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Servitized SMEs' performance and the influences of sustainable procurement, packaging, and distribution: The mediating role of eco-innovation

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A R T I C L E I N F O

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A B S T R A C T

The current paper is one of the pioneering studies to specifically analyze the role of both inbound and outbound sustainable supply chain practices (SSCP) of servitized SMEs in a relatively high-risk emerging economy context of Pakistan. Building on Porter's Value Chain Model, this study analyzes the influence of sustainable servitization on multiple performance indicators (including environmental, economic, social, and operational) of servitized SMEs. We further investigate the role of eco-innovation as a mediator. The study employs a time-lagged research design, based on primary data collected from 280 managers of servitized SMEs. We found that sustainable practices positively impact servitized SMEs' performance, except for sustainable procurement's influence on operational performance. Finally, eco-innovation was found to partially mediate the analyzed inter-relationships.

1. Introduction

Scholars have referred to servitization as being critical for achieving sustainability in recent years (Bustinza et al., 2018; de Guimarães et al., 2021). At the same time, value-creating network formed by members of a supply chain (Kothandaraman and Wilson, 2001) has been highlighted as vital for servitization in the context of sustainability (Marić and Opazo-Basáez, 2019). More specifically, sustainable servitization represents a strategy that aims at the continuous shift from traditional linear patterns of product lifecycle towards a sustainability continuum (Opazo-Basáez et al., 2018). Hence, sustainability's incorporation in both inter-, and intra-organizational operations, including collaboration between servitized suppliers and focal firms is needed (Paulraj et al., 2017; Paiola et al., 2021). The current paper aims to offer empirical evidence on the influence of sustainable servitization practices on the firm's performance.

Although previous meta-analysis studies on sustainability literature focused primarily on environmentally sustainable practices (Dixon-Fowler et al., 2013; Golicic and Smith, 2013), studies addressing both social and environmental sustainability dynamics in servitization, have been lacking. This research gap becomes even more visible in the case of relatively high-risk emerging economies such as Pakistan (e.g., Zahoor et al., 2021). Also, sustainability initiatives are even more critical as it is one of the worst affected countries by climate change, as evidenced by recent unexpected floods (Devi, 2022). In this concern, it is important to stress that researchers such as Villena and Gioia (2018) focused on the riskiness of lower-tier suppliers in their study of supply chain sustainability. However, a specific analysis of sustainable outcomes of sustainable supply chain management from a servitized supplier point of view is missing in the existing literature, especially in emerging economies. Hence, our paper aims to fill these gaps in the extant literature by specifically focusing on servitized small and medium-sized enterprises (SMEs).

Servitized SMEs do not have the resources as large firms to invest in sustainability initiatives, including their supply chains (Johnson and Schaltegger, 2016). Large firms can invest in sustainability-related measures and reap their long-term rewards, but SMEs face challenges in servitization (Queiroz et al., 2020), including perceptions of

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environmental initiatives being perceived as costly and the lack of information/expertise (e.g., Roxas and Chadee, 2016). Hence, it has been argued that SMEs' responsiveness to sustainability has been low (Prabawani, 2013; Huang-Saad et al., 2017), especially in emerging economies (Kreye, 2017). At the same time, the benefits of sustainable supply chain practices (SSCP) for SMEs are well-established in the literature. However, research on SSCP for servitized SMEs is lacking as most prior studies have focused on manufacturing firms (e.g., Valtakoski and Witell, 2018). Previous studies have been carried out with cross-sectional design; thus, a time lag/longitudinal study on the impact of SSCP on sustainable performance is needed (e.g., Qorri et al., 2021). Likewise, Wong and Hernandez (2012) emphasized that in the case of a cross-sectional study, it is difficult to signify causation and connections between SSCP and the performance of the organization. Consequently, a time-lagged study like the current paper is useful for a clearer understanding of the causal relationships between SSCP and firm performance.

It should further be stressed that within the context of green servitization, sustainable practices can extensively differ between emerging and technologically advanced countries (Mani et al., 2020). Since most of the studies in this domain have focused on the developed economies, our research offers novel insights to relatively high-risk emerging economy contexts such as Pakistan. Similarly, research has shown that greater operational performance can be achieved by incorporating sustainability aspects across the entire supply chain (e.g., Sancha et al., 2015; Sarkis, 2021). Yet very few studies have specifically focused on social sustainability and operational performance (e.g., Mani and Gunasekaran, 2018; Mani et al., 2020); especially from servitization point of view (Li et al., 2021).

Researchers have pointed out several benefits of servitization that provide resource-constrained manufacturers access to innovations across the product lifecycle (Lafuente et al., 2019) and provide knowledge (Xing et al., 2023). By bringing in another under-researched element of eco-innovation (e.g., Afshari et al., 2020) and its mediating influences, our paper is one of the pioneering studies to specifically analyze the role of sustainable procurement and sustainable packaging and distribution on multiple performance indicators (including environmental, economic, social, and operational) of SMEs in a relatively high-risk emerging economy context of Pakistan. Moreover, building on the work of Koc and Bozdag (2017), our paper is one of the few studies to stress the theoretical significance of Porter (1985) value chain model (VCM) for servitized SMEs' sustainability initiatives and associated performance outcomes. Thus, we strengthen the extant literature on servitization by stressing the vitality of whole value chain activities (inbound and outbound) across the product lifecycle while studying sustainability and performance inter-relationship.

The rest of this paper is organized as follows. The next section presents the theoretical background and study hypotheses. After that, methodology, analysis, and results are presented. The paper concludes by discussing findings, study implications, limitations, and future research directions.

2. Theoretical background and study hypotheses

Research in practice-based fields like supply chain management often lacks theoretical underpinnings as they rely heavily on practical solutions to complex operational problems (e.g., Walker *et al.* 2015). Consequently, prior scholars have used several theories and perspectives (Ghadge *et al.* 2019; Touboulic and Walker 2015). These include the stakeholder theory (see Carter and Liane Easton, 2011), the dynamic capabilities view (DCV) that is derived from the RBV theory (e.g., Ghadge et al., 2012), or the natural resource-based theory (Shi *et al.* 2013) to address different topics. Our study, however, uses the integrated view of the Value Chain Model (VCM) proposed by Porter in 1985 as a theoretical underpinning of the proposed model to propose and test the sustainable supply chain practices of the servitized SMEs. According to Koc and Bozdag (2017), this model highlights the set of activities that firms perform to deliver the products/services to their customers, forming the value chain. The activities include designing, production and operations, marketing, logistics, and delivery, and finally, supporting the end users. Porter maintained that firms could achieve long-term success only if firms perform value chain activities in a way that distinguishes them from their competitors. The value chain activities comprise primary and secondary categories. The primary category encapsulates the activities pertaining to the actual design and development of the product and/or service in addition to marketing, delivery, and after-sales support. Below, we offer a discussion of the application of this VCM in the context of servitized SMEs and associated dynamics of sustainability and performance inter-relationships.

2.1. Sustainable procurement

Suppliers have been identified as important collaborators in the green (sustainable) servitization efforts of manufacturing firms from a relational perspective (Xing et al., 2023). Sustainable procurement is described as the planning of minimizing pollution and waste while taking ecological and sustainability implications into account in procurement decisions. Many enterprises in the papermaking, electronics, and chemical industries have implemented environmentally friendly measures and are continually implementing such policies (e.g., Salam, 2007).

An important part of the support subgroup of the Porter VCM, procurement entails many activities like supplier selection and buyer-supplier relationship management that are critical to maintaining a competitive advantage for the supply chain (Ghadge *et al.* 2019). Organizations can expand their emission control measures by collaborating with other supply chain actors (Hart and Dowell, 2011; Qorri et al., 2021). Wong and Hernandez (2012) maintain that enterprises that employ a sustainability strategy across the supply chain demonstrate a long-term environmental commitment. According to them, process stewardship symbolizes a process-oriented environmental approach that aims to reduce undesirable environmental impacts from operational activities across all supply chain stages. To create servitized offerings, manufacturers collaborate with their supply chain partners across the value chain to augment their knowledge of environmentally friendly practices and enhance their capabilities (e.g., Huo et al., 2014). Such partnerships often result in the adopting sustainable supply chain practices by these servitized firms (Vural, 2017). These servitized firms adopt environmental thinking and endeavor to select environmentally conscious suppliers and practice environmentally friendly strategies (Chan et al., 2016; Zhu and Sarkis 2007). Based on this discussion, we hypothesize that servitized firms also improve their environmental performance through sustainable procurement practices:

H1a. Sustainable procurement is positively linked to servitized SMEs' environmental performance.

Economic performance is the ability of the firms to cut down the costs of materials, energy and waste and thus improve their productivity and profitability (Zhu et al., 2008). Procurement entails practices ranging from sourcing raw material or parts in required quantities to the logistics involved in procuring these parts and materials from the suppliers (Kaur and Singh 2019). Any change in procurement costs directly impacts the overall economic performance as they contribute to around 60% of the overall product cost (De Boer *et al.* 2001). The sustainable procurement practices of the servitized firms impact their economic performance through both cost minimization and revenue generation. However, opposing views exist on the expanse and direction of such an impact. On one hand, researchers have argued that there are costs associated with SSCM. For example, Bowen et al. (2001) argued that environment-friendly practices do not affect firms' profitability in the short run, nor it has any effect on sales performance. On the other hand, Min and Galle (2001) argued that sustainable procurement can be costly for firms, as a result, the financial performance of businesses may decline.

Crozet and Milet (2017) found that micro and small businesses benefited from servitization as servitized SMEs had higher sales and production and thus were more profitable. At the same time, some scholars have argued that green servitization can improve economic performance in two ways. First, businesses can improve their profitability by reducing waste, and energy costs because of greater collaboration through servitization (Bustinza et al., 2021). Second, servitized firms can get economic benefits by implementing sustainable practices, enhancing their customer loyalty, goodwill, and reputation among their clients and thus get more economic benefits (Schmidt et al., 2017). Based on this discussion, we hypothesize that:

H1b. Sustainable procurement is positively related to servitized SMEs' economic performance.

The global advancements and sustainability awareness among the various stakeholders in recent years have compelled businesses to take moral and ethical obligations more seriously, and the community's acceptance of the actions carried out by these entities has become mandatory. As a result, the importance of sustainable social practices cannot be overstated (Mani and Gunasekaran, 2018). Several studies have analyzed the implications of sustainable supply chain methods on economic and environmental performance. However, social performance has been ignored in the SCM context (Rajeev et al., 2017).

The positive image of the firm caused by sustainable supply chain methods is enormously vital for both the customers and the organization itself. It enhances customer satisfaction and loyalty and improves the firm's goodwill (Junaid et al., 2022). According to Xie and Breen (2012), these sustainable practices can result in a well-established corporate image, stronger connections with all stakeholders, and increased employee motivation. Servitization helps improve firms' social value through higher employee commitment, improved customer orientation and stakeholder involvement (Zhang et al., 2022a).

Globalization and digital transformation have made sustainable procurement quite difficult for servitized firms. The situation is even more complex when the supplier engagement varies across different levels and locations in the global supply chain network i.e., their tier levels (e.g., Naughton et al., 2020). Some of these suppliers operate in business-to-business (B2B) and not business-to-customer (B2C) situations and could, exploit their distance and position in the value chain to satisfy minimum sustainability obligations (e.g., Siegel, 2009). Nevertheless, rising sustainability requirements are driving most of these servitized firms to adopt sustainable practices across their value chain (Meehan and Bryde 2011) in addition to other criteria of price, lead time, and adaptability (Ghadimi *et al.* 2016).

Based on this discussion, we hypothesize that:

H1c. Sustainable procurement is positively related to servitized SMEs' social performance.

Sustainable supply chain activities are implemented to reduce costs, increase efficiency, improve quality, and maintain a competitive edge (Lintukangas et al., 2016). Several business performance assessments, mostly focusing on environmental aspects, have been investigated by scholars (Famiyeh et al., 2018). However, a limited number of studies have directly studied the link between sustainable procurement strategies and a firm's operational performance. As sustainable procurement comprises material reduction, reusing, and disposal, it can increase product quality, offer creative goods, reduce manufacturing time, and reduce raw material inventories (Zhu et al., 2011). According to Vachon and Klassen (2006), implementing sustainable procurement and engaging with consumers can improve operational performance by allowing enterprises to be more flexible.

Some scholars have argued that organizational operations for servitization can be constrained due to the implementation of environmental practices (e.g., Salandri et al., 2022), especially in SMEs. At the same time, it has been argued that eco-design can boost an industry's operational performance through reduced levels of inventory, product variety (expanded product lines), as well as quality improvements in the processes (Qorri et al., 2021) of servitized SMEs; however sustainable procurement practices are an integral part of the whole process. For example, green services support operations compliant with environmental regulations and thus align the company's operations with environmental constraints (Opazo-Basáez et al., 2018). The bulk of SP's logistical integration is defined by flexibility in supply procurement, servicing, and transportation, specifically when environmental safety is at stake (Webster Jr, 1992). This flexibility is frequently the result of improved collaborations among the parties involved in supply chain activities and through suppliers that are highly selective and formal in their pursuit of ecological sustainability (Ring and Van de Ven, 1992; Liu et al., 2019), particularly in servtized SMEs. Based on this discussion, we hypothesize that:

H1d. Sustainable procurement is positively related to servitized SMEs' operational performance.

2.2. Sustainable packaging & distribution

Green servitization encompasses environmentally focused practices that contribute towards achieving organizational objectives of operational conformity to environmental regulations (Opazo-Basáez et al., 2018). Environmental expenditures and company waste can be minimized to a larger extent with the support of ecologically friendly packaging initiatives (Huang and Matthews, 2008). Sustainable packaging includes reduced packing size, employing sustainable packing materials, encouraging recyclable initiatives, and working with suppliers and vendors to harmonize packaging, thereby reducing the amount of material used and the time it takes to unpack. Sustainable logistics or transportation is all about distributing products efficiently and effectively to the user, using lot quantities instead of smaller batches. It also entails using energy-efficient alternative means of transportation that consume less fuel and delivering orders together rather than separately. Reducing freight movement is vital as it contributes directly to reducing environmental pollution.

According to the Porter VCM, both packaging and logistics are core activities of the value chain and hence play a critical role in performance outcomes. Recently researchers have highlighted the role of incorporating methods to neutralize carbon emissions and reduce the massive cost of logistics and transport in the supply chain models (Cholette and Venkat 2009; Ubeda *et al.* 2011). Implementing sustainable packaging and distribution methods, together with sustainable products, and introducing innovation into processes can result in lower air pollution levels, material wastage, and water usage (Wang and Dai, 2018). In this way, sustainable packaging and distribution may lead to superior environmental performance due to low materials and energy consumption along with low waste production.

Sustainable distribution can further save an organization from several unforeseen risks and dangerous circumstances. Greener logistics are not only better for the firm but for the employees/workers, for their health, and for the health of the environment as well. If the firms do not follow proper rules and regulations developed for greenhouse gas emissions from trucks and other freight vehicles, they must bear the liability subsequently. Servitized firms involve different stakeholders, including upstream partners (e.g., different tier suppliers) and downstream partners (e.g., customers and end users) across their value chain in their sustainable practices very early in their product lifecycle (Lightfoot et al., 2012). Thus, value chain members of the servitized ecosystem work in collaboration towards achieving environmental objectives (Xing et al., 2023) through careful planning to minimize pollution by using only essential parts and materials and avoiding using harmful materials (e.g., Hao et al., 2021). Hence, we hypothesize that:

H2a. Sustainable packaging and distribution is positively related to servitized SMEs' environmental performance.

Sustainable supply chain management strategies increase a firm's capacity to satisfy environmental and social goals, but they require a significant upfront investment as well as direct operations expenditures (e.g., Schmidt et al., 2017). However, most researchers argue that servitization enhances SME financial performance (Queiroz et al., 2020). Companies should aspire for a "win-win" scenario to streamline capital in sustainable activities in terms of progress related to economic, operational, social, and environmental aspects (Balasubramanian and Shukla, 2017). These "win-win" scenarios are feasible for two reasons: they may save business costs by lowering costs and enhancing productivity (Chan et al., 2016). Second, firms may reduce waste in their manufacturing and distribution processes by partnering with their supply chain partners, resulting in cheaper costs, higher production efficiency, and increased ease of use. Furthermore, reusing critical components throughout the refurbishing and reprocessing activities contributes to improved eco-performance (Khor et al., 2016).

According to Porter's VCM, firms need to adopt sustainable processes in core activities since companies may benefit from them in various ways. It can enhance reputation, cost-effectiveness, and better penetration in the market, and moreover, consumer satisfaction may enhance (Nair and Menon, 2008). Similarly, long-term collaboration with various stakeholders along the value chain, results in the formation of successful management routines and implied knowledge (Blome et al., 2014). Due to these reasons, servitized firms may provide better maintenance services across the product life cycle, including optimal use of parts, recycling, and product life extension to reduce product turnover (Hao et al., 2021). Therefore, it is suggested that SP&D adaption might result in a variety of benefits, ranging from reduced resource and operating costs to increased sales and profits, resulting in the enhanced economic growth of servitized SMEs. Hence, we hypothesize that:

H2b. Sustainable packaging and distribution is positively related to servitized SMEs' economic performance.

An increased understanding of corporate social responsibility has resulted in a more visible consideration of social concerns in supply chain management. Sustainable packaging and distribution can get firms to realize several benefits in this concern. It may enable enterprises to have a more favorable image and goodwill in the eyes of all stakeholders, including consumers, workers, the community, investors, and the government, among others (e.g., Hao et al., 2019). It also helps firms to increase customer gratification and loyalty. Whereas the financial and ecological gains of sustainable packaging and distribution have been investigated and argued in the recent literature, the same cannot be said for the social aspects. Although both technological advancement and social concerns are necessary for the development of sustainable packaging, the social components of sustainable packaging have been rather under-explored. However, in a recent study, Afif et al. (2022) referred to that sustainable packaging has positive performance influences, including social performance. This is in line with Porter's VCM, as sustainability across the value chain may lead any organization towards competitiveness and can also affect many other areas of the organization positively. For example, it can also enhance the organization's positive online reviews, which is favorable for the organization to attain goodwill and future profits. Based on this discussion, we hypothesize that:

H2c. Sustainable packaging and distribution is positively related to servitized SMEs' social performance.

Product value and process flexibility optimization in the production processes is included in operational performance (Chien and Shih, 2007). Timely and efficient incoming supplies, transportation, distribution time reduction, decreased log, and increased value in manufacturing have been referred to as the benefits of SSCP adoption (e.g., Hong et al., 2018). According to Zhu et al. (2010), sustainable supply chain services can enhance product production and delivery reliability. Considering the arguments mentioned above, we argue that as per Porter's VCM, businesses establish unique, meaningful, and rare functionalities by minimizing their use of resources, eradicating potentially dangerous product parts, and partnering with network partners, which will eventually promote innovation and technological progress in operations, leading to efficient operations. Additionally, servitized firms collaborate with their customers to pack and distribute products/services sustainably without compromising customer requirements and specifications; in this way, the operating costs could be decreased (Agrawal and Bellos, 2017). Consequently, sustainable packaging and distribution techniques promote operational performance outcomes to eliminate wasting energy. Based on this discussion, we hypothesize that:

H2d. Sustainable packaging and distribution is positively related to servitized SMEs' operational performance.

2.3. Mediating role of eco-innovation

Eco-innovation refers to a coordinated set of initiatives or creative solutions to a firm's products (goods/services), processes, market strategy, and organizational structure that improve environmental performance and competitiveness (e.g., Afshari et al., 2020). This may assist SMEs in accessing new and expanding markets, increasing productivity, attracting new investment, increasing profitability across the value chain, and staying ahead of rules and standards. Eco-innovation has a dual externality, according to Zubeltzu-Jaka et al. (2018), in that it may increase a firm's performance by lowering negative environmental externalities (e.g., emission regulation) while raising positive knowledge externalities e.g., adoption/diffusion of innovative green technology by other enterprises.

Contemporary organizations need to readjust their skills and corresponding funds to create new sources of value while keeping in view the preservation of natural resources of the firms. As per Porter's VCM, a firm's capabilities are vital for a firm's survival and performance and must be refreshed frequently to cope with the changing corporate environment. Firms and supply channel networks increasingly realize the value of being ecologically proactive in designing and executing green strategies as well as in managing eco-friendly practices in responding to market, regulatory, and community challenges. Roscoe et al. (2016) in their study underline the need for supplier collaboration for eco-innovations and maintain that supplier collaboration may aid in the discovery of innovative ways to decrease environmental impacts across the product lifetime (Bustinza et al., 2021) and the realization of process eco-innovations that reduce environmental impacts in manufacturing processes.

Similarly, Hong et al. (2018) discovered that sustainable supply chain practices greatly impacted firm performance. Asha'ari and Daud (2019) also found a link between sustainable procurement and corporate sustainability performance using data from Malaysian companies. According to a study by Cankaya and Sezen (2019), sustainable procurement has considerable beneficial implications on environmental, social, economic, and operational performance. Implementing sustainable new practices improves both environmental and economic performance, validating the idea that sustainable performance may be achieved using sustainable practices.

Surprisingly, the relationship between eco-process innovation and sustainability performance has only recently attracted academic attention in the servitization literature (Xing et al., 2023). Eco-innovation is critical for resolving social and environmental challenges and enhancing human living circumstances such as safety and health (Adams et al., 2016). According to Zhu and Sarkis (2007), companies that generate sustainable products have a higher market share and income than companies that do not produce green products. Servitized SMEs face several challenges where the product/service mix involves uncertain environmental conditions, and thus, process-oriented innovative practices provide competitive advantage to the firms (Hao et al., 2021). These firms tend to be more successful in producing innovative eco-friendly product-service offerings through efficient use of resources, balancing the increased environmental costs, and improving environmental performance (Chen and Hung, 2014; Xing et al., 2023). Based on the above discussion, we hypothesize that:

H3. The links between sustainable procurement and servitized SMEs' a) environmental performance, b) economic performance, c) social performance, and d) operational performance are mediated by eco-innovation.

Díaz-García et al. (2015) reiterated in their literature review that eco-innovation is different from other types of innovation, and thus it is important to study its drivers and consequences. Packaging contributes significantly to product cost and product performance in supply chains since it allows for efficient product distribution and lowers environmental consequences due to spoilage or waste. Because of the recent heightened attention to global climate change, green packaging has been the main emphasis area to minimize waste and enhance air quality. Sustainable packaging practices (e.g., size, form, and materials) have varying effects on the servitized SMEs. According to Hsu et al. (2013), green packaging encompasses cost (materials and transportation), performance (sufficient product protection), convenience (ease of use), legal compliance (compliance with legal standards), and environmental effect (Liu et al., 2013).

An eco-innovation strategic approach in the supply chain directs businesses to create goods and enhances processes based on product lifecycle perspectives, as well as imposes higher environmental criteria for the firms (Bustinza et al., 2021). To improve existing product and process innovations, such a plan necessitates environmental skills and incorporates critical ecological operations, such as procurement, manufacturing, and packaging (Chen and Hung, 2014). As a result, an eco-innovation strategy encourages businesses to invest additional resources and develop creative skills to ensure supply chain sustainability.

Packaging eco-design must be incorporated into products and services from the start to be genuinely effective. Eco-principles must relate to a firm's broader business objectives for this to happen. When environmental concerns are included in the pursuit of commercial goals and when they are embedded into the overall design criteria, most "sustainable" product development initiatives are lucrative, and thus managers need to prioritize economic concerns in the eco-packaging process (Holdway et al., 2002; Liu et al., 2013, 2019).

The circular economy and waste management in the downstream supply chain processes are also affected by sustainable packaging. Similarly, eco-innovation in packaging for achieving sustainable development is a significant problem since businesses must decrease waste in their operations and retail locations. Sustainable packaging is intimately tied to the circular economy; it promotes long-term growth by recycling, minimizing, and reusing. Innovative packaging design is a significant aspect of the circular production process since it encapsulates diverse sustainability requirements and prolongs the material and product life span.

Firms must also learn how to integrate sustainability concerns into their product and service delivery to meet their social, environmental, and economic goals, because of the recent rise in the stakeholders' expectations. In this way, as per Porter's VCM, the environmental sustainability practices in upstream and downstream value chains also provide a chance to improve competitiveness (e.g., Porter and van der Linde, 1995). Aside from regulatory compliance and competitiveness, another key motive for businesses to produce green goods stems from concerns about social commitments and values. Similarly, Hollos et al. (2012) also discovered that sustainable distribution leads to better environmental and economic performance, even if it is long-term. Similarly, sustainable distribution reduces the chain's waste levels and CO_2 emissions (Esfahbodi et al., 2016) and eco-innovation acts as a catalyst in this process (Chiou et al., 2011). It can be argued that sustainable packaging and distribution will improve the performance of servitized SMEs through eco-innovation. Therefore, we hypothesize that:

H4. The links between sustainable packaging and distribution and servitized SMEs' a) environmental performance, b) economic performance, c) social performance, and d) operational performance are mediated by eco-innovation.

3. Research methodology

3.1. Sample and procedure

This study selected the positivist research paradigm to test the proposed model. The population frame for this research is the servitized SMEs of Pakistan. The questionnaires were distributed electronically by one of the authors to 280 servitized SMEs operating in Pakistan. These SMEs were the Tier 1 suppliers of a major public sector organization and supplied equipment along with services to their buyers. These tier 1 suppliers were chosen as a part of the sample because they fulfilled the criteria, SMEs (employees less than 250), and servitized firms (offered products and services both). These servitized SMEs supplied equipment and parts, in addition to various services including scheduled maintenance, technical helpdesk, parts repair, operator training and development, conditional monitoring and spare part provisioning. Hence, they can be categorized as servitized SMEs as per the guidelines provided by Queiroz et al. (2020). These SMEs belong to multiple sectors, including telecom, electronics, and textile.

The data was collected during October–December 2021 from these servitized SMEs. The survey instrument was distributed among 370 servitized SMEs and 300 responses were received after two reminders sent out by the researchers. Out of these 300 responses, 280 were found to be valid responses as 20 responses were rejected due to missing data issues. Gender, age, educational qualifications, and job experience were among the demographic information gathered by the study's 280 respondents. Details of the respondents are included in Table 1.

Structural-equation-modeling (SEM) using partial-least-square approach was selected as the empirical strategy for the study and Smart PLS 3.3.2 was selected as the tool. Previous researchers have also used this technique to analyze data and test their hypotheses (see Aboelmaged, 2018; Ahmed et al., 2022; Cui et al., 2018). The time horizon of this research was time lagged since the data was collected from respondents in two phases. T1 responses related to independent variable and mediators while at T2 responses for dependent variables were

Table 1
Demographics.

Category	Number of Respondents	Percent	Cumulative Percent
Gender			
Male	188	67.1	67.5
Female	86	30.7	97.9
Prefer not to say	6	2.1	100.0
Age			
20–30 years	96	34.3	34.3
31–40 years	136	48.6	82.9
41–50 years	31	11.1	93.9
50 Above	17	6.1	100.0
Qualification			
Intermediate/ Diploma	117	41.8	41.8
Bachelor's	108	38.6	80.4
Masters	40	14.3	94.6
PhD	15	5.4	100.0
Experience			
1–5 years	105	37.5	37.5
6–10 years	102	36.4	73.9
11–15 years	46	16.4	90.4
Above 15 years	27	9.6	100.0

collected from servitized firms.

3.2. Measures

Survey questionnaire was used to gather data where each item was measured with Likert - scale with 1 (strongly disagree) to 5 (strongly agree). The measurement items for sustainable procurement (chronbach alpha = 0.850) and sustainable packaging & Distribution (chronbach alpha = 0.845) were measured through 3 items and 5 items respectively, scale adopted from (Qorri et al., 2021). Eco-innovation scale was measured through 5 item scale adopted from Wugan and Guangpei (2018) (chronbach alpha = 0.883). Four items were adopted to measure environmental performance (chronbach alpha = 0.839), 3 items were adopted for economic performance (chronbach alpha = 0.856), 4 items were adopted for social performance (chronbach alpha = 0.868) and 4 items were adopted to measure operational performance (chronbach alpha = 0.842). The scales were adopted from Qorri et al. (2021) based on previous literature including Abdul-Rashid et al. (2017), Ali et al. (2017), Dong et al. (2014), Graham and Potter (2015), Longoni et al. (2018), and Petljak et al. (2018). All the items are shown in appendix-B.

4. Analysis & results

In Table 2, Pearson's correlation values show that all constructs are positively correlated.

Several measures were taken to reduce common method bias (CMB). First, all measurement items of the study were adopted from scales that were validated in previous studies. Second, the recommended statistical test (the Harman factor test) was carried out and the results of the scale items for this study indicate that there was more than one factor with an eigenvalue value higher than 1. Moreover, no single factor represented more than 50% of the complete variance (Podsakoff et al., 2003). Thus, this result rules out the likelihood of common method bias.

The measurement model shows how latent constructs were measured across their observed variables (Fornell and Larcker, 1981). Next, composite reliability (CR), Cronbach's alpha, rho_A and average variance extracted (AVE) were measured. AVE score of more than 0.5 (explaining more than 50% of the change in construct) is a good measure of composite reliability. Table 3 shows alpha, rho_A and CR values above 0.7 and AVE above 0.5, showing an acceptable level of internal consistency and converging validity.

Discriminant validity is assessed using both Fornnel-Larcker and HTMT criterion (Henseler et al., 2015). The bolded items in Table 4 show that the discriminant validity test for Fornell and Lacker was met. The HTMT ratios obtained in this study, as shown in Table 5, clearly indicate that no problem of discriminating validity exists between constructs. The highest inter-construct HTMT recorded is 0.848 (i.e., between SP&D and SocP). This value is lower than 0.85, so there is sufficient evidence for discriminant validity. Figs. 1 and 2 show the theoretical model and structural equation model, respectively.

Table 3
Factor loadings & convergent validity.

Item Code	Factor Loadings	α	ρ_A	CR	AVE
Sustainable Procurement		0.850	0.851	0.909	0.769
SusPur1	0.883				
SusPur2	0.902				
SusPur3	0.845				
Sustainable Packaging & Distribution		0.845	0.848	0.889	0.617
SusPD1	0.798				
SusPD2	0.772				
SusPD3	0.775				
SusPD4	0.790				
SusPD5	0.790				
Eco-Innovation		0.883	0.885	0.915	0.682
EcoInn1	0.819				
EcoInn2	0.823				
EcoInn3	0.809				
EcoInn4	0.872				
EcoInn5	0.803				
Environmental Performance		0.839	0.876	0.897	0.691
EnvPer1	0.906				
EnvPer2	0.906				
EnvPer3	0.902				
EnvPer4	0.559*				
Economic Performance		0.856	0.858	0.912	0.776
EcoPer1	0.871				
EcoPer2	0.899				
EcoPer3	0.873				
Social Performance		0.868	0.870	0.910	0.717
SocPer1	0.884				
SocPer2	0.840				
SocPer3	0.846				
SocPer4	0.815				
Operational Performance		0.842	0.854	0.894	0.680
OpePer1	0.857				
OpePer2	0.826				
OpePer3	0.737				
OpePer4	0.872				

Note: Cronbach's alpha, ρA = rho_A, CR = composite reliability, AVE = average variance extracted.

Table 4
Discriminant validity (fornell-larker criterion).

	EI	Ecop	EnvP	OpeP	SP	SPD	SocP
EI	**0.826**						
EcoP	0.612	**0.881**					
EnvP	0.378	0.453	**0.831**				
OpeP	0.311	0.336	0.445	**0.825**			
SP	0.533	0.532	0.411	0.334	**0.877**		
SPD	0.515	0.531	0.449	0.508	0.590	**0.785**	
SocP	0.488	0.612	0.467	0.430	0.637	0.742	**0.847**

Note: EI = Eco-innovation, EcoP = Economic Performance, EnvP = Environmental Performance, OpeP= Operational Performance, SP= Sustainable Procurement, SP&D = Sustainable Procurement and Distribution, SocP = Social Performance.

Table 2
Correlation table.

		EI	SP	SP&D	EnvP	EcoP	SocP	OpeP
EI	Pearson Correlation	1						
SP	Pearson Correlation	.532**	1					
SP&D	Pearson Correlation	.515**	.584**	1				
EnvP	Pearson Correlation	.380**	.407**	.447**	1			
EcoP	Pearson Correlation	.607**	.530**	.531**	.454**	1		
SocP	Pearson Correlation	.487**	.672**	.732**	.437**	.612**	1	
OpeP	Pearson Correlation	.309**	.326**	.504**	.442**	.328**	.425**	1

Note: EI = Eco-innovation, EcoP = Economic Performance, EnvP = Environmental Performance, OpeP= Operational Performance, SP= Sustainable Procurement, SP&D = Sustainable Procurement and Distribution, SocP = Social Performance.

Table 5
HTMT values.

	EI	Ecop	EnvP	OpeP	SP	SPD	SocP
EI							
EcoP	0.699						
EnvP	0.441	0.537					
OpeP	0.358	0.387	0.527				
SP	0.614	0.622	0.482	0.386			
SP&D	0.598	0.621	0.530	0.597	0.685		
SocP	0.557	0.710	0.555	0.497	0.783	0.848	

Note: EI = Eco-innovation, EcoP = Economic Performance, EnvP = Environmental Performance, OpeP= Operational Performance, SP= Sustainable Procurement, SP&D = Sustainable Procurement and Distribution, SocP = Social Performance.

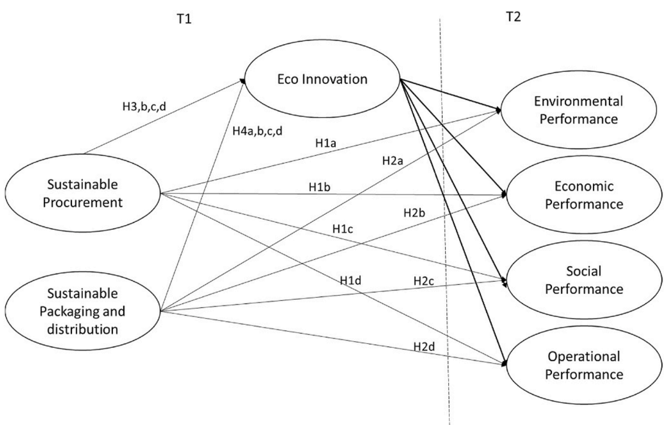

Fig. 1. Theoretical model.

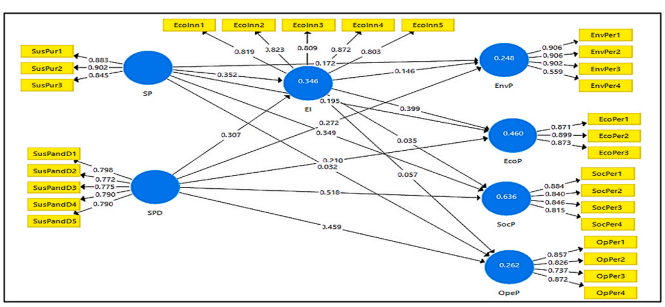

Fig. 2. Structural equation modeling.

Table 6
Hypotheses testing for direct relationships.

Hypotheses	Relationships	Β	*t*-Statistics	*p*-values	Results
H1a	SP→ EnvP	0.167	2.233	0.020	Supported
H1b	SP → EcoP	0.191	3.236	0.001	Supported
H1c	SP→ SocP	0.350	6.900	0.000	Supported
H1d	SP→ OpeP	0.025	0.391	0.696	Not Supported
H2a	SP&D→ EnvP	0.277	3.705	0.000	Supported
H2b	SP&D→ EcoP	0.209	3.072	0.002	Supported
H2c	SP&D→ SocP	0.522	9.936	0.000	Supported
H2d	SP&D→OpeP	0.466	6.836	0.000	Supported

Note: EI = Eco-innovation, EcoP = Economic Performance, EnvP = Environmental Performance, OpeP= Operational Performance, SP= Sustainable Procurement, SP&D = Sustainable Procurement and Distribution, SocP = Social Performance.

4.1. Path coefficient (β) and t -values (results of the main (direct) relationships)

The results in Table 6 indicate that all direct hypotheses are accepted except H1d. The influence of sustainable procurement on environmental performance was found to be significant (β = 0.167, t = 2.233, p = 0.020), supporting H1a. Similarly, the results show that positive and significant relationships exist between sustainable procurement and economic performance (β = 0.191; t = 3.236; p = 0.001), and between sustainable procurement and social performance (β = 0.350, t = 6.900, p = 0.000) supporting H1b & H1c. However, relationship between sustainable procurement and operational performance (β = 0.025, t = 0.391, p = 0.696) was not found supporting H1d. Furthermore, results indicate the relationship between sustainable packaging and distribution and environmental performance (β = 0.277, t = 3.705, p = 0.000) and between sustainable packaging and distribution and economic performance (β = 0.209, t = 3.072, p = 0.002) was found significant and supporting H2a & H2b. Similarly, the results show that positive and significant relationships exist between sustainable packaging and distribution and social performance (β = 0.522, t = 9.936, p = 0.000) and between sustainable packaging and distribution and operational performance (β = 0.466, t = 6.836, p = 0.000) supporting H2c & H2d.

4.2. Mediation analysis

The third and fourth hypotheses were tested through mediation by smart PLS. The number of bootstrap samples for bias-adjusted bootstrap confidence intervals was maintained at 5000, while the confidence level for all confidence intervals was maintained at 95%. This mediation analytical test presents the total, direct and indirect effects of the mediation model variables.

In hypothesis 3a, the total effect of sustainable purchasing (SP) on environmental performance was significant (β = 0.224, t = 3.114, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation), the (direct) effect of SP on environmental performance was significant (β = 0.172, t = 2.251, p = 0.012). The indirect effect of the relationship between SP and environmental performance through eco innovation was also significant (β = 0.051, t = 2.02, p = 0.022). This shows that the relationship between SP and environmental performance is partially mediated by eco innovation. As a result, H3a is supported.

In hypothesis 3b, the total effect of sustainable purchasing (SP) on economic performance was significant (β = 0.336, t = 5.294, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation) the (direct) effect of SP on economic performance was significant (β = 0.194, t = 3.075, p = 0.001). The indirect effect of the relationship between SP and environmental performance through eco innovation was also significant (β = 0.142, t = 4.805, p = 0.001). This shows that the relationship between SP and economic performance is partially mediated by eco innovation. As a result, H3b is supported.

In hypothesis 3c, the total effect of sustainable purchasing (SP) on social performance was significant (β = 0.361, t = 7.3, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation) the (direct) effect of SP on social performance was significant (β = 0.349, t = 7.152, p = 0.001). The indirect effect of the relationship between SP and social performance through eco innovation was also significant (β = 0.012, t = 2.634, p = 0.001). This shows that the relationship between SP and social performance is partially mediated by eco innovation. As a result, H3c is supported.

In hypothesis 3d, the total effect of sustainable purchasing (SP) on operational performance was significant (β = 0.05, t = 0.709, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation) the (direct) effect of SP on operational performance was significant (β = 0.03, t = 0.41, p = 0.001). The indirect effect of the relationship between SP and operational performance through eco innovation was also significant (β = 0.02, t = 2.799, p = 0.001). This shows that the relationship between SP and operational performance is

Table 7
Mediation.

Hypothesis	Total Effect		Direct Effect		Indirect Effect				
	Effect (β)	p - value	Effect (β)	p - value	Effect (β)	SD	T value	p - value	BI [5%; 95%]
H3a: SP- > Eco Innov- > Env Perf	0.224	0.001	0.172	0.012	0.051	0.025	2.02	0.022	0.013; 0.096
H3b: SP- > Eco Innov- > Econ Perf	0.336	0.001	0.194	0.001	0.142	0.03	4.805	0.001	0.099; 0.196
H3c: SP- > Eco Innov- > Soc Perf	0.361	0.001	0.346	0.001	0.012	0.018	2.634	0.001	0.016; 0.045
H3d: SP- > Eco Innov- > Op Perf	0.05	0.001	0.03	0.001	0.02	0.025	2.799	0.001	0.021; 0.061
H4a: Sust Pkg & D- > Eco Innov- > Env Perf	0.317	0.001	0.272	0.001	0.045	0.024	1.866	0.031	0.011; 0.09
H4b: Sust Pkg & D- > Eco Innov- > Econ Perf	0.332	0.001	0.209	0.001	0.124	0.035	3.54	0.001	0.073; 0.188
H4c: Sust Pkg & D- > Eco Innov- > Soc Perf	0.529	0.001	0.519	0.001	0.01	0.016	2.626	0.001	0.014; 0.039
H4d: Sust Pkg & D- > Eco Innov- > Op Perf	0.478	0.001	0.461	0.001	0.017	0.023	2.757	0.001	0.016; 0.06

partially mediated by eco innovation. As a result, H3d is supported.

In hypothesis 4a, the total effect of sustainable Packaging and Distribution (SP&D) on environmental performance was significant (β = 0.317, t = 0.856, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation) the (direct) effect of SP&D on environmental performance was significant (β = 0.272, t = 3.761, p = 0.001). The indirect effect of the relationship between SP&D and environmental performance through eco innovation was also significant (β = 0.045, t = 1.866, p = 0.031). This shows that the relationship between SP&D and environmental performance is partially mediated by eco innovation. As a result, H4a is supported.

In hypothesis 4b, the total effect of sustainable Packaging and Distribution (SP&D) on economic performance was significant (β = 0.332, t = 5.137, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation) the (direct) effect of SP&D on economic performance was significant (β = 0.209, t = 3.133, p = 0.001). The indirect effect of the relationship between SP&D and economic performance through eco innovation was also significant (β = 0.124, t = 3.54, p = 0.001). This shows that the relationship between SP&D and economic performance is partially mediated by eco innovation. As a result, H4b is supported.

In hypothesis 4c, the total effect of sustainable Packaging and Distribution (SP&D) on social performance was significant (β = 0.529, t = 12.067, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation) the (direct) effect of SP&D on social performance was significant (β = 0.519, t = 10.464, p = 0.001). The indirect effect of the relationship between SP&D and social performance through eco innovation was also significant (β = 0.01, t = 2.626, p = 0.001). This shows that the relationship between SP&D and social performance is partially mediated by eco innovation. As a result, H4c is supported.

In hypothesis 4d, the total effect of sustainable Packaging and Distribution (SP&D) on operational performance was significant (β = 0.478, t = 7.351, p = 0.001) as shown in Table 7. With the inclusion of mediating variable (Eco Innovation) the (direct) effect of SP&D on operational performance was significant (β = 0.461, t = 6.511, p = 0.001). The indirect effect of the relationship between SP&D and operational performance through eco innovation was also significant (β = 0.017, t = 2.757, p = 0.001). This shows that the relationship between SP&D and operational performance is partially mediated by eco innovation. As a result, H4d is supported. These results are summarized in Table 7.

4.3. *Explanatory power of the model*

The predictive precision of the model is estimated using the coefficient of determination (R^2) as shown in Table 8. The R2 statistic indicates the model's explanatory power, or the aggregate influence of all exogenous factors on dependent variable. The R2 value ranges from 0 to 1, with a greater value indicating greater prediction accuracy. The model with an R-square value of 0.449, 0.359 and 0.381 showed a moderate level of predictive precision in the creative deviant, prosocial-motivation, and social capital.

Table 8
Dependent variable and related R-square.

No	Dependent Variable	R^2
1	Eco-Innovation	0.346
2	Economic Performance	0.460
3	Environmental Performance	0.248
4	Operational Performance	0.262
5	Social Performance	0.636

4.4. *Effect size f2*

The size of the effect of the predictor construct may be measured by f^2 (Cohen et al., 1988). The f^2 value of 0.02 indicates a small effect, the f^2 value of 0.15 indicates an average effect and the f^2 value of 0.35 indicates a significant effect (Cohen et al., 1998). The results show that external corporate social responsibility, internal corporate social responsibility, prosocial motivation, and social capital have small effect on creative deviance. Whereas external corporate social responsibility has a medium effect on prosocial motivation and internal corporate social responsibility has a small effect on prosocial motivation. The results of that model are presented in the following Table 9.

5. Discussion, implications, and limitations

The study findings reveal that sustainable procurement positively influences the environmental, economic, and social performance of servitized Pakistani SMEs. Hence, we receive significant support for the application of Porter's VCM logic that influences of such initiatives are not limited to one specific function. Also, these findings support prior research by Meehan and Bryde (2011), Ghadge et al. (2019), Schmidt et al. (2017) and Qorri et al. (2021), where the positive influences of sustainable procurement on different performance indicators of the firms was referred to. The lack of significance of sustainable procurement on the operational performance can probably be explained by referring to high economic (and political) uncertainty and consequent risks in Pakistani context (e.g., Abas et al., 2022; Ahmed et al., 2022). Despite the criticality of sustainability, operational level performance in such contexts tends to be more dependent on external factors (Munir

Table 9
Effect size for Constructs.

Construct	EI	EcoP	EnvP	OpeP	SocP
EI		0.193 (Average)	0.018 (Small)	0.03(Small)	0.002(No)
SP	0.123 (Small)	0.041 (Small)	0.023 (Small)	0.001(No)	0.194 (Average)
SP&D	0.094 (Small)	0.049 (Small)	0.059 (Small)	0.170 (Average)	0.438 (Average)

Note: EI = Eco-innovation, EcoP = Economic Performance, EnvP = Environmental Performance, OpeP= Operational Performance, SP= Sustainable Procurement, SP&D = Sustainable Procurement and Distribution, SocP = Social Performance.

et al., 2020).

We further found that despite risks and uncertainties, sustainable packaging, and distribution by servitized Pakistani SMEs tends to positively influence performance over the whole value chain i.e., environmental, economic, social, and operational performance. Hence, our findings support some prior studies that stressed the criticality of both packaging and distribution (logistics) in relation to the performance indicators (e.g., Lightfoot et al., 2012; Blome et al., 2014; Wang and Dai, 2018; Hao et al., 2021; Afif et al., 2022).

The findings of mediation analysis support our hypotheses 3 and 4. An interesting finding relates to eco-innovation partially mediating the relationship between sustainable procurement and operational performance. This shows that despite uncertainties and vulnerabilities of the external context, servitized SMEs can improve their operational performance in relation to sustainable procurement by efficient use of eco-innovation. Hence, process-oriented innovative practices, including those linked to sustainability (Hao et al., 2021) can offer operational benefits to the servitized firms (Zhu and Sarkis, 2007).

5.1. Implications

The study findings offer both theoretical and practical implications. A major theoretical implication relates to the applicability of Porter's VCM as a solid theoretical foundation while studying sustainability practices in the inbound or outbound value-chain functions of servitized firms. Keeping in view, the interconnectedness of the organizational functions and consequent performance influences, Porter's VCM should be considered as a useful theoretical lens by the scholars analyzing such topics due to its inclusiveness.

Another theoretical implication of our study relates to the current debate in green servitization literature. Often called as a strategy (Maric and Opazo-Basáez, 2019) or a business model (Zhang et al., 2022b), green servitization has opened a whole new paradigm for achieving sustainable supply chain objectives. Previously researchers have hinted the benefits of servitization for resource constrained firms through introducing value-adding services (e.g., Crozet and Milet, 2017; Rabetino et al., 2018). Our study shows the criticality of eco-innovation for servitized SMEs in relatively high-risk emerging economies. Our analysis covered all the aspects of green servitization, namely inbound logistics (sustainable procurement) and outbound logistics (sustainable packaging and distribution) and their influence on a firm's environmental, economic, social, and operational performance. Hence, our findings stress the vitality of collaboration with upstream and downstream partners of servitized SMEs to achieve SSCP. Also, our findings show that eco-innovation can help servitized SMEs to overcome some of the negative influences of external context such as risks and uncertainties on their operational performance. Thus, a strong implication for the scholars exploring the impact of green servitization, eco-innovation is a critical factor that can strengthen theorization of their research.

For the managerial audience, our study's key takeaway is understanding the benefits of sustainable servitization. Our results show SME managers especially the ones operating in emerging economies that green servitization can potentially enhance customer satisfaction and improve their overall performance, including operational, environmental, social, and economic performance (Zhang et al., 2022b). Furthermore, both financial and non-financial benefits of eco-innovation should be considered by the managers as eco-innovation may enhance an organization's market share, marginal profitability (Li et al., 2014), and non-financial performance by raising its environmental reputation and offering innovative services and products (Malmi and Brown, 2008). This, to some extent, can help these manaers justify the costs involved in servitization process and improve their brand name.

Our findings also explain how green servitization affects performance, despite uncertainty and high-risk conditions prevalent in emerging economies. Previously researchers have highlighted the impact of environmental uncertainty in emerging economies that create challenges for firms offering servitized services (Kreye, 2017). Keeping in view the visible environmental degradation in countries as Pakistan, those servitized SMEs which take the lead towards sustainability will benefit from reputational and branding benefits as well. Our study established the intermediating role of eco-innovation for servitized SMEs where eco-innovation methods include six market prospects: reduced risk, enhanced performance and savings, a guarantee of authenticity, planning dependability, new clients and market sections, and new product and service sections. Such benefits can be achieved by other SMEs operating in similar contexts by benchmarking these attributes.

5.2. Limitations

Our paper has several limitations as well. First the current literature on servitization highlights the importance of understanding the dynamics of product life cycle and relate it to sustainable servitization debate (Bustinza et al., 2021). Our study, however, considers the Porter Value chain model to tracks the impact of various sustainable supply chain practices on the performance of these servitized SMEs. Future researchers can combine the value chain model with the product life cycle approach to track the impact of these practices across the life cycle and even the extended life cycle. Thus, other sustainable practices of servitized SMEs (e.g., sustainable product design, sustainable production, sustainable customer cooperation, reverse logistics etc.) could be added to the model. Second, digital servitization along with servitization ecosystem have also been identified by researchers as two of the possible research streams in the servitization literature. How technologies help servitized SMEs improve their service offerings and deliver sustainable services remotely to an international client base is a valid and pertinent research question, which can be studied by future researchers, especially in the emerging economy context.

We specifically focused on servitized SMEs in Pakistan, so generalization possibilities based on our findings are limited. However, considering the dearth of research on these topics in relatively high uncertainty and risk countries like Pakistan, our paper builds a good basis for future scholars to build on. We primarily focused on two sustainable supply chain practices (i.e., sustainable procurement and sustainable packaging & distribution); which can be considered a limitation as well.

Future studies can also analyze variances in sustainability-based performance outcomes across the value chain, particularly for enterprises which are transitioning or have transitioned to servitization. In this concern, the role of power of different value chain members can be an insightful topic to study as well. Further on, examining how the expenses of sustainable practices and the associated performance advantages are shared (or not shared) along the value chain would be interesting area to research in this concern. Finally, future studies can look at the influences of internal and external incentives for firms pursuing sustainability initiatives across their supply chains. In this concern, it would also be useful to evaluate both possible facilitators (such as supporting programs like ISO 9000 and ISO 14000) and obstacles (such as a lack of training or supply chain power) to various sustainability-based performance objectives.

Data availability

The data that has been used is confidential.

Appendix-A: Constructs Definitions

Sustainable Procurement: Reflects the importance of cooperating with suppliers for the purpose of developing products that are environmentally and socially sustainable (Qorri et al., 2021, p. 198).

Sustainable Packaging and Distribution: Any means of transportation from suppliers to manufacturers to final customers with the purpose of having the minimal harmful impacts and packaging usage (Qorri et al., 2021, p. 198).

Eco-innovation: the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives (Kemp and Pearson, 2007, p. 8).

Environmental Performance: Environmental outcomes represent consequences of SSCM practices on the natural environment inside and outside organizations (Qorri et al., 2021, p. 200).

Social Performance: Social performance represents indicators covering improvements in overall stakeholder welfare, community health and safety of workers (Qorri et al., 2021, p. 200, p. 200).

Operational Performance: Operational outcomes measure improvements in operational activities to more efficiently produce and deliver products to customers (Qorri et al., 2021, p. 200, p. 200).

Economic Performance: Economic outcomes are expected financial benefits resulting from sustainable supply chain practices (Qorri et al., 2021, p. 200).

Appendix-B: Research instrument

Sustainable Supply Chain Practices

Sustainable Procurement

My supplier controls hazardous substances and have or are obtaining standards such as ISO 14001, OHSAS 18000, ISO 9000, SA8000, and/or ISO 26000.

I carry out environmental and social audit of suppliers' internal management practices.

Cooperation with suppliers is carried out for improving environmental and social practices to achieve sustainability goals.

Sustainable Packaging & Distribution

You carry out cooperation with buyers to standardize and downsize packaging and to use renewable energy in transportation.

Our organization devotes a lot to provide a better life for future generations.

How often do you promote and adopt reusable and recycled packaging?

How often do you make use of alternative fuel vehicles and collaborative warehouses?

How often do you combine modes of transportation and upgrade freight logistics to minimize negative environmental impacts?

How often do you try to get the customer feedback regarding the use of green transportation?

Suppliers' Sustainable Performance

Environmental Performance

Reduction of air emission and wastewater.

Reduction of solid waste and energy consumption.

Reduction of used harmful and toxic materials.

Firm's environmental accidents decline and biodiversity protection in the surrounding area.

Economic Performance

Cost reduction for purchased materials, energy consumption, waste treatment and discharge.

Growth in market share and profitability.

Increase on return on investment and sale growth.

Social Performance

Improvement of corporate image.

Enhanced employee job satisfaction.

Enhanced health and safety of employees.

Improvement of awareness and protection of the claims and rights of people in community served.

Operational Performance

Reduction in delivery time and improvements in capacity utilization.

Reduction in inventory levels and scrap rate.

Improvement in the efficiency of inbound and outbound logistics.

Quality improvement of products and services.

Eco-Innovation

Low energy consumption such as water, electricity, gas, and petrol during production/use/disposal.

Recycle, reuse, and remanufacture material.

Use of cleaner technology to create savings and prevent pollution.

The manufacturing process of the firm effectively reduces the emissions of hazardous substances and waste.

The manufacturing process of the firm reduces the use of raw material.

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