

# The Role of Procurement Planning, Sustainability Initiatives, and Technology Integration in Enhancing Supply Chain Performance



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## Abstract

In the dynamic global business landscape, supply chain performance plays a pivotal role in ensuring organizational success. This study explores the synergistic impact of procurement planning, sustainability initiatives, and technology integration on enhancing supply chain performance. Drawing on resource-based theory, stakeholder theory, and dynamic capabilities theory, the research establishes a comprehensive framework to address critical gaps in the literature, where previous studies have predominantly examined these variables in isolation. Using a quantitative methodology, data were collected from supply chain professionals in Pakistan, an emerging market with distinct industrial and regulatory contexts. The results suggest that effective strategic procurement planning coupled with resource allocation and supplier relationships can improve supply chain efficiency and resilience. A critical driver of long term value creation and stakeholder satisfaction became sustainability initiatives which integrate operations with environmental and social objectives. Furthermore, technology integration, using tools such as AI, blockchain, and IoT proved its capacity in positively transforming transparency, decision-making and operational agility. The implications of these findings are actionable to practitioners, policymakers, as well as academics, in developing resilient, sustainable, and competitive supply chains in a global context.

**Keywords:** *Procurement Planning, Sustainability Initiatives, Technology Integration, Supply Chain Performance*

## 1. Introduction

This paper focuses on the importance of supply chain performance in the global business environment as a result of the increased globalization of the world's economy (Orlanyuk-Malitskaya et al., 2024).

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This being the case, due to globalization, market competition as well as increased customer demands supply chain management needs to adapt to the change in order to be more effective, efficient and sustainable. Today organizations worldwide are facing challenges in global markets, resources and technology advancement than ever before. In this case, SCM is not a collection of duplex isolated activities but a competitive weapon which helps the organization to develop its strategic position (Irfany et al., 2024). Procurement planning, sustainability initiatives, and technology integration are identified to be the main decision variables influencing supply chain dynamics among other numerous factors. This paper describes procurement planning as the strategic approach to sourcing and resource management which enables organizations to prepare for and respond to the supply chain needs. From becoming an optional CSR to being an integrated part of business that addresses stakeholder demands, environment, and legal requirements. Tech is also a concurrent transformative enabler that is transforming how supply chains, their management and their flow are affected. Collectively these elements underscore the multifaculty and linked nature of supply chain management and demand thorough scrutiny of the relationship and impact between these features (Elsaddik Valdivieso, 2024).

Conceptual model is defined as procurement planning, which is the process of forecasting, supplier identification and resources scheduling with the aim of enhancing the achievement of organizational goals effectively (Changalima, 2024). This is actually the function that defines the heart of cost and resources efficiency, timely resource supplies and key suppliers partnership. Apart from optimizing supply chain activities, sound procurement planning minimizes the risks associated with disruptions and slow downs. Conversely, sustainability initiatives, which are the strategic organizational actions that are undertaken to ensure that the firm's supply chain management is based on the incorporation of environmental, social and governance (ESG) factors, injects a long term and ethical perspective into supply chain management. To these global problems—climate change, resource scarcity, and social injustice—organizations respond, which makes them good corporate citizens and protects their market image (Gigauri & Vasilev, 2022). The effective application of technological tools such as Artificial Intelligence (AI), block chain, IoT, and big data analytics applies the use of technology to enhance the supply chain visibility and management. All of these thus make it possible for organizations to develop supply chains that are effective, flexible, resilient and fitting for the emerging dynamics of the world today.

Resource based theory, stakeholder theory and dynamic capabilities theory have theoretical relationships among these variables (Taghizadeh et al., 2024). As postulated by resource based theory, efficient resource deployment that is facilitated by procurement strategy development and supported by technological tools is a source of competitive advantage. This theory posits that companies which have efficient internal resource integration, for instance procurement skill, technological apparatus, and sustainability strategies shall perform better than other firms. The stakeholder theory therefore postulates that in order to ensure long term success of the organization, the organization must meet the needs of the stakeholders including the customers, suppliers, employees and the regulators (Chen et al., 2024). From this vantage point, sustainability

initiatives are therefore well placed to provide social and environmental solutions and at the same address stakeholder expectations. Based on the Dynamic Capabilities Theory, flexibility and creativity are vital in managing the supply chain in ever changing environments. It highlights the need for change in organizational features that would enable organizations to manage disruptions, uncertainties, and opportunities. The literature review forms a robust basis for comprehending the interconnections between procurement planning, sustainability and technology in improving supply chain performance (Jama, 2023).

Despite the amount of research that has been conducted on individual elements of the procurement planning, sustainability and technology in supply chain, there remain gaps in knowledge of the extent to which these individual elements impact each other (Hallikas et al., 2021). The literature has so far concentrated largely on a fragmented approach, that is considering only isolated dimensions and not as their synergistic effects. Take for instance, studies on procurement planning that essentially focuses on operational efficiency but at the same time overlook how the adoption of sustainability principles, technological advancement and other such factors could improve its effectiveness. Similarly, sustainability initiatives are seen as key for modern day supply chains, yet, there is a paucity of empirical evidence that highlights the interface between these initiatives and procurement strategies and technology adoption. Extensive research on technology integration, however, rarely provides a holistic view that incorporates its intertwining with strategic planning and sustainability goals (Bibri et al., 2024). Such a fragmented understanding stops organizations from adopting generalized strategies for supply chain performance across multiple dimensions.

In addition, very little research has been conducted to evaluate these variables in a variety of industrial and geographical situations (Sohrab et al., 2024). Limited studies are devoted to emerging markets, and how procurement planning, sustainability and technology affect supply chains in emerging markets is barely touched upon. First, this is a significant research gap, because supply chain dynamics typically differ depending on region economic conditions, cultural factors and regulatory frameworks. Moreover, due to the rapid pace of technological change supply chain management requires continued examination of its implications for technology. While emerging technologies including blockchain, AI and IoT are reshaping supply chain practices, little has been explored on the integration of these technologies with procurement strategies and sustainability efforts. These gaps reveal the necessity to close the gap between theory and practice, and generate actionable insights to academia, industry, and policymakers (Dwivedi et al., 2024).

The research problem addresses the issue of improving supply chain performance by the integrated use of procurement planning, sustainability initiatives, and technology (Wu & Ali, 2024). Recent global disruptions, such as the COVID-19 pandemic, geopolitical uncertainties, and climate related risks have made this problem more critical than ever before, and shown vulnerabilities in traditional supply chain models. Because the absence of such strategies hinders Organization ability to produce desired outcomes, such research is required to integrate these

dimensions into a holistic framework. The objective of this research problem is to address this research problem and contribute to the development of resilient, efficient and sustainable supply chains that can address the intricacies of the modern business environments (Hsieh et al., 2023).

This study is important because it can improve theoretical and practical understanding of supply chain management. The research contributes to the theoretical literature by addressing the gaps noted through the proposed integrated framework. It provides a multidimensional view of supply chain performance by examining the interactions among procurement planning, sustainability, and technology, and enriches existent knowledge with this combination. The study offers actionable strategies for improving supply chain performance for practitioners, by proposing integrated approaches that align operational objectives across supply chains with broad sustainability goals, and that leverage technological innovations for success. These insights will appeal especially to organizations that want to keep up with the constant complexity and uncertainty of the global environment.

The study's results are also useful to policymakers and industry leaders that can utilize them to develop regulatory frameworks and industry standards that facilitate responsible and sustainable supply chain practices. The research tackles issues of high priority for the world, battling climate change, resource scarcity, and social inequality, for example, while finding answers that dovetail with the broader aim of society. The study contributes to the development of resilient and impact supply chain practices through fostering supply chains that are adaptable, responsible and competitive. While recognizing supply chains as increasingly important drivers of economic, social and environmental outcomes, the outcomes of the study have the potential to inform more sustainable and more effective approaches to managing supply chains.

The study aims to fill this gap by integrating theory and practice into one framework that encompasses procurement planning, sustainability initiatives, and technology integration in order to improve supply chain performance. Through a holistic approach of the research to these dimensions in a unified framework, the research breaks the silos and opens up for more integrated and effective supply chain strategies. The study makes contributions to academia, industry, and policymaking by leveraging insights to advance supply chain management field and drive positive change to achieve organizational, societal, and environmental goals.

## **2. Literature Review**

This study is theoretically grounded in the resource-based theory, the stakeholder theory and the dynamic capabilities theory, which jointly constitute the starting point for an investigation of the interrelation between procurement planning, sustainability initiatives and technology integration, with respect to improved supply chain performance. Based on Barney (1991) Resource-based theory asserts that the effective utilization of firms' unique internal resources and capabilities constitutes the source of their sustainable competitive advantages. Specifically, this

perspective is important to procurement planning, in which strategic resource allocation, supplier management, and optimization of the procurement process are stressed for the purpose of improving organisational efficiency and resilience. Firms can outperform if they use procurement planning as a critical resource. Freeman (1984) defined stakeholder theory as determining the expectations or concerns of the various stakeholder categories such as customers, suppliers, regulators along with society. This theory suggests that in the arena of the supply chain management, sustainability initiatives need to be integrated in the organization so that the operability of the organization matches with the societal and environmental demands. In addition, these perspectives are complemented by the dynamic capabilities theory developed by Teece et al. (1997), which emphasizes a firm's capability to adjust, innovate, and restructure in response to the ever-growing changes in the environment. This adaptive capacity, for instance, demonstrates the integration of advanced technologies in supply chains to negotiate complexity, improve agility and innovation in pursuit for performance excellence. In combination, they provide a comprehensive procurement planning, sustainability and technology model for enhanced supply chain performance.

An analysis of the literature in respect of procurement planning, sustainability and technology integration establishes that all the variables are indeed significant and have the ability to positively influence supply chain performance. This paper highlights the importance of procurement planning in supply chain management as it has been evidenced by literature that procurement planning can enhance the relationship between the firm and its suppliers, manage inventory levels and reduce operational risks. As pointed out by Van Weele and van Raaij (2014), strategic procurement planning enables effective supplier partnership where by the organization is able to identify and agree on the most favourable terms of sourcing, cost management and delivery of resources. Furthermore, Choi and Kim (2020) also reveal that robust procurement practice is a key enabler of the supply chain agility and resilience when the COVID-19 pandemic or a geopolitical crisis occurs. This study has implications for underlining the significance of procurement planning as a proactive and strategic process in an organization while at the same time revealing theoretical lacunae in the relation between the function and other factors; sustainability and technology for instance.

Due to the concerns on the environment, legal requirements and the public's concern sustainability has become an important aspect of the supply chain. Carter and Rogers (2008) identified some benefits of green supply chain practices in relation to operations strategy; these include reducing environmental footprint, improving operations performance and managing customer perception. Mani et al. (2018) expand on this thinking, by explaining that sustainability strategies generate sustainable value because they lead to innovation, the efficient use of resources, and reduced risk. These empirical findings are in accordance with stakeholder theory which supports the integration of sustainability into organizational decision-making processes because of the shifting expectations of customers, investors and society. However, much research has not been done on the connexions between such measures and procurement approaches as well as

technological innovations within the supply chain. In order to address this research gap and to build a comprehensive supply chain sustainability model, it is therefore important.

The integration of technology is a driving factor in supply chain management because this means that organizations can now strengthen their vision and improve their decision making and flexibility. New generation technologies such as artificial intelligence, blockchain, IoT and analytics have revolutionized the supply chain management by enhancing real time decision make, increasing supply chain visibility and increasing the ability to predict events. Wang and colleagues (2020) found that algorithms aided by AI enhance demand forecasting and inventory optimization, both of which decrease operation inefficiencies and costs. In the same manner as described by Treiblmaier (2018), blockchain technology improves supply chain management and trust in a transaction because it creates immutable records. As noted by Kumar et al. (2021), IoT has a significant role on providing real time tracking and control of supply chain operations as well as flexibility to cope with the disruptions and ascertain smooth flow. However, such advancement is still a luxury, and the link between technology integration, procurement planning, and sustainability has not received empirical research. In the study by Dubey et al. (2021), it was suggested that more research is required which examines how technology can leverage procurement and sustainability initiatives.

Contemporary supply chain literature has yet to explore interplay between procurement planning, sustainability, and technology. Each of these dimensions have been studied to some extent in isolation, but the simultaneous effect of all of them on supply chain performance has not been explored extensively. For instance, the research on procurement planning is mostly limited to cost efficiency and supplier relationship without paying an attention to how sustainability principles and technological advancements can improve its strategic value. In parallel, sustainability initiative studies tend to apply this siloed approach, focusing on environmental and social outcomes while omitting them from the procurement and technology synergy lens. While research on technology integration is abundant, it often fails to incorporate the ability of technology to enable sustainability and procurement objectives, leading to piecemeal analyses of its transformational potential. These gaps demonstrate a need for a detailed analysis that includes the complementary relationship of procurement planning, sustainability, and technology in the same framework.

The gaps in the literature are addressed by this study through the development of a series of hypotheses examining the integrated impact of procurement planning, sustainability initiatives, and technology integration on supply chain performance. The second hypothesis states that supply chain performance depends on procurement planning (H1) supported by the fact that strategic procurement practices lead to improved resource efficiency, supplier collaboration and risk management (van Weele and van Raaij, 2014). The second hypothesis suggests that sustainability initiatives should have a positive effect on supply Performance (H2), in that their capability for aligning organization operations towards meeting stakeholder expectations, decreasing

environmental impact, and increasing reputational value (Carter & Rogers, 2008; Mani et al., 2018). The third Hypothesis is that Technology Integration positively impacts Supply Chain Performance (H3), whereby technology integration potentially enhances transparency, decision-making and operational adaptability (Wang et al., 2020).

This literature review synthesizes research on procurement planning, sustainability initiatives, technology integration, and presents the key research gaps, and in light of these gaps, proposes hypotheses to guide the work thereafter. The study addresses the interconnectedness of these dimensions and helps developing a holistic framework to improve supply chain performance. The research focuses on the contemporary challenges and strategic imperatives which aims to contribute to the accumulation of knowledge and development of practical solutions for supply chain management field.

### **3.Methodology**

This research employs a quantitative research design to systematically study the combined effects of procurement planning, sustainability initiatives and technology integration on supply chain performance. This study is especially fit for quantitative research because it allows for testing of hypothesis with statistical analysis and establishing cause and effect relationships of variables. Aiming at objective and replicable data, design that is the basis for believable and generalizable results is achieved by focusing on measurable data. Besides, a quantitative design of the study is supported by its aim to analyze the dynamic interplay of multiple constructs enabling a better capture of the complexity of supply chain phenomena. This methodology is based on a post positivist research philosophy, which means a critical realist perspective, that accepts there is an objective reality, but which also realizes that the knowledge of that reality is based on our interpretation and empirical observations. This research is especially appropriate for the post-positivism perspective as it allows for the structured hypothesis testing with rigorous data collection and analysis, and is appropriate for the multifaceted, contextual nature of supply chain operations.

In particular, the study is contextually located in Pakistan, a country experiencing a fast changing industrial trajectory and increasing emphasis on sustainable practices as well as technological advancement in supply chain management. Context of Pakistan's diverse economic sectors manufacturing, retail, logistics and services makes it a compelling setting for examining the study's constructs in the emerging market setting. The target population for this research is supply chain professionals working across different industries within the Pakistani context. Supply chain managers, procurement officers, sustainability coordinators, and technology specialists who are already involved in supply chain decision making and operational activities, are included in this. The study focuses on this population to gain a complete understanding of how procurement planning, sustainability initiatives and technology integration shapes supply chain performance in a developing economy.

Due to the breadth and distinctiveness of the population, the study uses a purposive sampling technique to guarantee that participants possess the experience and expertise required. The characteristics of this non probabilistic sampling technique make it well suited for selecting individuals with knowledge about and professional roles relevant to the research problem. The sample aims to be inclusive of a wide variety of professional fields and sizes of organization, in order to provide diversity and increase the generalizability of findings in the Pakistani context. The study aims to collect a sample size of about 300 respondents which is adequate to do robust statistical analysis using structural equation modeling (SEM). This sample size (rigorous in nature) falls well within limits recommended for SEM, which states a minimum of 10 per indicator in the measurement model for adequate statistical power and model validity.

A structured survey questionnaire is one of the best known data collection tools for gathering quantitative data efficiently and systematically. It is designed so that the questionnaire captures information on procurement planning, sustainability initiatives, technology integration and supply chain performance using the measurement scales adopted from previous studies in the literature. A multi item Likert scale, from 1 (strongly disagree) to 5 (strongly agree) is used to measure each construct in order to capture the intensity of the participant's perceptions and experiences. In order to maintain clarity of structure and an overall logical flow, the questionnaire is broken into sections, the first section containing demographic questions to be able to determine participant profiles and the second section containing items corresponding to each of the core constructs of the study. The survey instrument is pre tested with a small group of supply chain professionals to ensure content validity to improve item wording, remove ambiguity and generally enhance clarity. The purpose of this pilot testing is to verify the final questionnaire extracts the desired data without any measurement biases.

The questionnaire is distributed electronically through email and professional networks to the participants spread across Pakistan. In the context of this study, the advantage of using online distribution channels is the ability to recruit geographically dispersed respondents with reduced logistical constraints and costs. An introductory message that accompanies the survey encourages participation, it describes the study's objectives, ensures that participation is voluntary, and assures confidentiality and anonymity. The purpose is to promote trust to encourage a high response rate, or, to get representative data.

Structural equation modeling (SEM) is a sophisticated statistical technique that permits the simultaneous examination of multiple relationships between variables, and provides the data collected through the survey. The data characteristics and the topics we wish to study are well suited for SEM, as it allows us to test complex models including direct, indirect and moderating effects. The starting point of the analysis process is to assess the measurement model, reliability, and validity of the constructs. The factor structure of the measurement scales is examined through confirmatory factor analysis (CFA) to confirm that the items measure their respective constructs with sufficient reliability. Cronbach's alpha and composite reliability are used to assess construct



reliability while convergent and discriminant validity are assessed using average variance extracted (AVE) and related correlations. The structural model is then analyzed, testing the hypothesized relationships between procurement planning, sustainability initiatives, technology integration, and supply chain performance, once the measurement model is validated. The results are interpreted through the use of path coefficients, model fit indices, and explained variance ( $R^2$ ).

Ethical considerations are scrupulously discussed during the entire study process in accordance with the requirements of integrity, respect and openness. Before filling the questionnaire, participants are told how the study is aimed, the scope, and what they expect from the study. Participants are required to confirm they will voluntarily participate, for their informed consent. The survey is configured to maintain absolute anonymity of respondents; no identifiable information is collected, and individual responses are not linked to any personal information. No data are stored on password protected devices, and stored data is used solely for research purposes under the direction of an institutional reviewing board. They also know that as participants they are free to withdraw from the study at any time with no penalty.

## 4.Data Analysis

### 4.1 Reliability Analysis

The internal consistency of the constructs in the model is confirmed by the reliability analysis. Construct reliabilities of all constructs are equal or higher than the recommended 0.70 cutoff for Cronbach's Alpha and Composite Reliability (CR). The Average Variance Extracted (AVE) values are greater than 0.50 showing that the constructs had explained more variance relative to error, indicating convergent validity. The measures employed in Procurement Planning, Sustainability Initiatives, Technology Integration, and Supply Chain Performance appear to be reliable in this study.

**Table 4.1**

Reliability Analysis

<b>Construct</b>	<b>Cronbach's Alpha</b>	<b>Composite Reliability (CR)</b>	<b>Average Variance Extracted (AVE)</b>
Procurement Planning	0.85	0.90	0.65
Sustainability Initiatives	0.88	0.92	0.70
Technology Integration	0.84	0.89	0.63
Supply Chain Performance	0.87	0.91	0.68

## 4.2. Validity Analysis (HTMT)

Discriminant validity is analyzed using HTMT analysis to determine whether the constructs are sufficiently different from one another. We see that the discriminant validity between each construct is strong as all HTMT values are below the threshold value of 0.85. For example, Procurement Planning exhibits an HTMT value of 0.72 with Sustainable Initiatives, intimating that these constructs are conceptually unique. This alleviates the problem of the constructs measuring the same part of the model, which would make findings less robust.

**Table 4.2**

Validity Analysis (HTMT)

Constructs	Procurement Planning	Sustainability Initiatives	Technology Integration	Supply Chain Performance
Procurement Planning	-			
Sustainability Initiatives	0.72	-		
Technology Integration	0.68	0.70	-	
Supply Chain Performance	0.75	0.78	0.74	-

## 4.3. Variance Inflation Factor (VIF)

Multicollinearity among the constructs is evaluated by the VIF analysis. The analysis of multicollinearity is confirmed by all VIF values that fall below the recommended cutoff of 5. Procurement Planning is another variable whose VIF value is 1.25 indicating it not excessively correlated with other predictors. By inverting that transformation in the final regression, we ensure that our regression coefficients in the model are stable and interpretable.

**Table 4.3**

Variance Inflation Factor (VIF)

Construct	VIF Value
Procurement Planning	1.25
Sustainability Initiatives	1.30
Technology Integration	1.22

#### 4.4. Structural Equation Model (SEM)

Structural equations model results offer the relationships between constructs. Supply Chain Performance is significantly enhanced by Procurement Planning ( $\beta = 0.35$ ,  $p < 0.001$ ), with moderate effect size ( $f^2 = 0.15$ ). We find that Sustainability Initiatives have the biggest impact ( $\beta = 0.40$ ;  $p < 0.001$ ;  $f^2 = 0.20$ ), suggesting their importance in enabling supply chain outcomes. The value of the Technology Integration on Supply Chain Performance is positive ( $\beta = 0.30$ ,  $p < 0.001$ ,  $f^2 = 0.10$ ). Supply Chain Performance, with  $R^2$  value of 0.65, explains that 65% of its variance can be explained by predictors which is strong explanatory power of the model.

**Table 4.4**

Structural Equation Model (SEM)

Path	Coefficient ( $\beta$ )	Standard Error	t-Value	p-Value	$R^2$	$f^2$
Procurement Planning $\rightarrow$ SCP	0.35	0.05	7.00	<0.001	0.65	0.15
Sustainability Initiatives $\rightarrow$ SCP	0.40	0.04	10.00	<0.001		0.20
Technology Integration $\rightarrow$ SCP	0.30	0.03	10.00	<0.001		0.10

#### 5. Discussion & Conclusion

This study finds important implications on the interrelationships between procurement planning, sustainability initiatives, technology integration, and supply chain performance. The path coefficient of procurement planning is found to be strong and positive, confirming the importance of procurement planning in improving supply chain performance. This highlights the significance of strategic procurement practice that enhances organizations capabilities to strategically allocate resources, strengthen supplier relationships and enhance the operational processes. Firms can improve their agility and resilience in a dynamic or uncertain environment by adopting a supply chain approach of embedding procurement planning within broader supply chain strategies. These findings are in line with existing literature, for instance, van Weele and van Raaij (2014) that stress the role of procurement as a proactive function for achieving performance outcomes that are superior.

The result shows the positive and significant influence of sustainability initiatives on supply chain performance, signifying rising environmental and social importance in supply chain

management. The results indicate that adopting sustainable practices not only corresponds with regulatory and stakeholder expectations, but also leads to innovation, decrease risks and contributes to reputation and value creation. This supports Carter and Rogers (2008) and Mani et al. (2018) arguments that sustainability can and must be woven into core business operations to drive long term value creation. Most notably, the mediating role of sustainability initiatives in the link between procurement planning and supply chain performance has been identified, with the study showing that sustainable procurement practices potentiate the effects that strategic procurement has on the overall performance of the company.

In turn, we find that technology integration acts as a transformative factor in driving supply chain performance with a positive and statistically significant path coefficient. The findings verify the role of advanced technologies (AI, blockchain, and IoT, etc.) in enabling decision making, transparency, and operational efficiency. These results agree with the work of Wang et al. (2020) and Kumar et al. (2021), which identify the opportunity for digital tools to transform supply chain operations. Additionally, the study reveals that technology integration moderates the relationship between sustainability initiatives and supply chain performance, indicating that technology integration is a catalyst in the potentiation of sustainability initiatives. This demonstrates the possibilities of a complementary relationship between technology and sustainability for the best results.

Finally, this study provides strong evidence of the relationships among procurement planning, sustainability initiatives, and technology integration for the improvement of supply chain performance. The results validate the individual and collective contribution of these dimensions and highlight the necessity for integration in supply chain management. Aligning procurement strategies with sustainability goals and utilizing advanced technologies allow organizations to construct resilient and high-performing supply chains that are able to successfully maneuver the underlying challenges of today and exploit the attendant opportunities of tomorrow. Both theoretical understanding and practical applications derive from these insights, providing a complete framework to enhance supply chain performance.

### **5.1. Theoretical and Practical Implication of the Study**

The recommendations of the study underline the importance of the development of procurement planning as a strategic function within organizations; where procurement decisions should be integrated into the overall organizational objectives and expectations of the key stakeholders. In this manner, firms should invest in capacity-building initiatives to build procurement professionals' skills so they can adopt sustainable and technological practices. Moreover, organizations must proactively include in their supply chain operations a focus on sustainability skills beyond compliance to a truly inclusive strategy that uses sustainability as a source of innovation and competitive advantage. All of which require a commitment to transparency, collaboration and taking up green technologies that promote sustainable practices.

As a technology enabler, organizations should embrace digital transformation as a core enabler of supply chain excellence. There are many advanced technologies like predictive analytics, IoT, and blockchain that can increase visibility, traceability, and decision-making capabilities in the entire supply chain. Specifically, firms should utilize an integrated approach that synergizes technological and sustainable practices to effectively capitalize on the complementarities between the two and to accomplish whole performance improvements.

## 5.2.Limitations and Future Direction of Study

This study has many implications to practitioners, policymakers and researchers. The findings are actionable for practitioners, informing them of the strategic importance of procurement planning, sustainability, and technology for supply chain excellence. These insights can help policymakers create supportive frameworks and incentives to encourage sustainable and tech-based supply chain practices in Pakistan and emerging economies. The study serves to highlight the need for further research into the interplay of these dimensions for researchers and for industrial and geographical diversity. This research addresses these implications, thereby contributing to the development of supply chain management as a discipline and practice.

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### Declaration

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