corporate behaviors related to autonomy, competitiveness and innovation [28]. GEO also includes motivation to adopt green options as well as the risk-taking behaviours [25,75]. The recent research highlights that the GEO practices of a firm, when assisted by the green innovation capabilities, collectively serve as green organizational strategy in its attempt to achieve a sustainable advantage [17,73]. In this regard, the scholars especially attribute green innovation capabilities as the driving forces when it comes to a firm's effort to achieve sustainable performance [1]. Based on the above literature arguments, we therefore hypothesize as follow:

*H5: Green Innovation mediates the relationship between GEO and FSP in the SMEs.*

The above scholarly discussion makes it evident that most of the recent literature emphasizes on achieving sustainable performance in the business firms through green resource practices and efforts. This research is unique in a sense that it presents a research model that operationalizes Green Intellectual Capital and Green Entrepreneurial Orientation and examines their influence under a mediation effect of Green Innovation on various dimensions of firm sustainable performance in the SMEs of Pakistan.

## 3. Research methodology

### 3.1. Research design & data collection

To understand the causal relationship between the key variables chosen for this research, a quantitative research method was employed and administered via a survey questionnaire.

### 3.2. Sample population, sample size and sampling technique

Among many probability sampling techniques, a simple random sampling offers equal chances to all the potential members of the representative population. Thus, we employed a random sampling technique to collect data using an online survey questionnaire from the available senior managers who worked in 380 manufacturing SMEs of Pakistan. These SMEs mainly represented food processing, chemical and textile sector. An assurance was given regarding anonymous use of their data for research purposes only. In response to the invitation, 326 responses were received in total, which represented a response rate of 85.7%. This response rate was considered acceptable in line with Sierles [76] who recommended a response rate between 60%–70% in self-administered surveys. These responses were checked for completeness & consistency. After data cleansing, 309 were found to be complete and thus were used in the data analyses. Moreover, the issue of potential common method bias was also addressed by ensuring confidentiality and designing a concise survey questionnaire, leaving no possibility for

vagueness and ambiguous terms [77]. These precautions led us in designing the questionnaire that was free from common method bias.

### 3.3. Survey measures

The survey measures for this research were developed for 4 constructs. The first one of these constructs was Green Entrepreneurial Orientation (GEO) with operational definition in this research as strategic inclination towards sustainability through innovation, risk-taking and proactive environmental actions. To measure this construct, 6 items were adapted from Hughes & Morgan [78]. The second construct was Green Intellectual Capital (GIC) having operational definition in this research as the intangible resource, aiding the firms in achieving their environmental sustainability goals. The GIC (comprising of human, structural & relational dimensions) was measured using 15 items adapted from Chen [79]. The third construct was Green Innovation (GI) with operational definition in this research as the development & implementation of new or significantly improved products, processes or services that are environment-friendly and sustainable. The GI was measured with 7 items drawn from Chen, Lai & Wen [80]. The fourth construct, Firm Sustainable Performance (FSP), having an operational definition in this research as a framework for evaluating organizational sustainability on economic, environmental & social performance fronts. It is also called a firm's Triple Bottom Line. This FSP was measured using 15 items adapted with minor modification from Abdul-Rashid et al. [81], Hami et al. [67] and Sezen & Cankaya [62].

## 4. Results & analyses

The data were screened through SPSS and then analyzed using SMART-PLS based SEM technique. PLS-SEM can handle complex modeling efficiently, especially in the case of explanatory research. It is thus widely used in the business research [82,83]. It also helps in measuring as to what level one part of the research model can predict the accuracy of the other part. Therefore, it is more robust in handling reflective measures than covariance-based analysis tools [84].

### 4.1. Measurement model

Before proceeding with hypothesis testing, it was important to ensure the reliability & validity of the model. As part of the measurement model assessment, the convergent & discriminant validities were evaluated.

#### 4.1.1. Convergent validity

It measures as to what extent an item correlates with another item within the same construct [82]. According to Henseler et al. [85], the Factor Loading, Cronbach's alpha and Average Variance Extracted (AVE) should be determined to measure the convergent validity. The recommended values for factor loading threshold of 0.6 were achieved (refer to Table 2) while items with lower factor loadings i.e., GIC8 to GIC15 and FSP15 were deleted. Furthermore, the values for AVE were >0.5 and the values for Cronbach's alpha were above 0.7 which were in line with Hair et al. [82] recommendations.

#### 4.1.2. Discriminant validity

The Fronell-Larcker criterion for correlation was used for the constructs used in this research. Gold & Malhotra [86] recommended discriminant values should be below 0.9. It simply highlights the distinctiveness of the items relating to the constructs as shown in Table 3.

After the measurement model assessment, we performed structural model assessment for measuring the effect and predictive relevance for model fit indices. In this regard, the Standardized-Root-Mean-Square-Residual (SRMR) was determined before conducting the further analysis. For an ideal model fit, the acceptable value for SRMR should be

**Table 1**

Number of items for the research constructs and related literature. (Source: This Research).

Construct	Number of Items	Adapted From the Studies
Firm Sustainable Performance (FSP)		
Economic Performance	5	Abdul-Rashid et al. [81] Hami et al. [67] Sezen & Cankaya [62]
Social Performance	4	
Environmental Performance	6	
Green-Entrepreneurial-Orientation (GEO)		
Green Entrepreneurial Orientation	6	Hughes & Morgan [78]
Green Intellectual Capital (GIC)		
Green Human-Capital	5	Chen [79]
Green Structural-Capital	6	
Green Relational-Capital	4	
Green Innovation (GI)		
Product	4	Chen, Lai & Wen [80]
Process	3	
Total: 43		

**Table 2**

Measurement model results.

Variable	Items	Loadings	Cronbach's alpha	AVE
FSP	FSP9	0.904	0.964	0.686
	FSP6	0.882		
	FSP10	0.889		
	FSP4	0.881		
	FSP8	0.870		
	FSP11	0.863		
	FSP14	0.827		
	FSP7	0.816		
	FSP12	0.813		
	FSP2	0.791		
	FSP3	0.793		
	FSP1	0.758		
	FSP13	0.747		
	FSP5	0.738		
	GEO	GEO1		
GEO3		0.888		
GEO4		0.868		
GEO5		0.820		
GEO2		0.758		
GEO6		0.708		
GI	GI1	0.936	0.980	0.893
	GI5	0.957		
	GI3	0.953		
	GI7	0.953		
	GI4	0.941		
	GI6	0.942		
	GI2	0.930		
GIC	GIC3	0.916	0.937	0.731
	GIC7	0.900		
	GIC4	0.899		
	GIC2	0.890		
	GIC6	0.890		
	GIC5	0.756		
	GIC1	0.709		

**Table 3**

Fronell-Larcker- discriminant validity.

	FSP	GEO	GI	GIC
FSP	0.828			
GEO	0.327	0.819		
GI	0.464	0.307	0.945	
GIC	0.346	0.415	0.445	0.855

between 0.1 and 0.05 [84,83]. This value came out to be 0.081 and therefore was considered acceptable.

### 4.2. Structural model

Once the acceptable level of model fit is achieved in the measurement model, the analysis is followed by structural assessment. The R<sup>2</sup>, beta and t-values were calculated at a bootstrapped sample of 5000 for determining the predictive relevance (Q<sup>2</sup>) including also the effect size (F<sup>2</sup>) for demonstrating confidence in the model to proceed for more complex analyses [82]. As suggested by Chin [87], the value of R<sup>2</sup> should be above 0.67 for high, 0.33 for moderate and below 0.33 for weak model fit. Furthermore, the Cohen’s [88] standard was followed for all the effect sizes such as small (0.2), medium (0.5) and greater effects (0.8 & above). Accordingly, the effect size of GI on FSP was 0.274, while the effect size of GEO and GIC on GI was 0.023 and 0.155 respectively. These results in Table 4 show that the independent variables can explain 22 % variance in the mediator (GI) and 21 % in the dependent (FSP) variable. Whereas the blindfolding values above ‘0’ for Q<sup>2</sup> show significant model predictiveness. The Q<sup>2</sup> value for this model is 0.074 for FSP and 0.205 for GI. This shows a higher predictiveness for the research model.

In the model, three hypotheses were tested for direct relationship while two were tested for meditating relationship. The results in Table 4 and Fig. 3 show strong positive relationships between GEO (β=0.148, t-value=2.442, p-value 0.015<0.05) and GIC (β=0.383, t-value=6.419, p-value 0.000<0.05) with GI. Furthermore, the GI (β=0.464, t-value=8.928, p-value=0.000<0.05) significantly served as a mediator between the mentioned variables and FSP. Moreover, the mediation values were observed for an indirect relationship which appeared for GEO as (β=0.068, t-value=2.192, p-value=0.028<0.05) and for GIC as (β=0.178, t-value=5.066, p-value=0.000<0.05) through GI towards the FSP. The Table 4 above shows the structural model and its relevant values. These values are visualized in Fig. 3.

### 5. Discussions

Globally, the SMEs are viewed as the powerhouses for socio-economic growth in the modern economies. This research was aimed at identifying and evaluating the impact of some green resource capabilities and practices that promoted sustainable performance in the SMEs of Pakistan. Accordingly, the research examined an individual effect of GEO and GIC on GI and how GI subsequently assisted in deriving sustainable economic, social and environmental performance in the SMEs. To this end, the RBV theory was utilized as a supporting theoretical framework. In terms of one-on-one relationship between the key variables, the results highlighted a strong link between GIC and GI, whereas the GEO demonstrated a slightly weaker link with GI in the wake of achieving Firm Sustainable Performance (FSP). Overall, the research results add to the extant literature and suggest the SMEs to strategically renew their organizational policies by capitalizing on and adopting green practices & initiatives with a view to optimizing resource efficiency and achieving ecofriendly product development. Besides enriching the relevant literature, this research particularly supports the work of prior scholars who examined one or more of the above variables

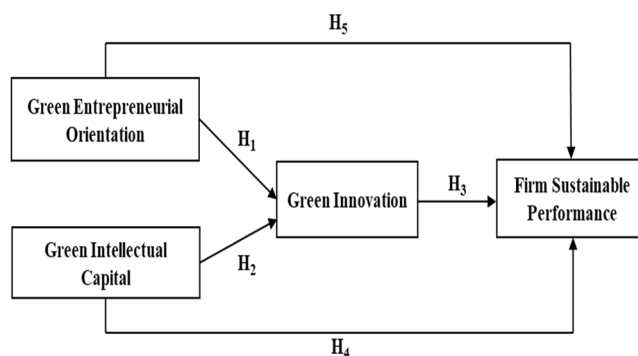


Fig. 1. Theoretical research model (Source: This Research).

in the sustainable firm performance context such as: Shahbaz & Malik [4], Shahbaz et al. [13], Al-Swidi et al. [45,53]; Bhatti et al. [1], Aljuboori et al. [34], Marco-Lajara et al. [31], Anik & Sulisty [50], Asadi et al. [25], Yusliza et al. [35] etc.

Based on the empirical evidence, the results highlight a positive mediation effect of green innovation capability on the relationship between GEO and firm sustainable performance. These results are consistent with the prior literature such as Ishaq et al. [2]; Shehzad et al. [20], Wang et al. [21] and Muangmee et al. [24]. These results indicate that SMEs that concentrate on green entrepreneurial mindset always have this edge of having employees who exhibit smart and innovative approaches towards managing environmental sustainability issues. The reason perhaps could be that the contemporary SMEs have now realized the need to become environmentally-conscious in their actions. This increased ecological consciousness has encouraged them to apply green innovation practices in their firms. The results also revealed that Green IC considerably promoted the green innovation capabilities in the SMEs. These results are also supported by the work of recent scholars like Shahbaz et al. [13], Shehzad et al. [20], Bhatti et al. [1] and Borah et al. [3]. This implies that once the employees develop green intellectual competencies and subsequently embrace an overall culture of green innovation in their firms, this combination of green resource capabilities enables them to develop more innovative & environment-friendly products, thereby demonstrating their long-term commitment for maintaining a robust sustainability culture and contributing to the SDGs [1].

The results also highlighted that green innovation capabilities have significant effect on sustainable performance of the SMEs. These results are congruent with research of Appiah et al. [22] and Asadi et al. [25] and highlight that boosting an SME’s ability to innovate on firm sustainability front, especially by acquiring green production processes and cutting-edge technologies, can help derive sustainable competitive advantage in the form of optimized resource usage, minimal waste and cost-effective operations, eventually leading to the development of ecofriendly products and satisfied customers. Moreover, linking the results with RBV as the underlying theoretical framework, these imply that the green resource capabilities (such as GIC, GEO and GI) are instrumental in achieving a sustained performance advantage in the SMEs. Lastly, the results also highlight that both small and medium sized SMEs

Table 4  
Structural model assessment.

Hypotheses	Variables	beta	t-value	p-value	F <sup>2</sup>	R <sup>2</sup>	Q <sup>2</sup>
<i>Direct Effect</i>							
H1	GEO->GI	0.148	2.442	0.015	0.023	FSP 0.215	FSP 0.074
H3	GI->FSP	0.464	8.928	0.000	0.274	GI 0.216	GI 0.205
H2	GIC->GI	0.383	6.419	0.000	0.155		
<i>Indirect Effect</i>							
H4	GEO->GI->FSP	0.068	2.192	0.028			
H5	GIC->GI->FSP	0.178	5.066	0.000			

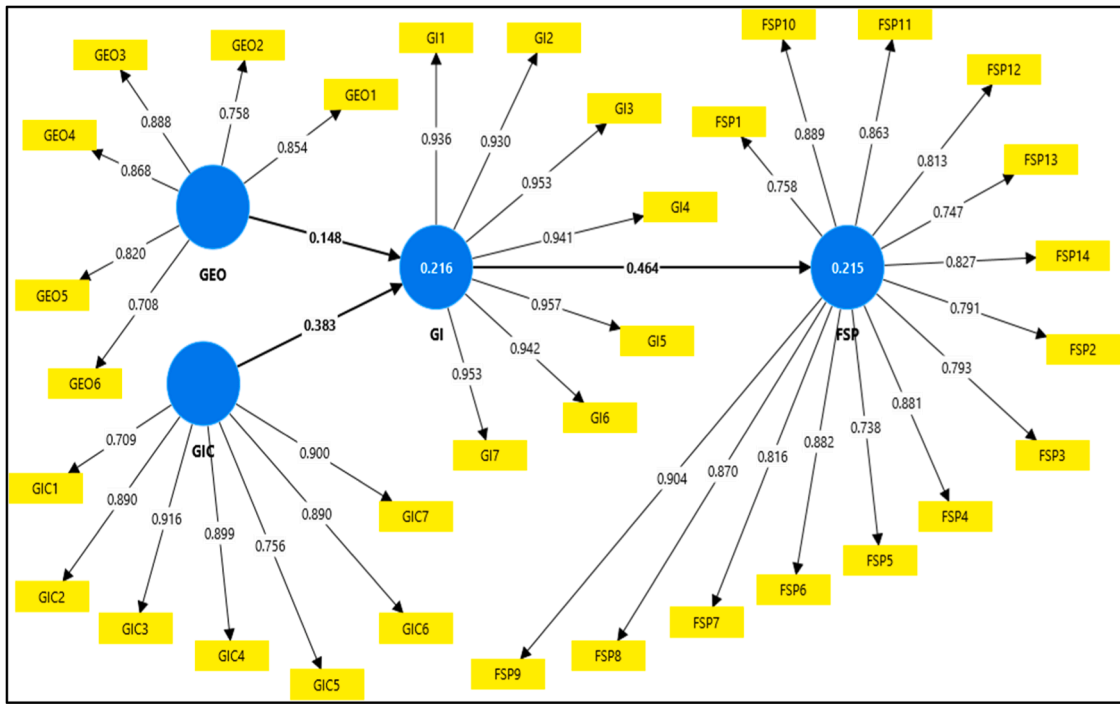


Fig. 2. Measurement model (Source: This Research).

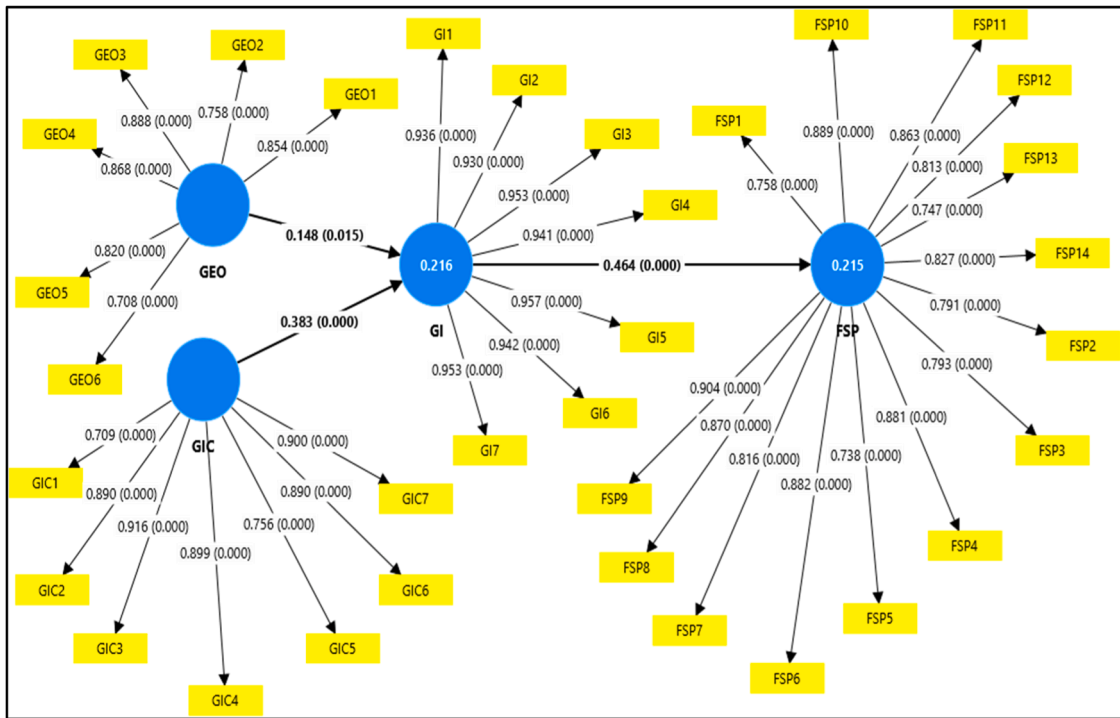


Fig. 3. Structural model.

were observed to be mindful regarding the adverse effects of their SMEs' production processes on the environment, signifying the indispensable role of green innovation capabilities in deriving a green competitive advantage in their SMEs.

## 6. Implications and contributions

The implications and contributions of this research are multifold:

### 6.1. Theoretical implications

- First, while prior studies have reported the positive impacts of various green resources and initiatives in the context of firm sustainable performance, nevertheless, by operationalizing the key variables like GEO, GIC & GI simultaneously in a single research framework and examining their unique effects on firm sustainable

performance, it adds a novel contribution to the extant literature on the SMEs of the developing countries in the sustainability context.

- Second, this research signifies the mediating role of GI as a critical enabler in augmenting the effectiveness of GEO and GIC for deriving sustainable performance in the SMEs of the developing countries, as this aspect has not been sufficiently addressed in the extant literature.
- Third, by specifically operationalizing Green Innovation (GI) as a mediator for deriving sustainable performance (triple bottom-line) in the SMEs, it contributes to the additional uniqueness of the research model as the prior researchers mostly operationalized GI in achieving economic &/or environmental performance, ignoring the social dimension of the firm performance.
- Fourth, it broadens our understanding about two key drivers of sustainable performance in the SMEs i.e., GEO and GI, which were not sufficiently examined by the prior researchers in the context of the SMEs in the developing countries. The prior research mostly focused on evaluating the effects of GEO on environmental performance of the firms.
- Fifth, keeping in view the suggested green resource capabilities and practices in the wake of deriving firm performance, this research enriches and supports the application of RBV theory by suggesting how SMEs can utilize the green resources capabilities like GIC, GEO & GI and derive sustainable competitive advantage.

### 6.2. Implications for SME owners and managers

- First, this research suggests owners and managers in SMEs to take into consideration the 'Green Innovation' as a strategic organizational capability, serving as a powerful driver of economic, environmental and social value. Given an increased environmental consciousness, especially in the developing countries in recent times, and the fact that environmental sustainability is no longer a choice but a regulatory requirement, there has been an ever-increasing emphasis on the utilization of green innovation practices in the SMEs of these countries with a view to achieving long-term competitiveness and sustainability.
- Second, by specifically focus on building green IC resource capabilities, SME managers can utilize these in smart resource management for creating environment-friendly products & services. This investment in sustainable and green initiatives like IC would enable them to reap maximum benefits and demonstrate economically, environmentally and socially responsible behaviour.
- Third, by reviewing the current performance of their green IC resource capabilities, SME managers can accordingly revisit and renew their overall IC strategy in terms of how to maximize and optimally utilize the existing stock of green IC resource capabilities in a manner to achieve sustainable performance advantage over the competing SMEs.
- Fourth, the green resource capabilities like GEO, GIC & GI, when practically implemented into the production operations, practices and activities as part of strategic green policy framework in the SMEs, these can holistically serve as value-drivers for the SMEs, economy, environment and society.
- Fifth, the suggested green resource practices & initiatives additionally serve as the 'Sustainability KPIs' for the owners, managers and employees of the SMEs, enabling them to identify gaps & opportunities when it comes to the current sustainability efforts and goals set by the SMEs. Doing so would also help them reliably measure their overall economic, environmental and social sustainability performance and accordingly take corrective actions in these areas.
- Sixth, it assists the SME owners and managers to rethink their sustainable performance targets from the longer-term perspective and with a view to staying competitive in the contemporary business environment. This renewed firm performance perspective necessitates them to innovate existing production processes, adopt

ecofriendly technologies and introduce sustainable ways of working in order to reduce their economic, environmental and social sustainability of their operations.

- Seventh, the managers in case of environmentally non-compliant SMEs (particularly in the Seth-owned SMEs of Pakistan), should suggest their Seths (SME owners) to transit to an overall culture of green practices by adopting sustainable resource mindset and capitalizing on green technological capabilities with an aim to deliver ecofriendly products & services. However, this requires realizing the strategic significance of green competencies and resource capabilities coupled with imparting training and awareness on 'sustainability' to educate Seths (SME owners) about the consequence of utilizing obsolete production facilities and technologies on triple bottomline performance of their SMEs.
- Last but not the least, in their effort to differentiate and sustain, the SME owners and managers in the developing countries must practically adopt green entrepreneurial vision while continually building Green IC competencies in order to further develop their green innovation capabilities and consequently derive a green competitive advantage.

### 6.3. Implication for young entrepreneurs

Notably, 'Entrepreneurship' and 'Innovation' emerge as the overarching themes from the two operationalized green resource practices such as GEO and GI respectively. These emergent dimensions call for a need to embrace a culture of sustained innovation especially in the SMEs owned by the young entrepreneurs. With an innovation-led mindset, young entrepreneurs can clearly differentiate and come-up with even more innovative, sustainable and value-added products & services as opposed to the SME owners representing a conventional business mindset.

### 6.4. Implications for government policy makers and environment regulatory authorities

- First, the worsening environmental conditions and consequent sustainability pressures have prompted the governments in the developing countries to identify some emerging enablers of the sustainability, especially the ones that foster sustainable development through the green resource practices & initiatives. Therefore, the government in these countries should review their current environment policy frameworks and regulatory mechanisms by enforcing 'sustainability' as a national agenda for all the contemporary SMEs, obligating them to transit from the traditional 'Firm Performance' targets (that mainly focused on achieving economic value) to 'Sustainable Firm Performance' targets that additionally incorporate social and environmental performance benchmarks.
- Second, the recommended green resource practices & initiatives, if adopted and enforced by the environment regulatory authorities in the developing countries as part of their environmental regulatory framework, it would help enhance their capacity to enforce environmental laws and mobilize the achievement of 'triple bottomline' targets from mere micro-level (organizational-level) to macro-level (country-level), thereby bringing a collective greener impact on the economy, society and environment.
- Third, the environment regulatory authorities as policy makers should consider the strategic significance of the recommended green resource practices & initiatives and accordingly launch new green programs and campaigns in collaboration with Universities, NGOs and other environment advocacy organizations. Such measures would inculcate a sense of social and environmental responsibilities in the non-compliant SMEs, urging them to minimize their dependence on unsustainable raw material resources and instead adopt green production practices, utilize renewable resources and deploy sustainable technologies. Eventually, these initiatives would

enhance environmental consciousness and sense of responsibility in the non-compliant SMEs including the end-users of their products & services, thereby leading to a more purposeful achievement of the environment protection goals and sustainability targets set by the regulatory authorities.

### 6.5. Implications for united nations (from SDGs perspective)

Given the global SDG targets set by the United Nations, especially the ones related to achieving environmental sustainability in the developing countries, these countries are under pressure to upgrade their industrial infrastructure and incorporate ecofriendly production processes & technologies. Therefore, the SMEs of Pakistan should implement the best practices and procedures followed by the SMEs of the developed countries to address the issue of environment degradation caused by the unsustainable production practices. From the SDGs perspective, the suggested framework recommends robust green practices and initiatives like GIC, GEO and GI as key drivers of sustainable performance in the SME sector of Pakistan, thus aiding the government of Pakistan to play its part and contribute to following SDGs in particular:

- SDG#1 (No Poverty) and SDG#8 (Decent Work and Economic Growth)
  - By acquiring and utilizing Green Innovation capabilities, the SMEs can develop cost-effective and sustainable products, thereby creating additional avenues for income, leading to poverty reduction and economic prosperity (GI).
  - By building and maintaining Green IC competencies, the SMEs can boost their knowledge and expertise in sustainable business practices, resulting in increased productivity and competitive market advantage, which would consequently aid them in the growth of their businesses and create new employment opportunities (GIC).
  - By inculcating entrepreneurial mindset, the SMEs can tap on emerging ideas in addition to innovative value-addition to their current products & offerings, leading to the creation of new job opportunities and overall growth of the national economy (GEO).
- SDG#9 (Industry, Innovation and Infrastructure)
  - By adopting Green Innovation practices, the SMEs can create sustainable infrastructures, systems, resources and facilities such as renewable energy systems, green production facilities, green building and sustainable transportation (GI).
  - By promoting entrepreneurial spirit, the SMEs can further innovate and transform their organizational infrastructure and production facilities to a more robust, sustainable and ecofriendly infrastructure (GEO).
  - By developing Green IC competencies with a particular focus on infrastructural upgradation and acquiring innovative technologies, the SMEs can further augment their core capabilities and sustain long-term industrial growth (GIC).
- SDG#12 (Responsible Production and Consumption)
  - By innovating and developing environmentally-sustainable products, the SMEs can considerably reduce their industrial waste and achieve responsible production (GI).
  - By building their pool of Green IC competencies (via green knowledge, skills and expertise), the SMEs can adopt sustainable and ecofriendly manufacturing processes, thereby achieving responsible production goals (GIC).
  - By embedding entrepreneurial thinking into their production processes and utilizing ecofriendly raw materials and green resources, the SMEs can substantially reduce their environmental waste and achieve responsible production, and reasonably advocate for responsible consumptions by the end users (GEO).
- SDG#13 (Climate Action)

- By developing climate-friendly innovative technologies, sustainable infrastructure and green production facilities, the SMEs can substantially lower their carbon emission levels (GI).
- By building awareness about climate change and applying green knowledge and expertise, the SMEs can develop sustainable climate action strategies and launch relevant programs (GIC).
- By implementing innovative ideas as part of their green entrepreneurial vision, the SMEs can achieve climate-resilient infrastructure & production facilities and thus contribute to climate action programs and initiatives (GEO).

## 7. Limitations & future recommendations

Like the other similar researches, this research also presents some limitations that researchers can address in future.

- First, while the research examined the effects of GIC and GEO on GI and subsequently on the overall sustainable performance of the SMEs, however, the future researchers should additionally evaluate the effect of other types of green resource capabilities while aiming to achieve sustainable performance in the SMEs.
- Second, as the research involved SME samples from Pakistan, the generalization primarily makes more sense in the context of Pakistan. Thus, the future researchers should consider enhancing the scope of this work by including samples from the SMEs of other developing countries like Iran, Bangladesh, Nepal, Malaysia, Maldives etc.
- Third, as this study sampled the SMEs of the manufacturing sector, inclusion of data from the services sector SMEs would offer holistic implications on theory, policy & practice of the SMEs in the developing countries.
- Fourth, the future researchers should conduct this research in the SMEs of the developed countries to determine the extent to which the findings of this research can be generalized. Additionally, comparative research may also be performed to examine the unique behaviour of the SMEs in the developing and developed countries.

## 8. Conclusion

This research empirically validated the effectiveness of green resource capabilities and practices for achieving triple bottomline performance in the SMEs of Pakistan, thereby enabling them to derive green competitive advantage. Be it environmentally conscious customer, strict government regulations, effects of climate change, smart entrepreneurial orientation or social growth aspirations, the SMEs of Pakistan must undergo strategic renewal on sustainable resource management front by adopting the suggested green resource capabilities and practices in all aspects of their operations and production activities, leading to their long-term survival and meaningful contribution to the SDGs.

### Ethics statement

The article acquired ethical approval from the relevant ethical review committee and received the informed consent of the participants.

### CRedit authorship contribution statement

**Abdul Samad Dahri:** Conceptualization, Writing – original draft, Project administration, Investigation, Formal analysis. **Ummi Naiemah Binti Saraih:** Supervision, Project administration, Methodology. **Junaid Rehman:** Writing – review & editing, Visualization, Data curation, Validation. **Anas A. Salameh:** Writing – review & editing, Validation. **Fatuma Namisango:** Writing – review & editing, Software, Visualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.sfr.2025.100618](https://doi.org/10.1016/j.sfr.2025.100618).

## Data availability

Data will be made available on request.

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