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## Abstract

This study examines the dynamics of buyer-supplier relationship connectors and sustainable supply chain performance, with the moderating role of the level of Servitization and the mediating role of Supply Chain Integration. A purposive sampling survey conducted by a well-structured questionnaire has been administered through a sample of 120 organizations. The manufacturing industries of Pakistan, including, automotive, textile, chemical, electronics, and pharmaceutical were selected for data collection. Using the theoretical lens of Social Exchange Theory, the outcomes reveal that a positive relationship exists between buyer-supplier relationships and sustainable supply chain performance. The results imply that companies that actively engage in building strong and collaborative relationships with their suppliers are expected to achieve higher levels of sustainability in their operations. Moreover, through a mediated moderating model, supply chain integration and servitization emerged as significant mediators and moderator among buyer-supplier relationships and sustainable supply chain performance. Besides the theoretical contribution, this study offers substantial evidence to policymakers regarding how to improve and reshape their relations to accomplish supply chain integration and enhance sustainable supply chain performance.

**Keywords:** Buyer-Supplier Relationship Connectors, Servitization, Sustainable Supply Chain Performance, Manufacturing Sector of Pakistan

## 1. Introduction

Sustainability is considered as a main component of competitive advantage (Zhang et al., 2018) and has gained immense importance in both the business world and society at large. As external pressures abound, manufacturers need to emphasize their contribution towards the triple bottom line (3P's- people, planet, and profit) (Bocken et al., 2014). Servitization, the process of integrating services with physical products (Baines et al., 2009), is found to have an impact on sustainability in various ways (Doni, 2019; Correa, 2018). Keeping in view the significance of servitization, manufacturing firms undergo a transition in the direction of a service-centric business model (Mastrogiacomo et al., 2020). Today, manufacturers are augmenting their complex products with a wide range of services, driven by an amalgamation of economic, environmental, and market factors. This shift reveals the fact that the importance of services in value creation is growing while the economic impact of manufacturing is weakening (Peneder & Streicher, 2018). This would be consistent with efforts toward increased sustainability in supply chains.

Although theory supports the servitization stance and successful practical instances of the world's top firm servitized projects abound (Spohrer, 2017), numerous companies encounter challenges when transitioning to service-oriented business models (Lütjen et al., 2017). For many, servitization remains enigmatic (Kamal et al., 2020), leading to various difficulties. Hence, for servitization, effective management of relationships within the supplier network becomes crucial (Gebauer et al., 2013; Johnson & Mena, 2008; Martinez et al., 2010). In this context, the significance of fostering robust collaborative buyer-supplier relationships, even in situations characterized by evident market power imbalances, is considered binding for success. When a buyer cultivates a collaborative and supportive relationship with its suppliers, it is more probable that suppliers will demonstrate exceptional commitment which consequently leads to competitiveness (Hobbs, 2020).

Interestingly, many manufacturers possess technical and product-centric skills (Alghisi & Saccani, 2015) but are short of resources and competencies to offer both goods and services at the same time (Xing et al., 2017), hence, firms should integrate with the external environment, particularly with their key suppliers (Gebauer et al., 2013). Such 'integration' acts as the linchpin in the interplay of buyer-supplier relationships and supply chain performance (Jajja et al., 2018). It involves seamless coordination and information exchange both within the organization and externally, encompassing suppliers and customers (Schoenherr & Swink, 2012). It is further observed that a strongly established buyer-supplier relationship helps to sustain the partners thereby leading to improved sustainable supply chain performance (Crespin-Mazet & Dontenwill, 2012). Authors, like, Kumar and Rahman (2016) suggested that a positive relationship exists between buyer-supplier relationship and supply chain sustainability.

There are limited studies in the current literature on variables affecting the relationship between the buyer-supplier and sustainable supply chain firm performance (Brax et al., 2021). In this regard, the level of servitization is one of the most relevant factors highlighted by several authors in understanding the relationship between buyers and sellers in a supply chain (Martín-Peña et al., 2023). Servitization has the potential to impact the dynamics of a buyer-supplier relationship by bringing in layers of collaboration, dependence, shared objectives, and risk/reward sharing. It is therefore, suggested that future researchers can study the link between buyer-supplier relationships and different types of service provision by taking into account the nature of the relationships and transactional versus longitudinal buyer-supplier relationship (Shah et al., 2020, p. 13).

Accordingly, an attempt has been made to understand the relationship between buyer-supplier relationship and sustainable supply chain performance. Further, for better insights, the mediating role of supply chain integration (SCI) and the moderating role of servitization between buyer-supplier relationships and sustainable supply chain performance have been identified. This study has been carried out in the manufacturing sector of Pakistan. It is believed that the results of this research will aid in an improved understanding of buyer-supplier relationships and their effect on sustainable supply chain performance.

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## **2. Literature Review**

To servitize manufacturing firms need to partner with their suppliers to make sure that necessary resources and capabilities are available (Johnson & Mena, 2008; Martinez et al., 2010; Gebauer et al., 2013). Thus, manufacturers must consider the intricacies of the buyer-supplier relationship and its impact on sustainable supply chain performance. To investigate the buyer-supplier relationships, we use the existing framework from Cannon and Perreault (1999).

### **2.1. Buyer-Supplier Relationship Connectors (BSRC)**

Cannon and Perreault's (1999), framework suggests five relationship “connectors” in buyer-supplier relationship and the same have been used multiple times to explore buyer-supplier relationship. For example, Penttinen and Palmer (2007) used the model to analyze downstream relationships of servitized manufacturers, and Bastl et al. (2012) focused on the upstream ones whereas more recently Bressanelli, G et al. (2022) used the framework to study the relationships within a circular economy driven industrial district. Relationship connectors are defined as “dimensions that reflect the behaviors and expectations of behaviors in a buyer-seller relationship” (Cannon & Perreault, 1999, p.441) and each one of them provides unique information about how firms interact and exchange. The connectors include information exchange, operational linkages, legal bonds, cooperative norms, and adaptations by the buyer and supplier.

### **2.2. Sustainable Supply Chain Performance (SSCP)**

In recent years, the importance of sustainability in the context of supply chain management has increased. Assessing, enhancing, and advancing the sustainability performance of a company's supply chain is now crucial for identifying targets and future actions (Chatman & Flynn, 2001). Four sustainable supply chain performance indicators, i.e. operational, economic, environmental, and social have been identified by numerous authors to measure sustainable performances. Operational indicators are a crucial aspect of supply chain management, playing a key role in driving sustainable supply chain performance. Recently there has been a mounting emphasis on the significance of sustainable supply chain practices, as businesses recognize the impact that their operations can have on the environment, society, and their bottom line (Tseng et al., 2019). Bag et al. (2020) state that sustainable supply chain performance is achieved by green operations practices application. Green operations refer to the use of environmentally friendly practices in the design, planning, execution, and control of operations processes. Research has shown that green operations like energy-efficient manufacturing procedures and sustainable sourcing can lead to benefits comprising cost reduction, enhanced environmental performance, and social responsibility (Baah et al., 2021).

Second, Economic indicators, as research has shown that the adoption of circular economy principles can lead to a range of economic benefits, including reduced costs, increased revenue, and improved competitiveness (Younis & Sundarakani 2020). For example, studies have found that the reuse of materials and components in closed-loop supply chains can reduce the need for new resources and lower production costs, while also reducing waste generation and enriching environmental performance (Chen et al., 2006). Similarly, the use of renewable energy sources in supply chain operations can reduce energy costs and increase energy independence, while also reducing greenhouse gas emissions and improving environmental performance (Alzoubi et al., 2020).

Third, Environmental factors, as environmentally sustainable supply chain performance, is the adoption of sustainable procurement practices. Research has shown that the implementation of sustainable procurement practices, such as selecting suppliers based on environmental performance and promoting the use of sustainable materials, can lead to significant reductions in environmental impact throughout the supply chain (Balon, V 2020). For example, Choudhary et al. (2020) discovered that supplier selection criteria based on environmental performance can lead to significant reductions in environmental impact in the supply chain.

Lastly, Social sustainability factors discuss the capability of companies to achieve social impact and have a positive contribution to the social and economic development of the communities in which they operate (Beltagui et al., 2020). The studies reviewed demonstrate that social sustainability in the supply chain has gains for companies and their stakeholders alike, including improved worker well-being, enhanced reputation, and increased social capital (D'Eusonio et al., 2019; Mani et al., 2020).

### **2.3. Buyer-Supplier Relationship Connectors and Sustainable Supply Chain Performance**

Sustainability within B2B relationships is an ideal condition, as it reduces expenses and enhances profitability, particularly in the context of global B2B operations (Graça, 2021). BSRCs can facilitate sustainability by building trust and cooperation between buyers and suppliers, thereby reducing transaction costs and promoting the exchange of sustainability-related information (Sarkis et al., 2011). Not confined solely to sustainability, a well-balanced buyer's relationship with its suppliers can yield a threefold impact on the dynamics of buyer-supplier relations (Jaegler & Roques, 2023), and companies that implement best practices in sustainable social supply chains not only enhance their corporate image but also prevent unnecessary costs and productivity losses (Fernando et al., 2022).

Relationships between buyers and suppliers facilitate the implementation of innovative environmental technologies (Zhu et al., 2007). Ageron et al. (2012) have emphasized the impact of strategically formed partnerships to foster effective collaboration amongst supply chain partners, leading to the establishment of a sustainable supply chain. Collaborations with upstream and downstream partners directly influence the implementation of environmental sustainability practices (Vachon & Mao, 2008). To promote the adoption of sustainable practices and foster long-term relationships, companies should employ relationship strategies that cultivate trust and commitment among their supply chain partners (Ki Fiona Cheung & Rowlinson, 2011). Therefore, effective relationship management with both customers and suppliers is imperative for the effective employment of sustainability practices across the supply chain resulting in competitive advantages and profitability (Zhu et al., 2008). Thus, incorporating any kind of sustainable supply chain management (SSCM) practices results not only in improved sustainability performance but also in enhanced organizational performance across dimensions such as cost, quality, speed, flexibility, and innovation (Yusuf et al., 2020).

Achieving superior supply chain performance is not solely determined by a certain type of relationship between manufacturer and service suppliers. Instead, both external contingent factors and relationship connectors determine the performance outcomes. For instance, within the context of the UK grocery sector, Tesco's delisting of certain Coca-Cola products (Telegraph, 2015) points to the absence of a cooperative relationship, leading to dependence on formal governance. Conversely, Tesco has kept a strong and

collaborative partnership with Procter and Gamble (Manager, 2013) despite their contractual foundation. Interestingly, both Coke and P&G demonstrate commendable supply chain performance (Gartner, 2015). These findings align with empirical studies that indicate diverse types of relationships (Vesalainen & Kohtamäki, 2015) can yield superior firm performance.

Kumar and Rahman (2016), discovered that the triple bottom line of sustainability measures was positively impacted by a strong buyer–supplier relationship. However, there are also several potential limitations to this relationship. For example, a strong focus on buyer–supplier relationship connectors may cause limited focus on short-term gains, instead of long-term sustainability goals (Seuring & Müller, 2008). Additionally, there are trade-offs between environmental and social objectives and financial performance, which may not always be aligned with the goals of all parties involved.

Overall, while the relationship between BSRC and SSCP is complex and multifaceted, there is evidence to suggest that a positive relationship exists (Kumar & Rahman, 2016). Based on the identified research need and the aforementioned literature, the following hypothesis is established:

H<sub>1</sub>: Buyer-supplier relationship connectors have a significant impact on the sustainable supply chain performance of a firm.

#### **2.4. Moderating Effect of Servitization**

Servitization involves a shift from the conventional approach of offering products and basic support services to delivering advanced services that generate enhanced value for customers worldwide (Baines & W. Lightfoot, 2013). Sousa and da Silveira (2017), have classified services into basic and advanced. Basic services are services that efficiently establish and maintain fundamental production functionality for the customer. The traditional perspective of basic services is matched by conventional servitization. It reflects the incremental transformation of the business model and views services as an extension or “add-on” to the product. Product delivery, installation, and maintenance are examples of essential services. For fundamental services, the primary function of service is to guarantee that products perform properly (Adshead et al., 2019). Advanced services are services that co-create value with consumers and go beyond basic product functionality to tailor products and services to customer requirements. Advanced services indicate a significant business model transition in which items are viewed as an integral component of the service provided to clients. Services and goods are bundled as an integrated offering for advanced services, which is the primary source of income and profits (Rapaccini et al., 2020). Integrated solutions, equipment rental services, and process-oriented training services are examples of advanced services.

Buenechea-Elberdin et al. (2023) studied servitization as a moderating variable in the relationship between intellectual capital and product/service innovation performance and reported significant results. Wang, Gao et al. (2022) reported significant moderation effects of servitization on the positive relationship between latent needs identification of supply chain members and radical product innovation performance of firms. Kohtamäki et al. (2020) observed significant interaction effects of servitization in a positive relationship between digitalization and firm performance. Ou et al. (2023) determined significant interaction effects of servitization as it tends to weaken the relationship between economic policy uncertainty and firm performance. The empirical work of Kumar and Rahman (2016) also used servitization as a potential moderating variable.

Primarily, the focus of this study is to measure an exchange relation while the level of servitization can significantly influence the strength of relationships. It is, therefore, hypothesized that:

H<sub>2a</sub>: Basic services strengthen the relationship between buyer-supplier relationship connectors and the sustainable supply chain performance of a firm.

H<sub>2b</sub>: Advanced services strengthen the relationship between buyer-supplier relationship connectors and sustainable supply chain performance of a firm.

#### **2.5. Mediating Role of SCI between Buyer-Supplier Relationship Connectors and SSCP**

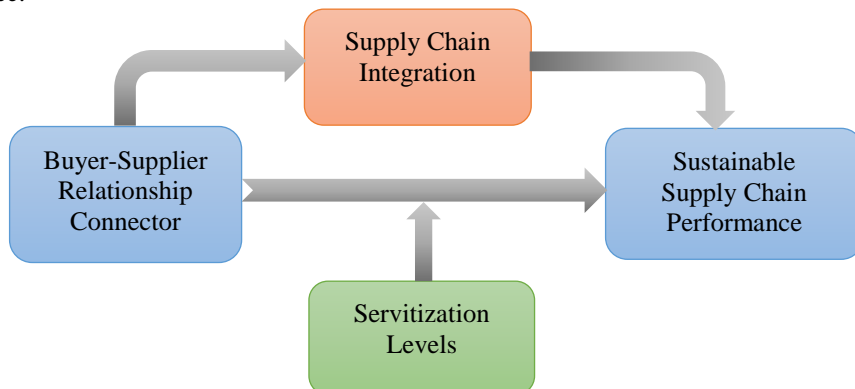
SCI is characterized by strategically partnering with supply chain collaborators, while also harmonizing internal practices about the flow and manufacturing of products, services, information, and collective decision-making across diverse functional domains within the organization. This integration extends both within the firm (internal integration) and beyond its boundaries, encompassing both supplier and customer integration (Jajja et al., 2018). SCI mainly involves coordination and information-sharing activities that enable the firm to understand suppliers’ processes, capabilities, and constraints (Schoenherr & Swink, 2012).

Buyer-supplier relationships frequently serve as the bedrock of SCI. This foundation relies on effective communication, trust, and collaboration between buyers and suppliers, resembling a partnership model. Such collaborative efforts are vital for sharing information, coordinating activities, and jointly striving to attain common objectives. Supplier integration, in this context, often adopts a partnership model characterized by deeper and long-term relationships with a limited number of vendors, who, in turn, maintain fewer connections with customers. These enduring partnerships foster the development of robust communication channels and trust, creating an environment conducive to extensive knowledge sharing within the supply chain (Stevens & Johnson, 2016). Moreover, in the context of a buyer-supplier relationship and SCI, when one party commits to this partnership, it becomes essential for both parties to engage in effective information sharing. This sharing of information is crucial to synchronize the operational processes of both parties. Failure to provide the necessary information can jeopardize the relationship, as it hinders the smooth execution of operational processes by one party, leading to disruptions that impact the entire supply chain (Birasnav et al., 2019).

According to Munir et al.(2020), SCI is the linchpin for robust supply chain risk management and heightened operational performance of any supply chain. It enables the collection of accurate information from external suppliers and customers, bolstering risk detection and prevention. Additionally, internal integration enhances information sharing within the organization, enabling effective analysis and implementation of external data. Therefore, it can be stated that an enhanced integration can yield significant performance improvements in terms of cost, quality, product variety, and service levels.

In light of the aforementioned insights, it becomes evident that SCI plays a pivotal and multifaceted role in the intricate web of buyer-supplier relationships and supply chain performance. As established, SCI is the prerequisite for robust supply chain risk management and heightened operational performance. It forms the bridge that links the strategies and collaboration embedded within buyer-supplier relationships to the tangible outcomes experienced in supply chain performance. When buyer-supplier relationships

are fortified through effective communication, trust, and collaborative efforts, they set the stage for the harmonious integration of internal practices and external supply chain processes. As these integrated processes and relationships mature, the supply chain benefits in terms of cost-efficiency, product quality, variety, and service levels. In essence, SCI can be seen to be acting as the mediator, translating the collaborative foundations of buyer-supplier relationships into tangible performance improvements across the supply chain, affirming the intricate relationship between these elements. Based on this, it is thus proposed that,  
H<sub>3</sub>: Supply Chain Integration mediates the relationship between Business-Supplier Relationship Connectors and Sustainable Supply Chain Performance.



**Fig 1: Theoretical Framework**

**3. Methodology**

The target population was manufacturing firms operating in Pakistan. The questionnaire, once finalized, was reviewed by experts whose constructive feedback significantly contributed to enhancing the questionnaire. The data collection took place between January to May 2023. The data was collected from five major manufacturing industries, i.e. Automotive, Textile, Chemical, Electronics, and Pharmaceutical. Based on the Pakistan Stock Exchange directory of listed companies, firms were identified and approached for data collection. A sample of 120 organizations fitting the criteria mentioned was chosen. The constructs included in the study’s model were operationalized by using multiple (adapted) scale items. Table 1 provides details of the measurement items.

**Table 1: Measurement of Variables**

Variables	Operationalization
Buyer-Supplier Relationship Connectors (Cannon and Perrault 1999 relationship framework).	Information exchange and cooperative norms (1 = very inaccurate description to 7 = very accurate description). Operational linkages and Legal Bonds (1= Strongly Disagree to 7 = Strongly Agree). Whereas relationship-specific adaptations for seller and buyer (1= not at all and 5= very much)
Sustainable Supply Chain Performance (Zailani et al., 2012).	Operations were measured by five items. The remaining constructs including economic, social, and environmental were measured by three items each. (1= strongly disagree to 7= strongly agree)
Supply Chain Integration (Kauppi et al., 2016; Chaudhuri et al., 2018).	Sharing information with suppliers (customers) Developing collaborative approaches with suppliers (customers) System coupling with suppliers (customers) Joint decision-making with suppliers (customers) (1= strongly disagree to 7= strongly agree) Basic services with three items: Maintenance and repair of products sold to the company (BAS1) Installation/implementation services (BAS2) Spare-parts/consumables provision for the company (BAS3)
Servitization Levels (Sousa and da Silveira 2017).	Advanced services with five items: Rental/lease of products (ADS1) Product modifications and customization (ADS2) Help desk/customer support center (ADS3) Training in using the products to the company (ADS4) Consultancy services (ADS5)’. (1= to a small extent, 4= to a very large extent)

This study used the PLS-SEM method (i.e., a commonly used method in management research) for the analysis of data (Kaufmann and Gaeckler, 2015). Considering the sample size and model characteristics, a PLS-SEM approach was found suitable for this analysis (Henseler et al., 2016; Reinartz et al., 2009). The data were analyzed with SmartPLS software (i.e., SmartPLS 4) (Ringle et al., 2015), and the bootstrap technique was applied to test the significance level of the hypothesized relationships.

#### 4. Results

Structural equation modeling (SEM) was employed to evaluate the hypothesis. Before running the model using Smart PLS, a CMB test was performed. When an instrument has the same number of answer possibilities and identical scales, it can lead to common method bias (Podsakoff et al., 2003). The connection between variables can be impacted by common technique bias, which can provide inaccurate findings. As a result, the researchers must run a common method variance test. Harman’s one-factor test is the most popular methodology for finding common method bias. Two requirements are part of the test: first, there must be many factors with Eigenvalues larger than 1, and second, no one factor may explain more than 50% of the total variation (Podsakoff et al., 2012). The first requirement was satisfied when six components had Eigenvalues larger than one. The second criterion was satisfied as the primary factor (Principle Component Analysis) explained 22% of the total variance, indicating that common technique bias did not affect the data's validity.

##### 4.1. Measurement Model

The criteria to evaluate the measurement model included: scale, reliability, and validity of the first- and second-order constructs. Scale items with loadings of 0.707 or more were retained in the case of five first-order (latent) constructs. While items having loadings between 0.5 and 0.707 were scrutinized. Four indicators were removed (IE information exchange, OL operational linkages, LB legal bonds, and BA buyer adaptation). Consequently, 8 constructs were maintained: 2 related to Buyer Supplier Relationship Connectors (CN cooperative norms and SA Supplier Adaptations), 2 related to Servitization Level (BAS & ADS), and 4 related to Sustainable Supply Chain Performance (OPE operational, EOC economic, SOC social and EN Environmental). The values of Cronbach’s alpha ( $\alpha$ ) and composite reliability (CR) are higher than 0.7 for the key constructs (i.e., five first-order reflective constructs) revealing their reliability (Hair et al., 2017).

Moreover, average variance extracted (AVE) and composite reliability with Dijkstra–Henseler’s rho ( $\rho_A$ ) were estimated to assess the convergent validity. For all of the key constructs (i.e., first-order latent constructs),  $\rho_A$  is greater than 0.707 (Dijkstra & Henseler, 2015). Although in this study AVE is less than 0.5 for key constructs, however, due to higher composite reliability (see Table 2), the convergent validity of the key constructs can be considered adequate (Fornell & Larcker, 1981). No collinearity issues were present as the maximum variance inflation factor was 2.6, which is less than the suggested threshold level of 3.3 (Petter et al., 2007). Lastly, discriminant validity was measured by inspecting the cross-loadings and by using the Fornell and Larcker criterion. At the item level, it is confirmed that each scale item loads higher to its respective construct than with any other construct included in this study. At the construct level, it was found that the square root of AVE for each construct was higher than the respective correlations involving the same construct (Fornell and Larcker, 1981), thus discriminant validity of key constructs was revealed.

**Table 2: Measurement Model Convergent Validity Profiles**

	Cronbach's Alpha	Composite Reliability	AVE
Buyer-Supplier Relationship	0.822	0.854	0.369
Supply Chain Performance	0.876	0.899	0.431

##### 4.2. Structural Model

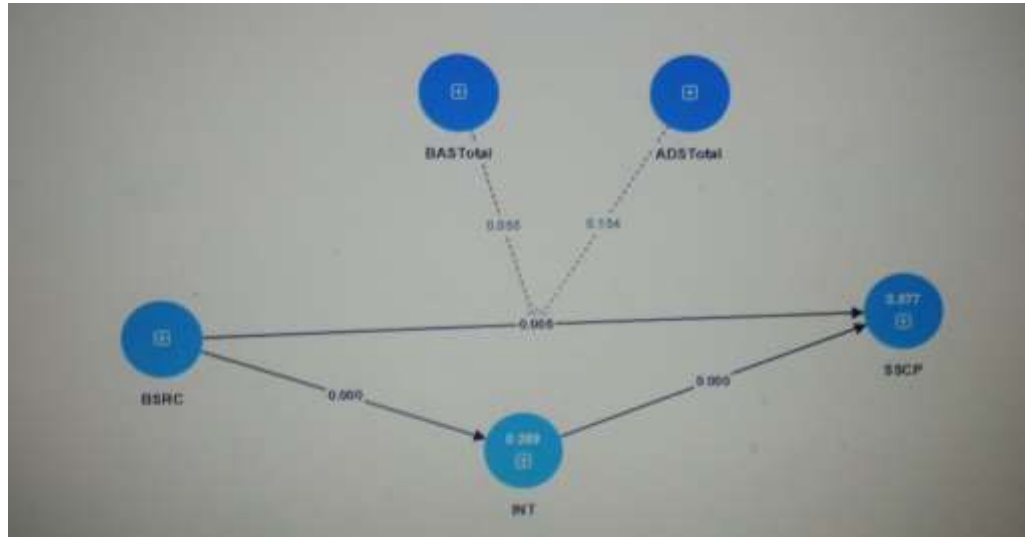
The path coefficients are used to evaluate the structural model. According to Hair Jr. et al. (2019), PLS-SEM uses bootstrapping, a nonparametric statistical test, to determine the significance of the calculated path coefficients. The values of the path coefficients, p-values, and t-values between variables that were determined empirically are given in Table 3. The hypothesis was evaluated using path assessments to decide whether to accept or reject it. Therefore, at a significance level of 0.05, three of the hypotheses were supported by the results provided for the current study.

**Table 3: Hypothesis Testing Results – Path Coefficients**

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
Advanced Level Moderator Effect -> Supply Chain Performance	0.110	0.085	0.108	1.021	0.154
Basic Level Moderator Effect -> Supply Chain Performance	0.204	0.192	0.128	1.595	0.055
Buyer-supplier relationship -> Supply Chain Performance	0.272	0.251	0.104	2.613	0.005
Buyer-supplier relationship -> Supply Chain Integration -> Supply Chain Performance	0.245	0.274	0.066	3.710	0.000

A structural model was employed to test the hypothesis in light of the PLS-SEM results. To test the hypothesis, the values of t-values, p-values, and path coefficients at a significance level of 0.05 were assessed. Based on these numbers, three hypotheses in the current investigation were approved and the details are given in table 4.

**Figure 3: Final Structural Model results showing P values**



**Table 4: Hypothesis Results**

Hypothesis	p-value	Result
H <sub>1</sub> : The presence of buyer-supplier relationship measures enhances the sustainable supply chain performance of a firm.	0.005	Supported
H <sub>2a</sub> : Basic services strengthen the relationship between buyer-supplier relationship and sustainable supply chain performance of a firm.	0.055	Supported
H <sub>2b</sub> : Advanced services strengthen the relationship between buyer-supplier relationship and sustainable supply chain performance of a firm	0.154	Not Supported
H <sub>3</sub> : Supply Chain Integration mediates the relationship between buyer-supplier relationship connectors and sustainable supply chain performance.	0.000	Supported

The findings of hypothesis H<sub>1</sub> show a strong and favorable correlation between a firm's SSCP and its BSRC. The path coefficient from BSRC to SSCP has a t-statistics of 2.613 and a significant p-value of 0.005. This indicates that BSRC measures significantly and positively affect SSCP. In light of the findings, it may be said that establishing and nurturing buyer-supplier relationships generate a favorable effect on the overall performance of a firm in terms of sustainability.

Secondly, the study proposed the moderating role of a basic level of servitization H<sub>2</sub> and the results reflect that the basic level of servitization moderated the strength of the relationship between the buyer-supplier relationship and sustainable supply chain performance of a firm. Moreover, the interaction term between Advanced Services and Buyer-Supplier Relationship Connectors (BSRC) has a T-statistic of 1.021 and a p-value of 0.154. This suggests a less clear, perhaps weak, moderating effect of ADS on the relationship between BSRC and SSCP.

Finally, hypothesis H<sub>3</sub> posits that Supply Chain Integration (SCI) serves as a mediator in the relationship between BSRC and SSCP. Analyzing the data, we find the total indirect effect from BSRC to SSCP with a T-statistic of 3.710 and a significant p-value of 0.000. This statistical evidence strongly supports the hypothesis, suggesting that SCI indeed serves as a key component in mediating the relationship between BSRC and SSCP. The outcomes align with many studies, for example, Erboz et al., (2022); Jajja et al., (2018); Sundaram et al., (2018), wherein, it was observed that SCI is a potential mediator and leads to effective SSCP.

This finding carries significant implications. It underscores that it's not merely the existence of strong buyer-supplier relationships that directly influences SSCP. Instead, it is the extent to which these relationships lead to effective SCI that ultimately drives sustainability performance within a supply chain. This means that organizations should not only focus on fostering robust BSRC but also prioritize efforts to ensure that these relationships translate into streamlined and integrated supply chain operations.

## 5. Theoretical & Practical Contribution and Future Directions

The study contributes to the existing literature on SSCP from the theoretical lens of Social Exchange Theory (SET). It means a healthy buyer-supplier motivates supply chain members to put maximum effort into integrating their processes and operations and it will lead to SSCP. Similarly, buyer-supplier relationships supported by planned servitization generate multiplier effects on SSCP. Secondly, this study contributes to supply chain and management literature because this study observed the mediating role of SCI and supports the previous empirical works of Jajja et al., 2018; Sundram et al., (2018) where SCI emerged as a potential mediating variable that led to SSCP. The current study reveals that SCI is an important factor that has the potential to improve an organization's supply performance as well as give room for better buyer-supplier relationships, coordination, and collaboration.

Thirdly, the study used the level of servitization as the moderator between the buyer-supplier relationship and SSCP. The current study has implications for better SSCP and to strengthen buyer-supplier collaboration. In the light of social exchange theory, both basic and higher degrees of servitization, the process of adding services to conventional product offerings put businesses in a better position to take advantage of buyer-supplier interactions and improve the supply chain's sustainability performance. To achieve



improved sustainability results in SCM, this research emphasizes the significance of taking a holistic strategy that considers both the degree of servitization and the structure of buyer-supplier interactions. Businesses looking to enhance the performance of their sustainable supply chains should be particularly aware of how their servitization initiatives enhance and supplement the advantages of strong buyer-supplier relationships.

In a recent article on “state-of-the-art research priorities”, Baines et al. (2017) described SCI as an emerging theme. Hence, the current analysis delivers numerous theoretical contributions that expand the knowledge of the service field. The level of servitization within a firm plays a critical part in strengthening the positive relationship between buyer-supplier measures and SSCP. Firms that provide higher levels of service and integrate services into their traditional product offerings are better positioned to leverage customer-supplier relationships to improve their supply chain’s sustainability performance. This finding highlights the importance of adopting a holistic approach to improving supply chain sustainability, where service efforts complement and amplify the benefits of effective buyer-supplier relationships.

Overall, this research contributes to the literature by highlighting the significance of adopting a holistic approach that considers both the level of servitization and the nature of buyer-supplier relationships in achieving higher sustainability outcomes in SCM. The identification of servitized firms as better positioned to leverage buyer-supplier relationships for enhanced supply chain sustainability emphasizes the strategic value of integrating services into traditional product offerings. These findings offer valuable insights for managers and decision-makers seeking to improve their supply chain sustainability efforts in today’s environmentally conscious business landscape. Furthermore, the study contributes to the academic discourse on supply chain management, buyer-supplier relationships, and sustainability by providing empirical evidence that enriches and advances existing theoretical perspectives in this field.

The results of this study offer the manufacturing sector, an evidence-based recommendation about the importance of planned cooperation between buyer and supplier relationships for SCI and SSCP. The findings give policymakers, guidance on how to improve and reshape their workforce to accomplish SCI and enhance SSCP. When it comes to addressing supply chain problems especially supply chain performance issues that are seriously harming the supply chains' environmental quality, SCI can assist policymakers and top management in incorporating suggestions from employees, customers, and suppliers. It is recommended that supply chain managers fund more servitization activities to reap the benefits and enhance supply chain performance. The manufacturing industry and supply chain managers may support SCI initiatives and activities by using the moderated mediation model created in this study. It also guides organizations who are not already implementing these initiatives on how to enhance their SCI.

Research projects in the future can address the limitations of this study. On one hand, by increasing the number of respondents, more solid and generalizable, statistical results and new analyses would become possible. This will help to determine differences at the sectoral level. Second, additional research could discover deeper why, the different connectors have a stronger or weaker impact on SSCP. Third, key suppliers were selected to generate the responses from the manufacturing industries, further studies could be done by including other types of suppliers to study their impact on the firm’s SSCP. Such varying perspectives might provide deeper insights for managers, researchers, and policymakers.

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